

SUPERSPECIALITY CURRICULUM (D.M./M.Ch.)

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**ALL INDIA INSTITUTE OF MEDICAL SCIENCES
BHUBANESWAR**



FOREWORD



AIIMS Bhubaneswar started its first superspeciality courses in Neurosurgery, Paediatric Surgery and Pulmonary, Critical Care & Sleep Medicine in July 2017. There was a great sense of accomplishment and pride when the first residents joined the institute. Once the courses started, I requested our faculty to take a critical look at the curricula, and we quickly realized the need to bring in some sort of uniformity in the manner in which the formative and summative assessments were conducted. Changing and improving the question paper pattern, and the clinical training provided to residents, planning for training in areas in which we did not have the infrastructure or expertise were also on top of our agenda.

The superspeciality training in India is almost like the gurukul tradition where residents are expected to see, do and perform with a nearly passive training for three years. While this has been working for many decades, the change in the attitude of learners, method of selection of candidates for the courses which rely only on knowledge of answering MCQs and the fact that some of the departments had just three faculty members or less meant that faculty did not have much time to spend on teaching. In addition, being a young institute, we did not have the privilege of institutional memory to sustain our efforts as many things taken for granted in the older institutions needed to be spelt out in order to achieve and maintain consistent standards of training.

A well-designed curriculum that is ably reinforced and supported by faculty development programmes which prepare the faculty to fulfil the departmental vision is the cornerstone of any training programme. However, this is not very much understood or “liked” by faculty, as it is often seen as a tool that controls their authority and limits their decision making when it comes to assessment. Nothing is further from the truth. A curriculum prescribes minimal standards. The resident and the faculty need to chart their own course of learning as there is no limit that can be put on the skills that can be learnt in any subject. The curriculum, pedagogy and assessment are all inherently linked in order to deliver an optimal training programme, and it is this aspect, I hope, we have concentrated on. We have tried to make the written examinations more specific, less ambiguous so that residents learn to argue the intricacies of the subject and the depth of their knowledge is assessed rather than superficial learning. The introduction of a paper in research methodology at the end of second semester and critical appraisal of a scientific paper in the practical examination will certainly make sure that our students know how to evaluate clinical information that may need to be incorporated into practice.

The process was long, arduous and has taken one and a half years, but at least we have a document in hand now which will be extremely useful to the faculty and residents and will be a benchmark to compare with other curricula. Annual feedback, from faculty and residents,

will add to the critical evaluation for the next edition. This task would not have been possible without the immense contribution of the members of the Board of Studies of the superspeciality courses, whose experience, wisdom and understanding of the training of postgraduates in our country have contributed immensely to this document. My sincere thanks to all of them. We have borrowed from curricula all over the world, adding, adapting and adopting as we found necessary. I congratulate all the faculty who despite their heavy clinical workload have spent time in drafting the curriculum pertaining to their subject. It has indeed been a labour of love from them. I place on record my appreciation of the interest, effort and unflagging enthusiasm of the Associate Dean (Academics), member of the Medical Education Unit and Additional Professor of Pharmacology, Dr Rituparna Maiti, who has seen this document through the many revisions, cajoled and coaxed the departments to submit revisions as necessary.

Kahlil Gibran once said, “The teacher who is indeed wise does not bid you to enter the house of his wisdom but rather, leads you to the threshold of your mind.” I believe this curriculum strives to achieve that and will prepare our postgraduates to become exemplary scholars, life-long learners, skilled and ethical clinicians who will continue to update their knowledge and treat patients with empathy, compassion and kindness.

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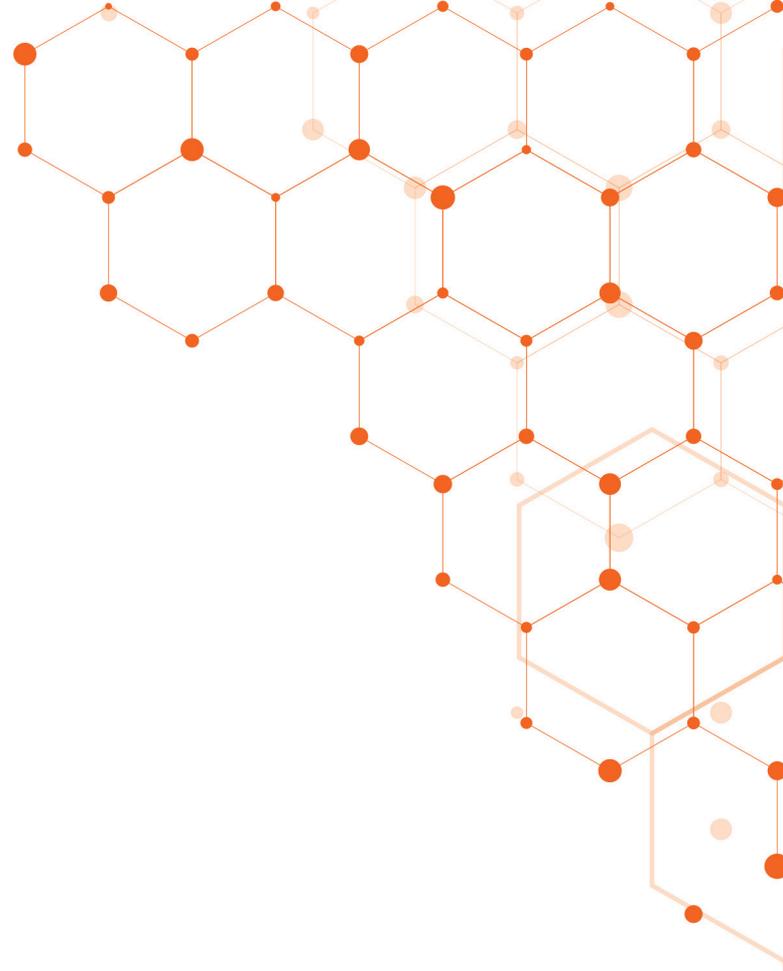
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INTRODUCTION



THE PROCESS FOLLOWED FOR THE REVISION OF PG CURRICULUM

Step 1: A draft regarding the format of the curriculum and uniform assessment method was made under the guidance of the Director and was circulated to all faculty by email and opinion was sought regarding the draft.

Step 2: All the opinions received from faculty members were collated and a meeting was called for open discussion on 13th September 2018.

Step 3: All the Heads of the Departments and faculty members who are in-charge of departmental PG academic activities attended the meeting under the chairmanship of the Director on 13.09.18. Various issues were discussed and final opinion was formed. The minutes of the meeting was prepared and signed by all the faculty members present in the meeting.

Step 4: All the departments were instructed to submit the PG Curriculum by 31st October 2018.

Step 5: The curricula from various departments were distributed among the members of the Medical Education Unit for initial screening. If there was any deficiency, it was corrected by the individual department.

Step 6: A list of external evaluators for each subject was prepared and approval was taken from the Director.

Step 7: The curriculum was sent to the external experts for review and comments/suggestions were received.

Step 8 : The suggestions/comments were communicated to the respective department and the final draft was submitted.

Step 9: The curriculum and the highlights of the changes were communicated to all the members of the Board of Studies on Superspeciality, AIIMS-Bhubaneswar.

Step 10: The Board of Studies meeting for DM/MCh course was held on 9th March 2019. The minutes of the meeting was circulated and the suggestions from the board members were incorporated into the curriculum.

Step 11: The agenda regarding the revision of superspeciality curriculum was placed before the Standing Academic Committee and was approved in its 6th Meeting held on March 17, 2019, at AIIMS-Bhubaneswar.

Step 12: The revised curriculum was ratified by the Governing Body and Institute Body.

HIGHLIGHTS OF THE REVISED CURRICULUM

1. Compulsory written examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination/formative assessment.
- Candidate should pass (obtaining 50% marks) to appear in Final examination.
- No marks from this examination will be added to the final/summative examination.
- Will be conducted by Examination Cell in the month of June-July & December-January of each year.

It is to be noted that the Dean's office conducts a ~25 hours session on Research Methodology and Biostatistics for all newly admitted PG students in the month of March (for January session) and September (for July session) every year.

2. Internal Examination pattern

Theory and practical/clinical examinations will be held at specific intervals. The marks obtained will be added to the marks of the final (summative) examination.

Timeline: End of the 3rd semester, 4th semester and pre-final (4 months before final examination).

Marks distribution:

- Theory 100 marks
- Practical 100 marks (Clinical/Experimental-70, viva-20, logbook-10)

The marks of the 3 internal examinations will be averaged to 100 each for theory and practical/clinical and will be added to the final examination.

3. Summative/Final Examinations:

- a. Theory:
 - 4 papers (100 marks each)
 - Topic distribution to be made by the individual department.
- b. Theory question paper format:
 - One long essay type question – 20 marks
 - Eight Short question/notes – 10 x 8 = 80 marks
- c. Total marks in theory: 500 marks
 - 4 papers in the final examination – 400 marks
 - Average of 4 internal theory examinations – 100 marks
- d. Practical/Clinical examination: Total marks: 500
 - Practical and viva in the final examination – 400 marks
 - Average of 4 internal practical/clinical examinations- 100 marks
 - The format of the practical examination (400 marks) is as follows:

Part	Components	Marks allotted
Part A** 200 marks	Longcase (1)	75
	Short cases (3)	75
	Ward round	50
Part B 200 marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Scientific writing (manuscript written out of the thesis)	15
	Logbook	10
	Viva	50

** Students should pass (secure 50% marks) separately in Part A

4. Final marking pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	4 month before final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

5. The decision related to passing marks:

- The student has to secure 50% marks in the internal examination to be eligible to appear for the final examination.
- In the final theory examination, a student should secure 50% marks (200 out of 400) to pass.
- In the final practical examination, a student has to secure 50% marks (100 out of 200) in part A of practical examination separately and overall 50% marks (200 out of 400).

6. Thesis Evaluation

- The student should submit the completed thesis 6 months before the final examination (30th November and 30th June).
- Plagiarism check: If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done through Turnitin Feedback Studio before the thesis is bound.
- The thesis will be sent to one external evaluator for approval.
- The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as Accepted, Suggested modification and Rejected.
- If the thesis is accepted or some modifications are suggested, the comments of the evaluator will be intimated to the student and the guide for necessary correction/modifications. After modification, the thesis will be evaluated by an internal departmental committee for final approval.
- If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination.

7. Eligibility for appearing in Final examination

Students will be allowed to appear in the final examination if :

- Passed (secured 50% marks) in the examination on Research Methodology and biostatistics and
- Passed (secured 50% marks) in internal examinations and
- The thesis is submitted 6 months before final examination and
- The thesis is approved/accepted by an external evaluator.

8. Special training in other institutions

For special training, students may be sent to other institutions for training which is presently not available at AIIMS, Bhubaneswar. Depending on the type of training, 1-2 months training may be undertaken without any financial implication (TA/DA/Training fee etc.) for the institute. The type of training and institute to be decided by the department after approval of the Director.

9. A period of 15 days sanctioned for attending academic activities

To promote research, improve networking and other academic competencies among postgraduate students, in addition to the existing leave (as per residency rule), all postgraduate students are allowed to attend conferences, workshops, any specialised training, CMEs etc. related to their fields for 15 days in the tenure of 3 years. These 15 days will be treated as on-duty and will be part of their postgraduate training. Prior permission to be obtained.

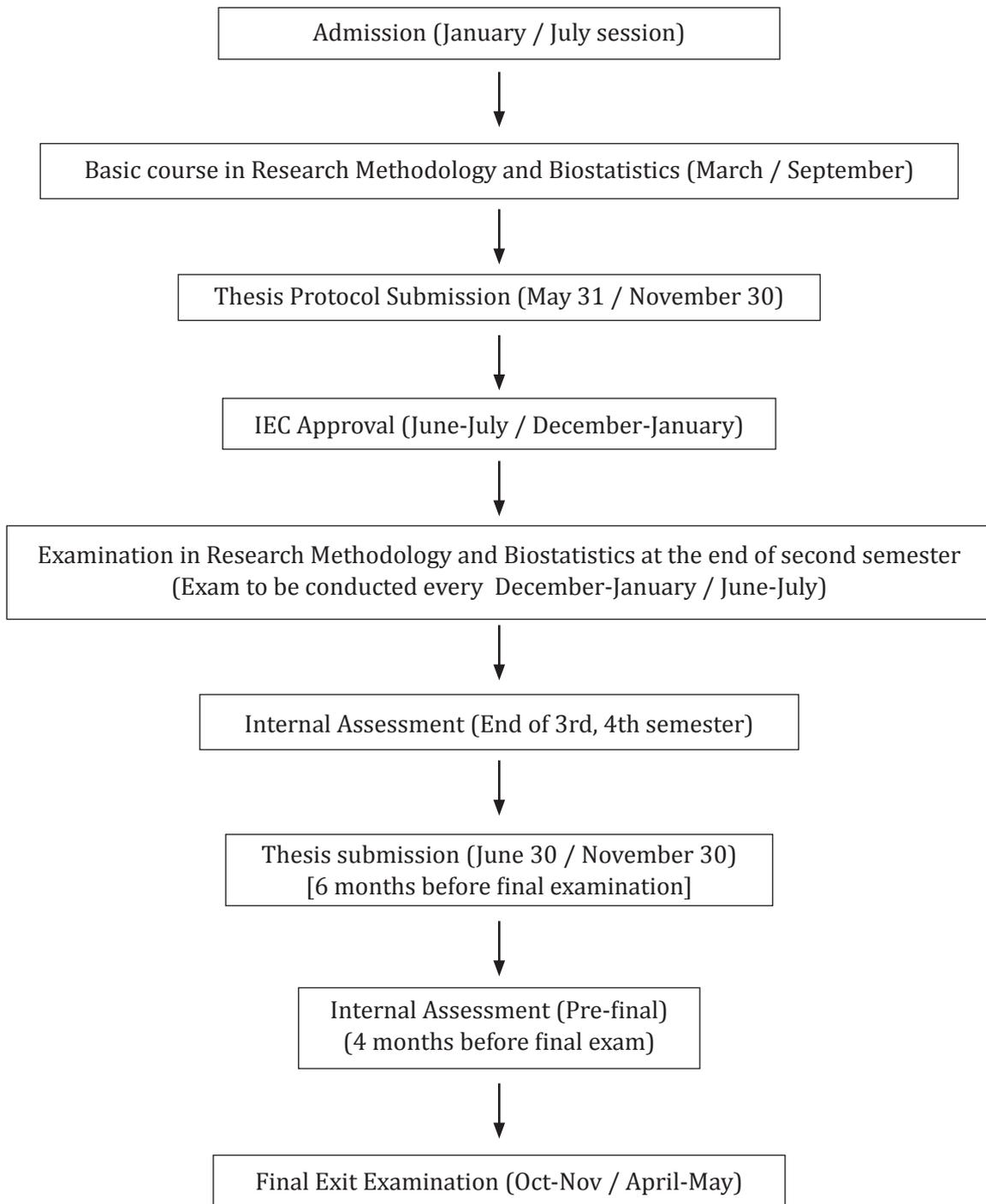
10. Inclusion of Entrustable Professional Activities and skill assessment

To follow competency-based medical education, Entrustable Professional Activities (EPA) has been included in the curriculum and thus, the expected level of skills and supervision at a certain stage of training have been pre-defined. Some of the skills should be assessed on the patients and few on manikins during the internal examinations. EPA has been prepared by most of the departments by adaptation from the curriculum of Mahatma Gandhi Medical college and Research Institute, Puducherry.

11. Workplace-based assessment (WPBA)

Workplace-based assessments are promoted as part of formative assessment in which teaching, learning, assessment and feedback are closely integrated. WPBA may be done using the tools like Mini-Clinical Evaluation Exercise, Direct Observation of Procedural Skills, Case-based Discussion, Mini-PAT (Peer Assessment Tool) etc.

FLOW CHART FOR DM/MCh COURSE



Research Methodology & Biostatistics

A basic course in 'Research Methodology & Biostatistics' for newly joined postgraduate residents is conducted in every March and September each year on the following topics:

- Research: Need and importance
- Selection of a topic for research
- Framing research question, hypothesis and objective
- Literature search and review
- Research Design: Observational studies
- Research Design: Interventional studies
- Referencing style and referencing tool

- Concepts in Biostatistics
- Demonstration of statistical software
- Sample size calculation
- Protocol writing
- Ethics in biomedical research

It is mandatory for every postgraduate student to attend the course during their first semester. At the end of 2nd semester, the students should appear for the examination on 'Research Methodology & Biostatistics' which is held in every June-July and December-January. The candidate should pass (obtaining 50% marks) to be eligible to appear in the Final examination.

MODEL QUESTION PAPER

RESEARCH METHODOLOGY & BIOSTATISTICS

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams/flow chart (if necessary)

1. What is "Research"? What is the rationale of including thesis/dissertation in the postgraduate curriculum? 2½+2½=5
2. What is "FINER" criteria of a good research question? Frame one research question each on the following health issues: 2+3=5
 - a. Hypothyroidism in pregnancy and weight of the new-born.
 - b. Dose and frequency of albendazole in Mass Drug Administration (MDA) for filariasis.
3. What should be the best study design to answer the following study question? Explain your proposed study design with the help of a flow-chart. 5

Can Arbekacin achieve a better cure rate in comparison to Vancomycin in patients infected with methicillin-resistant Staphylococcus aureus (MRSA)?
4. Differentiate between: 2½ + 2½ = 5
 - a. Primary research and secondary research
 - b. Regulatory clinical trial and Academic clinical trial
5. A student was asked to cite a publication in Vancouver style, and he has cited incorrectly as below. Correct and rewrite the citation in Vancouver style. 5

RP Nidanapu, B Tamijarassy, S Mahadevan, G Batmanabane (2017) Comparative Effect of Divided Doses of Adult Solid and Liquid Oral Formulations of Antiepileptic Drugs in the Management of Pediatric Epilepsy. J Pharmacol Pharmacother. 8(2); 54-61.

6. What is Evidence-based Medicine? Draw a 'level of evidence pyramid' showing different types of research studies according to their strength of evidence. 2+3=5
7. Match column A (reporting guidelines) with column B (study types). 5

Column A (Reporting guidelines)	Column B (Study types)
CARE	Observational studies
ARRIVE	Systemic reviews and meta-analysis
STROBE	Diagnostic studies
PRISMA	Pre-clinical animal studies
STARD	Case reports

8. Comment on the correctness of the following statements: 2½ + 2½ = 5
- The Journal of Arthroplasty is PubMed indexed.
 - A journal is called 'International' when it is published outside India.
9. What do you mean by Boolean Operators? Explain their use with examples. 5
10. In a 20-week, randomized, clinical trial on painful diabetic neuropathy, in the first phase, group 1 received 0.025% capsaicin gel and group 2 received placebo for 8 weeks. After a washout period of 4 weeks, group 1 received placebo and group 2 received 0.025% capsaicin gel for another 8 weeks. Explain the type of study design followed in this study. Why a washout period was allowed in between the study? 2½+2½=5
11. What information should be included to write a good 'Introduction' of a research protocol? 5
12. The following table represents the change in serum calcium in postmenopausal women (n=30) with osteoporosis after receiving 1,25(OH)₂D₃ for 7 days. Data is in mean ± standard deviation.

Parameter	At Baseline	At follow-up	Mean difference	95% Confidence Interval (CI)	P value
Serum Calcium (mg/dl)	8.9 ± 2.9	9.3 ± 3.1	0.4	-1.03 to +1.11	0.02

What does 95% CI (-1.03 to 1.11) mean? Comment on the p-value which is found to be significant (<0.05) presented in the above table. 2½+2½=5

13. You have planned to conduct a study to compare the effect of oxytocin and carbetocin in the prevention of postpartum haemorrhage after vaginal delivery. What data/information you need to calculate the sample size for the study? 5
14. You have data on VAS (Visual Analogue Scale) pain score of 20 patients with radiculopathy at baseline (before therapy) and at follow-up (after therapy). You tested the data for normality and found the data to be not normally distributed. 1+2+2=5
- What descriptive statistics you should perform to represent the data?
 - What statistical test you should use to test the effect of the therapy on radicular pain?
 - What may be the probable reasons for the non-normality of your data?

-
15. Go through the part of the abstract of the following study and discuss the study design followed here with a special note on the rationale/correctness of the design.

To test the hypothesis that statins lower the risk of pancreatic cancer in patients with chronic pancreatitis, a nationwide population-based study was done on all Danish patients diagnosed with chronic pancreatitis from January 1996 to December 2012. The Danish National Prescription Registry was used to ascertain information on statin prescriptions for members of the study population before and after their pancreatitis diagnosis. The main outcome measures were incidence rates, and adjusted hazard ratios for pancreatic cancer, comparing statin users with nonusers. The study observed 153 pancreatic cancers during 60,365 person-years of follow-up. 5

16. You have planned a clinical research on adolescent asthma in the age group 10-19 years. What type of consent process you should follow in your study? 5

17. In a study, women with Polycystic Ovarian Syndrome (PCOS) receiving letrozole as a primary treatment achieved a significantly ($P = 0.02$) higher pregnancy rate (61%) compared to Clomiphene citrate (43%). What does $P=0.02$ mean in the above finding? 5

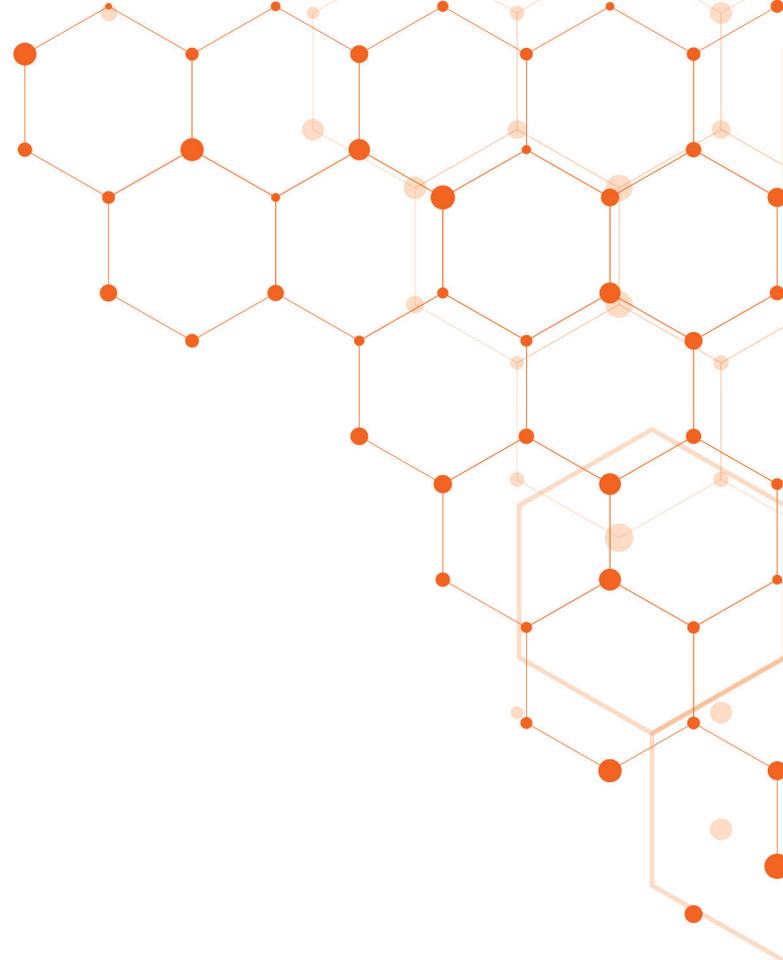
18. Frame Null hypothesis, Alternate Hypothesis and one objective from the following research question. 5

Research Question: Is there a difference in performance in the examination on Research methodology between the students who attended the classes and those who did not attend?

19. Describe four basic ethical principles of biomedical and health research with suitable example for each: 5

- a. Autonomy,
- b. Beneficence
- c. Non-maleficence
- d. Justice.

20. List five journals (from your speciality) which are available/searchable on PubMed. (State your speciality and then list the journal name in full) 5



CARDIOLOGY



DM in Cardiology

COURSE NAME:

DM in Cardiology

DURATION OF COURSE:

3 years

ELIGIBILITY:

MBBS, MD/DNB (General Medicine / Paediatrics)

OBJECTIVES

The aim of the curriculum is to provide a basic framework for the course of DM cardiology. The candidate is expected to learn to deliver “state of the art” clinical care in a scientific, cost-effective, ethical and compassionate manner to an individual and patient and develop an attitude of committed learning, teaching, and research for the welfare of the society. It will be supervised and objectively evaluated. The curriculum is subjected to the periodic revision in every 3 to 5 years. It is a 3-year course which involves the training of students in theoretical, clinical and practical aspects of Cardiology. Based on the training, the trained cardiologist is expected to have an in-depth, comprehensive knowledge of all facets of cardiovascular diseases and their management, have skills to effectively deliver curative and preventive care, have attitudes and behaviour consistent with highest professional standards and with a reasonable degree of knowledge in teaching and research.

Competence expected at the end of the training

- **Clinical skills:** Include the ability to take a discerning history, perform a relevant clinical examination, decide the appropriate investigations and derive the management plan.
- **Technical skills in noninvasive diagnostic techniques:** The candidate is expected to be able to perform and interpret relevant noninvasive cardiac investigations independently,
- **Interventional/Invasive skills:** The training in invasive procedures are designed to provide maximum possible experience to the senior

residents. These procedures will be under the supervision of a faculty member without affecting the safety of the patients at any cost. The goal of fixing the minimum number of cases to be performed is to make the resident well-versed and confident in performing the common procedures independently and other procedures under limited supervision at the end of 3 years.

SYLLABUS

BASIC SUBJECTS

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

CLINICAL CARDIOLOGY

Etiopathology, hemodynamic, clinical evaluation, non-invasive 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 the heart
11. Heart muscle diseases
12. Traumatic heart disease
13. Tumours 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 TECHNIQUES

To perform and interpret various non-invasive techniques, including:

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

INVASIVE CARDIOLOGY

- Experience in cardiac catheterization- to calculate and interpret various hemodynamic parameters.
- Right and left heart Catherization 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 understand the functional principles of various bio-medical equipment's used for the invasive and non-invasive cardiology.

RESEARCH PROJECTS

As a part of DM curriculum, the student should complete one thesis project during the tenure, and it is desirable to submit the proof of communication of the manuscript (originated from his/ her thesis) to an indexed peer-reviewed journal.

THEORY SYLLABUS CONTENT

THEORY: PAPER WISE

- Paper I: Basic & Allied Sciences (Attaining proficiency in Applied Anatomy including developmental anatomy, Physiology and Pathology related to the cardiovascular system)
- Paper II: Clinical cardiology (Etiopathology, hemodynamic, clinical evaluation, non-invasive and invasive evaluation and management strategies for the following disorders)
- Paper III: Interventional Cardiology, Electrophysiology & Paediatric Cardiology
- Paper IV: Recent Advances (Principle of cardiovascular genetics, Cardio-oncology, cardiovascular regeneration and repair, critical evaluation of the clinical trial, transcatheter intervention of congenital and acquired heart diseases, fetal therapy, gene therapy for cardiovascular diseases)

Basic & Allied Sciences

- Cardiac anatomy: applied anatomy of the cardiovascular system, normal variations, embryology, and alterations in disease states.
- Cardiac physiology: normal cardiovascular physiology including electrical activity, cardiac cycle, cardiac metabolism, and physiology of circulation. Range of normal responses, and alterations in health and disease states.
- Cardiac pharmacology: Basic understanding of pharmacokinetics of drugs and pharmacodynamics of drugs used in cardiology. Their mechanism of action, metabolism, adverse effects, drug interactions, drug development, and practice of prescription utilising best scientific evidence.
- Cardiac pathology: structural alterations- structural alterations - macroscopic and microscopic, due to various diseases primarily and secondarily involving the heart and the vascular system.
- Cardiac investigations: A thorough knowledge of basic principles, indications, technique, results, strength and limitations of various diagnostic

tests is essential. Proficiency in independently ordering, performing and interpreting some of these investigations is essential, and accrue from a large number of tests performed under the supervision and independently as subsequently suggested. These include invasive and non-invasive investigations.

- Non-invasive investigations: ECG, Echocardiogram, Chest X-ray, Cardiac CT and CT angiography, Cardiac MRI and MR angiography, Nuclear cardiac imaging, exercise stress testing and Holter monitoring.
- Invasive investigations: Cardiac hemodynamics (pressure waveforms, oximetry, cardiac output, vascular resistance, shunts, valve area), normal and abnormal angiographic anatomy of heart and blood vessels, safety precautions, complications of cardiac catheterizations and their management.
- Invasive electrophysiological studies – basic understanding of electrical signals, interpretations, physics of radiofrequency and pacemaker.
- Epidemiology and preventive cardiology: principles of epidemiology in relation to cardiac diseases. Concepts of risk factors, population approaches, prevention of diseases and health promotion.
- Genetics and molecular cardiology;
- Basics of statistical methods; Research methodology;
- Biomedical engineering: Basic understanding of physical principles of various biomedical instruments and devices used in cardiac diagnosis and therapeutics to optimally utilize them.

Clinical cardiology

The epidemiology, etiopathogenesis, clinical presentation, diagnosis, differential diagnosis, treatment, complications, prognosis and preventive aspects (wherever applicable) of the following heart diseases

- Atherosclerotic heart disease - acute and chronic coronary artery diseases.

- Valvular heart disease including rheumatic heart diseases
- Congenital heart disease in infants, children and adults
- Heart failure- acute and chronic heart failure
- Systemic hypertension – primary and secondary
- Cardiac arrhythmias
- Sudden cardiac death, syncope
- Heart muscle disease – myocarditis and cardiomyopathy
- Pericardial disease- acute and chronic Pericarditis,
- Constrictive Pericarditis, pericardial effusion
- Infective endocarditis – diagnosis, treatment and prevention
- Lungs and heart diseases including pulmonary hypertension
- Diabetes mellitus and heart disease
- Pregnancy and heart disease
- Stroke and heart disease
- Cardiac involvement in other systemic diseases
- Diseases of aorta including aneurysms, aortitis, aortic dissection
- Peripheral vascular diseases, venous system diseases including thromboembolism
- Anaesthesia and non-cardiac surgery and heart
- Cardiac trauma
- Cardiac neoplasms

Interventional cardiology

- Radiation safety
- Artery and venous access
- Cardiac hemodynamic study
- Techniques of angiogram and angioplasty
- Balloon valvuloplasty
- Rotational atherectomy
- IVUS/OCT/FFR/iFFR
- TAVI
- Pacemakers and ICD
- CRT

Recent advances

- Principle of cardiovascular genetics
- Cardio-oncology
- Cardiovascular regeneration and repair
- Critical evaluation of the clinical trial
- The transcatheter intervention of congenital and acquired heart diseases
- Fetal therapy
- Gene therapy for cardiovascular diseases

SEMESTER-WISE TOPIC DIVISION

Semester-I

Cardiac anatomy, embryology, cardiac hemodynamic, History and physical examination, electrocardiography, TMT, ECHO, Chest -x-ray and Biostatistics, Ethics in cardiovascular medicine, clinical decision making in cardiology.

Semester II

Cardiac Biomarkers, Nuclear cardiology, CMRI, Cardiac CT, Risk markers and primary prevention of cardiovascular diseases, mechanics of cardiac contractility, lipoprotein disorders and cardiovascular disease, nutrition and cardiovascular and metabolic diseases, hemostasis, thrombosis, fibrinolysis, Atherosclerosis

Semester III

Cardiac catheterization, coronary angiography and intravascular imaging, OCT, approach to a patient with chest pain, vascular biology of atherosclerosis, Obesity and cardiometabolic diseases,

Semester IV

Heart failure, HTN, Hypotension and syncope, myocardial infarction, congenital heart diseases, cardiomyopathy, pulmonary embolism and pulmonary HTN, COPD, Sleep disorder, cardiovascular diseases in elderly and women, Anesthesia in non-cardiac diseases

Semester -V

Arrythmia, DM, air pollution, valvular heart diseases, cardiovascular infection, rheumatic fever, pericardial diseases, rheumatic diseases, diseases

of the aorta, PCI, PAD, Ischemic stroke, pregnancy and heart diseases, tumours of the heart and autonomic disorders

Semester-VI

- Critical evaluation of the clinical trial
- Cardiovascular genetics
- Cardiovascular regeneration and repair
- Exercise and sport cardiology
- Prosthetics heart valves
- Transcatheter therapy for valvular diseases
- Catheter bases treatment of CHD
- Cardio-Oncology
- Cardiovascular manifestation of HIV infection
- Cardiovascular diseases in a heterogeneous population
- Endocrine disorders
- Psychiatric and behavioural aspect
- Neurology disorder
- Cardiorenal syndrome
- Fetal therapy and fetal intervention

PRACTICAL SYLLABUS CONTENT

Semester-I

- History taking, clinical examination and investigations of patients with cardiovascular diseases in the ward and OPD
- Familiar with basic haematological investigations and interpretation of results of routine investigations like ECG, CHEST-RAY, and ECHO, procedures like various routine vascular access, pericardiocentesis and management of cardiac emergencies

Semester-II

- Exposure to intensive care of acute coronary syndrome, hypertension emergencies and acute limb ischemia
- Submission of Thesis project
- Other basic cardiac investigations like TMT and TEE, congenital ECHO

-
- Knowledge of drugs used, their pharmacology, posology, adverse events etc.
 - Management of patients with hypertension, stable and unstable angina

Semester-III

- Supervision of First year DM trainee
- Sophisticated lab investigations like Holter, the echo of a complex congenital echo, the echo of multi-valvular heart disease
- Presentation of new and interesting cases in Hematopathology Meeting and other Interdepartmental Meetings
- Continuation of Thesis
- Presentation of Paper in National conference

Semester-IV

- Posting to the CathLab
- Exposure to peripheral arterial doppler
- Continuation of Thesis work
- Counselling, Interpersonal communication skill, Interaction with patient, patient's relatives, Breaking bad news
- Interaction with colleagues, staffs

Semester-V

- Posting to CathLab and cardiothoracic OT, nuclear medicine and coronary CT angiogram
- Independent decision making
- Teaching skill
- Skill of delivering lectures, presentation in conferences etc
- Emphasis on completion of projects/data analysis

Semester-VI

- Ward responsibilities (lesser)
- Outpatients
- Clinical case presentation three times a week along with the topic discussion
- Completion of the thesis

TEACHING AND LEARNING METHODS

A candidate pursuing DM in cardiology should work in the institution as full-time resident. Each candidate would be required to give in undertaking that he/she will not run a clinic/laboratory / nursing home or doing private practice during his postgraduate course. Each semester will be taken as unit for the purpose of calculating attendance. Every trainee must attend the teaching and learning activities during the year a prescribed and not be absent without valid reasons.

The list of teaching and learning activities designed to facilitate appropriate training is mentioned below.

PG Orientation: A PG Orientation programme is organized under the Medical Education Department of AIIMS Bhubaneswar, every year. The DM students should attend the course during the first semester of training. This course is designed to in calculate skills in the residents and apprise them of research methodology, biostatistics, writing a dissertation, use of library, medical code of conduct and medical ethics.

Integrated Lectures: Integrated lectures are recommended to be taken by multidisciplinary teams for selected topics.

Journal club: It will be held once a week. All the DM students will be expected to attend and actively participate in the discussion and enter relevant details in the log book. A time table with names of subject, students and the moderator will be scheduled in the beginning of every semester. The presentations would be evaluated using checklists and would carry weightage for internal assessment

Subject Seminar: It will be held once a fortnight. All the DM students will be expected to attendant actively participate in the discussion and enter relevant details in the Log book. Further every candidate must make a presentation on the selected topics at least four times a year and a total 12 presentations in 3 years. The presentations would be evaluated using checklists and would carry weightage for internal assessment. A time table with names of subject, students and the moderator will be scheduled in the beginning of every semester.

Ward rounds: Ward round shall be service or teaching rounds.

Teaching Rounds: Every week there will be “grand round” for teaching purpose. All DM students will be required to attend the grand round.

Medical Audit: The session will be held once in a month. The discussion will be about complicated cases and the morbidity. All the DM students will participate and present acquisitioned cases.

Inter-departmental Meetings:

- CTVS department: Which patients need cardiac surgery and why: Clinical presentation, complete cardiac evaluation with batteries of investigation and the opinion of cardiac surgeons
- Radiology: Chest X-RAY, CECT Chest, Cardiac CT, CT Aortogram, Cardiac MRI, CT coronary angiogram
- Nuclear Medicine Department: Stress and REST MPI and PET SCAN etc.

Teaching skills: DM students must teach undergraduate students (Medical and Nursing) by taking tutorials, bedside clinics. The residents will also take demonstration and case discussion for postgraduates, on peripheral postings from other departments.

Continuing Medical Education (CME) Programme and Conference: From second year onwards, the DM trainee would be encouraged to attend conference and present paper/poster.

Weekly schedule:

Day	topic	time
Monday	Seminar	8 a.m. – 9 a.m.
Tuesday	Congenital ECHO	8 a.m. – 9 a.m.
Wednesday	Journal club	8 a.m. – 9 a.m.
Thursday	Bed side	8 a.m. – 9 a.m.
Friday	Graphics	8 a.m. – 9 a.m.
Saturday	Hemodynamic	8 a.m. – 9 a.m.

CLINICAL TRAINING

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 catherization procedures including interventions assisted or done: 100

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
- Paediatric Cardiology -4 months

Special training in another institute

For special training, students may be sent to other institutions for training which is presently not available at AIIMS, Bhubaneswar. Depending on the type of training 1-2 months training may be undertaken without any financial implication (TA/DA/Training fee etc.) for the institute. The type of training and institute to be decided by the department after approval of the Director.

ASSESSMENT

There will be periodic assessment of learning outcomes. The methods to be followed are mentioned below.

1. Personal attitudes
2. Acquisition of knowledge
3. Clinical and Procedural skills
4. Teaching skills
5. Periodic Tests
6. Logbook

7. Thesis

Personal attitudes

- Caring attitude
- Punctuality
- Initiative
- Organizational ability
- Potential to cope with stressful situation and undertake responsibility
- Trustworthiness and reliability
- To understand and communicate with reasoning with patients and others
- To maintain cordial professional relationship with colleagues and patients
- Ability to work in a team
- Periodic reviews will be given by supervisors and peers to residents

Acquisition of Knowledge

Logbook will be assessed by periodic checking which will record participation in various teaching/ learning activities by the residents. The number of activities attended, and the presentations made will be recorded. The logbook will be validated periodically by the supervisors.

Clinical and Procedural skills

Skills in outpatients and various procedures will be assessed periodically

a. Clinical Meetings

Candidates should periodically present cases to his peers and faculty members. Candidates approach to the case, diagnostic abilities, analysis and treatment planning will be assessed using check list.

b. Procedural skills

The candidate will be given graded responsibilities to enable learning by apprenticeship. The assessment would include candidate's analytical ability, preprocedural assessment, procedural skills and post procedure care. The performance will be assessed by the guide by direct observation.

Teaching skills

Candidates will be encouraged to teach post graduate students (MD General Medicine and MD Pediatrics) and paramedical students. This performance will be based on assessment by the faculty members of department and feedback from the undergraduate students.

INTERNAL ASSESSMENT

- Examination on Research Methodology & Biostatistics
 - Timing: End of 2nd Semester
 - Total marks: 100
 - Will be considered as an internal examination
 - Candidate should pass (obtain 50% marks) to appear in Final examination
 - No marks will be added to final / summative examination
 - Will be conducted by Examination Cell in the month of June-July & December-January
- A total of 3 internal examinations will be conducted at end of the 3rd semester, 4th semester and pre-final (4 months before final examination).
- Marks distribution: Theory 100 marks, and Practical with viva and logbook (Practical – 70, viva – 20, logbook – 10=100 marks). The marks of the 3 internal examinations will be averaged to 100 each for theory and practical.

SUMMATIVE/ FINAL EXAMINATIONS

Eligibility for appearing in the Final Examination

- Passed (secured 50% marks) in the examination on Research Methodology and biostatistics (end of 2nd semester) and
- Passed (secured 50% marks) in aggregate of internal examinations, theory and practical and
- Dissertation/thesis submitted six months before the final examination and is approved/ accepted by an external evaluator.

Final Theory Examination

- Theory: 4 papers (100 marks each)
 - Paper I: Basic & Allied Sciences
 - Paper II: Clinical Cardiology
 - Paper III: Interventional Cardiology, Electrophysiology and Paediatric Cardiology
 - Paper IV: Recent Advances
- Theory question paper format:
 - One Long question – 20 marks
 - Eight Short question/notes – 10 x 8 = 80 marks

- Total marks in theory: 500 marks
 - Four papers in the final examination – 400 marks
 - Average of 3 internal examinations – 100 marks

Final Practical Examination

- Total marks - 500 marks
 - An average of 3 internal examinations: 100 marks.
 - Practical and viva in the final examination: 400 marks.

The format of the practical examination (400 marks)

Part	Component	Marks allotted
Part A (200 Marks)**	Longcase – One	75
	Short cases – Three (25 X 3)	75
	Ward Round	50
	Subtotal	200
Part B (200 Marks)	Operative Procedure and Instruments/department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva (Pathology specimens/Radiology / others)	50
	Logbook	10
	Scientific Writing (Manuscript written out of the thesis)	15
	Subtotal	200
	Total	400

** Students should pass (secure 50% marks) separately in Part A

Final Marking Pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	Four months before the final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

Passing Marks

- The student has to secure $\geq 50\%$ marks in the internal examination to be eligible to appear for the final examination.
- In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
- In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

LOGBOOK

The candidate is required to maintain a logbook which details his clinical experience during his tenure as assistant, physician and supervisor.

The logbook is updated daily basis and the Head of the Department counterchecks and endorses it every 6 months to notice any shortcomings in the residents training.

The candidate is expected to maintain a logbook as described below:

1. Biodata
2. Complete list of Postings with periods and dates
3. Interesting cases seen and worked up during the period of posting
4. All the procedures by the trainee
5. Details of cardiovascular correlation seminar, mortality review and complicated cases meeting
6. List of short reviews
7. List of long reviews presented
8. List of Cases presented and discussed in Bed side clinics
9. List of Abstracts presentations in AIIMS Bhubaneswar scientific Society, Conferences, PG Seminars
10. Abstracts and lists of papers published or sent for publication

11. Any other research projects undertaken

12. Any other interesting details

THESIS

- The student should submit the completed thesis six months before the final examination
- If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.
- The thesis will be sent to one external evaluator for approval. The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as accepted, accepted with suggested modification or rejected.
- If the thesis is accepted with suggested modifications, the comments of the evaluator will be intimated to the student and the guide for necessary correction/ modifications.
- After modification, the thesis will be evaluated by a departmental committee for final approval.
- If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination.

RECOMMENDED BOOKS

Textbooks – General

1. Kasper DL, Hauser SL, Loscalzo J, Longo DL, Jameson JL, Fauci AS. Harrison's Principles of Internal Medicine: McGraw-Hill Education; 2018.
2. Zipes DP, Libby P, Bonow RO, Mann DL, Tomaselli GF. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine: Elsevier Health Sciences; 2018.
3. Fuster V, Harrington RA, Narula J, Eapen ZJ. Hurst's the Heart: McGraw-Hill Education; 2017.

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4. Otto CM, Bonow RO. Valvular Heart Disease: A Companion to Braunwald's Heart Disease: Elsevier; 2020.
 5. Opie LH, Gersh BJ. Drugs for the Heart E-Book: Elsevier Health Sciences; 2012.
 6. Alpert JS, Dalen JE, Rahimtoola SH. Valvular Heart Disease: Lippincott Williams & Wilkins; 2000.

Interventional Cardiology

1. Moscucci M. Grossman & Baim's Cardiac Catheterization, Angiography, and Intervention: Wolters Kluwer Health; 2015.
2. Topol EJ, Teirstein PS. Textbook of Interventional Cardiology: Elsevier Health Sciences; 2019.
3. Kern MJ, Sorajja P, Lim MJ. Cardiac Catheterization Handbook: Elsevier India; 2015.
4. Mullins CE. Cardiac Catheterization in Congenital Heart Disease: Pediatric and Adult: Wiley; 2008.

Echocardiography and ECG

1. Armstrong WF, Ryan T. Feigenbaum's Echocardiography: Wolters Kluwer Health; 2012.
2. Snider AR, Serwer GA, Ritter SB. Echocardiography in Pediatric Heart Disease: Mosby; 1997.
3. Schamroth CC. An Introduction to Electrocardiography: Wiley; 2000.
4. Wagner GS, Strauss DG. Marriott's Practical Electrocardiography: Wolters Kluwer Health; 2014.
5. Chou TC. Electrocardiography in clinical practice: Grune & Stratton; 1986.

Paediatric Cardiology

1. Rudolph AM. Congenital Diseases of the Heart: Clinical-Physiological Considerations: John Wiley & Sons, Incorporated; 2020.
2. Perloff JK, Marelli A. Perloff's Clinical Recognition of Congenital Heart Disease: Expert Consult - Online and Print: Elsevier Health Sciences; 2012.
3. Allen HD, Shaddy RE, Penny DJ, Feltes TF, Cetta F. Moss and Adams' Heart Disease in Infants, Children, and Adolescents: Including the Fetus and Young Adult: Wolters Kluwer; 2016.
4. Park MK. Pediatric Cardiology for Practitioners: Mosby/Elsevier; 2008.
5. Anderson RH, Baker EJ, Redington A, Rigby ML, Penny D, Wernovsky G. Paediatric Cardiology: Elsevier Health Sciences UK; 2009.
6. Freedom RM, Yoo S, Mikailian H, Williams WG. The Natural and Modified History of Congenital Heart Disease: Wiley; 2008.

Electrophysiology

1. Ellenbogen KA, Wilkoff BL, Kay GN, Lau CP, Auricchio A. Clinical Cardiac Pacing, Defibrillation and Resynchronization Therapy: Elsevier Health Sciences; 2016.
2. Ellenbogen KA, Wood MA. Cardiac Pacing and ICDs: Wiley; 2008.
3. Josephson ME. Josephson's Clinical Cardiac Electrophysiology: Techniques and Interpretations: Lippincott Williams & Wilkins; 2015.
4. Zipes DP, Jalife J, Stevenson WG. Cardiac Electrophysiology: From Cell to Bedside: Elsevier Health Sciences; 2017.

MODEL SAMPLE QUESTION PAPERS

PAPER I

BASIC AND ALLIED SCIENCES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss in detail the development of interatrial septum.
2. Describe the phases and genesis of cardiac action potential.
3. Describe Frank Starling law and its clinical implication in heart failure.
4. Describe the mechanism of genesis of cardiac arrhythmias.
5. Write short note on Ibutilide in atrial fibrillation.
6. Describe pathophysiology of rheumatic mitral stenosis.
7. Write short note on familial hypercholesterolemia and its management.
8. Describe the methods to calculate QT interval and its clinical significance.
9. Describe risk factors and epidemiology of hypertension in India.

PAPER II

CLINICAL CARDIOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss pathogenesis and management of acute decompensated heart failure.
2. Write a short note on clinical features and management of Prinzmetal angina.
3. Describe the role of beta-blockers in acute myocardial infarction.
4. Discuss the etiopathogenesis and management of Eisenmenger syndrome.
5. Discuss the advantages and limitations of novel oral anticoagulant therapy in atrial fibrillation.
6. Describe the peripheral signs of aortic regurgitation and its role in diagnosis of severe aortic regurgitation.
7. Discuss genetic basis, clinical features, risk stratification and management of Brugada syndrome.
8. Write short note on aetiology, clinical features and management of Type A aortic dissection.
9. Describe echocardiographic assessment of severity of mitral regurgitation (MR).

PAPER III

INTERVENTIONAL CARDIOLOGY, ELECTROPHYSIOLOGY AND PAEDIATRIC CARDIOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the various physiologic assessment modalities to diagnose the lesion severity in intermediate coronary artery lesions.
2. Describe the indications, procedure and complications of alcohol septal ablation.
3. Describe transcatheter aortic valve replacement in low risk aortic stenosis with evidence.
4. Describe the indications and benefits of His bundle pacing.
5. Describe the types and radiofrequency ablation of atrioventricular nodal reentrant tachycardia.
6. Describe the localisation of accessory pathway and procedure of left lateral accessory pathway ablation.
7. Describe the indications, procedure and complications of balloon pulmonary valvotomy.
8. Write a short note on oximetry run and its implication in acyanotic congenital heart disease.
9. Write a short note on balloon atrial septostomy in neonates.

Paper IV

RECENT ADVANCES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe indications and role of left ventricular assist devices (LVAD) in end stage heart failure.
2. Describe the indications, benefits and pitfalls of leadless pacemaker.
3. Write a short note on Subcutaneous ICD(S-ICD) in primary prevention of sudden cardiac death with its evidence.
4. Describe role of baroreceptor stimulation in hypertension and heart failure.
5. Describe mechanism of action and therapeutic use of sacubitril and valsartan with its recent evidence.
6. Discuss the primary and secondary outcome of ISCHAEMIA trial.
7. Discuss the role of stem cell therapy in myocardial infarction.
8. Compare and contrast the role of coronary lithoplasty versus rota ablation in severely calcific coronary lesions.
9. Describe quantitative flow ratio (QFR) and its role in assessment of intermediate coronary lesions.

Entrustable Professional Activities [EPA]

Sr. No	Entrustable Professional Activities	COMPETENCIES							EXPECTED LEVEL			MSF
		MK	PC	ICS	P	PBLI	SBP	Ist year	2 nd year	3 rd Year		
Clinical CARDIOLOGY												
1	In Patient care	Y	Y	Y	Y	Y	Y	Y	2	3	5	PG, H, P, I, C
2	Emergency Care and intensive care	Y	Y	Y	Y	Y	Y	Y	2	3	5	P, H, PG, I
3	Out Patient Care	Y	Y	Y	Y	Y	Y	Y		3	4	P, H, PG, I
4	Day Care Services	Y	Y	Y	Y	Y	Y	Y		3	5	P, H, PG
5	Inter-departmental Consultation	Y	Y	Y	Y	Y	Y	Y		3	4	S, H, PG
6	Community cancer screening program	Y	Y	Y	Y	Y	Y	Y		3	4	C, I
7	Principles of management of different solid heart failures	Y	Y	Y	Y	Y	Y	Y	1	2	4	S, H
8	Approach to acute chest pain	Y				Y	Y	Y	1	2	4	H, PG
9	Basic fields including occultation	Y			Y		Y	Y	1	2	4	H
10	Basic pathophysiologic mechanisms and therapy of disease of heart	Y					Y	Y	1	2	4	H
11	Aetiology, epidemiology, natural history, diagnosis, and management of the most common cardiac diseases	Y	Y						1,2	3,4	5	S,H
12	Different kind of manifestation of acute coronary syndrome	Y	Y	Y	Y	Y	Y	Y	1	2,3	4,5	H
13	management of the patients with arrhythmia	y	y	y	y	Y	Y	y	1,2	3,4	5	P, H, C, PG
14	Relevant drugs, their mechanisms of actions, pharmacokinetics and clinical indications and limitations, including effects, toxicity, and interactions and their management	Y	Y		Y	Y		Y	1,2	3,4	5	PG, H
15	Triaging treatment for ACS	Y	Y	Y	Y	Y	Y	Y	1,2	3,4	5	P, C, H
16	Peripheral and central arteriovenous access		Y		Y	Y	Y	Y	2,3	4	5	H, I, P
17	Establishment and care of indwelling catheter	Y	Y		Y	Y	Y	Y	1,2	3,4	5	H, I, P

Sr. No	Entrustable Professional Activities	COMPETENCIES							EXPECTED LEVEL			MSF
		MK	PC	ICS	P	PBLI	SBP	1st year	2nd year	3rd Year		
		Y	Y	Y	Y	Y	Y	3,4	3,4	5		
18	Emergency pericardiocentesis	Y	Y	Y	Y	Y	Y	3,4	3,4	5	S, H, UG, P	
19	Learn and apply protocol-based therapies	Y	Y		Y	Y	Y	2	3,4	5	S	
20	Approach to patients with SOB	Y	Y		Y			1,2	3,4	5	S, H, I	
21	Should be able to present oral and poster presentations, write paper in conferences				Y	Y	Y	2,3	4	5	S	
22	Data keeping, data analysis, research and involvement in different projects				Y	Y	Y	3	4	5	S, H, I	
23	Knowledge on recent advances of cardiology	Y	Y	Y	Y	Y	Y	3	4	5	S, H, I	
24	Should be able to teach pathology to undergraduates (MBBS), and allied health sciences like BDS, BSc (Nursing), BSc (MLT), BSc (Radiology), etc.	Y			Y	Y	Y	3	4	5	UG, H	
25	Should be able to supervise supportive staffs, technicians etc		Y	Y	Y		Y	2	3	4	H, P, C	
26	Performance of soft skills such as counselling with the patient /attenders/ Breaking a bad news/Grave prognosis/Death/informed consent/discharge advice/follow up			Y	Y	Y	Y	3	4	5	P, I, C, H	
27	Should have thorough knowledge of Biomedical Waste disposal		Y			Y	Y	3	4	5	PG, H	
INVESTIGATIONS												
28	Chest X-RAY:	Y	Y					1,2	3,4	5	S, H, I	
29	EKG	Y	Y			Y		1	3,4	5	S, H, I	
30	ECHO	Y	Y			Y		1	3,4	5	H, I	
31	TEE	Y	Y			Y		1	3,4	5	H, I	
32	TMT	Y	Y			Y		1	3,4	5	S, H	
33	HOLTER		Y	Y		Y	Y	3	4	5	H, I	
34	Congenital echo	Y	Y					1,2	3	4	S, H	

Sr. No	Entrustable Professional Activities	COMPETENCIES							EXPECTED LEVEL			MSF
		MK	PC	ICS	P	PBLI	SBP	Ist year	2 nd year	3 rd Year		
35	Peripheral arterial Doppler					Y	Y	1	2,3	4	S	
36	Understanding the cardiac biomarkers	Y	Y			Y		2	3	4	S, H	
CARDIAC EMERGENCIES												
37	Arteriovenous access	Y	Y	Y		Y		1	2,3	4	S	
38	Temporary pacing	Y	Y			Y		1	2,3	4	S	
39	Pericardiocentesis	Y	Y			Y		1	2	3,4	S	
40	Triaging care of ACS	Y	Y			Y		1	2,3	4	S, H	
41	Thrombolysis	Y						1	1	1	S	
42	Management of acute heart failure	Y	Y					1	2,3	4	S, H, PG	
CARDIAC ICCU												
43	Approach to patient with chest pain	Y	Y			Y		3	4	5	S, H, PG	
44	Acute heart failure	Y	Y					3	4	5	S, PG, H	
45	Tachyarrhythmia	Y	Y			Y		3	4	5	S, PG	
46	Bradyarrhythmia	Y	Y					3	4	5	S, PG	
47	Cardiogenic shock	Y	Y					3	4	5	S, H, PG	
48	Cardiac tamponade	Y	Y			Y		3	4	5	P, PG, H	
49	Complication of previously done cardiac procedure					Y		2	3	4	S	
50	Supporting cardiogenic shock with IABP, IMPELLA	Y	Y			Y		2	3	4	S	
51	Acquainted with basic and advance life support		Y			Y		1,2	3	4	S, H, PG	
52	Emergency pericardiocentesis	Y	Y					2,3	4	5	S, H	
53	Counselling of attendants in cases of death with empathy	Y				Y		1	3	4	S, H	
CARDIAC CATHETERIZATION												
54	Familiar with Checklists for catheterization laboratory procedures	Y	Y					1	2	4	S, H	
55	Counselling of patients for catheterization procedures	Y	Y					1	2	4	S, H	

Sr. No	Entrustable Professional Activities	COMPETENCIES						EXPECTED LEVEL			MSF
		MK	PC	ICS	P	PBLI	SBP	1st year	2 nd year	3 rd Year	
56	Inform consent	Y	Y	Y		Y	Y	1	2,3	4	S, PG, H
57	familiarize with various catheterization Laboratory equipment		Y					1	2,3	4	S, H, PG
58	Basic knowledge of coronary angiogram and performing coronary angiography with supervision	Y	Y				Y	1	2,3	4	S, PG, H
59	Independent coronary angiogram	Y	Y					1	2	3	S, H
60	Hemodynamic study in congenital heart disease under general anaesthesia		Y					1	2	3	S, H
61	Angioplasty	Y	Y					1	2	3	S, H
62	Pacemaker implantation	Y	Y					1	2	3	S

Abbreviations

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

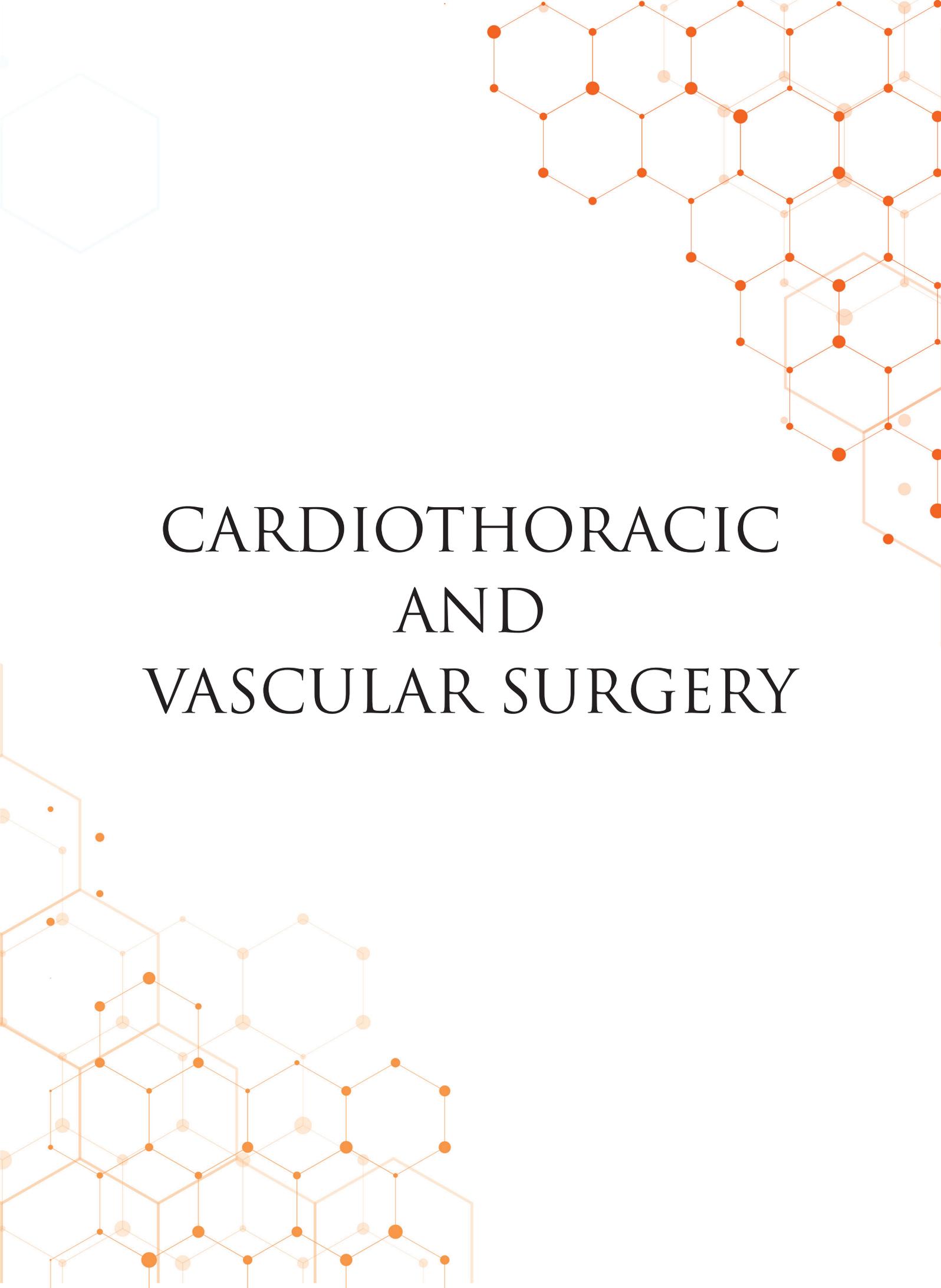
Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



CARDIOTHORACIC
AND
VASCULAR SURGERY

MCh in Cardiothoracic and Vascular Surgery

COURSE NAME:

MCh in Cardiothoracic & Vascular Surgery

DURATION OF COURSE:

3 years

ELIGIBILITY:

MS (General Surgery), DNB (General Surgery)

OBJECTIVES

The programme aims to provide sound knowledge in preoperative evaluation, and post-operative management of patients having of Cardio-Thoracic & Vascular diseases requiring surgery. Besides, candidates will receive graded and supervised operative experience so that they are trained to become competent Cardiothoracic Vascular Surgeons.

Duties and responsibilities

During the training period, the trainee shall work as a full-time resident under the head of the division. He shall take part in all activities of the department including participation in seminars, conferences, teaching assignment, operating sessions, experimental surgery and other duties that may be assigned to him.

Programme Objectives

The purpose of the training program in the speciality of CTVS is to produce competent individuals who can meet the health care needs of the society concerning Cardiothoracic Vascular diseases.

Specific objectives of the programme

- To train to perform elective and emergent Cardio Thoracic Vascular Surgery procedures
- To have a scientific approach to Cardio-Thoracic Vascular illness to be able to decide on optimal therapeutic strategy ranging from the risk factor modifications, medical interventional and surgical options appropriately.

- To be able to develop an interdisciplinary partnership with, cardiologist, radiologist, etc

SPECIFIC LEARNING OBJECTIVES

- To develop knowledge levels and to acquire skills to handle elective and emergent problems in the field of Cardio-Thoracic Vascular Surgery.
- To expose and train individuals to plan and operate on Cardio-Thoracic Vascular Surgery procedures
- To provide equipment skills to diagnose, plan, treat and follow-up Cardio-Thoracic Vascular Surgery patients.
- To update recent knowledge and to keep in pace with rapid advances in the progress of techniques.
- To sensitize the trainee to newer learning methods and research tools & to encourage clinical research.
- To publish papers in indexed journals, e.g., an article, short papers, short case reports, clinical reviews, research papers during the training period.

THEORETICAL TRAINING

- To impart training in theory and practices in Cardio-Thoracic Vascular Surgery
- To conduct the monthly audit.
- To take part in the departmental academic programme and interactive sessions.

PRACTICAL TRAINING

- To expose the trainee to diagnose and work-up outpatient cases.
- To plan and prepare inpatient for major surgical procedures.
- To conduct interactive ward rounds and to assess the trainee with regard to clinical skills.
- The objective in the operating room is to infuse confidence and impart surgical skills in a graded manner.

- The first-year candidate would be exposed to operate on minor surgical procedures.
- The second and third-year candidates would be trained to assist critical procedure and finally to independently operate major procedure under supervision faculty.

Competence expected at the end of the training

<p>Professionalism</p>	<ul style="list-style-type: none"> • Demonstrate a commitment to their patients, profession, and community • Consistently apply ethical principles • Is accountable for their own decisions and actions • Maintain appropriate relations with patients <p>Recognize medico-legal issues</p> <ul style="list-style-type: none"> • Identify ethical expectations that impinge on the most common medico-legal issues • Recognise the principles and limits of patient confidentiality • Apply appropriate national / state regulations <p>Demonstrate a commitment to their patients, profession, and community through participation in profession-led regulation</p> <ul style="list-style-type: none"> • Employ a critically reflective approach to their practice • Acknowledge and learn from mistakes • Participate in peer review
<p>Scholar / Teacher</p>	<ul style="list-style-type: none"> • Access and interpret relevant evidence • Integrate new learning into practice <p>Critically evaluate medical information and its sources, and apply appropriately to practice decisions</p> <ul style="list-style-type: none"> • Draw on different kinds of knowledge to weigh up patients’ problems in terms of context, issues, needs and consequences • Describe the principles of critical appraisal • Critically appraise new trends in surgery <p>Facilitate the learning of patients, families, trainees, other health professionals, and the community</p> <ul style="list-style-type: none"> • Collaboratively identify the learning needs and desired to learn outcomes of others • Describe principles of learning relevant to medical education • Provide effective feedback <p>Contribute to the development, dissemination, application, and translation of new medical knowledge and practices</p> <ul style="list-style-type: none"> • Select and apply appropriate methods to address a research question • Describe the principles of research ethics • Conduct a systematic search for evidence

Health Advocacy	<ul style="list-style-type: none"> • Respond to individual patient health needs • Identify the health needs of an individual patient <p>Promote health maintenance of patients</p> <ul style="list-style-type: none"> • Advise patients (and their families) on ways to maintain and/or improve their health <p>Respond to the health needs of the community</p> <ul style="list-style-type: none"> • Describe the health needs in the practise communities that they serve • Identify opportunities for advocacy and health promotion and respond appropriately • Identify the determinants of health in the populations including barriers to access to care and resources <p>Promote health maintenance of colleagues</p> <ul style="list-style-type: none"> • Describe the ethical and professional issues inherent to working in teams <p>Look after their own health</p> <ul style="list-style-type: none"> • Take responsibility to ensure that when they are on duty or on-call, they are at the optimal level of performance <p>Advocate for improvements in health care</p> <ul style="list-style-type: none"> • Identify points of influence in the health care system and its structures • Describe the role of the medical profession in advocating collectively for health and patient safety
Management and Leadership	<ul style="list-style-type: none"> • Manage and lead clinical teams • Is respectful of the different kinds of knowledge and expertise which contribute to the effective functioning of a clinical team • Communicate with and co-ordinate surgical teams to achieve an optimal surgical environment • Manage their practise and career effectively • Use time management skills appropriately • Maintain accurate and up-to-date patient records • Serve in administration and leadership roles, as appropriate • Chair or participate effectively in monthly audit
Collaboration	<ul style="list-style-type: none"> • Work in collaboration with members of interdisciplinary teams where appropriate • Collaborate with other professionals in the selection and use of various types of treatments assessing and weighing the indications and contraindications associated with each type • Effectively work with other health professionals to minimise interprofessional conflict and maximise patient care • Demonstrate a respectful attitude towards other colleagues and members of interpersonal terms.

	<ul style="list-style-type: none"> • Develop a care plan for a patient in collaboration with members of an interdisciplinary team • Recognise the need to refer patients to other professionals • Initiate the resolution of misunderstandings or disputes
Communication	<ul style="list-style-type: none"> • Develop rapport, trust and ethical therapeutic relationships with patients and families • Establish positive therapeutic relationships with patients and their families • Respect patient's confidentiality, privacy and autonomy • Respect patient diversity and difference (including gender, age, religion, culture) <p>Accurately elicit and synthesize relevant information from patients, families, colleagues and other professionals</p> <ul style="list-style-type: none"> • Gather information about a health condition and also about a patient's beliefs, concerns, expectations and illness experience • Identify when a patient is likely to interpret information as bad news and adjust their communication accordingly <p>Accurately convey relevant information and explanations to patients and families, colleagues and other professionals</p> <ul style="list-style-type: none"> • Communicate information to patients (and their family) about procedures, potentialities, and risks associated with surgery in ways that encourage their participation in informed decision making • Communicate with the patient (and their family) the treatment options, potentials, complications, and risks associated with the use of drugs • Appropriately adjust the way they communicate with patients to accommodate cultural and linguistic differences <p>Develop a common understanding (with patients, families, colleagues and other professionals) on issues, problems and plans</p> <ul style="list-style-type: none"> • Discuss relevant information with patients (and their family) in ways that encourage their participation in informed decision making • Encourage patients to discuss and question • Effectively identify and explore problems to be addressed from a patient encounter
Medical Expertise	<p>Establish and maintain clinical knowledge, skills and attitudes appropriate to their practice</p> <ul style="list-style-type: none"> • Basic Sciences • Anatomy • Biology • Pathology, particularly oncology • Immunology • Microbiology and antibiotics • Pharmacology

	<ul style="list-style-type: none"> • Physiology • Genetics, particularly neonatal • Pre-operative, intra-operative, and post-operative care and assessment in particular • DVT prophylaxis • Fluid and electrolytes • Wound care • Haemostasis
Clinical Decision Making	<ul style="list-style-type: none"> • Recognize the symptoms of, accurately diagnose, and manage common problems in their area of expertise • Manage patients in ways that demonstrate sensitivity to their physical, social, cultural, and psychological needs • Use preventative and therapeutic interventions effectively
	<ul style="list-style-type: none"> • Manage the critically ill patient • Effectively manage complications <p>Perform a complete and appropriate assessment of a patient</p> <ul style="list-style-type: none"> • Take a history, perform an examination, and arrive at a well-reasoned diagnosis • Efficiently and effectively examine the patient <p>Organize diagnostic testing, imaging and consultation as appropriate</p> <ul style="list-style-type: none"> • Appraise and interpret radiographic investigations against patient's needs including • Plain radiographs • Ultrasound • Echocardiography • angiography • CT • MRI
Technical Expertise	<ul style="list-style-type: none"> • Safely and effectively perform appropriate surgical procedures • Consistently demonstrate sound surgical skills • Demonstrate procedural knowledge and technical skill at a level appropriate to their level of experience • Approach and carry out procedures with due attention to the safety of patient, self, and others • Analyze their clinical performance for continuous improvement

SYLLABUS

CARDIAC SURGERY

Fundamentals

- Surgical Anatomy of the Heart
- Cardiac Surgical Anatomy and Physiology
- Cardiac Embryology
- Cardiovascular Pharmacology and Pathology
- Cardiac Imaging
- Risk Stratification and Comorbidity

Perioperative/Intraoperative Care

- Preoperative evaluation for cardiac surgery and cardiac anaesthesia
- Transfusion therapy and blood conservation deep hypothermic circulatory arrest myocardial protection
- Postoperative care of cardiac surgery patients and cardiopulmonary resuscitation
- Temporary mechanical circulatory support
- Late complications of cardiac surgery

Cardiopulmonary bypass

- Physiology and pathology
- Haematology
- Clinical applications
- Cardiopulmonary bypass in neonates, infants and children

Pathophysiology

- Atherosclerosis
- Coronary artery disease
- Valvular heart disease
- Rheumatic fever
- Aortic aneurysm Aortic dissection
- Congenital heart disease
- Congestive Heart failure
- Pericardial diseases

Immunobiology of Heart and Heart-lung transplantation

Thoracic Surgery

The Lung, Pleura, Diaphragm and Chest Wall

- Anatomy of the Thorax
- Embryology of the Lungs
- Ultrastructure and morphometry of the human lung
- Cellular and molecular biology of the lung
- Surgical Anatomy of the Lungs
- Anatomy of the thoracic duct and chylothorax
- Lymphatics of the Lungs
- Pulmonary gas exchange mechanics of breathing

Thoracic Imaging

- Radiographic evaluation of the Lungs and Chest
- Computed Tomography of the Lungs, Pleura, and Chest Wall
- Magnetic Resonance Imaging of the Thorax
- Positron Emission Tomography in Chest Diseases
- Radionuclide Studies of the Lung

Diagnostic Procedures

- Laboratory Investigations in the diagnosis of pulmonary diseases
- Molecular Diagnostic Studies in Pulmonary Disease
- Bronchoscopic evaluation of the lungs and tracheobronchial tree
- Invasive diagnostic procedures
- Video-Assisted thoracic surgery as a diagnostic tool

Assessment of the Thoracic Surgical Patient

- Pulmonary physiologic assessment of operative risk
- Preoperative cardiac evaluation of the thoracic surgical patient

Anesthetic Management of the General Thoracic Surgical Patient

- Preanesthetic evaluation and preparation conduct of anaesthesia
- The Shared Airway: management of the patient with airway pathology
- Anaesthesia for pediatric general thoracic surgery

Postoperative Management of the General Thoracic Surgical Patient

- General principles of postoperative care
- Mechanical ventilation of the surgical patient

Embryology and anatomy

- Lung, Tracheobronchial tree, Diaphragm, Pleura

Lung cancer

- Epidemiology
- Screening for Lung Cancer: challenges for thoracic surgery pathology of carcinoma of the lung
- Present concepts in the molecular biology of lung cancer
- Clinical presentation of lung cancer
- Radiologic evaluation of lung cancer diagnosis and staging of lung cancer

Mediastinum

Anatomy

- The Mediastinum, its compartments, and the mediastinal lymph nodes
- The Thymus
- Mediastinal Parathyroids
- Neurogenic Structures of the Mediastinum

Noninvasive Investigations

- Radiographic, Computed Tomographic, and Magnetic Resonance

Investigation of the Mediastinum

- Radionuclide studies of the mediastinum mediastinal tumour markers

Pathology of mediastinal tumours

Vascular Surgery

Applied Anatomy

Regional and developmental - of Aorta and arteries and branches.

Exposure of blood vessels at every body part in the chest, abdomen, and neck, Veins in extremities and inferior vena cava.

Applied Physiology

- Blood pressure, Cardiac output, regional circulation especially those of subsystem and peripheral in the extremities, carotid arteries and cerebral circulation.

Applied Pathology

- Pathology of diseases of Aorta, Arteries,
- Pathology of Deep Venous thrombosis, AV malformation.

Applied Bacteriology

- Infection in Vascular Surgery, prosthetic graft infection, primary and secondary arterio-venous fistula

Cardiovascular Engineering

- Concept of flow, pressure gradient, heart as a pump, prosthetic heart valves, extracorporeal circulation, biocompatibility, materials in the cardiovascular application, medical physics, electronics in transducers, clinical monitoring and medical imaging

Biostatistics

- Methodology and design of clinical research Statistical Inference
- Biostatistics for clinical Research-sample size, statistical approach, statistical significance,

sensitivity, specificity, Univariate and multivariate analysis, actuarial survival.

Ischemic Heart Disease

- Indications for Revascularization
- Myocardial Revascularization with Percutaneous Devices
- Myocardial Revascularization with Cardiopulmonary Bypass
- Myocardial Revascularization without Cardiopulmonary Bypass
- Myocardial Revascularization with Carotid Artery Disease Myocardial Revascularization after Acute Myocardial Infarction
- Minimally Invasive Myocardial Revascularization
- Coronary Artery Reoperations
- Transmyocardial Laser Revascularization and Extravascular Angiogenesis techniques to increase myocardial blood flow
- Surgical treatment of complications of Acute Myocardial Infarction
- Postinfarction ventricular septal defect and free wall rupture
- Ischemic Mitral Regurgitation
- Left Ventricular Aneurysm

Valvular Heart Disease

- Aortic Valve Replacement with a Mechanical Cardiac Valve Prosthesis
- Bioprosthetic Aortic Valve Replacement: Stented Valves
- Stentless Aortic Valve Replacement: Autograft/Homograft
- Stentless Aortic Valve Replacement: Porcine and Pericardial Aortic Valve Repair and Aortic Valve-Sparing Operations
- Surgical Treatment of Aortic Valve Endocarditis
- Minimally Invasive Aortic Valve Surgery
- Percutaneous Aortic Valve Interventions Mitral Valve Repair
- Mitral Valve Replacement
- Surgical Treatment of Mitral Valve Endocarditis

- Minimally Invasive and Robotic Mitral Valve Surgery
- Percutaneous Catheter-Based Mitral Valve Repair
- Tricuspid Valve Disease
- Multiple Valve Disease
- Reoperative Valve Surgery
- Valvular and Ischemic Heart Disease

Diseases of the Great Vessels

- Aortic Dissection
- Ascending Aortic Aneurysms
- Aneurysms of the Aortic Arch
- Descending and Thoracoabdominal Aortic Aneurysms
- Endovascular Therapy for the Treatment of Thoracic Aortic Disease
- Pulmonary Embolism and Pulmonary Thromboendarterectomy
- Trauma to the Great Vessels

Surgery for Cardiac Arrhythmias

- Cardiac rhythm disturbance
- Interventional therapy for atrial and ventricular arrhythmias
- Surgical treatment of atrial fibrillation
- Surgical implantation of pacemakers and automatic defibrillators

Other Cardiac Conditions and Operations

- Adult Congenital Heart Disease
- Pericardial Disease
- Cardiac Neoplasms
- Hypertrophic Obstructive Cardiomyopathy
- Heart Failure

Critical Care

Transplant and Circulatory Support

- Heart Transplantation
- Mechanical circulatory support & total artificial heart

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- Nontransplant surgical options for heart failure
 - Tissue engineering for cardiac valve surgery
 - Stem Cell-Induced Regeneration of Myocardium

CONGENITAL HEART SURGERY

- Atrial Septal Defect and Partial Anomalous Pulmonary Venous Connection
- Total Anomalous Pulmonary Venous Connection
- Cor Triatriatum
- Unroofed Coronary Sinus Syndrome
- Atrioventricular Septal Defect
- Ventricular Septal Defect
- Congenital sinus of Valsalva Aneurysm
- Aortic-Left Ventricular Tunnel
- Patent Ductus Arteriosus
- Ventricular Septal Defect with Pulmonary Stenosis or Atresia Pulmonary Stenosis or Atresia and Intact Ventricular Septum
- Tricuspid Atresia and Management of Single-Ventricle Physiology
- Ebstein Anomaly
- Truncus Arteriosus
- Aortopulmonary Window
- Origin of Right or Left Pulmonary Artery from Ascending Aorta
- Anomalies of the Coronary Arteries
- Congenital Aortic Stenosis
- Coarctation of the Aorta and Interrupted Aortic Arch
- Aortic Atresia and Other Forms of Hypoplastic Left Heart Physiology
- Congenital Mitral Valve Disease
- Vascular Ring and Sling
- Complete Transposition of the Great Arteries
- Double Outlet Right or Left Ventricle
- Congenitally Corrected Transposition of the Great Arteries and Other Forms of Atrioventricular Discordant Connection
- Double Inlet Ventricle and Atretic Atrioventricular Valve

- Anatomically Corrected Malposition of the Great Arteries
- Atrial Isomerism

THORACIC SURGERY

Pulmonary Resections

- Thoracic Incisions
- General Features of Pulmonary Resections
- Technical Aspects of Lobectomy
- Sleeve Lobectomy
- Pneumonectomy and its modifications
- Tracheal Sleeve Pneumonectomy
- Segmentectomy and Lesser Pulmonary Resections
- Emphysema Surgery
- Instruments and Techniques of Video-Assisted Thoracic Surgery
- Video-Assisted Thoracic Surgery for Wedge Resection, Lobectomy, and Pneumonectomy
- Median Sternotomy and Parasternal approaches to the lower trachea and main stem bronchi
- Extended resection of bronchial carcinoma in the superior anterior approach to superior sulcus lesions
- Complications of Pulmonary Resection
- Management of perioperative cardiac events

Chest Wall

- Chest wall deformities infections of the chest wall thoracic outlet syndrome thoracoscopic sympathectomy
- Anterior transthoracic approaches to the spine chest wall tumours
- Chest wall reconstruction

The Diaphragm

- Diaphragmatic function, diaphragmatic paralysis, and eventration of the diaphragm
 - The pacing of the diaphragm
 - Congenital posterolateral diaphragmatic hernias and other less common hernias of the diaphragm in infants and children
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- Foramen of Morgagni Hernia
 - Tumours of the Diaphragm

The Pleura

- Pneumothorax
- Parapneumonic Empyema
- Postsurgical Empyema
- Tuberculous and Fungal Infections of the Pleura
- Fibrothorax and Decortication of the Lung
- Thoracoplasty: Indications and Surgical Considerations
- Localized Fibrous Tumour of the Pleura
- Diffuse Malignant Mesothelioma
- The technique of Extrapleural Pneumonectomy for Diffuse Malignant Pleural Mesothelioma
- Uncommon Tumors of the Pleura
- Malignant Pleural Effusions Malignant Pericardial Effusions

Thoracic Trauma

- Blunt and penetrating injuries of the chest wall, pleura, and lungs barotrauma and inhalation injuries
- Acute Respiratory Distress Syndrome
- Management of foreign bodies of the airway
- Diaphragmatic Injuries

The Trachea

- Tracheostomy
- Techniques of resection and reconstruction of the trachea
- Management of nonneoplastic diseases of the trachea
- Benign and malignant tumours of the trachea
- Compression of the trachea by vascular rings

Congenital, Structural, and Inflammatory Diseases of the Lung

- Congenital lesions of the lung
- Pulmonary complications of cystic fibrosis
- Congenital vascular lesions of the lungs

- Chronic Pulmonary Emboli
- Bullous and bleb diseases of the lung
- Emphysema of the lung and lung volume reduction operations
- Bacterial infections of the lungs and bronchial compressive disorders
- Pulmonary tuberculosis and other Mycobacterial diseases of the lungs
- Surgery for the management of *Mycobacterium Tuberculosis* and Nontuberculous Mycobacterial infections of the lung
- Thoracic mycotic and actinomycotic infections of the lung
- Pleuropulmonary Amebiasis
- Hydatid disease of the lung
- Pulmonary Paragonimiasis and its surgical complications solitary pulmonary nodule
- Diffuse lung disease lung transplantation

Carcinoma of the Lung

- Surgical treatment of non-small cell lung cancer
- Mediastinal lymph node dissection
- Endoluminal management of malignant airway disease
- Basic Principles of Radiation Therapy in Carcinoma of the Lung Radiation
- Therapy for Carcinoma of the Lung
- Chemotherapy of Non-Small Cell Lung Cancer
- Multimodality Therapy for Non-Small Cell Lung Cancer
- Novel Systemic Therapy for Advanced Non-Small Cell Lung cancer
- Small Cell Lung Cancer
- Novel Strategies for Lung Cancer Immunotherapy

Other Tumors of the Lung

- Carcinoid Tumors
- Adenoid Cystic Carcinoma and Other Primary Salivary Gland-Type Tumors of the Lung
- Benign Tumors of the Lung
- Uncommon Primary Malignant Tumors of the Lung

- Secondary Tumors of the Lungs
- Lung Tumors in the Immunocompromised Host

Mediastinum

Invasive Diagnostic Investigations and Surgical Approaches

- Cervical Substernal “Extended” Mediastinoscopy Sternotomy and Thoracotomy for mediastinal disease
- Posterior Mediastinotomy
- Video-Assisted Thoracic Surgery for Mediastinal Tumors and Cysts and other diseases within the mediastinum
- Mediastinal Infections, an overview of mass lesions in the mediastinum and control of vascular obstructing symptomatology
- Acute and chronic mediastinal infections
- Overview of primary mediastinal tumours and cysts
- Diagnostic investigation of mediastinal masses
- Lesions masquerading as primary mediastinal tumors or cysts
- Vascular masses of the mediastinum
- Superior Vena Cava Syndrome: clinical features, diagnosis, and treatment
- Vein grafts for the superior vena cava
- The use of prosthetic grafts for the replacement of the superior vena cava

Primary Mediastinal Tumours

- Myasthenia Gravis
- Standard Thymectomy, Transcervical Thymectomy
- Video-Assisted Thymectomy, Extended Transsternal Thymectomy
- Transcervical-Transsternal Maximal Thymectomy for Myasthenia Gravis
- Evaluation of results of thymectomy for non-thymic related Myasthenia Gravis
- Benign lymph node disease involving the mediastinum

- Biological Markers and pathology of mediastinal lymphomas
- Diagnosis and treatment of mediastinal lymphomas
- Benign Germ Cell tumours of the Mediastinum
- Primary Seminomas of the Mediastinum
- Nonseminomatous malignant germ cell tumors of the mediastinum
- Poorly differentiated carcinoma of the mediastinum
- Benign and malignant neurogenic tumours of the mediastinum in children and adults
- Excision of Hourglass tumours of the paravertebral sulcus
- Mediastinal paragangliomas and pheochromocytomas
- Mesenchymal tumours of the mediastinum
- Mediastinal parathyroid adenomas and carcinomas

Mediastinal Cysts

- Foregut Cysts of the Mediastinum in infants and children
- Foregut Cysts of the Mediastinum
- Gastroenteric Cysts and Neurenteric Cysts in infants and children
- Mesothelial and other less common cysts of the mediastinum

Vascular Surgery

- Clinical vascular surgery
- Endovascular intervention
- Recent advances in Vascular & Endovascular Surgery
- Clinical and operative surgery of Aorta, all arteries, veins, inferior vena cava.
- Endo Vascular intervention like Angioplasty, Stenting, Endo Vascular stent-graft repair of aneurysm of arteries and abdominal aorta.
- Vascular medicine including prophylaxis, treatment of deep vein thrombosis and pulmonary embolism

TEACHING & LEARNING METHODS

Academic sessions

During the course, the candidate shall present some academic sessions and attend the others.

Each session will be designed to last 1 hour with at least 15 minutes devoted to a discussion on the topic

An academic session may be any of the following –

1. *Subject seminar* at least two such sessions are recommended every month. The seminars are aimed to cover the majority of topics in the syllabus. Each candidate shall present at least four seminars in one academic year and attend at least 12 others.
2. *Journal review* - Recommended at least once a fortnight. Relevant articles from recommended journals are reviewed. Each candidate shall present at least four journal reviews in one academic year and attend at least 12 others.
3. *Clinical case presentation* – Representative clinical cases shall be presented and discussed in detail in these sessions. Two such sessions are recommended every month and should include a mix of short and long cases. Each candidate shall present at least four clinical cases in one academic year and attend at least 12 others.
4. *Interdepartmental meetings* – Inter-departmental meetings shall facilitate clinical/group discussion/symposia etc. Two such monthly meets are recommended. Each candidate shall present at least four such meets in one academic year and attend at least 12 others. The inter-departmental meets are as follows. Cardiology-CTVS Cath Meet- Once a week, Pathology & CTVS- Bi-monthly, Radiology & CTVS- Bi-monthly, Pulmonary Medicine & CTVS- Bi-monthly, Paediatric /Neonatology & CTVS- Bi-monthly Cardiac Anaesthesia/ Critical care & CTVS- Bi-monthly.
5. *Operative procedures* – This session, recommended once a month, aims at discussing common operative procedures and practical

details. Each candidate shall present at least two such meets in one academic year and attend at least six others.

6. *Treatment planning* – Recommended once monthly, this session will focus on management strategies of specific clinical cases, particularly where a multi-speciality approach is planned. Each candidate shall present at least two such meets in one academic year and attend at least six others.
7. *Ward rounds and Teaching round* – There would be at least once consultant-led ward round daily. This would be a service round with individual case presentation and a brief discussion. Besides, at least three teaching rounds per week are recommended involving detailed discussion on admitted clinical cases. Besides theoretical aspects, emphasis must be laid on bedside assessment and practical management issues.

External Postings

The MCh (Cardiothoracic & Vascular Surgery) trainee will be posted in the following allied specialities. The total duration of these postings shall not exceed three months.

i. Cardiology (Cathlab Posting)	2 weeks
ii. Perfusion Techniques posting	4 weeks
iii. Echocardiography, TMT, Holter, ECG	2 weeks
vi. Bronchoscopy	1 week

- *Coronary care Intensive Care Unit*: Duration- 2-4 weeks. This is intended to familiarize the candidate to the principles of pediatric medical intensive care and its applications to pediatric surgical care.
- *Posting in emergency medicine*- all trainee should attend the call emergency in the emergency department when given a call without fail. They should be on call for CTVS related management. They may be posted to the emergency department for two weeks to 4 weeks, subjected to availability of residents in the parent department to manage regular duty in CTVS department.

- *Optional* - Other postings may be scheduled as deemed necessary for the fulfilment of curricular demands, e.g. Thoracic Oncosurgery, etc. in the third year, in the same or another tertiary teaching centre

During cardiology/ echo/ perfusion posting the trainee shall familiarize and learn the following Interventional cardiology including catheter skills, measurement of cardiac output, Qp, Qs, coronary angiogram views, basics of PTMC, Transthoracic echocardiogram-various echocardiography views, familiarize with the echo of congenital heart diseases, valvular heart diseases and ischemic heart diseases. At the end of perfusion posting, the trainee should be able to assemble CPB circuit and should have helped senior perfusionist in 5 open-heart cases

The conference, CMEs and Workshops

Participation and contributing to the organization of such meets is desirable. During the three years of training; it is desirable to attend at least one national level, and two state-level meets and present a paper in each of them. A total of 15 days are allowed to attend such academic activities in the tenure of 3 years and will be considered as on-duty.

Publications

The MCh trainee will be required to prepare a manuscript for publication under the guidance of a postgraduate teacher. It is desirable to submit at least one original article and one brief /case reports for publication during the course.

Teaching

The candidate will assist and be involved in the teaching of undergraduate medical/ nursing students and those training for MS (Gen. Surg.) and MD (General Medicine & Pulmonary Medicine). He/she will learn the use of various teaching media (e.g. audiovisual aids) in this exercise.

Journal club & Seminar

There will be mandatory one journal club & One seminar each week on Tuesday & Saturday

respectively of 1 hr each in the departmental seminar room.

PRACTICAL, CLINICAL AND LABORATORY EXPERIENCE TO BE IMPARTED

Operative Experience

The total operative experience must be recorded in the Trainee logbook, which will be assessed every six months by the programme director. It is emphasized that these numbers are only a general guide

Year 1

Second Assistant to 25 Cardio-Thoracic vascular cases

Perform the following under supervision:

1.	Sternotomy	5
2.	Closure of Sternotomy	5
3.	Vein harvest	5
4	Cannulation for cardiopulmonary bypass	2

Year 2

First assistant at 25 Cardiothoracic cases

Perform the following under supervision:

1.	Cannulation for cardiopulmonary bypass	10
2.	Sternotomy and closure	10
3.	Vein Harvest	10
5.	ASD Closure	02

Year 3

First assistant at 50 Cardiothoracic Surgery cases

Perform the following under supervision:

1.	Proximal Anastomosis in CABG	5
2.	IMA harvest	5
3.	ASD Closure	5
4.	MVR / AVR	2

Thoracic and Vascular surgery requirements in 3 years

1.	Assisting to Major Thoracic procedures	25
2.	Perform Thoracotomy/ Lobectomy/Pneumonectomy	15
3.	Assistant to Major vascular Procedures	15

Clinical training modules

The training modules are developed so that the trainee will have broad exposure to all spectrum of cardiothoracic and vascular surgery. Diseases of the oesophagus will not be covered in training as well as in examination. All residents are expected to attend the 1-day course every year to familiarize about Advanced trauma and life support class (ATLS)

First Year

Adult cardiac surgery	6 months
Pediatric cardiac surgery	4 months
Thoracic and Vascular surgery	2 months

Second Year

Adult cardiac surgery	6 months
Pediatric cardiac surgery	4 months
Thoracic and vascular surgery	2 months

Final Year

Adult cardiac surgery	6 months
Pediatric cardiac surgery	4 months
Thoracic and Vascular Surgery	2 months

ASSESSMENT

There will be a periodic assessment of learning outcomes. Following will be methods of assessment:

1. Personal Attitudes
2. Acquisition of Knowledge
3. Clinical and Operative Skills
4. Teaching skills
5. Periodic Tests
6. Logbook
7. Thesis

Personal Attitudes

The essential items are:

- Caring attitude
- Punctuality
- Initiative
- Organizational ability
- Potential to cope with stressful situations and undertake responsibility
- Trustworthiness and reliability
- To understand and communicate intelligibly with patients and others
- To behave in a manner which establishes professional relationships with patients and colleagues
- Ability to work in a team
- A critical enquiring approach to the acquisition of knowledge.

The methods used mainly consist of observation. Periodic reviews and feedback will be given to the residents, by the supervisors and peers.

Acquisition of knowledge

Logbook will be assessed by periodic checking which will record participation in various teaching/learning activities by the residents. The number of activities attended and the presentations made will be recorded. The logbook will be validated periodically by the supervisors.

Clinical and Operative Skills

Skills in outpatient, endoscopy room and ward work will be assessed periodically.

a. Clinical Meetings:

Candidates should periodically present cases to his peers and faculty members. Candidates approach the case, diagnosis abilities, case workup and treatment planning will be assessed using a checklist.

b. Procedural Skills:

The candidate will be given graded responsibilities to enable learning by apprenticeship. The assessment will include candidates' analytical ability, pre-procedural assessment, planning for endoscopy, assistance during the procedure, procedural skills and post-procedural care. The performance will be assessed by the guide by direct observation.

Teaching Skills

Candidates will be encouraged to teach undergraduate students, postgraduate students (MS General Surgery) and paramedical students, if any and also MD (General Medicine, Pulmonary Medicine &) students on peripheral posting. This performance will be based on the assessment by the faculty members of the department and from feedback from the undergraduate/postgraduate students.

INTERNAL ASSESSMENT

a. Compulsory examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination assessment.
- Candidate should pass (obtaining 50% marks) to appear in Final examination.
- No marks from this examination will be added to the final examination.

- Will be conducted by Examination Cell in June-July & December-January

b. Internal Assessment Examination

- A total of three internal examinations will be conducted at the end of 3rd Semester; end of 4th Semester & four months before the final examination.
- Marks distribution: Theory 100 marks and Practical 100 marks (Clinical/practical/experimental=70, Viva=20, Logbook=10).
- The marks of the three internal examinations will be averaged to 100 each for theory and
- practical and will be added to the final examination.

Syllabus for internal examinations:

- 1st Internal assessment exam (18th Month)- Topics on Basic Science cardiothoracic vascular surgery and Allied sciences (Cardiology / Pulmonary Medicine) & Adult Cardiothoracic Vascular Surgery.
- 2nd Internal Examination (24th Month)- Topics on Paediatric / Congenital Cardiothoracic Vascular Surgery & Recent advances in Cardiothoracic Vascular Surgery.
- Pre-Final (32nd Months)- All topics

Eligibility for appearing in Final Examination

- Passed (secured 50% marks) in the examination on Research Methodology and Biostatistics and
- Passed (secured 50% marks) in internal examinations and
- The thesis submitted six months before the final examination and is approved/accepted by an external evaluator.

SUMMATIVE ASSESSMENT

Final Exit Examination will be carried out by two external examiners and two internal examiners.

Final Theory paper examinations: 4 Theory papers (100 marks each)

- Paper I: Basic and Allied sciences (Cardiology / Pulmonary Medicine).
- Paper II: Adult Cardiothoracic Vascular Surgery
- Paper III: Congenital/ Paediatric Cardiothoracic Vascular Surgery
- Paper IV: Recent advances in Cardiothoracic Vascular Surgery.

Theory question paper format:

- One Long question – 20 marks
- Eight Short question/notes – 10 x 8 = 80 marks

Total marks in Final Theory exam: (500 marks)

- Four papers in the final examination – 400 marks
- Average of 3 internal assessment Theory examination – 100 marks

Students have to secure 50% marks in internal marks (in both theory and practical) to be eligible to appear for the final examinations

Final Practical Examination (Total Marks 500)

- Practical examination: Total marks: 500
- Practical and viva in the final examination– 400 marks

Final marking pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	4 month before final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

- Average of 3 internal Assessment Practical examinations-100 marks

The format of the practical examination (400 marks) is as follows:

Part	Component	Marks Alloted
PART A (200 Marks)**	Long Case (01)	75
	Short Cases (03)	75
	Ward Round	50
PART B (200 Marks)	Operative procedure/ Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva Voice	50
	Log Book	10
	Scientific writing (manuscript written out of the thesis)	15

** Students should pass (secure 50% marks) separately in Part A

THESIS

The candidate must be familiar with basic research methodology, including statistical methods and undertake at least one research project under the guidance of a postgraduate teacher. The research may be experimental or clinical. This will be assigned to the candidate at the inception of the training, and he/she will be required to submit a report on the same by the end of the course. Periodic evaluation of the progress will be done by the postgraduate teacher and departmental head. The student should complete one thesis project during the tenure and it is desirable to submit the proof of communication of the manuscript (originated from his/her thesis) to an indexed peer-reviewed journal.

Thesis evaluation

- The student should submit the completed thesis six months before the final examination.
- Plagiarism check: If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.
- The thesis will be sent to one external evaluator for approval.
- The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as Accepted, Accepted with suggested modification and Rejected.
- If the thesis is accepted with suggested modifications, the comments of the evaluator will be intimated to the student and the guide for necessary correction/modifications. After modification, the thesis will be evaluated by a departmental committee for final approval.
- If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination.

LOGBOOK

A logbook is a comprehensive record of all academic events during the three years course. Work done by the student in the department should be entered in the logbook regularly. The logbook shall be checked by faculties at regular intervals. The logbook will be reviewed every six-monthly by departmental faculties to supplement deficits if any in the succeeding six months. The logbook shall be reviewed at the time of viva-voce at the time of final examination.

The candidate is expected to maintain a Logbook of all his/her activities with respect to:

1. Bio-data
2. Complete list of postings with periods and dates
3. Interesting cases seen and worked up during the period of posting
4. Details of clinic-pathological correlation seminars, mortality review, difficult case meet
5. List of short reviews presented
6. List of long reviews presented
7. List of journals reviewed
8. List of cases presented and discussed in bed-side clinics
9. List and abstracts of presentations in AIIMS, Bhubaneswar Scientific Society, Conferences, PG Seminars, CPCs etc.
10. Abstracts and lists of papers published or sent for publication
11. Any other research projects undertaken
12. Any other interesting details

Passing Marks

1. In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
2. In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

SPECIAL TRAINING IN OTHER INSTITUTE

- For the training of Surgeries / Interventions which is/are not presently available at AIIMS, Bhubaneswar.
- Duration: 1-2 months.
- Prior approval of the Director, AIIMS, Bhubaneswar is mandatory.

RECOMMENDED BOOKS

1. Kirklin JW, Barratt-Boyes BG. Cardiac Surgery: Morphology, Diagnostic Criteria, Natural History, Techniques, Results, and Indications: Wiley; 1986.
2. Cohn LH, Adams DH. Cardiac Surgery in the Adult: McGraw-Hill Education; 2017.
3. Sabiston DC, Sellke FW, Nido PJD, Swanson SJ. Sabiston & Spencer Surgery of the Chest: Saunders/Elsevier; 2010.
4. Stark JF, de Leval MR, Tsang VT, Courtney M. Surgery for Congenital Heart Defects: Wiley; 2006.
5. Gravlee GP. Cardiopulmonary Bypass: Principles and Practice: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2008.
6. Thomas W Shields MDD, LoCicero J, Reed CE, Feins RH. General Thoracic Surgery: Wolters Kluwer Health; 2015.
7. Cronenwett JL, Johnston KW. Rutherford's Vascular Surgery: Saunders/Elsevier; 2014.
8. Mullins CE. Cardiac Catheterization in Congenital Heart Disease: Pediatric and Adult: Wiley; 2008.
9. Castañeda AR. Cardiac Surgery of the Neonate and Infant: Saunders; 1994.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC & ALLIED SCIENCES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss in detail about fibrous skeleton of the heart.
2. Discuss development of Inter Atrial Septum.
3. Describe Segmental and sequential analysis of Pulmonary Function Test.
4. Describe types of Cardiac transplantation and its post-surgical management.
5. Describe port placements in Video assisted thoracic surgery and its benefits over open thoracotomy.
6. Enumerate steps of Hybrid Cardiac procedure?
7. Enumerate the lymphnode stations draining lungs with respect to carcinoma lungs.
8. Discuss Surgical management of Cardiac failure.
9. Discuss common Atrio-ventricular Canal defects.

PAPER 2

ADULT CARDIOTHORACIC AND VASCULAR SURGERY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe clinical features of aortic regurgitation and its surgical management.
2. Describe the development and surgical management of diaphragmatic hernias.
3. Clinical assessment and treatment of Infective Endocarditis.
4. Describe the development and management of Patent Ductus arteriosus.
5. Discuss Mitral Valve Repair techniques.
6. Describe various types of conduits used for coronary artery bypass graft surgery.
7. Discuss the pathological classification of Thymoma and its surgical management.
8. Describe pathological classification, aetiology and surgical management of Carcinoma of the lung.
9. Describe the classification of Aortic Aneurysm and its surgical management.

PAPER 3

CONGENITAL/PAEDIATRIC CARDIOTHORACIC AND VASCULAR SURGERY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the development of tetralogy of Fallot and its surgical management.
2. Describe the surgical management of coronary arteriovenous fistula.
3. Describe the classification of the Maze procedure.
4. Management of major aortopulmonary collateral artery in tetralogy of Fallot.
5. Describe Surgical management of pulmonary atresia.
6. Discuss types of common AV Canal defects.
7. Classification and surgical management of ventricular septal defect.
8. Enumerate surgical steps of Rastelli's Operation and its significance.
9. Surgical Management of Transposition of Great vessels.

PAPER 4

RECENT ADVANCES IN CARDIOTHORACIC AND VASCULAR SURGERY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the classification and surgical steps of heart transplantation.
2. Describe various Left Ventricular Assist Devices.
3. Short note on the clinical utility of myocardial viability test.
4. Describe the use of intra-aortic balloon pump in managing severe left ventricular failure.
5. Describe the clinical usages of Extra Corporeal Membrane oxygenator.
6. Enumerate Immuno-suppressive Therapy in Cardiac Transplant
7. Describe steps of Transcatheter Aortic Valve Implantation and various implants used.
8. Discuss the usage of Endovenous laser therapy in the management of varicose vein.
9. Discuss the benefits of Del Nido cardioplegia over conventional.

ENTRUSTABLE PROFESSIONAL ACTIVITIES

SL. No	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of MCh	End of 2 nd sem.	End of 4 th sem.	End of 6 th sem.	
1	Gather a history and perform a physical examination	*	*	*		*	*	2	4	4	5	I,S,PG
2	Establish a provisional diagnosis and prioritize a differential diagnosis	*		*		*		1	3	4	5	I,S,PG
3	Recommend and interpret common diagnostic tests	*	*	*		*		1	3	4	5	I,S,PG
4	Documentation of clinical findings in the hospital record.	*		*		*		2	3	4	5	I,S,PG,H
5	Provide an oral presentation of clinical case	*				*		1	3	4	5	I,S,PG,H
6	Differentiate an elective from emergency setting to initiate appropriate management	*	*		*	*		1	3	4	5	I,S,PG,H
7	Basic trauma management	*	*	*		*		1	3	4	5	I,S,PG,H
8	Basic Cardiopulmonary resuscitation	*	*	*		*		1	3	4	5	I,S,PG,H
9	Form clinical questions and obtain evidence to facilitate patient care.	*	*	*		*		1	3	4	5	I,S,PG
10	Enter therapeutic orders and prescriptions	*	*		*	*		1	3	4	5	I,S,PG,H
11	Obtain informed consent for tests and procedures.	*	*		*	*		1	3	4	5	I,S,PG,P,H
12	Monitor and enforce planned clinical care	*	*		*	*		1	3	4	5	I,S,PG,H
13	Give/receive a patient handover in the transition of clinical responsibility	*	*		*	*		1	3	4	5	I,S,PG,H
14	Collaborate as a member of an interdisciplinary team / liaise with other departments	*	*		*	*		1	3	4	5	I,S,PG,H

Sl. No	EPA	Competency Domains							Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of MCh	End of 2 nd sem.	End of 4 th sem.	End of 6 th sem.		
15	Identify system failures and work towards patient safety	*	*		*	*	*	1	3	4	5	I,S,PG,H	
16	Effective communication with peers / superiors/ subordinates	*	*			*	*	1	3	4	5	I,S,PG,H	
17	Attitude towards patient and caretakers.	*	*			*	*	1	3	4	5	I,S,PG,P,H	
18	Preoperative counselling of patient and caretakers	*	*			*	*	1	3	4	5	I,S,PG,P,H	
19	Perform general procedures for the sick child, e.g. peripheral venous line placement, wound dressings	*	*		*	*		1	2	3	5	I,S,PG,H	
20	Basic Pre & post operative care of the sick child	*	*		*	*	*	1	2	3	5	I,S,PG,H	
21	Adherence to OT protocols – Asepsis, Scrubbing, Attire, etc.	*	*		*	*		2	3	4	5	I,S,PG,H	
22	Principles of infection control and adherence to antibiotic policy	*	*		*	*		2	3	4	5	I,S,PG,H	
23	Use of energy devices- diathermy, Harmonic scalpel	*	*			*		1	2	3	5	I,S,PG,H	
24	Handling instruments, Suture materials. Etc.	*	*		*	*		2	3	4	5	I,S,PG,H	
25	Basic operative skills, e.g. Suturing	*	*		*	*		2	4	4	5	I,S,PG,H	
26	Percutaneous guided procedures,	*	*					1	2	3	4	I,S,PG,H	
27	Performing minor procedures, e.g. icd insertion. Sternotomy	*	*	*				1	2	3	5	I,S,PG,H	
28	Performing major procedure, e.g. CPB placement, CABG, ohs	*	*	*	*			1	2	3	4	I,S,PG,H	
29	Performing a cardiac surgery e.g. .ASD, MVR	*	*	*	*	*		1	2	3	4	I,S,PG,H	

Sl. No	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of MCh	End of 2 nd sem.	End of 4 th sem.	End of 6 th sem.	
30	Orientation to bronchoscopy and procedures	*	*	*	*	*		1	1	2	3	I,S,PG,H
31	Orientation to Minimally invasive Surgery (midcab,)	*	*		*	*		1	1	2	3	I,S,PG,H
32	UG teaching / discussions	*		*		*	*	1	2	3	4	I,S,PG
33	PG teaching / discussions	*		*		*	*	1	2	3	3	I,S,PG
34	Nursing teaching/ discussions	*		*		*	*	1	2	3	4	I,S,PG,H
	Ability to conduct simple research studies							1	2	3	3	I,S,PG
35	Able to write Scientific Papers	*				*	*	1	2	3	3	I,S,PG
36	Able to discuss Scientific Papers					*	*	1	2	3	4	I,S,PG
37	Able to make a podium presentation at clinical fora	*				*	*	1	2	3	4	I,S,PG
39	Knowledge of biomedical ethics in practice	*				*	*	1	2	3	3	I,S,PG,H,C

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I

Annexure 1
ASSESSMENT OF SEMINAR PRESENTATION

Date: _____

Topic: _____

Criterion	N	U	S	G	O
Coverage of topic / Content					
Comprehension of subject					
Clarity of presentation					
Cross-referencing of relevant publications.					
Use of audio-visual aids					
Time management					
Ability to answer questions					
Overall performance					
AGGREGATE GRADE					
Miscellaneous remarks:					

O = Outstanding , G = Good , S = Satisfactory , U = Unsatisfactory , N = Not assessed

Name and Signature of assessing faculty:

Annexure 2
ASSESSMENT OF JOURNAL REVIEW

Date: _____

Article(s) reviewed:

1. _____

2. _____

Criterion	N	U	S	G	O
Choice of Article (s)					
Comprehension of scope & objectives of the article (s)					
Clarity of presentation					
Review of relevant cross-references/ relevant publications					
Ability to respond to questions on the article (s) / subject					
Use of Audio-Visual aids					
Ability to analyse the article (s)					
AGGREGATE GRADE					
Miscellaneous remarks:					

Name and Signature of assessing faculty:

Annexure 3

ASSESSMENT OF CLINICAL PRESENTATION

Date: _____

Clinical Case: - _____

Criterion	N	U	S	G	O
Elicitation of history					
Interpretation of history					
General physical examination					
Specific systemic examination					
Interpretation of physical signs					
Basis of clinical diagnosis (History and examination)					
Investigative work up					
• Complete list					
• Relevant order					
• Interpretation					
Justification of differential / final diagnosis					
Approach to treatment					
Clarity and order of presentation					
Response to questions					
AGGREGATE GRADE					
Miscellaneous remarks:					

Name and Signature of assessing faculty:

Annexure 4

ASSESSMENT OF OPERATIVE PROCEDURE

Date	Name of the procedure:
Emergency / Elective	

Assessment: Mark as O/G/S/U/N

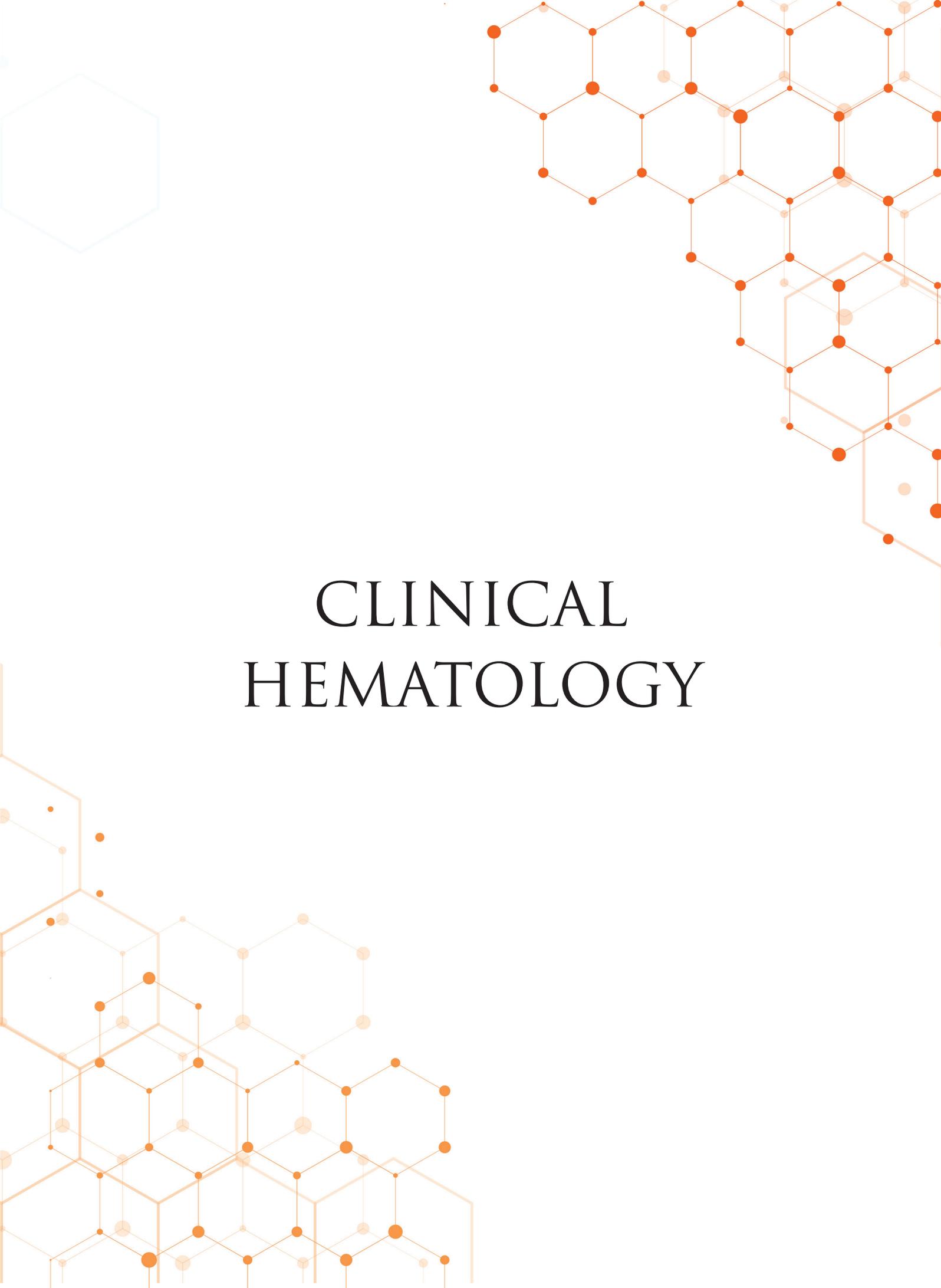
Obtains consent, after explaining the procedure and possible complications to the caregiver	
Prepares for procedure as per agreed protocol	
Knowledge of effective analgesia/anaesthesia	
Asepsis and safe use of instruments and sharps	
Performs the technical aspects in line with the guidance notes	
Deals with any unexpected event /seek help when appropriate	
Completes required documentation	
Communicates clearly with staff and patient throughout the procedure	
Demonstrates professional behaviour throughout the procedure	

O = Outstanding, G = Good, S = Satisfactory, U = Unsatisfactory, N = Not assessed

Summary: Please tick

Insufficient evidence observed to support a summary judgement	
Able to assist with guidance (was not familiar with all steps of the procedure)	
Able to assist without guidance (knew all steps of the procedure and anticipated next move)	
Able to perform the procedure with guidance / minimal help.	
Able to perform procedure confidently without guidance.	

Name and Signature of assessing faculty:



CLINICAL HEMATOLOGY

DM in Clinical Hematology

COURSE NAME:

Clinical Hematology

DURATION OF COURSE:

3 years

ELIGIBILITY:

MD or DNB in Medicine/Pediatrics

OBJECTIVES

The department of Medical Oncology Haematology offers a post-doctoral course in DM (Clinical Hematology) of 3 years' duration. This course would provide comprehensive training in Clinical Haematology and Laboratory Haematology.

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

1. Acquire knowledge in various hematological disorders.
2. Acquire skills and competence to diagnose and manage all patients with non-malignant and malignant hematological disorders.
3. Acquire skills and competence in various procedures required in hematology
4. Interpret laboratory data and synthesize laboratory and clinical data to provide rational solutions for patients with hematological problems.
5. Supervise the activities of a clinical hematology/ laboratory services where ever necessary.
6. To provide the state of art therapy to patients with hematological disorders.
7. To be able to prepare and perform protocol based therapies for various and hematological and hematological oncological disorders.
8. To have knowledge and expertise to start a bone marrow transplantation program
9. Acquire knowledge to supervise academic training program in hematology

SYLLABUS

THEORY SYLLABUS CONTENT

Theory: Paper wise

Paper I: Basic & Allied Sciences related to Clinical Hematology

Paper II: Benign Haematology (like Red cell, white cell and platelet disorders and Hemostasis and Thrombosis etc)

Paper III: Malignant Haematology (like Acute Leukemia, Chronic Leukemia, Lymphoma, Multiple Myeloma etc)

Paper III: Recent advances in Haematology

Semester I

Core Topics:

- A. Introduction to clinical hematology.
- B. Introduction to Laboratory hematology.
- C. Allied speciality: Nuclear Medicine., Biostatistics.

Subtopics:

1. Basic morphology and basic concepts of haematopoiesis.
 2. Bone marrow structure and examination.
 3. Red blood cells: Structure and function.
 4. White cells: Structure and function
 5. Platelets: Structure and function
 6. Hemostasis: Basic concepts
 7. Thrombosis: Basic concepts
 8. Development of the Immune system.
 9. Approach to diagnosis of red cell disorder like anemia
 10. Approach to diagnosis of bone marrow failure syndromes
 11. Approach to diagnosis of white cell disorder like acute leukaemia
 12. Approach to diagnosis of white cell disorder like chronic leukaemia
-

13. Approach to diagnosis of lymphoma and myeloma

14. Approach to diagnosis of Platelet disorders

15. Approach to diagnosis of Bleeding disorders.

16. Approach to diagnosis of Thrombotic disorders

17. Basic Laboratory Methods in haematology

- Principles of automated cell counter and interpretation of results.
- Interpretation of Complete blood count AND Reticulocyte count
- Examination of Peripheral blood smear examination
- Basic Coagulation tests like Prothrombin time and Activated Thromboplastin Time (PT and APTT)
- Approach to Bone marrow aspiration and biopsy
- Examination of Cerebrospinal fluid
- Hemoglobin electrophoresis.
- Special stains and cytochemistry.
- Flow cytometry and its applications.
- Diagnostic procedures for analyzing DNA.

18. Principles of Nuclear Medicine: and applications in haematology & oncology.

19. Biostatistics.

Semester II

Core Topic: Disorders of Erythrocytes: Anemia (Part I)

Subtopics:

Erythropoiesis and general aspects of Anemia

1. Iron deficiency anemia.

- Nutritional and metabolic aspects of Iron
- Dietary Iron
- Iron absorption and transport
- Iron requirements
- Iron deficiency

- Clinical features

- Causes

- Laboratory Diagnosis

- Differential diagnosis

- Treatment of Iron deficiency anemia

- Role of Parenteral iron therapy

2. Megaloblastic anemia.

- Nutritional and metabolic aspects of Folic acid and vitamin B12

- Absorption, Transport and biochemical function of B12

- Absorption, Transport and biochemical functions of Folic acid

- Clinical features

- Causes

- Laboratory Diagnosis

- Biochemical basis of Megaloblastic anemia

- Differential diagnosis of Megaloblastic anemia

- Pernicious anemia

- Treatment of Megaloblastic anemia

3. Pathophysiology, diagnosis and treatment of Sideroblastic anemia

4. Pathophysiology, diagnosis and treatment of anemia of chronic disease

5. Hemolytic anemia

Approach to hemolytic anemia

Congenital Hemolytic anemia

Red cell membrane defect: hereditary spherocytosis.

- Pathophysiology

- Clinical features

- Diagnosis

- Treatment

Red cell enzymopathies: Glucose 6 Phosphate dehydrogenase deficiency

- Pathophysiology

- Clinical features

- Diagnosis
- Treatment

Hemoglobinopathies

- Diagnosis of specific types of Hemoglobinopathies

Thalassemia:

- Epidemiology
- Pathophysiology
- Molecular genetics
- Clinical features
- Diagnosis
- Treatment of Beta-thalassemia Major
- Community screening and Prevention of thalassemia
- Prenatal diagnosis of Beta Thalassemia Major
- Approach and diagnosis and treatment of other types of thalassemia like Alpha thalassemia

Sickle cell anemia

- Epidemiology
- Pathophysiology
- Molecular genetics,
- Clinical features
- Diagnosis
- Treatment of Sickle cell anemia
- Community screening and Prevention of sickle cell anemia
- Prenatal diagnosis of sickle cell anemia
- Treatment of sickle cell anemia in Pregnancy

6. Other types of Abnormal hemoglobins like Hb Constant Spring etc

7. Immune hemolytic anemia (Warm and Cold autoimmune hemolytic anemia)

- Causes
- Pathophysiology
- Clinical features
- Diagnosis
- Treatment

Semester III

Core topics: Disorders of white cells (Part I)

Subtopics:

1. Benign disorders of Granulocytes
 - Qualitative disorder of neutrophils like May Hegglin anomaly etc.
 - A quantitative disorder like Neutrophilic Leucocytosis
 - Leukaemoid reaction
 - Neutropenia: congenital, Kostmanns syndrome,
 - Basophillia
 - Eosinophilia: Hypereosinophilic syndrome
2. Benign disorder of Lymphocytes and monocytes
 - Reactive lymphocytosis
 - Lymphopenia
 - Approach to lymphadenopathy
 - Monocytosis
3. Approach to Immune deficiency
4. Cell cycle and carcinogenesis
 - Cells of origin in leukemia, lymphoma, myeloma
 - Oncogenes
 - Activation of oncogenes in hematological malignancies
 - Tumor suppressor genes
 - Inherited and acquired predisposition to Leukemia and lymphoma
 - Chromosome Nomenclature
 - Cytogenetics
 - Fluorescence in situ Hybridization
 - Molecular biology of hematological malignancy
5. Acute leukemias
 - Classification
 - FAB classification
 - WHO 2016 Classification
 - Clinical features

-
- Laboratory diagnosis
 - Immunophenotype of acute leukemia
 - Cytogenetics
 - Molecular Biology
 - Minimal Residual Disease
 - Approach to treatment of acute leukemia
6. Acute lymphoblastic leukemia in Adults
- Clinical features
 - Immunophenotyping
 - Cytogenetics
 - Molecular biology
 - Diagnosis
 - Treatment
 - Risk stratification
 - Prognosis
7. Acute myeloid leukemia in adults
- Clinical features
 - Immunophenotyping
 - Cytogenetics
 - Molecular Biology
 - Diagnosis
 - Treatment
 - Minimal Residual Disease
 - Risk stratification
 - Prognosis
8. Acute lymphoblastic leukemia in children
- Clinical features
 - Immunophenotyping
 - Cytogenetics
 - Molecular Biology
 - Diagnosis
 - Treatment
 - Minimal Residual Disease
 - Risk stratification
 - Prognosis
9. Acute myeloid leukemia in children
- Clinical features
 - Immunophenotyping
 - Cytogenetics
 - Molecular Biology
 - Diagnosis
 - Treatment
 - Minimal Residual Disease
 - Risk stratification
 - Prognosis
10. Acute Promyelocytic leukemia
- Clinical features
 - Immunophenotyping
 - Cytogenetics
 - Molecular Biology
 - Diagnosis
 - Treatment
 - Minimal Residual Disease
 - Risk stratification
 - Prognosis
11. Acute Biphentotypic Leukemia
12. Mixed Lineage leukemia
13. Minimal residual disease in acute leukemia.
14. Multidrug Resistance genes in Leukemia.
15. Chronic Leukemia
- Classification
 - FAB classification
 - WHO 2016 Classification
 - Clinical features
 - Laboratory diagnosis
 - Immunophenotype of acute leukemia
 - Cytogenetics
 - Molecular Biology
 - Minimal Residual Disease
 - Approach to treatment of acute leukemia
-

16. Chronic lymphoproliferative disorder (CLPD)

- Classification
- FAB classification
- WHO 2016 Classification
- Clinical features
- Laboratory diagnosis
- Immunophenotype of acute leukemia
- Cytogenetics
- Molecular Biology
- Minimal Residual Disease
- Treatment of CLPD
- Risk stratification
- Prognosis

17. Chronic Myeloproliferative Neoplasm (CMPN)

- Classification
- WHO 2016 Classification
- Clinical features
- Laboratory diagnosis
- Immunophenotype of chronic leukemia
- Cytogenetics
- Molecular Biology
- Minimal Residual Disease
- Treatment of CLPD
- Risk stratification
- Prognosis

18. Chronic Myeloid Leukemia

- Clinical features
- Laboratory diagnosis
- Cytogenetics
- Molecular Biology
- Molecular monitoring
- Treatment of CML
- Risk stratification
- Prognosis

19. Essential thrombocythemia

- Clinical features
- Laboratory diagnosis

- Cytogenetics
- Molecular Biology
- Treatment
- Risk stratification
- Prognosis

20. Myelofibrosis

- Clinical features
- Laboratory diagnosis
- Cytogenetics
- Molecular Biology
- Treatment of CML
- Risk stratification
- Prognosis

21. Polycythemia

- Clinical features
- Laboratory diagnosis
- Cytogenetics
- Molecular Biology
- Treatment of CML
- Risk stratification
- Prognosis

22. Chronic Eosinophilic Leukemia

23. Chronic Neutrophilic Leukemia

24. Systemic Mastocytosis

Semester IV

Core Topics: Disorders of Hemostasis and Thrombosis

Subtopics:

1. Overview of megakaryopoiesis
2. Platelets
 - Platelet production
 - Platelet circulation
 - Platelet structure
 - Platelet antigen
 - Platelet function

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3. Quantitative platelet disorders.
 - Immune Thrombocytopenic Purpura*
 - Acute ITP and Chronic ITP
 - Pathophysiology
 - Diagnosis
 - Treatment
 - Thrombocytopenia in pregnancy
 - Drug-induced immune thrombocytopenia
 - Post transfusion Purpura
 - Infections associated with thrombocytopenia
 - Thrombotic Thrombocytopenic purpura (TTP)
 - Hemolytic Uremic Syndrome (HUS)
 - Disseminated intravascular coagulation (DIC)
 4. Qualitative platelet disorders.
 - Hereditary disorders
 - Glanzmann's Thrombasthenia
 - Bernard-Soulier Syndrome
 - Storage Pool Disorder
 - Acquired Disorders
 - Drugs: Aspirin, Clopidogrel
 - Heparin
 - Hyperglobulinemia
 - Uremia
 - Myeloproliferative disorder
 - Myelodysplastic syndrome
 5. Laboratory diagnosis of platelet function defects.
 - Platelet count
 - Bone marrow examination
 - Platelet aggregation studies
 - Platelet adhesion studies
 - Von Willebrand factor assay
 - Factor 8 clotting assay
 - PFA 100
 6. Coagulation system (Hemostasis)
 - Details of the coagulation mechanism
 - Primary Hemostasis
 - Secondary Hemostasis
 - Physiologic limitation of blood coagulation
 - Fibrinolysis
 - Tests of Hemostatic function in detail
 - Complete blood count
 - Peripheral blood smear examination
 - Bleeding Time
 - Screening tests of blood coagulation
 - Prothrombin Time (PT)
 - Activated Partial Thromboplastin Time (APTT)
 - Thrombin Time (TT)
 - Specific assays of coagulation factors like Factor VIII and factor IX
 7. Congenital Coagulation disorders
 - Haemophillic A (Factor 8 Deficiency)
 - Haemophillic A (Factor 8 Deficiency)
 - Molecular genetics
 - Clinical Features
 - Laboratory Diagnosis
 - Treatment
 - Special management issues
 - Prenatal Diagnosis of Hemophilia
 - Types of Factor Concentrates
 8. Von Willebrand Disease
 - Molecular genetics
 - Clinical features
 - Laboratory Diagnosis
 - Treatment
 9. Other rare coagulation disorders.
 10. Dysfibrinogenemia
 11. Acquired Coagulation disorders
 - Vitamin K Deficiency
 - Liver disorder
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- Disseminated intravascular coagulation
- Acquired antibodies causing coagulation disturbance
- Overdosage of anticoagulants
- Massive transfusion syndrome

12. Fibrinolysis and defects of the fibrinolytic pathway.

13. Hemostasis in the Newborn.

14. Bleeding disorders in the Newborn.

- Hemorrhagic Disorder of Newborn

15. Lupus anticoagulant

- Laboratory diagnosis.
- Clinical presentation and management

Semester V

Core Topic:

A. Disorders of hemostasis and thrombosis.

B. Disorders of erythrocytes Part II.

Subtopics:

Part A

1. Arterial Thrombosis

- Pathogenesis
- Clinical Risk Factors
- Treatment

2. Venous Thrombosis

- Pathogenesis
- Clinical Risk Factors
- Inherited Risk factors of thrombosis
- Protein C DEFICIENCY
- Protein S Deficiency
- Antithrombin Deficiency
- Factor V Leiden Mutation
- Prothrombin Gene G20210A Mutation
- Increased levels of FACTORS VII, VIII, XI and XII
- Hyperhomocysteinemia

• Laboratory diagnosis of Inherited Thrombotic disorders

• Diagnosis of venous thrombosis

• Treatment

• Principles of Anticoagulation

• Monitoring of anticoagulants

• Newer Oral Anticoagulants

3. Thrombosis in Children

4. Thrombosis in Pregnancy

5. Thrombosis in Special situations like Cancer

Part B

1. Bone marrow failure syndrome

- Inherited Bone Marrow Failure(BMF) Syndromes
- Fanconi anemia
- Dyskeratosis congenita
- Schwachmann Diamond Syndrome
- Severe congenital neutropenia
- Thrombocytopenia with absent radii
- Congenital Megakaryocytic Thrombocytopenia (CAMT)
- Characteristics of Inherited BMF Syndromes
- Genetics
- Diagnosis
- Treatment

2. Acquired Aplastic Anemia

- Pathogenesis
- Clinical features
- Differential Diagnosis
- Diagnosis
- Management

3. Paroxysmal nocturnal Hemoglobinuria(PNH)

- Pathogenesis
- Clinical features
- Differential Diagnosis
- Diagnosis
- Management

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4. Hematological manifestation syndrome disease.
 - Anemia of Chronic disorder
 - Malignant disease other than Primary Bone Marrow disease
 - Connective Tissue Disorder like Rheumatoid Arthritis
 - Renal failure
 - Liver Disease
 - Infections
 - Viral
 - Bacterial
 - Human Immunodeficiency Virus (HIV)
 5. Spleen
 - Tropical Splenomegaly syndrome
 - Hypersplenism
 - Effects of Splenectomy
 - Mast cell Disorder
 6. Red cell disorder of Pregnancy
 7. Red cell disorder of Newborn
 - Rh D Hemolytic Disorder of Newborn
 - ABO hemolytic disorder of Newborn

Semester VI

Core Topic:

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

Subtopics:

Part A

1. Myelodysplastic syndrome.
 - WHO 2016 Classification
 - Clinical features
 - Cytogenetics

- Molecular changes
 - Differential Diagnosis
 - Diagnosis
 - Treatment
2. Non-Hodgkin's lymphoma
 - WHO 2016 Classification
 - Clinical features
 - Staging
 - Cytogenetics
 - Molecular changes
 - Differential Diagnosis
 - Diagnosis
 - Treatment
 - Assessment of Response
 - Long term Follow up
 3. Hodgkin's Lymphoma
 - WHO 2016 Classification
 - Clinical features
 - Staging
 - Differential Diagnosis
 - Diagnosis
 - Treatment
 - Assessment of Response
 - Long term Follow up
 4. Plasma cell Disorders (Multiple Myeloma)
 - Clinical features
 - Cytogenetics
 - Molecular changes
 - Differential Diagnosis
 - Diagnosis
 - Assessment of Response
 - Treatment
 5. Histiocytosis
 - Clinical features
 - Cytogenetics
 - Differential Diagnosis
 - Diagnosis

- Assessment of Response
- Treatment

Part B

1. Blood Banking

- Red cell antigens
- ABO,Rh and other system
- Blood Grouping
- Front typing
- Reverse typing
- Techniques of blood group serology
- Direct coombs Test
- Indirect Coombs Test
- Identification of antibodies
- Component Therapy
- Packed cells
- Random donor platelets
- Single donor platelets
- Fresh frozen plasma
- Cryoprecipitate
- Granulocyte Transfusion
- Complications of Blood Transfusion: Immediate and Long Term
- Investigation of Immediate Transfusion reaction
- Safety of Blood Products
- Nucleic acid Test(NAT)
- Irradiation of blood product
- Autologous Transfusion
- Red cell substitutes

2. Consultative hematology

- Obstetrics and Gynecology.
- Surgery.
- Intensive Care Unit

PRACTICAL SYLLABUS CONTENT

The curriculum is designed in such a way that at the end of 3 years of training in the DM Clinical Haematology Course, the candidate would be conversant with all the complex haematological problems and would be able to acquire high degree of competence and skills in Outpatient, Inpatient and Emergency cases relating to branch of Clinical Haematology as well as to acquire academic excellence and proficiency in research.

1st Semester

- History taking, clinical examination and investigations of patients with benign and malignant haematological diseases in-ward and OPD
- Familiarization with basic hematological investigations and interpretation of results of hematological investigations like collection and handling of blood samples and tissues, CBC, Peripheral smear, Reticulocyte count, Hb-HPLC, Coagulation screening, different staining methods etc.
- Knowledge and expertise on microbiology lab and hematology in tropics
- Inpatient management of patients with benign and malignant haematological diseases
- Inpatient procedures like central venous access
- Management of hematological emergencies

2nd Semester

- Exposure to intensive care and artificial respiratory support with ventilators
- Laboratory approach to hemolytic disorders and bleeding disorders.
- Flow cytometry and its applications.
- Biochemical investigations relevant to diseases of the blood, e.g. Serum Protein Electrophoresis, Vit B12 assay, Serum Iron, S. Ferritin etc
- Knowledge of drugs used, their pharmacology, posology, adverse events etc.

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- Management of patients with benign and malignant hematological diseases

3rd Semesters

- Sophisticated lab investigations like Factor assay, Platelet function analysis, Hemophilia inhibitor assay, Thrombophilia work up, Thromboelastography etc
- Knowledge of instruments used in hematology laboratory, quality control etc
- Learning radiation in hematology, use of nuclear medicine in hematology.
- Knowledge and expertise on blood banking, transfusion of blood components and investigations conducted in blood bank
- Bone marrow aspiration, biopsy and other investigations from aspirate sample
- Independent Procedures like Bone Marrow Aspirate/LUMBAR Puncture with intrathecal Chemotherapy
- Molecular diagnostic techniques in hematology
- Radiation and nuclear medicine use in hematology
- Hematology intensive care management
- Reporting of Peripheral Blood smear/Bone marrow aspirate slides under supervision.
- Presentation of new and interesting cases in Hematopathology Meeting and other Interdepartmental Meetings
- Presentation of Paper in National conference

4th Semester

- Exposure to autologous and allogeneic transplant in benign and malignant hematology, e.g. pre-transplant workup, conditioning regimen, stem cell harvesting, preservation, manipulation of stem cell, managing complications of transplant and post-transplant follow up.
- Genetic counselling
- Practising protocol-based treatment

- Identification, investigation and management of disease and treatment-related complications

- The skill of managing patients with hematological diseases under loose supervision

- The skill of managing day-care

- Counselling, Interpersonal communication skill, Interaction with the patient, patient's relatives, Breaking bad news

- Interaction with colleagues, staffs

5th Semester

- Community hematology

- Consultative hematology.

- Quality assurance program.

- Independent decision making

- Teaching skill

- The skill of delivering lectures, presentation in conferences etc

- Emphasis on completion of projects/data analysis

6th semester

- Clinical case presentation three times a week along with the topic discussion

TEACHING AND LEARNING METHODS

A candidate pursuing DM in Clinical Haematology should work in the institution as a full-time resident. Each candidate would be required to give in undertaking that he/she will not run a clinic/laboratory/nursing home or doing private practice during his postgraduate course. Each semester will be taken as a unit to calculate attendance. Every trainee must attend the teaching and learning activities during the year as prescribed and not be absent without valid reasons.

The list of teaching and learning activities designed to facilitate appropriate training is mentioned below.

1. PG Orientation:

A basic course in Research Methodology and Biostatistics is organised every year. The DM students should attend the course during the first semester of training. This course is designed to inculcate skills in the residents and apprise them of research methodology, biostatistics, writing dissertations of the library, medical code of conduct and medical ethics.

2. Integrated Lectures:

Integrated lectures are recommended to be taken by multidisciplinary teams for selected topics.

3. Journal club:

It will be held once a week. All the DM students will be expected to attend and actively participate in the discussion and enter relevant details in the logbook. A time table with names of the subject, students and the moderator will be scheduled at the beginning of every semester. The presentations would be evaluated using checklists and would carry weightage for internal assessment.

4. Subject Seminar:

It will be held once a fortnight. All the DM students will be expected to attend and actively participate in the discussion and enter relevant

details in the Logbook. Further every candidate must make a presentation on the selected topics at least four times a year and a total of 12 presentations in 3 years. The presentations would be evaluated using checklists and would carry weightage for internal assessment. A time table with names of the subject, students and the moderator will be scheduled at the beginning of every semester.

5. Ward rounds:

Ward round shall be service or teaching rounds.

6. Teaching Rounds:

Every week, there will be a "grand round" for teaching purpose. All DM students will be required to attend the grand round.

7. Medical Audit:

The session will be held once in a month. The discussion will be about complicated cases and morbidity. All the DM students will participate and present their cases.

8. Inter-departmental Meetings:

- Pathology department: The new and interesting cases peripheral blood smears, bone marrow aspirate and biopsy slides will be presented by the DM students in the presence of faculty from hematology and pathology department.

- Radiology and Nuclear Medicine Department: Interesting cases and image modalities will be discussed including CECT, MRI, Bone scan and PET SCAN etc.

9. Teaching skills:

DM students must teach undergraduate students (Medical and Nursing) by taking tutorials, bedside clinics. The residents will also take demonstration and case discussion for postgraduates, on peripheral postings from other departments.

10. Continuing Medical Education (CME) Programme and Conference:

From the second year onwards, the DM trainee would be encouraged to attend the conference and present paper/poster.

11. Departmental Training schedule & posting of residents:

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

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

- Nuclear medicine: 2 weeks
- Transfusion medicine: 2 weeks
- Bone Marrow Transplantation: 4 weeks
- Medical oncology: 2 weeks
- Radiotherapy: 2 weeks

The remaining six months are spent in the clinical hematology. The trainee resident actively participates in the management of the inpatients under the full supervision of the faculty. Residents get the broader exposure and lean from the allied department regarding these services available there and their application to hematology.

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

Day	Tuesday	Thursday	Saturday
Time and duration	10 am -12 noon	10 am - 1 pm	9 am -10 am
	Procedures in Operation Theatre	Grand Rounds Case Presentations	Ist: Mortality Meet/Audit 2nd: Radiology Meeting 3rd: Difficult/ Interesting Case Presentation 4th: Radiology Meeting
Time and duration	3 pm - 4 pm	3 pm - 4 pm	12 - 1 pm
	Ist: Admission Rounds 2nd: Topic Seminar 3rd: Hemato-Pathology Meeting 4th: Topic Seminar	Journal Club	Weekend Handover Rounds

CLINICAL TRAINING

The clinical training (24 months) is spread over 3 years, this has the advantage that the resident gets to follow up the patients over a prolonged period, 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 (Monday, Wednesday, Friday) 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.
- 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. **Daycare service:** the resident is expected to supervise the running of the daycare centre on a rotation basis during their clinical training period. The daycare centre provides blood transfusion facilities for patients with chronic anemia. The daycare centre 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 opinion has been sought.

LABORATORY TRAINING

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

- a. Morphology and general hematology b) Haemostasis and thrombosis laboratory c) Hemolytic anemia laboratory d) Leukaemia laboratory
- b. **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 leukaemia diagnosis. They are also required to learn how to use automated cell counters. The 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.
- c. **Haemostasis 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, the 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 prenatal diagnosis of inherited coagulation defects.

d. Hemolytic anemia laboratory: The trainee will spend time in learning tests performed for the diagnosis of haemolytic anemia like Osmotic Fragility test, Autohemolysis and Heinz body etc. 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.

e. Leukemia Laboratory: The trainee will develop both academic and practical expertise in the immunophenotyping of leukaemia and lymphomas by Immunohistochemistry. 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.

f. Peripheral Rotations

1. Bone Marrow Transplantation (4 weeks) During this post the resident is expanded to develop the ability to gather, collate and interpret clinical, radiological and laboratory information that is required to assess a patients suitability for transplantation. He /she should acquire the knowledge, procedure and attitudinal skills to perform an autologous and allogeneic transplant. The chief goals of this posting are as follows

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

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

iii. 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.

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

v. Management of post-transplant patient

2. Transfusion Medicine (2 weeks) The training develops the resident's 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. The resident will learn the principles of immunohematology and various other tests being conducted in the blood bank.

3. Medical oncology (2 weeks) The resident will learn the principles of management of different solid tumors, other hematological malignancies such as NHL, Hodgkin's disease, multiple myeloma. They will also learn the basics of high dose chemotherapy and newer modalities of treatment.

4. Radiotherapy (2 weeks) The resident will learn the principles of radiotherapy, the use of various radioisotopes. Radiotherapy in the management of NHL, Hodgkin's disease, multiple myeloma, CNS prophylaxis in acute leukaemia's. They will also familiarize themselves with various radiotherapy equipment.

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5. Nuclear medicine (2 weeks) The resident will be expected to acquire the basic knowledge of the use of nuclear medicine in the 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.

LOGBOOK

The candidate is required to maintain a log book which details his clinical experience during his tenure as assistant, physician and supervisor.

The logbook is updated daily basis and the Head of the Department counterchecks and endorses it every six months to notice any shortcomings in the residents training.

The candidate is expected to maintain a logbook as described below:

1. Biodata
2. Complete list of Postings with periods and dates
3. Interesting cases seen and worked up during the period of posting
4. All the procedures by the trainee
5. Details of Hematopathological correlation seminar, mortality review and complicated cases meeting
6. Journal Club attended/presented
7. Topic Seminar attended/presented
8. List of Cases presented and discussed in Bedside clinics
9. List of Abstracts presentations in AIIMS Bhubaneswar scientific Society, Conferences, PG Seminars
10. Abstracts and lists of papers published or sent for publication
11. Any other research projects undertaken
12. Any other interesting details

ASSESSMENT

1. There will be a periodic assessment of learning outcomes. The methods to be followed are mentioned below.
2. Personal attitudes
3. Acquisition of knowledge
4. Clinical and Procedural skills
5. Teaching skills
6. Periodic Tests
7. Logbook
8. Dissertation

Personal attitudes

- Caring attitude
- Punctuality
- Initiative
- Organisational ability
- Potential to cope with a stressful situation and undertake responsibility
- Trustworthiness and reliability
- To understand and communicate with reasoning with patients and others
- To maintain a cordial professional relationship with colleagues and patients
- Ability to work in a team
- Periodic reviews will be given by supervisors and peers to residents

Acquisition of Knowledge

Logbook will be assessed by periodic checking, which will record participation in various teaching/ learning activities by the residents. The number of activities attended and the presentations made will be recorded. The logbook will be validated periodically by the supervisors.

Clinical and Procedural skills

Skills in out-patients and various procedures will be assessed periodically

a. Clinical Meetings

Candidates should periodically present cases to his peers and faculty members. Candidates approach the case, diagnostic abilities, analysis and treatment planning will be assessed using a checklist.

b. Procedural skills

The candidate will be given graded responsibilities to enable learning by apprenticeship. The assessment would include candidates analytical ability, preprocedural assessment, procedural skills and post-procedure care. The performance will be assessed by the guide by direct observation.

Teaching skills

Candidates will be encouraged to teach postgraduate students (MD General Medicine and MD Pediatrics) and paramedical students. This performance will be based on the assessment by the faculty members of the department and feedback from the undergraduate students.

Periodic Tests

A total of 3 internal examinations will be conducted at the end of 3rd, 4th, and prefinal(4 month before final examination).

Log book

The maintenance of Log book will be mandatory for the trainee. It will be a record of important activities of the candidate during his training. Internal assessment will be based on the evaluation of the logbook. Collectively, log books will be a tool for the evaluation of the training programme of the institution by external agencies. The record will include academic activities as well as presentations and procedures carried out/observed/assisted by the candidate.

INTERNAL ASSESSMENT

1. Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination. No marks will be added to the final examination.
- Candidate should pass (obtaining >50% marks) to appear in Final examination. If someone secures <50%, he/she will appear in the next examination.
- No marks will be added to final/summative examination
- Will be conducted by Examination Cell in June & December

2. A total of 3 internal examinations will be conducted at the end of 3rd semester, 4th semester and at pre-final (4 months before final) examination.

3. Marks distribution: Theory paper will carry 100 marks. There will be topic wise assessment (table 4). Practical with viva and logbook (Clinical/ experimental/ practical = 70, viva = 20, logbook = 10) will be of 100 marks. The marks of the 3 internal examinations will be averaged to 100 each for theory and practical.

FINAL / SUMMATIVE ASSESSMENT

Final assessment will be carried out by two external examiners and two internal examiners. The summary of the examinations as follows:

1. A maximum of 1000 marks will be awarded. Total marks in theory and practical will carry 500 marks each. The candidate must obtain at least 50% (i.e. 500) marks to pass the examination.
2. There will be 4 papers in theory which will carry 100 marks each. Out of 500 marks of theory, 100 marks will be from the Internal Assessment.
3. A total of 500 marks will be assigned to the practical examination. The final practical and

viva will carry 400 marks. The average of 3 internal examinations will carry 100 marks (Total 500 marks).

4. A student will be eligible to appear for the final examination only when he /she:

- Passed (secured 50% marks) in the examination on Research Methodology and biostatistics and
- Passed (secured 50% marks) in internal examinations and
- The thesis submitted six months before the final examination and is approved/accepted by an external evaluator.

Final Theory examination

1. Paper wise distribution of topics: 4 papers (100 marks each)

Paper I: Basic & Allied Sciences related to Clinical Hematology

Paper II: Benign Hematology

Paper III: Malignant Hematology

Paper III: Recent Advances in Hematology

2. Question paper format: Theory examination will consist of structured essay questions with emphasis on problem solving exercises (In each paper, one long question will carry 20 marks and eight (8) short questions / notes will carry 10 x 8 = 80 marks).

Final Marking pattern:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time Frame	End of 3 rd semester	End of 4 th semester	Four months before the final			
Theory	100	100	100	100	400	500
Practical*	100	100	100	100	400	500

Final Practical Examination

The format of the practical examination:

Parts	Components	Marks allotted
PART A ** 200 Marks	Longcase (1)	75
	Short cases (3)	75
	Ward Round	50
PART B 200 Marks	Operative procedure/ Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	50
	Logbook	10
	Scientific writing (manuscript written out of the thesis)	15

** Students should pass (secure 50% marks) separately in Part A

Passing Marks

1. The student has to secure $\geq 50\%$ marks in the internal examination to be eligible to appear for the final examination.
2. In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
3. In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

THESIS

As a part of DM Curriculum, the student should complete one thesis project during the tenure and it is desirable to submit the proof of communication of the manuscript (originated from his/her thesis) to an indexed peer-reviewed journal.

- The student should submit the thesis six months before the final examination.
- Plagiarism check: If more than 20% plagiarism is detected, the student will be asked to rewrite and resubmit. Plagiarism checking will be checked before the thesis is ready to be bound.
- The thesis will be sent to one external evaluator for approval.
- The external evaluator will be provided with an evaluation report from where the thesis will be evaluated as Accepted/Accepted with suggested modification/Rejected.
- If the thesis is accepted with suggested modification, the comments of the evaluator will be intimated to the student and guide for necessary correction/modifications. After the modification, the thesis will be evaluated by the department committee for final approval.
- If the thesis is rejected, after necessary corrections, the thesis will be sent again to another evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination.

RECOMMENDED BOOKS

1. Hoffman R, Benz EJ, Silberstein LE, Heslop H, Anastasi J, Weitz J. Hematology: Basic Principles and Practice: Saunders/Elsevier; 2013.
2. Hoffbrand AV, Steensma DP. Hoffbrand's Essential Haematology: Wiley; 2019.
3. Greer JP, Arber DA, Glader B, List AF, Means RT, Paraskevas F, et al. Wintrobe's Clinical Hematology: Wolters Kluwer Health; 2013.
4. Bain BJ, Bates I, Laffan MA, Lewis SM. Dacie and Lewis Practical Haematology: Expert Consult: Online and Print: Elsevier Health Sciences UK; 2016.
5. Swerdlow SH, Campo E, Harris NL, Pileri SA. WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues: International Agency for Research on Cancer; 2017.
6. Kaushansky K, Lichtman MA, Prchal J, Levi MM, Press OW, Burns LJ, et al. Williams Hematology, 9E: McGraw-Hill Education; 2015.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC AND ALLIED SCIENCES RELATED TO CLINICAL HAEMATOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Outline Principles of Quality control in a coagulation laboratory.
2. Discuss advantages, problems and pitfalls of NGS (Next generation sequencing) in Haematology.
3. Write short note on Blood Group Discrepancies.
4. Discuss regulation of Iron Homeostasis.
5. Enumerate NK (Natural Killer Cell) cell function and therapeutic potentials.
6. Describe Pathophysiology and Epidemiology of Hemophagocytic Lymphohistiocytosis.
7. Describe the site and mechanism of action of different groups of chemotherapeutic drugs in the cell cycle.
8. Discuss the approach to a patient with haemolytic anaemia.
9. Discuss Pharmacogenomics of the anti-neoplastic drugs used in Acute Lymphoblastic Leukaemia

PAPER 2

BENIGN HAEMATOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss Clinicopathogenesis, Diagnosis, Therapeutic planning and Prognosis of Low Risk Myelodysplastic syndrome (MDS).
2. Laboratory diagnosis and management of Paroxysmal Nocturnal Haemoglobinuria (PNH).
3. Describe the significance of pulmonary hypertension in Sickle Cell Anaemia.
4. Outline the laboratory diagnosis of antiphospholipid syndrome.
5. Describe common mutations in Beta Thalassemia Major.
6. Discuss the approach to a patient with bleeding disorder.
7. Discuss the importance of red cell morphology in evaluation of anaemia.
8. Describe point of care testing in haematology.
9. What is the role of bone marrow microenvironment in bone marrow failure syndrome?

PAPER 3

MALIGNANT HAEMATOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss Double Hit Lymphomas with respect to current paradigms and novel treatment approaches.
2. Discuss outcome of clinical trials with JAK (Janus Kinase) inhibitors in management of Idiopathic Myelofibrosis.
3. Describe the Role of PET CT (Positron Emission Tomography) in Early Hodgkin's Disease
4. Discuss treatment free remission in CML (Chronic Myeloid Leukaemia).
5. Write short note on Epstein Barr Virus and Haematology.
6. Discuss Post-Transplant Lymphoproliferative Disorder.
7. Summarize current concepts of management of Hairy Cell Leukaemia.
8. Enumerate the role of minimal residual disease in AML (Acute Myeloid Leukaemia).
9. What are the pros and cons of Early versus Delayed ASCT (Autologous Hematopoietic Stem Cell Transplantation) in Multiple Myeloma?

PAPER 4

RECENT ADVANCES IN HAEMATOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the principles of gene therapy in beta thalassemia major.
2. Discuss Advantages and disadvantages of CAR-T Cell (Chimeric Antigen Receptor T cells) therapy.
3. Discuss the genomic landscape in aggressive B – Cell lymphoma.
4. Discuss the Management of Triple negative Myeloproliferative neoplasm.
5. What are the current approaches to prevent and treat GVHD (Graft versus Host Disease) after allogeneic stem cell transplantation?
6. Describe the management of Richter transformation in the era of novel agents.
7. Discuss genetic markers in prognosis of paediatric ALL (Acute Lymphoblastic Leukaemia).
8. Describe monitoring of newer anticoagulants and their interaction with other anticoagulants.
9. Discuss role of Haploidentical Transplantation in Beta Thalassemia Major.

ENTRUSTABLE PROFESSIONAL ACTIVITIES

Sl. No	Entrustable Professional Activities	COMPETENCIES							EXPECTED LEVEL			MSF	
		MK	PC	ICS	P	PBLI	SBP	1 st year	2 nd year	3 rd Year			
Clinical Hematology													
1	In-Patient care	Y	Y	Y	Y	Y	Y	Y	Y	2	3	5	PG, H, P, I, C
2	Hematological Emergency Care and intensive care	Y	Y	Y	Y	Y	Y	Y	Y	2	3	5	P, H, PG, I
3	Out-Patient Care	Y	Y	Y	Y	Y	Y	Y	Y		3	4	P, H, PG, I
4	Day Care Services	Y	Y	Y	Y	Y	Y	Y	Y		3	5	P, H, PG
5	Inter-departmental Consultation	Y	Y	Y	Y	Y	Y	Y	Y		3	4	S, H, PG
6	Morphology, physiology and biochemistry of blood, marrow, lymphatic tissue and spleen	Y				Y	Y	Y	Y	1	2	4	H, PG
7	Basic fields including immunology, pharmacology, cell biology, and molecular genetics	Y				Y				1	2	4	H
8	Basic pathophysiologic mechanisms and therapy of disease of the blood	Y							Y	1	2	4	H
9	Etiology, epidemiology, natural history, diagnosis, and management of benign and malignant hematological diseases	Y	Y							1,2	3,4	5	S, H
10	The hematological manifestation of systemic diseases	Y	Y	Y	Y	Y	Y	Y	Y	1	2,3	4,5	H
11	management of the immunocompromised patients	y	y	y	y	y	y	y	y	1,2	3,4	5	P, H, C, PG
12	Relevant drugs, their mechanisms of actions, pharmacokinetics and clinical indications and limitations, including effects, toxicity, and interactions and their management	Y	Y		Y	Y			Y	1,2	3,4	5	PG, H
13	Administration of chemotherapy	Y	Y	Y	Y	Y	Y	Y	Y	1,2	3,4	5	P, C, H
14	Bone marrow aspiration and biopsy		Y		Y	Y			Y	2,3	4	5	H, I, P
15	Establishment and care of the indwelling catheter	Y	Y	Y	Y	Y	Y	Y	Y	1,2	3,4	5	H, I, P
16	Lumbar puncture with chemotherapy	Y	Y	Y	Y	Y	Y	Y	Y	3,4	3,4	5	S, H, UG, P

Sl. No	Entrustable Professional Activities	COMPETENCIES							EXPECTED LEVEL			MSF
		MK	PC	ICS	P	PBLI	SBP	1 st year	2 nd year	3 rd Year		
17	Learn and apply protocol based therapies	Y	Y		Y	Y	Y	2	3,4	5	S	
18	Formulation of chemotherapy protocols	Y	Y		Y			1,2	3,4	5	S, H, I	
19	Should be able to present oral and poster presentations, write a paper in conferences				Y	Y	Y	2,3	4	5	S	
20	Data keeping, data analysis, research and involvement in different projects				Y	Y	Y	3	4	5	S, H, I	
21	Knowledge of recent advances of hematology	Y	Y	Y	Y	Y		3	4	5	S, H, I	
22	Should be able to teach pathology to undergraduates (MBBS), and allied health sciences like BDS, BSc (Nursing), BSc (MLT), BSc (Radiology), etc.	Y			Y	Y	Y	3	4	5	UG, H	
23	Should be able to supervise supportive staffs, technicians etc		Y	Y	Y		Y	2	3	4	H, P, C	
24	Performance of soft skills such as counselling with the patient /attenders / Breaking a bad news/Graveprognosis/Death/informed consent/discharge advice/follow up			Y	Y	Y	Y	3	4	5	P, I, C, H	
25	Should have a thorough knowledge of Biomedical Waste disposal		Y				Y	3	4	5	PG, H	
Laboratory hematology												
1	Morphology and general hematology:	Y	Y					1,2	3,4	5	S, H, I	
2	Haemostasis and thrombosis laboratory	Y	Y			Y		1	3,4	5	S, H, I	
3	Hemolytic anemia laboratory	Y	Y			Y		1	3,4	5	H, I	
4	Leukaemia laboratory	Y	Y			Y		1	3,4	5	H, I	
5	Genetic aspects of hematology	Y	Y			Y		1	3,4	5	S, H	
6	Should be able to perform urgent investigations like CSF, Platelet count etc. during emergency duties		Y	Y		Y	Y	3	4	5	H, I	

Sl. No	Entrustable Professional Activities	COMPETENCIES							EXPECTED LEVEL			MSF	
		MK	PC	ICS	P	PBLI	SBP	1 st year	2 nd year	3 rd Year			
7	Familiarize with various hemato-pathology equipment	Y	Y							1,2	3	4	S, H
8	Quality control and quality assurance program in the hematology laboratory					Y	Y			1	2,3	4	S
9	Should demonstrate familiarity with laboratory investigations in Microbiology and biochemistry	Y	Y			Y				2	3	4	S, H
Bone Marrow Transplantation (Autologous and Allogenic)													
1	Donor selection	Y	Y	Y		Y				1	2,3	4	S
2	Conditioning regimens	Y	Y			Y				1	2,3	4	S
3	Harvesting and manipulation of the bone marrow	Y	Y			Y				1	2	3,4	S
4	Management of transplant complications	Y	Y			Y				1	2,3	4	S, H
5	Transplantation immunology	Y								1	1	1	S
6	Management of post-transplant patient	Y	Y							1	2,3	4	S, H, PG
Transfusion Medicine													
1	Blood transfusion practice	Y	Y							3	4	5	S, H, PG
2	Identification, prevention and treatment of adverse events of component transfusion	Y	Y							3	4	5	S, PG, H
3	basis of blood compatibility	Y	Y			Y				3	4	5	S, PG
4	principles and methods of screening and cross-matching	Y	Y							3	4	5	S, PG
5	procurement and preservation of blood and blood components	Y	Y							3	4	5	S, H, PG
6	Clinical use for specific component therapy	Y	Y					Y		3	4	5	P, PG, H
7	quality control and quality assurance program with the blood bank							Y		2	3	4	S
8	immunohematology and various other tests being conducted in blood bank	Y	Y					Y		2	3	4	S

Sl. No	Entrustable Professional Activities	COMPETENCIES							EXPECTED LEVEL			MSF	
		MK	PC	ICS	P	PBLI	SBP	1 st year	2 nd year	3 rd Year			
9	Apheresis technique		Y			Y				1,2	3	4	S, H, PG
10	Phlebotomy, exchange transfusion	Y	Y							2,3	4	5	S, H
11	Rules and regulations of blood banking	Y				Y				1	3	4	S, H
Radiotherapy & Nuclear medicine													
1	principles of radiotherapy	Y	Y							1	2	4	S, H
2	use of various radioisotopes	Y	Y							1	2	4	S, H
3	Rational use of radiation in various hematological diseases	Y	Y	Y		Y			Y	1	2,3	4	S, PG, H
4	familiarize with various radiotherapy equipment		Y							1	2,3	4	S, H, PG
5	Basic knowledge of the use of nuclear medicine in the diagnosis of both oncologic and non-oncological hematological disorders	Y	Y						Y	1	2,3	4	S, PG, H
6	To perform studies for hypersplenism, red cell mass estimation for polycythemia, nuclear bone scans and bone marrow scans	Y	Y							1	2	3	S, H
7	Rules and regulations of radiation		Y							1	2	3	S, H

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

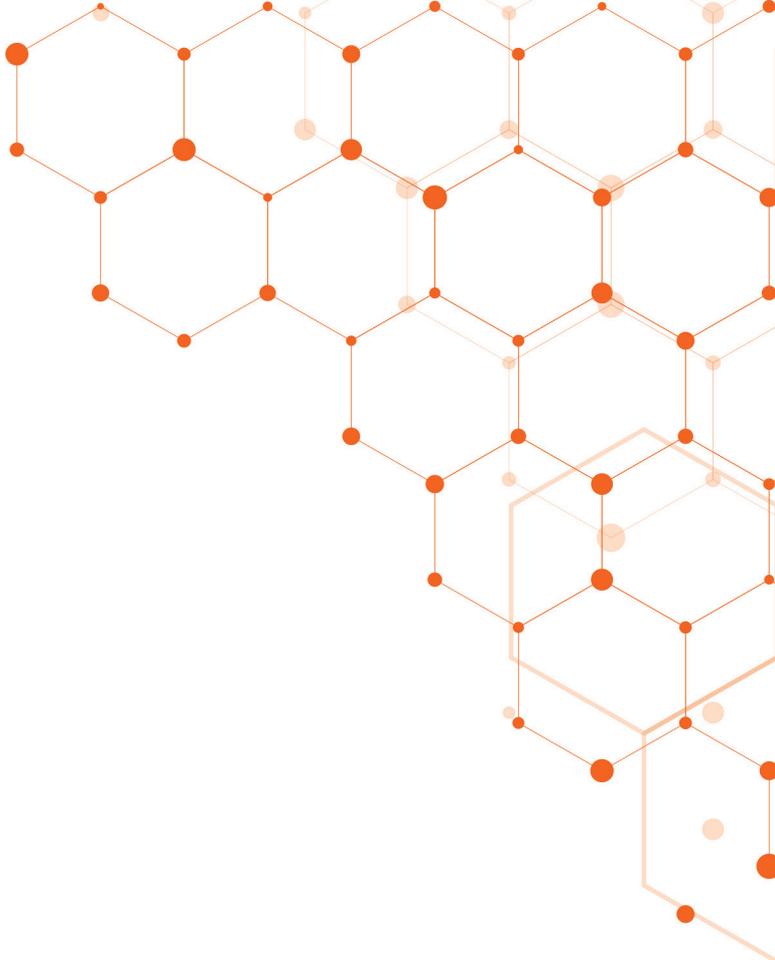
Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



CLINICAL PHARMACOLOGY

DM in Clinical Pharmacology

COURSE NAME:

DM in Clinical Pharmacology

DURATION OF COURSE:

3 years

ELIGIBILITY:

MBBS, MD (Pharmacology/Medicine/Pediatrics)

PREAMBLE

Clinical Pharmacology is a translational science discipline involving all aspects of the relationships between drugs and humans. A Clinical Pharmacologist is a medical doctor with specialized knowledge of Clinical Pharmacology and the necessary skills and competence to ensure safe and effective use of pharmaceutical products in individual patients as well as in patient populations; plan, execute and guide the process of new drug development; undertake pharmacovigilance, pharmacoepidemiology and pharmacoeconomic activities and contribute to drug related issues in the academia, government and pharmaceutical industry.

The broad aims of a post-doctoral specialized training program in clinical pharmacology (3 year DM course) would be to prepare the resident to:

- Plan, administer, monitor and evaluate drug therapy, in individual patients as well as in special patient populations / therapeutic situations, independently and in conjunction with clinical departments, to ensure that pharmacotherapy is rational, safe, effective and optimal.
 - Impart clinical pharmacology and therapeutics knowledge and skills to medical and paramedical residents, as well as clinical colleagues, either in the form of informal (e.g. bedside) teaching or through formal courses.
 - Advise clinical specialists in medical colleges and institutes in the designing of protocols for Phase II, Phase III and Phase IV clinical trials as well pharmacoepidemiologic and pharmacoeconomic studies.
- Conduct drug trials in the form of Phase I clinical trials, pharmacokinetic and pharmacodynamic studies, post-marketing surveillance, pharmacovigilance, pharmacoepidemiology, pharmacoeconomics, personalized medicine studies, etc., and report the same.
 - Establish and operate Therapeutic Drug Monitoring (TDM) centre, adverse drug reaction (ADR) monitoring centre and Drug Information Unit.
 - Function as part of a regulatory or drug technical advisory set-up within the government to assist in regulatory affairs and formulate policies and guidelines pertaining to safe, effective and rational use of pharmaceutical products.
 - Hospital Formulary development
 - Participate in the activities of pharmaceutical industry such as the new drug development process, due diligence activity, medical writing and medico-marketing affairs.
 - Continuing Medical Education
 - Research on herbal products

COURSE OBJECTIVES

To fulfill above mentioned aims, the curriculum is designed to be competency based, so that the course objectives can appropriately address the following key learning domains:

- I. Knowledge: Theory & research methodology
- II. Attitude: Including communication skills
- III. Skills: Practical & Clinical

I. Knowledge

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

- Describe key areas of history and development of Clinical Pharmacology.
- Describe theories of drug-receptor concept, structure & action of receptors, dose-response relationships, potency and efficacy.

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- Describe the principles of: correct choice of route of administration, absorption of drugs, metabolism and excretion of drugs, interpretation of drug concentration in body fluids and pharmacokinetic modeling.
 - Explain the principles of rational therapeutics and essential medicines.
 - Explain the concepts of pharmacogenetics and personalized medicine.
 - Explain the mechanisms of action and modes of use of common therapeutic drugs.
 - Describe the sources of individual variation including genetic, age and gender related (including pregnancy and lactation), and other sources of individual variation especially coexisting renal hepatic and other disease and drug interaction both beneficial and adverse.
 - Demonstrate knowledge of important (common and/or severe) adverse effects of drugs used in their area of clinical practice, common clinical presentations of ADR, ways to identify and report them and appropriate management of suspected ADR.
 - Describe the principles of Good Clinical practice (GCP), Good Laboratory Practice (GLP) And Good Manufacturing Practice (GMP).
 - Explain the roles of national and international regulatory authorities in the process of drug approval.
 - Describe the principles of controlled experiments (clinical trials), randomization, use of placebo and blinding. The resident should know the problems encountered in different types of trials and how such problems can be resolved.
 - Describe ethical principles of research on human subjects including duties, rights and role of Institute Ethics Committee.
 - Should be able to function as a member of various committees, e. g. DSMB.
 - Explain the working principles of various analytical instruments like HPLC, multiplate reader, Electrolyte analyzer, Spectrophotometer, EMIT Spirometer, Treadmill, tools for psychopharmacology evaluation, ECG, etc.
 - Describe drug pricing and drug price control methodology in India and in other selected countries.
 - Explain the various statistical methods used in data analysis.
 - Interpret non-clinical data of a drug and justify its appropriateness prior to first in human administration.
 - Describe the differences between clinical trials of drugs, vaccines and medical devices.
 - Critically interpret the information from published literature including meta-analysis and systematic reviews.
 - Explain the appropriate management of drug abuse, overdose and poisoning
- ## II. Attitude
- At the end of the course the resident should be able to:
- Contribute to public education about drugs and their utilization
 - Appreciate the need for meticulous record keeping and research governance.
 - Appreciate the importance of communicating research data orally and in meticulously written form.
 - Understand and appreciate the laws and guidelines (e.g. ethical) related to drug use in patients and also the laws related to approval process.
 - Appreciate the utility of hospital formulary, antibiotic use policy and the role of drug and therapeutics & audit committees.
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III. Skills

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

- Choose and adjust dose regimens correctly.
- Select drugs and dose regimens rationally based on individual factors.
- Critically analyze a prescription
- Develop prescribing policies, formularies and guidelines using available evidence.
- Evaluate guidelines on drug utilization in the context of Drugs & Therapeutics Committees.
- Formulate standard treatment guidelines for evaluation and implementation by such committees.
- Make effective submissions to formulary committees and various regulatory authorities for new drugs and audit drug utilization.
- Develop clinical trial protocols for all Phases of clinical trials.
- Perform PD and PK studies in human volunteers and patients (including Phase I studies).
- Measure end points reliably and record data accurately. Analyze data including risk benefit analysis and dose determination for phase-II and phase -III studies.
- Critically analyze published research articles regarding rationale, cogency, experimental design, analytical methodology, method of analysis, potential sources of bias, confounding, conflict of interest, appropriateness of discussion, validity of conclusions.
- Critically analyze advertising claims made for medicinal products.
- Critically evaluate research protocols
- Screen potential subjects for inclusion/exclusion criteria, and obtain valid informed consent prior to their recruitment in clinical research.
- Arrange visits of research subject to clinical laboratory or research clinic and perform or supervise clinical measurements.
- Maintain records to the standard required by GCP.
- Utilize the principles of Evidence Based Medicine to answer scientific queries.
- Manage common and serious ADR, including anaphylaxis, appropriately. Use printed and electronic resources to identify unusual or uncertain ADR.
- Report suspected ADR Prescribe with due regard to general knowledge, as specified combined with specific patient related information relating to demographic characteristics, drug history and individual preference.
- Be alert to the possibility that clinical events might be drug-related
- Recognize the need for individualization of therapy wherever necessary.
- Respect patient/ subject autonomy, the primacy of safety of the subject and other principles of ethics.
- Analyze post marketing surveillance studies critically.
- Apply therapeutic principles in drafting management guidelines.
- Capable of planning, review and reconciliation of pharmacotherapy and suspected failure of drug therapy in conjunction with clinical colleagues.
- Write accurate and legally valid prescriptions of controlled drugs.
- Carry out calculation of drug doses based on various types of nomograms.
- Carry out calculation of the strength of an infusion based on the required rate of drug administration.
- Operate and maintain analytical instruments like HPLC, ELISA reader, Spectrophotometer, ECG machine etc.

In addition, the curriculum should also be able to fulfill the following objectives:

- Create trained manpower in the emerging field of Clinical Pharmacology so as to deliver super specialty health care in the country.
- Start Clinical Pharmacology units in their institution after completing the course.
- To be able to work in any hospital with minimum facilities and facilitate the delivery of appropriate treatment regimens and work hand in hand with the treating physician.
- To be able to initiate an individual research project with the help of various funding agencies and aid in the improvement of health care research in our country.

Scope of the course

- The course is for three calendar years beginning from the January or July academic sessions.
- The residents will go through a four months' orientation schedule in clinical departments. During their period of rotation in clinical departments they will participate actively in the clinical ward rounds of these departments. In addition, they will undergo 2 months of internship in a pharmaceutical industry to learn various aspects of clinical drug development process.
- Throughout the course, during the 4 months of hospital posting, they will participate in the weekly grand rounds in ICU/Medicine/Trauma & emergency wards to understand and suggest rational pharmacotherapy and the log book to be maintained accordingly.
- The course would be conducted by holding seminars, group discussions, lectures, and journal clubs as well as practical sessions. However, learning in this postgraduate course shall be essentially autonomous and self-directed.
- The residents will also be involved in various clinical research works being undertaken in the department by faculty members. Each resident is required to participate in at least one research

project during his or her tenure, apart from the thesis project.

- The DM residents will be required to participate in departmental teaching activity, with focus on clinical pharmacology and therapeutics related topics, as per departmental /institutional schedule for various categories of residents like MBBS residents, MD residents in Pharmacology and other disciplines and nursing and paramedical students.
- The residents will be encouraged to present their research work(s) in National and International conferences/ seminars/ workshops and publish the same in peer reviewed journals. It is desirable that each resident should publish at least one article (original research/ review/ meta-analysis) in a peer reviewed indexed journal.

Participating department(s)

The course will be conducted primarily by the faculty of the Department of Pharmacology, AIIMS Bhubaneswar. Wherever necessary the faculty members of other department(s) of the institute shall be invited to participate.

COURSE CONTENT

THEORY

Theory coverage should be able to satisfy each of the specific objectives and should include:

A. Introduction

- a. History and development clinical pharmacology
- b. Definition and scope of clinical pharmacology
- c. General principles in clinical pharmacology
- d. Molecular basis of drug action
- e. Mechanism of drug action
- f. Dose response relationship and effective therapeutic dose.
- g. Metabolism e.g. route of administration, enzyme induction, absorption, distribution, biotransformation and excretion of drugs use of radioisotopes.

-
- h. Aims of clinical trials.
 - i. Problems in clinical trials.
 - Patient compliance
 - Follow-up
 - Dropouts
 - Matched drugs
 - Fixed combination of drugs
 - Patient's sensitivity to drugs
 - Protocol compliance
 - Observer's errors
 - j. Clinical Trial Report
 - k. Pharmaceutical literature
 - l. Criteria for selection of investigation
 - m. Principles in the design of protocol
 - n. Critical appraisal of literature

B. The clinical Pharmacologist: Role and Functions

- a. Definition of the clinical pharmacology
- b. Academic background.
- c. Training of the clinical pharmacologist.
- d. Role of the clinical pharmacologist in institutional/national/international setting, and within the academia, drug industry and government.

C. Drug development Process

- a. Need for a new drug.
- b. Selection of a chemical compound for screening as a potential drug.
- c. Computer assisted drug designing.
- d. General pharmacological and systemic screening
- e. Acute toxicity studies.
- f. Sub-acute toxicity studies.
- g. Chronic toxicity studies
- h. Mutagenicity, carcinogenicity, reproduction and teratogenicity studies.
- i. Role of government institute, pharmaceutical companies, universities, centres of excellence

- and the government in drug development collaborative efforts.
- j. Present dilemmas in drug development; patent protection, price control regulation, generic vs. branded, national vs. multinational drug companies.
- k. Orphan drugs.
- l. Role of national/international regulatory agencies.
- m. Good Laboratory Practice (GLP).
- n. Good Clinical Practice (GCP)

D. Pharmacoepidemiology

- a. Prescribing habits and skills.
- b. Provision of drug information (including the resources used for drug information).
- c. Drug utilization studies.
- d. Pharmacoeconomics.
- e. Essential drug list and hospital formulary.
- f. Rational drug use.
- g. Pharmacovigilance

E. Assessment of preclinical data

- a. Animal pharmacology – effectiveness and safety.
- b. Assessment of preclinical data, (example would be provided of actual assessment being carried out for the drugs controller of India) adequacy of toxicity studies.
- c. Pharmacokinetic studies in animal.
- d. Selection of initial human dose from animal data.
- e. Other aspects:
 - Comparison with placebo / other drugs.
 - Effectiveness.
 - Adverse effects.
 - Carcinogenicity, mutagenicity and teratogenicity.
 - Cost.
 - Assessment of benefit and risk.
 - Pharmaceutical aspects- shelf life, purity, stability of formulation etc.

F. Ethical and legal aspects of Drug Development and Clinical Trial

- a. Evolution, scope and membership of an ethics committee.
- b. Ethical aspects of carrying out a clinical trial.
- c. Legal aspects of carrying out clinical trials.
- d. Consent of subject – written / verbal statement made to and by subject before consent is obtained.
- e. Subjects in clinical trials.
 - Volunteers, normal, healthy.
 - Prisoners.
 - Children.
 - Mentally unsound persons
 - Pregnant women
 - Patients
 - Students.
 - Employees.

G. Miscellaneous aspects

- a. Drugs and the foetus.
- b. Payments to volunteers.
- c. Compensation to subject for injury during participation in drug trials.
- d. Insurance/Indemnification for doctors and the institute.
- e. Administration of drugs by non-medical personnel.
- f. Assessment of risk and benefit.
- g. Historical perspectives in human experimentation on prisoners at concentration camps.
- h. Declaration of Helsinki.
- i. Nuremberg code.
- j. International perspectives (CIOMS-WHO guidelines).
- k. ICMR bioethics guideline.
- l. ICH-GCP and Indian GCP
- m. Drugs & Cosmetics Act (1940) and Drugs & Cosmetics Rules (1945).

H. Types of clinical studies (trials) envisaged

- a. Retrospective Vs. Prospective studies.
- b. Single centre Vs. Multicentre trials.
- c. Fixed dosage Vs. Variable dosage.
- d. Prophylactic drug trial.
- e. Quality of life assessment trials.
- f. Clinical trials with herbal products
- g. Bioequivalence trials

I. Protocol Designing

- a. Rationale and importance of protocol.
- b. Broad principles in protocol designing.
- c. Development of expertise in protocol making – role of industry.
- d. Designing of SOPs and CRF (case report forms).

J. Pharmacokinetics and Pharmacogenetics

- a. Absorption, distribution, biotransformation and excretion of drugs- use of radioisotopes.
- b. Studies on bioavailability of new drugs delivery system and population PK/PD studies
 - Drug-Drug, Drug-Disease and Drug-Food interactions involving various physiology systems.
 - Enzyme induction and inhibition and their effects on drug kinetics.
 - Trial of multiple combinations.
 - Therapeutic drug monitoring (TDM).
 - Setting up of a TDM centre.
 - Good Laboratory Practice – Quality assurance.
 - Role of genetic variations and polymorphisms on efficacy and safety of a drug.

K. Conduct of clinical trials

- a. Principles of controlled clinical trials.
- b. Investigator / centre, facilities, reputation.

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- c. Informed consent, importance process of obtaining it.
 - d. Institute Ethics Committee: Role and functions.
 - e. Permission from drugs controller/regulatory agencies.
 - f. Patient /volunteer recruitment, inclusion / exclusion criteria.
 - g. First administration of a chemical to the human.
 - h. Controlled clinical trial - sequential trials, choice of variables, crossover techniques, randomization, open-label and double-blind studies.
 - i. Fixed dosage Vs. variable dosage schedule.
 - j. Problem faced in carrying out clinical trials.
 - k. Criteria for exclusion and methods to deal with dropouts in clinical trials.
 - l. Role of Clinical Pharmacologist in various phases of clinical trials.
 - m. Monitoring of adverse events—how and when?
 - n. Statistical issues—sample size, power of the trial.
 - o. Data analysis—interim and final.

L. Phases of clinical trials

Preclinical requisites for phase I, II, III and IV trials and their clinical significance.

- a. Phase I
 - Purpose, end-points in human pharmacological studies, Maximum tolerated dose, tolerance, single dose/multiple dose, dose escalation.
 - Determination of safety: signs, symptoms and lab parameters.
 - Human pharmacodynamic studies.
 - Pharmacokinetic studies.
- b. Phase IIA
 - Clinical trials -selection of subject.
 - Dose determination.
- c. Phase IIB
 - Design parameters to be observed duration variable.
 - Detailed pharmacokinetics.
 - Safety parameters.
- d. Phase III
 - Selection of subjects.
 - Dose determination for use in phase III.
 - Safety parameters.
- e. Phase III
 - Clinical trials—selection of subjects / design / parameters to be observed / duration / variables / safety parameters / single centre / multicentre.
 - Dosage fixed / variable.
- f. Phase IV
 - Limited marketing permission coupled with mandatory post marketing surveillance.
 - Types of Phase IV clinical trials.
 - Design of Phase IV clinical trials.
 - Selection of subject / parameter to be observed / duration / variables.
 - Extended phase IV or field trials under less than ideal conditions.
 - Postmarketing Surveillance: Significance and purpose of PMS

M. Multicentric Trials

- a. Phase I
 - b. Phase IIA
 - c. Phase IIB
 - d. Phase III
 - e. Phase IV
- a. Indications for multicentric trials.
 - b. Organization of a multicentric study.
 - c. Number of centres.
 - d. Quality control at different centres: training facilities / protocol compliance.
 - e. Standardization.
 - f. Data processing –coordinating centre / role of computerized data collection.
 - g. Experience of pharmaceutical organizations.
 - h. Experience of World Health Organization / ICMR in conducting such studies
 - i. Problems encountered in multicentric trials.

N. The Placebo

- a. Historical aspects.
- b. Pharmacology of placebo (DRC / AE of placebo).
- c. Use of placebo.
- d. Active placebo.
- e. Inert placebo.
- f. Placebo reactors.
- g. Ethical issues in use of placebo.

O. Randomization

- a. Need of randomization.
- b. Methods of randomization: randomization tables/computers etc.
- c. Stratification / balanced randomization.
- d. Problem and how to tackle them.

P. Withdrawals and dropouts

- a. Reasons for dropouts –
 - Drug related
 - Non-drug related
 - Random reasons
- b. Reasons for withdrawals
- c. Selection and exclusion criteria
- d. Duration of trial extended due to lack of subject.
- e. Patient does not co-operate-physician choice.
 - Loss to follow up/ attrition.
 - Patient gets seriously ill/slow improvement.
 - Patient concomitantly gets other drugs contrary to the protocol
 - Biostatistical adjustment for dropouts and missing data.

Q. Run-in and Washout period

- a. Necessity.
- b. Ethical aspects.
- c. Duration.
- d. Problem in cross-over trials

R. Special features of clinical trial with plant based/ nutraceutical products

- a. History of the use of plant products.
- b. Present status.
- c. Standardization.
- d. Preclinical evaluation and toxicity requirements-problem, WHO recommendation.
- e. Ethical aspects – preclinical requisites.
- f. Preparation and use of plant products.
- g. Advantages and disadvantages.
- h. Problems.
- i. Coordination of clinical trials on plants and nutraceutical products.
- j. Consultation with Ayurvedic and Unani practitioners of medicine.

S. ADR monitoring – Pharmacovigilance

- a. Definition and classification.
- b. Prediction of adverse effects and interactions of a particular potential drug from the chemical structure and animal studies.
- c. Methods for ADR monitoring.
- d. Monitoring of commonly observed adverse effects.
- e. Monitoring of rare adverse effects in marketed drugs.
- f. Hospital monitoring systems.
- g. Maintenance of an adverse drug reaction registry: hospital / regional / national database.
- h. Drug surveillance.
- i. Measurement of drug levels in plasma for monitoring side- effects.
- j. Investigations of cause and effect relationship (causality), therapeutic challenge.

T. Drug interactions

- a. Definition.
- b. Classification:
 - Drug host interactions

- Drug disease interactions.
- Drug-drug interactions.
- Drug food interactions.
- Drug nutrition interactions.
- Drug environment interactions.

- c. Mechanisms.
- d. Clinical relevance.

U. Data management

- a. Role of biostatistician in protocol designing.
- b. Choice of biostatistical technique.
- c. Data dredging
- d. Data mining.
- e. Intention to treat and per protocol concepts in analysis.
- f. Data processing and verifying the analysis.
- g. Documentation of data.
- h. Writing of the result of the trials by whom -Investigator / Sponsor.

V. Iatrogenic Diseases

- a. Definition.
- b. Occurrence, incidence, causes, morbidity, mortality.
- c. Investigation to define causal relationship, therapeutic challenge.
- d. Role of the clinical pharmacologist in preventing iatrogenic diseases.

W. General problems in organization and carrying out clinical trials

- a. Preparation of a flow chart for the entire trials-initiation to completion.
- b. Collaboration between different departments involved in the trial.
- c. Collaboration with the manufacturer / supplier of the drug to ensure uninterrupted regular supply of drug.
- d. Incentive / payment to investigator / volunteers.

- e. Medical insurance -investigator / volunteers.
- f. Compilation of forms in time.
- g. Regular and phased processing of data, publication of results.

X. Drug regulation-National and International

- a. Definition and evolution of drug regulation.
- b. Requirement for introduction of a new drug.
- c. Requirement for news use of existing drugs.
- d. Requirement for altered dosages and new combinations.
- e. Quality control procedures
 - Principles of dealing with controlled drugs.
 - Laws and local regulations related to drug stores and pharmacies.
 - Principles of dealing with substandard / counterfeit products.
- f. National regulatory agency /state regulatory agency.
- g. Acceptance of data obtained in one country by the drug regulatory agency of another country for use of the drug in another country racial/genetic/Nutritional differences.
- h. Special problem in clinical evaluation of plant medicines.
- i. Administration of drug by trained paramedical personnel.
- j. Laboratory facilities essential for clinical evaluation of drug – phase II and III.
- k. Extended phase IV trials.
- l. Drug regulation of India and some other countries (USA, UK, Japan, and EU).
- m. Role of World Health Organization.

Y. Centres for clinical pharmacology – Teaching, Training, Research

- a. Need for centres and development of new centres – personnel, facilities.
- b. Requirement: personnel, equipment, facility for food, beds for patients / volunteers.

-
- c. Existing centres – national / international.
 - d. Future expansion.

Z. Pharmaceutics

- a. Drug formulation.
- b. Pharmaceutical equivalence – disintegration and dissolution.
- c. Good Manufacturing Practice (GMP).
- d. Bioavailability and bioequivalence.
- e. New drug delivery systems.

SPECIAL CLINICAL PHARMACOLOGY

A. Preclinical evaluation of new drug dossiers

- a. How to prepare a checklist.
- b. Animal pharmacology – general, specific, ED_{50}
- c. Adequacy of data
- d. Toxicology data
- e. Animal pharmacokinetics
- f. Pharmaceutical data / aspects
- g. ED_{50} , LD_{50} , therapeutic index.

B. Preclinical evaluation of:

- a. Antifertility drugs
- b. Drugs acting on central nervous system
- c. Drugs acting on cardiovascular system
- d. Drugs acting on the kidney
- e. Drugs acting on gastrointestinal tract

C. Pathophysiology of specific disease states and clinical pharmacology of drugs used in:

- a. Anxiety and affective disorders
- b. Autoimmune disorders
- c. Bronchial asthma
- d. Cancer pharmacotherapy
- e. Cardiac arrhythmias
- f. CNS degenerative disorders

- g. Dermal diseases
- h. Diabetes mellitus
- i. Epilepsy
- j. Heart failure
- k. Hyperlipidemia
- l. Hypertension
- m. Ischaemic heart disease
- n. Migraine
- o. Ocular conditions
- p. Peptic ulcer
- q. Psychosis
- r. Rheumatoid arthritis
- s. Shock
- t. Sleep disorders
- u. Stroke

D. Fundamental principles involved in chemotherapy of microbial and parasitic disease

- a. Antimicrobials
- b. Antimalarial drugs
- c. Anthelmintic drugs
- d. Antiviral drugs
- e. Antifungal drugs.
- f. Antitubercular drugs.
- g. Antiparasitic drugs.
- h. Antiretroviral drugs
- i. Community acquired infections
- j. Hospital acquired infections

E. Drug usage in

- a. Renal failure
- b. Hepatic failure
- c. Cardiac failure
- d. Extremes of age
- e. Pregnancy and lactation.
- f. Malnutrition

F. Clinically important drugs interactions

- Antiepileptic; hypnotics and psychoactive drugs
- Cardiovascular drugs
- Anti – inflammatory and analgesic drugs
- Antimicrobials

G. Clinical pharmacology of contraception

- Contraceptive agents
- Assay of reproductive hormones
- Metabolic and biochemical changes associated with oral contraceptives
- Recent advances in contraceptive technology
- Clinically important drug interaction of steroidal contraceptive.

H. Special problem in clinical trials

- Prophylactic drug trials
- Oral contraceptives and intrauterine devices
- Central nervous system drugs
- Cardiovascular drugs including diuretics.
- Drugs in tropical diseases
- Acid peptic disease drugs.
- Trials on vaccines
- Trials in Oncology
- Immunosuppressant drug trials

I. Miscellaneous topics

- Transfer of drugs across blood -brain barrier
- Gene based therapy
- Poisoning and its management
- Products of recombinant D.N.A technology
- Hematopoietic growth factors
- Immunomodulators
- Use of drugs for diagnostic purposes

PRACTICALS

Practical exposure to design and conduct of on-going clinical trials in one of the following areas: To be completed by end of 2nd year

- Cardiovascular pharmacology
- Reproductive pharmacology
- Neuropsychopharmacology
- Gastroenterology
- Renal pharmacology
- Tropical medicine
- Rheumatology
- Bioequivalence

Short internship in a pharmaceutical Industry: for training in the areas of drug discovery/development.

Patient management: to be undertaken during 4 months posting in clinical departments. This includes 2 months of posting in General Medicine, one month in Trauma and Emergency Medicine and one month in the ICU in 1st year of the course.

Laboratory techniques: To be completed by end of 1st year of the course.

At the end of the course the candidate must understand and interpret the following

- Haematology: Hemogram, prothrombin time.
- Liver function tests: AST, ALT, Alk. phosphatase, serum bilirubin
- Kidney function tests: Urine analysis blood urea, uric acid, creatinine clearance
- Other biochemical tests: Blood lipid profile, electrolytes, blood glucose tolerance test oral/ I.V.
- Hormone assay: (using suitable assay technique)

FSH	Progesterone
LH	Estradiol
HCG	Testosterone
HPL	T3, T4
TSH	Oxytocin
Insulin	Vasopressin

Growth hormone
ACTH

Prostaglandins
Cortisol

PRACTICAL TESTS TO BE DEMONSTRATED / CARRIED OUT

A. Pharmacodynamics:

- a. Recording of blood pressure
- b. Chronobiology of blood pressure and heart rate
- c. Recording of E.C.G. and measuring heart rate
- d. Exercise testing and hemodynamic monitoring
- e. Effect of mental stress on blood pressure and heart rate
- f. Effect of hand grip exercise on blood pressure and heart rate
- g. Comparative effect of suitable beta-blockers on cold – stress induced increase in arterial blood pressure
- h. Effect of beta-blockers on exercise tolerance in volunteers utilising treadmill / bicycle ergometry / Master's two step test
- i. Hemodynamic effects of exercising on a treadmill
- j. Assessing the effect of drug on psychomotor performance
- k. Assessing the analgesic effects of drugs in human volunteers
- l. Spirometry and respiratory function tests and effect of bronchodilators
- m. Assessing the effect of diuretic on urinary volume and sodium, potassium excretion
- n. Effect of NSAIDs on diuretic action in volunteers
- o. Demonstrate the mydriatic, miotic and cycloplegic effects of ophthalmic drugs in volunteers.

B. Pharmacokinetics:

- a. To assess the acetylator status of a patient / volunteers using isoniazid.

- b. Monitoring of plasma levels of lithium in patients.
- c. Estimation of sodium, potassium using flame photometry or any other technique.
- d. Cumulative urinary excretion of drugs for estimation of pharmacokinetics parameters.
- e. To study the pharmacokinetics of aspirin in volunteers using spectrofluorimetric or other methods.
- f. Study the kinetics of phenytoin by HPLC method.
- g. Study the pharmacokinetics of carbamazepine by HPLC method
- h. Study the pharmacokinetics of phenobarbitone by HPLC method

THESIS

As a part of DM curriculum, the student should complete one thesis project during the tenure and it is desirable to submit the proof of communication of the manuscript (originated from his/ her thesis) to an indexed peer- reviewed journal.

- The student should submit the completed thesis 6 months before the final examination
- If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.
- The thesis will be sent to one external evaluator for approval. The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as accepted, accepted with suggested modification or rejected.
- If the thesis is accepted with suggested modifications, the comments of the evaluator will be intimated to the student and the guide for necessary correction/ modifications.
- After modification, the thesis will be evaluated by a departmental committee for final approval.
- If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination.

TEACHING & LEARNING METHODS

In the Department

The minimum teaching schedule for the DM residents shall incorporate the participation in following:

- **Seminars:** At least one per week, minimum of 48 seminars. The presentation should be discussed and finalized with the faculty assigned as the moderator, at least one week prior. The presenter will be assessed by all the faculty and marks recorded in log book.
- **Journal club:** Which will include critical appraisal of original research article published in peer reviewed national / international journals. The article should be circulated to all at least one week prior. The presenter will be assessed by all the faculty and marks recorded in log book.
- **Subject Review/Therapeutic club:** Complete updated review of literature with critical analysis of major topics in clinical pharmacology and therapeutics. The abstract of the review should be circulated at least one week prior. The presenter will be assessed by all the faculty and marks recorded in log book.
- **Lectures:** Lectures in statistics and research methodology and other clinical pharmacology related topics will be conducted periodically. Residents will be given assignments that they have to complete and submit.
- **Practical:** Clinical pharmacology experiments will be demonstrated, and the residents have to practice and familiarize themselves with these experiments. The clinical pharmacology experiments and procedures performed by the residents should be recorded in the log book. A practical record should also be maintained.
- **Modular Teaching:** - Participation in Undergraduate Modular Teaching in the subjects of Clinical Pharmacology and Therapeutics.

In addition, the resident will also participate in

- Interdepartmental meetings between various clinical departments (Medicine, Dermatology,

Neurology) and the clinical Pharmacology unit of Department of Pharmacology.

- **Bed-side Clinics/Rounds**– Routinely conducted for postgraduates in the various clinical departments, in which the resident is posted.

Posting of Residents and Training Schedule

The residents will go through a four months orientation schedule in clinical departments in the 1st Year of the course. During their period of rotation in clinical departments they will participate actively in the clinical ward rounds of these departments. In addition, they will undergo 2 months of internship in a pharmaceutical industry to learn various aspects of clinical drug development process.

ASSESSMENT

INTERNAL ASSESSMENT

1. Examination on Research Methodology & Biostatistics will be conducted at the end of 2nd Semester. Students have to pass this examination by securing at least 50 marks as an eligibility criterion to appear in the final examination. If someone secures <50, he/ she has to appear in subsequent examinations. No marks will be added to the final/ summative examination. Examination will be conducted by examination cell in the month of June-July and December-January every year.
2. A total of 3 internal examinations will be conducted at the end of 3rd semester, 4th semester and at prefinal (4 months before final) examination.
3. Marks distribution: Theory paper will carry 100 marks. There will be topic wise assessment. Practical with viva and logbook (Clinical/ experimental/ practical = 70, viva = 20, logbook = 10) will be of 100 marks. The marks of the 3 internal examinations will be averaged to 100 each for theory and practical.

FINAL / SUMMATIVE ASSESSMENT

Eligibility for appearing in the Final Examination

1. Passed (secured 50% marks) in the examination on Research Methodology and biostatistics (end of 2nd semester) and
2. Passed (secured 50% marks) in aggregate of internal examinations, theory and practical (end of 3rd, 4th semester and prefinal) and
3. Dissertation/thesis submitted six months before the final examination and is approved/accepted by an external evaluator.

Final Theory Examination

1. Theory: 4 papers (100 marks each)
 - Paper I: Basic & Allied Sciences
 - Paper II: General Clinical Pharmacology & Clinical drug evaluation methodology
 - Paper III: Systemic Clinical Pharmacology
 - Paper IV: Recent advances in therapeutics

2. Theory question paper format:

- One Long question – 20 marks
- Eight Short question/notes – 10 x 8 = 80 marks

3. Total marks in theory: 500 marks

- Four papers in the final examination – 400 marks
- Average of 3 internal examinations – 100 marks

Final Practical Examination

1. Total marks - 500 marks

- An average of 3 internal examinations: 100 marks.
- Practical and viva in the final examination: 400 marks.

The format of the practical examination (400 marks)

Part	Component	Marks allotted
Part A (200 Marks)**	Longcase (Preferably Pharmacodynamics) - One	75
	Short experiments – Three (25 X 3)	75
	Pharmacokinetic exercise	50
	Subtotal	200
Part B (200 Marks)	Instruments/department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	50
	Logbook	10
	Scientific Writing (Manuscript written out of the thesis)	15
	Subtotal	200
	Total	400

** Students should pass (secure 50% marks) separately in Part A

Final marking scheme

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	Four months before the final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

Passing Marks

1. The student has to secure $\geq 50\%$ marks in the internal examination to be eligible to appear for the final examination.
2. In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
3. In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

LOGBOOK

The resident's performance will be recorded by the faculty of the department / laboratory where he / she has worked. The resident should maintain a daily log of his/her activities and this will be reviewed by the concerned faculty. The progress will be discussed with the resident and his/her chief guide every 3 months. The chief guide will periodically monitor the progress of the resident and sign on the log book every quarter. The logbook will be countersigned by the head of the department prior to the final DM examination.

RECOMMENDED BOOKS

1. Atkinson AJ, Abernethy DR, Daniels CE, Dedrick R, Markey SP. Principles of Clinical Pharmacology; Elsevier Science; 2011.
2. Bonate PL. Pharmacokinetic-Pharmacodynamic Modeling and Simulation: Springer US; 2011.
3. Brody T. Clinical Trials: Study Design, Endpoints and Biomarkers, Drug Safety, and FDA and Ich Guidelines: Elsevier Science & Technology Books; 2016.
4. Brunton L, Knollman B, Hilal-Dandan R. Goodman and Gilman's The Pharmacological Basis of Therapeutics, 13th Edition: McGraw-Hill Education; 2017.
5. Burton ME. Applied Pharmacokinetics & Pharmacodynamics: Principles of Therapeutic Drug Monitoring: Lippincott Williams & Wilkins; 2006.
6. Capelo-Martínez JL, Igrejas G. Antibiotic Drug Resistance: Wiley; 2019.
7. Clarke W, Dasgupta A. Clinical Challenges in Therapeutic Drug Monitoring: Special Populations, Physiological Conditions and Pharmacogenomics: Elsevier Science; 2016.
8. Daniel WW, Cross CL. Biostatistics: A Foundation for Analysis in the Health Sciences: Wiley; 2018.
9. Dasgupta A. Therapeutic Drug Monitoring: Newer Drugs and Biomarkers: Elsevier Science; 2012.
10. Friedman LM, Furberg CD, DeMets DL. Fundamentals of Clinical Trials: Springer New York; 2010.
11. Halabi S, Michiels S. Textbook of Clinical Trials in Oncology: A Statistical Perspective: CRC Press; 2019.
12. Källén A. Understanding Biostatistics: Wiley; 2011.

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13. Katzung BG. Basic and Clinical Pharmacology: McGraw-Hill Education; 2017.
14. Müller M. Clinical Pharmacology: Current Topics and Case Studies: Springer Vienna; 2011.
15. Owen JS, Fiedler-Kelly J. Introduction to Population Pharmacokinetic / Pharmacodynamic Analysis with Nonlinear Mixed Effects Models: Wiley; 2014.
16. Wells BG, Talbert RL, DiPiro JT, Yee GC, Matzke GR, Posey LM. Pharmacotherapy: A Pathophysiologic Approach: McGraw-Hill Education; 2020.

MODEL SAMPLE QUESTION PAPERS

PAPER I

BASIC & ALLIED SCIENCES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the various strategies of supply chain management employed in the delivery of essential medicines across various levels of health care.
2. Discuss the importance and application of cardiac rate pressure product in pharmacologic stress testing.
3. Outline two major strategies used to implement an antimicrobial stewardship programme in a hospital and enumerate the metrics used to track the antimicrobial usage.
4. Describe the pathophysiological changes that have to be accounted for during drug usage in acute renal failure.
5. Discuss the role of single nucleotide polymorphisms in modifying the metabolism of anticancer drugs.
6. Write a note on the role of siRNA, shRNA and miRNA in the regulation of protein synthesis.
7. Outline the core components of the Universal Immunization Programme of India
8. Discuss the importance of Beer-Lambert law in spectrophotometric analysis citing suitable examples.
9. Discuss the principle of HPLC and explain how a suitable solvent is chosen for assay of small molecules.

PAPER II

GENERAL CLINICAL PHARMACOLOGY AND CLINICAL DRUG EVALUATION METHODOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the components and utility of multi-compartment model in pharmacokinetics.
2. Enumerate importance and limitations of therapeutic drug monitoring for antiepileptic drugs.
3. Discuss three scoring based methods for causality assessment of adverse drug reaction.
4. Discuss five important causes of low bioavailability of drugs citing suitable examples for each.
5. Describe in brief the US-FDA pregnancy risk categorization of drugs.
6. Enumerate the important characteristics and the role of surrogate end points in a clinical trial.
7. Write a note on adaptive Clinical trials.
8. Discuss the importance of Post-Trial access of an investigational product in the context of new drugs and clinical trials rules 2019.
9. Explain the different methods of dose titration in Phase I clinical trials.

PAPER III

SYSTEMIC CLINICAL PHARMACOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the pharmacotherapy of HIV infection with special emphasis on the important antiretroviral regimens suggested by National AIDS Control Organization.
2. Discuss the advantages and disadvantages of “dissociated” corticosteroids over conventional corticosteroids.
3. Outline the medical management of anemia of chronic disease in elderly patients.
4. Outline the mechanism and implications of aspirin resistance in patients with coronary artery disease receiving low dose aspirin.
5. Explain the medical management of ulcerative colitis in a young adult, using a treatment algorithm.
6. Outline the pharmacotherapy of opioid dependence in young adults.
7. Discuss the pharmacotherapy of extensively drug resistant tuberculosis (XDR-TB).
8. Outline the step wise pharmacological management of bronchial asthma according to the 2019 Global Initiative for Asthma (GINA) guideline and briefly discuss the important changes compared to the previous guideline.
9. Explain in brief the medical management of hypertensive emergency and hypertensive urgency using suitable treatment algorithm.

PAPER IV

RECENT ADVANCES IN THERAPEUTICS

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Explain the mechanism of action and clinical pharmacology of incretin modulators in the management of Type2 diabetes mellitus.
2. Discuss the therapeutic role of oxytocin receptor antagonists in management of preterm labour.
3. What are Radiopharmaceuticals? Write a note on Indian perspective of Radiopharmaceuticals.
4. Discuss the current status of Sphingosine 1-phosphate (S1P) receptor modulators in multiple sclerosis.
5. Discuss the therapeutic role of Calcitonin Gene-Related Peptide modulators in migraine.
6. Explain how vaptans are useful in the management of hyponatremia in the elderly?
7. Explain the role of monoclonal receptor activator of nuclear factor kappa-B ligand (RANKL) antibody in prevention of osteoporosis.
8. Give a brief account of newer antibiotics approved for treatment of carbapenem-resistant gram negative bacteria.
9. Discuss current status of immune checkpoint inhibitors in treatment of metastatic melanoma.

ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA)

A. CLINICAL

Sl. No.	EPA	Competency Domains							Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Resi-dency	End of 1 st year	End of 2 nd year	End of 3 rd year		
1	History taking and general physical examination	*	*	*	*	*	*	3	3	4	5	S, P, PG, I	
2	Interpretation of common diagnostic tests	*	*	*	*	*		2	3	4	4	S, I	
3	Discussing orders and prescriptions and giving the necessary instructions to the patients	*	*	*	*	*	*	2	3	4	4	S, P, PG, I	
4	Document clinical details in the patient record/Writing OP/IP case sheets / Filling up various Lab. requisition forms / Writing a discharge summary		*		*	*	*	2	3	4	5	S, PG, I	
5	Clinical presentation of a case to the Professor and discuss t the provisional diagnosis/ results of the investigations/ care plan dose adjustment	*	*	*	*	*	*	2	2	3	4	S, PG, H	
6	Using evidence based medicine to improve patient care	*	*	*	*			2	3	4	4	S, I	
7	Participating efficiently as a member of an inter-professional team		*			*	*	1	2	3	3	S, PG, H, I	
8	Recording ECG/ Interpreting a. Basic ECG b. Advanced ECG (arrhythmias) c. Interpretation of ABG analysis report d. CSF analysis e. Radiologic Images f. USG							2	3	3	4	S, P, PG, H, I	

Sl. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
9	Performing bedside procedures such as IM/IV/SC injections/ Ryle's tube, Urinary catheter insertions / drawing venous blood	*	*	*	*			2	3	4	4	S, P, PG, H, I
10	Learning to use electronic medical records		*		*	*		2	2	3	4	S, PG, H, I
11	Develop prescribing policies, formularies and guidelines using available evidence.	*	*	*	*			2	3	3	4	S, H, I
12	Capable of planning, review and reconciliation of pharmacotherapy and suspected failure of drug therapy in conjunction with clinical colleagues	*	*	*	*			1	2	3	4	S, PG, H, I
13	Carry out calculation of drug doses based on various types of nomograms/ Carry out Calculation of the strength of an infusion based on the required rate of drug administration.	*	*	*	*			1	2	3	4	S, PG, H, I
14	Manage common and serious ADR, including anaphylaxis, appropriately. Use printed and electronic resources to identify and analyze unusual or uncertain ADR, and report ADR to appropriate authorities	*	*	*	*			1	2	3	4	S, P, PG, H, I

B. RESEARCH AND TEACHING

Sl. No.	EPA	Competency Domains						Level of competency				MSF	
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Resi-dency	End of 1 st year	End of 2 nd year	End of 3 rd year		
1	Knowing the Research Methodology/ Collecting data for the research and compiling them/ Analysis of the collected research data and writing a research paper	*		*	*	*		2	3	4	4		S, I
2	Develop clinical trial protocols for all Phases of clinical trials.	*		*	*			2	3	4	5		S, I
3	Perform PD and PK studies in human volunteers and patients (including Phase I studies).	*		*	*		*	2	3	4	4		S, PG, H, I
4	Screen potential subjects for inclusion/ exclusion criteria, and obtain valid informed consent prior to their recruitment in clinical research.	*	*	*	*		*	2	3	4	4		S, PG, H, I
5	Arrange visits of research subject to clinical laboratory or research clinic and perform or supervise clinical measurements.	*					*	2	3	4	4		S, P, PG, H, I
6	Maintain records to the standard required by GCP	*					*	2	3	4	4		S, I
7	Operate and maintain analytical instruments like HPLC, ELISA reader, Spectrophotometer, ECG machine.	*			*		*	2	3	4	4		S, I
8	Participation in UG/PG clinical class/ seminar/ symposium /journal club etc.	*		*	*		*	3	3	4	4		S, PG, I

Abbreviations

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

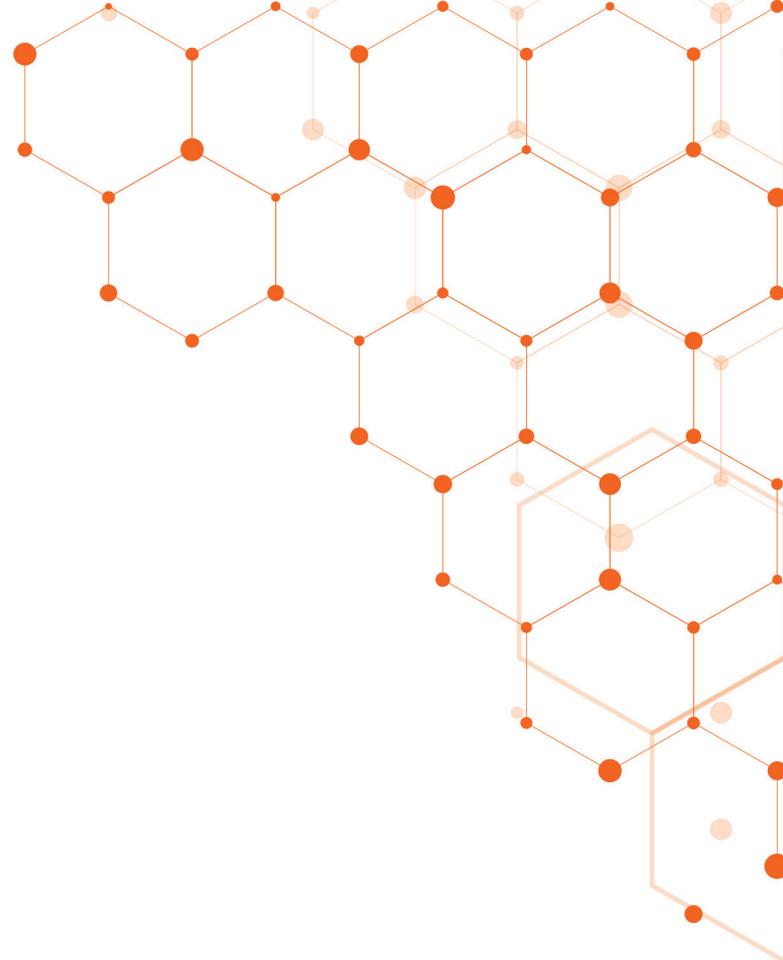
Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



GASTROENTEROLOGY



DM in Gastroenterology

COURSE NAME:

DM in Gastroenterology

DURATION OF COURSE:

3 years

ELIGIBILITY:

MBBS, MD/DNB (General/Internal Medicine)

OBJECTIVE

The aim of the DM Programme is to provide advanced training in Gastroenterology and Hepatology to produce competent super-specialists, who will be able to provide clinical care as well as endoscopic intervention of the highest order in the field of gastroenterology and will serve as future teachers, trainers, researchers, and leaders in the field of Gastroenterology.

SYLLABUS CONTENT

THEORY

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.

Esophagus

Basic anatomy, histology and physiology of the oesophagus, developmental anomalies of the oesophagus, oesophageal motility and motor disorders, mechanism of deglutition and dysphagia, approach to a patient with dysphagia, gastro-oesophageal reflux disease, Barretts oesophagus, tumours of the oesophagus, oesophageal webs, membranes and diverticulum, benign and malignant oesophageal strictures,

corrosive oesophageal injury, oesophagus and systemic diseases, esophageal diseases caused by medication, trauma and infection, foreign bodies in the oesophagus and stomach, esophageal perforation and its management

Stomach and Duodenum

Gastric anatomy, histology, functions, gastric secretion, gastric mucosal defence mechanism, gastroduodenal motility in health and diseases, Helicobacter pylori, gastritis and gastropathies, peptic ulcer disease and its management both medical and surgical, management of ulcer complications, functional dyspepsia, gastric hypersecretory states including Zollinger Ellison syndrome, post gastrectomy complications, bezoars, tumors of the stomach.

Biliary System

Anatomy of the biliary system, physiology of bile formation and excretion, biliary tract motor function and dysfunction, enterohepatic circulation, bilirubin metabolism, congenital diseases of the biliary systems including developmental anomalies and pediatric disorders of the biliary tract, approach to a patient with jaundice, gallstones- its complications, and management, acute acalculous cholecystitis, acute cholangitis, benign biliary structure, benign and malignant neoplasms of the biliary system, endoscopic and radiologic management of biliary obstruction, cholelithiasis, adenomyomatosis and polyposis of the gall bladder, sclerosing cholangitis and recurrent pyogenic cholangitis

Liver

Anatomy, physiology, blood supply, functions of the liver, microcirculation of liver, normal and abnormal liver histology, liver function tests, pathophysiology of portal hypertension, hepatic venous pressure gradient and its measurement, extrahepatic portosplenic vein obstruction, non-cirrhotic portal fibrosis, Wilson's disease, hemochromatosis and other inherited metabolic diseases of the liver, Budd Chiari syndrome, hepatitis A, B, C, D, E and miscellaneous causes of hepatitis, approach to chronic hepatitis, acute liver failure and its management, acute on chronic liver

disease, cirrhosis of liver and its complications-ascites, spontaneous bacterial peritonitis, hepatic encephalopathy, variceal bleed, hypersplenism, hepatorenal syndrome, hepatopulmonary syndrome, bacterial, fungal and parasitic infections of the liver including liver abscesses, drug induced liver disease, alcoholic liver disease, non-alcoholic steatohepatitis, autoimmune liver disease, primary biliary cirrhosis, fibrocystic diseases of the liver, liver in porphyria, hepatic tumors, liver in pregnancy, liver in congestive heart failure, liver biopsy, artificial liver support and liver transplantation.

Pancreas

Anatomy, physiology, blood supply, developmental anomalies, physiology of the pancreatic secretion, pancreatic function tests, acute pancreatitis including severity assessment, classifications and management, approach to recurrent acute pancreatitis, Chronic pancreatitis, malignancies of the pancreas (Exocrine and endocrine), cystic fibrosis and other childhood disorders of the pancreas, autoimmune pancreatitis, hereditary pancreatitis, tropical calcific pancreatitis, endoscopic treatment of pancreatic diseases, pancreatic transplantation

Peritoneum, Omentum, Retroperitoneum

Ascites, peritoneal tuberculosis, malignant ascites, peritoneal tumours, diseases of the retroperitoneum.

Spleen

Splenic tumours including lymphomas, splenic abscesses, approach to a case of massive splenomegaly, hypersplenism, splenic artery embolization.

Small Intestine

Anatomy, blood supply, histology, motility of the small intestine, congenital anomalies including Meckel's diverticulum, normal absorption of the nutrients, intestinal electrolyte absorption and secretion, Intestinal microflora in health and diseases, malabsorption syndromes-pathophysiology, manifestations and approach,

celiac disease, tropical sprue, Whipple's disease, infectious diarrhoea and food poisoning, parasitic diseases, small intestinal ulcers, short bowel syndrome and intestinal transplantation, eosinophilic gastroenteritis, food allergies, intestinal obstruction and pseudo-obstruction, short bowel syndrome, acute appendicitis, malrotation of the gut, approach to chronic diarrhoea, GI lymphomas, small intestinal tumours, small intestinal transplantation

Colon, Rectum and Anal Canal

Basic anatomy blood supply, histology and functions, motility of the colon and disorders of motility, congenital anomalies, approach to megacolon, constipation, colonic pseudo-obstruction, fecal incontinence, antibiotic associated diarrhoea, inflammatory bowel disease-. Ulcerative colitis and Crohn's disease, Indeterminate colitis, Ileostomies and its management, diverticular disease of the colon, radiation enterocolitis, colonic polyps and polyposis syndromes, malignant diseases of the colon, other inflammatory diseases of colon including solitary rectal ulcer syndrome, diversion colitis, collagenous and microscopic colitis, non-specific ulcerations of the colon, malakoplakia, pneumatosis cystoides intestinalis, haemorrhoids, diseases of the anorectum

Miscellaneous Topics

Gastrointestinal hormones and neurotransmitters, tumour growth and oncogenesis, mucosal immunity, pre and probiotics, nutrition in gastroenterology-normal nutritional requirements, assessment of nutritional status, protein energy malnutrition, manifestations and management of nutritional deficiency and excess, 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 X-ray films of the abdomen, barium studies, ultrasound examination, CT scans CT angiography, MR scans and MRCP, ERCP films.

GI Pathology

Reading and interpreting histological slides related with common gastrointestinal and liver diseases.

Endoscopic Training

Basic physics of endoscopy, parts of endoscope, endoscopic accessories, sterilization of endoscopes and accessories, electrosurgical instrument, fluoroscopic equipment, keeping of endoscopes and accessories, video documentation, sedation during endoscopy

Liver Transplant Programme

Each resident is expected to be conversant with the issues related to liver transplantation (viz. recipient selection and workup, pre-transplant evaluation, Indian brain death law, brain dead donor management -recipient management post-transplant care, immunosuppression and follow up.

ENDOSCOPIC SKILLS: Practical

Graded responsibility will be given depending upon the knowledge and skills already acquired by the trainee. No exhaustive list is possible, and the maximum extent of procedural exposure a candidate would acquire would depend on his/her competence. However, a basic level of endoscopic competence is essential by the end of the course.

Endoscopic Procedures, each Candidate is Expected to Perform /assist at the end of his / her DM course in Gastroenterology

- Diagnostic upper GI endoscopy with biopsy
- Diagnostic sigmoidoscopy with biopsy
- Diagnostic colonoscopy with biopsy
- Endoscopic variceal ligation
- Endoscopic sclerotherapy
- Side viewing duodenoscopy
- Cyanoacrylate glue injection for gastric varices
- Achalasia cardia pneumatic dilatation
- Oesophageal, pyloric, and colonic stricture dilatation

- Therapeutic Endoscopic retrograde cholangiopancreatography
- Polypectomy
- Percutaneous endoscopic gastrostomy
- Endoscopic cystogastrostomy
- Capsule endoscopy and small bowel enetroscopy

Proposed list of minimum number of procedures

Upper GI Endoscopy	: 200
Side viewing duodenoscopy	: 10
Endoscopic variceal ligation	: 50
Endoscopic sclerotherapy	: 10
Flexible sigmoidoscopy	: 150
Full length colonoscopy	: 100
Polypectomy	: 10
Endoscopic retrograde cholangio-pancreatography	: 15*

* May only assist

The candidate is also expected to be trained in performing percutaneous liver biopsies independently and assisting in hepatic venous pressure gradient monitoring.

Logbook

- The candidate is required to maintain a log book which details his clinical and endoscopic experience during his tenure in the department as an assistant, physician 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 training.

The candidate is expected to maintain a Log Book of all his/her activities with respect to:

1. Bio-data
2. Complete List of Postings with periods and dates

3. All the Endoscopy procedures done by the students with follow up
4. Interesting cases seen and worked up during the period of posting
5. Details of clinic-pathological correlation seminars, mortality review, difficult case meet
6. List of Short Reviews presented
7. List of Long Reviews presented
8. List of Journals reviewed
9. List of Cases presented and discussed in Bed-side clinics
10. List and abstracts of presentations in AIIMS, Bhubaneswar Scientific Society, Conferences, PG Seminars, CPCs etc.
11. Abstracts and lists of papers published or sent for publication
12. Any other research projects undertaken
13. Any other interesting details

TEACHING AND LEARNING ACTIVITIES

A candidate pursuing the course should work in the institution as a full time resident. Each candidate will be required to give an undertaking that he/she will not run a clinic/laboratory/nursing home during his postgraduate course. Each year will be taken as a unit for the purpose of calculating attendance. Every resident must attend the teaching and learning activities during the year as prescribed by the department and not be absent himself/herself from work without valid reasons.

A list of teaching and learning activities designed to facilities the resident acquiring essential knowledge and skills is given below.

Postgraduate Orientation

A basic course in Research Methodology and Biostatistics is organized at AIIMS, Bhubaneswar for every session. The DM students should attend the course during their first semester of residency. This course is designed to inculcate communication skills in the residents and apprise them of research methodology, Bio-statistics, writing a protocol, use

of library, medical code of conduct and medical ethics etc.

Integrated Lectures

Integrated lectures are recommended to be taken by multidisciplinary teams for selected topics.

Journal Club

It will be held once a week. All the DM students will be expected to attend and actively participate in the discussion and enter the relevant details in the log book. The presentations would be evaluated using check and would carry weightage for internal assessment. A time table with names of students and the moderator will be put up at the beginning of every term.

Subject Seminar

Seminar will be held at least once a fortnight. All the DM students will be expected to attend and actively participate in the discussion and enter the relevant details in the Log Book. Further, every candidate must make a presentation on selected topics at least four times a year and a total of 12 presentations in three years. The presentations would be evaluated using checklists and would carry weightage for internal assessment. A time-table for the subject with names of the student and the moderator will be scheduled at the beginning of every term.

Ward Rounds:

Ward rounds will be service or teaching rounds.

Teaching Rounds

Every week there will be one 'grand round' for teaching purpose. All DM students will be required to attend the grand round.

Medical Audit

This session will be held once in a month. The patients with complications and morbidity will be discussed. All the DM students will participate and present their cases.

Inter Departmental Meetings

The frequency and schedule of the meeting will be decided depending upon the availability of the faculty from concerned department. These meetings will be attended by DM students.

- a. With Pathology: A set interesting cases will be chosen and presented by DM students and discussed by them as well as the senior staff of Medical Gastroenterology department. The staff of pathology department would then show the slides and present the final diagnosis.
- b. With Radio diagnosis: Interesting cases and the imaging modalities will be discussed including OPG,CT,MRI,3D Reconstructions, Angiograms etc.
- c. With Surgical Gastroenterology/Surgical oncology: Management of Medical Gastroenterology cases which require surgery will be discussed.

Teaching Skills

DM students must teach under-graduate students (E.g. Medical, Nursing and endoscopic assistant trainees by tasking demonstrations, beside clinics, tutorials etc.) The residents will also take demonstration and case discussion for the postgraduates (MS/MD) on peripheral posting from various departments.

Continuing Medical Education Programmes (CME) and Conference From second year onwards, residents shall be encouraged to attend at least one conference per year (ISG/specialty conference) and it is desirable to present a paper/poster. A total of 15 days are sanctioned for attending academic activities in the tenure of 3 years and these 15 days are considered as on-duty.

COURSE STRUCTURE

This curriculum was devised so that at the end of 3 years of training in the Department of Gastroenterology, a resident would be conversant with all the complex gastrointestinal 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 clinical skill, a resident requires being proficient with both the theoretical and practical aspects of gastrointestinal diseases. With this aim the curriculum for the DM (Gastroenterology) course in AIIMS, BHUBANESWAR is drafted. The training period consists of three years duration. Each candidate undergoes a stepwise training programme as mentioned below:

1st Year

- Clinical exposure with bed responsibilities
- 1st on call duties for in patients.
- Exposure to intensive care and artificial respiratory support with ventilators.
- Academic work - Journal Club/Topic discussion/Seminars
- Protocol submission for research projects
- Endoscopic work - mainly as an assistant in endoscopic procedures-emergency + elective. In addition, he is allowed few procedures under supervision.

2nd Year

- Ward responsibilities + out patients (supervision of 1st year residents).
- Project work
- Perform emergency and elective endoscopic procedures as specified below.
- Academic presentation - topic discussion/ journal clubs/ grand rounds and case conferences.
- Endoscopic work as outlined in the table above.

3rd Year (1st Half)

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

3rd Year (2nd Half)

- Ward responsibilities (lesser duties) + out patients.
- Submission of research projects.
- Clinical case presentation - 3 times/ week along with topic discussion.
- Endoscopic work including performing therapeutic cases under supervision and assisting and teaching residents junior to him in endoscopy room.

Rotation and posting in other departments:

- Surgical Gastroenterology/Surgical Oncology – 15 days, in 2nd year DM
- Anaesthesiology and Critical Care – 15 days in 1st year DM
- Psychiatry-7days
- Extra-mural posting – 1 month, in 3rd year DM., to observe other renowned departments

ASSESSMENT

There will be periodic assessment of learning outcomes. Following will be methods of assessment:

- Personal Attitudes
- Acquisition of Knowledge
- Clinical and Operative Skills
- Teaching skills
- Periodic Tests
- Logbook
- Thesis

Personal Attitudes

The essential items are:

- Caring attitude
- Punctuality
- Initiative
- Organizational ability
- Potential to cope with stressful situations and undertake responsibility
- Trustworthiness and reliability

- To understand and communicate intelligibly with patients and others
- To behave in a manner which establishes professional relationships with patients and colleagues
- Ability to work in a team
- A critical enquiring approach to the acquisition of knowledge.
- The methods used mainly consist of observation. Periodic reviews and feedback will be given to the residents, by the supervisors and peers.

Acquisition of knowledge

Log Book will be assessed by periodic checking which will record participation in various teaching/ learning activities by the residents. The number of activities attended and the presentations made will be recorded. The log book will be validated periodically by the supervisors.

Clinical and Operative Skills

Skills in outpatient, endoscopy room and ward work will be assessed periodically.

a. Clinical Meetings:

Candidates should periodically present cases to his peers and faculty members. Candidates' approach to the case, diagnosis abilities, case work up and treatment planning will be assessed using a check list.

b. Procedural Skills:

The candidate will be given graded responsibilities to enable learning by apprenticeship. The assessment will include candidates' analytical ability, pre-procedural assessment, planning for endoscopy, assistance during procedure, procedural skills and post procedural care. The performance will be assessed by the guide by direct observation.

Teaching Skills

Candidates will be encouraged to teach post graduate students (MD General Medicine) and paramedical students, if any and also MD (General Medicine) students on peripheral posting to the

department of Medical Gastroenterology. This performance will be based on assessment by the faculty members of the department and from feedback from the undergraduate students.

Internal examination

1. Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to final / summative examination
- Will be conducted by Examination Cell in the month of June-July & December-January

2. A total of 3 internal examinations will be conducted at the end of 3rd semester, 4th semester and pre-final (4month before final examination).

- Marks distribution:
 - a. Theory 100 marks
 - b. Practical 100 marks (Clinical/ Experimental -70, viva-20, logbook-10)
- The marks of the 3 internal examinations will be averaged to 100 each for theory and practical and will be added to the final examination.

Final/Summative Examinations

Theory:

4 papers (100 marks each)

The distribution of the topics in the question papers would be:

- Paper 1 – Basic & Allied Sciences
- Paper 2 – Clinical Gastroenterology (Liver, Biliary System & Pancreas)

- Paper 3- Clinical Gastroenterology (Luminal Gastroenterology)
- Paper 4– Recent Advances in Gastroenterology

Theory question paper format:

- One Long question – 20 marks
- Eight Short question/notes – 10 x 8 = 80 marks

Total marks in theory: 500 marks

- Four papers in the final examination – 400 marks
- Average of 3 internal examinations – 100 marks

Practical:

Total marks: 500

- Practical and viva in the final examination– 400 marks
- Average of 3 internal examinations-100 marks

The format of the practical examination (400 marks) is as follows:

Part	Components	Marks allotted
Part A** 200 marks	Longcase (1)	75
	Short cases (3)	75
	Ward round	50
Part B 200 marks	Operative procedure/ Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Scientific writing (manuscript written out of the thesis)	15
	Logbook	10
	Viva	50

** Students should pass (secure 50% marks) separately in Part A

Final marking pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	4 month before final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

Eligibility for appearing in final exam

- Passed (secured 50% marks) in the examination on Research Methodology and Biostatistics and
- Passed (secured 50% marks) in internal examinations and
- The thesis submitted 6 months before final examination and is approved/accepted by external evaluators.

Logbook

The maintenance of Log book will be mandatory for the trainee. It will be a record of the important activities of the candidate during his training. Internal assessment will be based on the evaluation of the log book. Collectively, log books will be a tool for the evaluation of the training programme of the institution by external agencies. The record will include academic activities as well as the presentations and procedures carried out / observed / assisted by the candidate.

Format of the log book for the different activities will be submitted. Copies may be made and used by the candidate.

THESIS

As a part of DM curriculum, the student should complete one thesis project during the tenure and should submit the proof of communication of the manuscript (Originated from his/her thesis) to an indexed peer-reviewed journal.

Decision related to thesis evaluation

- The student should submit thesis, 6months before final examination.

- Plagiarism check: If more than 20% plagiarism is detected, the student will be asked to rewrite and resubmit. Plagiarism checking will be done before thesis bound.
- The thesis will be sent to one external evaluator for approval
- The external evaluator will be provided with an evaluation report from where the thesis will be evaluated as Accepted/Accepted with suggested modification/ and Rejected.
- If thesis accepted with suggested modification, the comments of the evaluators will be intimated to the student and guide for necessary correction/modifications. After modification, the thesis will be evaluated by the department committee for final approval.
- If thesis rejected, after necessary corrections, the thesis will be sent again to another evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination.

Passing Marks

- The student has to secure $\geq 50\%$ marks in the internal examination to be eligible to appear for the final examination.
- In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
- In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

POSTING IN EMERGENCY MEDICINE

The DM Gastroenterology students should attend the cases when any case is referred to their department from the Emergency unit.

SPECIAL TRAINING IN OTHER INSTITUTE

- Will be considered for the training which is presently not available at AIIMS, Bhubaneswar
- Duration: 1-2 months
- Prior approval of the Director will be taken before attending.

RECOMMENDED BOOKS

1. Qayed E, Srinivasan S, Shahnavaz N. Sleisenger and Fordtran's Gastrointestinal and Liver Disease Review and Assessment: Elsevier Health Sciences; 2016.
2. Schiff ER, Maddrey WC, Reddy KR. Schiff's Diseases of the Liver: Wiley; 2017.
3. Beger HG, Warshaw AL, Hruban RH, Buchler MW, Lerch MM, Neoptolemos JP, et al. The Pancreas: An Integrated Textbook of Basic Science, Medicine, and Surgery: Wiley; 2018.
4. Podolsky DK, Camilleri M, Fitz JG, Kalloo AN, Shanahan F, Wang TC. Yamada's Textbook of Gastroenterology: Wiley; 2015.
5. Haycock A, Cohen J, Saunders BP, Cotton PB, Williams CB. Cotton and Williams' Practical Gastrointestinal Endoscopy: The Fundamentals: Wiley; 2013.
6. Baron TH, Kozarek RA, Carr-Locke DL. ERCP: Elsevier Health Sciences; 2018.
7. Dooley JS, Lok ASF, Garcia-Tsao G, Pinzani M. Sherlock's Diseases of the Liver and Biliary System: Wiley; 2018.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC AND ALLIED SCIENCES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss Hepatitis C virus (HCV) Resistance associated variants and their clinical implications.
2. What is Evidence-based Medicine? Draw a 'level of evidence pyramid' showing different types of research studies according to their strength of evidence.
3. Discuss fecal microbiota diversity and its implications.
4. Write short note on genetics of gastrointestinal polyposis.
5. Write short note on Couinaud liver segments and discuss its applied importance.
6. Discuss the role of chromoendoscopy in diagnosis of gastro intestinal malignancies.
7. Write short note on high resolution manometry (HRM) and its role in management of achalasia cardia.
8. Define small intestinal bacterial overgrowth (SIBO) and discuss its pathophysiology.
9. Discuss ductal plate malformations and it's clinical implications.

PAPER 2

CLINICAL GASTROENTEROLOGY (LIVER, BILIARY SYSTEM AND PANCREAS)

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Define Acute on Chronic Liver Failure (ACLF). Discuss its pathophysiology and describe the approach to treatment of the same.
2. Write short note on post ERCP (endoscopic retrograde cholangio-pancreatography) pancreatitis.
3. Discuss the diagnostic approach to cystic space occupying lesions of pancreas.
4. Write short note on management of difficult common bile duct stones.
5. Define and discuss the approach to recurrent acute pancreatitis (RAP).
6. Discuss the management of non-alcoholic fatty liver disease (NAFLD).
7. Describe the prevention strategies of Hepatitis B virus (HBV) transmission from mother to baby.
8. Discuss the gastrointestinal involvement in Ig G4 (Immunoglobulin G4) related diseases.
9. Write short note on progressive familial intrahepatic cholestasis (PFIC).

PAPER 3

CLINICAL GASTROENTEROLOGY (LUMINAL GASTROENTEROLOGY)

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss the role of biologicals in inflammatory bowel diseases (IBD).
2. Write short note on per oral endoscopic myotomy (POEM).
3. Write short note on diagnosis and management Barret's Oesophagus.
4. Discuss about various endoscopic closure devices.
5. Discuss approach to diarrhoea in immunocompromised, patients.
6. Write short note on screening of colorectal cancer.
7. Discuss the medical management of fistulizing Crohn's disease.
8. Discuss the role of transient lower oesophageal sphincter relaxation (TLER) in gastro oesophageal reflux disease.
9. Discuss non-variceal GI (gastrointestinal) bleed and enumerate its various causes.

PAPER 4

RECENT ADVANCES IN GASTROENTEROLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss the role of gut microbiota in health and disease.
2. Write short note on recent advances in management of hepatocellular carcinoma.
3. Write short note on endoscopic management of obesity.
4. Discuss the newer management modalities for bleeding gastric varices.
5. Discuss the role of Islet cell transplantation in GI (gastrointestinal) diseases.
6. Discuss novel therapies in alcoholic hepatitis.
7. Write short note on role of Confocal laser endomicroscopy and endocytoscopy in GI (gastrointestinal) diseases.
8. Discuss the role of endoscopic palliation of pancreatic neoplasms.
9. Discuss the role of radiofrequency ablation (RFA) in various GI (gastrointestinal) diseases.

ENTRUSTABLE PROFESSIONAL ACTIVITIES

S. No.	EPA	Competency Domains							Level of competency					MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year			
1	Manage common acid peptic-related problems	✓	✓	✓	✓	✓	✓	1	3	4	5	S, PG, I		
2	Manage common functional GI disorders	✓	✓	✓	✓	✓	✓	1	3	4	5	S, PG, I		
3	Manage common GI motility disorders	✓	✓	✓	✓	✓	✓	1	2	3	4	S, I		
4	Manage liver diseases	✓	✓	✓	✓	✓	✓	1	2	3	4	S, PG, I		
5	Manage complications of cirrhosis	✓	✓	✓	✓	✓	✓	1	2	3	4	S, PG, I		
6	Perform upper and lower endoscopic evaluation of the luminal GI tract for screening, diagnosis, and intervention	✓	✓	✓	✓	✓	✓	1	2	3	4	S, PG, I		
7	Perform endoscopic procedures for the evaluation and management of GI bleeding	✓	✓	✓	✓	✓	✓	1	2	2	3	S, PG		
8	SVE	✓	✓	✓	✓	✓	✓	1	1	2	4	S, PG		
9	ERCP such as Sphincterotomy, Ballon extraction, Stent placement	✓	✓	✓	✓	✓	✓	1	1	2	3	S		
10	SG dilation, PEG, APC, CRE dilation	✓	✓	✓	✓	✓	✓	1	1	2	3	S		
11	Manage biliary disorders	✓	✓	✓	✓	✓	✓	1	2	3	4	S, PG, H, I		
12	Manage pancreatic diseases	✓	✓	✓	✓	✓	✓	1	2	3	3	S, PG, H, I		
13	Manage common GI infections in nonimmunosuppressed and immunocompromised populations	✓	✓	✓	✓	✓	✓	1	2	3	4	S, PG, I		
14	Identify and manage patients with non-infectious GI luminal disease	✓	✓	✓	✓	✓	✓	1	2	3	4	S, PG, I		
15	Manage common GI and liver malignancies and associated extraintestinal cancers	✓	✓	✓	✓	✓	✓	1	2	2	3	S, PG, I		

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
16	Assess nutritional status and develop and implement nutritional therapies in Gastrointestinal diseases	✓	✓	✓	✓	✓	✓	1	2	3	4	S, PG, I, H
17	Formulate care plan for critically ill patients(GI bleed, HE, Cholangitis, Severe pancreatitis)	✓	✓	✓	✓	✓	✓	1	4	4	4	S,PG,I,H
18	Knowing the Research Methodology/ Collecting data for the research and compiling them/ Analysis of the collected research data and writing a research paper/Thesis	✓	✓	✓	✓	✓	✓	1	2	3	4	S,I,H
19	Interpreting images of GI disorders 1. Abdominal USG 2.CT Abdomen and Pelvis 4. MRI,MRCP of Abdomen 5. X-Ray Abdomen	✓	✓	✓	✓	✓	✓	1	2	2	3	S,H
20	Learning to write interdepartmental references for consultations/ Learning to use electronic medical record	✓		✓	✓		✓	1	3	4	4	S,I
21	Techniques of performing USG Abdomen, Its interpretation in various GI disorder	✓		✓	✓		✓	1	2	2	3	S,H
22	Performing Liver biopsy	✓		✓	✓		✓	1	2	3	4	S, PG
23	Performing bedside procedures such as Abdominal paracentesi	✓	✓	✓	✓	✓	✓	1	4	5	5	S, PG, I
24	Counseling patients on various diets and lifestyle modification for various GI disorder	✓	✓	✓	✓	✓	✓	1	2	4	4	S, H, P

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
25	Searching for / and applying evidence based medicine	✓	✓	✓	✓	✓	✓	1	2	2	3	S
26	Participation in UG/PG clinical class/ seminar/ symposium /journal club etc	✓	✓	✓	✓	✓	✓	1	2	2	4	S, PG
27	Presentation of a case to the Professor and discuss with him about the provisional diagnosis/ results of the investigations/ care plan/ on dose adjustment /transferring patient from critical areas to general ward/ discharging a patient/ opinions on the referred patients/Evidence based medicine	✓	✓	✓	✓	✓	✓	1	2	3	4	S
28	Ordering relevant investigations/ Writing a prescription	✓	✓	✓	✓	✓	✓	1	4	5	5	S, PG, H
29	Formulate care plan for critically ill patients	✓	✓	✓	✓	✓	✓	1	2	3	4	S,H,PG
30	Performance of soft skills such as counselling with the patient / attenders/ Breaking a bad news/ Graveprognosis/Death/informed consent/discharge advice/follow up	✓	✓	✓	✓	✓	✓	1	2	3	4	S, P, H
31	Recognition of adverse drug reactions/ blood transfusion reactions/ complications	✓	✓	✓	✓	✓	✓	1	2	3	4	S, H

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

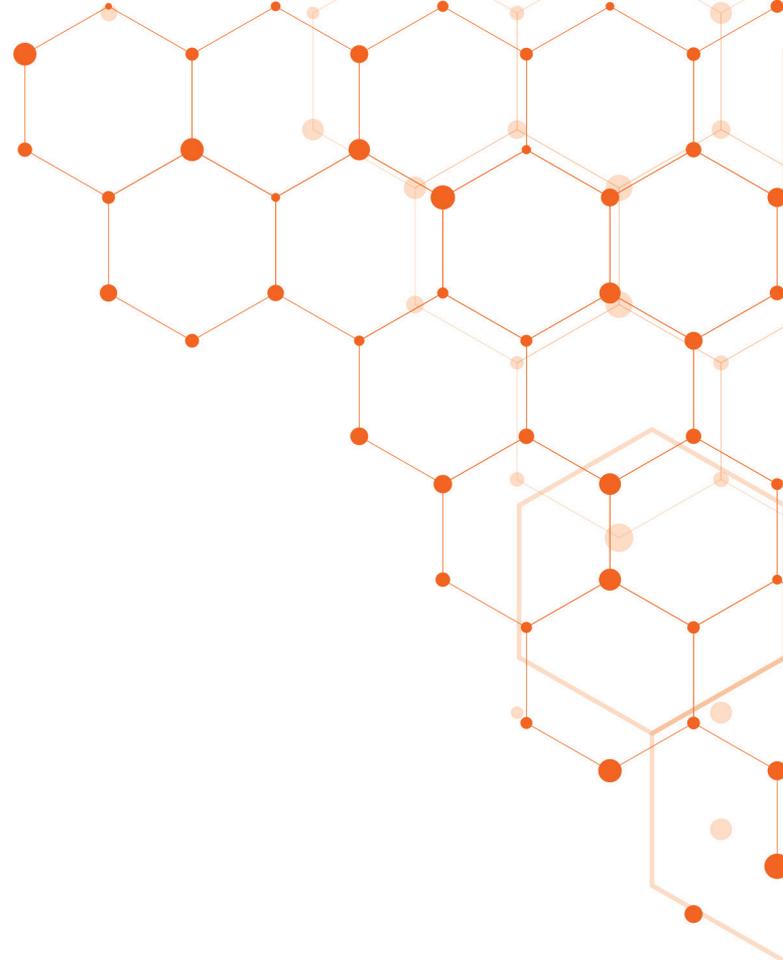
Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



NEONATOLOGY



DM in Neonatology

COURSE NAME:

DM in Neonatology

DURATION OF COURSE:

3 years

ELIGIBILITY:

MBBS, MD/DNB (Pediatrics)

LEARNING OBJECTIVES

Upon completion of DM (Neonatology), the student will be able to:

1. Provide primary, secondary and tertiary care to all neonates 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.
2. Implement a comprehensive follow up and early intervention programme for the 'at risk' neonates, and plan, counsel and advise rehabilitation of the developmentally challenged infants.
3. Formulate and practice infection control and antibiotic policy.
4. Exhibit communication skills of a high order and demonstrate compassionate attributes befitting a caring neonatologist.
5. Take rational decisions in the face of ethical dilemmas in neonatal - perinatal practice.
6. Teach newborn care to the medical and the nursing students as well as grassroots health functionaries, and develop learning resource materials for them.
7. Seek and analyse new literature and information on Neonatology, update the concepts, and practise evidence-based Neonatology.
8. Plan and carry out research in neonatal health in clinical, community and laboratory settings.

9. Use and maintain the essential neonatal equipment and keep abreast with advances in newborn care technology.
10. Analyse neonatal health problems scientifically, considering 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.
11. Organize neonatal 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.
12. Plan, establish and manage level II and level III neonatal units independently.
13. 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.
14. Be a role model to junior residents and nurses, demonstrate managerial skills, resolve conflicts arising in neonatal care, abide by the medical ethics and motivate the team mates to do so.

SYLLABUS CONTENT

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, physiology and hemodynamics of congenital heart disease

- Metabolic pathways pertaining to glucose, calcium, and magnesium
- Fetal and intrauterine growth
- Development and maturation of central 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 imbalances
- Biochemical basis of inborn errors of metabolism

General topics

- Research methodology
- Biostatistics
- Internet search
- Principle of medical education
- Computer, information and technology
- Ethics in Neonatology/ Perinatology

Perinatology

- Perinatal and neonatal mortality, morbidity, epidemiology
- Perinatal intervention for improvement of neonatal care
- Fetal monitoring: Clinical, electronic/ invasive and non -invasive
- Intrapartum monitoring and procedures
- Assessment of fetal risks, decision for termination of pregnancy
- Diagnosis and management of fetal distress
- Medical disease affecting pregnancy and fetus, psychological and ethical considerations
- Fetal intervention and therapy
- Fetal origin of adult diseases

Neonatal ventilation

- Principles of neonatal ventilation

- Blood gas and acid base disorders
- Non -invasive ventilation
- Invasive ventilation
- Principles of high frequency ventilation
- Troubleshooting of non -invasive ventilation
- Troubleshooting of invasive ventilation
- Weaning from ventilation
- Ventilation for specific diseases

Neonatal assessment and follow up

- Assessment of gestation, neonatal behaviour, neonatal reflexes
- Developmental assessment, detection of neuromuscular delay
- Neurodevelopmental therapy
- Immunization

Respiratory system

- Neonatal airways: physiology, pathology, management
- Pulmonary diseases: Hyaline membrane disease, transient tachypnea of newborn, aspiration pneumonia
- Pulmonary air leaks syndromes, pulmonary haemorrhage, developmental defects
- Principles of respiratory monitoring and therapy
- Bronchopulmonary dysplasia
- Oxygen therapy and its monitoring
- Pulmonary infections
- Miscellaneous pulmonary disorders
- Respiratory failure in term newborns
- Surgical disorder of chest wall and airways

Cardiovascular system

- Fetal circulation, transitional physiology
- Examination and interpretation of cardiovascular signs and symptoms
- Special tests and procedures (Echocardiography, angiography)
- Diagnosis and management of congenital heart diseases

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- Patent ductus arteriosus in preterm infants
 - Persistent pulmonary hypertension
 - Rhythm disturbances
 - Hypertension in neonates
 - Shock: pathophysiology, monitoring, management
 - Cardiovascular drug therapy
 - Fetal and neonatal echocardiography

Gastrointestinal system

- Disorders of liver and biliary system
- Bilirubin metabolism
- Neonatal jaundice: diagnosis, monitoring, management, phototherapy, exchange transfusion
- Prolonged hyperbilirubinemia
- Abdominal wall problems
- Disorders of Liver, Cholestasis
- Kernicterus
- Congenital malformations
- Necrotising enterocolitis, short bowel syndrome
- Developing intestinal microbiomes and its implications
- Structural abnormalities of G.I tract
- Metabolic liver disease

Nutrition

- Fetal nutrition
- Physiology of lactation
- Breast feeding
- Lactational management, milk banking, maternal medication
- Parenteral nutrition
- Vitamins and micronutrients in newborn health

Renal system

- Developmental disorders
- Renal functions
- Glomerulonephritis and disorders of tubular function
- Renal vascular disease in newborn

- Fluid and electrolyte management
- Acute renal failure (Diagnosis, monitoring and management)
- Urinary tract infection and vesicoureteral reflux

Endocrine and metabolism

- Glucose metabolism, hypoglycemia, hyperglycemia
- Calcium metabolism
- Magnesium metabolism disorders
- Thyroid disorders
- Adrenal disorders
- Ambiguous genitalia
- Inborn error of metabolism
- Disorders of hypopituitarism

Haematology

- Physiology
- Anemia
- Erythrocyte disorder in Infancy
- Polycythemia
- Bleeding and coagulation disorders
- Rh hemolytic disease
- Neonatal leucocyte physiology and disorders
- Congenital malignant disorders

Neurology

- Clinical neurological assessment
- EEG, ultrasonography, CT scan
- Neonatal seizures
- Intracranial haemorrhage
- Neuroimaging in newborn
- Congenital malformation of CNS
- Hypoxic-ischemic encephalopathy
- Neuromuscular disorders
- Degenerative diseases
- Neuroprotection
- CNS malformations
- Risk assessment and neurodevelopmental outcome

Surgery and Orthopedics

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

Neonatal infections

- Intrauterine infections
- Superficial infections
- Diarrhoea
- Septicemia, pneumonia
- Meningitis
- Osteomyelitis and arthritis
- Perinatal HIV
- Miscellaneous infective disorders including HBV and candidemia

Neonatal ophthalmology

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

Organization of neonatal care

- Community neonatology
- National programme
- Vital statistics, health system
- Neonatal care priorities
- Care at primary health centre
- Role of different health functionaries
- Care at secondary level
- National Neonatology forum

Neonatal imaging: X-ray, ultrasounds, CT scan, MRI

Neonatal dermatology

Transport of neonates

Neonatal procedures

Neonatal resuscitation

TEACHING & LEARNING METHODS

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. In addition, depending on the strength of the institution's session or imaging, pathology, microbiology, as well as interdepartmental seminars will be undertaken.

Teaching methodology

It includes regular bedside case presentations, demonstrations, didactic lectures, seminars, journal clubs, clinical meetings, and combined conferences with allied departments. Departments will encourage e-learning activities.

Departmental training schedule and posting of residents, essential rotations

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. The candidates must get adequate exposure to neonatal follow up, neonatal emergencies, delivery room care of neonates and acquisition of practical skills.

Posting	Department	Duration
Perinatology	Obstetrics-Gynecology	1 month
Neonatal Surgery	Pediatric Surgery	1 month
Cardiology	Cardiology	1 month
Community Neonatology	Rural Health Centre (CHC)	1 month
Elective*		2 months

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

Activity	Frequency	Preceptor	Evaluator
1. Journal club	Once in 2 weeks	SR & faculty	Other faculties
2. Case discussion			
a. Clinical case discussion	Once a week		
b. Pathology	Once in 2 months		
c. Microbiology	Once in 2 months		
d. Imaging	Once a month		
3. Physiology round	Once in 2 weeks		
4. Seminar	Once a week	faculty	faculty
5. Perinatal round	Once a week	SR & faculty	faculty
6. Biostatistics	Once in 6 months	faculty	
7. Mortality audit	Once a month	SR & faculty	Other faculties
8. Statistics NICU	Once a month	NICU/PICU Faculty	Other faculties
9. Interesting/ difficult cases	Once a month	SR	Other faculties
10. Faculty teaching	Once a month		

Optional rotations

The departments will have the flexibility of additional rotations for up to 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/ biostatistics, 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].

THESIS

As a part of DM curriculum, the student should complete one thesis project during the tenure and it is desirable to submit the proof of communication of the manuscript (originated from his/ her thesis) to an indexed peer- reviewed journal.

- The student should submit the completed thesis 6 months before the final examination
- If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.

- The thesis will be sent to one external evaluator for approval. The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as accepted, accepted with suggested modification or rejected.
- If the thesis is accepted with suggested modifications, the comments of the evaluator will be intimated to the student and the guide for necessary correction/ modifications.
- After modification, the thesis will be evaluated by a departmental committee for final approval.
- If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination.
- Two papers (pertaining to the thesis or otherwise) for publication in indexed journal(s) before appearing for the final DM examination.

Objectives

By carrying out a research project and presenting his/her work in the form of thesis, the student will be able to:

- Identify a relevant research question
- Conduct a critical review of literature
- Formulate a hypothesis
- Determine the most suitable study design
- State the objectives of the study
- Prepare a study protocol
- Analyze and interpret research data, and draw conclusion
- Write a research paper

ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA)

An Entrustable Professional Activity (EPA) is a key task of a discipline (i.e. specialty or subspecialty) that an individual can be trusted to perform in a given health care context, once sufficient competence has been demonstrated (vide infra).

ASSESSMENT

INTERNAL ASSESSMENT

- Candidate will be assessed continuously all through the tenure in the department. He/ she has to appear in internal examinations periodically too.
- Continuous assessment would be based on the feedback from departmental colleagues, colleagues from other departments, nursing officers, and faculties.
- Examination on Research Methodology & Biostatistics will be conducted at the end of 2nd Semester. Students have to pass this examination by securing at least 50 marks as an eligibility criterion to appear in the final examination. If someone secures <50, he/ she has to appear in subsequent examinations. No marks will be added to the final/ summative examination. Examination will be conducted by examination cell in the month of June-July and December-January every year.
- A total of 3 internal examinations will be conducted at the end of 3rd semester, 4th semester and at prefinal (4 months before final) examination.

- Marks distribution: Theory paper will carry 100 marks. There will be topic wise assessment (table 4). Practical with viva and logbook (Clinical/ experimental/ practical = 70, viva = 20, logbook = 10) will be of 100 marks. The marks of the 3 internal examinations will be averaged to 100 each for theory and practical.

Theory papers for internal assessment

Semester	Topics
1 st Internal examination (18 th month)	1 st NRP, Cardiovascular system, Neonatal transport, Neonatal infection,
	2 nd Gastrointestinal system, Nutrition, Dermatology, Endocrine and metabolism
	3 rd Basic sciences, Respiratory system, Ventilation, Ophthalmology
2 nd Internal examination (24 th month)	4 th Neurology, Imaging, Neonatal assessment and follow up, Community Neonatology
	5 th Perinatology, Renal system, Surgery/ Orthopedics, Hematology
Prefinal (32 nd month)	All topics

FINAL / SUMMATIVE ASSESSMENT

Final assessment will be carried out by two external examiners and two internal examiners. The summary of the examinations as follows:

- A maximum of 1000 marks will be awarded. Total marks in theory and practical will carry 500 marks each. The candidate must obtain at least 50% (i.e. 500) marks to pass the examination.
- There will be 4 papers in theory which will carry 100 marks each. The 1st paper will include basic and allied sciences. The 2nd and 3rd paper will include core subject specific domain in Neonatology. The 4th paper will include recent advances in Neonatology. Out of 500 marks of theory, 100 marks will be from the Internal Assessment.

- A total of 500 marks will be assigned to the practical examination. The final practical and viva will carry 400 marks. The average of 3 internal examinations will carry 100 marks (Total 500 marks).
- A student will be eligible to appear for the final examination only when he /she:
 - a. Passed (secured 50% marks) in the examination on Research Methodology and biostatistics and
 - b. Passed (secured 50% marks) in internal examinations and
 - c. The thesis submitted six months before the final examination and is approved/accepted by an external evaluator.

Final Theory Examination (400 marks)

This will have four papers of 100 marks each. The broad areas covered in these papers will be as follows:

Paper I: Basic and allied sciences related to Neonatology and Perinatology

Paper II: Clinical Neonatology

Paper III: Community Neonatology

Paper IV: Recent advances in Neonatology

Theory examination will consist of structured essay questions with emphasis on problem solving exercises (In each paper, one long question will carry 20 marks and eight (8) short questions / notes will carry 10 x 8 = 80 marks).

Final Practical Examination (400 marks)

The format of the practical examination

Parts	Components	Marks allotted
PART A ** 200 Marks	Longcase (1)	75
	Short cases (3)	75
	Ward Round	50
PART B 200 Marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	50
	Logbook	10
	Scientific writing (manuscript written out of the thesis)	15

** Students should pass (secure 50% marks) separately in Part A

Final Marking Pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3rd semester	End of 4th semester	Four months before the final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

Passing Marks

1. The student has to secure $\geq 50\%$ marks in the internal examination to be eligible to appear for the final examination.
2. In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
3. In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

Logbook

A logbook is a comprehensive record of all academic events during the 3 years course. Work done by student in the department should be entered in the log book regularly. The log book shall be checked by faculties at regular intervals. The logbook will be reviewed every 6 months by departmental faculties to supplement deficits if any in the succeeding 6 months. The log book shall be reviewed at the time of viva voce at the time of final examination. The log book details are as follows:

The candidate is expected to maintain a Logbook of all his/her activities with respect to:

1. Bio-data
2. Complete list of postings with periods and dates
3. Interesting cases seen and worked up during the period of posting
4. Details of clinic-pathological correlation seminars, mortality review, difficult case meet
5. List of short reviews presented
6. List of long reviews presented
7. List of journals reviewed
8. List of cases presented and discussed in bedside clinics
9. List and abstracts of presentations in AIIMS, Bhubaneswar Scientific Society, Conferences, PG Seminars, CPCs etc.

10. Abstracts and lists of papers published or sent for publication
11. Any other research projects undertaken
12. Any other interesting details

RECOMMENDED BOOKS

1. Wilson CB, Nizet V, Maldonado Y, Remington JS, Klein JO. Remington and Klein's Infectious Diseases of the Fetus and Newborn Infant: Elsevier Health Sciences; 2015.
2. Marcdante KJ, Kliegman R. Nelson Essentials of Pediatrics: Elsevier; 2018.
3. Singh M. Care of the New Born Revised: CBS Publishers & Distributors; 2017.
4. Cloherty JP, Eichenwald EC, Hansen AR, Stark AR. Manual of Neonatal Care: Wolters Kluwer Health; 2012.
5. Paul Vinod K. Ghai Essential Pediatrics; CBS Pub & Dist Pvt Limited (I); 2019.
6. Goldsmith JP, Karotkin E. Assisted Ventilation of the Neonate: Elsevier Health Sciences; 2016.
7. Gleason CA, Devaskar S. Avery's Diseases of the Newborn: Elsevier Health Sciences; 2011.
8. Martin RJ, Fanaroff AA, Walsh MC. Fanaroff and Martin's Neonatal-Perinatal Medicine, 2-Volume Set: Diseases of the Fetus and Infant: Elsevier - Health Sciences Division; 2019.
9. Polin RA, Abman SH, Rowitch D, Benitz WE. Fetal and Neonatal Physiology: Elsevier Health Sciences; 2016.
10. Park MK. Park's the Pediatric Cardiology Handbook: Elsevier Saunders; 2015.
11. Guha DK. Neonatal Asphyxia, Resuscitation and Beyond: Jaypee Brothers Medical Publishers Pvt. Limited; 2008.
12. De Mazumder N. Neonatal Orthopaedics: Jaypee Brothers Medical Publishers Pvt. Limited; 2013.

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13. Holschneider AM, Hutson JM. Anorectal Malformations in Children: Embryology, Diagnosis, Surgical Treatment, Follow-up: Springer Berlin Heidelberg; 2007.
 14. Textbook of Neonatal Haematology-Oncology: Jaypee Brothers Medical Publishers; 2003.
 15. Kliegman RM, Stanton BMD, Geme JS, Schor NF. Nelson Textbook of Pediatrics: Elsevier Health Sciences; 2015.
 16. Perlman JM. Neurology: Neonatology Questions and Controversies: Elsevier Health Sciences; 2018.
 17. Fanaroff AA, Benitz WE, Donn SM, Neu J, Papile LA, Van Marter LJ. Year Book of Neonatal and Perinatal Medicine: Elsevier - Health Sciences Division; 2016.
 18. Jones KL, Jones MC, Campo M. Smith's Recognizable Patterns of Human Malformation: Elsevier Saunders; 2013.
 19. Suchy FJ, Sokol RJ, Balistreri WF. Liver Disease in Children: Cambridge University Press; 2014.
 20. Rennie JM, Robertson NRC. Robertson's Textbook of Neonatology: Elsevier/Churchill Livingstone; 2005.
 21. Khilnani P. Pediatric and Neonatal Mechanical Ventilation: Jaypee Brothers Medical Publishers; 2014.
 22. Bancalari E, Polin RA. The Newborn Lung: Neonatology Questions and Controversies: Elsevier; 2019.
 23. Bagga A. Protocols in Pediatric Nephrology: CBS Publishers & Distributors; 2017.
 24. Chattri GL. Pediatric Drug Doses: Jaypee Brothers Medical Publishers Pvt. Limited; 2015.
 25. RN Srivastava AB. Pediatric Nephrology: Jaypee Brothers Medical Publishers Pvt. Limited; 2016
 26. Poisoning in Children: Jaypee Brothers Medical Publishers Pvt. Limited; 2013.
 27. Khilnani P. Practical Approach to Pediatric Intensive Care: Jaypee Brothers Medical Publishers Pvt. Limited; 2015.
 28. Panna Choudhury ABKCSR. Principles of Pediatric and Neonatal Emergencies: Jaypee Brothers Medical Publishers Pvt. Limited; 2011.
 29. Avery GB, MacDonald MG, Seshia MMK, Mullett MD. Avery's Neonatology: Pathophysiology & Management of the Newborn: Lippincott Williams & Wilkins; 2005.
 30. Ghosh A, Mitra M, Choudhury J. Treatment & Prognosis in Pediatrics: Jaypee Brothers Medical Publishers Pvt. Limited; 2013.
 31. Briggs GG, Freeman RK, Forinash AB, Towers CV. Drugs in Pregnancy and Lactation: A Reference Guide to Fetal and Neonatal Risk: Wolters Kluwer; 2017.
 32. Illingworth RS. The Normal Child: Some Problems of the Early Years and Their Treatment: Churchill Livingstone; 1991.
 33. Singh M. A Manual of Essential Pediatrics: Thieme; 2014.
 34. Arvind R. Applied Neonatology: Jaypee Brothers Medical Publishers; 2006
 35. Guha Dipak K. Manual of Newborn Critical Care Medicine: Jaypee Brothers Medical Publishers; 2006
 36. Gowrishankar. Management Update for Common Pediatric Problems: Jaypee Brothers Medical Publishers (P) Ltd.; 2004
 37. M. Nagaraj Rao, Dharmapuri Vidya Sagar, Armida Fernandez. Recent Advances in Neonatology: Jaypee Brothers Medical Publishers (P) Ltd.; 2004
 38. Bajpai A. Practical Pediatric Endocrinology: Jaypee Brothers Medical Publishers; 2003
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MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC & ALLIED SCIENCES RELATED TO NEONATOLOGY & PERINATOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss the physiology of control of breathing in neonates.
2. Describe the pulmonary graphics in different conditions.
3. Discuss the advantages and challenges of analgesia and sedation in a ventilated neonate.
4. Describe the heart defects resulting from abnormalities of cardiac looping in a neonate.
5. Describe the mechanism of antibiotic resistance in neonates and strategies for its prevention.
6. Describe the recent advances on prevention and management of Broncopulmonary dysplasia (BPD).
7. Describe Universal new born screening and discuss its feasibility in remote geographical locations in India.
8. Discuss the mechanism of blood pressure maintenance in neonates and use of vasopressors in neonates.
9. Describe the physiology of calcium regulation and disorders of metabolism of calcium in a neonate.

Paper 2

CLINICAL NEONATOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Enumerate non-pulmonary causes of respiratory distress in a neonate and discuss the approach of management in case wise scenario.
2. Discuss the controversies in defining the target oxygen saturation for a preterm neonate. How will you manage a neonate with persistent desaturation?
3. How will you evaluate a neonate who had antenatally detected renal abnormalities?
4. Discuss the diagnostic approach to anemia in a newborn and the salient features of transfusion guidelines for preterm neonates.
5. Describe the approach to a neonate with acute renal failure.

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6. Discuss the pathogenesis of periventricular leucomalacia. Enumerate the steps to prevent development of periventricular leucomalacia in extreme preterm.
 7. Describe the delivery room strategies with specific reference to respiratory support in very preterm with respiratory distress syndrome. Enumerate the steps to prevent hypothermia with evidence.
 8. What are the lung protection strategies that should be present in a good neonatal ventilator. Discuss pulmonary graphics.
 9. Compare and contrast self inflating bag, flow inflating bag and T piece Resuscitator.

Paper 3

COMMUNITY NEONATOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the India Newborn Action Plan (INAP) launched by Govt. of India. What strategies can be used for implementation of the programme. Analyze the bottlenecks.
2. Enumerate the ophthalmic complications of perinatal outcome and its impact in long term follow-up.
3. Discuss the economic cost of a low birth weight baby and its impact on long term economics. Write a strategy to develop a cost effective model for preterm neonatal care in your Neonatal intensive care unit.
4. Discuss the multidisciplinary management of a high-risk infant with moderate neurodevelopmental handicap.
5. Discuss the importance of Antenatal Doppler and its implication to the fetus and neonate.
6. Define medication errors and describe how you will recognize and prevent them in an intensive care unit.
7. Describe the national programmes which are linked to improvement of neonatal care.
8. What are the differential diagnosis of neonatal erythroderma. How will you manage such a case?
9. Describe the etiology, evaluation and management of a non-thriving neonate.

Paper 4

RECENT ADVANCES IN NEONATOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Enumerate recent advances in prevention and management of Broncopulmonary dysplasia.
2. Discuss placental histopathology and how it links to improvement in neonatal care.
3. List the newer biomarkers of sepsis and its practical implications.
4. Describe the pharmacological prevention and treatment of maternal and neonatal HIV infection.
5. Describe the recent advances in management of short gut syndrome.
6. Enumerate recent advances in surfactant replacement therapy, and discuss its practical implications and feasibility in a developing country.
7. Describe heated humidified high flow nasal cannula (HHHFNC) therapy in preterm neonates.
8. Describe the pain management protocols for different procedures in NICU.
9. Describe bundle of care in NICU to improve optimum neonatal care.

ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA)

S. No.	EPA	Competency Domains						Level of Competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
1.	History taking and examination of newborns	+	+	-	-	-	+	III	IV	V	V	S, P, PG, I
2.	History taking and examination of newborns on follow up	+	+	-	-	+	+	II	III	IV	V	S, P, PG, H, I
3.	Formulation of a differential diagnosis based on history and examination	+	-	+	-	-	+	II	III	IV	V	S, PG, I
4	Order and interpretation of common diagnostic tests	+	-	+	-	-	-	II	III	IV	V	S, P, PG, H, I
5	Neonatal drug therapy	+	-	+	+	-	-	III	IV	V		S, P, PG, H, I
6	Entering and discussing orders and prescriptions, give the necessary instructions to the parents, nursing personnel, fellows	+	+	+	+	+	+	II	III	IV	V	S, PG, H, I
7	Documentation of clinical details in the patient record	+	+	-	-	+	+	II	III	IV	V	S, PG, H, I
8	Informed consent for tests and/or procedures	-	+	-	-	+	+	III	IV	V		S, PG, H, I
9	Bed side tests: shake test, sepsis screen, haematocrit, urine examination, Kleihauer technique, Apt test	+	-	-	+	-	-	II	III	IV	V	S, PG, H, I
10	Perform bloodletting procedures aseptically (capillary, venous, arterial)	-	+	-	-	-	-	III	IV	V		S, PG, H, I
11	Insertion of intravenous cannula aseptically	-	+	-	-	+	-	III	IV	V		S, P, PG, H, I
12	Insertion of umbilical lines (arterial, venous) aseptically	-	+	+	+	-	-	II	III	IV	V	S, P, PG, H, I
13	Exchange transfusion	-	+	+	+	-	-	I	II	III	IV/V	S, H, PG
14	Intubation of newborn	+	+	+	+	-	-	II	III	IV	V	S, PG, H, I
15	Lumbar puncture and ventricular tap under aseptic precaution	+	+	-	-	-	-	III	IV	V		S, PG, I, H

S. No.	EPA	Competency Domains						Level of Competency					MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year		
16	Stain peripheral smear and report on smear effectively	+	+	+	-	-	-	II	III	IV	V	S, PG, I	
17	Performing CSF cell count	+	+	+	-	-	-	I	II	III	IV/V	S, PG, I	
18	Placement of ppercutaneously inserted central catheter (PICC)	+	-	-	+	-	-	I	II	III	IV/V	S, PG, I, H	
19	Orders for total parenteral nutrition (TPN) and prepare TPN	+	+	+	+	-	-	I	II	III	IV/V	S, PG, H, I	
20	Monitoring: invasive, non-invasive	+	+	-	+	-	-	III	IV	V		S, PG, H, I	
21	Care of neonates requiring non-invasive ventilation	+	+	+	+	-	-	I	II	III	IV/V	S, PG, H, I	
22	Care of ventilated neonates	+	+	+	+	-	-	II	III	IV	V	S, PG, I, H	
23	Breastfeeding counseling	+	+	-	+	-	+	I	II	III	IV	S, PG, H, C	
24	Functional echocardiography of newborn	+	+	+	+	-	-	I	II	III	IV/V	S, PG	
25	Cranial Ultrasonography	+	-	+	-	-	-	I	II	III	IV/V	S, PG	
26	Amplitude integrated EEG	+	-	+	-	-	-	I	II	III	IV/V	S, PG	
27	Handling, effective utilization and troubleshooting of neonatal equipment	+	+	-	+	+	-	II	III	IV	V	S, PG, H, I	
28	Nursery housekeeping routines and asepsis procedures	-	+	-	-	+	+	II	III	IV	V	S, PG, H, I, C	
29	Assessing the Growth & Development and Nutritional status neonates in NICU, step-down nursery and postnatal ward	+	+	+	+	-	-	III	IV	V		S, PG, H, I	
30	Antenatal counselling	-	+	-	+	+	+	III	IV	V		S, PG, H, I	
31	Resuscitation of a newborn according to standard NRP protocol	+	-	+	-	-	+	III	IV	V		S, PG, H	
32	Clinical presentation of a case	+	-	+	-	-	+	III	IV	V		S, PG, H, I	
33	Counselling the parents of a sick newborn and breaking the bad news	+	+	-	-	-	+	I	II	III	IV	S, PG, H, I	

S. No.	EPA	Competency Domains						Level of Competency					MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year		
34	Communication with parents, families and communities	-	+	-	-	+	+	III	IV	V		S, PG, H, I, C	
35	Conducting clinical classes for postgraduate students	+	-	+	-	-	+	I	III	III	IV	S, PG	
36	Teaching skills: lectures, tutorials	+	-	+	-	-	-	III	IV	V		S, PG, I, H	
37	Preparing learning resource material	+	-	+	+	-	-	II	III	IV	V	S, PG, I	
38	Frame of research question, design and conduction of study, analyze and interpretation data and writing a paper.	+	-	+	-	-	+	I	II	III	IV/V	S, PG	
39	Work as a team with effective communication abilities to juniors, nurses. Management of emotions and respecting sentiments of colleagues	-	-	-	-	+	+	II	III	III	III	S, PG, UG, H	
40	Record keeping of clinical and non-clinical data	-	+	-	-	-	+	II	III	IV	V	S, PG, I	
41	Pre-discharge counseling	-	+	-	-	-	+	II	III	IV	V	S, C, H, PG	

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level I: Knowledge only; can observe

Level II: Can do under strict supervision

Level III: Can do under loose supervision

Level IV: Can do independently

Level V: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

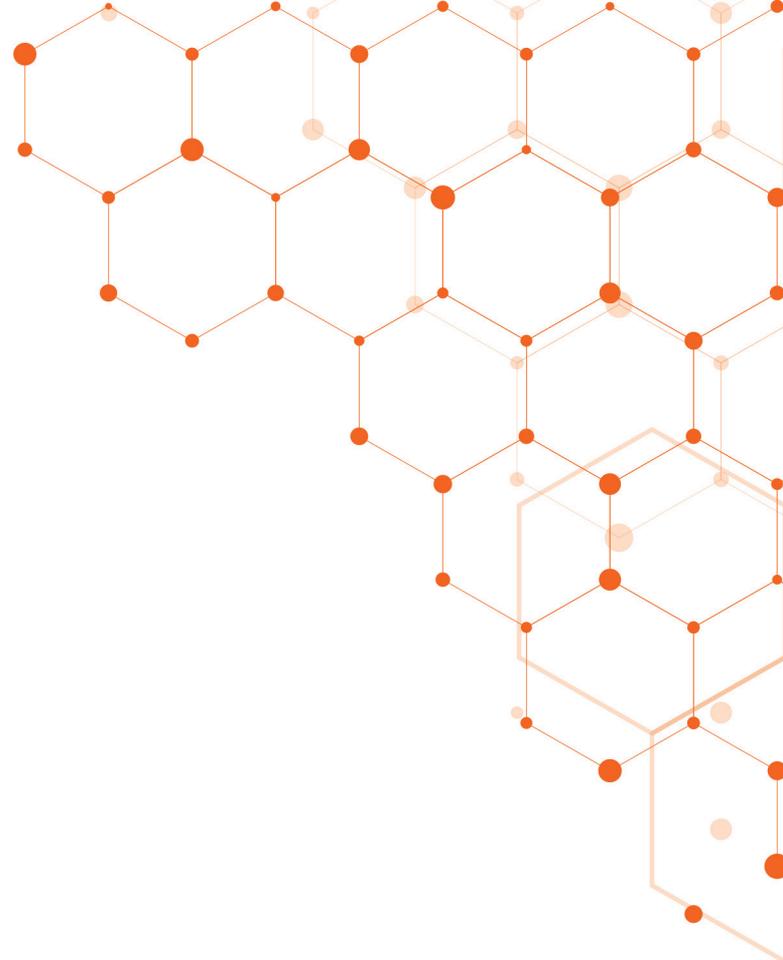
Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



NEUROANAESTHESIA



DM in Neuroanaesthesia

COURSE NAME:

DM in Neuroanaesthesia

DURATION OF COURSE:

3 years

ELIGIBILITY:

MD/DNB in Anaesthesiology

INTRODUCTION

A course curriculum for “DM in Neuroanaesthesia” aims to produce anaesthesiologist, who after undergoing the required training in Neuroanaesthesia should be able to provide holistic care of patients undergoing various neurosurgical and interventional neurological procedures.

The burden of neurosurgical disease including neuro-trauma continues to rise and complex neurosurgical procedures like aneurysm clippings, intracranial tumor resections, compressive myelopathies and stereotactic surgeries like deep brain stimulation are increasingly being undertaken in the general population. In addition, the ever increasing risk of cerebrovascular accidents and traumatic brain injuries add to the spectrum of cases being dealt by the neurosurgeons.

The increasing rise of interventional neurological procedures like aneurysm clippings, intra-arterial thrombolysis (for stroke patients) and AVM coiling also requires a thorough understanding of the pathophysiology so as to provide efficient and safe anaesthesia to these patients. Apart from the intraoperative care, which includes advanced hemodynamic monitoring, neuromonitoring, and neuroprotection, diligent ICU care of patients undergoing neurosurgery is extremely important in improving the outcome of such patients.

International Status

Centers in USA, UK, Canada and Europe are running structured training programmes in neuroanaesthesia and neurocritical care from past few years.

National Status

In India, centers like AIIMS, New Delhi, PGI, Chandigarh, NIMHANS, Bangalore and Sree Chitra Tirunal Institute for Medical Sciences, Trivandrum are offering DM in Neuroanaesthesia.

At AIIMS Bhubaneswar, the department of Anaesthesiology has been providing anaesthesia for neurosurgery since its inception in March 2013. Neurosurgical case load includes both elective and emergency cases, including neuro-oncology, neurovascular surgery, skull base surgeries, spine surgery, pediatric neurosurgery and trauma cases. The neurosurgery cases under the trauma and emergency department have also increased. In addition, a dedicated neurosurgery ICU is functioning at AIIMS Bhubaneswar which will provide the requisite training for neurocritical care.

THE NEED

The complex spectrum of neurosurgery over the past decade has resulted in increasing complexity of anaesthesia for neurosurgery, including the concept of neuroprotection, advanced monitoring and neurocritical care which has resulted in patients having improved outcomes. Devoted neuroanesthesiologists have the knowledge, the skill and the fundamentals of brain and spinal cord pathophysiology and dynamics. Their perioperative knowledge in neurocritical care, neuromonitoring, and neuroprotection have made them distinguished and irreplaceable in the operating room. They are well prepared to deal with various neurosurgical urgencies and emergencies. Intraoperative neurophysiological monitoring, early monitoring of vasospasm in SAH patients, ICP monitoring in patients with head injury and the understanding of the concept of “ Time is brain “ especially in patients of stroke and neurotrauma with improved concepts of neurocritical care requires dedicated and focused approach to the specialty. Being a tertiary health care center in the eastern sector of the country, it is our responsibility to generate such professionals who can bring up the level of care in neurosurgical and neurological patients.

FUTURE PROSPECTS

- These physicians will be in high demand in the coming decades as the burden of neurosurgical diseases and neurotrauma continue to rise.
- Major neurocenters and teaching institutions in the country are running postgraduate degrees in anaesthesiology but the specialized training with specific needs of neurosurgical patients is lacking. Thus, this course will be able to build up a pool of specialists to fill these gaps.
- The specialist training programme will open new avenues for trainee in academic posts in medical colleges and institutes with multi-specialty facilities.

DESCRIPTION AND SCOPE OF WORK

Goals and Objectives

The goals and objectives are designed to provide advanced training in the anaesthesia and critical care for neurosurgical patients undergoing surgery and other related procedures like interventional neuroradiology. Patient population ranges from children to adults, inpatients to outpatients, and involves operating room anaesthesia, out-of-operating room anaesthesia and neurocritical care.

1. Such training can improve the perioperative care of patients undergoing neurosurgery by holistic approach in the preoperative, intraoperative, postoperative period as well as postoperative critical care.
2. The trainee will be aware of contemporary advances & developments in medical sciences as related to neuroanesthesia management and the various areas concerned with this discipline.
3. The trainee will be oriented to principles of research methodology.
4. The trainee will acquire skills in educating and training medical and paramedical professionals.
5. The trainee will acquire skills in effectively communicating with medical and paramedical personnel, patients and family.

6. The trainee will acquire the competencies pertaining to the specialty and its sub-areas that are required to be practiced in the community and at all levels of improving health system.

TEACHING METHODOLOGIES AND DUTIES

1. Bedside (OTs and critical care units)
2. Lectures
3. Discussion
4. Student Directed Learning
5. Case Based Learning
6. Web Based learning

Teaching components will consist of:

1. Didactic learning - theory lectures, seminar (twice a month) and journal club sessions (preferably twice a month)
2. Non-didactic/practical/clinical learning- (operating theatres, critical care bed-side, treatment procedure, clinical demonstration, case discussion, laboratory observation sessions).
3. Mortality/ Morbidity meetings (once in every three months)
4. Quality Assurance meeting (Audit meetings/ presentations- once in 3 months)
5. Combined interdepartmental teachings (Neuroanesthesia, neurosurgery, neurology and interventional neuroradiology) (once in 6 months)

THEORETICAL AND PRACTICAL KNOWLEDGE TO BE ACQUIRED

A. Basic Neuroanatomy and Physiology

1. Anatomy of the brain
2. Physiology of the brain
3. Arterial circulation
4. Venous drainage
5. CBF & CMRO₂

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6. ICP – Herniation syndromes
 7. Determinants of brain elastance, cerebral perfusion pressure, cerebral auto-regulation, and metabolic coupling
 8. Respiratory physiology
 - a. Physiology of ventilation
 - b. Indications for mechanical ventilation
 - c. Modes of ventilation
 - d. Weaning from ventilatory support
 - e. Complications of mechanical ventilation – recognition and management
 - f. Monitoring during ventilatory support
 - g. Care of the patient on mechanical ventilation
 9. Cardiovascular physiology
 - a. Recognition and management of arrhythmias
 - b. Management of hemodynamic disturbances – hypotension, hypertension
 - c. Monitoring cardiovascular function
 10. Renal physiology
 - a. Fluid and electrolytes physiology and pathophysiology
 - b. Acid-base disorders
 - c. Prevention, diagnosis and management protocol for acute kidney disease
 - d. Basic knowledge of dialysis
 11. Metabolic
 - a. Pathophysiology and management of the electrolyte disturbances in neurosurgical patients
 - b. Understand the causes and management of hyperthermia in the neurointensive care population

B. Pathology

The pathologies affecting central nervous system, respiratory system, cardiovascular system, renal and hepatic system and the implications of these

pathologies in the anaesthetic management of the patients presenting with pathology

C. Pharmacology

1. Basic understanding of pharmacokinetics of drugs and pharmacodynamics of drugs used in anaesthesiology with relevance to brain and spinal cord.
2. Understanding their mechanism of action, metabolism, adverse effects, drug interactions, drug development, and practice of prescription utilizing best scientific evidence.
3. Understanding of pharmacokinetics and pharmacodynamics of drugs used in treating nervous system, renal, cardiac disease, metabolic disorders; their mechanism of action, metabolism, adverse effects, drug interactions and their impact in anaesthetic management.

D. Microbiology

1. Understanding the epidemiology, etiology, pathogenesis, investigational and therapeutic management, prevention of infectious diseases encountered in neurologically ill patients.

E. Investigations and monitoring

1. A thorough knowledge of basic principles, indications, technique, results, strength and limitations of various diagnostic tests is essential.
2. Proficiency in independently ordering, performing and interpreting some of these investigations is essential, and accrue from a large number of tests performed under supervision and independently as subsequently suggested. These include invasive and non-invasive investigations.
3. Non-invasive tests: chest X-Ray, ECG, Transthoracic ECHO, NIRS, TCD, brain and spinal cord CT and CT angiography, MRI and MR angiography, electrophysiological monitoring like EEG, evoked potentials, nerve conduction studies etc.

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4. Invasive tests/monitoring include: invasive arterial blood pressure, central venous pressure, cardiac output monitoring, jugular venous oximetry, cerebral blood flow measurement, ICP measurement etc.

F. Neuroimaging

1. Basics of neuroradiology
2. CT, MRI, TCD (Trans cranial Doppler), USG (Ultrasound)
3. Interventional Neuroradiologic procedures
4. Identify the basic structures in the central nervous system (ventricles, cisterns, sinuses, major anatomic landmarks)
5. List the imaging techniques/signs used to identify acute intracranial hemorrhages, mass lesions, arterial and venous lesions, and ischemic penumbras / infarcts
6. Distinguish imaging characteristics of SAH, epidural hematomas, subdural hematomas, intraparenchymal hemorrhage and relate to anatomic structures
7. Understanding the concepts of medical and surgical managements of various emergencies based on imaging and various decision paradigms

G. Anesthetic management

1. Anesthetic management of patients undergoing neurosurgical procedures for different pathologies like neuro-oncology, neurovascular surgery, skull base surgery, spine surgery, pediatric neurosurgical cases and trauma cases.
2. Anesthetic management of patients for diagnostic and interventional neuroradiological procedures
3. Anesthetic management of patients for diagnostic procedures like CT, MRI

H. Neurocritical care management

1. Neurocritical care of patients with various neurological/neurosurgical diseases
2. Critical care management of neuro-trauma patients

3. Resuscitation of head injured
4. Airway management techniques – in normal and difficult situations
5. Nutrition of neurocritical ill
6. Management of infection, sepsis, DVT, coagulopathy, shock, poly-trauma

I. Pain management

1. Understanding the etiology, pathophysiology, diagnosis and management of disease conditions responsible for various pain syndromes

J. Procedures

1. Invasive arterial line
2. Central venous line
3. Tracheostomy – surgical and percutaneous tracheostomy
4. ICP and chest drain insertion
5. Care of patients with invasive equipment e.g ICP lines, epilepsy electrodes etc

K. Scientific advances

1. Recent advances in the field of anesthesia, neurology, neurosurgery and neuroradiology in relation to perioperative and critical care of neurologically ill.

L. Patient safety

Basic understanding of the epidemiology, risk factors, diagnosis, management reporting and preventive aspects of adverse relation to patient management.

DUTIES

1. Routine and emergency duties in theatres, post-anaesthesia care unit and intensive care units (ICU) as per roster
2. Preanaesthetic checkup (PAC)
3. Attend ICU rounds
4. Discuss problematic patients with consultants in Anaesthesiology, Neurosurgery and other multispecialty

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5. Care of neurosurgical patients in theatre/ ICU/ indoor
 6. Attend weekly journal clubs and seminar and present the same by rotation
 7. Attend lectures by visiting faculty and experts
 8. Attend/participate and present papers in state/zonal/national and international conferences
 9. Actively participate and help in organization of departmental workshops, courses and conferences

THE TRAINING PATH AND CLINICAL POSTING

First year

1. Academic and practical training commences in the Department of Anaesthesiology, AIIMS Bhubaneswar as described in the curriculum section
2. At the end of second month of training, literature review commences for thesis topic identification
3. At the end of fourth month of training, thesis synopsis submission for Ethics approval, i.e. IRB
4. After six months of training, commencement of work on thesis
5. Didactic and clinical training within the unit
6. Learning the good clinical practice skills pertaining to the curriculum
7. Team work, bed-side practice, out-patient care understanding by the end of 8 months duration
8. Two months dedicated Intensive Care Unit (ICU) posting

Second year

1. Continued clinical training in the area of neuroanaesthesia and its advances
2. Rotational postings in operation theaters, interventional neuroradiology including CT/MRI, cathlab etc.
3. Two months dedicated ICU posting

Third year

1. Continued clinical training in the area of neuroanaesthesia and its advances
2. One month posting in neuroradiology
3. One week posting in blood bank
4. Two months training in ICU
5. Thesis submission
6. Practical and academic skills demonstrations, seminar presentations
7. Preparing for final exams
8. Actively participate in record keeping, audit and mortality and morbidity meetings of the unit.
9. Fifteen days training in neurology department to learn about the spectrum of neurological diseases and their influence on perioperative decision making, various aspects of care of neurological patients, neurophysiological monitoring etc.
10. One-month training in neuroanaesthesia and neurocritical care at other affiliated centers (preferably after their 3rd semester)
 - There will be no compulsory posting in trauma and emergency medicine. However, residents will be sent to cover neuroemergencies operated under TEM on a case to case basis as far as practicable.
 - 15 days will be sanctioned for attending academic activities (will be considered as on-duty)

LOGBOOK

The trainees will keep a logbook / portfolio including reflective journal, reflective practices, description of procedures performed/assisted/observed and case reports to document the work done in the 3 years program. The logbook will be certified by faculty in charge of various interdisciplinary Departments where candidate will be rotated.

THESIS

All DM postgraduates will be required to carry out one research project under the guidance of faculty of the centre. They will be encouraged to select interdisciplinary project of their choice. They must submit the protocol for Institute ethics committee as per Institutional guidelines before commencement of the thesis work.

COURSE DESIGN AND CONTENTS

The neuroanaesthesia training is meant for outstanding anesthesiologists who desire to deepen and enhance their experience in the field of anesthetic care for a wide variety of neurosurgery patients. The training will focus on providing comprehensive care to patients for neurological and neurological patients.

ASSESSMENT

- a. Regular internal assessments
- b. End of term assessment
- c. Award of degree

The assessment of competence (what the student or physician is able to do) should provide insight into actual performance (what he or she does

habitually when not observed), as well as the capacity to adapt to change, find and generate new knowledge, and improve overall performance.

Assessment Methods

1. Assessment by supervising teachers/facilitators: Structured directed observation (Check list), Oral examination.
2. Clinical simulations (OSCE)
3. Portfolio: Portfolios include documentation of and reflection about specific areas of a trainee's competence – log books /practical files/projects
4. Written: Short answer, Structured Essay / problem based

Competency	Method of Evaluation	Evaluators (s)
I. Professionalism	360-degree assessment Standardized patient assessment	Peers, teachers Supervising Teacher
II. Patient Care	Case Presentation OSCE/Ward rounds Global rating with comments	Supervising clinician Teacher Supervising clinician
III. Medical Knowledge	MCQ Essay type question OSCE/Ward rounds Oral examination	Supervising teacher Supervising teacher Supervising teacher Supervising teacher
IV. Situation/Problem Based Learning	Seminar /case presentations	Teachers
V. Interpersonal and communication skills	Active feedback on real time scenarios	Teachers

INTERNAL ASSESSMENT

1. Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to final / summative examination
- Will be conducted by Examination Cell in the month of June-July & December-January

2. A total of 3 internal examinations will be conducted at the end of 3rd semester, 4th semester and at pre-final (4 months before final) examination.

3. Marks distribution: Theory paper will carry 100 marks. There will be topic wise assessment (table 4). Practical with viva and logbook (Clinical/ experimental/ practical = 70, viva = 20, logbook = 10) will be of 100 marks. The marks of the 3 internal examinations will be averaged to 100 each for theory and practical.

SUMMATIVE/FINAL EXAMINATION

Eligibility for appearing in Final Exam

1. Passed (secured 50% marks) in the examination on Research Methodology and biostatistics and
2. Passed (secured 50% marks) in internal examinations and
3. The thesis submitted 6 months before final examination and is approved/accepted by external evaluator.

Final Theory Examination

1. Theory Papers for the Final Assessment examination will consist of 4 papers (each carrying 100 marks with 3 hours duration).

Paper wise distribution of topics is as follows:

Paper-I - Basic & Allied Neurosciences

Paper II - Neuroanesthesiology including anesthesia for allied subjects

Paper III - Neurocritical Care

Paper IV - Recent advances in Neuroanesthesia and Neurocritical care

2. Format of theory papers:

- Structured essay question (1): 20 marks
- Short answer type questions (8): 8x10=80 marks

FINAL PRACTICAL EXAMINATION

- Practical examination: Total marks: 500 (Practical and viva in the final examination – 400 marks and an average of 3 internals- 100 marks)

The format of the practical examination

Parts	Components	Marks allotted
PART A ** 200 Marks	Longcase (1)	75
	Short cases (3)	75
	Ward Round	50
PART B 200 Marks	Operative procedure/ Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	50
	Logbook	10
	Scientific writing (manuscript written out of the thesis)	15

** Students should pass (secure 50% marks) separately in Part A

Final Marking Pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	Four months before the final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

Passing Marks

1. The student has to secure $\geq 50\%$ marks in the internal examination to be eligible to appear for the final examination.
2. In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
3. In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

RECOMMENDED BOOKS

1. Cucchiara RF, Black S, Michenfelder JD. Clinical Neuroanesthesia: Churchill Livingstone; 1998.
2. Cottrell JE, Young WL. Cottrell and Young's Neuroanesthesia: Elsevier Health Sciences; 2016.
3. Gropper MA, Miller RD. Miller's Anesthesia: Elsevier; 2020.
4. Butterworth JF, Wasnick JD, Mackey DC. Morgan and Mikhail's Clinical Anesthesiology: McGraw-Hill Education; 2018.
5. Macintosh RR, Mushin WW, Jones PL. Macintosh, Mushin and Epstein: Physics for the Anaesthetist: Blackwell; 1987.
6. Barash P, Cullen BF, Stoelting RK, Cahalan M, Stock CM, Ortega R. Clinical Anesthesia: Wolters Kluwer Health; 2013.
7. Benumof J, Saidman LJ. Anesthesia & Perioperative Complications: Mosby; 1999.
8. Aitkenhead AR, Thompson J, Rowbotham DJ, Moppett I. Smith and Aitkenhead's Textbook of Anaesthesia: Elsevier Health Sciences; 2013.
9. Stoelting RK, Flood P, Shafer SL, Rathmell JP. Stoelting's Handbook of Pharmacology and Physiology in Anesthetic Practice: Lippincott Williams & Wilkins; 2014.
10. Healy TEJ, Knight PR. Wylie Churchill-Davidson's A Practice of Anesthesia: Taylor & Francis; 2003.
11. Stoelting RK, Miller RD. Basics of Anesthesia: Churchill Livingstone; 2007.
12. Marino PL. Marino's The ICU Book: Wolters Kluwer Health; 2013.
13. Miller CM, Torbey M. Neurocritical Care Monitoring: Springer Publishing Company; 2014.
14. Gabrielli A, Layon AJ, Yu M. Civetta, Taylor, and Kirby's Manual of Critical Care: Wolters Kluwer Health; 2011.
15. Shoemaker WC. Shoemaker Textbook of Critical Care: SPCK Publishing; 1995.
16. Shoemaker WC, Thompson WL, Holbrook PR, Berry G. Textbook of Critical Care: Saunders; 1984.

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17. Gupta AK, Summors AC. Notes in Neuroanaesthesia and Critical Care: Greenwich Medical Media; 2001.
 18. Brambrink AM, Kirsch JR. Essentials of Neurosurgical Anesthesia & Critical Care: Strategies for Prevention, Early Detection, and Successful Management of Perioperative Complications: Springer International Publishing; 2019.
 19. Matta BF, Menon DK, Turner JM. Textbook of Neuroanaesthesia and Critical Care: Greenwich Medical Media; 2000.
 20. Loftus CM, Biller J, Baron E. Intraoperative Neuromonitoring: McGraw-Hill Education; 2014.
 21. Mongan P. A Practical Approach to Neuroanesthesia: Wolters Kluwer Health; 2013.
 22. Gupta A, Adapa R, Gelb A, Duane D. Gupta and Gelb's Essentials of Neuroanesthesia and Neurointensive Care: Cambridge University Press; 2018.
 23. Newfield P, Cottrell JE. Handbook of Neuroanesthesia: Wolters Kluwer/Lippincott Williams & Wilkins; 2012.
 24. Raj PP. Textbook of Regional Anesthesia: Churchill Livingstone; 2002.
 25. Fishman SM. Bonica's Management of Pain: Wolters Kluwer Health; 2012.
 26. Cousins MJ. Cousins and Bridenbaugh's Neural Blockade in Clinical Anesthesia and Pain Medicine: Wolters Kluwer Health; 2012.
 27. Hines RL, Marschall K. Stoelting's Anesthesia and Co-Existing Disease: Elsevier Health Sciences; 2008.
 28. Shapiro BA, Peruzzi WT, Kozelowski-Templin R. Clinical Application of Blood Gases: Mosby-Year Book; 1994.
 29. Dorsch JA. Understanding Anesthesia Equipment: Wolters Kluwer Health; 2012.
 30. Davis PJ, Cladis FP. Smith's Anesthesia for Infants and Children: Elsevier; 2016.
 31. Orkin FK, Cooperman LH. Complications in Anesthesiology: Lippincott; 1983.
 32. Hagberg CA. Benumof and Hagberg's Airway Management: Elsevier Health Sciences; 2012.
 33. Kasper DL, Hauser SL, Loscalzo J, Longo DL, Jameson JL, Fauci AS. Harrison's Principles of Internal Medicine: McGraw-Hill Education; 2018.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC AND ALLIED NEUROSCIENCES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. What are the factors that regulate cerebral blood flow? Discuss three methods to measure cerebral blood flow. Discuss how cerebral blood flow velocities and their ratio changes in patients with a) vasospasm b) hyperperfusion.
2. Describe the anatomy of circle of Willis with the help of diagrams.
3. Discuss the pharmacology of three common drugs used in management of status epilepticus.
4. Discuss the pathophysiology of cerebral ischemia in traumatic brain injury. What is excitotoxicity?
5. Describe the tests to determine the intactness of hypothalamo-pituitary-adrenal axis.
6. Describe the composition of CSF. Explain the changes encountered in meningitis.
7. Describe the microbiological etiology of brain abscess. What are the predisposing factors and locations of brain abscess?
8. What are the various radiological pictures of raised intracranial tension?
9. What are the advantages and disadvantages of using total intravenous anesthesia in neurosurgery? What are the different pharmacokinetic models used commonly?

PAPER 2

NEUROANAESTHESIOLOGY INCLUDING ANAESTHESIA FOR ALLIED SUBJECTS

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the preoperative evaluation and intraoperative management of a patient with features of acromegaly posted for trans-nasal pituitary tumour resection. What are the possible postoperative complications?
2. Discuss the pros and cons of early versus delayed awakening following neurosurgery.
3. Discuss about blood conservation strategies in complex spine surgeries.
4. What is venous air embolism? What are the risk factors? How is it diagnosed? How is it managed?
5. What is awake craniotomy? What are the indications for awake craniotomy? What are the anesthetic concerns of conducting a case of awake craniotomy?

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6. Enumerate the causes of post-operative vision loss following surgery in prone position. What measures will you take to prevent it?
 7. Enumerate the anesthetic concerns for a child coming for endovascular treatment of vein of Galen malformation.
 8. What are the effects of anesthetics on seizure threshold? Discuss the role of induction agents in potentiating the therapeutic efficacy of electroconvulsive therapy.
 9. A 64 years old lady with suspected aneurysmal rupture has come for diagnostic angiography. How will you proceed with the case?

PAPER 3

NEUROCRITICAL CARE

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss three monitors of cerebral oxygenation, outlining the principles behind the use of such monitoring, the advantages and the fallacies.
2. Discuss the etiology, prevention and management of ventilator associated pneumonia.
3. What is brain death? How is it diagnosed?
4. What are the various causes of hyponatremia in the neurosurgical patients? What are its complications?
5. What is myasthenic crisis and what are the triggers? How will you give respiratory support to such patient?
6. What are the risk factors of deep vein thrombosis? How will you prevent occurrence of deep vein thrombosis in a neurosurgical patient?
7. What are the indications of intubation and mechanical ventilation in a patient with high cervical spine injury? Discuss about airway management.
8. How will you assess the nutritional needs of a patient on long term mechanical ventilation? What are the complications of enteral nutrition and how will you monitor?
9. What is multimodal analgesia? Discuss about the management of postoperative pain following lumbar spinal surgery.

PAPER 4

RECENT ADVANCES IN NEUROANAESTHESIA AND NEUROCRITICAL CARE

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. What is the importance of applying enhanced recovery after surgery (ERAS) protocol on recovery of neurosurgical patients? Describe the components of such protocol briefly. What analgesia would you prefer for enhanced recovery?
2. Describe how you will set up services for a day-care neurosurgery practice in terms of patient selection, procedures and infrastructure.
3. Describe the newer advances / knowledge in available biomarkers for prognostication of traumatic brain injury.
4. What is functional neurosurgery? What are the anesthetic challenges for deep brain stimulation?
5. What is deep hypothermic circulatory arrest? How is it initiated? Discuss the role of deep hypothermic circulatory arrest in neurosurgery.
6. Discuss about newer interventions for managing vasospasm in patients operated for aneurysmal clipping.
7. Discuss of mean velocity index and pressure reactivity index and their clinical utility.
8. Discuss about the mechanism of neuroprotection of volatile anesthetic agents.
9. Discuss about the newer modalities for managing super-refractory status epilepticus.

ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA)

SI No.	Entrustable Professional Activities (Epa)	Competency Domains						Expected Level Of Competency			Feedback
		MK	PC	PBLI	SBP	P	IPCS	1ST YR	2ND YR	3RD YR	
1	History Taking	R	R	R	R	R	R	4	5	5	C, M, SE
2	Clinical Examination	R	R	R	R	R	R	3	4	5	C, M, SE
3	Pre-Op Assessment	R	R	R	R	R	R	3	4	5	C, M, SE
4	Document The Clinical Details In Record	R	NA	NA	NA	R	NA	4	4	5	C, M, SE
5	Ordering And Interpretation Of Basic Diagnostic Tests	R	NA	NA	R	R	R	4	4	5	C, M, SE
6	Perioperative Management Plans	R	NA	NA	R	R	R	3	4	5	C, M, SE
7	Hemodynamic And Respiratory Monitoring	R	R	R	R	NA	R	3	4	5	C, M, SE
8	Airway Equipments For Difficult Airway And Unstable Cervical Spine	R	R	R	R	R	R	2	3	4	C, M, SE
9	Central Venous And Arterial Cannulation	R	R	R	R	R	R	3	4	5	C, M, SE
10	Abg Analysis	R	R	R	R	NA	R	3	4	5	C, M, SE
11	Management Of Massive Blood Loss	R	R	R	R	R	R	2	3	4	C, M, SE
12	Cardio-Pulmonary Resuscitation	R	R	R	R	R	R	2	3	4	C, M, SE
13	Basic And Advanced Ventilation Including Weaning	R	R	R	NA	NA	R	3	4	5	C, M, SE
14	Managing Brain Tumour Patients With Intracranial Hypertension	R	R	R	R	R	R	2	3	4	C, M, SE
15	Managing Neurovascular Surgical Patients Including Cerebral Aneurysms, Carotid Endarterectomy, Moyamoya Disease	R	R	R	R	R	R	2	3	4	C, M, SE
16	Transferring At Risk Neurological Patients From Icu/Ot For Diagnostic/Therapeutic Procedures	R	R	R	R	R	R	3	4	5	C, M, SE
17	Managing Emergency Neurosurgical Patients	R	R	R	R	R	R	2	3	4	C, M, SE
18	Perioperative Care Of Neurotrauma Patients (Adult And Pediatric)	R	R	R	R	R	R	2	3	4	C, M, SE
19	Managing Patients In Neuroradiological Suites	R	R	R	R	R	R	2	3	4	C, M, SE
20	Managing Pediatric Neurosurgical Patients	R	R	R	R	R	R	2	3	4	C, M, SE
21	Anesthesia For Awake Craniotomy	R	R	R	R	R	R	2	3	4	C, M, SE

SI No.	Entrustable Professional Activities (Epa)	Competency Domains							Expected Level Of Competency			Feedback
		MK	PC	PBLI	SBP	P	IPCS	1ST YR	2ND YR	3RD YR		
22	Cardiopulmonary Bypass For Complicated Neurovascular Cases	R	R	R	R	R	R	2	3	3	C, M, SE	
23	Managing Diagnostic Procedural Sedation	R	R	R	R	R	R	3	4	5	C, M, SE	
24	Monitoring Icp	R	R	R	R	R	R	3	4	5	C, M, SE	
25	Basics Of Sterility, Infection Control, Patient Safety	R	R	R	R	R	R	3	4	5	C, M, SE	
26	Performing Transesophageal Echocardiography	R	R	R	R	R	R	2	3	3	C, M, SE	
27	Basic Ultrasonography	R	R	R	R	R	R	3	4	5	C, M, SE	
28	Using Transcranial Doppler	R	R	R	R	R	R	3	4	5	C, M, SE	
29	Using Near-Infrared Spectroscopy	R	R	R	R	R	R	3	4	5	C, M, SE	
30	Using Eeg	R	R	R	R	R	R	2	3	4	C, M, SE	
31	Using Jugular Venous Oximetry	R	R	R	R	R	R	2	3	4	C, M, SE	
32	Using Depth Of Anesthesia Monitors	R	NA	R	R	NA	R	3	4	5	C, M, SE	
33	Using And Interpreting Evoked Potentials	R	R	R	R	R	R	2	3	4	C, M, SE	
34	Perioperative Coagulation Monitoring Including Use Of Thromboelastography	R	R	R	R	R	R	2	3	4	C, M, SE	
35	Interpreting Ct/Mri/Angiography Of Brain And Spinal Cord	R	NA	R	NA	NA	R	3	4	4	C, M, SE	
36	Performing Percutaneous Tracheostomy	R	R	R	NA	R	R	3	4	4	C, M, SE	
37	Respiratory Care Of Spine Injured Patients	R	R	R	R	R	R	2	3	4	C, M, SE	
38	Neurocritical Care Of Adult And Pediatric Post-Surgical Patients (Including Post-Sah Vasospasm, Hyperperfusion Syndrome)	R	R	R	R	R	R	2	3	4	C, M, SE	
39	Neurocritical Care Of Adult And Pediatric Neurological Patients (Including Management Of Status Epilepticus, Stroke, Meningitis, Encephalitis, Neuroinflammatory And Neurodegenerative Disorders, Plasmapheresis)	R	R	R	R	R	R	2	3	4	C, M, SE	
40	Managing Various Pain Syndromes	R	R	R	R	R	R	2	2	3	C, M, SE	
41	End Of Life, Palliative Care And Counselling Of Patient Relatives	R	R	R	R	R	R	2	3	4	C, M, SE	
42	Diagnosis And Management Of Brain Dead Patients	R	R	R	R	R	R	2	3	4	C, M, SE	
43	Academic Activities (Presentations/Research/Thesis)	R	NA	NA	NA	R	R	2	2	4	C, M, SE	

Abbreviations:**Competency Domains**

MK: Medical knowledge

PC: Patient care

PBLI: Practice based learning and improvement

SBP: System based practice

P: Professionalism

IPCS: Interpersonal communication Skills

Level of Competency

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has expertise to teach others

Applicability of Domains

R: Required

NA: Not applicable

Feedback

C: Consultant

M: Mentor/guide

SE: Self

ANNEXURE 1: EVALUATION FORM FOR CLINICAL PRESENTATION

Name of the student:

Date:

Topic of presentation:

Name of the Faculty / Observer:

Serial no.	Items of observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very good 4
1	Completeness of history					
2	Accuracy of clinical signs					
3	Clarity of presentation					
4	Assessment of problem and investigational plan					
5	Anesthesia management/ treatment plan					
6	Ability to defend diagnosis and plan					
7	Knowledge of the current and past literature					
	Grand Total					

ANNEXURE 2: EVALUATION OF JOURNAL REVIEW PRESENTATIONS

Name of the Student:

Topic:

Name of the Faculty / Observer:

Date:

Serial no.	items of observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very good 4
1	Extent of understanding of scope and objectives of the paper					
2	To critically evaluate methods, analysis and interpretations of study					
3	Whether cross references have been consulted					
4	Whether other relevant publications consulted					
5	Ability to respond to questions on the paper/subject					
6	Ability to defend the paper					
7	Clarity of presentation					
8	Audio-visual aids used					
9	Ability to propose new research ideas based on study discussed					
	Total score					

ANNEXURE 3: EVALUATION OF SEMINAR PRESENTATIONS

Name of the student:

Topic:

Name of the Faculty / Observer:

Date:

Serial no	Items of observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very good 4
1	Whether all relevant publications consulted					
2	Understanding of the subject					
3	Completeness of preparation					
4	Clarity of presentation					
5	Current concepts coverage					
6	Ability to answer the questions					
7	Time scheduling					
8	Appropriate use of audio-visuals					
9	Overall performance					
	Total score					

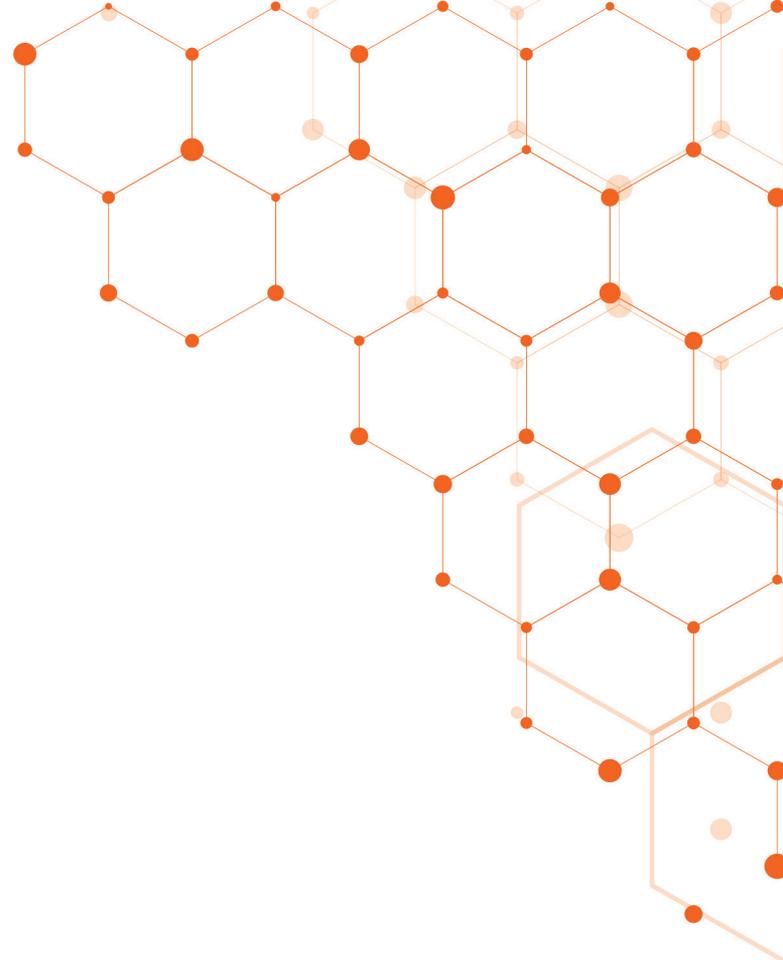
ANNEXURE 4: EVALUATION OF CLINICAL WORK IN OT/WARD/ICU

Name of the student:

Name of the Faculty / Observer:

Date:

Serial no	Items of observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very good 4
1	Regularity of attendance and punctuality					
2	Presentation of cases during preop period					
3	Maintenance of anesthesia case records					
4	Investigation workup					
5	Interaction with colleagues and supporting staff					
6	Teaching and training junior colleagues					
7	Anticipation of complications					
8	Follow up of cases					
9	Overall quality of clinical work					
10	Total score					
	Total score					



NEUROLOGY



DM in Neurology

COURSE NAME:

DM in Neurology

DURATION OF COURSE:

3 years

ELIGIBILITY:

MBBS, MD/DNB in General Medicine/ Pediatrics.

AIMS AND OBJECTIVES

Aim

1. To function as Faculty/consultants in the speciality
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.

Learning Objectives

At the completion of the training, the candidate is expected to:

1. Be able to diagnose and treat common clinical problems in Neurology.
2. Have acquired necessary skills to conduct common neurological procedures/ Neurophysiology techniques, be aware of his / her limitations and should understand where he needs to discuss or involve his senior colleagues and also the need for referring patient to the concerned specialist / tertiary centres.
3. Should be able to clinically evaluate, manage, and where to stop or take consultation from senior colleagues.
4. Be familiar with common Neurological conditions and be able to plan rational investigations and interpret the same.
5. Have a reasonable knowledge of allied disciplines, including basic medical sciences,

which have direct relevance to safe and scientific practice of Neurology.

6. Have acquired skills to identify, plan and carry out research projects relevant to the speciality.
7. Familiarity with Medico-legal procedures.
8. Familiarity with Bio-statistical methods and research methodology.
9. Continuing Medical Education: Be aware of recent advances/developments/ techniques in the field of Neurology.
10. Have acquired knowledge, skill and attitude to be able to function as an independent consultant Neurologist and a teacher.

The scope of modern Neurology has vastly widened with the development of distinct subspecialty areas (*vide supra*). None of the existing centres in the country would have adequate infrastructure and expertise to impart training in all the areas, neither it is feasible to train the students adequately in all the subspecialty-areas within the stipulated period of three years. After the candidate qualifies, he can join a fellowship program to further enhance his knowledge and skills in the area of his/ her subspecialty.

Therefore, the target of the training programme should be to train the students adequately in core areas of Neurology relevant to the need of the country which are:

1. Management of Neurological emergencies
 - Stroke
 - Myasthenic crisis
 - Guillain Barré syndrome with respiratory failure
 - Intracranial haemorrhage
 - Neurotoxic snake bite
 - Approach to coma
 - Multisystem involvement
2. Acquire a comprehensive knowledge of the basics of Neurology including all allied specialities related to Neurology like Neuroanatomy, Neurophysiology,

Neurochemistry, Neuropharmacology, Neuroimaging, Neuropathology, Neuroinfections, Neuroimmunology, Preventive Neurology, Neuroepidemiology, Paediatric Neurology and Neurosurgery

3. Possess complete knowledge of all the commonly used Neurophysiological diagnostic Tests like Electroencephalography, Electromyography, evoked Potentials.
4. Possess knowledge of the recent advances in the subject of Neurology and all its allied specialities and working knowledge of the sophisticated and routine equipment, consumables used in Neurology especially for Neurochemistry, Neurogenetic and molecular diagnostic techniques.
5. Possess knowledge of principles of research work in the field of Neurology in both the Clinical and experimental field with the ability to analyse data.
6. Acquire knowledge in the performance and interpretation of special investigations such as Polysomnography, Video EEG, autonomic function tests, Transcranial Doppler tests.
7. Acquire knowledge in the interpretation of common neuroimaging investigations such as CT scanning, MRI scanning, MR and Digital subtraction angiography, MR spectroscopy, Single Photon Emission Computerised Tomography and PET.

The candidate should have a clear understanding of identification of complicated cases requiring specialized / multi-disciplinary care, for a referral to specialized centres.

TEACHING AND LEARNING METHODS

Lecture, Discussion, Student-Directed Learning, Case-Based Learning, Role Playing, Simulated Patient Lab, E-learning, Web-Based.

Teaching Methods:

1. Clinical teaching in the Outpatient Clinics and Emergency, at the bedside during ward rounds and in the neurophysiology lab.

2. Case discussion and treatment planning session on day to day basis.
3. Presentation of seminars focusing on core-areas of Neurology- 1 hour weekly.
4. Presentation of journal clubs to remain abreast with the recent advances- 1 hour weekly.
5. Departmental statistical meeting (morbidity & mortality) to analyze significant complications and morbidity/deaths- monthly for 1hour.
6. Joint departmental meetings with allied specialities:

The purpose is to focus on essential issues in case management, discussion of challenging and interesting cases requiring interdisciplinary care. This would widen the exposure and field of knowledge.

Departmental Training schedule

- The Outpatient service - 3 days a week
- Major ward rounds - 3 days a week
- Topic Seminars - Once a week
- Journal club - Once a week
- Neuroradiology (teaching session) - Once a week
- EEG/EMG/ Electrophysiology - Once a week
- The teaching of MD Medicine, Psychiatry, Physiology, Rehabilitation Medicine & Pediatrics residents by the DM students if available, is part of the training).

Posting of residents

The trainee will be posted in different specialities as follows:

- Neurology - 2 years and 7 months
- Clinical Neurophysiology - 3 months
- Neurosurgery - 15 days
- Neuropathology - 15 days
- Neuroradiology - 15 days
- Neuropsychiatry - 15 days

Posting in Emergency Medicine

- No compulsory posting in Emergency Medicine.
- The DM students should attend the cases when any case is referred to the department from the Emergency unit.

Thesis and research exposure

- As a part of DM curriculum, the student should complete one thesis project during the tenure, and it is desirable to submit the proof of communication of the manuscript (originated from his/ her thesis) to an indexed peer-reviewed journal.
- The student should submit the completed thesis six months before the final examination.
- If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.
- The thesis will be sent to one external evaluator for approval. The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as accepted, accepted with suggested modification or rejected. If the thesis is accepted with suggested modifications, the comments of the evaluator will be intimated to the student and the guide for necessary correction/ modifications. After modification, the thesis will be evaluated by a departmental committee for final approval.
- If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination
- The candidate must attend continuing medical education, symposia, workshops and conferences including meetings of the neurology forums.

SYLLABUS

THEORY (paper wise)

Paper I: Basic & Allied Medical Sciences related to Neurology

Paper II: Clinical Neurology including Paediatric Neurology- I

Paper III: Clinical Neurology including Paediatric Neurology- II

Paper IV: Recent Advances in Neurology & Neurorehabilitation

BASIC SCIENCES RELATED TO NEUROLOGY

Neuroanatomy

The Neuroanatomy with special emphasis on development of Neuraxis (brain, spinal cord and neurons and glia), autonomic nervous system and their maturation process in the postnatal, childhood and adolescent states; the location and significance of stem cells, CSF pathways, Blood supply and sinovenous drainage of brain and spinal cord, the meninges, skull and vertebral column, the cranial nerves, spinal roots, plexuses, and their relation to neighbouring structures; anatomy of peripheral nerves, neuromuscular junction and muscles; histology of cerebrum, cerebellum, pituitary gland, brain stem and spinal cord, nerves and neuromuscular junction and muscle. Functional anatomy of lobes of cerebrum and white matter tracts of brain and spinal cord, craniovertebral junction, conus and epiconus and cauda equina, brachial and lumbosacral plexuses,

cavernous and other venous sinuses; New developments in understanding of ultrastructural anatomy of neurons, axonal transport, neural networks and synapses and nerve cell function at molecular level.

Neurophysiology

Neurophysiology will cover all the physiological changes in the nervous system during its normal function with special reference to nerve impulse transmission along myelinated fibres, neuromuscular junction and synaptic transmission,

muscle contraction; visual, auditory and somatosensory and cognitive evoked potentials; regulation of secretions by glands, neural control of viscera such as heart, respiration, GI tract, bladder and sexual function; sleep-wake cycles; maintenance of consciousness, special senses, control of pituitary functions, control of autonomic functions, cerebellar functions, extrapyramidal functions, reflexes, upper and lower motor neuron concepts and sensory system.

Molecular Biology

The brain is the one structure where maximum genes are expressed in the human body. Principles of molecular biology including Gene Structure, Expression and regulation; Recombinant DNA Technology; PCR Techniques, Molecular basis for neuronal and glial function, Molecular and cellular biology of the membranes and ion-channels, mitochondrial genome, role of RNA in normal neuronal growth and functional expression, receptors of neurotransmitters, molecular and cellular biology of muscles and neuromuscular junction, etc., The Human Genome and its future implications for Neurology including developmental and neurogenetic disorders, bioethical implications and genetic counselling, Nerve growth and other trophic factors and neuroprotectors, Neural Tissue modification by genetic approaches including Gene Transfer, stem cell therapy etc., Molecular Development of neural tissue in peripheral nerve repair are exciting areas where students need to have basic exposure.

Neurochemistry

All aspects of normal and abnormal patterns of neurochemistry including neurotransmitters associated with different anatomical and functional areas of brain and spinal cord, especially with respect to dopaminergic, serotonergic, adrenergic and cholinergic systems, opioids, excitatory and inhibitory aminoacids; their role in pathogenesis of parkinsonism, depression, migraine, dementia, epilepsy; neuromuscular junction and muscle contractions; carbohydrate, aminoacid and lipid metabolism and the neural expression of disorders of their metabolism, electrolytes and their effect on encephalopathies and muscle membrane function, storage disorders, porphyrias.

Neuropharmacology

Application of neuropharmacology is the mainstay of all medical therapy of epilepsy, parkinsonism, movement disorders, neuropsychiatric syndromes, spasticity, pain syndromes, disorders of sleep and dysautonomic syndromes. Their drug interactions with commonly used other drugs, usage during disorders of renal, hepatic function and in the demented, their adverse reactions etc. are part of the basic curriculum for DM course in Neurology.

Neuropathology

All pathological changes in various neurological diseases with special reference vascular, immune-mediated, de/dysmyelinating, metabolic and nutritional, genetic and developmental, infectious and iatrogenic and neoplastic aetiologies to clinical correlation included. Special emphasis on pathological changes in nerve and muscle in neuropathies and myopathies. Ultrastructural pathologies such as apoptosis, ubiquitinopathies, mitochondrioses, channelopathies, peroxisomal disorders, inclusion bodies, prion diseases, disorders mediated by antibodies against various cell and nuclear components, paraneoplastic disorders etc.

Neuromicrobiology

The various microbiological aspects of infectious neurologic diseases including encephalitis, meningitis, brain abscess, granulomas, myelitis, cold abscess, cerebral malaria, parasitic cysts of nervous system, rhinocerebral mycoses, leprosy neuritis, neuro-leptospirosis, Primary and secondary Neuro HIV infections, congenital TORCH infections of brain, slow virus infections such as JCD and SSPE, neurological complications of viral infections such as Polio, EBV, Chickenpox, Rabies, Herpes, Japanese encephalitis and other epidemic viral infections.

Neurotoxicology

Organophosphorus poisoning, hydrocarbon poisoning, lead, arsenic, botulinum toxin and tetanus toxicity, snake, scorpion, spider, wasp and bee stings are important tropical neurotoxic syndromes whose prompt diagnosis and effective therapy are crucial in life saving.

Neurogenetics and Proteomics

Autosomal dominant and recessive and X-linked inheritance patterns, disorders of chromosomal anomalies, Gene mutations, trinucleotide repeats, dysregulation of gene expressions, enzyme deficiency syndromes, storage disorders, disorders of polygenic inheritance, and proteomics in health and disease.

Neuroepidemiology

Basic methodologies in community and hospital-based neuroepidemiological studies such as systematic data collection, analysis, derivation of logical conclusions, concepts of case-control and cohort studies, correlations, regressions and survival analysis; basic principles of clinical trials.

CLINICAL NEUROLOGY INCLUDING PEDIATRIC NEUROLOGY & NEUROPSYCHIATRY

General evaluation of the patient

The science and art of history taking, Physical Examination including elements of accurate history taking, symptoms associated with neurological disease, The physical examination of adults, children, infants and neonates, syndromes associated with congenital and acquired neurological disease, cutaneous markers, examination of unconscious patients, examination of higher mental functions, cranial nerves, the ocular fundus, examination of tone, power of muscles, proper elicitation of superficial and deep reflexes including the alternate techniques and neonatal and released reflexes, neurodevelopmental assessment of children, sensory system, peripheral nerves, signs of Meningeal irritation, skull and spine examination including measurement of head circumference, shortness of neck and carotid pulsations .and vertebral bruits.

Coma

Pathophysiology and diagnosis of COMA, Diagnosis and management of coma, delirium and acute confusional states, reversible and irreversible causes, persistent vegetative states and brain death, neurophysiological evaluation and confirmation of these states and mechanical ventilation and other

supportive measures of comatose patient and prevention of complications of prolonged coma. The significance of timely brain death in organ donation and ICU resource utilization.

Seizures and Epilepsy and Syncopes

Diagnosis of seizures, epilepsy and epileptic syndromes, Recognition, clinical assessment and management of seizures especially their electrodiagnosis, video monitoring with emphasize on phenomenology and their correlation with EEG and structural and functional brain imaging such as CT and MRI and fMRI and SPECT scan, Special situations such as epilepsy in pregnant and nursing mothers, driving, risky occupations, its social stigmas differentiation from pseudoseizures, use of conventional and newer antiepileptic drugs, their drug interactions and adverse effects etc., modern lines of management of intractable epilepsies, such as ketogenic diet, vagal nerve stimulation, epilepsy surgery and about presurgical evaluation of patients. Management of status epilepticus and refractory status epilepticus; Differentiation of seizures from syncope, drop attacks, cataplexy, startles, etc..

Headaches and other cranial neuralgias

Acquisition of skills in the analysis of headaches of various causes such as those from raised intracranial pressures, migraines, cranial neuralgias, vascular malformations, Meningeal irritation, psychogenic etc. and their proper pharmacologic management.

Cerebrovascular Diseases

Vascular anatomy of brain and spinal cord, various causes and types of cerebrovascular syndromes, ischemic and haemorrhagic types, arterial and venous types, anterior and posterior circulation strokes, OCSP and TOAST classifications, investigations of strokes including neuroimaging using Dopplers, CT and MR imaging and angiography, acute stroke therapy including thrombolytic therapy, interventional therapy of cerebrovascular diseases, principles of management of subarachnoid haemorrhage etc. Special situations like strokes in the young, Strategies for primary and secondary prevention of stroke

Dementias

Concept of minimal cognitive impairment, Reversible and irreversible dementias, causes such as Alzheimer's and other neurodegenerative diseases and vascular and nutritional and infectious dementias, their impact on individual, family and in society, Genetic and familial syndromes. Pharmacotherapy of dementia, Potential roles of cognitive rehabilitation and special care of the disabled.

Parkinsonism and movement disorders

Disorders of the extrapyramidal system such as parkinsonism, chorea, dystonias, athetosis, tics, their diagnosis and management, pharmacotherapy of parkinsonism and its complications, management of complications of parkinsonism therapy, including principles of deep brain stimulation and lesional surgeries. Use of EMG guided botulinum toxin therapy, management of spasticity using intrathecal baclofen and TENS.

Ataxic Syndromes

Parainfectious demyelination, cerebellar tumours, hereditary ataxias, vestibular disorders; Diagnosis and management of brainstem disorders, axial and extra-axial differentiation.

Cranial Neuropathies

Disorders of smell, vision, visual pathways, pupillary pathways and reflexes, internuclear and supranuclear ophthalmoplegia; other oculomotor disorders, trigeminal nerve testing, Bell's palsy, differentiation from UMN facial lesions, brainstem reflexes, Investigations of vertigo and dizziness, differentiation between central and peripheral vertigo, Differential diagnosis of nystagmus, investigations of deafness, bulbar and pseudobulbar syndromes.

CNS Infections

Diagnosis and management of viral encephalitis, meningitis bacterial, tuberculous, fungal, parasitic infections such as cysticercosis, cerebral malaria, SSPE, Neuro HIV primary and secondary infections with exposure to gram stain and cultures, bac tec, QBC, ELISA and PCR technologies.

Neuroimmunologic Diseases

Diagnosis and management of CNS conditions such as Multiple sclerosis, PNS conditions such as GBS, CIDP, Myasthenia gravis, polymyositis and other recent advances in neuroimmunology spectrum.

Neurogenetic Disorders

Various chromosomal diseases, single-gene mutations such as enzyme deficiencies, autosomal dominant and recessive conditions and X-linked disorders, trinucleotide repeats, disorders of DNA repair. Genetics of Huntington's disease, familial dementias, other storage disorders, hereditary ataxias, hereditary spastic paraplegias, HMSN, muscular dystrophies, mitochondrial inheritance disorders,

Developmental disorders of the nervous system

Neuronal migration disorders, craniovertebral junction diseases, spinal dysraphism.

Myelopathies

Clinical diagnosis of distinction between compressive and non-compressive myelopathies, spinal syndromes such as anterior cord, subacute combined degeneration, central cord syndrome, Brown-Sequard syndrome, tabetic syndrome, Eellsberg phenomenon. Diagnosis of spinal cord and root compression syndromes, CV junction lesions, syringomyelia, conus-cauda lesions, spinal AVMs, tropical and hereditary spastic [paraplegias, Fluorosis.]

Peripheral Neuropathies

Immune-mediated, hereditary, toxic, nutritional and infectious type peripheral neuropathies; their clinical and electrophysiological diagnosis

Myopathies and neuromuscular junction disorders

Clinical evaluation of patients with known or suspected muscle diseases aided by EMG, muscle pathology, histochemistry, immunopathology and genetic studies. Dystrophies, polymyositis, channelopathies, congenital and mitochondrial

myopathies. Neuromuscular junction disorders such as myasthenia, botulism, Eaton-lambert syndrome and snake and organophosphorus poisoning, their electrophysiological diagnosis and management. Myotonia, stiff person syndrome.

Paediatric Neurology

Normal development of motor and mental milestones in a child, Cerebral palsy, Attention deficit disorder, Autism, developmental dyslexia, Intrauterine TORCH infections, Storage disorders, Inborn errors of metabolism affecting the nervous system, developmental malformations, Childhood seizures and epilepsies, neurodegenerative diseases.

Cognitive Neurology and Neuropsychiatry

Detailed techniques of higher mental functions evaluation, basics of primary and secondary neuropsychiatric conditions such as anxiety, depression, schizophrenia, acute psychosis, acute confusional reactions (delirium), organic brain syndrome, primary and secondary dementias, differentiation from pseudodementia

Tropical Neurology

Conditions which are specifically found in the tropics like neurocysticercosis, cerebral malaria, tropical spastic paraplegia, Snake/scorpion/Chandipura encephalitis, Madras Motor Neuron disease, leprosy etc. will be dealt with in special detail in the curriculum

Diagnostic Neurology

Performing and interpreting Digital Electroneurogram, Electromyogram, Evoked potentials, Electroencephalography, Interpretation of skull and spine X rays, computerized tomography of brain and spine, Magnetic resonance images of brain including correct identification of various sequences, angiograms, MR spectroscopy, basics of functional MRI, Interpretation of digital subtraction imaging, SPECT scans of brain, subdural EEG recording, transphenoidal electrode EEG Techniques for temporal lobe seizures, video EEG interpretation of phenomenology and EEG-phenomenology correlations, EEG telemetry,

Transcranial Doppler diagnosis and monitoring of acute ischemic stroke, subarachnoid haemorrhage, detection of right-to-left shunts etc.; Colour duplex scanning in Carotid and vertebral extracranial segment screening.

Interventional Neurology and Neuroinstrumentations

To acquire skills in Procedures like

- a. Intrathecal administration of antispasticity drugs, beta interferons in demyelination, opiates in intractable pain etc.,
- b. EMG guided Botox therapy for dystonias,
- c. Subcutaneous administration of antimigraine and antiparkinsonian drugs
- d. Intraarterial thrombolysis in extended windows of thrombolysis in ischemic strokes,
- e. Transcranial Ultrasound clot-bust intervention in a registry in the acute stroke care unit
- f. Planning in deep brain stimulation therapy in uncontrolled dyskinesias and on-off phenomena in long-standing parkinsonism
- g. Planning in vagal nerve stimulation in intractable epilepsy

Critical care Neurology

Adequate skill and knowledge to manage emergency neurological disorders and able to manage neurology intensive care.

RECENT ADVANCES IN NEUROLOGY

Advances in Neuroimaging Techniques

Integration of CT, MR, SPECT images with each other and with EEG, EVOKED potentials based brain maps in structural and functional localization in neurological phenomena and diseases, Fluorescent dye tagged study of neurons in diseases in animal models in vivo and tissue cultures in-vitro.

Bionics in neural prosthesis and rehabilitation

Advanced techniques in neurorehabilitation such as TENS, principles of man-machine Interphase

devices in the cord, nerve and plexus injuries, cochlear implants, artificial vision.

Neuroproteomics and Neurogenetics

Brain functions are regulated by proteomics and genomics linked to various proteins and genes relevant to the brain, body's maximum number of proteins and genes being expressed in the brain as neurotransmitters or channel proteins and predisposing brain to a number of disorders of abnormal functioning of these proteins.

Stem Cell and Gene Therapy

Principles of ongoing experiments on stem cell therapy for nervous system disorders such as foetal brain tissue transplants in parkinsonism; intrathecal marrow transplants in MND, MS, Spinal trauma; myoblasts infusion therapy in dystrophies

Neuroepidemiological Studies and Clinical Trials

The students of the DM course will be trained in conducting sound neuroepidemiological studies on regionally and nationally important neurological conditions as well as on diseases of scientific and research interest to the department.

SYLLABUS

PRACTICAL (year wise)

First-year

- Familiar with AIIMS environment
- Submission of thesis protocol
- Taking ward round and reporting to consultant
- Attending OPD and emergency
- Learning basic neurological procedures like lumbar puncture, nerve and muscle biopsy
- Dealing with critical patients and learning ICU procedures

Second year

- Supervising first year DM resident
- Learning at neurophysiology lab and related procedures

- Reporting and discussing neuroradiology
- Continuation of thesis and presentation at national level

Final year

- Teaching at the bedside and taking classes of undergraduates/postgraduates/nursing and paramedical
- Thesis submission and preparation / submission of the manuscript in an indexed journal
- Independent procedures and ward/ICU rounds

LOG BOOK

The candidate is expected to maintain a Log Book of all his/her activities with respect to:-

1. Bio-data
2. Complete List of Postings with periods and dates
3. Interesting cases seen and worked up during the period of posting
4. Details of clinic-pathological correlation seminars, mortality review, and difficult case meet
5. List of Short Reviews presented
6. List of Long Reviews presented
7. List of Journals reviewed
8. List of Cases presented and discussed in Bed-side clinics
9. List and abstracts of presentations in AIIMS, Bhubaneswar Scientific Society, Conferences, PG Seminars, CPCs etc.
10. Abstracts and lists of papers published or sent for publication
11. Any other research projects undertaken
12. Any other interesting details

This Log Book would be scrutinized and certified by the Head of Department and other Consultants and presented to the external examiners at the time of the final examination.

ASSESSMENT

INTERNAL ASSESSMENT

1. Examination on Research Methodology & Biostatistics
 - Timing: End of 2nd Semester
 - Total marks: 100
 - Will be considered as an internal examination
 - Candidate should pass to appear in Final examination
 - No marks will be added to final/summative examination
 - Will be conducted by Examination Cell in the month of June-July & December-January
2. Three internal examinations will be conducted in the department at the end of the 3rd semester, 4th semester and pre-final (4 months before final examination).
3. Marks distribution:
 - a. Theory = 100 marks, (Single Theory Paper; in each paper, One Long question carrying 20 marks and Eight Short question/notes: $10 \times 8 = 80$ marks.)
 - b. Practical with viva and logbook = 100 Marks (Practical = 70, viva = 20, logbook = 10, Total 100 marks).
 - c. The marks of the three internal examinations will be averaged to 100 each for theory and practical to calculate in the final examination.

SUMMATIVE/FINAL EXAMINATIONS

Eligibility for appearing in the Final Examination

- Passed (secured 50% marks) in the examination on Research Methodology and biostatistics (end of 2nd semester) and
- Passed (secured 50% marks) in aggregate of internal examinations, theory and practical (end of 3rd semester, 4th semester and prefinal) and
- Dissertation/thesis submitted six months before the final examination and is approved/accepted by an external evaluator.

Final Theory Examination

1. Theory: 4 papers (100 marks each)
 - Paper I: Basic & Allied Medical Sciences related to Neurology
 - Paper II: Clinical Neurology including Pediatric Neurology-I
 - Paper III: Clinical Neurology including Pediatric Neurology-II
 - Paper IV: Recent advances in Neurology, and Neurorehabilitation
2. Theory question paper format:
 - One Long question – 20 marks
 - Eight Short question/notes – $10 \times 8 = 80$ marks
3. Total marks in theory: 500 marks
 - 4 papers in the final examination – 400 marks
 - Average of 3 internal examination – 100 marks

Final Practical examination

1. **Total marks - 500 marks**
 - An average of 3 internal examinations - 100 marks.
 - Practical and viva in the final examination – 400 marks.

The format of the practical examination (400 marks)

Part	Component	Marks allotted
Part A (200 Marks)**	Longcase – One	75
	Short cases – Three (25 X 3)	75
	Ward Round	50
	Subtotal	200
Part B (200 Marks)	Operative Procedure and Instruments/department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva (Pathology specimens/Radiology / others)	50
	Logbook	10
	Scientific Writing (Manuscript written out of the thesis)	15
	Subtotal	200
	Total	400

** Students should pass (secure 50% marks) separately in Part A

Final marking scheme

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	Four months before the final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

RECOMMENDED BOOKS

- Campbell WW. DeJong's The Neurologic Examination: Wolters Kluwer Health; 2012.
- Brazis P, Masdeu JC, Biller J. Localization in Clinical Neurology: Wolters Kluwer Health; 2016.
- Mack S, Kandel ER, Jessell TM, Schwartz JH, Siegelbaum SA, Hudspeth AJ. Principles of Neural Science: McGraw-Hill Education; 2013.
- Levin KH, Chauvel P. Clinical Neurophysiology: Basis and Technical Aspects: Handbook of Clinical Neurology Series: Elsevier Science; 2019.
- Aminoff MJ. Aminoff's Electrodiagnosis in Clinical Neurology: Elsevier Health Sciences; 2012.
- Strub RL, Black FW. The Mental Status Examination in Neurology: F.A. Davis Company; 2000.
- Posner JB, Saper CB, Schiff ND, Claassen J. Plum and Posner's Diagnosis and Treatment of Stupor and Coma: Oxford University Press, Incorporated; 2019.
- Vinken PJ, Bruyn GW. Handbook of Clinical Neurology: North-Holland Publishing Company; 2010.
- Wadia NH, Khadilkar SV. Neurological Practice: An Indian Perspective: Elsevier Health Sciences; 2015.
- Misra UK. Tropical Neurology: CRC Press; 2003.

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11. Bradley WG. Neurology in Clinical Practice: Butterworth-Heinemann/Elsevier; 2008.
 12. Ropper AH, Samuels MA, Klein J. Adams and Victor's Principles of Neurology: McGraw-Hill Education; 2014.
 13. Engel J, Pedley TA, Aicardi J. Epilepsy: A Comprehensive Textbook: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2008.
 14. Schomer DL, da Silva FL. Niedermeyer's Electroencephalography: Basic Principles, Clinical Applications, and Related Fields: Wolters Kluwer Health; 2012.
 15. Jankovic J, Tolosa E. Parkinson's Disease and Movement Disorders: Wolters Kluwer Health; 2015.
 16. Fenichel GM. Clinical Pediatric Neurology: A Signs and Symptoms Approach: Expert Consult - Online and Print: Elsevier Health Sciences; 2009.
 17. Caplan LR. Caplan's Stroke: Cambridge University Press; 2016.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC AND ALLIED MEDICAL SCIENCES RELATED TO NEUROLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe cerebral Circulation. Pathophysiology and pathology of acute cerebral infarction and the role of thrombolytic therapy in the management of acute stroke.
2. Discuss the normal electroencephalography (EEG) rhythms and describe in brief EEG maturation with age.
3. Describe the cerebrospinal formation and dynamics. Discuss the complications of lumbar puncture.
4. Discuss the neurophysiology of rapid eye movement (REM) sleep. Describe the causes of REM sleep disorder.
5. Discuss the innervation and neurophysiology of bladder. Describe the cortical micturition control.
6. Discuss the laboratory diagnosis of viral encephalitis. Investigational approach to Herpes simplex encephalitis.
7. Explain neurophysiology of muscle contraction and muscle tone.
8. Draw a neuron and synapse. Explain axonal transport, salutatory conduction and synaptic transmission.
9. What are monoclonal antibodies. Describe the monoclonal antibody-based therapies in CNS demyelinating diseases.

PAPER 2

CLINICAL NEUROLOGY INCLUDING PAEDIATRIC NEUROLOGY - I

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss the differential diagnosis and management of a 40-year-old person presenting with acute onset of blurring of vision in left eye.
2. Define status epilepticus. Describe the management of status epilepticus.
3. Describe the epidemiology of Multiple Sclerosis. Discuss the disease modifying therapies for Multiple Sclerosis
4. Describe the approach to a case of hyponatremia in Neurological ICU. Evaluation and management of cerebral salt wasting syndrome.
5. Discuss the diagnostic criteria and management guideline of chronic inflammatory demyelinating polyneuropathy.
6. List the neurological manifestations of vitamin B12 deficiency. Describe the steps in the diagnosis and management of subacute combined degeneration of spinal cord.
7. Explain how to diagnose a case of Myasthenia gravis. Write the management of myasthenic crisis.
8. Describe the approach to a case of Idiopathic intracranial hypertension. Describe its imaging finding.
9. Enumerate the central nervous system manifestations of acquired immunodeficiency syndrome. Explain the management of a case of cryptococcal meningitis in HIV positive patient.

PAPER 3

CLINICAL NEUROLOGY INCLUDING PAEDIATRIC NEUROLOGY - II

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. What is the recent classification of headache disorders. Discuss the pathophysiology and recent advances in the management of migraine.
2. Define febrile seizure. Discuss the approach to a case of febrile seizures in a five-year-old child.
3. Enumerate the uses of plasmapheresis in neurological disorders. Discuss its role in the management of Guillain Barre syndrome.
4. Discuss the approach and management of a case of intractable neuropathic pain. Describe the treatment modalities of diabetic neuropathy.
5. What are inflammatory myopathies? Describe the clinical presentation and management of dermatomyositis.

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6. Define and classify dystonias. Discuss the application of botulinum toxin in focal dystonia.
 7. Enumerate the causes of chronic meningitis. Describe the diagnostic modalities for evaluation of tubercular meningitis.
 8. Enumerate the electrophysiological methods for evaluation of carpal tunnel syndrome and describe the diagnostic criteria.
 9. What are dysmyelinating disorders presenting in childhood. Describe the clinical presentation and management of adrenoleukodystrophy.

PAPER 4

RECENT ADVANCE IN NEUROLOGY AND NEUROREHABILITATION

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss the recent advances in the management of advanced Parkinson's disease and the role of stem cell therapy in Parkinson's disease.
2. List the causes of rapidly progressive dementia. Describe how to approach a case of Creutzfeldt-Jakob disease.
3. List the long-term complications of stroke. Discuss the recent advances in neurorehabilitation techniques of post stroke spasticity.
4. What is cognitive rehabilitation? Write briefly about the role of cognitive rehabilitation in cerebral palsy.
5. List the methods of vascular imaging of brain. Describe the role of vascular intervention in intracranial stenosis.
6. What is medication over use headache? Discuss the application of transcranial magnetic stimulation in chronic migraine.
7. Discuss the recent advances in management of refractory epilepsy. List the indications and complications of vagus nerve stimulation.
8. Describe the clinical manifestations of myelin oligodendrocyte glycoprotein associate CNS disorders. Describe the imaging features of CLIPPERS.
9. Enumerate the trinucleotide repeat disorders in neurological practice. Discuss the role of genetic counselling and recent advances in management of Huntington's disease.

ENTRUSTABLE PROFESSIONAL ACTIVITIES

S. No.	EPA	Competency Domains						Level of Competency		
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 3 rd Sem	End of 6 th Sem
1	History taking and general physical examination	*	*	*	*	*	*	II	III	IV
2	Formulating a differential diagnosis based on history and examination	*		*			*	I	II	III
3	Ordering and interpretation of common diagnostic tests	*	*	*	*	*		II	III	IV
4	Entering and discussing orders and prescriptions and giving the necessary instructions to the patients	*	*	*	*	*	*	I	II	III
5	Document clinical details in the patient record/thesis record		*	*	*	*		I	II	III
6	Clinical presentation of a case	*		*	*	*	*	II	III	IV
7	Using evidence based medicine to improve patient care	*		*				I	II	III
8	Give or receive a patient handover to transition care responsibility	*	*	*	*	*	*	I	II	III
9	Participating efficiently as a member of an interprofessional team	*					*	I	II	III
10	Diagnosing conditions requiring emergency care and providing primary care	*	*	*	*	*	*	I	II	III
11	Obtain informed consent for tests and/or procedures	*	*	*	*	*	*	II	III	IV
12	Performing general medical and surgical procedures (Lumbar puncture/ Intubation/ skin, nerve and muscle biopsy)	*	*	*	*	*	*	I	II	III
13	Identifying system failures and taking appropriate corrective measures	*	*	*	*	*	*	I	II	III
14	Bio medical Knowledge of equipments used in Neurophysiology lab and Neuro ICU	+	-	+	+	+	-	II	III	IV
15	Attending emergency calls and managing critical patients in neuro icu	+	+	+	+	+	-	I	II	III
16	Knowledge and skills in mechanical ventilation/NIV	+	+	+	+	+	-	I	III	IV
17	Counselling the relatives of a sick patients with poor prognosis and breaking the bad news	+	-	-	+	+	+	I	II	III
18	Conducting clinical demonstration classes for undergraduate students	+	-	+	+	+	+	I	III	III
19	Preparedness for academic presentation	+	+	+	+	+	-	I	II	III
20	Maintaining Ethical and clinical standards in practice	-	-	-	+	+	+	I	III	IV
21	Manners, attitude and Motivation for new learning									

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

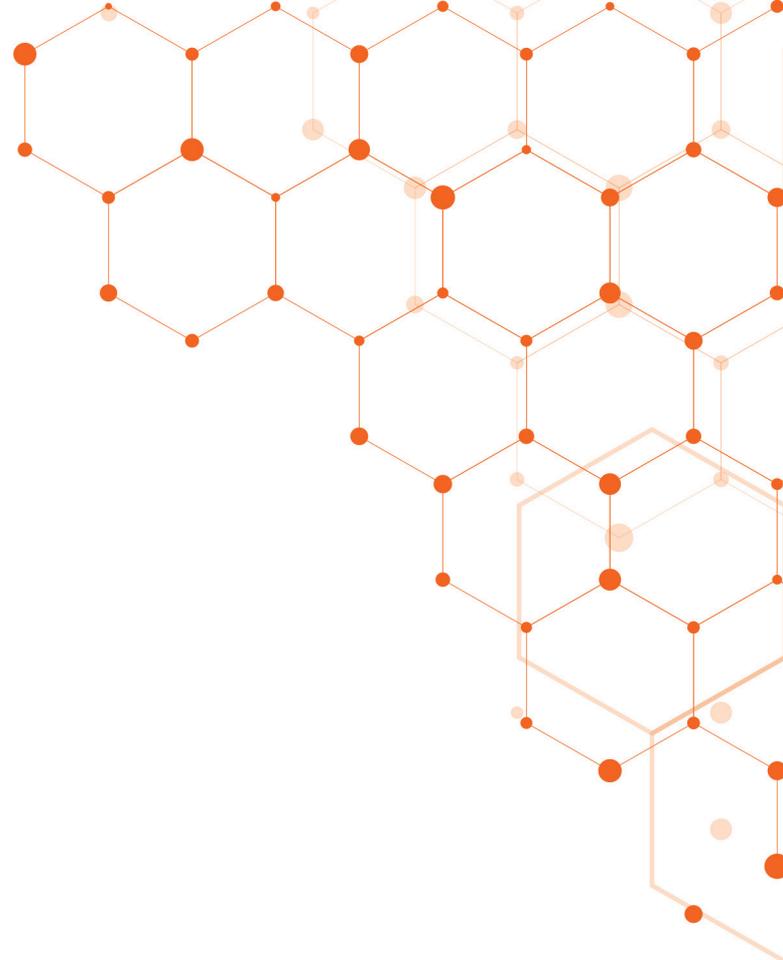
Level I: Knowledge only; can observe

Level II: Can do under strict supervision

Level III: Can do under loose supervision

Level IV: Can do independently

Level V: Has the expertise to teach others



NEUROSURGERY



MCh in Neurosurgery

COURSE NAME:

MCh in Neurosurgery

DURATION OF COURSE:

3 years

ELIGIBILITY:

MBBS, MS in General Surgery

OBJECTIVES

The End Product (MCh in Neurosurgery):

- Should be well versed with the current literature on relevant aspects of the basic, investigative, clinical and operative neurosciences.
- Should have learned indications and performance skills of common neurosurgical operations.
- Should have acquired performance skills and ability to interpret relevant clinical investigations.
- Should be able to diagnose, plan investigations and treat common conditions in the neurosurgery speciality by relevant current therapeutic methods.
- Should be acquainted with allied and general clinical disciplines to ensure appropriate and timely referral.
- Should be capable of imparting basic neurosurgical training.
- Should be able to identify, frame and carry out research proposals in the relevant speciality.
- Should have the ability to train him /her self-regarding various updates in neurosurgery by participating in various continuing medical education (CME) activities in future.

SYLLABUS CONTENT

This curriculum reflects the body of knowledge which should be attained by an individual completing residency training in Neurosurgery. It serves to create an organizational structure of academic, clinical, and technical criteria for the training of residents in Neurological Surgery. The goal is to improve patient care by assuring residents completing the training have achieved the highest possible level of competency in Neurosurgery. An exhaustive list of the details of the required subject matter is given in **Annexure 1**. However, at the end of tenure, the resident is expected to have possessed a comprehensive knowledge of the following:

Basic Topics

- Neuroanatomy
- Neurophysiology
- Neuropathology
- Neuropharmacology
- Neurology
- Neuroradiology

General Clinical Topics

- Fluid, Electrolytes, and Nutrition
- General Critical Care
- Infection
- Practice Management, Legal, and Socioeconomic Issues

Neurosurgical Clinical Topics

- Cranial trauma
- Spontaneous intracranial haemorrhage
- Hydrocephalus
- Intracranial tumours
- CNS infections
- Spinal trauma
- Benign intradural tumours
- Malignant spinal cord compression
- Degenerative spinal disorders

Emergency Neurosurgery Care

- Cerebrovascular Surgery
- Neurosurgical Oncology
- Neurotrauma and Neurosurgical Critical Care
- Pain Management
- Paediatric Neurosurgery
- Surgery of the Peripheral Nervous System
- Spinal Surgery
- Stereotactic and Functional Neurosurgery

TEACHING & LEARNING METHODS

1. Orientation
2. Integrated Lectures

Integrated lectures are recommended to be taken by multidisciplinary teams for selected topics.

3. Journal Club (once a week) / Seminar & Case presentation (every week)

All the MCh students will be expected to attend and actively participate in the discussion and enter the relevant details in the logbook. The presentations would be evaluated using a check and would carry weightage for internal assessment. A time table with names of students and the moderator will be put up at the beginning of every term.

4. Ward Rounds/Case presentation
5. Pre & Post-operative discussions
6. Medical Audit (Monthly Mortality Meetings)
7. Inter-Departmental Meetings- Neuroradiology & Neuropathology
8. Continuing Medical Education Programmes (CME) and Conference
9. Operation room duty (Assist & Perform)

-Exclusively on the whole time-in-service basis, on clinical residency pattern.

The three-year program consists of fundamental clinical evaluation, neurosurgical training and research to allow for the acquisition of graduated experience in all aspects of neurological surgery and develop the following skills:

Clinical and theoretical skills: a knowledge-based on texts/journals/ departmental academic activities. Clinical skills include the ability to take a discerning history, perform a relevant clinical examination, decide the appropriate investigations and derive the management plan.

Surgical and procedural skills: The candidate should be able to perform basic neurosurgical procedures independently and should have a firm grasp on many others. To assure this, each resident is expected to assist and independently perform a minimum number of procedures.

Communication skills: The candidate is expected to develop into an effective communicator to the patients, their family, colleagues and students.

Research aptitudes: The curriculum is intended to provide essential skills in conducting medical research, and to get them presented in scientific forums and published in peer-reviewed journals. Essential training in biostatistics will also be a part of the curriculum.

Departmental Training schedule & posting of residents:

Duty Schedule

There shall be two residents on duty after routine working hours and on holidays. One resident on duty and the other resident "on-call". In case of any emergency, the HOD may insist on a greater number of doctors to stay back on duty.

Duty Resident

The duty doctor will be responsible for all the ICU and ward patients after routine duty hours. Besides, his duty consists of

1. Taking evening and early morning rounds of all the inpatients along with duty consultant
2. Inform the Head of the department about all problems in the ICU and ward daily evening
3. Inform the faculty on-call / operating surgeon in case of any problem
4. Perform urgent therapeutic intervention, e.g. twist drill, ventric tap, tracheostomy or such emergency procedure, which should be done promptly without any delay

First on Call duty

The duty consists of:

1. To respond to all the casualty calls immediately.
2. Evaluating and informing the consultant on duty about the patients seen in the casualty.
3. For patients who are referred to other Hospitals, to make sure that this takes place on time.
4. To inform the duty resident anytime, a patient is admitted to the Ward /ICU
5. To inform duty (neuro) anaesthetist, and OT Nursing Staff each time any patient is admitted for emergency surgery.
6. Assist the on-call duty consultant for all emergency surgery procedures
7. To arrange for all urgent blood investigations, CT, Cardiology or other consultation etc. or whatever is required before admission and operation.
8. To make sure that the patient promptly reaches the OT, ICU or ward from the Casualty as the case may be.
9. In case of any ward situations, the resident should inform the duty consultant and Head of the department.
10. To attend to all routine and urgent consultations from other Departments.

Call schedules

Call Schedules are the responsibility of the Senior Resident. The call schedule, however, needs to be approved by the Head of the Department and a copy of the same needs to be distributed to all the concerned departments

Duty Hours

Duty hours are defined as all clinical and academic activities related to the residency program, i.e., patient care (both inpatient and outpatient), administrative duties related to patient care, the provision for transfer of patient care, time spent in-house during call activities, and scheduled academic activities such as conferences. Duty hours do not include reading and preparation time spent away from the duty site.

1st year:

1. Basic courses in computers, data-keeping & privacy and Hospital Information System, basic biostatistics, training in Hospital fire safety (to be given by the Dept. of Hospital Administration, AIIMS Bhubaneswar), various compulsory elective courses of the institute, reporting of serious adverse effects (SAE), antibiotics & various drugs/antibiotic protocol of the hospital, informed consent protocol, patient records & discharge summaries writings etc.
2. Study revision of Anatomy, physiology, biochemistry pharmacology of nervous system and advance knowledge thereof. Study revision of clinical history taking, examination and basic neurosurgical skills in the ward, ICU and advance knowledge thereof.
3. Skill-based training in cadavers & neurosurgery Labs, Basic Life support skills, virtual training in laboratories regarding various basic neurosurgical procedures, ICU care etc.
4. Responsible for taking informed consent before surgery & procedures, maintaining clinical records and discharge summaries, follow up details of patients.
5. Supervised learning in simple elective and all emergency neurosurgical procedures, attending neurosurgical emergency, learning hospital protocols etc.
6. Academic presentation of above learnings to internal classes and correction of any shortcomings thereof. The resident will be assigned one neurosurgical sub-speciality area to cover.
7. Empowered to receive “first responder call” on emergency neurosurgical situations, internal emergency references and elective OPD after three months of above exposure. He/she will also be responsible for medicolegal reports thereof as speciality clinical expert.
8. Revision training of basic research methodology and they will be assigned a research thesis subject for conducting research. Submission of

research protocol synopsis in proper form has to be completed within two calendar months of joining to the competent office.

9. The students are instructed to make at least two logbooks, and the data be filled regularly and checked by respective teachers: one for the academic presentations, presentations in various conferences & meetings, publications in various journals and the second one for the neurosurgery skills training, ICU log & operative procedures performed under supervision etc.
10. Participation in all academic activities of the Neurosurgery Department and interdepartmental meetings. Internal assessment & evaluation reports at the end of one year.

2nd year:

1. Primarily responsible for supervised ward rounds, informed consent, patient records and discharge summaries, follow up of patients and skill training to his/her immediate junior colleagues.
2. Second responder on call on elective and emergency neurosurgical procedures, internal & emergency references and OPD.
3. Advance learning in neurosurgery, neuro-critical care, neuroimaging, neuropathology etc.
4. Skill-based training on cadavers & micro-neurosurgery Labs, Advance Trauma Life support skills, virtual training in laboratories regarding various advance neurosurgical procedures, ICU care etc.
5. Advance learning of different general neurosurgical procedures, skill development in handling different neurosurgical equipment, assisting in major neurosurgical procedures with the teachers.
6. Supervised learning in various complex neurosurgical procedures, ICU care & neuro-interventions. Supervised performance of certain simple neurosurgical procedures independently.

7. Academic presentation of above learnings in internal classes and correction of any shortcomings thereof. He/she will be assigned one neurosurgical subspecialty area to develop the skill.

8. Various interim presentations & status updates regarding his/her research thesis subject for the ongoing research. It is desirable to conduct more research in certain potential areas, if so, record keeping and publications from one neurosurgical subspecialty area.

9. Participation in all academic activities of the Neurosurgery Department and interdepartmental meetings. Internal assessment & evaluation reports at the end of one year.

3rd year:

1. Overall in charge of neurosurgical wards. Inclusive responsible for supervised ward rounds, informed consent, patient records and discharge summaries, follow up of patients and skill training to his/her junior colleagues. They will be responsible for maintaining a liaison between the patients and the consultants.
2. The first responder on-call in operating rooms. Based on individual competence, will be assigned independent operating rooms for skill training.
3. More advanced learning in neurosurgery, neuro-critical care, neuroimaging, neuropathology etc. More advanced learning of different special neurosurgical procedures, skill development in handling different neurosurgical equipment, assisting in complex neurosurgical procedures with the teachers.
4. Supervised learning in various complex neurosurgical procedures, ICU care & neuro-interventions. Supervised performance of various neurosurgical procedures independently.
5. Fifteen days of the month of external ward posting in Neurology & Radiology Department of AIIMS, Bhubaneswar.

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6. One to two months (which may be split into two halves) of external posting in another neurosurgery centre in India for various advance skills in neurosurgery, provided the same training is not offered or adequately available in volume in Neurosurgery Department of AIIMS, Bhubaneswar. The trainee students will be given duty leave for this period. Depending on the local requirement of the department and various time slots available in the recipient centres, the student may apply for the training in their second or third academic year only.
 7. Participation in all academic activities of the Neurosurgery Department and interdepartmental meetings. Internal assessment & evaluation reports at the end of one year.
 8. Completion and submission of research thesis both in digital & in the hardbound form (two copies one for office another for the library) at least six months before the final examination to the competent authority. The thesis should be completed all aspect and made publication-ready. Only two months of the grace period will be allowed in case of late-breaking findings with the discretion of the head of the department or guide.
 9. Candidates who fail to achieve the above mentioned academic targets will not be allowed to appear in the final examination.

TRAINING ON SUB-SPECIALITY OF NEUROSCIENCES

Neuro-Anaesthesiology

There should be didactic lectures on resuscitation management of coma, life-support systems and monitoring of patients. The Neurosurgery trainees should know the interaction of anaesthetic drug/ protocols 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 once a week.

Clinical Neurology Neurophysiology

Candidates should have two months (one month in the beginning and one 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. Regarding weightage in the examination, it is felt that it should be five per cent of the theory and the practical examination.

Neuro-Biochemistry, Neuroimmunology

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

Visit to other Institutions

Candidate in 2nd or 3rd year is encouraged to apply for an observer-ship visit to other neurosurgical centres recognized by MCI for 1-2 months to be able to observe the difference in approaches to various neurosurgical problems and learn new procedures with prior approval from Director. The visit (which may be split into two halves) of external posting in another neurosurgery centre in India for various advance skills in neurosurgery, provided the same training is not offered or adequately available in

the Department. The trainee students will be given duty leave for this period. Depending on the local requirement of *the Department* and various time slots available in the recipient centres, the student may apply for the training in their second or third academic year only. Permission may also be granted to have skill development training in certain special areas like micro-surgical Lab. training outside the Institute when such facilities don't exist in *the Department.* However, this external observership &/or training may not be claimed as a matter of right by the students, and this will be subject to academic fulfilment by the candidates & other priorities of *the Department.* In such a scenario, the decision of *the HOD* will be final and binding. At the end of the external posting, the student has to submit a posting report after joining within one month.

RESEARCH AND PUBLICATIONS

THESIS

The candidate should be involved in one research project, which should preferably be prospective.

- Each candidate will be allotted a mentor/ guide by the Head of Department in consultation with the faculty members in the initial three months.
- The areas of project work should be decided in discussion with these mentors, and the research project should be presented in the departmental research meeting at the end of three months of joining the training period
- The candidate should get his thesis approved by the technical advisory committee and the institute ethics committee before commencing his work.
- Departmental thesis committee meetings held every six months will evaluate the progress of the thesis of the candidate. Each candidate will have his turn for thesis presentation by rotation
- The completed thesis should be ready for submission at 30 months of residency training.
- The research projects should have been published or publishable in peer-reviewed journals at this point of the training period.

- Additional credits will be awarded to residents who involve in peer-reviewed projects funded by institute/external funding agencies.

Paper publications and presentations

- It is desirable to have at least one clinical paper submitted in a peer-reviewed journal indexed in "Index Medicus" before appearing the final examination.
- At least one abstract presentation should be made at a national/international level scientific meeting.

ASSESSMENT

INTERNAL EXAMINATIONS

1. Examination on Research Methodology & Biostatistics will be conducted at the end of 2nd Semester. Total marks: 100 (20x5 = 100). This examination will be considered as an internal examination, but no marks will be added to the final/summative examination. Students must pass (obtaining $\geq 50\%$ marks) this examination as an eligibility criterion to appear in the Final examination. If someone secures $< 50\%$, he/she will appear in the next examination. The examination will be conducted by Examination Cell in the month of June-July & December-January every year. This is the duty of the student to enroll himself /herself for the above examination by applying through the proper channel.
2. Three internal examinations will be conducted in the department at the end of the 3rd semester, 4th semester and pre-final (four-month before final examination).
3. Marks distribution:
 - a. Theory = 100 marks, (Single Theory Paper; in each paper, One Long question carrying 20 marks and Eight Short question/notes: $10 \times 8 = 80$ marks.)
 - b. Practical with viva and logbook=100 Marks (Practical = 70, viva = 20, logbook =10, Total 100 marks).

Academic Schedule

The academic schedule of the department will be as follows:

Monday	Ward Round & Preoperative discussion	Operation Theatre	
		8:30 am -1:00 pm(OPD)	
Tuesday	8:30 am - 9:15 am (Preoperative discussion)	9:00 am -1:00 pm (OPD)	3:00-4:00 pm (Neuroradiology Conference)
Wednesday	Ward Round & Preoperative discussion(POD)	Operation Theatre	
		8:30 am -1:00 pm (OPD)	
Thursday	8:30 am - 9:15 am (Seminar Morbidity/Mortality Presentation)	9:00 am -1:00 pm (OPD)	4:00 pm – 5:00 pm (Neuropathology Conference)
Friday	Ward Round & Pre & post-operative discussion	Operation Theatre	
		8:30 am -1:00 pm (OPD)	
Saturday	8:30 am - 9:15 am (Journal Club)		

- c. The marks of the three internal examinations will be averaged to 100 each for theory and practical to calculate in the final examination.
4. A student will be eligible to appear for the final examination only when he /she:

- Passed (secured 50% marks) in the examination on Research Methodology and biostatistics and
- Passed (secured 50% marks) in internal examinations and
- The thesis submitted six months before the final examination and is approved/accepted by an external evaluator.

SUMMATIVE/FINAL EXAMINATIONS

1. Theory Examination (for MCh Neurosurgery):
Four (4) papers (100 marks each)

- Paper 1: Basic & Allied Sciences
- Paper 2: Applied & Clinical Neurosurgery (Brain)
- Paper 3: Applied & Clinical Neurosurgery (Spine & Peripheral Nerves)
- Paper 4: Recent advances

2. Question Paper Format: In each paper, One Long question carrying 20 marks and Eight Short question/notes: 10 x 8 = 80 marks.

3. Total theory marks: 500

Theory papers in the final examination=400 marks plus an average of 3 internal examination = 100 marks.

5. The theory examinations will be held earlier than the Clinical and Practical examination so that the answer books can be assessed and evaluated before the start of the Clinical/ Practical and viva examinations.

6. Practical examination:

Total marks: 500 (Practical and viva in the final examination – 400 marks and an average of 3 internals- 100 marks)

The format of the practical examination

Parts	Components	Marks allotted
PART A ** 200 Marks	Longcase (1)	75
	Short cases (3)	75
	Ward Round	50
PART B 200 Marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	50
	Logbook	10
	Scientific writing (manuscript written out of the thesis)	15

** Students should pass (secure 50% marks) separately in Part A

Final Marking Pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	Four months before the final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

Passing Marks

1. The student has to secure $\geq 50\%$ marks in the internal examination to be eligible to appear for the final examination.
2. In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
3. In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

Thesis

As a part of MCh Neurosurgery curriculum, the student should complete one thesis project during the tenure and it is desirable to submit the proof of communication of the manuscript (originated from his/her thesis) to an indexed peer-reviewed journal.

Thesis Evaluation

1. The student should submit the completed thesis six months before the final examination.
2. Plagiarism check: If more than 20% plagiarism is detected, the student will be asked to rewrite and resubmit. Plagiarism checking will be done before the thesis is bound.
3. The thesis will be sent to one external evaluator for approval.
4. The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as Accepted, Accepted with suggested modification and Rejected
5. If the thesis is accepted with suggested modifications, the comments of the evaluator will be intimated to the student and the guide for necessary correction/modifications. After modification, the thesis will be evaluated by a departmental committee for final approval.

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6. If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
 7. Approval of the thesis is mandatory to appear for the final examination.
 4. Brazis PW, Masdeu JC, Biller J. Localization in Clinical Neurology: Wolters Kluwer Health; 2012.
 5. Winn HR. Youmans Neurological Surgery: Elsevier Health Sciences; 2011.

RECOMMENDED BOOKS

1. Apuzzo MLJ, Abeloff D. Brain Surgery: Complication Avoidance and Management: Churchill Livingstone; 2010.
2. Campbell WW. DeJong's The Neurologic Examination: Wolters Kluwer Health; 2012.
3. Ropper AH, Samuels MA, Klein J. Adams and Victor's Principles of Neurology: McGraw-Hill Education; 2014.
6. Quinones-Hinojosa A. Schmidek and Sweet: Operative Neurosurgical Techniques: Indications, Methods and Results: Elsevier Health Sciences; 2012.
7. Yaşargil MG, Abernathey CD. Microneurosurgery: Thieme; 1996.
8. Rengachary SS, Ellenbogen RG. Principles of Neurosurgery: Elsevier Mosby; 2005.
9. Love S, Perry A, Ironside J, Budka H. Greenfield's Neuropathology: CRC Press; 2018.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC & ALLIED SCIENCES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the microsurgical anatomy of Cavernous sinus.
2. Describe the pathophysiology of rigidity.
3. Describe the principles of brain Magnetic Resonance Imaging (MRI).
4. Describe the adverse effects of newer antiepileptics drugs.
5. Discuss the rationale of antibiotic prophylaxis for brain & spine surgery.
6. Describe the recent WHO histopathological classification of Glioma.
7. Describe the treatment options for VAP (Ventilator Associated Pneumonia) in neurosurgical intensive care.
8. What are the advantages & limitations of Intraoperative neurophysiology monitoring (IONM)?
9. Describe the epidemiology of head injury in India and their preventive strategies undertaken.

PAPER 2

APPLIED & CLINICAL NEUROSURGERY (BRAIN)

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the surgical approaches to Pineal tumours.
2. Describe the classification and management in parasagittal meningioma.
3. Describe the surgical approaches to Craniopharyngiomas.
4. Describe the management strategy of vasospasm in Subarachnoid Haemorrhage.
5. Describe the nonsurgical management of trigeminal neuralgia.
6. Describe the outcome in Low grade glioma (LGG) treatment in relation to various other treatment strategies.
7. Describe the management of Minor Head Injury.
8. Describe the classification of arteriovenous malformations (AVM) of brain.
9. Describe the complications in Endoscopic 3rd Ventriculostomy.

PAPER 3

APPLIED & CLINICAL NEUROSURGERY (SPINE & PERIPHERAL NERVES)

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the diagnosis & management of Cranio-Vertebral Junction (CVJ) anomaly.
2. Describe types of split cord malformations (SCM) and its management options.
3. Describe the classifications of thoracic scoliosis.
4. Describe the treatment options in thoracic spine injury.
5. Describe the neurosurgical management of dystonia in cerebral diplegia.
6. Describe the various nerve transfer techniques in traumatic brachial plexus injury.
7. Describe the clinical features & diagnosis in peri-conus extramedullary spinal cord tumour.
8. Discuss the classification of Arteriovenous malformations of spinal cord.
9. Discuss the classification of syringomyelia & treatment options.

PAPER 4

RECENT ADVANCES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the role of invasive EEG & MEG (Magneto Encephalography) in preoperative evaluation of a patient for epilepsy surgery.
2. Discuss the advantages & limitations in the use of robots in neurosurgery.
3. Discuss the gene therapy for Glioma.
4. Describe the surgical complications in minimally invasive spine (MIS) surgery.
5. Describe the preoperative planning of Image Guided Spine surgery.
6. Write briefly about stem cell therapy in parkinsonism.
7. Discuss salient features in the recent guidelines of endovascular surgery in ischemic brain stroke.
8. Describe the recent advances in neuro-endovascular management of basilar top aneurysms.
9. Describe the various complications in awake craniotomy brain surgery.

ANNEXURE 1

(Model Syllabus)

PAPER 1

(Basic & Allied Sciences)

NEUROANATOMY

Neurosurgical anatomy of the Brain, Spinal Cord & Peripheral Nerves.

NEUROPHYSIOLOGY

Clinical Pathophysiology of Traumatic Brain & Spine Injury

Anatomy & Physiology of Pain, Neurovascular syndromes.

Pathophysiology of Movement disorders & Parkinsonism.

Intraoperative Neurophysiology & Electro Encephalogram (EEG)

Neurophysiology of Neuromuscular diseases.

NEUROCHEMISTRY, MOLECULAR MEDICINE & PATHOPHYSIOLOGY

Neurochemical Patho-mechanisms in Traumatic Brain & spine Injury

Neurochemistry & Molecular Biology and Genomics for Neurosurgeons

MICROBIOLOGY & INFECTION

Basic Science of Central Nervous System Infections

Infections of the Brain & Spine

Infective diseases of peripheral nerves

NEUROPATHOLOGY

WHO Classifications of brain tumours.

Neuropathology Pathology of Spinal tumours.

Neuropathology of Neuromuscular Disorders

Neuropathology of Traumatic Brain & Spinal Cord Injury

NEUROPHARMACOLOGY

Antiepileptic Drugs

Pharmacology of Neuroendocrine, Bone & Metabolic disorders

Cerebral Antioedema medications & Corticosteroids

Pharmacology of Chemotherapeutic drugs in Neuro-oncology

Material Pharmacology & Bone substitutes

NUTRITION & DIETETICS IN NEUROSURGERY

Dietary manipulation in Epilepsy

NEUROIMAGING & NEURORADIOLOGY

Computed Tomography and Magnetic Resonance Imaging of the Brain

Radiology of the Head & Spine

Molecular Imaging of the Brain with Positron Emission Tomography

REHABILITATION & PHYSIOTHERAPY

Rehabilitation of Patients with Traumatic Brain & Spine Injury

Rehabilitation of Patients with Stroke.

EPIDEMIOLOGY OF NEUROSURGICAL DISEASES

NEUROSURGICAL CRITICAL CARE

PAPER 2

(Brain)

NEURO-ONCOLOGY (Brain)

Neoplasms of Brain

Neurocutaneous syndromes

Familial Brain tumours

Radiotherapy & Chemotherapy for brain tumours

NEUROTRAUMA (Brain)

Traumatic Brain Injury

CEREBROVASCULAR SURGERY

Cerebral Aneurysm & Arteriovenous malformations (AVMs).

Vascular Syndromes & Stroke

CEREBRO VASCULAR NEUROSURGERY

EPILEPSY SURGERY

STEREOTACTIC AND FUNCTIONAL NEUROSURGERY (Brain)

NEUROSURGERY OF PAIN MANAGEMENT

NEURO-ENDOVASCULAR SURGERY (Brain)

PEDIATRIC NEUROSURGERY (Brain)

CRANIO-STENOSES & HYDROCEPHALOUS

PAPER 3

(Spine & Peripheral Nervous System)

NEURO-ONCOLOGY (Spine & Peripheral Nerves)

Tumours of the spinal cord

Neurocutaneous syndromes (Peripheral Nerves)

Spinal Metastasis

CONGENITAL & DEGENERATIVE DISEASES OF SPINE

Craniovertebral Anomalies

Degenerative diseases of spine & spondylolistheses

NEUROTRAUMA (Spine & Peripheral Nerves)

Traumatic Spine Injury

Traumatic injury of Peripheral Nervous system.

DEGENERATIVE & DEFORMITY SPINAL SURGERY

VASCULAR NEUROSURGERY OF SPINE & SPINAL CORD

NEURO-ENDOVASCULAR SURGERY OF SPINE & SPINAL CORD

SPINAL BIOMECHANICS & INSTRUMENTATION

PEDIATRIC NEUROSURGERY (Spine)

SURGERY OF THE PERIPHERAL NERVOUS SYSTEM

PAPER 4

(Recent Advances in Neurosurgery)

RECENT ADVANCES in NEUROONCOLOGY

Stereotactic Radiosurgery (SRS) & Gamma Knife

Stem Cell Therapy

Gene Therapy

RECENT ADVANCES in EPILEPSY SURGERY

RECENT ADVANCES in STEREOTACTIC AND FUNCTIONAL NEUROSURGERY

RECENT ADVANCES in NEUROSURGICAL CRITICAL CARE

RECENT ADVANCES in NEURO-ENDOVASCULAR SURGERY

RECENT ADVANCES in SPINAL BIOMECHANICS & INSTRUMENTATION

MINIMALLY INVASIVE SPINE SURGERY

RECENT ADVANCES in NEURO ENDOSCOPY

ROBOTICS & IMAGE GUIDED SURGERY OF BRAIN & SPINE

TRANSPLANT SURGERY & NEUROSCIENCES

RECENT ADVANCES in NEUROSURGICAL TRAINING & SIMULATION.

BRAIN COMPUTER INTERFACE & Artificial Intelligence (AI) in Neurosurgery

RECENT ADVANCES in PHYSIOTHERAPY in REHABILITATION in Neurosurgery

Entrustable Professional Activities

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
1	Gathering a history and performing a physical examination	*	*	*	*	*	*	II	III	IV	V	S, P, PG, I
2	Prioritizing a differential diagnosis following a clinical encounter	*		*			*	I	II	III	IV	S, PG, I
3	Recommending and interpreting common diagnostic and screening tests	*	*	*	*			II	II	III	IV	S, I
4	Entering and discussing orders and prescriptions and giving the necessary instructions to the patients	*	*	*	*		*	II	III	IV	V	S, P, PG, I
5	Documenting a clinical encounter in patient records	*	*			*		II	II	III	IV	S, PG, I
6	Provide an oral presentation of a clinical encounter	*		*			*	I	III	IV	V	S, PG, I
7	Form clinical questions and retrieve evidence to advance patient care	*		*				I	II	III	IV	S, I
8	Give or receive a patient handover to transition care responsibility	*	*	*	*		*	I	II	III	IV	S, PG, H, I
9	Collaborate as a member of an inter-professional team	*					*	II	III	IV	V	S, PG, H, P, I
10	Recognize a patient requiring urgent or emergency care and initiate evaluation and management	*	*	*	*		*	I	II	III	IV	S, PG, H, P, I
11	Obtain informed consent for tests and/or procedures	*	*		*		*	II	III	IV	V	S, P, PG
12	Performing general procedures of a physician / neurologist / surgeon	*	*	*	*		*	I	III	IV	V	S, PG, I
13	Identify system failures and contribute to a culture of safety and improvement	*	*	*	*		*	I	II	III	IV	S, PG, I
14	Management of unconscious patient	*	*	*	*		*	I	II	III	IV	S, PG, P, I, H
15	Management of Traumatic Brain Injury	*	*	*	*		*	I	II	III	IV	S, PG, P, I, H
16	Management of patient with status epilepticus	*	*	*	*		*	I	II	III	IV	S, PG, P, I, H

S. No.	EPA	Competency Domains						Level of competency					MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year		
17	Management of acute hydrocephalous	*	*	*			*	I	II	III	IV	S, PG, P, I, H	
18	Preoperative evaluation and counselling of Neurosurgery cases	*	*			*	*	I	III	IV	V	S, PG, P, I, H,	
19	Post-operative care & ICU management	*	*					I	II	III	IV	S, PG, P, I, H,	
20	Performing Lumbar Puncture & CSF Sampling	*	*			*	*	II	III	IV	V	S, PG, P, I, H,	
21	Preforming & Removal of Tracheostomy	*	*			*	*	I	II	III	IV	S, PG, P, I, H,	
22	Emergency Craniectomy/ ostomy for Head Injury	*	*			*	*	I	II	III	IV	S, PG, P, I, H,	
23	Performing Burr hole	*	*			*	*	I	III	IV	V	S, PG, P, I, H,	
24	Performing evacuation of EDH surgery	*	*			*	*	I	III	IV	V	S, P, I, H, PG	
25	Performing evacuation of Chronic SDH	*	*			*	*	I	II	III	IV	S, PG, P, I, H,	
26	Performing VP shunt & EVD removal	*	*			*	*	I	II	III	IV	S, PG, P, I, H,	
27	Perform Craniotomy for lobar glioma	*	*			*	*	I	II	III	IV	S, PG, P, I, H,	
28	Perform Laminectomy for Lumbar PIVD	*	*			*	*	I	II	III	IV	S, PG, P, I, H,	
29	Performing Pterional Craniectomy	*	*			*	*	I	II	III	IV	S, PG, P, I, H,	
30	Performing RMSO (retromastoid suboccipital craniectomy)	*	*			*	*	I	II	III	IV	S, P, I, H, PG	
31	Performing anterior cervical discectomy for cervical PIVD	*	*			*	*	I	II	III	IV	S, PG, P, I, H,	
32	Performing cranioplasty surgery	*	*			*	*	I	II	III	IV	S, PG, P, I, H,	
33	Performing surgery for CTS (Carpal Tunnel Syndrome)	*	*			*	*	I	II	III	IV	S, PG, P, I, H,	
34	Performing Taping of a Brain Abscess	*		*				I	II	III	IV	S, PG, I	
35	Performing common OPD office procedures: Ophthalmoscopy, nasal pack removal & resuturing of scalp wound	*	*	*		*	*	I	II	III	IV	S, PG, P, I, H,	
36	Cadaver temporal bone dissection: Brachial Plexus exposure	*		*				I	II	III	IV	S, PG, I	
37	Reading and interpreting all basic CT Scan, MRI & X-ray of Brain & Spine.	*	*			*	*	I	II	III	IV	S, PG, I	

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
38	Reading and interpretation of EEG, PTA, BERA. VEP, Basic Neurophysiology findings etc	*	*		*	*	*	I	II	III	IV	S, PG, I
39	Reading and interpretation of CT PNS, HRCT temporal bone and CT angio/DSA of Brain & Spine.	*	*			*	*	I	II	III	IV	S, PG, I
40	Research Methodology and Writing up a research paper	*				*	*	I	II	III	IV	S, I
41	Day-care and minor procedures in Neurosurgery: EVD / Stereotactic Head Frame placement / Basic Neuronavigation Skills etc	*	*			*	*	I	II	III	IV	S, PG, P, I, H,
42	Performing surgery for meningomyelocele, & pediatric VP shunt	*	*			*	*	I	II	III	IV	S, PG, P, I
43	Cadaver temporal bone dissection, ACP (Anterior Clinoid Process) drilling etc	*		*				I	II	III	IV	S, PG, I
44	Performing all Neurosurgical Positioning & Head Frame placement.	*	*			*	*	I	II	III	IV	S, PG, I
45	Performing & assisting Cranial IA DSA procedure in Cath Lab	*	*			*	*	I	I	I	II	S, PG, I
46	Performing a Stereotactic Biopsy procedure	*	*			*	*	I	II	III	IV	S, PG, I

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level I: Knowledge only; can observe

Level II: Can do under strict supervision

Level III: Can do under loose supervision

Level IV: Can do independently

Level V: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

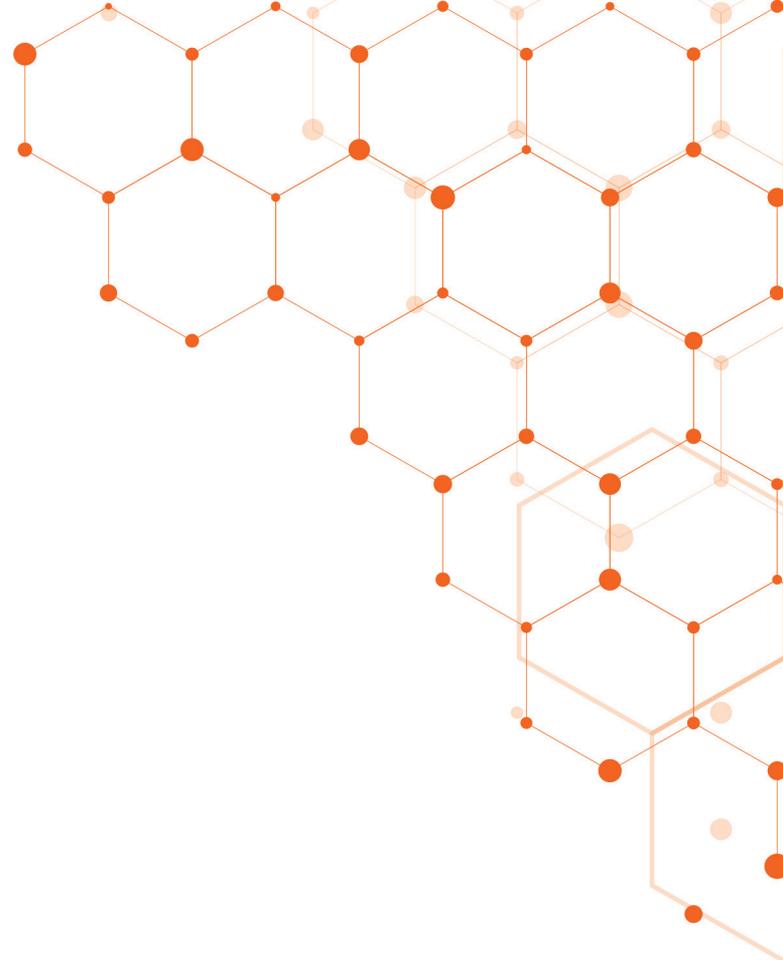
Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



PAEDIATRIC SURGERY



MCh in Paediatric Surgery

COURSE NAME:

MCh Paediatric Surgery

DURATION OF COURSE:

Three years

ELIGIBILITY:

MBBS, MS/ DNB (General Surgery)

OBJECTIVES

The aim of MCh Paediatric Surgery course is to produce Paediatric Surgeons who are capable of setting a standard and demonstrate commensurate expertise in the field.

The training should aim to facilitate the candidate's acquisition of a judicious mix of the three domains of learning –

- Cognitive (knowledge),
- Psychomotor (practice) and
- Affective (communication).

At the end of the training, the candidate must have attained the following

A. Knowledge

- Be conversant with the aetiology, pathophysiology, diagnosis and management of common neonatal and paediatric surgical problems; both elective and emergency.
- Have a clear understanding of the basic sciences (anatomy, physiology, etc.), paediatric and neonatal medicine as applicable to paediatric surgical practice.
- Recognize the importance of the interdisciplinary approach in the management of various paediatric surgical disorders and obtain relevant specialist / ancillary services' consultation where appropriate.
- Should have participated in either/both clinical and experimental research studies

and published articles / presented work at scientific meet/conferences.

- Recognize the importance of family, society and socio-cultural environment in the treatment of the sick child.

B. Practice

- Evaluate a given patient thoroughly completely (history, clinical examination), order relevant investigations and interpret them to reach a diagnosis and management strategy.
- To perform simple investigations/ procedures (bedside, laboratory, radiology suite) independently.
- Be able to provide basic and advanced life support services in emergencies.
- Be able to prepare a patient for an elective/emergency surgery and postoperative period.
- Be conversant with counselling techniques for the family / primary caretakers.
- Be skilled in the performance of routine ward procedures (e.g. venesection, bladder catheterization, dressings, and mechanical bowel preparation).
- Be able to perform prescribed minor and major operative procedures with assistance and independently.
- Be able to monitor the patient post-operatively in the intensive care setting / routine post-op ward.
- Be ready to provide relevant advice to patient and family at discharge for follow up.

C. Communication skills

- Develop and practice effective communication skills.
- Professionally interact and obtain relevant specialist/ancillary services' consultation where appropriate
- Display the ability to impart the acquired

training to others in a teaching unit and establish a paediatric surgical unit.

- Effective communication with the caregivers of the paediatric patient, including counselling.

D. Medical Ethics and Human values

Adoption of ethical principles in all aspects of pediatric surgical practice/ research. (Professional honesty and integrity, humility, informed consent, counselling, recognize patients' rights and privileges, etc.).

At the end of the training, a candidate shall be able to:

1. Provide optimum care to paediatric patients needing surgical service.
2. Teach and train paediatric surgery students and junior doctors in medical college and other institutions.
3. Carry out and guide research in surgical science and education
4. Develop knowledge, skills and attitude (Competence) in areas of interest in different sub-specialties.
5. Organize and work effectively as a member of the medical team at different levels, including natural disasters.
6. Develop and maintain ethical and moral values.
7. Be available for national needs and expectations in health care as appropriate.

As one caring for the sick child with a surgical problem, he should be proficient in the following specifically -

- a. Receive and assess the children with surgical problems by
 - Eliciting pertinent history
 - Performing correct physical examination
 - Making a working diagnosis
 - Determining the type of care - outpatient/ inpatient /daycare

- Initiate and institute life-saving emergency care, including CPR.
 - Requesting appropriate investigation and interpretation of their result.
 - Perform emergency and elective surgical procedures with due competence.
 - Identify promptly the complications promptly and deal with them safely.
 - Document and maintain a record of patients systematically.
 - Seek professional help from other colleagues where needed.
 - Treat patients and their relatives with respect and empathy.
- b. Organize teamwork and appreciate the role of team members.
 - c. Establish effective communication with patients, their relatives, colleagues and other health professionals.
 - d. Advice for the prevention of diseases and promotion of health in the community
 - e. Conduct scientific research and publish findings.

SYLLABUS CONTENT

General

- Medical Genetics.
- Antenatal diagnosis and fetal therapy
- Developmental and transitional physiology of the respiratory, cardiovascular and renal systems
- Neonatal physiology and assessment of the surgical neonate.
- Neonatal sepsis
- Nutrition – enteral, parenteral
- Vascular access
- Paediatric analgesia and anaesthesia.
- Biomedical ethics and legal issues in paediatric surgical practice.
- The organisation of a paediatric surgical unit
- HIV/AIDS in children

Trauma

- Paediatric trauma – general principles.
- Thoracic, abdominal, genitourinary, central nervous system trauma (detail)
- Soft tissue and envenomation injuries
- Musculoskeletal and vascular trauma
- Burns
- Child abuse.

Paediatric Oncology

- General principles
- Wilm's tumor, Neuroblastoma, Liver tumours, Rhabdomyosarcoma, Teratomas and Germ cell tumours and Gonadal tumors – (details)
- Other tumor of childhood (outline)- Lymphomas, Bone tumours, Brain tumours, Retinoblastoma.

Transplantation

- General principles
- Kidney and liver transplantation (details)

Head and Neck

- Craniofacial anomalies
- Cleft lip and palate
- Disorders of the upper airway and oral cavity.
- Salivary glands
- Disorders of lymph nodes.
- Thyroid and parathyroid gland
- Cysts and sinuses of the neck
- Torticollis

Thorax

- Congenital chest wall deformities.
- Disorders of the breast.
- Diaphragmatic hernia and eventration
- Mediastinal mass lesions.
- Endoscopy of the upper aerodigestive tract.
- Congenital tracheal and Bronchopulmonary/foregut malformations.

- Infective pleuropulmonary condition.
- Congenital oesophageal anomalies
- Oesophageal motility disorders
- Oesophageal rupture, stricture, perforation.
- Oesophageal replacement.

Abdomen

- Umbilical disorders and abdominal wall defects.
- Inguinal hernias and hydroceles
- Testicular maldescent, torsion
- Hypertrophic pyloric stenosis.
- Duodenal atresia, annular pancreas.
- Jejunioileal atresia and stenosis
- Meconium ileus
- Meckel's diverticulum
- Intussusception.
- Disorder of midgut rotation.
- Short bowel syndrome
- Gastrointestinal endoscopy and laparoscopy.
- Gastrointestinal bleeding
- Gastrointestinal duplications.
- Mesenteric and omental cysts
- Ascites
- The polypoid disease of the GIT
- Necrotising enterocolitis.
- Intestinal stomas
- Primary peritonitis.
- Inflammatory bowel disease in children.
- Colonic atresia and functional obstruction.
- Appendicitis
- Hirschsprung's disease, neuromuscular disorders of intestines
- Anorectal malformations.
- Colonic and rectal tumours
- Neonatal/Infantile obstructive cholangiopathy
- Congenital biliary dilatation.
- Infective and inflammatory hepatobiliary disorders.

- Benign liver tumours
- Portal hypertension.
- Disorders of the pancreas
- Splenectomy and post-splenectomy sepsis.
- Adrenal gland.

Genitourinary and related disorders

- Renal agenesis, dysplasia, cystic disease, ectopia.
- Pelvic ureteral junction obstruction.
- Vesicoureteric reflux
- Infective and inflammatory renal disorder.
- Congenital ureteric anomalies.
- Prune belly syndrome
- Urinary diversion and undiversion, bladder augmentation
- Disorders of bladder function.
- Structural bladder disorders
- Exstrophy – epispadias complex.
- Hypospadias.
- Anomalies of the external genitalia
- Disorders of Sex Differentiation
- Abnormalities of the female genital tract.

Special Paediatric Surgery

- Spina bifida
- Hydrocephalus
- Congenital heart disease
- Congenital orthopaedic deformities
- Amputation, bone and joint infections
- Conjoined twins
- Hemangiomas & vascular malformations.

PRACTICAL

The student will receive graded exposure to the different operative procedures, and these will be recorded in the logbook. They are to be recorded as O-Observed, A-Assists senior, PA-Performs with assistance from a senior or under supervision, P-Performed independently during the course. The total number of cases on an annual basis (year 1,

year 2, year 3) has to be mentioned in the Logbook as per departmental format.

The student must prepare a Logbook, which is a detailed record of the activities and training are undertaken for three years. This is an outline of educational activities, assessment tools and performance indicators. It will contain date-wise details of the academic and other activities carried out by the student, as well as the assessment form for each activity as per the annexure.

The logbook is reviewed six monthly by the departmental faculty to supplement deficits if any in the succeeding six months.

In general, assessment will grade the student as -

O = Outstanding , G = Good , S = Satisfactory , U = Unsatisfactory , N = Not assessed

TEACHING & LEARNING METHODS

Academic sessions

During the course, the candidate shall present some academic sessions and attend the others. Each session will be designed to last 1 hour with at least 15 minutes devoted to a discussion on the topic

An academic session may be any of the following:

- a. Subject seminar: At least two such sessions are recommended every month. The seminars are aimed to cover the majority of topics in the syllabus. Each candidate shall present at least four seminars in one academic year and attend at least 12 others.
- b. Journal review: Recommended at least once a week. Relevant articles from recommended journals are reviewed. Each candidate shall present at least 8 journal reviews in one academic year and attend at least 24 others.
- c. Clinical case presentation: Representative clinical cases shall be presented and discussed in detail in these sessions. Two such sessions are recommended every month and should include a mix of short and long cases. Each candidate shall present at least four clinical cases in one academic year and attend at least 12 others.

-
- d. Interdepartmental meetings: Inter-departmental meetings shall facilitate clinical/group discussion/symposia etc. (e.g., pediatric pathology, paediatric radiology/ nuclear medicine meeting.) Two such monthly meets are recommended. Each candidate shall present at least four such meets in one academic year and attend at least 12 others.
- f. Pediatric pathology meeting: This is conducted in association with the consultant pathologist(s). The subject may include histopathology review, clinicopathological conferences, autopsy discussion etc.,
- g. Pediatric radiology/ nuclear medicine meeting: Organized along with consultant Radiologist(s), it enables an analysis of common and uncommon radiological/nuclear medicine investigations in general or certain clinical cases in particular.
- e. Operative procedures: This session, recommended once a month, aims at discussing common operative procedures and practical details. Each candidate shall present at least two such meets in one academic year and attend at least six others.
- f. Treatment planning: Recommended once monthly, this session will focus on management strategies of specific clinical cases, particularly where a multi-speciality approach is planned. Each candidate shall present at least two such meets in one academic year and attend at least six others.
- g. Ward rounds and Teaching round: There would be at least once consultant-led ward round daily. This would be a service round with individual case presentation and a brief discussion. Besides, at least three teaching rounds per week are recommended involving detailed discussion on admitted clinical cases. Besides theoretical aspects, emphasis must be laid on bedside assessment and practical management issues.
- months. There is no specified compulsory posting in Emergency Medicine/ Casualty; however, the student will attend the emergency cases pertaining to/ referred to their department at the Emergency department / Casualty in the course of the routine clinical duties.
- a. Pediatric Intensive Care Unit: Duration- 2-4 weeks. This is intended to familiarize the candidate to the principles of pediatric medical intensive care and its applications to pediatric surgical care.
- b. Neonatology Intensive Care Unit: Duration- 2-4 weeks. During this posting, the candidate will receive training on care of the sick neonates, particularly premature and small for dates. Neonatal resuscitation, management of common neonatal problems (e.g. hypoglycemia, hyperbilirubinemia) and advanced life support systems (e.g., ventilatory care) will be included.
- c. Optional External Posting: Other postings may be scheduled as deemed necessary for the fulfilment of curricular demands, e.g. Paediatric Oncology, etc. in the third year, in the same or another tertiary teaching centre/ institute. The special training in another institute may be for one that is currently not available at AIIMS, Bhubaneswar. It may be for 4-8 weeks with the prior approval of the Director. Prescribed institutional regulations will be adhered to for such an external posting.

The conference, CMEs and Workshops

- a. Participating in and contributing to the organization of such meets is desirable. During the three years of training; he/she should attend at least one national level, and two state-level meets and present a paper in each of them.
- b. A total of 15 days may be availed by the student for attending such academic activities over the three years. This will be considered as On-duty.

External Postings

The MCh (Pediatric Surgery) trainee will be posted in the following allied specialities. The total duration of these postings shall not exceed three

Thesis

The candidate must be familiar with basic research methodology, including statistical methods and undertake at least one research project under the

guidance of a postgraduate teacher. The research may be experimental or clinical. This will be assigned to the candidate at the inception of the training, and he/she will be required to submit a report on the same by the end of the course. Periodic evaluation of the progress will be done by the postgraduate teacher and departmental head.

The student should complete one thesis project during the tenure and should submit the proof of communication of the manuscript (originated from his/her thesis) to an indexed peer-reviewed journal.

Thesis evaluation

- The student should submit the completed thesis six months before the final examination.
- Plagiarism check: If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.
- The thesis will be sent to one external evaluator for approval.
- The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as Accepted, Accepted with suggested modification and Rejected.
- If the thesis is accepted with suggested modifications, the comments of the evaluator

will be intimated to the student and the guide for necessary correction/modifications. After modification, the thesis will be evaluated by a departmental committee for final approval.

- If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination.

Publications

The MCh trainee will be required to prepare material for publication under the guidance of a postgraduate teacher. It is desirable to submit at least one original article from the content in the MCh thesis that he/ she has worked on for publication and it is mandatory to present it (manuscript for publication to an indexed journal) to the examiners at the summative examination.

Teaching

The candidate will assist and be involved in the teaching of undergraduate medical/ nursing students and those training for MS (Gen. Surg.) and MD (Paed). He/she will learn the use of various teaching media (e.g. audiovisual aids) in this exercise.

DEPARTMENTAL TRAINING SCHEDULE & POSTING OF RESIDENTS

Ist Year

Academic	Training	Procedure/operative skills
<ul style="list-style-type: none"> • Seminars • Journal Review • Departmental presentation (in the house) 	<ul style="list-style-type: none"> • Case Notes • Presentation on rounds • Summary • Communication skills • Computer skills; computer-assisted learning • NALS/PALS course • Research methodology course 	<ul style="list-style-type: none"> • Resuscitation • Bedside procedures • Minor OT procedure (e.g. Herniotomy, orchidopexy) • Major OT procedures (e.g., neonatal colostomy, laparotomy for intestinal obstruction.)

IInd Year

Academic	Training	Procedure/operative skills
<ul style="list-style-type: none"> • Seminars • Operative procedure • Interdepartmental presentation • Publication Conference / Workshop / CME 	<ul style="list-style-type: none"> • Research activity • Pedagogy training 	<ul style="list-style-type: none"> • Simple endoscopic procedures and minimally invasive surgeries (e.g. cystoscopy, bronchoscopy for foreign body, minor laparoscopy) • Major OT procedures (e.g. pyelolithotomy, laparotomy for trauma).

IIIrd Year

Academic	Training	Procedure/operative skills
<ul style="list-style-type: none"> • Treatment planning • Operative procedures. • Symposium • Publication 	<ul style="list-style-type: none"> • Planning a department (Equipment, administration etc.) • External postings 	<ul style="list-style-type: none"> • Endoscopic procedures and minimally invasive surgeries (e.g. major laparoscopy) • Major OT procedure (e.g. neonatal bowel anastomosis, pyeloplasty) • Neonatal surgery.

ASSESSMENT

CONCURRENT ASSESSMENT

The primary purpose of this day to day evaluation is to identify areas for development by constructive feedback between the student and the teacher. Collectively they are used as a part of the annual performance assessment of the student. These are completed immediately after the academic activity.

The methods used for concurrent assessment of the following academic activity are appended in respective Annexures -

- Seminar (Annexure - 1)
- Journal Review (Annexure -2)
- Clinical Case Discussion (Annexure - 3)
- Operation Theatre Assessment (Annexure - 4)
- Entrustable Professional Activities (EPA) & Skill Assessment

Workplace-based assessments (WPBA) using various formats (Mini-Clinical Evaluation Exercise – mini CEX, Direct Observation of Procedural Skills - DOPS, Case-based Discussion- CBD and Mini- Peer Assessment Tool- mini PAT) as appropriate may be employed for formative assessment.

INTERNAL ASSESSMENT

- An examination on 'Research Methodology & Biostatistics' will be conducted at the end of 2nd Semester. This examination will be considered as an internal examination, but no marks will be added to the final/summative examination. The total marks are 100 (20x5=100). Students have to pass (obtaining >50% marks) this examination as an eligibility criterion to appear in the Final examination. If one secures <50%, he/she will appear in the next examination. The examination will be conducted by Examination Cell in the month of June & December every year.
- There will be no examination on applied sciences at the end of the 2nd semester. It will be assessed at the final examination as a part of Paper I in most of the specialities
- A total of three internal examinations will be conducted at the end of the 3rd semester and 4th semesters and pre-final (at least four months before final examination).
- Marks distribution: Theory 100 marks and Practical with viva and logbook 100 marks (Practical – 70, viva – 20, logbook – 10). The marks of the three internal examinations will

be averaged to 100 each for theory and practical and added to the final examination.

Paper III: Oncology, Genitourinary, Special Paediatric Surgery

Paper IV: Recent advances in Paediatric surgery

SUMMATIVE ASSESSMENT

Eligibility for appearing in the Final Examination

- Passed (secured 50% marks) in the examination on Research Methodology and biostatistics (end of 2nd semester) and
- Passed (secured 50% marks) in aggregate of internal examinations, theory and practical (end of 3rd, 4th semester and prefinal) and
- Dissertation/thesis submitted six months before the final examination and is approved/accepted by an external evaluator.

Final Theory Examination

• Paper wise syllabus distribution

Paper I: Basic & Allied Sciences

Paper II: Head & Neck, Thorax, Abdomen and Trauma

- **Question Paper Format:** In each paper, One Long question carrying 20 marks and Eight Short question/notes – 10 x 8 = 80 marks.

• Total marks - 500 marks

- Final examination - 400 marks
- An average of three internal examinations - 100 marks

Final Practical examination

• Total marks - 500 marks

- An average of 3 internal examinations - 100 marks.
- Practical and viva in the final examination - 400 marks.

The format of the practical examination (400 marks)

Part	Component	Marks allotted
Part A (200 Marks)**	Longcase – One	75
	Short cases – Three (25 X 3)	75
	Ward Round	50
	Subtotal	200
Part B (200 Marks)	Operative Procedure and Instruments/department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva (Pathology specimens/Radiology / others)	50
	Logbook	10
	Scientific Writing (Manuscript written out of the thesis)	15
	Subtotal	200
	Total	400

** Students should pass (secure 50% marks) separately in Part A

Final Marking Pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	Four months before the final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

Passing Marks

1. The student has to secure $\geq 50\%$ marks in the internal examination to be eligible to appear for the final examination.
2. In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
3. In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

RECOMMENDED BOOKS

1. Docimo SG, Canning D, Khoury A, Salle JLP. The Kelalis-King-Belman Textbook of Clinical Pediatric Urology: CRC Press; 2018.
2. Eichenwald EC, Hansen AR, Stark AR, Martin C. Cloherty and Stark's Manual of Neonatal Care: Wolters Kluwer; 2017.
3. Pizzo PA, Poplack DG, Adamson PC, Blaney SM, Helman L. Principles and Practice of Pediatric Oncology: Wolters Kluwer; 2015.
4. Kliegman RM, Stanton BMD, Geme JS, Schor NF. Nelson Textbook of Pediatrics: Elsevier Health Sciences; 2015.
5. Spitz L, Coran AG. Rob & Smith's Operative Surgery: Pediatric Surgery, 5Ed: Taylor & Francis; 1998.
6. Rao PSSS, Richard J. An Introduction to Biostatistics: A Manual for Students in Health Sciences: Prentice Hall India Pvt., Limited; 2004.
7. Gray SW, Skandalakis JE. Embryology for surgeons: the embryological basis for the treatment of congenital defects: Saunders; 1972.
8. Puri P. Newborn Surgery: CRC Press; 2017.
9. Slovis TL, Caffey J. Caffey's Pediatric Diagnostic Imaging: Mosby/Elsevier; 2008.
10. Stocker JT, Dehner LP, Husain AN. Stocker and Dehner's Pediatric Pathology: Wolters Kluwer Health; 2012.
11. David L. Katz, Joann G. Elmore, Wild D, Sean C Lucan. Jekel's Epidemiology, Biostatistics, Preventive Medicine, and Public Health: Elsevier Health Sciences; 2013.
12. Corn AG, Adzick NS, Krummel TM, Laberge JM, Shamberger RC, Caldamone AA. Paediatric Surgery: Elsevier - Health Sciences Division; 2012
13. Gillenwater JY, Grayhack HT, Howard SS, Mitchell ME. Adult and paediatric urology: Lippincott, Williams and Wilkins; 2002
14. Freeman NV, Burge DM, Griffiths DM, Malone PSJ. Surgery of the Newborn: Churchill Livingstone; 1994

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC AND ALLIED SCIENCES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss the genetics of Neuroblastoma. What are its clinical applications in diagnosis and prognostication of the disease?
2. Describe the embryology of Multicystic Dysplastic Kidney.
3. Discuss the physiology of thermoregulation in a neonate.
4. Briefly describe the pharmacotherapy for vascular anomalies.
5. Discuss the management of hypoglycaemia in paediatric surgical patients.
6. Write in brief about ergonomics in paediatric laparoscopic surgery.
7. Describe the intraoperative fluid management in children.
8. Briefly outline the airway management in accidental trauma.
9. What are the long-term effects of radiotherapy for childhood malignancies?

PAPER 2

HEAD AND NECK, THORAX, ABDOMEN AND TRAUMA

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Classify Hirschsprung disease. Describe the diagnosis and principles of surgical management of Hirschsprung disease.
2. Discuss the Pediatric Trauma Score.
3. Enumerate the second branchial cleft anomalies.
4. Classify the Congenital Pulmonary Airway Malformation.
5. What are the surgical procedures in the management of Long Gap Esophageal Atresia?
6. Describe the resuscitation strategy of an infant with Infantile Hypertrophic Pyloric Stenosis.
7. What are the options available for nonoperative managements of Intussusception?
8. Discuss the investigations to confirm a diagnosis of Meckel's diverticulum.
9. Briefly describe the prognosis of extra hepatic biliary atresia.

PAPER 3

ONCOLOGY, GENITOURINARY, SPECIAL PEDIATRIC SURGERY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Classify tumours of the kidney in children. Describe the investigations, staging and treatment of Wilms tumour.
2. Briefly outline the staging of Hepatoblastoma.
3. What are the prognostic factors in Sacrococcygeal Teratoma?
4. Describe feminizing genitoplasty in Congenital Adrenal Hyperplasia.
5. Write briefly about the radiographic evaluation of Posterior Urethral Valve.
6. Discuss the diagnostic evaluation of Vesicoureteric Reflux.
7. Enumerate the differential diagnosis of a mass at the introitus in prepubertal girls.
8. What are the complications due to surgical incorporation of intestine into the urinary tract?
9. Describe the imaging in Occult Spinal Dysraphism.

PAPER 4

RECENT ADVANCES IN PEDIATRIC SURGERY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the criteria for antenatal diagnosis of hydronephrosis. Discuss the counselling and stepwise management of the condition during the antenatal and neonatal period.
2. Discuss the principles of Functional Magnetic Resonance Imaging.
3. Write briefly on immunohistochemistry in the diagnosis of small blue round cell tumours.
4. What are the advantages and disadvantages of robotic surgery over laparoscopic surgery in children?
5. Discuss the advanced ventilation strategies in Congenital Diaphragmatic Hernia.
6. Briefly describe immunosuppression in pediatric organ transplantation.
7. What are the patient selection criteria for adolescent bariatric surgery ?
8. Describe the utility of videourodynamics in paediatric urology.
9. Discuss the impact of tissue engineering in paediatric surgery.

ENTRUSTABLE PROFESSIONAL ACTIVITIES

Sl. No.	EPA	Competency Domains							Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of MCh	End of 2 nd sem.	End of 4 th sem.	End of 6 th sem.		
1	Gather a history and perform a physical examination	*	*	*		*	*	2	4	4	5	I,S,PG	
2	Establish a provisional diagnosis and prioritize a differential diagnosis	*		*		*		1	3	4	5	I,S,PG	
3	Recommend and interpret common diagnostic tests	*	*	*		*		1	3	4	5	I,S,PG	
4	Documentation of clinical findings in the hospital record.	*		*		*		2	3	4	5	I,S,PG,H	
5	Provide an oral presentation of clinical case	*				*		1	3	4	5	I,S,PG,H	
6	Differentiate an elective from emergency setting to initiate appropriate management	*	*		*	*		1	3	4	5	I,S,PG,H	
7	Basic trauma management	*	*	*	*	*		1	3	4	5	I,S,PG,H	
8	Basic Cardiopulmonary resuscitation	*	*	*	*	*		1	3	4	5	I,S,PG,H	
9	Form clinical questions and obtain evidence to facilitate patient care.	*	*	*		*		1	3	4	5	I,S,PG	
10	Enter therapeutic orders and prescriptions	*	*		*	*		1	3	4	5	I,S,PG,H	
11	Obtain informed consent for tests and procedures.	*	*		*	*		1	3	4	5	I,S,PG,P,H	
12	Monitor and enforce planned clinical care	*	*		*	*		1	3	4	5	I,S,PG,H	
13	Give/receive a patient handover in the transition of clinical responsibility	*	*		*	*		1	3	4	5	I,S,PG,H	
14	Collaborate as a member of an interdisciplinary team / liaise with other departments	*	*		*	*		1	3	4	5	I,S,PG,H	
15	Identify system failures and work towards patient safety	*	*		*	*		1	3	4	5	I,S,PG,H	

Sl. No.	EPA	Competency Domains							Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of MCh	End of 2 nd sem.	End of 4 th sem.	End of 6 th sem.		
16	Effective communication with peers / superiors / subordinates	*	*			*	*	1	3	4	5	I,S,PG,H	
17	Attitude towards patient and caretakers.	*	*			*	*	1	3	4	5	I,S,PG,P,H	
18	Preoperative counselling of patient and caretakers	*	*			*	*	1	3	4	5	I,S,PG,P,H	
19	Perform general procedures for the sick child, e.g. peripheral venous line placement, wound dressings	*	*		*	*	*	1	2	3	5	I,S,PG,H	
20	Basic Pre & post operative care of the sick child	*	*	*	*	*	*	1	2	3	5	I,S,PG,H	
21	Adherence to OT protocols – Asepsis, Scrubbing, Attire, etc.	*	*		*	*	*	2	3	4	5	I,S,PG,H	
22	Principles of infection control and adherence to antibiotic policy	*	*		*	*	*	2	3	4	5	I,S,PG,H	
23	Use of energy devices- diathermy, Harmonic scalpel	*	*			*	*	1	2	3	5	I,S,PG,H	
24	Handling instruments, Suture materials. Etc.	*	*		*	*	*	2	3	4	5	I,S,PG,H	
25	Basic operative skills, e.g. Suturing	*	*		*	*	*	2	4	4	5	I,S,PG,H	
26	Percutaneous guided procedures, e.g. PCN	*	*					1	2	3	4	I,S,PG,H	
27	Performing minor procedures, e.g. Inguinal Herniotomy.	*	*	*				1	2	3	5	I,S,PG,H	
28	Performing major procedure e.g. Pyeloplasty	*	*	*	*			1	2	3	4	I,S,PG,H	
29	Performing a neonatal surgery, e.g. Laparotomy for int. obst.	*	*	*	*	*	*	1	2	3	4	I,S,PG,H	
30	Orientation to Endoscopy and procedures (Cystoscopy/ Bronchoscopy)	*	*	*	*			1	1	2	3	I,S,PG,H	
31	Orientation to Minimally invasive Surgery (Laparoscopy / Thoracoscopy)	*	*	*	*			1	1	2	3	I,S,PG,H	
32	UG teaching / discussions	*		*		*	*	1	2	3	4	I,S,PG	

Sl. No.	EPA	Competency Domains							Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of MCh	End of 2 nd sem.	End of 4 th sem.	End of 6 th sem.		
33	PG teaching / discussions	*		*		*		1	2	3	3		I,S,PG
34	Nursing teaching/ discussions	*		*		*		1	2	3	4		I,S,PG,H
	Ability to conduct simple research studies							1	2	3	3		I,S,PG
35	Able to write Scientific Papers	*				*		1	2	3	3		I,S,PG
36	Able to discuss Scientific Papers					*		1	2	3	4		I,S,PG
37	Able to make a podium presentation at clinical fora	*				*		1	2	3	4		I,S,PG
39	Knowledge of biomedical ethics in practice	*				*		1	2	3	3		I,S,PG,H,C

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I

ANNEXURE 1

ASSESSMENT OF SEMINAR PRESENTATION

Date:

Topic:

Criterion	N	U	S	G	O
Coverage of topic / Content					
Comprehension of subject					
Clarity of presentation					
Cross-referencing of relevant publications.					
Use of audio-visual aids					
Time management					
Ability to answer questions					
Overall performance					
AGGREGATE GRADE					
Miscellaneous remarks:					

O = Outstanding , G = Good , S = Satisfactory , U = Unsatisfactory , N = Not assessed

Name and Signature of assessing faculty:

ANNEXURE 2
ASSESSMENT OF JOURNAL REVIEW

Date:

Article(s) reviewed:

- 1.
- 2.

Criterion	N	U	S	G	O
Choice of Article (s)					
Comprehension of scope & objectives of the article (s)					
Clarity of presentation					
Review of relevant cross-references / relevant publications					
Ability to respond to questions on the article (s) / subject					
Use of Audio-Visual aids					
Ability to analyse the article (s)					
AGGREGATE GRADE					
Miscellaneous remarks:					

Name and Signature of assessing faculty:

ANNEXURE 4

ASSESSMENT OF CLINICAL PRESENTATION

Date:

Clinical Case:

Criterion	N	U	S	G	O
Elicitation of history					
Interpretation of history					
General physical examination					
Specific systemic examination					
Interpretation of physical signs					
Basis of clinical diagnosis (History and examination)					
Investigative work up <ul style="list-style-type: none">• Complete list• Relevant order• Interpretation					
Justification of differential / final diagnosis					
Approach to treatment					
Clarity and order of presentation					
Response to questions					
AGGREGATE GRADE					
Miscellaneous remarks:					

Name and Signature of assessing faculty:

ANNEXURE 5

ASSESSMENT OF OPERATIVE PROCEDURE

Date	Name of the procedure:
Emergency / Elective	

Assessment: Mark as O/G/S/U/N

Obtains consent, after explaining the procedure and possible complications to the caregiver	
Prepares for procedure as per agreed protocol	
Knowledge of effective analgesia/anesthesia	
Asepsis and safe use of instruments and sharps	
Performs the technical aspects in line with the guidance notes	
Deals with any unexpected event /seek help when appropriate	
Completes required documentation	
Communicates clearly with staff and patient throughout the procedure	
Demonstrates professional behaviour throughout the procedure	

O = Outstanding , G = Good , S = Satisfactory , U = Unsatisfactory , N = Not assessed

Summary: Please tick

Insufficient evidence observed to support a summary judgement	
Able to assist with guidance (was not familiar with all steps of the procedure)	
Able to assist without guidance (knew all steps of the procedure and anticipated next move)	
Able to perform the procedure with guidance / minimal help.	
Able to perform procedure confidently without guidance.	

Name and Signature of assessing faculty :

A decorative background featuring a hexagonal grid pattern. The grid is composed of orange lines and dots, with some dots being larger and more prominent. The pattern is partially obscured by a light blue hexagonal shape in the top left corner.

PLASTIC & RECONSTRUCTIVE SURGERY

MCh in Plastic & Reconstructive Surgery

COURSE NAME:

MCh in Plastic & Reconstructive Surgery

DURATION OF COURSE:

3 years

ELIGIBILITY:

MBBS, M.S. (General Surgery)

GOALS

The Goal of the MCh in Burn & Plastic Surgery course of AIIMS, Bhubaneswar is to produce competent specialists as well as medical teachers

- Who shall recognize the health needs of the community, and carry out professional obligations ethically and in keeping with the objectives of the national health policy.
- Who shall have mastered most of the competencies, pertaining to the speciality (Burn & Plastic surgery), those are required to be practiced at the secondary and the tertiary levels of the health care delivery system?
- Who shall be aware of the contemporary advances and developments in the discipline of plastic surgery?
- Who shall have acquired a spirit of scientific inquiry and is oriented to the principles of research methodology and epidemiology; and
- Who shall have acquired the basic skills in teaching the medical and paramedical students/trainees/ professionals.

OBJECTIVES

- To acquire the competencies pertaining to all areas of plastic surgery those are required to be practiced in the community and at all levels of health care system.
- To train in 8 essential Core areas of plastic surgery. The training should provide sufficient scientific knowledge and skills. They include (in alphabetical order)

- Aesthetic Surgery & Medicine,
- Burns
- Brachial plexus & Peripheral nerve surgery
- cleft lip palate and craniomaxillofacial surgery
- Hand Surgery
- Microvascular & Peripheral vascular surgery
- Reconstructive surgery
- Urogenital surgery, External genitalia & Intersex

- The training of essential core areas may be obtained, in addition to the parent unit, from different units by rotation if the need is felt by the Head of the department within the regulations of the institution.
- To acquire skills in effective communication with different specialities and provide inter-speciality services.
- To acquire skills in effective communication with patients, family and the community;
- To acquire skills in educating medical and paramedical professionals.
- To be updated on contemporary advances and developments in plastic surgery
- To be able to understand research methodology, ethics, critical analysis, statistical methods and be able to conduct independent research.
- To acquire skills in writing a scientific manuscript for peer-reviewed publications and analyze evidence-based literature.
- To be updated with record-keeping, medicolegal knowledge, consumer protection law, consent and other contentious issues of rights of patients and consumer.

THE SYLLABUS

At the end of the training, the candidates demonstrate in-depth knowledge of basic science and principles, and various regional and essential core areas of plastic, reconstructive and aesthetic surgery.

General Principles, basic sciences

- History of Plastic Surgery
- History and development of plastic surgery in India and across the world
- The scope of plastic surgery
- Research methodology and research in plastic surgery
- Medico-legal issues in plastic surgery practice
- Liability issues in plastic surgery, legal & insurance perspective.
- Documentation, Recordkeeping and consent.
- Patient safety issues in plastic surgery
- The psychological aspect of plastic surgery
- Ethics
- Photography in plastic surgery
- Training modules for Plastic surgery trainees

Technology applications

- Technological innovations
- Laser and energy device applications
- Tissue expansion- principles and application
- Distraction Histogenesis
- Endoscopy in Plastic Surgery
- Robotics and simulations
- Navigation Surgery
- Telemedicine
- 3-D printing technology & applications
- Implants and Biomaterials
- Transplantation
- Regenerative medicine, Tissue engineering, cell therapy & stem cells
- Foetal surgery
- Information Technology for Plastic surgeon
- Teaching tools, methods & innovations in plastic surgery residency training

Basic principles and techniques

- Wound: Definition, classification and implications.

- Wound healing (normal and abnormal) and Wound management, Mechanical and pharmacological; dressing techniques
- Scar biology and management
- Scars and their complications - prevention and management
- Anatomy and functions of the skin.
- Skin grafts
- Blood supply to the skin, cutaneous circulation and basis of flaps.
- FLAPS: General indications, principles and technique of flap planning, designing and application.; Classification of flaps; Local skin flaps. Pedicled skin flaps. Muscle flaps, osseous flaps, free flaps; Cutaneous flaps- perforator flaps, freestyle perforator flaps, Keystone flaps, chimeric flaps, flow-through flaps etc.
- Grafts – fat, fascia, tendon, nerve, cartilage, bone.
- Infective conditions of the skin.
- Hospital infections.
- Suture materials.
- Surgical instruments.
- Principles of genetics and general approach to the management of congenital malformations.
- Local anaesthesia, nerve blocks, regional anaesthesia.
- Principles of anaesthesia for infants, adults, hypothermia, hypotensive anaesthesia.
- Pain management
- Transplant Biology

Craniofacial Surgery

General

- Embryology and anatomy of the craniofacial complex.
- Growth and development changes in the face, the anatomy of the facial skeleton.
- Structure and development of teeth and Dentofacial anomalies.

Craniofacial Anomalies

- Principles of craniofacial surgery
- Planning of treatment –preparation of splints, models, mock surgery
- Pre and post-surgical orthodontics- principles
- Craniofacial clefts. Tessier's clefts classification
- Craniosynostosis-: syndromic and non-syndromic Hypertelorism
- Craniofacial microsomia.
- Craniofacial distraction.
- Hemifacial atrophy
- Craniofacial syndromes
- Orthognathic surgery (LeForte Osteotomies, BSSO, Genioplasty)
- Distraction osteogenesis – Principle & practice

Cleft Lip and Palate

- Embryology of head and neck.
- Embryogenesis of cleft lip and palate.
- History and evolution of techniques in Cleft surgery.
- Classification of Clefts
- Unilateral & bilateral Cleft lip
- Cleft Palate
- Alveolar Clefts
- Secondary deformity correction in cleft lip & palate
- Cleft nose correction
- Midface skeletal evaluation and corrections.
- Orthognathic surgery/ distraction in Clefts.
- Velopharyngeal incompetence, cleft Orthodontics, speech therapy in cleft lip and palate.

Maxillofacial trauma

- Dentofacial anatomy, occlusions, various terminologies
- Evaluation of injuries, imaging, principles of treatment.
- Management of Airway and acute care

- ATLS protocols
- Diagnosis & management of fractures of facial bones, skull vault, orbit and skull base.
- Temporomandibular joint pathologies & their management
- Obstructive sleep apnea – evaluation, planning and management
- Obstructive sleep apnea – Surgical treatment: Genioglossus advancement, hyoid suspension, Maxillomandibular advancements etc.
- Principles of facial soft tissue injury repair
- Soft tissue injuries and management- Repair of various specific areas: Eyelids, lacrimal injury, ear, nose, lips etc.
- Facial nerve injuries and management
- Restoration of anatomical subunits of face
- Head and neck infections, space infections

Head and Neck Reconstruction:

(Includes various congenital deformities, defects, post oncological resection defects etc.)

- Reconstruction of Scalp and the face
- Reconstruction of the Nose defects, deformities
- Reconstruction of the external ear. (Congenital, Post-traumatic, as well as Aesthetic Otoplasty or ear reshaping)
- Reconstruction of the Lip and commissure, Cheek, tongue, maxilla, mandible, eyelids socket for a prosthetic eye.
- Facial paralysis and various reconstructive procedures for it
- Corrective Rhinoplasty.
- Skull Base Surgery- principles
- Management of vascular malformations of head and neck

Tumours of Head and Neck

- Vasoformative lesions of the skin and adnexa.
- Malignant and benign tumours of head and neck.
- Tumors of oral cavity, oropharynx and mandible, jaw tumors, lesions and cyst.

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- Cancer of upper Aerodigestive system- Principles of management for reconstruction
 - Resection of tumour and Reconstruction of mandible, maxilla and facial hard and soft tissue
 - Tumours of skin-benign and malignant; resection and reconstructions
 - Paediatric head and neck tumors

Dermatological conditions & surgery

- Management of skin lesions (benign and malignant)
- Superficial soft tissue tumors (benign and malignant) and cyst
- Management of hyper/hypopigmentation

Oculoplastic Surgery

- Reconstruction of eyelids, upper, lower, total.
- Ptosis evaluation and correction
- Reconstruction of the orbital socket
- Prosthetic rehabilitation

Aesthetic Surgery and Medicine

- Safety in cosmetic surgery and patient evaluation
- Managing cosmetic surgery patient
- Anatomy of ageing skin
- Non-surgical procedures
- Cutaneous resurfacing-Chemical peeling, dermabrasion & Laser resurfacing
- Facial rejuvenation techniques, Soft tissue fillers, Botulinum toxin, Chemical peeling and dermabrasion
- Management of scars of the face and other regions
- Blepharoplasty, Facelift, Forehead lift surgical/ endoscopic
- Laser therapy- and various applications
- Aesthetic and functional Rhinoplasty- open, closed
- Facial augmentation with implants and autologous tissue: e.g., chin, angle, midface etc.
- Structural fat grafting

- Liposuction, liposculpting with various modalities like PAL, LASER, Ultrasonic
- Abdominoplasty, Lipoabdominoplasty and Body sculpting
- Post Bariatric reconstruction

Hair Restoration

- Scalp Anatomy, Biology of the hair follicle from the surgical perspective
- Scalp pathology, Medical restoration
- Various techniques of restoration, including strip harvest (FUT), FUE, Body hair transplant (Non-scalp donor harvest)
- Setting up a hair restoration practice.

Breast

- Breast cancer and overview of management
- Approach to breast reconstruction – options
- Breast reconstruction- Different surgical techniques, free flaps and prosthetic reconstruction
- Reconstruction of nipple and areola
- Congenital anomalies of breast and correction
- Reduction mammoplasty- various techniques
- Mastopexy
- Augmentation mammoplasty & breast implants
- Detailed knowledge about various breast implants, prosthesis
- Corrections of gynecomastia.

Lower Extremity

- Functional anatomy of lower extremity
- Lower extremity trauma management.
- Principles and techniques of fracture management of lower limb
- Post-traumatic soft tissue defect reconstruction
- Skeletal reconstruction of the lower extremity
- Reconstruction of soft tissue defects
- Reconstruction of foot defects
- Skeletal fixation of foot fractures

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- Diabetic and neuropathic foot management and reconstruction
 - Non-traumatic deformity lower extremity
 - Acquired deformities of the foot and corrections
 - Various post-burn deformities
 - Congenital foot deformity
 - Lymphedema (detailed in Lymphology)
 - Leprosy deformities of leg and foot
 - Nerve entrapment in lower extremity

Trunk/ chest

- Thoracic reconstruction
- Sternal reconstruction
- Abdominal wall reconstruction
- Management of incisional hernia
- Pressure (decubitus) ulcers

Genito Urinary, external genitalia, intersex & Perineum

- Embryology and anatomy of the male and female external genitalia and perineum
- Various defects-Oncological, Fournier's gangrene
- Reconstruction of the perineum, managing incontinence
- Hypospadias, Epispadias and ectopia vesicae
- Reconstruction of Male external genitalia
- Vaginal atresia, malformations, Vaginoplasty, Reduction Labioplasty, Clitoroplasty
- Transsexualism, Intersex, Gender reassignment procedures, Aesthetic external genital procedures, Penile implant techniques

Hand and upper extremity

- Embryology of upper extremity.
- Functional anatomy of the hand.
- Examination of hand.
- General principles of hand surgery
- Congenital Hand deformities - Embryology and classification

- Various corrective procedures for congenital hand
- Thumb reconstruction - Various techniques
- Hand Trauma
 - Treatment of acute hand injuries
 - Fingertip injuries
 - Flexor tendon & Extensor tendon injuries
 - Principles of reconstruction in mutilating hand injuries
 - Fractures and dislocation of hand - metacarpal, phalanges and wrist
 - Treatment principles, options, the technique for hand fractures
 - Soft tissue cover for hand, fingers, thumb
 - Nail injuries, grafting
 - Vascular injuries and repairs
 - Nerve injuries and repairs
 - Replantation of amputations/disarticulations of the upper limb, proximal, distal and digits
 - Tendon transfers
 - Burn Hand
- Non-traumatic Hand conditions
 - Vascular anomalies of the upper extremity
 - Lymphedema in upper extremity
 - Ischaemic conditions of the upper extremity
 - Vasospastic disorders of hands
 - Nerve compression syndromes
 - Surgery for spastic and tetraplegic hand
 - Problems of small joints
 - Dupuytren's disease
 - Principles and treatment of old and neglected hand deformities
 - Rheumatoid arthritis of hand (Reconstructive procedures)
 - Benign and malignant tumours of the hand
 - Hand infections.
- Physiotherapy & Rehabilitation
 - Basic principles of physical therapies, techniques

- Manual and assisted therapy, electrotherapy, ultrasonic, Laser and other modalities
- Functional outcome evaluation of hand
- Rehabilitation of hand, prosthesis.
- Allogeneic Transplantation
 - Basic principles, immunology, transplant biology
 - Hand Transplantation
 - Face transplantation

- Replantation of the upper limb, lower limb and other body parts
- Revascularisation surgery in extremity vascular injury
- Microvascular (free) tissue transfers
- Free Functioning muscle transfer
- Micro neural repair
- Tubal recanalization
- Other applications of magnification

Brachial plexus and peripheral nerve surgery

- Pathophysiology and classification of nerve injuries
- Principles of nerve repair
- Peripheral nerve reconstructions
- Nerve grafts, donor sites
- Distal nerve transfers in nerve injuries
- Electrodiagnostic tests and interpretations
- Brachial plexus injury(BPI) - Principles of management
- Examination, Investigation & planning
- Exploration of brachial plexus, neurolysis, neurotization, Nerve grafting, distal nerve transfers
- Extra plexal nerve transfers
- Secondary surgeries in BPI
- Free functioning muscle transfer
- Obstetrical Brachial Plexus Injuries Primary management and secondary procedures
- Tendon transfers for nerve injury
- Nerve entrapments, e.g. carpal/cubital tunnel syndrome
- Leprosy deformity of hand and corrections
- Assessment of nerve recovery, functional results.

Microvascular surgery

- Principles of microsurgery and its applications in plastic surgery
- Basic techniques; instrumentation; operative microscopes

Vascular surgery

- Repair and reconstruction of vascular injuries of extremity and other parts
- Reconstruction of ischaemic limb
- Reconstruction of larger vessels
- Various grafts, synthetic, prosthetic grafts
- Vascular access (Artero venous fistula) to Chronic renal diseases
- Management of peripheral vascular disorders

Burns and post-burn sequelae

- History of management of burns
- Multidisciplinary teams in burn management
- Outpatient burn management and Pre-hospital care and transport
- Management of all types of burns and cold-induced injuries
- Pathophysiology of burns, burn shock and oedema
- Fluid therapy in burns and acute management
- Management of airway and inhalation burns
- Burns of special areas: Facial, genital, hand burns
- Burns in extremes of age and their management
- Burn wound management
- Infection in burns, sepsis, SIRS, Multi-organ failure
- Nutrition in burns
- Prognostic factors
- Reconstruction of acute burns, including electrical burns

- Skin substitutes
- Skin donation and banking
- Advances in the management of burns
- Post-burn contractures – treatment of sequel
- Reconstruction of deformities and prevention
- Indication and use of skin grafts, flaps and expanders in reconstruction
- Psychological management of burn patients
- Comprehensive rehabilitation of burn patients
- Prevention of burn injuries and first aid
- Organizing and preparing a burn disaster team
- Organization of Burns Unit

Lymphology and surgery

- Detailed knowledge of the pathophysiology of lymphedema
- Management of lymphedema – conservative & surgical
- Basic knowledge of neck, axillary, groin lymph node dissection
- Lymph node free flap transfer

Recent advances in Plastic Surgery

Knowledge of recent advances should be acquired and given higher priority in learning. It should be updated with various CME activity learning, CME articles from recommended journals.

SKILL DEVELOPMENT- CLINICAL

1. History, examination and documentation
2. Detailed physical examination should include general/systemic and local evaluation
3. Skills in writing up notes, maintaining problem-oriented records, progress notes, and presentation of cases during ward rounds, planning investigations and making a treatment plan
4. The resident should be able to analyze history and correlate it with clinical findings
5. Be able to clinically analyze the patient & decide for pertinent Investigations required for a specific patient
6. Should be well versed with all radiological investigations like CT Angio, CTFace with 3D Reconstruction, MRI, DSA and plain radiographs
7. Able to understand the dental models, facial moulds, 3-D models, image-guided 3-D templates of defects & models for planning and reconstruction
8. Evaluation of the defect, three-dimensional description of the defect
9. Evaluation of multiple options for the treatment and analysis of the pros/cons of each
10. Concept of the reconstructive triangle
11. Planning in reverse of flap cover
12. Able to evaluate and manage critical patients of trauma, burns and develop management skills, fluid balance, and choice of drugs

SKILL DEVELOPMENT- OPERATIVE

Operative skills in the various core specialities are developed by observing, assisting seniors, performing under the supervision and performing procedures independently.

Cadaveric dissection: Basic operative skills of procedures are developed with periodic cadaver dissections supervised by the faculty members.

At the end of the training, candidates should be able to learn various surgical procedures, the planning and principles elaborated in the syllabus and perform independently the basic techniques encompassing below-mentioned procedures:

1. Debridement, Fasciotomy, preparation for coverage
2. Different types and techniques of excision of wounds of various origin.
3. Contracture release and coverage options
4. Skin grafting-STSG/FTSG- Harvesting, application, meshing, micrografting techniques
5. Various Local flaps and their applications
6. Regional flaps and extracorporeal flaps – dissection & applications
7. Flap planning, designing, harvesting and transfer

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8. Various reconstruction techniques for thumb
 9. Hand fracture reduction & fixation- Closed, percutaneous pin and open techniques
 10. Tendon repair, graft and transfers.
 11. Nerve injury repair- Peripheral nerves, facial nerve, nerve graft harvesting etc.
 12. Brachial plexus exploration and nerve transfer techniques
 13. Vascular injury repair- Microvascular repairs and peripheral vascular injuries
 14. Arch bar fixation& intermaxillary fixation- Various techniques of IMF
 15. Osteosynthesis techniques, plating, osteotomes, mandibulectomy
 16. Fixation of all facial bone fractures
 17. Harvesting bone and cartilage grafts from various sources
 18. Repair of soft tissue injuries of various regions of the body.
 19. Reconstruction of various organs or tissue defects of different origin
 20. Primary & secondary surgeries of Cleft Lip & Cleft palate.
 21. Alveolar bone grafting and cleft rhinoplasty
 22. Aesthetic surgical procedures of the face, trunk, breast and other body parts.
 23. Excision of benign tumours, lesions, vascular malformations
 24. Hair restoration techniques (harvesting and implanting)
 25. Liposuction- planning and different techniques
 26. Body contouring procedures (Abdominoplasty, Brachioplasty & lipectomy)
 27. Various fat grafting procedures, Use of implants for augmentation, and tissue expander insertions
 28. Non-surgical aesthetic procedures (Chemical peeling, dermabrasion, fillers, laser etc.)
 29. Planning and Harvesting of free flaps of various regions, Microanastomosis and microneural repairs
 30. Hypospadias repair, Repair of genital injuries and anomalies
 31. Techniques of vaginoplasty, clitoroplasty, sex reassignment, penile reconstruction
 32. Post-mastectomy breast reconstruction and surgery for gynaecomastia
 33. Reconstruction of Oncological resection defects of different regions of the body
 34. Reconstruction of traumatic defects of limb, soft tissue, and skeletal loss
 35. Reconstruction of the scalp and calverial defects
 36. Reconstruction techniques for congenital hand anomalies, traumatic defects
 37. Osteotomy techniques for orthognathic surgery, genioplasty, BSSO, LeFort osteotomy
 38. Different surgical procedures for Lymphoedema of different origin
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- ACADEMIC ACTIVITIES: ACTIVITIES OF LEARNING & EFFECTIVE COMMUNICATION**
- Didactic lectures are of lesser importance; small group discussion such as seminars, journal clubs, symposia, reviews and guest lectures should get priority for theoretical knowledge. Bedside teaching, grand rounds, structured interactive group discussions and clinical demonstrations should be the hallmark of clinical/practical learning with appropriate emphasis on e-learning. The student should have hands-on training in performing various procedures and ability to interpret various tests/investigations. Exposure to newer specialized diagnostic/therapeutic procedures concerning her/his subject should be given. Self-learning tools like assignments and case-based learning may be promoted.
- Documentation of each of the below activity is to be maintained in the Logbook with the countersignature of teacher/moderator on a daily basis.
1. Small group discussions
 2. Lectures
 3. Journal Club
 4. Subject Seminar
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5. Student Symposium
 6. Tutorials
 7. Ward Rounds
 8. Clinico-Pathological Conferences
 9. Inter-Departmental Meetings
 10. Teaching activity
 11. Continuing Medical Education Programs
 12. Conferences/ workshop presentation
 13. Rotation and posting in other departments

RESEARCH

1. Thesis: The student should complete a thesis project during the tenure and should submit the proof of the submission of the manuscript originating from it to an indexed peer-reviewed journal.
2. Research methodology: The trainee should know the basic concepts of research methodology, various randomized trials, differences in prospective and retrospective studies, planning a research project, review of the literature and be able to retrieve information from library and electronic sources.
3. Writing a research paper: The trainee should understand basic tenets of writing paper, understand the different types of manuscripts from short communications to original articles and meta-analysis.
4. He/she should write a research paper during their tenure.
5. Biostatistics: Should have basic knowledge of biostatistics and application for various studies.
6. Ethical issues in research and patient confidentiality - The trainee should be well aware of the Helsinki Declaration and adopt and comply with the guidelines for the research
7. Paper Presentations: A postgraduate student is required to present one poster presentation, to read one paper at a national/state conference.
8. One research paper should be published/accepted for publication/submitted

for publication during the period of his postgraduate studies to make him eligible to appear at the postgraduate degree examination.

TEACHING SKILLS

The candidates should be encouraged and acquire teaching skills to enable them to teach postgraduates of surgery, undergraduate medical students and paramedical students (if any). Use of PowerPoint, other teaching aids, conducting small group discussions and practical sessions are necessary. This activity is monitored by the faculty members and considered as an essential skill to acquire so as to qualify as teachers in medical colleges.

Personal attributes: Professionalism, Attitude & Effective communication

Professionalism inpatient care:

1. The student will show integrity, accountability, respect, compassion and dedicated patient care.
2. The student will demonstrate a commitment to excellence and continuous professional development.
3. The student should demonstrate a commitment to ethical principles relating to providing patient care, the confidentiality of patient information and informed consent.
4. The student should show sensitivity and responsiveness to patients' culture, age, gender and disabilities.

Professionalism with colleagues:

1. Caring attitudes, Initiative, Communication skill
 - a. With teachers and seniors
 - b. With colleagues
 - c. With paramedics
 - d. Aptitude for counselling
 - e. Organisational ability
 - f. Potential to cope with stressful situations and undertake responsibility

- g. Trustworthiness and reliability
- h. To behave in a manner which establishes professional relationships with patients and colleagues
- i. Ability to work in a team
- j. A critical inquiring approach to the acquisition of knowledge

The methods used mainly consist of observation. It is appreciated that these items require a degree of subjective assessment by the guide, supervisors and peers.

DEPARTMENTAL TRAINING SCHEDULE & POSTING OF RESIDENTS

Clinical training:

The residents will be posted in emergency, ward, OPD, minor OT and major OT with a frequency-dependent upon the availability of residents in the department at a particular time. The residents will be supervised for all procedures during the initial period of posting in the above areas. Once they are competent enough to carry out those procedures, they will be allowed to perform without supervision.

Posting in Emergency Medicine: The students will attend the cases when referred to their department from the emergency unit.

Academics:

- a. **Seminars:** The candidate will have to present the topic/subject seminar, which will be conducted in the department once a week. The subject/title of the seminar will be proposed by the HOD/faculty in charge of the departmental academics at least a month before the date of presentation. The student has to present on powerpoint with reference to the latest literature available on that subject.
- b. **Journal club:** The student has to analyze critically one of the recently published journal articles of the common interest to the speciality and present in powerpoint in the journal club of the department. The articles to be presented are to be shown to and approved by the faculty

in charge of departmental academics or the HOD. The frequency of journal club in the department should be once in a week.

- c. **Case presentation:** The student has to study a clinical case and present it before all the faculties and residents, which should include clinical history, detailed investigations and treatment planning. This will be conducted in the department once a week.
- d. **Other departmental academics:** The student has to participate in other academic activities included by the department like mortality & morbidity meetings, departmental audit, photographic case analysis or any other new academic program incorporated as and when.
- e. **Organizational activity:** The student should be involved actively in organizational activities of any conference, workshop or CME organized by the department during his tenure.
- f. **Attending academic activities:** To promote research, improve networking and other academic competencies among postgraduate students, in addition to the existing leaves (as per residency rule), all postgraduate students are allowed to attend conferences, workshops, any specialized training, or CME related to their fields for 15 days in the tenure of 3 Years. These 15 days will be treated as On-duty and will be part of their postgraduate training. Prior permission has to be obtained.

Specialised Training in other institutes:

The students may be instructed to attend some of the centres of excellence for any subspecialties of the subject felt necessary by the department head. The maximum permissible duration for that purpose is 1 to 2 months during the entire tenure of three years. The visit should fulfil any deficiency in training due to lack of infrastructure or practice in our centre. The timing and the centre will be decided by the department taking into consideration the interest of the student with prior approval of the Director. The period will be considered as regular working period, but without any financial implication (TA / DA / Training fee etc.) for the institute.

The student may be posted in other departments for additional training if felt necessary by the parent department at any point of time during the training period. The details of the posting will be decided by the department considering the importance of the same.

Presentation of scientific paper:

It is desirable to present a scientific paper/poster in at least one of the state level and one national-level conference.

ASSESSMENT

Assessment will be comprehensive & objective. It will address the stated competencies of the course. The assessment will be spread over the duration of the course.

INTERNAL ASSESSMENT

Internal assessment shall be continual and to assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self directed learning and ability to practice in the system.

- Examination on Research Methodology & Biostatistics will be conducted at the end of 2nd Semester. This examination will be considered as an internal examination but no marks will be added to the final/summative examination. Students have to pass (obtaining >50% marks) this examination as an eligibility criterion to appear in the Final examination. If someone secures <50%, he/she will appear in the next examination. The examination will be conducted by Examination Cell in the month of June & December every year. No marks from this examination will be added to the final examination.
- A total of 3 internal examinations will be conducted at the end of 3rd semester, 4th semester and at prefinal (4 months before final) examination.

- Marks distribution: Theory paper will carry 100 marks. There will be topic wise assessment (table 4). Practical with viva and logbook (Clinical/ experimental/ practical = 70, viva = 20, logbook = 10) will be of 100 marks.
- The marks of the 3 internal examinations will be averaged to 100 each for theory and practical and added to the final examination.

SUMMATIVE / FINAL ASSESSMENT

Eligibility for appearing Final Exam

- Passed (secured 50% marks) in Research methodology and Biostatistics and
- Passed (secured 50% marks) in Internal examinations and
- Thesis submitted 6 months before final examination and is approved / accepted by external evaluator.

Final Theory Examination

- The distribution of topics in the question papers shall be:
 - Paper I: Basic & Allied Sciences, General principles of Plastic & Reconstructive Surgery
 - Paper II: Plastic & Reconstructive Surgery (Burns, Head & Neck, Upper extremity)
 - Paper III: Plastic & Reconstructive Surgery (Trunk, Lower extremities)
 - Paper IV: Recent advances in Plastic & Reconstructive surgery
- Question Paper Format: In each paper, One Long question carrying 20 marks and Eight Short question/notes – 10 x 8 = 80 marks.
- Total theory marks = 500 (Theory papers in the final examination – 400 and an average of 3 internal examination – 100 marks).

Final Practical Examination

The format of the practical examination

Parts	Components	Marks allotted
PART A ** 200 Marks	Longcase (1)	75
	Short cases (3)	75
	Ward Round	50
PART B 200 Marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	50
	Logbook	10
	Scientific writing (manuscript written out of the thesis)	15

** Students should pass (secure 50% marks) separately in Part A

Final Marking Pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3rd semester	End of 4th semester	Four months before the final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

Passing Marks

1. The student has to secure $\geq 50\%$ marks in the internal examination to be eligible to appear for the final examination.
2. In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
3. In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

THESIS

As a part of MCh curriculum, the student should complete one thesis project during the tenure and it is desirable to submit the proof of communication of the manuscript (originated from his/ her thesis) to an indexed peer- reviewed journal.

- The student should submit the completed thesis 6 months before the final examination

- If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.
- The thesis will be sent to one external evaluator for approval. The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as accepted, accepted with suggested modification or rejected.
- If the thesis is accepted with suggested modifications, the comments of the evaluator will be intimated to the student and the guide for necessary correction/ modifications.
- After modification, the thesis will be evaluated by a departmental committee for final approval.
- If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.

- Approval of the thesis is mandatory to appear for the final examination.
- It is mandatory to submit the manuscript (originated from his/ her thesis) during the final practical examination.

Following record is maintained during the training period

1. Maintaining Log Book

- The log book is a record of the important activities of the candidate during his training. Internal assessment should be based on the evaluation of the logbook. Collectively, logbooks are a tool for the evaluation of the training program of the institution by external agencies. The record includes:

- All academic activities as well as the presentations and procedures carried/ assisted/observed out by the candidate
- Record of Seminars
- Record of Journal Club
- Record of clinical cases presented
- Leave records
- Record of research work and progress

2. Record of Clinical cases with photographs

3. Periodic theory and practical examination marks

4. Quarterly assessment reports evaluated by guide / HOD / Assessor

5. Assessment and feedback forms of all academic activities as desirable

RECOMMENDED BOOKS

1. Grabb & Smiths Plastic Surgery – 7th Edition. Thorne, Charles H, Lippincott, 2013
2. Plastic Surgery- 3rd Edition Vol 1-6, Peter C. Neligan, Elsevier publisher, 2012
3. Textbook of Plastic, Reconstructive and Aesthetic Surgery. By K. Agrawal(Ed.), Thieme,2017.
4. Listers-The Hand Diagnosis and Indications – 4th Edition, Smith, Paul. Mosby, 2002
5. Fundamental Techniques of Plastic Surgery and Their Surgical Applications - 10th Edition, McGregor, Alan D. Churchill Livingstone, 2004.
6. Maxillofacial Injuries Vol.I&II. Edited By N.L. Rowe & J.L1. Williams, Churchill Livingstone, 1985, Indian Print 2009.
7. Greens Operative Hand Surgery – 6th Edition Volume I &II. Green, David P. Elsevier, 2011.
8. Current Therapy in Plastic Surgery – 1st Edition. McCarthy, Joseph, Saunders, 2006.
9. Acland’s Practical Manual for Microvascular Surgery by Robert Acland & Sabhpathy R. 3rd Edition, 2008.
10. Liposuction Principles and Practice - Shiffman, Melvin A. Springer, 2006.
11. Total Burn Care -4th edition , by David Herdon. Saunders Elsevier, 2012.
12. Achauer and Soods Burn Surgery Reconstruction and Rehabilitation – 1st Edition, Sood, Rajiv. Saunders, 2006.
13. Techniques in Ophthalmic Plastic Surgery. By Jeffrey Nerad , Saunders Elsevier, 2010.
14. Essentials of Septorhinoplasty- By Tardy & Behrbohm. Thieme, 2004. Reconstructive surgery- Mathes 2nd Edn.
15. Grabbs Encyclopedia of Flaps: Head And Neck - Vol I, II &III 3rd Edition Strauch, Berish (Ed) (Etal). Lippincott, 2009.
16. Evolution and Revolution of Perforator Flaps, By Jeong Tae Kim, Medic edicine, 2017
17. Colour Atlas of Microsurgical Anatomy: Vasculature of Skin Flaps - Heping Zheng (Ed). Academia pub, 2008.
18. Lymhedema Surgery-principle and practice. By Cheng, David Chang, et al Patel, Elsevier, 2016.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC AND ALLIED SCIENCES, GENERAL PRINCIPLES OF PLASTIC & RECONSTRUCTIVE SURGERY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the anatomy of Brachial plexus in detail. Mention the clinical features of Erb's palsy.
2. Explain the basic principle involved in delay phenomenon and describe different methods of delay of flaps.
3. Discuss the Electrodiagnostic tests for peripheral nerve injury?
4. Explain the physiological basis of hemodynamic instability during early hours after burn injury.
5. Describe the pathophysiology of wound healing.
6. Discuss the preparation of a wound for skin grafting from the microbiological point of view.
7. Enumerate the different anticoagulants used for flap salvage with a note on their advantages and limitations.
8. Describe the pathological basis of classification of haemangioma and vascular malformations.
9. Discuss the development of face with reference to cleft lip and cleft palate.

PAPER 2

PLASTIC & RECONSTRUCTIVE SURGERY
(BURNS, HEAD & NECK, UPPER EXTREMITY)

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss in detail the clinical assessment and management of acute burn injury.
2. What are the common donor sites for free autogenous bone graft? Describe the surgical technique of harvesting calvarial bone graft.
3. Mention the principles of lip reconstruction and different flaps used for that purpose.
4. List the clinical features of naso-orbito-ethmoidal fractures and their management.
5. Enumerate the surgical procedures for restoration of smile in facial paralysis of more than one year duration.
6. What are the causes and types of temporomandibular joint (TMJ) ankylosis. Describe one operative procedure for the release of TMJ ankylosis.

-
7. Describe different techniques for repair of unilateral complete cleft lip. Mention in detail about any one such technique with necessary diagrams.
 8. Principles of release of congenital simple syndactyly of hand. Describe one common technique of release.
 9. Explain the statement - "External wound in electric burn is the tip of an iceberg".

PAPER- III

**PLASTIC & RECONSTRUCTIVE SURGERY
(TRUNK, LOWER EXTREMITIES)**

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the principles of post-mastectomy breast reconstruction. Mention in detail the surgical steps involved in breast reconstruction using Transverse Rectus Abdominis Myocutaneous (TRAM) flap. Discuss the complications of that surgery.
2. Discuss the vascular anatomy of fibula and its versatility to be used as free flap for reconstruction.
3. How do you reconstruct a Neovagina in a case of Vaginal agenesis ?
4. Enumerate the various surgical techniques used to treat lymphoedema of leg.
5. Discuss briefly the complications of urethroplasty.
6. Describe the tendon transfer for foot drop.
7. What is the anatomical basis of groin flap? Mention the steps of groin flap dissection.
8. How will you diagnose and treat varicose veins of leg?
9. Describe the reverse sural artery flap.

PAPER IV

RECENT ADVANCES IN PLASTIC & RECONSTRUCTIVE SURGERY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Give an elaborate description on Acellular dermal matrix (ADM), its preparation, sterilization and human application.
2. Write a note on breast implant-associated anaplastic large cell lymphoma (BIA-ALCL).
3. Enumerate the uses of endoscope in plastic surgery.
4. What is artificial intelligence and how is it used in plastic & reconstructive surgery?
5. Discuss the use of Bio resorbable materials in plastic surgery.
6. Describe briefly about skin substitutes.
7. Write in brief on Nd:YAG laser and its application in aesthetic surgery.
8. Write a note on allogenic hand transplant.
9. What is the scope of stem cells in tissue reconstruction ?

ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA)

Sl.No	Activity	Competency Domains						Procedural skill (Level of competency form 1 to 5)					MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Residency	End of 1 st year	End of 2 nd year	End of 2 nd year		
1	Gather a history and perform a physical examination	√	√	√	√	√	√	2	3	4	5	S, P, PG, I	
2	Prioritize a differential diagnosis following a clinical outcome	√		√			√	1	2	3	4	S, PG, I	
3	Recommend and interpret common diagnostic and screening tests	√	√	√	√	√		1	2	3	4	S, I	
4	Enter and discuss orders and prescriptions	√	√	√	√	√	√	1	2	3	4	S, P, PG, I	
5	Document a clinical encounter in the patient record.	√	√					2	3	4	5	S, PG, I	
6	Provide an oral presentation of a clinical encounter	√		√			√	2	3	4	5	S, PG, I	
7	Form clinical questions and retrieve evidence to advance patient care.	√		√				1	2	3	4	S, I	
8	Give or receive a patients handover to transition care responsibility	√	√		√		√	1	2	3	4	S, PG, H, I	
9	Collaborate as member of an interprofessional team	√				√	√	1	2	3	4	S, PG, H, P, I	
10	Recognize a patient requiring urgent or emergent care and initiate evaluation and management	√	√	√	√	√	√	1	2	3	4	S, PG, H, P, I	
11	Obtain informed consent for tests and procedures.	√	√		√		√	1	2	3	4	S, P, PG	
12	Perform general procedures of a physician	√	√	√	√	√	√	2	3	4	5	S, PG, I	
13	Identify system failures and contribute to culture of safety and improvement	√	√	√	√	√	√	1	2	3	4	S, PG, I	
14	Effective communication with patients, peers and superiors	√	√				√	2	3	4	5	S, P, PG, H	

Sl.No	Activity	Competency Domains						Procedural skill (Level of competency form 1 to 5)					MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Residency	End of 1 st year	End of 2 nd year	End of 2 nd year		
15	Attitudes towards patient, relatives, peers and Supervisors	√	√	√	√	√	√	3	4	4	5	S, P, PG, H, C, I	
16	Effective relevant systemic Examination in OPD and bedside clinics	√	√	√		√	√	1	2	3	4	S, PG,	
17	Ability to make a diagnosis and DD	√	√	√		√	√	1	2	3	4	S, PG, I	
18	Preoperative counseling of patient and attendant	√	√	√	√	√	√	1	2	3	4	S, PG, P, H, I, C	
19	Basic Pre & post operative care	√	√	√	√	√		1	2	3	4	S, PG	
20	OR basic techniques – patient positioning, Scrubbing, Gowning, cleaning and draping	√	√		√	√	√	2	4	5	5	S, PG, H, I	
21	Handling instruments, Suture materials, implants	√	√	√		√	√	1	3	4	5	S, PG, H, I	
22	Suturing & Knotting techniques	√	√		√	√	√	2	3	4	5	S, PG, I	
23	Use of POP slabs, casts & splints	√	√	√	√	√		1	3	4	5	S, PG, I	
24	Diathermy, tourniquet & C – arm	√	√		√	√	√	1	2	3	4	S, PG, H, I	
25	Performing simple swelling Excision	√	√			√	√	2	3	4	5	S, PG, I	
26	Basic trauma management	√	√			√	√	1	3	4	5	S, PG, I	
27	Reading and interpreting radiological reports relevant to plastic surgery	√	√			√	√	1	2	3	4	S, PG, I	
28	Able to teach UG (Clinical)	√	√			√	√	2	3	4	4	S, PG, UG, I	
29	Able to write Scientific Papers	√	√		√	√	√	1	2	3	4	S, PG, I	
30	Able to Make podium Presentation	√	√		√	√	√	2	2	3	4	S, PG, I	
31	Knowledge in Hospital infection control	√	√			√	√	1	2	3	4	S, PG, H, I	
32	Skin grafting, Repair of complex wounds, Fixation of small bone fractures of hand & feet, Simple tendon injuries, Peripheral nerve decompression, Fasciotomy & escharotomy.	√	√		√	√	√	1	2	4	5	S, PG, I	

Sl.No	Activity	Competency Domains						Procedural skill (Level of competency form 1 to 5)					MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Residency	End of 1 st year	End of 2 nd year	End of 2 nd year		
33	All local flaps, Complex facial fractures & injuries, Release of contractures, Complex tendon injuries, Small soft tissue tumours, Excision of skin cancers and reconstruction, Liposuction, Repair of peripheral nerve & vessels. Tangential excision of burns,	√	√		√	√	√	1	2	3	4	S, PG, I	
34	Cleft lip repair; Cleft palate repair; Syndactyly of hand & foot, Hypospadias, Vascular malformations, Gynaecomastia surgery, Hair restoration, Peripheral neuro-vascular injuries, Regional flaps,	√	√		√	√	1	2	3	4	S, PG, I		
35	Microvascular surgery, Brachial plexus reconstruction, Augmentation mammoplasty, Reduction mammoplasty, Breast reconstruction, Abdominoplasty, calvarial remodeling, Osteotomies of facial skeleton. Distraction osteogenesis of facial bones.	√	√		√	√	1	2	2	2	S, PG, I		

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

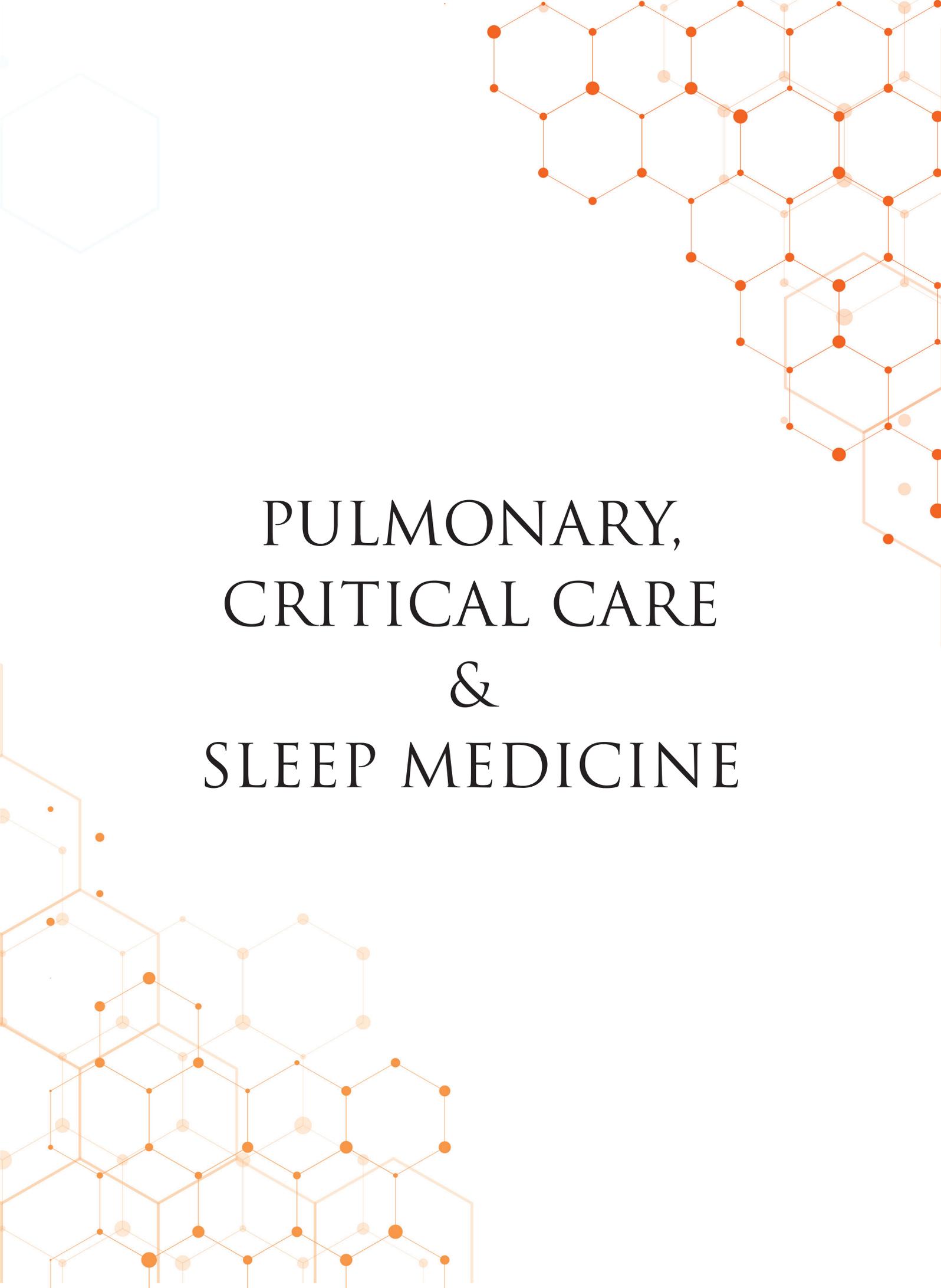
Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



PULMONARY,
CRITICAL CARE
&
SLEEP MEDICINE

DM in Pulmonary, Critical Care & Sleep Medicine

COURSE NAME:

DM in Pulmonary, Critical Care & Sleep Medicine

DURATION OF COURSE:

3 years

ELIGIBILITY:

MBBS and MD or DNB in (Medicine/ Pulmonary Medicine/ Chest Medicine/ Respiratory Medicine)

OBJECTIVES

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

- A thorough knowledge of pathological abnormalities, clinical manifestations, and principles of management of a large variety of medical conditions affecting respiratory system.
- Skill and competence to choose and interpret correctly the results of the various routine investigations necessary for proper management of the patient. While ordering these investigations, a resident must be able to understand the sensitivity, specificity and the predictive value of the proposed investigation, as well as its cost-effectiveness in the management of the patient.
- Skill and competence in interventions like endotracheal intubation, needle lung biopsy, interventional and diagnostic bronchoscopy, needle thoracocentesis, Intercostal drain placement, pericardiocentesis, thoracoscopy, and various endobronchial procedures.
- Skills and competence to perform commonly used diagnostic procedures, namely, pleural aspiration, pleural biopsy, lung biopsy, allergy testing, fine needle aspiration, polysomnography, ultrasonography and cardiopulmonary exercise testing.
- Skill and competence to choose and interpret correctly the results of specialized investigations including radiologic, ultra-sonographic, biochemical, hemodynamic, electrocardiographic, electrophysiological, pulmonary functional, haematological, immunological, nuclear isotope scanning, arterial blood gas analysis results, polysomnographic and bronchoscopic results.
- Skill and competence to provide consultation to other medical and surgical specialties and sub-specialties, whenever needed.
- Skill and competence to function effectively in varied clinical settings, namely emergency/ critical care, ambulatory care, out-patient clinic, in-patient wards.
- Skill and competence to take sound decisions regarding hospitalization, or timely referral to other consultants of various medical sub specialties recognizing his limitations in knowledge and skills in these areas.
- Proficiency in selecting correct drug combinations for different clinical problems with thorough knowledge of their pharmacological effects, side-effects, interactions with the other drugs, alteration of their metabolism in different clinical situations, including that in the elderly.
- Skill and competence to advise on the preventive, restorative and rehabilitative aspects including those in the elderly, so as to be able to counsel the patient correctly after recovery from an acute or chronic illness.
- Skill and competence to understand research methodology in Pulmonary Medicine and to undertake a critical appraisal of the literature published in various medical journals and be able to apply the same in the setting in which the resident is working.
- Skill and competence to work cohesively in Resuscitation team along with paramedical personnel and maintain discipline and healthy interaction with the colleagues.
- Skill and competence to communicate clearly and consciously, and teach other junior residents, medical students, nurses and other paramedical staff, the theory as well as the practical clinical skills required for the practice of Pulmonary Medicine.

SYLLABUS CONTENT

Basic sciences

- Embryologic development of the respiratory system and how congenital anomalies arise
- Basic principles of clinical genetics relevant to the respiratory system and diseases of the respiratory system
- Gross and microscopic anatomy of the lungs, pulmonary vasculature, chest wall, and neuromuscular apparatus and the basic anatomy of the upper airway and brainstem
- Respiratory physiology:
 - Alveolar gas composition
 - Ventilation and its control
 - Distribution of alveolar ventilation
 - Diffusion
 - Perfusion and vascular physiology
 - Ventilation perfusion relationships
 - Oxygen delivery, utilization, and transport
 - Carbon dioxide transport
 - Acid base balance
 - Mechanics of breathing
 - Respiratory muscle function
 - Respiratory system in sleep
 - Respiratory system during exercise
- Basic principles of clinical immunology as they apply to respirology
- Basic principles of molecular biology relevant to respirology
- Mechanisms of action of major pharmacological agents with effects on the respiratory system
- Broad knowledge of microbiology as it relates to respirology, including normal defense mechanisms
- Fundamental principles of epidemiology
- Cardiovascular physiology as it applies to respirology and cardiopulmonary interaction as seen in various respiratory disorders
- Basic gross and microscopic pathology applied to respiratory diseases.

Clinical sciences

- Pathophysiology, clinical manifestations, differential diagnosis, general approach to prevention, diagnosis and management, natural history and prognosis of the following.
 - Signs and symptoms: dyspnea, cough, snoring, hemoptysis, chest pain, cyanosis, adventitious sounds, clubbing
 - Abnormalities of developmental origin or disease arising from prematurity that may have continuing impact in adult life
- Airway disease:
 - Upper airway, including:
 - o Epiglottitis
 - o Laryngotracheobronchitis
 - o Tracheitis
 - o Foreign bodies
 - Lower airway, including:
 - o Asthma
 - o Chronic obstructive pulmonary disease (Chrobronchitis, emphysema)
 - o Bullous disease
 - o Bronchiectasis
 - o Cystic fibrosis
 - o Bronchiolitis
 - o Ciliary Dysmotility Disorders
 - Pleural disorders: Pleural effusions, pneumothorax, pleural plaques and thickening, mesothelioma and other malignancies
 - Mediastinum: Mediastinitis, pneumomediastinum, mediastinal masses, vascular abnormalities
 - Neoplastic disorders: Diagnosis, staging and management including chemotherapy as per decision of the Tumour Board
 - o Benign
 - o Malignant (primary and secondary)
 - o Paraneoplastic syndromes
 - Infectious diseases:

-
- o Infections of upper and lower respiratory tract
 - o Infections in the normal host (community acquired and nosocomial) and in the immunocompromised host
 - o Infections caused by bacteria, viruses, mycoplasma, Chlamydia, rickettsias, fungi, protozoons, metazoons, mycobacteria
 - Industrial and environmental disease:
 - o Inorganic and organic pneumoconiosis
 - o Air pollution, sick building syndrome, and smoking
 - o Occupational asthma, reactive airways dysfunction syndrome
 - Complications of aspiration of:
 - o Gastric contents
 - o Foreign bodies
 - o Lipoid material
 - o Water, including immersion injuries
 - Immunologic diseases:
 - o Rhinitis
 - o Asthma
 - o Extrinsic allergic alveolitis
 - o Eosinophilic lung disease
 - o Respiratory manifestations of collagen vascular disease
 - o Pulmonary vasculitis
 - o Bronchiolitis obliterans organizing pneumonia
 - Lung injury:
 - o Trauma
 - o Drugs (including recreational and illicit drugs)
 - o Radiation
 - o Oxygen
 - o Thermal
 - o Barotrauma
 - Restrictive diseases:
 - o Chest wall deformities
 - o Neuromuscular diseases
 - o Interstitial lung diseases
 - o Pleural disorders
 - Pulmonary hemorrhage syndromes
 - Disorders of the pulmonary circulation:
 - o Pulmonary embolism (thromboembolism, fat, air, tumor, amniotic fluid)
 - o Pulmonary hypertension
 - o Pulmonary edema
 - o Cor pulmonale
 - o Pulmonary arteriovenous malformations, fistulas and other vascular abnormalities.
 - Non-cardiogenic pulmonary edema
 - Sleep disorders:
 - o Excessive daytime somnolence
 - o Sleep disordered breathing
 - o Hypoventilation syndromes
 - o Non-respiratory sleep disorders (restless legs syndrome, periodic limb movement disorder, narcolepsy, parasomnias insomnia)
 - Respiratory manifestations of extra pulmonary disorders
 - Respiratory complications of pregnancy
- Demonstrate an understanding of indications, benefit, contraindications, complications and general techniques of the following therapeutic / diagnostic interventions:**
- Pulmonary rehabilitation
 - Radiation therapy
 - Chemotherapy
 - Respiratory therapy
 - Physical therapy
 - Interventional bronchoscopy including endobronchial ultrasound (EBUS), airway stenting, argon plasma coagulation and cryotherapy procedures
-

- Common surgical interventions:
 - Mediastinoscopy
 - Thoracotomy and lung resection
 - Thoracoscopy including medical thoracoscopy
 - Surgical management of empyema
 - Lung reduction surgery
 - Lung transplantation
- Palliative care
- End of life decision making

Critical Care Medicine

- Ventilatory Support:
 - Non-Invasive Ventilation: CPAP, BiPAP
 - Pressure and Volume ventilators
 - Traditional and newer modes of invasive ventilation.
 - Airway pressures and their significance, Respiratory Waveform Graphics
 - Barotrauma
 - Weaning methods
- Procedural skills:
 - Maintenance of an open airway
 - Tracheal intubation (Oral, Nasal)
 - Tracheostomy, transtracheal catheters
 - Non-invasive ventilation
 - Invasive Mechanical Ventilatory support; Respiratory graphics
 - Prone Ventilation
 - Topical use of respiratory medication (inhalers & nebulizers)
 - Suctioning, chest physiotherapy and incentive spirometry.
 - Weaning techniques
 - Fiberoptic bronchoscopy, Flexible video bronchoscopy (at least 100 procedures) including learning of EBUS (at least 25 EBUS procedures) and conventional TBNA (at least 25 procedures)

- Chest tube insertion (at least 25 procedures); chest drainage systems
- Bedside pulmonary function tests.
- USG and CT guided procedures
- Medical Thoracoscopic procedures (at least 25 procedures)

Perform a complete and appropriate assessment of a patient

- Identify and explore issues to be addressed in a patient encounter effectively, including the patient's context and preferences
- Elicit a history that is relevant, concise and accurate to context and preferences for the purposes of prevention and health promotion, diagnosis and / or management.
- Perform a focused physical examination that is relevant and accurate for the purposes of prevention and health promotion, diagnosis and/or management
- Select medically appropriate investigative methods in a resource – effective and ethical manner.
- Demonstrate effective clinical problem solving and judgment to address patient problems, including interpreting available data and integrating information to generate differential diagnoses and management plans.
 - Demonstrate proficiency in interpretation of chest radiographs
 - Recognize common abnormalities on chest computerized axial tomography (CT) scan
 - Demonstrate proficiency in interpretation of pleural fluid analysis
 - Demonstrate proficiency in the interpretation of common pulmonary function tests and cardiopulmonary exercise testing; understand the indications, technical aspects and quality assurance issues of such tests.
 - Demonstrate proficiency in the interpretation of blood gases
 - Identify common abnormalities and understand basic technical aspects of polysomnography

Demonstrate proficiency in the performance and use of:

- Spirometry
- Oxygen delivery systems
- Inhalational devices

Demonstrate proficient and appropriate use of procedural skills, both diagnostic and therapeutic

Perform indications, contraindications, technical aspects and quality assurance issues, and potential complications of the following.

- Endotracheal intubation (oro and nasotracheal) with and without the use of bronchoscope
- Initiation, maintenance and discontinuation of acute and chronic mechanical ventilation (including non-invasive techniques)
- Bronchoscopy (including transbronchial biopsy (25 procedures), endobronchial biopsies (25 procedures), bronchoalveolar lavage (25 procedures) and bronchoscopic fine needle aspiration)
- Thoracentesis with or without ultrasound guidance (at least 50 procedures)
- Pleurodesis
- Placement of closed intrapleural chest tube
- Arterial puncture and cannulation
- Venous cannulation for placement of central venous and pulmonary artery catheters
- Testing for latent tuberculosis
- Ensure appropriate informed consent is obtained for procedures
- Document and disseminate information related to procedures performed and their outcomes.
- Ensure adequate follow-up is arranged for procedures performed.

The resident will also need to have an understanding of research methodology and teaching. He needs to undertake at least 1 project and present the results or publish the results during the course of his tenure.

He will also need to have grounding in medical and research ethics.

TEACHING & LEARNING METHODS**General Principals**

Acquisition of practical competencies being the keystone of postgraduate medical education, postgraduate training is skills oriented. Learning in postgraduate program is essentially self-directed and primarily emanating from clinical and academic work. The formal sessions are merely meant to supplement this core effort.

Teaching Sessions

The teaching methodology consists of bedside discussions, ward rounds, case presentations, clinical grand rounds, statistical meetings, journal club, lectures and seminars. Along with these activities, trainees should take part in inter-departmental meetings i.e clinico-pathological and clinico-radiological

meetings that are organized regularly. Trainees are expected to be fully conversant with the use of computers and be able to use databases like the Medline, Pubmed, Ermed, E-Journals subscribed by AIIMS Bhubaneswar etc. They should be familiar with concept of evidence-based medicine and the use of guidelines available for managing various diseases.

Maintenance of logbook

1. Every Post-Graduate degree candidate shall maintain a record of skills he has acquired during the three years training period certified by the various Head of Departments in which he/she has undergone training.
2. The candidates should also be required to participate in the teaching and training program of undergraduate and post graduate (MD) students.
3. In addition, the Head of the Department shall involve their Post-Graduate Pulmonary Medicine candidates in Seminars, Journal Clubs, Group Discussions and participation in clinical, clinicopathological conferences.

4. Candidates are required to attend at least 2 Regional/National/ International Conferences and make at least one presentation at any of these conferences during the course on relevant subjects. These should be entered in the Log Book.
5. The Head of the Department shall scrutinize the Log Book once in every three months.
6. At the end of the course, the candidate should summarize the contents and get the Log Book Certified by the Head of the Department.
7. The Log book should be submitted at the time of practical Examination for the scrutiny of the Board of Examiners.

At the end of three years of training program, a post graduate of DM Pulmonary Medicine should at least possess following skills

Clinical Skills

1. History taking & Physical examination: Analysis of data for clinical diagnosis
2. Knowledge about common clinical problems, Symptom complex, Diagnostic reasoning
3. Various investigations, interpretation
4. Interventional procedures
5. Critical care, Life saving procedures, Palliation and end of life decisions

Communication Skills

1. Professional Relationships
 - a. Patients and relatives
 - b. Colleagues/team work
 - c. Other staff
2. Consultation Skills
3. Record keeping
4. Bereavement Care
 - a. Breaking bad news
 - b. Referral for counseling

Managerial Skills

1. Policies/procedures (NHS, Hospital, Departmental)
2. Staff management
3. Resource management
4. Contracting/ setting standards, quality monitoring
5. Information technology/Health informatics
6. Clinical governance/audit, risk management
7. Compliments/complaints
8. Medico-legal statements
9. Committee Work
10. Public Relations/media
11. Major Incident planning/exercises/ Academic symposium

Teaching Skills

1. Lecture preparation
2. Small Group techniques
3. Presentation techniques
4. Teaching critique
5. Departmental teaching programme
6. Professional Development (self-directed learning)
7. Teaching certificate expected

DEPARTMENTAL TRAINING SCHEDULE & POSTING OF RESIDENTS

Following is the suggested weekly teaching program in the Department of Pulmonary Medicine & Critical Care

Seminar : Once in two weeks

Journal Club : Once a week

Grand Round/Case Based Learning : Once a week

Emergency/ICU Case Discussion : Once a week

Clinicopathological meet : Once in two months

Clinicoradiological meet : Once in two months

Faculty Lecture : Once in a month

Web-based Learning : Once in a month
Departmental Mortality Meet : Once in a month

Clinical Postings

- Pulmonary Medicine (ward, OPD, Bronchoscopy, PFT/Allergy testing lab, Special clinics) - 24 (Twenty-four) months
- Respiratory Intensive Care Unit – 12 (Twelve) months
- Emergency department / Casualty posting is not mandatory.

ASSESSMENT

INTERNAL ASSESSMENT

- **Examination on Research Methodology & Biostatistics**

The student will appear an examination on Research Methodology & Biostatistics at the end of 2nd Semester. This examination will be conducted by *Examination Cell* in the month of June-July & December-January every year. This examination will be considered as an internal examination with a total of 100 marks that consists of 20 questions of five marks each (20 questions × 5 marks = 100). Marks obtained in this internal examination will not be added to the final/summative examination. However, students have to pass (obtaining >50% marks) this examination as an eligibility criterion to appear in the Final examination. If someone secures <50%, he/she will appear the same examination in the next session.

- **Internal examination at end of 3rd semester, 4th semester and Pre-final 4 months before the final examination**

The student will appear a total of 3 (three) internal examinations at the end of the 3rd semester and 4th semesters and a pre-final test four months prior to the final exit examination.

- The mark distributions for each internal examination will be as follows: Theory 100 marks, and Practical 100 marks (Practical – 70, viva – 20, logbook – 10 = 100 marks). The marks of the 3 internal examinations will be

averaged to 100 each for theory and practical and will be added to the marks obtained in final examination.

FINAL / SUMMATIVE ASSESSMENT

A student will be eligible to appear for the final examination only when he /she:

- Passed (secured 50% marks) in the examination on Research Methodology and biostatistics and
- Passed (secured 50% marks) in internal examinations and
- The thesis submitted six months before the final examination and is approved/accepted by an external evaluator.

Final Theory Examination

- There will be four (4) papers of 100 marks each (total 400 marks) in theory examination.
 - Paper I: Basic & Allied sciences
 - Paper II: Respiratory Infections including Mycobacterial diseases
 - Paper III: Non-infectious diseases, Critical care & Sleep Medicine
 - Paper IV: Recent advances
- Question Paper Format will be as follows: In each paper, One Long question carrying 20 marks and Eight short answer type questions – 10 x 8 = 80 marks.
- Total theory marks for a candidate is 500 that includes 400 marks of final theory papers and 100 marks (an average of 3 internal examinations) of internal assessment. Students have to secure 50% marks in internal examination (in both theory and practical) to be eligible to appear for the final examination.

Final Practical Examination

The format of the practical examination

Parts	Components	Marks allotted
PART A ** 200 Marks	Longcase (1)	75
	Short cases (3)	75
	Ward Round	50
PART B 200 Marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	50
	Logbook	10
	Scientific writing (manuscript written out of the thesis)	15

** Students should pass (secure 50% marks) separately in Part A

Final Marking Pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3rd semester	End of 4th semester	Four months before the final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

Passing Marks

- The student has to secure $\geq 50\%$ marks in the internal examination to be eligible to appear for the final examination.
- In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
- In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

THESIS

As a part of DM curriculum, the student should complete one thesis project on a topic relevant to Pulmonary Medicine, Critical care or Sleep medicine during the tenure and it is desirable to submit the proof of communication of the manuscript (originated from his/ her thesis) to an indexed peer- reviewed journal.

- The student should submit the completed thesis 6 months before the final examination

- If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.
- The thesis will be sent to one external evaluator for approval. The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as accepted, accepted with suggested modification or rejected.
- If the thesis is accepted with suggested modifications, the comments of the evaluator will be intimated to the student and the guide for necessary correction/ modifications.
- After modification, the thesis will be evaluated by a departmental committee for final approval.
- If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination.

RECOMMENDED BOOKS

1. Fishman JA, Kotloff R, Grippi MA, Pack AI, M R, Elias JA. Fishman's Pulmonary Diseases and Disorders: McGraw-Hill Education; 2015.
2. West JB, Luks A. West's Pulmonary Pathophysiology: The Essentials: Wolters Kluwer; 2017.
3. Broaddus VC, Mason RJ. Murray & Nadel's Textbook of Respiratory Medicine: Elsevier Saunders; 2016.
4. West JB, Luks A. West's Respiratory Physiology: The Essentials: Wolters Kluwer; 2016.
5. Lumb AB. Nunn's Applied Respiratory Physiology: Elsevier Health Sciences; 2012.
6. Cross J, Harden B, Broad MA, Quint M, Paul Ritson M, Thomas S. Respiratory Physiotherapy: An On-Call Survival Guide: Elsevier Health Sciences; 2008.
7. Cairo JM. Pilbeam's Mechanical Ventilation: Physiological and Clinical Applications: Elsevier Health Sciences; 2015.
8. Kryger MH, Roth T, Dement WC. Principles and Practice of Sleep Medicine: Elsevier; 2016.
9. Berry RB. Fundamentals of Sleep Medicine: Elsevier Health Sciences; 2011.
10. Kryger MH. Sleep and Breathing Disorders: Elsevier Health Sciences; 2016.
11. Olson EJ, Medicine AAoS, Winkelman JW. Case Book of Sleep Medicine: Second Edition: American Academy of Sleep Medicine; 2015.
12. Berry RB, Albertario CL, Harding SM, Lloyd RM, Plante DT, Quan SF, et al. The AASM Manual for the Scoring of Sleep and Associated Events: Rules, Terminology and Technical Specifications: American Academy of Sleep Medicine; 2018.
13. Medicine AAoS. Essential Readings in Sleep Medicine: American Academy of Sleep Medicine; 2009.
14. Bassetti CL, Đogaš Z, Peigneux P, Society ESR. ESRS European sleep medicine textbook: European sleep research society; 2014.
15. Mottram C. Ruppel's Manual of Pulmonary Function Testing: Elsevier Health Sciences; 2017.
16. Webb WR, Müller NL, Naidich DP. High-resolution CT of the Lung: Wolters Kluwer Health; 2014.
17. Elicker BM, Webb WR. Fundamentals of High-Resolution Lung CT: Common Findings, Common Patterns, Common Diseases, and Differential Diagnosis: Common Findings, Common Patters, Common Diseases and Differential Diagnosis: Wolters Kluwer Health; 2012.
18. Webb WR, Higgins CB. Thoracic Imaging: Pulmonary and Cardiovascular Radiology: Wolters Kluwer Health; 2011.
19. Marino PL. Marino's The ICU Book: Wolters Kluwer Health; 2013.
20. Marini JJ, Dries DJ. Critical Care Medicine: The Essentials and More: Wolters Kluwer Health; 2018.
21. Joseph E. Parrillo MDF, R. Phillip Dellinger MDMS. Critical Care Medicine: Principles of Diagnosis and Management in the Adult: Elsevier Health Sciences; 2013.
22. Vincent JL, Abraham E, Kochanek P, Moore FA, Fink MP. Textbook of Critical Care: Elsevier Health Sciences; 2011.
23. Tobin C, Lee YCG, Gleeson F, Rahman N, Feller-Kopman D. Pleural Ultrasound for Clinicians: CRC Press; 2014.
24. Light RW. Pleural Diseases: Wolters Kluwer Health; 2013.
25. Wanger J. Pulmonary Function Testing: Jones & Bartlett Learning; 2011.
26. Lichtenstein DA. Lung Ultrasound in the Critically Ill: The BLUE Protocol: Springer International Publishing; 2015.

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27. American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR). Guidelines for Pulmonary Rehabilitation Programs: Human Kinetics; 2019.
28. Cooper CB, Storer TW. Exercise Testing and Interpretation: A Practical Approach: Cambridge University Press; 2001.
29. Jindal S, Agarwal R. Oxygen Therapy: Jaypee Brothers, Medical Publishers Pvt. Limited; 2008.
30. Jindal S. Textbook of Pulmonary and Critical Care Medicine: Jaypee Brothers, Medical Publishers Pvt. Limited; 2017.
31. MacIntyre NR. Advances in Mechanical Ventilation, An Issue of Clinics in Chest Medicine: Elsevier Health Sciences; 2016.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC AND ALLIED SCIENCES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss the defence mechanism of lung with reference different anatomical and physiological correlations. Write various ways how it is altered in different pathological conditions.
2. Enumerate the various stages of sleep. Discuss how the sleep cycle alters with age.
3. Describe the boundaries of thoracic outlet. Discuss the symptoms and causes of thoracic outlet syndrome.
4. Discuss the role of diaphragm in respiration.
5. What is dynamic compliance. Discuss its role in a mechanically ventilated patient.
6. Discuss in brief the different molecular class and mechanism of carbapenem resistant Enterobacteriaceae and its clinical significance.
7. Discuss the role of ultrasound in evaluation of dyspnoea in emergency department.
8. Discuss the pathogenesis, clinical and radiological features of IgG4-related lung disease.
9. Discuss the role of multidetector computed tomography scan in diagnosis of pulmonary embolism.

PAPER 2

RESPIRATORY INFECTIONS INCLUDING MYCOBACTERIAL DISEASES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Enumerate the various pneumonia severity scores? Discuss the management of community-acquired pneumonia.
2. Discuss the relative merits and demerits of revised national tuberculosis control programme.
3. Describe the role of Mycobacterium growth index tube in diagnosis of tuberculosis.
4. Discuss the management of Acinetobacter infection in intensive care units.
5. What is extensively drug-resistant tuberculosis. Discuss its management and prognosis.
6. Write the management of pulmonary cryptococcosis.
7. What are the risk factors for Pneumocystis jirovecii pneumonia? Discuss its management.
8. Discuss the clinical manifestations and diagnosis of COVID-19.
9. Describe the diagnosis and management of empyema thoracis.

PAPER 3

NON-INFECTIOUS DISEASES, CRITICAL CARE AND SLEEP MEDICINE

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss the etiopathogenesis of lung cancer. What are the systemic diseases related to smoking? How will you plan an anti-smoking strategy?
2. Define Chylothorax. Enumerate its causes and diagnostic evaluation.
3. What is metabolic syndrome. Discuss the risk factors for obstructive sleep apnoea.
4. Discuss the ventilatory management of acute severe asthma.
5. Discuss the role of tiotropium in the management of severe persistent asthma.
6. What is restless leg syndrome. Discuss the symptoms and management of restless leg syndrome.
7. Describe the role of pulmonary rehabilitation in chronic obstructive pulmonary disease.
8. Enumerate various eosinophilic pneumonia. Discuss the diagnosis and management of allergic bronchopulmonary aspergillosis.
9. Discuss in brief the various causes of weaning failure.

PAPER 4

RECENT ADVANCES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. How will you manage a case of ARDS with multi organ failure? What is lung protective ventilation. How will you prevent barotrauma?
2. Enumerate the indications and contraindications of bronchial thermoplasty.
3. Discuss the role of radial probe endobronchial ultrasound in diagnosis of peripheral lung lesions.
4. Discuss the role of ceftazidime-avibactam in multi-drug resistance gram negative infections.
5. Discuss the role of Indacaterol & Gycopyrronium therapy in obstructive airway disease.
6. Current status of bronchoscopic lung volume reduction in chronic obstructive pulmonary disease.
7. Describe the role of cryobiopsy in diagnosis of interstitial lung diseases.
8. Discuss the newer therapeutic options in pulmonary sarcoidosis.
9. Discuss the advantages and disadvantages of newer modes of mechanical ventilation.

ENTRUSTABLE PROFESSIONAL ACTIVITIES

Sl. No	EPA	Competency Domains						Level of Competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Residency	End of I Year	End of II Year	End of III Year	
1	History taking, general physical examination, Systemic examinations with focus on Respiratory System	*	*	*	*	*	*	II	III	IV	V	S, P, PG, I
2	Formulating a differential diagnosis based on history and examination	*	*	*	*	*	*	II	III	IV	V	S, PG, I
3	Ordering and interpretation of common diagnostic tests	*	*	*	*	*	*	II	III	IV	V	S, I
4	Entering and discussing orders and prescriptions and giving the necessary instructions to the patients	*	*	*	*	*	*	II	III	IV	IV	S, P, PG, I
5	Document clinical details in the patient record	*	*	*	*	*	*	III	IV	V	V	S, PG, I
6	Clinical presentation of a case	*	*	*	*	*	*	II	III	IV	IV/IV	S, PG, H
7	Using evidence-based medicine to improve patient care	*	*	*	*	*	*	I	II	III	IV	S, I
8	Give or receive a patient handover to transition care responsibility	*	*	*	*	*	*	II	III	IV	V	S, PG, H, I
9	Participating efficiently as a member of an interprofessional team	*	*	*	*	*	*	II	III	IV	IV	S, PG, H, I
10	Diagnosing conditions requiring emergency care and providing primary care	*	*	*	*	*	*	II	III	IV	IV	S, PG, H, P, I
11	Obtain informed consent for tests and/or procedures	*	*	*	*	*	*	III	IV	IV	V	S, P, PG
12	Performing general medical and surgical procedures	*	*	*	*	*	*	II	III	III	IV	S, PG, I
13	Identifying system failures and taking appropriate corrective measures	*	*	*	*	*	*	I	II	III	IV	S, PG, I

Sl. No	EPA	Competency Domains						Level of Competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Residency	End of I Year	End of II Year	End of III Year	
14	Attending UG lectures / seminars			*		*	*	I	II	III	IV	S,U,G,PG
15	Respiratory specimen sampling	*	*		*			II	III	III	IV	S,P,H
16	Pleural aspiration	*	*		*		*	II	III	IV	V	S,P,H
17	Performance and Interpretation of ABG	*	*		*			II	III	IV	V	S,P,H
18	Performance of Spirometry	*	*		*			I	II	III	IV	S,P,H
19	Bronchoscopy preparation	*	*		*		*	I	II	III	IV	S,P,H
20	Intercostal Chest Drain insertion	*	*		*		*	I	II	III	IV	S,P,H
21	BLS and ACLS	*	*		*		*	II	III	IV	IV	S,P,H
22	Patient counselling for ATT drugs	*	*		*		*	I	II	III	IV	S,P,H
23	Bedside demonstration for UG course	*	*		*		*	II	III	IV	IV	S,H,P,PG
24	Interpretation of Spirometry (independent)	*		*				I/II	III	IV	V	S,PG
25	Performance of DLCO	*	*		*			I/II	II	III	IV	S,H
26	Performing Bronchoscopy (independent)	*	*		*		*	I	I	II/III	IV	S,H
27	Counselling for Pulmonary rehabilitation	*	*	*			*	I	I	II	III	S,H
28	Approach to TPN in sick patients	*	*		*			I	I	II	III	S,H
29	Counselling patients with airway disease for inhaler technique / Adherence to therapy	*	*		*		*	I	II	III	IV	S,H
30	Performing pleural biopsy	*	*		*		*	I	II	III	IV	S,P,H

SL No	EPA	Competency Domains							Level of Competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Residency	End of I Year	End of II Year	End of III Year		
31	Bronchoscopic sampling (Transbronchial biopsy / bronchoalveolar lavage)	*	*		*			I	II	III	IV	S,P,H	
32	Performing Thoracoscopy	*	*		*		*	I	I	II	III	S,H	
33	Performing Thoracic Ultrasonography	*	*		*			I	II	III	IV	S, PG,I	
34	USG Guided Lung Biopsy/Procedures	*	*		*			I	II	III	IV	S, PG, P	
35	Performing Conventional Transbronchial Needle Aspiration	*	*		*			I	I	II	III	S,PG,I	
36	Performing Endobronchial Ultrasound	*	*		*			I	I	II	III	S,PG,H	
37	Monitoring 6-minute Walk Test	*	*		*		*	I	II	III/IV	IV	S,PG,P,H	
38	Performing Allergy Skin Testing	*	*		*			I	II	III	IV	S,P,PG,H	
39	Interpretation of Skin Prick Test	*	*		*		*	I	II	III	IV	S,PG,H	
40	Performing Fractional Exhalation of Nitric Oxide	*	*		*			I	III	IV	V	S,I,PG	
41	Lung Volume Estimation (Plethysmography)	*	*		*			I	II	III	IV	S,PG	
42	Interpretation of HRCT Chest	*	*		*			II	III	IV	V	S,PG	
43	Patient Preparation and Hook Up in Polysomnography	*	*		*			I	III	IV	IV	S,PG,H	
44	Polysomnography Interpretation and Manual Scoring	*	*		*			I	II	III	IV	S,H,PG	
45	Planning Chemotherapy in Lung Cancer	*	*		*			I	II	III	III	S,PG,I	
46	Basic Echocardiography	*	*		*			I	II	III	IV	S,PG,I	
47	Hemodynamic Monitoring in ICU	*	*		*			I	II	III	IV	S,PG	
48	Central Venous Catheterization	*	*		*			I	II	III/IV	IV	S,PG,H,I	

Sl. No	EPA	Competency Domains						Level of Competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Residency	End of I Year	End of II Year	End of III Year	
49	Arterial Line Insertion	*	*		*			I	II	III/IV	IV	S,PG,H,I
50	Non-Invasive Ventilation in Respiratory Failure	*	*		*			I	II	III/IV	IV	S,PG,I
51	Invasive Mechanical Ventilation	*	*		*			I	II	III	IV	S,PG,I
52	Endotracheal Intubation	*	*		*			I	II	III	IV	S,PG,I
53	Performing Cricothyroidotomy	*	*		*			I	II	III	IV	S,PG,H,I
54	Performing Percutaneous Tracheostomy	*	*		*			I	II	II	III	S,PG,I,H
55	Thrombolysis Therapy	*	*		*			I	II	II	III	S,PG
56	Assisting Renal Replacement Therapy	*	*		*			I	II	II	II	S,H
57	Interpretation of Temporary Pacemaker	*	*		*			I	II/III	IV	IV	S,H,PG
58	Interpretation of IABP Waveforms	*	*		*			I	II	III	IV	S,PG,H
59	Pericardiocentesis	*	*		*			I	II	II	II	S,PG,H
60	Rigid Bronchoscopy and Therapeutic Procedures	*	*		*			I	I	II	III	S,H
61	Cryotherapy and Cryo-biopsy	*	*		*			I	I	II	III	S, H
62	End-of- Life Care in ICU, Breaking Bad News	*	*	*	*	*	*	I	II	III	IV	S,PG,I,H

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I

Levels of competence:

Level I: Knowledge only; can observe

Level II: Can do under strict supervision

Level III: Can do under loose supervision

Level IV: Can do independently

Level V: Has the expertise to teach others

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills



SURGICAL ONCOLOGY

COURSE NAME:

MCh Surgical Oncology

DURATION OF COURSE:

3 years

ELIGIBILITY:

MBBS, MS/DNB (General Surgery)

OBJECTIVES

The trainee should achieve such knowledge during the training period that he/she after qualification, independently or as a responsible surgical member of an interdisciplinary oncology team is able to:

- Recognise symptoms, signs of cancer and make a diagnosis of cancer in a patient and stage it accordingly.
- Perform an adequate preoperative workup.
- Define the multimodality approaches in a pre-treatment discussion within a multidisciplinary team.
- Role of surgery in a given cancer patient
- Perform cancer surgery within his/her speciality with high skill and quality.
- Manage postoperative care.
- Decide on and perform follow-up.
- Implement national guidelines into local practice.
- Perform palliative surgical treatment, supportive and terminal care.
- Diagnose and manage the complications of surgical treatment.
- Assess the impact of surgical interventions on quality of life.
- Communicate accurately and adequately to cancer patients and their relatives.
- Manage common psychologic reactions to crisis and the final stage of life.
- Practice medicine in accordance with medical ethics and patient's rights.

SYLLABUS CONTENT

THEORY

Part I: Basic Oncology

- Molecular Biology of Cancer
- Cell Cycle
- Cancer Genetics
- Invasion and Metastasis
- Aetiology of Cancer
- Epidemiology of Cancer
- Principles of Cancer Management
- Pharmacology of Cancer Chemotherapy
- Clinical Trials in Cancer
- Cancer Prevention
- Cancer Screening
- Imaging Techniques in Cancer Management
- Specialised techniques of Cancer Diagnosis and management
- Vascular Access and Specialised Technique of drug delivery
- Biostatistics
- Palliative care and Hospice program
- Cancer control programs

Part II: Clinical Oncology

- Cancer of Head and Neck
- Cancer of Lung
- Neoplasms of Mediastinum and Pleura
- Cancers of Gastro-Intestinal Tract
- Cancers of Genito Urinary System
- Gynaecological Cancers
- Cancer of the Breast
- Cancer of Endocrine System
- Sarcomas of Soft Tissues and Bones
- Cancer of Skin
- Neoplasm of C.N.S.
- Cancers of Childhood
- Lymphomas and Leukaemia
- Paraneoplastic Syndromes

- Cancers of Unknown Primary site
- Oncological Emergencies
- Treatment of Metastatic Cancers
- Bone Marrow dysfunction in Cancer Patient
- Infections in Cancer Patients
- Adverse effects of treatment
- Supportive Care and Quality of Life
- Rehabilitation of Cancer Patients
- Precision Medicine

Part III: Surgical Oncology

- Applied anatomy
- Operative Surgery

Part IV: Recent Advances in Oncology

- New technologies and recent developments in Oncology.

PRACTICAL

Head and Neck

- Major resections for the Oral cavity, laryngopharyngeal cancers, skull base tumours
- Surgical resection of Thyroid and salivary gland tumours
- Various types of neck dissections
- Major resections for melanoma, squamous/ basal cell carcinomas, soft tissue tumours

Breast

- Various types of Mastectomies
- Conservation treatment of breast cancer
- Localisation techniques for impalpable lesions and Operations for benign breast diseases
- Sentinel lymph node biopsies
- Breast reconstruction techniques and oncoplasty

Gastrointestinal Cancers

- Major resections for Gastric, Colorectal cancers and oesophageal cancers

- Resectional surgery for Hepatobiliary and pancreatic tumours
- Retroperitoneal tumour resections and Palliative procedures (Gastrostomy /colostomy)
- Cytoreductive surgery and HIPEC
- Minimally Invasive Surgery in GI oncology

Trunk and Extremities

- Operations for Soft tissue/bone tumours including limb salvage surgery
- Major resections for skin cancers (Squamous cell/ basal cell/melanoma)
- Radical lymph node dissections (inguinal, iliac, axillary)
- Routine + Major amputations (hemipelvectomy, forequarter amputation)

Thoracic Oncology

- Major Resections for Oesophageal cancers (Trans-hiatal and Trans-thoracic esophagectomy)
- Resection of chest wall tumours with reconstruction and Mediastinal tumours
- Resection of lung cancer and pulmonary metastases
- Management of empyema, thoracostoma
- Surgery for malignant mesothelioma

Genito Urinary Oncology

- Major surgeries for cervical, ovarian, Renal, testicular, urinary bladder and penile cancers
- Complex surgical procedures like pelvic exenterations and RPLND for advanced pelvic tumours

Miscellaneous

- Oncoplasty: Various flaps for reconstruction of common head and neck, trunk, chest wall and extremity defects.
- Endoscopy: Upper GI, Lower GI, Broncho, laryngo, pharyngo, and nasopharyngoscopy.
- Vascular Access Procedures and Intraperitoneal chemo catheter insertions

-
- Minimally Invasive Cancer Surgery/Robotic surgery
 - Lesser in oncology
 - Hyperthermic Intra-Peritoneal Chemotherapy

TEACHING AND LEARNING METHODS

Clinical Training

- Outpatient care - Workup, Stage and plan treatment for cancer patients by participating in outpatient clinics and tumour board discussions.
- Inpatient care (Pre, Intra and postoperative) of cancer patients undergoing surgery, including intensive care of critically ill postoperative patients.
- Active participation in the rehabilitation and follow up of treated cancer patients organising timely adjuvant therapies for operated patients.
- Active participation in departmental surgical audit and follow-up audit with database management and data analysis as per the protocols of the department, notified time to time.

Surgical training:

The trainee should be exposed to the following surgical procedures during the 3-year tenure. During the first and second year, the trainee will be given the opportunity to assist, and in the final year, he will be allowed to perform major surgeries under supervision.

1. Head and Neck:

- a. Major resections for the Oral cavity, laryngopharyngeal cancers, skull base tumours.
- b. Surgical resection of Thyroid and salivary gland tumours
- c. Various types of neck dissections
- d. Major resections for melanoma, squamous/basal cell carcinomas, soft tissue tumours.

2. Breast:

- a. Various types of Mastectomies
- b. Conservation treatment of breast cancer
- c. Localisation techniques for impalpable lesions and Operations for benign breast diseases
- d. Sentinel lymph node biopsies
- e. Breast reconstruction techniques

3. Gastrointestinal Cancers:

- a. Major resections for Gastric, Colorectal cancers and oesophageal cancers.
- b. Resectional surgery for Hepatobiliary and pancreatic tumours.
- c. Retroperitoneal tumour resections and Palliative procedures (Gastrostomy/colostomy)
- d. Minimally Invasive Surgery in GI oncology

4. Trunk and Extremities:

- a. Operations for Soft tissue/bone tumours including limb salvage surgery
- b. Major resections for skin cancers (Squamous cell/basal cell/melanoma).
- c. Radical lymph node dissections (inguinal, iliac, axillary)
- d. Routine + Major amputations (hemipelvectomy, forequarter amputation)

5. Thoracic Oncology:

- a. Major Resections for Esophageal cancers (Trans-hiatal and Trans-thoracic esophagectomy)
- b. Resection of chest wall tumours and Mediastinal tumours
- c. Resection of lung cancer and pulmonary metastases

6. Genito Urinary Oncology:

- a. Major surgeries for cervical, ovarian, renal, testicular and penile cancers
- b. Complex surgical procedures like pelvic exenteration and RPLND for advanced pelvic tumours.

6. Miscellaneous:

- a. Oncoplasty: Various flaps for reconstruction of common head and neck, trunk, chest wall and extremity defects.
- b. Endoscopy: Upper GI, Lower GI, Broncho, laryngo, pharyngo, and nasopharyngoscopy.
- c. Vascular Access Procedures and Intraperitoneal chemo catheter insertions
- d. Minimally Invasive Cancer Surgery
Hyperthermic Intra-Peritoneal
Chemotherapy

Academic activities:

- There will be multidisciplinary Seminars, Journal Clubs, Basic sciences lecture class, clinical discussions each of one-hour duration every week and the candidate should actively participate in such activities as per the roster.
- In addition, the candidate should also present a case in combined-round and contribute actively for the departmental Grand-round.
- They should also attend weekly radiology and pathology case discussions. The attendance of these activities is compulsory.
- Attending one national/international conference to present a paper/poster on a subject related to the project or core-area database.

Research and Project work

- Thesis / Dissertation Work: The candidate should register a subject of his / her thesis within six months of joining the course, and the completed work will be submitted six months prior to final examinations.
 - The subject should be related to clinical oncology/lab oncology / basic sciences.
 - The candidate must see that the study and conclusion should be published/ submitted in a national/international journal.
- Database project: Each resident will be given a core-area of departmental database, and he/she will be responsible for entry and update of clinical data and follow up. He will perform a

final outcome analysis and present the outcome in national/international conference and preferably publish as an original article before the final examination.

DEPARTMENTAL TRAINING SCHEDULE AND POSTING OF RESIDENTS

1. Surgical Oncology: 34 months.

The resident will be rotated in other allied oncology departments as follows, after one and a half year of joining in MCh course as per the decision of the HoD.

2. Radiation Oncology (2 weeks): To learn the basics of clinical radiotherapy including treatment planning, teletherapy and brachytherapy techniques.

3. Medical Oncology (2 weeks): For gaining exposure to common chemotherapy protocols used for solid tumours drug administration and management of chemotoxicity.

4. Basic sciences/ laboratory rotation (2 weeks): Related to basic sciences project or area of interest including biochemistry, molecular biology, genetics, immunology, radio-immunoassay lab, microvascular surgery lab or minimally invasive surgery lab etc.

5. Radiology: (2 weeks) To learn basic radiology for surgeons

ASSESSMENT

INTERNAL ASSESSMENT

1. Examination on Research Methodology and Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100 (20 x 5) marks
- It will be considered as an internal examination
- Candidate should pass to appear in Final examination (minimum 50% marks to pass)

- No marks will be added to final/summative examination
 - Will be conducted by Examination Cell in the month of June and December
2. A total of 3 internal examinations will be conducted at the end of 3rd semester, 4th semester and pre-final (4 months before final) examination.
3. Marks distribution: Theory paper will carry 100 marks. There will be a topic wise assessment (table 4). Practical with viva and logbook (Clinical/ experimental/ practical = 70, viva = 20, logbook = 10) will be of 100 marks. The marks of the three internal examinations will be averaged to 100 each for theory and practical.

SUMMATIVE/FINAL EXAMINATIONS

Eligibility for appearing in the Final Examination

- Passed (secured 50% marks) in the examination on Research Methodology and biostatistics and
- Passed (secured 50% marks) in internal examinations and
- The thesis submitted six months before the final examination and is approved/accepted by an external evaluator.

The format of the practical examination

Parts	Components	Marks allotted
PART A ** 200 Marks	Longcase (1)	75
	Short cases (3)	75
	Ward Round	50
PART B 200 Marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	50
	Logbook	10
	Scientific writing (manuscript written out of the thesis)	15

** Students should pass (secure 50% marks) separately in Part A

Final Theory Exam

- Theory: 4 papers (100 marks each, 3 hours duration) – topic described as below
 - Paper I: Basic & Allied Sciences related to Oncology
 - Paper II: Surgical Oncology - I
 - Paper III: Surgical Oncology - II
 - Paper IV: Recent advances in Oncology
- Theory question paper format
 - One Long question – 20 marks
 - Eight Short question/notes – 10 x 8 = 80 marks
- Total marks in theory: 500 marks
 - Average of 3 internal examinations – 100 marks
 - Four papers in the final examination – 400 marks

Final Practical examination

Total Marks in Practical examination: 500

- Final Examination: 400 marks
- Average of 3 internals: 100 marks

Final Marking Pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3 exams)	Final Examination	Total Marks
Time frame	End of 3rd semester	End of 4th semester	Four months before the final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

Passing Marks

- The student has to secure $\geq 50\%$ marks in the internal examination to be eligible to appear for the final examination.
- In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
- In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

LOGBOOK

A logbook is a comprehensive record of all academic events during the three years course. Work done by the student in the department should be entered in the logbook regularly. The logbook shall be checked by faculties at regular intervals. The logbook will be reviewed every six months by departmental faculties to supplement deficits if any in the succeeding six months. The logbook shall be reviewed at the time of viva-voce at the time of final examination.

THESIS

As a part of MCh curriculum, the student should complete one thesis project on a topic relevant to Pulmonary Medicine, Critical care or Sleep medicine during the tenure and it is desirable to submit the proof of communication of the manuscript (originated from his/ her thesis) to an indexed peer-reviewed journal.

- The student should submit the completed thesis six months before the final examination
- If more than 20% plagiarism is detected, the

student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.

- The thesis will be sent to one external evaluator for approval. The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as accepted, accepted with suggested modification or rejected.
- If the thesis is accepted with suggested modifications, the comments of the evaluator will be intimated to the student and the guide for necessary correction/ modifications.
- After modification, the thesis will be evaluated by a departmental committee for final approval.
- If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination.

RECOMMENDED BOOKS

1. DeVita VT, Lawrence TS, Rosenberg SA. DeVita, Hellman, and Rosenberg's Cancer: Principles & Practice of Oncology: Wolters Kluwer Health; 2015.
2. Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE. Abeloff's Clinical Oncology Review: Elsevier Health Sciences; 2013.
3. Djulbegović B, Sullivan DM. Decision Making in Oncology: Evidence-based Management: Churchill Livingstone; 1997.
4. Bland KI, Karakousis CP, Copeland EM. Atlas of Surgical Oncology: Saunders; 1995.
5. Thawley SE. Comprehensive management of head and neck tumors: W.B. Saunders; 1999.
6. Shah JP, Patel SG, Singh B, Wong R. Jatin Shah's Head and Neck Surgery and Oncology: Elsevier Health Sciences; 2019.
7. Bailey BJ, Johnson JT, Newlands SD. Head & Neck Surgery-otolaryngology: Lippincott Williams & Wilkins; 2006.
8. Donegan WL, Spratt JS. Cancer of the Breast: W.B. Saunders; 1995.
9. Patterson GA, Pearson FG, Cooper JD, Deslauriers J, Rice TW, Lerut AEMR, et al. Pearson's Thoracic and Esophageal Surgery: Churchill Livingstone, Elsevier; 2008.
10. Jarnagin WR. Blumgart's Surgery of the Liver, Biliary Tract, and Pancreas: Elsevier; 2016.
11. Rustgi AK. Gastrointestinal Cancers: Biology, Diagnosis, and Therapy: Lippincott-Raven; 1995.
12. Coppleson M. Gynecologic Oncology: Fundamental Principles and Clinical Practice: Churchill Livingstone; 1981.
13. Ashley SW, Zinner MJ, Hines OJ. Maingot's Abdominal Operations: McGraw-Hill Education; 2018.
14. Cohen M. Mastery of Plastic and Reconstructive Surgery: Little, Brown; 1994.
15. Mallick S, Rath GK, Benson R. Practical Radiation Oncology: Springer Singapore; 2019.
16. Sugarbaker PH, Nicholson TH. Atlas of Extremity Sarcoma Surgery: Lippincott; 1984.
17. Goldblum JR, Lamps LW, McKenney JK, Myers JL. Rosai and Ackerman's Surgical Pathology: Elsevier; 2017.
18. Hansen JT. Netter's Clinical Anatomy: Elsevier Health Sciences; 2017.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC AND ALLIED SCIENCES RELATED TO ONCOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss the etiology, pathogenesis and current clinical implications of viral Carcinogenesis.
2. Define genetic counselling and discuss the current role of risk reducing surgery in cancer.
3. Discuss the role of PET scan in head & neck squamous cell carcinoma.
4. Define Cancer stem cells. Discuss the mechanism of regulation and current implication of the same in cancer treatment
5. Discuss the various phases of Clinical trials in Oncology with examples from each phase.
6. Discuss the WHO analgesic ladder with examples.
7. What is Chemoprevention? Discuss Current evidence regarding five agents used for cancer prevention.
8. Discuss the challenges of breaking bad news to patients.
9. Define Cancer Screening and discuss different methods of cancer screening. Discuss screening of two cancers which improve survival.

PAPER 2

SURGICAL ONCOLOGY - I

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Classify Lung Cancer and discuss the staging workup and treatment of locally advanced Non-small cell carcinoma of lung.
2. What is Sentinel Node Biopsy? Discuss different Methods, Indications and Contra-indications in breast cancer.
3. What is Stereotactic Radio surgery? Discuss the indications, contraindications, and advantages.
4. Discuss the workup for a patient with solitary thyroid nodule.
5. Discuss the role of adjuvant therapy for oesophageal carcinoma.
6. Discuss organ preservation strategy in head and neck cancers.
7. Discuss the principles of Chest wall resection and reconstruction.
8. What are the different types of neck dissection, indications, and complications?
9. What is superior vena-cava syndrome? Discuss it's causes and management?

PAPER 3

SURGICAL ONCOLOGY - II

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss the types of resection and reconstruction in various pancreatic cancer Surgery. Enumerate the complications.
2. Define Castrate resistant prostate cancer. Discuss treatment options and outcome.
3. Discuss role of metastasectomy in Bone Sarcoma.
4. Describe with a diagram lymph node stations for gastric cancer. Describe D2 dissection for distal gastric cancer.
5. Discuss epidemiology, risk factors and TNM staging of endometrial cancer.
6. Discuss outcomes of Swedish and German trials in Rectal Cancer.
7. Discuss staging workup for renal cell carcinoma, indications for nephron sparing surgery and adjuvant therapy.
8. Discuss the principles of tissue diagnosis, imaging and surgery of Soft tissue sarcoma.
9. Discuss the types, indication and complications of inguinal dissection.

PAPER 4

RECENT ADVANCES IN ONCOLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. What is Hyperthermic Intraperitoneal Chemotherapy (HIPEC)? List its Indications and describe the methods and complications of HIPEC.
2. What is Overdiagnosis in cancer? Differentiate it from over testing and misdiagnosis. Give examples of over diagnosis.
3. Discuss the role of PET scan in lung cancer.
4. Enumerate the mechanism of Targeted therapy. Discuss indications in lung cancer and complications of targeted therapy.
5. Discuss the current indications of minimally invasive surgery in pelvic cancers.
6. List the indications and contraindications use of Radio-nucleotides in cancer. Describe its use in Thyroid Cancer.
7. Define Metronomic Therapy. What is the mechanism of action and discuss clinical use.
8. Describe the indications and contraindications of Ultra-low anterior resection for rectal cancer.
9. Discuss the role of Artificial Intelligence in Cancer Imaging with a note on its challenges & applications.

ENTRUSTABLE PROFESSIONAL ACTIVITIES

Sl. No	EPA	Competency Domains							Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of MCh	End of 2 nd sem.	End of 4 th sem.	End of 6 th sem.		
1	Gather a history and perform a physical examination	*	*	*		*	*	2	4	5	5	I,S,PG	
2	Establish a provisional diagnosis and prioritise a differential diagnosis	*		*		*		1	3	4	5	I,S,PG	
3	Recommend and interpret common diagnostic tests	*	*	*		*		2	3	4	5	I,S,PG	
4	Documentation of clinical findings in the hospital record.	*		*		*		2	3	4	5	I,S,PG,H	
5	Provide an oral presentation of clinical case	*				*		1	3	4	5	I,S,PG,H	
6	Differentiate an elective from emergency setting to initiate appropriate management	*	*		*	*		1	3	4	5	I,S,PG,H	
7	Form clinical questions and obtain evidence to facilitate patient care.	*	*	*		*		1	3	4	5	I,S,PG	
8	Enter therapeutic orders and prescriptions	*	*		*	*		1	3	4	5	I,S,PG,H	
9	Obtain informed consent for tests and procedures.	*	*	*	*	*		1	3	4	5	I,S,PG,P,H	
10	Monitor and enforce planned clinical care	*	*		*	*		1	3	4	5	I,S,PG,H	
11	Give/receive a patient handover in the transition of clinical responsibility	*	*		*	*		1	3	4	5	I,S,PG,H	
12	Collaborate as a member of an interdisciplinary team / liaise with other departments	*	*		*	*		1	3	4	5	I,S,PG,H	
13	Identify system failures and work towards patient safety	*	*		*	*		1	3	4	5	I,S,PG,H	
14	Effective communication with peers / superiors/ subordinates	*	*			*		1	3	4	5	I,S,PG,H	
15	Attitude towards patient and caretakers.	*	*			*		1	3	4	5	I,S,PG,P,H	
16	Preoperative counselling of patient and caretakers	*	*			*		1	3	4	5	I,S,PG,P,H	
17	Perform general procedures, e.g. peripheral venous line placement, wound dressings	*	*		*	*		1	2	3	5	I,S,PG,H	

Sl. No	EPA	Competency Domains							Level of competency				MSF	
		MK	PC	PBLI	SBP	P	ICS	Day 1 of MCh	End of 2 nd sem.	End of 4 th sem.	End of 6 th sem.			
18	Basic Preoperative and postoperative care	*	*	*	*	*	*	*	*	1	2	3	5	I,S,PG,H
19	Adherence to OT protocols – Asepsis, Scrubbing, Attire, etc.	*	*		*	*				2	3	4	5	I,S,PG,H
20	Principles of infection control and adherence to antibiotic policy	*	*		*	*				2	3	4	5	I,S,PG,H
21	Use of energy devices- diathermy, Harmonic scalpel	*	*		*	*				1	2	3	5	I,S,PG,H
22	Handling instruments, Suture materials. Etc.	*	*		*	*				2	3	4	5	I,S,PG,H
23	Orientation to Endoscopy and procedures (Cystoscopy/ Bronchoscopy)	*	*		*	*				1	1	2	4	I,S,PG,H
24	Orientation to Minimally invasive Surgery (Laparoscopy / Thoracoscopy)	*	*		*	*				1	1	2	3	I,S,PG,H
25	UG teaching / discussions	*			*	*				1	2	3	4	I,S,PG
26	PG teaching / discussions	*			*	*				1	2	3	3	I,S,PG
27	Nursing teaching/ discussions	*			*	*				1	2	3	4	I,S,PG,H
28	Ability to conduct simple research studies									1	2	3	4	I,S,PG
29	Able to write Scientific Papers	*				*				1	2	3	4	I,S,PG
30	Able to discuss Scientific Papers					*				1	2	3	4	I,S,PG
31	Able to make a podium presentation at clinical fora	*				*				1	2	3	4	I,S,PG
32	Lymph Node Biopsy, Excision Biopsy under LA	*	*		*	*				1	3	5	5	I,S,PG,H
33	Chemoport Insertion	*	*		*	*				1	1	3	5	I,S,PG,H
34	Breast Surgery	*	*		*	*				1	2	4	5	I,S,PG,H
35	Axillary Dissection	*	*		*	*				1	2	4	5	I,S,PG,H
36	Amputations	*	*		*	*				1	3	4	5	I,S,PG,H
37	Inguinal Dissection	*	*		*	*				1	1	3	5	I,S,PG,H
38	Wide Local Excision	*	*		*	*				1	1	3	5	I,S,PG,H
39	Neck Dissection	*	*		*	*				1	1	3	5	I,S,PG,H
40	Oral Cancer Resection	*	*		*	*				1	1	3	5	I,S,PG,H

SL No	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of MCh	End of 2 nd sem.	End of 4 th sem.	End of 6 th sem.	
41	Oral Cancer Reconstruction	*	*	*	*			1	1	3	5	I,S,PG,H
42	Weirtheim's Hysterectomy	*	*	*	*			1	1	3	4	I,S,PG,H
43	Pelvic Dissection	*	*	*	*			1	1	4	4	I,S,PG,H
44	Para-aortic Dissection	*	*	*	*			1	1	2	4	I,S,PG,H
45	Whipple's Operation	*	*	*	*			1	1	1	2	I,S,PG,H
46	Thoracotomy	*	*	*	*			1	1	1	2	I,S,PG,H
47	Esophagectomy	*	*	*	*			1	1	1	2	I,S,PG,H
48	Lung Resections	*	*	*	*			1	1	1	2	I,S,PG,H
49	Gastrectomy	*	*	*	*			1	1	1	4	I,S,PG,H
50	Colectomy	*	*	*	*			1	1	1	4	I,S,PG,H
51	Rectal Cancer Surgery	*	*	*	*			1	1	1	4	I,S,PG,H
52	RPLND	*	*	*	*			1	1	1	3	I,S,PG,H
53	Colostomy	*	*	*	*			1	1	3	5	I,S,PG,H
54	Gastrojejunostomy	*	*	*	*			1	2	4	5	I,S,PG,H
55	Feeding Jejunostomy	*	*	*	*			1	1	3	5	I,S,PG,H
56	Secondary Suturing of Burst Abdomen	*	*	*	*			1	2	4	5	I,S,PG,H

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

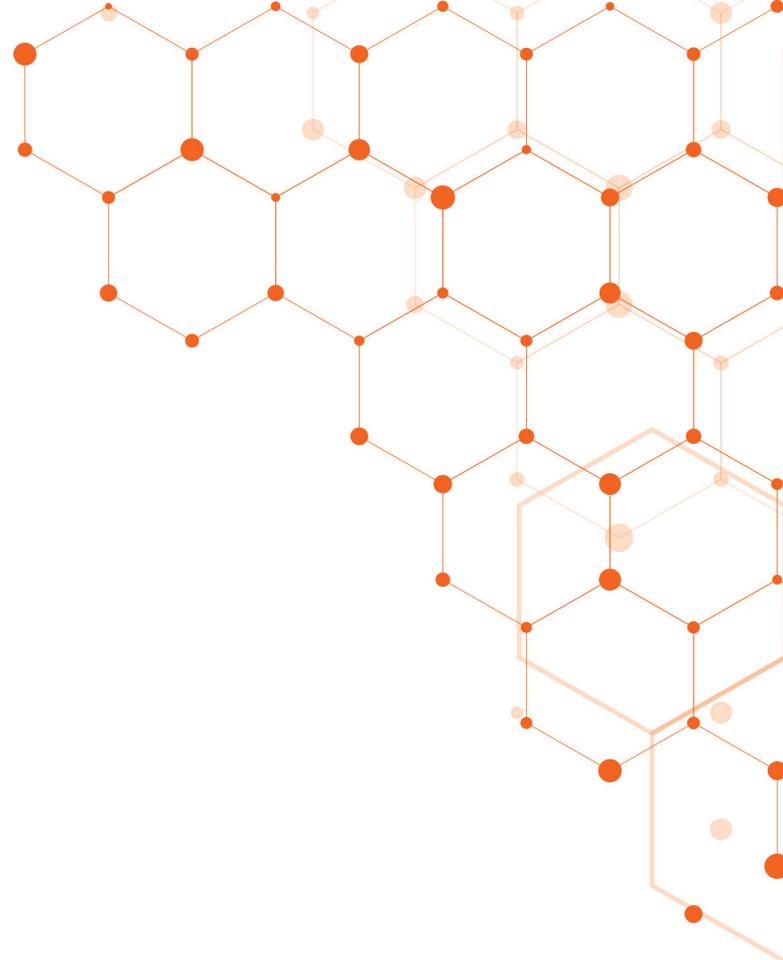
Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



UROLOGY



MCh in Urology

COURSE NAME:

MCh in Urology

DURATION OF COURSE:

3 years

ELIGIBILITY:

MBBS, MS (General Surgery)

OBJECTIVES

The objective of M.Ch (*Magister Chirurgiae*) in Urology degree course is to produce highly competent Urologists, able to deal effectively with the needs of the community and competent enough to handle all basic Urological problems. The training should provide in-depth knowledge of General Urology, sub-specialties of Urology and relevant basic allied subjects. The course is expected to inculcate a scientific approach with logical and analytical thinking in approaching a problem. The stress would be to prioritize development of psychomotor skills and safe surgical practices. This should culminate in shaping of a shrewd clinician, confident surgeon and a knowledgeable teacher well versed in basic and advanced research methodology.

The basis for such an ideal training program will be a powerful Urology service complete in every sense. The trainee should also acquire skill in supervision of Para-medical staff and be able to work as a team member of the health care providers. He / She should be aware of his/her limitations and should be able to decide the point of referral to a senior colleague or a higher institution. Urology is constantly evolving surgical science, which is observing a rapid transformation in face of increasingly better understanding of pathophysiology of various disease- processes and a slew of technological advancements. This evolution is now exemplified by the development of well-established subspecialties in Urology:

- Endo-Urology
- Laparoscopy & Robotics
- Uro-Oncology

- Genitourinary Reconstructive Urology
- Andrology & Men's Health
- Male Infertility
- Female Urology
- Neuro-Urology and Urodynamics
- Renal Transplantation
- Pediatric Urology
- Emergency Urology

The training program in Urology should be integrated and well thought-out in such a way that on completion of the training, the candidates become proficient in the principles and practice of urological surgery, allied basic medical sciences, investigative technique and research methodology with emphasis on common urological disorders prevalent in the community. This is a dynamic process and needs regular and periodic review for continuous updating.

The training is exclusively on a full time, in-service residency pattern. The major emphasis should be on practical training in the indoor wards, Outpatient clinics and Operation Theatres with active participation of the trainees in the day-to-day management of urological patients. A gradually increasing responsibility is given to the trainees depending upon their ability, experience and performance. The candidates are also required to be conversant with the research-methodology and preparation of scientific publications.

SYLLABUS CONTENTS

1. Basic science: Anatomy including embryology; Physiology; Biochemistry; Pathology; Microbiology, Immunology, Biophysics and Genetics as related to the practice of Urology
2. Principles of Nephrology, Radiology, Medical Oncology, Pharmacology and Nuclear Medicine as applied to Urology
3. Comprehensive clinical Urology encompassing all aspects of Urology
4. Recent advances in Urology
5. Biostatistics and Research Methodology

TOPICS IN DETAIL

Urolithiasis:

- Etiopathogenesis & Mineral Metabolism
- Genetics, Molecular chemistry
- Diagnosis and evaluation including various methods of stone analysis
- Medical & Surgical management
- Shock Wave Lithotripsy – Principles and practice

Urological Infections (bacterial, mycobacterium, fungal, viral & parasitic infestation):

- Definitions & classification
- Etiology & epidemiology
- Pathogenesis
- Principles of antimicrobial therapy
- Imaging techniques
- Evaluation and management

Voiding function & Dysfunction:

- Physiology & pharmacology of bladder & urethra.
- Neuro-urologic evaluation and management of neuromuscular dysfunction.
- Urinary incontinence
- Pathophysiology, diagnosis, evaluation and management
- Urodynamic studies.
- BPH
 - Molecular biology, endocrinology and physiology.
 - Etiology, pathophysiology.
 - Epidemiology & natural history.
 - Evaluation.
 - Medical management.
 - Surgical modalities of treatment.

Genitourinary trauma and urological emergencies

- Etiology, evaluation and management of renal, ureteral, bladder, urethral, penile and genital trauma.
- Evaluation and emergency management of urological sepsis including tuberculosis, acute renal failure and chronic kidney diseases, renal replacement therapy and other emergencies as depicted earlier

Endo-Urology & Laparoscopy

- Principles and practice (adult and pediatric)
- Management of complications
 - Lower Tract:
 - Rigid and Flexible Cystoscopy
 - Visual Internal Urethrotomy
 - Bladder Neck Incision
 - Transurethral Resection of Bladder Tumor (TURBT)
 - Transurethral resection of Prostate (TURP)
 - Holmium LASER Enucleation of Prostate (HoLEP)
 - Ureterocele Incision
 - Upper Tract:
 - PCN (Percutaneous Nephrostomy)
 - PCNL (Percutaneous Nephrolithotomy)
 - Ureteroscopy
 - RIRS (Retrograde intrarenal surgery)
 - Nephrectomy
 - Pyeloplasty
 - Ureterolithotomy

Uro-Oncology

- Molecular genetics, cancer biology and epidemiology
- Etiopathogenesis, evaluation and management of neoplasia of Kidney, Adrenal, Retroperitoneum, Urothelium, Testis, Prostate, Urethra and External Genitalia
- Surgical principles and procedures

- Principles and applications of Radiotherapy and systemic therapy
- Palliative care and support system
- Social issues

Andrology

- Male reproductive physiology and axis.
- Male infertility Evaluation and Management
- Assisted Reproductive Techniques: Principles
Hormonal assay (male &female)
IUI
Ovarian induction
IVF
ICSI
Sperm Retrieval Techniques
- Sexual function & dysfunction:
Physiology and pathology of penile erection
Evaluation and management of erectile dysfunction and priapism.
Male & female sexual health

Female Urology

- Anatomy and physiology of pelvic floor
- Pathophysiology and Evaluation of incontinence
- Principles of management (conservative and operative) of stress urinary incontinence.
- Pelvic organ prolapses: pathophysiology, evaluation and principles of management
- Genitourinary fistulae (e.g. Vesicovaginal, urethrovaginal, ureterovaginal, vesicouterine, ureterouterine etc.) and urethral diverticulum
 - Etiopathogenesis
 - Evaluation
 - Treatment modalities
- Vaginal & abdominal procedures (Laparoscopic/ Robotic assisted)
- Intraoperative assessment of bladder and ureteral injury

Pediatric Urology:

- Development of Urogenital system
- Perinatal physiology
- Antenatal evaluation of genitourinary abnormalities and management
- Paediatric urinary tract infections
- Evaluation of paediatric Urological patient
- Renal diseases
- Anomalies of upper urinary tract
- Renal Dysgenesis & cystic diseases
- Anomalies and surgery of the uretero-pelvic junction in children
- Vesico-ureteral reflux and megaureter, ureterocele
- Anomalies of lower urinary tract- Posterior urethral valves
- Hypospadias, Epispadias- Exstrophy complex
- Voiding dysfunction in children
- Evaluation and management of ambiguous genitalia
- Management of undescended testes
- Paediatric urologic oncology

Renal transplantation

- Etiology and Pathogenesis of renal failure
- Management of acute renal failure
- Management of chronic renal failure including access for dialysis (CAPD and AV fistulae) and dialysis & dialysis equipments
- Basic principles of immunology
- Workup of donor and recipient for transplant
- Immunosuppression
- Renal allograft rejection
- Donor and recipient operation
- Management of post-transplant complications

Teaching and learning methodology

- Lecture, Discussion, Student Directed Learning, Case Based Learning, Role Playing, Simulated Patient Lab, E-learning, Web Based.

TEACHING METHODS

1. Clinical teaching in the Outpatient Clinics and Emergency, at the bedside during ward rounds and in the operation theatres.
2. Case discussion and treatment planning session on day to day basis.
3. Presentation of seminars focusing on core-areas of Urology – 1 hour weekly.
4. Presentation of journal clubs to remain abreast with the recent advances– 1 hour weekly.
5. Departmental statistical meeting (morbidity & mortality) to analyze important operations / complications and morbidity / deaths – weekly for 1hour.
6. Joint departmental meetings with allied specialties, like:
 - A. **Essential:** Radiology (once every fortnight), Nuclear Medicine, Pathology (once in a month)
 - B. **Desirable:** Endocrinology, Gynecology; Plastic Surgery (Case-based discussions and periodic seminars)

The purpose is to focus on important issues in case management, discussion of difficult and interesting cases requiring interdisciplinary care. This would widen the exposure and field of knowledge.

Five to six hours per week should be devoted for academic teaching besides clinical teachings in OPD, Ward and operating room. Minimum academic teaching during 3 academic years should be at least 500 hours.
7. Performance and interpretation of urological investigations, including Uro- radiology [RGU, MCU, IVU, USG (KUB, Prostate and TRUS guided biopsy of prostate)] and Urodynamic
8. Performance of urological operations initially under supervision and independently later on (a proposed list is enclosed on semester-basis).

9. Presentation of a minimum of two scientific papers in National / Zonal Conference of the specialty.
10. Preparation of a minimum of two scientific manuscripts for publication and to publish the min indexed medical journals.

Departmental Training schedule & posting of residents:

The cognitive domain: The resident has to apply his/her knowledge and comprehend/understand based on his teaching and experience and should be able to apply and explain or analyze a clinical situation and then synthesize the gathered information in applying his or her clinical judgment.

The Affective domain relates to objectives concerned with interest, attitudes and values. The resident should be sensitivity to patient's well-being, clinical goals and objectives and be willing to attend to them. He/ she should be responding to these stimuli and work/engage himself/herself for achieving his goals. He should show commitment/conviction in his ideas/goals/beliefs and develop appropriate personal values to develop an organized system for the betterment of society.

Psychomotor Domain: In the residency training, the candidate should progress from mere physical experience - seeing, touching, moving etc. - through the carrying out of complex skills under guidance, to the performance of skilled surgeries independently. He/she should possess perceptual abilities (kinesthetic discrimination, visual discrimination, auditory discrimination and coordinated abilities of eye and hand, eye and foot), physical abilities and refined skilled movements. Major emphasis is laid on practical training by gradually giving more and more responsibilities in evaluation, patient care and Operative Urology.

Throughout the training period, the candidates work in the Urology Wards (Urology Ward: elective, emergency and critical care), Outpatient Clinics, Investigative Urology, various work stations (minor OT, urodynamic, lithotripsy, USG) and Operation Theatres. Each resident during the training period would be put on emergency duty by turn under supervision.

The participation in operative work should be as follows:

1st Year: Assisting in minor & major operative procedures under guidance of seniors / teachers.

2nd Year: As above and performing independent minor surgical procedures

3rd Year: Independent major surgical/ operative work under supervision of teachers.

Each candidate should have the following essential exposure by rotation:

- Ward (elective, intensive care, emergency & trauma), OPD, OT and emergency, covering general Urology and various subspecialty areas.
- Minor OT, investigative Urology (Ultrasonography, Uro-Radiology and Urodynamics), ESWL and Urological interventions (e.g. PCN, TRUS-guided prostate biopsy, etc.).
- Administrative exposure (in the form of chief residency for a period of 12- 16 weeks) must be an essential part of the tenure.
- During this period, the resident is assigned to carry out the duties of coordinating the work of the department in respect of patient care (admission, discharge, making operation theatre list and daily evening rounds) with an aim to enhance organizing skills.
- Rotation may be modified as per local practice.

THESIS

As a part of MCh curriculum, the student should complete one thesis project during the tenure and it is desirable to submit the proof of communication of the manuscript (originated from his/ her thesis) to an indexed peer- reviewed journal.

- The student should submit the completed thesis 6 months before the final examination
- If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.

- The thesis will be sent to one external evaluator for approval. The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as accepted, accepted with suggested modification or rejected.
- If the thesis is accepted with suggested modifications, the comments of the evaluator will be intimated to the student and the guide for necessary correction/ modifications.
- After modification, the thesis will be evaluated by a departmental committee for final approval.
- If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination.

LOGBOOK

- Detailed records of operative/interventional/ investigative/academic activities authenticated by the supervisor and Head of the department
- To be completed and signed on weekly basis by the Faculty

Participation in conferences and workshops:

- During the second and third year of the training, the candidates should actively participate in competitive prize-winning sessions / quiz / fellowship examinations / presentations of scientific papers in zonal and national conferences.
- To promote research, improve networking and other academic competencies among postgraduate students, in addition to the existing leaves (as per residency rule), all postgraduate students are allowed to attend conferences, workshops, any specialized training, CMEs etc. related to their fields for 15 days in the tenure of 3 years. These 15 days will be treated as on-duty and will be the part of their postgraduate training. Prior permission to be obtained. Ex post facto permission will not be granted.

Special training in other Institutions:

For special training, students may be sent to other institutions for training which is presently not available at AIIMS, Bhubaneswar. Depending on the type of training 1-2 months training may be undertaken without any financial implication (TA/DA/Training fee etc.) for the institute. The type of training and institute to be decided by the department after approval of the Director.

ENTRUSTABLE PROFESSIONAL ACTIVITIES AND SKILL ASSESSMENT

To follow competency-based medical education, Entrustable Professional Activities (EPA) has been included in the curriculum and thus, the expected level of skills and supervision at a certain stage of training have been pre-defined. Some of the skills should be assessed on the patients and few on the manikins during the internal examinations.

Journal club and seminar: One per week

ASSESSMENT

INTERNAL ASSESSMENT

1. Examination on Research Methodology & Biostatistics
 - Timing: End of 2nd Semester
 - Total marks: 100
 - Will be considered as an internal examination
 - Candidate should pass (obtain 50% marks) to appear in Final examination
 - No marks will be added to final / summative examination
 - Will be conducted by Examination Cell in the month of June-July & December-January
2. A total of 3 internal examinations will be conducted at end of the 3rd semester, 4th semester and pre-final (4 months before final examination).
3. Marks distribution: Theory 100 marks, and Practical with viva and logbook (Practical – 70, viva – 20, logbook – 10=100 marks). The marks of the 3 internal examinations will be averaged to 100 each for theory and practical.

SUMMATIVE/ FINAL EXAMINATIONS

Eligibility for appearing in the Final Examination

1. Passed (secured 50% marks) in the examination on Research Methodology and biostatistics (end of 2nd semester) and
2. Passed (secured 50% marks) in aggregate of internal examinations, theory and practical (end of 3rd, 4th semester and prefinal) and
3. Dissertation/thesis submitted six months before the final examination and is approved/accepted by an external evaluator.

Final Theory Examination

1. Theory: 4 papers (100 marks each)
 - Paper I: Basic and Allied Sciences
 - Paper II: Clinical Urology - 1
 - Paper III: Clinical Urology - 2
 - Paper IV: Recent Advances in Urology
2. Theory question paper format:
 - One Long question – 20 marks
 - Eight Short question/notes – 10 x 8 = 80 marks
3. Total marks in theory: 500 marks
 - Four papers in the final examination – 400 marks
 - Average of 3 internal examinations – 100 marks

Final Practical Examination

1. Total marks - 500 marks
 - An average of 3 internal examinations: 100 marks.
 - Practical and viva in the final examination: 400 marks.

The format of the practical examination (400 marks)

Part	Component	Marks allotted
Part A (200 Marks)**	Longcase – One	75
	Short cases – Three (25 X 3)	75
	Ward Round	50
	Subtotal	200
Part B (200 Marks)	Operative Procedure and Instruments/department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva (Pathology specimens/Radiology / others)	50
	Logbook	10
	Scientific Writing (Manuscript written out of the thesis)	15
	Subtotal	200
	Total	400

** Students should pass (secure 50% marks) separately in Part A

Final Marking Pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	Total Internal Marks (Average of 3exams)	Final Examination	Total Marks
Time frame	End of 3rd semester	End of 4th semester	Four months before the final			
Theory	100	100	100	100	400	500
Practical	100	100	100	100	400	500

Passing Marks

- The student has to secure $\geq 50\%$ marks in the internal examination to be eligible to appear for the final examination.
- In the final theory examination, a student should secure $\geq 50\%$ marks (200 out of 400) to pass.
- In the final practical examination, a student has to secure $\geq 50\%$ marks separately in Part A (100 out of 200) and overall $\geq 50\%$ marks (200 out of 400).

RECOMMENDED BOOKS

General Urology

1. W. Scott McDougal MDMAH, Wein AJ, Louis R. Kavoussi MDMBA, Partin AW, Peters CA. Campbell-Walsh Urology: Elsevier Health Sciences; 2015.
2. Mundy AR. The Scientific Basis of Urology: Informa Healthcare; 2010.
3. Kaufman JJ. Current Urologic Therapy: Saunders; 1986.
4. O'Reilly PH. Obstructive Uropathy: Springer London; 2012.
5. McAninch JW. Genitourinary Trauma: Saunders; 2006.
6. Whitfield HN, Hendry W, Kirby R, Duckett J. Textbook of Genito-Urinary Surgery: Wiley; 1998.

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7. Gillenwater JY. Adult and Pediatric Urology: Lippincott Williams & Wilkins; 2002.
 4. Schmutz R, Birkhäuser F, Zehnder P. Extracorporeal Shock Wave Lithotripsy: In Clinical Practice: Springer International Publishing; 2018.

Paediatric Urology

1. Docimo SG, Canning D, Khoury A, Salle JLP. The Kelalis--King--Belman Textbook of Clinical Pediatric Urology: CRC Press; 2018.
5. Jonas U, Dabhoiwala NF, Debruyne FMJ. Endourology: New and Approved Techniques: Springer Berlin Heidelberg; 2013.
2. Whitaker RH. Current Perspectives in Paediatric Urology: Springer London; 2012.

Uro-oncology

1. De Kernion JB, Paulson DF. Genitourinary Cancer Management: Lea & Febiger; 1987.
2. Daneshmand S, Chan KG. Genitourinary Cancers: Springer International Publishing; 2018.
3. Daneshmand S. Modern Management of Testicular Cancer: Elsevier Health Sciences; 2019.
2. Gunasekaran K, Pandiyan N. Male Infertility: A Clinical Approach: Springer India; 2016.
3. Silber SJ. Reproductive Infertility: Microsurgery in the Male and Female: Lippincott Williams & Wilkins; 1984.
4. Silber S. Fundamentals of Male Infertility: Springer International Publishing; 2018.

Urodynamics

1. Abrams P. Urodynamics: Springer London; 2013.
2. Mundy AR, Stephenson TP, Wein AJ. Urodynamics: principles, practice and application: Churchill Livingstone; 1994.
3. Barrett DM, Wein AJ. Controversies in neuro-urology: Churchill Livingstone; 1984.
4. Hald T, Bradley WE. The Urinary Bladder: Neurology and Dynamics: Lippincott Williams & Wilkins; 1982.
1. Jequier AM. Male Infertility: A Guide for the Clinician: Wiley; 2008.
3. Ostergard DR, Bent AE. Urogynecology and urodynamics: theory and practice: Williams & Wilkins; 1996.
4. Libertino JA. Reconstructive Urologic Surgery: Mosby; 1998.
5. Handa VL, Van Le L. Te Linde's Operative Gynecology: Lippincott Williams & Wilkins; 2019.

Stone Diseases

1. Smith AD, Preminger G, Badlani GH, Kavoussi LR. Smith's Textbook of Endourology: Wiley; 2012.
2. Nakada SY, Pearle MS. Advanced Endourology: The Complete Clinical Guide: Humana Press; 2007.
3. Carson CC, Dunnick NR. Endourology: Churchill Livingstone; 1985.
- Reconstructive and Female Urology**
1. O'Donnell PD. Urinary Incontinence: Mosby; 1997.
2. Aboumarzouk OM. Blandy's Urology: Wiley; 2019.
3. Handa VL, Van Le L. Te Linde's Operative Gynecology: Lippincott Williams & Wilkins; 2019.
- Renal Transplantation**
1. Knechtle SJ, Morris PJ. Kidney Transplantation - Principles and Practice: Elsevier Health Sciences; 2013.
2. Torpey N, Moghal NE, Watson E. Renal Transplantation: OUP Oxford; 2010.
3. Cogan MG, Schoenfeld P, Gotch FA. Introduction to dialysis: Churchill Livingstone; 1991.

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4. Shalhub S, Dua A, Shin S. Hemodialysis Access: Fundamentals and Advanced Management: Springer International Publishing; 2016.

Operative Urology

1. Graham SD, Keane TE, Glenn JF. Glenn's Urologic Surgery: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2010.
2. Bagley DH, Huffman JL, Lyon ES. Urologic Endoscopy: A Manual and Atlas: Little, Brown; 1985.
3. Goodwin WE, Mauermayer W, Fastenmeier K, Fiennes A, Flachenecker G, Hartung R, et al. Transurethral Surgery: Springer Berlin Heidelberg; 2012.

Laparoscopy

1. Gomella LG, Kozminski M, Winfield HN. Laparoscopic Urologic Surgery: Raven Press; 1994.
2. Guillonneau B, Gill IS, Janetschek G, Türk IA. Laparoscopic Techniques in Uro-Oncology: Springer London; 2009.
3. Hohenfellner M, Santucci RA. Emergencies in Urology: Springer Berlin Heidelberg; 2007.

Uro-Radiology

1. Dunnick R, Sandler C, Newhouse J. Textbook of Uroradiology: Wolters Kluwer Health; 2012.
2. Pollack HM. Clinical Urography: Saunders; 2000.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC AND ALLIED SCIENCES

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Discuss the pathology, laboratory tests, radiological tests and complications of renal tuberculosis
2. Enumerate four antibiotic resistance mechanism with example.
3. Describe the rationale, indications, advantages and disadvantages of Multiparametric magnetic resonance imaging in diagnosis of carcinoma prostate.
4. Describe the role of various Energy sources in trans-urethral resection of prostate and their advantages.
5. Enumerate the causes and treatment of Acute renal allograft rejection.
6. Discuss "Patent reported outcome measures".
7. Describe the embryology of urethra and three clinical conditions arising due to abnormal development.
8. Enumerate the surgical algorithm for the management of T4N3M1 non-seminoma of testis.
9. Describe the management of uncomplicated urinary tract infection in female.

PAPER 2

CLINICAL UROLOGY-1

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Define hormone resistant carcinoma prostate. Discuss the medical and surgical Management of hormone resistant carcinoma prostate. What are the complications of androgen ablation?
2. Describe the diagnostic tests and surgical management of megaureter.
3. Enumerate the etiology, pathogenesis, diagnostic tests and management of distal renal tubular acidosis.
4. Enumerate the causes and treatment of Non-ischemic priapism.
5. Discuss the etiology, pathogenesis, diagnostic tests and management of Pelvic floor prolapsed in female.
6. Describe the complication of trans-urethral resection of bladder tumor as per the modified-clavien dindo classification. How to manage a 3cm extraperitoneal bladder perforation?
7. Enumerate the operative steps of Snodgrass urethroplasty and enumerate three common complications.
8. Describe the diagnostic tests and surgical management of traumatic anterior urethral stricture.
9. Discuss the management of emphysematous pyelonephritis.

PAPER 3

CLINICAL UROLOGY-2

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the diagnostic tests and surgical management of Pelvi-ureteric junction obstruction.
2. Enumerate the diagnosis and Medical managements of Chronic kidney diseases.
3. Discuss the complications of PCNL as per the modified-clavien dindo classification.
4. Enumerate the surgical steps of laparoscopic radical nephrectomy; Advantages of laparoscopic radical nephrectomy over Open radical nephrectomy.
5. Describe the Indications of ileal conduit and ileal neobladder. Surgical landmarks of standard and extended lymph node dissection in carcinoma urinary bladder.
6. Discuss the management of unilateral 4cm inguinal lymph node in after partial penectomy for high grade carcinoma penis.
7. Enumerate the abnormal embryology of ureters.
8. Discuss the diagnosis and management of obstructive azoospermia.
9. Describe the etiology, diagnosis and surgical management of vesico-vaginal fistula.

PAPER 4

RECENT ADVANCE IN UROLOGY

Maximum Marks: 100

Time: 3 Hours

Answer all questions.

Illustrate your answer with suitable diagrams.

The first question carries 20 marks, and other questions carry 10 marks each.

1. Describe the indications, instruments and complication of Flexible uretero-rensoscopy.
2. Enumerate the Role of Target therapy in renal cell carcinoma.
3. Describe the outcomes of the STAMPEDE Trial.
4. Enumerate the vaccines used for carcinoma prostate.
5. Describe the various Modes of holmium laser in lithotripsy.
6. Discuss the indications, difficulties and interpretation of Ambulatory urodynamics.
7. Enumerate the use of Nano-technology in urology.
8. Describe the Role of Robots for Retrograde Intrarenal Surgery (RIRS).
9. Describe the advantages, indication and technical aspects of ejaculation sparing trans-urethral resection of prostate.

Entrustable Professional Activities

SL No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of MCh	End of 2 nd sem.	End of 4 th sem.	End of 6 th sem.	
1	Gather a history and perform a physical examination	*	*	*	*	*	*	2	4	4	5	I,S,PG
2	Establish a provisional diagnosis and prioritize a differential diagnosis	*		*		*		1	3	4	5	I,S,PG
3	Recommend and interpret common diagnostic tests	*	*	*		*	*	1	3	4	5	I,S,PG
4	Documentation of clinical findings in hospital record.	*		*		*		2	3	4	5	I,S,PG,H
5	Provide an oral presentation of clinical case	*				*	*	1	3	4	5	I,S,PG,H
6	Differentiate an elective from emergency setting to initiate appropriate management	*	*		*	*	*	1	3	4	5	I,S,PG,H
7	Basic trauma management	*	*	*		*	*	1	3	4	5	I,S,PG,H
8	Form clinical questions and obtain evidence to facilitate patient care.	*	*	*		*	*	1	3	4	5	I,S,PG
9	Enter therapeutic orders and prescriptions	*	*		*	*	*	1	3	4	5	I,S,PG,H
10	Obtain informed consent for tests and procedures.	*	*		*	*	*	1	3	4	5	I,S,PG,PH
11	Monitor and enforce planned clinical care	*	*		*	*	*	1	3	4	5	I,S,PG,H
12	Give / receive a patient handover in transition of clinical responsibility	*	*		*	*	*	1	3	4	5	I,S,PG,H
13	Collaborate as member of an inter-disciplinary team / liaise with other departments	*	*		*	*	*	1	3	4	5	I,S,PG,H
14	Identify system failures and work towards patient safety	*	*		*	*	*	1	3	4	5	I,S,PG,H
15	Effective communication with peers / superiors/ subordinates	*	*		*	*	*	1	3	4	5	I,S,PG,H

Sl. No.	EPA	Competency Domains							Level of competency					MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of MCh	End of 2 nd sem.	End of 4 th sem.	End of 6 th sem.			
16	Attitude towards patient and caretakers.	*	*			*	*	1	3	4	5	I,S,PG,PH		
17	Preoperative counseling of patient and caretakers	*	*			*	*	1	3	4	5	I,S,PG,PH		
18	Basic Pre & post operative care of the sick child	*	*	*	*	*	*	1	2	3	5	I,S,PG,H		
19	Adherence to OT protocols – Asepsis, Scrubbing, Attire , etc.	*	*		*	*	*	2	3	4	5	I,S,PG,H		
20	Principles of infection control and adherence to antibiotic policy	*	*		*	*	*	2	3	4	5	I,S,PG,H		
21	Use of energy devices- diathermy , Harmonic scalpel	*	*			*	*	1	2	3	5	I,S,PG,H		
22	Handling instruments , Suture materials. Etc.	*	*		*	*	*	2	3	4	5	I,S,PG,H		
23	Basic operative skills e.g. Suturing	*	*		*	*	*	2	4	4	5	I,S,PG,H		
24	Percutaneous guided procedures, e.g. PCCLT,PCN	*	*					1	2	3	4	I,S,PG,H		
25	Performing minor procedures, e.g.CPE,VIU,DJS.	*	*		*			1	2	3	5	I,S,PG,H		
26	Performing major procedure e.g.,NEPHRECTOMY	*	*	*	*			1	2	3	4	I,S,PG,H		
27	Orientation to Endoscopy eg-TURBT,PCNL	*	*	*	*	*	*	1	1	2	3	I,S,PG,H		
28	Orientation to Minimally invasive Surgery (Laparoscopy)	*	*		*	*	*	1	1	2	3	I,S,PG,H		
29	UG teaching / discussions	*		*		*	*	1	2	3	4	I,S,PG		
30	PG teaching / discussions	*		*		*	*	1	2	3	3	I,S,PG		
31	Nursing teaching/ discussions	*		*		*	*	1	2	3	4	I,S,PG,H		
32	Ability to conduct simple research studies							1	2	3	3	I,S,PG		
33	Able to write Scientific Papers	*				*	*	1	2	3	3	I,S,PG		
34	Able to discuss Scientific Papers					*	*	1	2	3	4	I,S,PG		

Sl. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of MCh	End of 2 nd sem.	End of 4 th sem.	End of 6 th sem.	
35	Able to make a podium presentation at clinical fora	*				*	*	1	2	3	4	I,S,PG
36	Knowledge of biomedical ethics in practice	*				*	*	1	2	3	3	I,S,PG,H,C

Abbreviations

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I

DESIGN & PRINT



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