Colour Coding
Global GREEN
Regional BLUE
National ORANGE
Local (State) PINK

M.D Pathology Curriculum

Guidelines for Competency Based Postgraduate Training Program for MD Pathology

Program Duration: Three academic years

Program Outcome

The objective of M.D Pathology training program is to produce a competent Pathologist who after completing three years in M.D. Pathology as Junior Resident is able to provide high quality health care. He/she must be capable enough to

1. Recognize the importance of Pathology in the health sector at regional, national and global level.
2. Practice Pathology ethically and in step with the principles of Good Clinical Practice.
3. To provide laboratory-based diagnosis of the disease independently.
4. Correlate the pathological findings with the clinical suspicion.
5. Be able to help in planning the future therapeutic interventions in a given case
6. Demonstrate competence and be able to participate in research, participate in organization of academic conferences and publications.
7. Develop skills in using educational methods and be able to teach juniors and technical staff/ nursing students.
8. Learn to work as a team member and function as an effective leader while encouraging others involved in patient care.
9. Respect his/her fellow colleagues, seniors, patients and staff members.
10. Play a vital role in the implementation of certain National Health Programs effectively

Eligibility Requirements

The candidate(s) shall be eligible for admission to M.D. course provide that he/she:

a. Has obtained MBBS degree from a university /Institute, recognized by Medical Council of India.
b. Has satisfactorily completed one year of compulsory rotating internship Institution recognized by Medical Council of India.
c. Has subsequently obtained permanent registration with the State Medical Council. has not been charged with misconduct/misbehaviour during MBBS study &his /her tenure of stay as intern /resident etc.

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SUBJECT SPECIFIC LEARNING OBJECTIVES

The objective of the training program is to train the medical undergraduate as 'Pathologist' having skills and in-depth understanding of the etiology, pathogenesis, diagnosis of the disease.

During the MD program of Pathology, a student will acquire:

a. Clinical, diagnostic, analytical, self-directed motivational learning with procedural and diagnostic skills required in diagnosis of the disease.
b. Have comprehensive knowledge and skills in the areas of basic and translational Pathology to understand the epidemiology, pathophysiology and key determinants of disease in relation to region/ state and country.
c. They shall have intellectual and technical capabilities to contribute in the growth of Pathology field by imparting training, teaching and conducting their own research.
d. Skills in formulating research questions, planning, initiating and conducting translational and pathological research that prioritizes thrust areas of Pathology at Institutional, state, national and international levels.
e. The various training areas during the entire course focus on rational postings following National Medical Commission, India guidelines, erstwhile MCI in different fields of pathology including Surgical Pathology, Cytopathology including fluid cytology, Hematology, Bone-marrow Laboratory, Transfusion Medicine and Clinical Pathology (clinical biochemistry, Immunopathlogy, Genetics, Molecular Pathology and Electron Microscopy).
f. Demonstrate compassions for patients and their families and have an ethical and holistic approach to deliver evidence-base diagnosis for better patient care.
g. Communication skills necessary for working with and educating patients and team members at local, national, regional and international forums.

The student is expected to gain knowledge in the following FOUR key areas

A. Theoretical Knowledge and Laboratory skills

i. The student will acquire knowledge in all aspects pertaining to the diagnosis of routine and complex clinical scenarios prevalent in the region, state and country on the basis of histopathology (Surgical pathology) and cytopathology specimens, blood and bone marrow examination and various tests of Laboratory Medicine (Clinical Pathology and clinical Biochemistry) as well as Transfusion Medicine.
ii. Interpret and correlate clinical and laboratory data explaining the clinical manifestations of the disease and advise appropriate tests necessary for diagnosis.
iii. Record the observations systemically and maintain accurate records of the tests and their results in a timeline manner.
iv. Is familiar with the function, handling and routine care of equipments in the laboratory.
v. Identify the problems in the laboratory and trouble shoots them to maintain quality.

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vi. Maintain quality control of all tests by being a part of Internal Quality Control Monitoring Program.

vii. Should be aware of safe and effective disposal of laboratory waste and ensure minimization risk of exposure to infection and accidents.

viii. In addition, research skill shall be prioritized so that MD Pathology trainee gets the skill to set up collaborative networking at institutional, state, national and global levels to add to the research milieu of the country.

ix. Shall be able to make patient-centric decisions based on the latest scientific advances in the Pathology and apply them in a cost-effective way according to the need of patient keeping the burden of the disease at state/ national and global level.

B. Teaching and training skill

i. Should be able to teach Pathology to undergraduates, postgraduates and paramedical staff including laboratory personnel the basics and pathophysiology of the diseases and tests and expertise them in running of different laboratories.

ii. The student will be groomed in a manner so that he/ she develops communication skills to word reports and professional opinion as well as interact with patients, peers and clinicians so as to enhance the skilled work force at local and regional level.

C. Research Methodology

i. The trainee would be involved in thesis project so that he/she is able to understand the

- Principles of Research methodology as applied to Pathology
- Biostatistics
- Bioethics
- Observational studies
- Laboratory research
- Critical appraisal of a scientific paper

ii. Shall have the skills to recognize knowledge gaps and unmet areas of need relevant to diagnosis of the disease.

iii. Shall be trained to formulate, write and conduct research proposal using appropriate methodologies related to Pathology in accordance with ethical guidelines.

iv. Shall have the skills to promote inter-institutional research and help and train and guide who wish to pursue research.

D. Group Approach

i. During the training program, student will be part of multidisciplinary meetings with allied clinical disciplines and other paramedical departments. This will help them to understand the etiology and pathophysiology of the disease and give an overall multidisciplinary approach in patient care, thus improving patient outcome in relation to geographic variation.

ii. Able to supervise and work with subordinates and colleagues in the laboratory

iii. Should be able to function as a part of team, develop an attitude of cooperation with colleagues and interact with clinicians and patients to provide the best possible diagnosis.

SUBJECT SPECIFIC COMPETENCIES

At the end of the course, the MD Pathology student will acquire the following competencies under the following three domains:

(A) Cognitive domain (Knowledge domain)

By the end of the course, the MD student should be

1. Capable to offer a high-quality, accurate diagnostic opinion in a given clinical scenario with appropriate and relevant sample for diagnosis of the disease.
2. Is able to correctly analyze and interpret the results of various routine and specialized tests thus helping in formulating appropriate therapeutic strategies for the patient management.
3. Have the skills to plan and order suitable further investigations needed for the diagnosis and management in a cost-effective way especially in a resource-limited situation commensurate with the requirements of the state/ country as to provide best possible treatment in all situations.
4. Be aware of different guidelines of various national and international associations for diagnosis and classification of the disease for better prognostication.
5. Is conversant in the histogenesis and pathophysiological process associated with the disease.
6. Acquire knowledge of the functioning of various equipments in routine use in the different laboratories of the Department to reduce their maintenance cost for the local authorities.
7. Is able to share his knowledge and teach skills to the others and thus enabling him/ her to take up teaching assignments in Medical Colleges/ Institutes to reduce the gap of teaching faculty at all levels.
8. Is conversant with the recent advances in science related to diagnostic techniques and their application to clinical outcome.
9. Demonstrate competence in research design, methodology and is capable to pursue clinical and laboratory-based research him/herself. Research shall be focused on local, regional and national health priorities.
10. Have a basic understanding of digital applications in Pathology and use of Artificial Intelligence and machine learning.

(B) Affective domain (Attitudes including Communication and Professionalism)

The M.D trainee should

1. Demonstrate respect, kindness, empathy and compassion towards all patients. He/she should be able to discuss medical issues with the patients in local/ regional or national language using non-scientific terms.
2. Demonstrate a commitment to excellence and continuous professional development.
3. Respect the patients right to information and second opinion.

4. Trainee shows a commitment to ethical principles relating to providing a comprehensive diagnosis.
5. Have the skill to participate in seminars, CME program, panel discussion to discuss and review recent scientific data. This will promote the status of the region or country on National and International forum.
6. Should actively cultivate skills to work in a team, show mutual respect, basic courtesy and supportive attitude with others.
7. Maintain principles of etiquette and abide with the country's laws.
8. Should be able to accept feedback and criticism with open mind.
9. Develop a habit of maintaining comprehensive medical record and demonstrate punctuality in the laboratory work.

(C) Psychomotor domain

At the end of the course, the student should be able to analyze correctly the results of frequently used as well as specialized tests and should understand the different equipments used in the laboratory and is aware of the principles of different tests. According to the various laboratories the student should have acquired following skills

a) Surgical Pathology skills

i) Is able to accurately describe the gross anatomic alterations of the given specimens independently.
ii) Is aware of the handling of the different types of specimen and knows how to take appropriate sections
iii) Is able to identify and accurately describe the histomorphological alterations.
iv) Is conversant with the different commonly used instruments in the laboratory.
v) Is able to perform basic stains on paraffin embedded sections.
vi) Is aware of the utility of various immunohistochemical stains.
vii) Is familiar with the frozen section cutting using cryostat.

b) Cytopathology skills

i) Is able to perform fine needle aspiration of all lumps.
ii) Can prepare and stain good quality smears independently.
iii) Is familiar with the techniques for concentration of specimens using various filters, cytocentrifuge and centrifuge.
iv) Is able to correctly diagnose the smears and categorize them according to different classifications used.

c) Hematology skills

i) Independently perform basic hemogram.
ii) Perform bone marrow aspiration and staining and trephine biopsy.
iii) Do the cytochemical leukemia panel.
iv) Is able to do basic coagulation profile.
v) Is able to do hemolytic anemia profile including HPLC, Hb electrophoresis.
vi) Describe the morphologic features in peripheral and bone marrow smears.
vii) Is familiar with the principle and interpretation of platelet function tests, thrombophilia profile, immunophenotyping of leukemia and cytogenetics and molecular diagnostics.

d) Laboratory Medicine skills

Needs: Local : Pink, National : Orange, Regional: light blue, International green

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i) Is able to plan the investigations needed according to the case scenario and correctly interpret the laboratory results of tests.
ii) Is able to perform routine urinalysis.
iii) Is able to do complete examination of CSF and serous effusion fluids.
iv) Do semen analysis.
v) Independently perform basic quantitative tests from serum both manually and by automated techniques.
vi) Prepare standard solutions and reagents, buffers and molar solutions.
vii) Is familiar with the principles of instrumentation and application of commonly used instruments.

e) *Transfusion Medicine skills*
i) Is able to select and do bleeding of donors.
ii) Is aware of the principles and procedures of commonly done tests.
iii) Is able to prepare the different blood components.
iv) Is able to perform ABO and Rh grouping.
v) Is able to do routine antenatal and neonatal workup.
vi) Is able to handle the complication of transfusion reaction.

f) *Immunohistochemistry skills*
i) Is able to perform immunohistochemical staining using paraffin section with commonly used antibodies.
ii) Is able to interpret the immunohistochemical stain.

g) *Molecular Pathology skills*
i) Is able to interpret the results of PCR, real time PCR, Sanger sequencing, FISH techniques.
ii) Is able to interpret direct and indirect Immunofluorescence results.
iii) Is able to interpret results of TEM in common non-neoplastic and neoplastic diseases.
iv) Navigate and annotate whole slide scanned images independently.

SYLLABUS

Course Contents

It includes all aspects of Pathology as encompassed in the branches of General and Systemic Pathology.

Courses offered in the program

- ***Course I: Basic Science including general pathology, immunopathology, genetics, clinical pathology, tropical pathology and applied microbiology***
- **Course II: Systemic Pathology including Surgical pathology and Cytopathology**
- **Course III: Hematology including transfusion medicine and clinical biochemistry**
- **Course IV: Recent advances in pathology**

Course Objective

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The curriculum of the course has been designed according to the National Medical Commission 2022. The period of training for obtaining this degree shall be three completed years including the examination period. The curriculum shall be competency based. The training pattern will comprise of practical training including advanced diagnostic and laboratory techniques relevant to the subject of specialization.

Course Outcome

The student/ Junior Resident should be able to

1. Diagnose routine and complex clinical cases based on the provided surgical, cytological, hematological and bone marrow specimens along with various clinical pathology tests.
2. Interpret the clinical and laboratory data correlating the manifestation of the disease
3. Advise in further evaluation of the other tests needed for arriving the diagnosis
4. Record the observations systematically within reasonable time frame
5. Trouble shoot the problems in execution of the tests and maintain the quality of the test
6. Capable of effective and safe disposal of laboratory waste
7. Plan, execute and analyze the research work
8. Is able to work in team, interact with clinicians and help the patients in best possible way
9. Is able to collect specimens and perform routine test in the laboratory.
10. Is familiar with the function, handling and routine care of equipment in the laboratory

Course I: Basic Science including general pathology, immunopathology, genetics, clinical pathology, tropical pathology and applied microbiology

Course objective

Student shall have an in-depth understanding about the anatomy, physiology, cellular mechanism, intracellular mechanism involved in the physiology and pathogenesis of various diseases.

Course outcome

Student shall have acquired in depth knowledge about the following

1. Physiological process involved in normal function of various organs
2. Alterations of the physiological function involved and implicated in various diseases or disease process
3. Role of Genetics and Immunopathogenesis of various disease process
4. Regulatory mechanism involved in maintaining the various functions of the organs and their interactions with other organ systems.
5. Student is able to interpret and correlate clinical and laboratory data so that clinical manifestations of the disease can be explained.
6. Is able to advise on the appropriate specimens and tests necessary to arrive at the diagnosis
7. Is able to use and take care of instruments, use of analytical methods including spectrophotometry, flame photometry , atomic absorption, turbidimetry, nephelometry, fluorometry, osmometry, ion – selective electrodes, electrophoresis,

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chromatography including HPLC, enzyme immunoassay and radioimmunoassay etc; practice and interpretation of various biochemical tests (manual and automated); examination of urine and other body fluids, semen amniotic fluid, sputum, gastric and duodenal contents and faeces etc; principles of identification of medically important micro-organisms and parasites including drug susceptibility testing and assays.

8. Has attained practical knowledge in interpretation and conduction of techniques and procedures for Chromosomal analysis including banding techniques, histocompatibility testing, assay of immunoglobulins and complement components, and study of various antigen- antibody reagent systems and leucocyte function tests etc, Experimental animal handling and animal experimentation.
9. To make the students aware of recent environmental changes and new infections and their impact on health.
10. Awareness about procedures for procurements and maintenance of laboratory equipment and consumables

Course II: Systemic Pathology including Surgical pathology and Cytopathology

Course objective:

Student should have acquired necessary skill, understanding and knowledge to diagnose routine and complex clinical problems on the basis of surgical pathology and cytopathology specimens.

Course outcome

1. The student is to perform routine surgical pathology reporting including independent grossing, tissue processing, microtomy and staining including various special stains, enzyme histochemistry and immunochemistry; frozen section reporting and immune-fluorescence; resin embedding and electron microscopic techniques; histometry, autoradiography, microphotography, museum and other demonstration techniques.
2. Is able to dissect various organ complexes and identify the gross anatomical alterations and is able to perform independent autopsies.
3. Is able to collect specimens as fine needle aspiration biopsies; smear preparation, staining and reporting of FNA smears and exfoliative cytology smears including filtration and cell block techniques; immunocytochemistry and flow cytometry.
4. Is able to do complete examination of CSF, Pleural and Peritoneal fluids.
5. Is familiar with the functioning, handling and routine care of equipments in the laboratory.
6. Immunohistochemistry: Trainee is able to decide appropriate panel for diagnosis, with understanding of controls, clones and dilutions, identify common problems and trouble shooting.

Course III: Hematology including transfusion medicine and clinical biochemistry

Course objective

Student should have acquired necessary skill, understanding and knowledge to diagnose routine and complex clinical problems on the basis of hematology and serum specimens.

Course outcome:

1. The student is able to perform the routine hemogram and coagulation test reporting.
2. Is able to describe the morphologic findings in the peripheral and bone marrow smears
3. Is able to perform bone marrow aspiration and trephine biopsies and is able to prepare staining and reporting of bone marrow smears including cytochemical and immunocytochemical Staining,
4. Is able to perform test of various types of anemias including hemoglobin electrophoresis and Immunohematology;
5. Is familiar with the principle and interpretation of platelet function tests including platelet aggregation and adhesion
6. Is able to interpret results thrombophilia profile including Lupus anticoagulant, anticardiolipin antibody, activated Protein C Resistance, Protein C, S and antithrombin III assay
7. Is able to collect and store blood; separation, storage and use of blood components, grouping and cross- matching ; and miscellaneous tests in hematology
8. Is able to do routine urinalysis including physical, chemical and microscopic examination of the sediment
9. Is able to perform semen analysis.
10. Is able to prepare standard solutions and reagents relevant to the basic clinical tests including preparation of normal solution, molar solution and buffers
11. Is well-versed with the principles of instrumentation, use and applications of the instruments used in the lab.
12. Is aware of Point of care tests at primary health care facilities e.g., Direct reading haemoglobinometers, Haemoglobin colour scale etc.
13. Understand utility of point of care tests e, g. Thromoboelastography in liver transplant and major cardiac surgeries

Course IV: Recent advances in Pathology

Course objective

Student shall be well-versed with the new knowledge, cutting edge issues, controversies, new diagnostic modalities, new interventions in the diagnosis of the various diseases.

Course outcome

The student shall have acquired the following knowledge, skill at the end of the course

1. Is able to interpret the results of PCR, real time PCR, Sanger sequencing, FISH and preparation of sample to perform these tests including trouble shooting
2. Interpretation of direct and indirect IF results independently and preparation of sample and perform IF on frozen section from skin/renal biopsy under supervision
3. Interpretation of TEM results in common non-neoplastic and neoplastic diseases independently. Observation of Preparation of specimen and process tissue for EM, interpret semi-thin sections and view ultrathin sections under EM.

4. Molecular Pathology: Hands on training in molecular techniques eg. Polymerase Chain Reaction (PCR), real time PCR, in-situ hybridization and interpretation of results of in a given clinical context.
5. Digital Pathology and artificial intelligence: Navigate and annotate whole slide scanned images. Observation and selection and scanning of slides for basic image analysis functions.

TEACHING AND LEARNING METHODS

General principles

The basic aim of postgraduate medical training in Pathology is to standardize Pathology teaching so that there is uniformity in teaching and thus creating adequate manpower with appropriate expertise. This will create specialists who will not only enhance the quality of health care but also provide an impetus to research, education and training of medical community.

Teaching Methodology

Active learning will be the mainstay of postgraduate training and will be done in a gradual and phased manner under supervision. Teaching sessions will be an overall amalgamation of various academic sessions. The frequency of the different academic sessions may vary based on perceived requirements, candidates' competencies, work load and overall working schedule. Self-directed motivational learning shall form a key part in training.

Formal teaching sessions

These includes regular case discussions in different laboratories, journal clubs, seminars, short topic presentation/ tutorial, formatted sessions, Intradepartmental/ interdepartmental case discussions, common grand rounds and student project presentation.

Each postgraduate student will undergo the following rotations in various Laboratory areas of Pathology during the three years of training in M.D Pathology

a) Surgical Pathology/ Histopathology including Immunohistochemistry lab: 12-16 months
b) Hematology, Lab Medicine, Blood bank: 8-10 months
c) Cytopathology lab: 6-9 months
d) Others (Basic Science, Immunopathology, Cytogenetics, EM, Molecular Pathology): 2-6 months.

Beside this the candidate will also be sent to Department of Pathology, KGMU, Lucknow for training in the areas complimentary to those at SPGIMS

Posting under District Residency Program: 3 months

Minimum sessions

Clinical case discussion	Daily
Journal Club	Once in 2 weeks
Seminar	Once in 2 weeks
Short topic presentation/ Tutorial	Once per week
Formatted sessions	Once in 4 weeks
Laboratory exercise	Once per week
Interactive slide and gross sessions	Once in 2 weeks
Interdepartmental case discussions	Twice a week
Combined Grand Round/ CPC at institutional level	Once a week
Student project presentation and review of research work	Once in 6 months
Rotational clinical/ Institutional postings	4 months
Postings under DRP	3 months

All above may refer to sessions conducted in a given Department and not for each trainee

- **Didactic Lectures**

Much of the learning is to be accomplished by the student himself. Interactive discussions are to be preferred over didactic lectures. However about 10 lectures per year covering recent advances in all aspects of Pathology would be taken by faculty members. All postgraduate students are required to attend these lectures.

- **Short term basic and clinical course on**

i. Biostatistics
ii. Research Methodology and experimental lab medicine relevant to Pathology
iii. Use of digital applications, artificial intelligence and machine learning in Pathology
iv. Bioethics and ethical issues in Pathology

- Each student is expected to attend accredited scientific meetings (CME, Symposia, Conferences, Seminars) at least once a year.

- Sessions on Research Methodology, experimental methods relevant to Pathology, digital application and use of computers and Artificial Intelligence in Pathology, Biostatics, pertinent Ethical and Legal issues in Pathology practice including teaching methodologies, Laboratory waste management are additionally suggested.

- Each postgraduate student would be required to present one poster presentation and read one paper at a National/ State level Conference.

- The student should write a research paper from the allotted research protocol which should be published/ accepted for publication/ sent for publication during the tenure of the postgraduate study

- **Log Book:** During the training period, the M.D Pathology student shall maintain a detailed and comprehensive Log book indicating the duration of the postings and work done in Pathology Department and Laboratories. Data should include procedures performed and teaching sessions attended. The purpose of the Log Book is to
  (a) Maintain record of the work profile during training
  (b) Enable Faculty to access information about the work of the student
  (c) Keep an eye on the progress and intervene if and when necessary
  (d) As a mean to periodically assess the quality of work performed by the MD trainee.
  (e) The Log Book will also serve as a source to help in internal evaluation of the MD student. This will be signed by the faculty members who are involved in the training of the student. It shall be further signed by the Head of the Department and a proficiency certificate from the Head of Department regarding the student's competence, overall skillful performance will be necessary before the student is allowed to appear in the final examination.

- **Research**
  - Each postgraduate student is required to undertake research under the guidance and mentorship of a faculty member.
  - Each candidate shall be required to work on a thesis project for a period of 18 months.
  - The MD student shall submit the synopsis of the proposed protocol through the head of the department to the Institute within the first year of the course on or before a date to be notified by the Institute.
  - The synopsis of the protocol shall include
    a) Proposed Title of the Thesis.
    b) Name of supervisor and co-supervisor (s), if any, who should recommend the application.
    c) Outline of the existing knowledge on the subject.
    d) Aims and objectives of the proposed work.
    e) Outline of work proposed to be done by the candidate.
    f) References.
  - In addition, faculty members belonging to any department of the Institute or belonging to any other Institute /university/national laboratory/ Armed forces hospital recognized for the purpose by the Institute, whose help is required for the subject of thesis, may be associated as co-supervisor.
  - The application shall be considered by a committee duly constituted by the Institute for the purpose. If approved, the subject will be registered. The registration shall be valid for a maximum period of 36 months. No candidate shall be permitted to change the subject of thesis without the prior approval of the committee.
  - The thesis shall be submitted in four copies within the specified time, embodying certificates from HOD Pathology, certifying attendance, and from supervisor and co-supervisor (s), certifying that" the techniques and methods

used in the thesis have been undertaken by the candidate himself and observations checked by me/us". while submitting the thesis the student shall have to deposit the requisite fees as prescribed by the Institute.

- The research work done by the candidate in connection of the thesis shall be considered the property of the department of pathology. The thesis shall be the property of the Institute and one copy shall be made available in the departmental library.
- The thesis shall be submitted for evaluation to a board of examiners, one of whom shall be the Head of department, and at least two external examiners. The thesis will be accepted only when unanimously approved by all the examiners appointed by the Institute for the purpose. In case of any deficiency pointed out by any examiner(s), the candidate shall be required to amend it to the extent pointed out by the examiner(s). The amended thesis must be submitted prior to the commencement of the final examination.
- Acceptance of thesis shall be an essential pre- requisite for permission to appear in the final examination. A candidate whose thesis has been accepted, but who has failed in examination, shall not be required to submit a fresh thesis before appearing in next M.D. examination (s).
- The M.D Pathology trainee shall have at least 1 original paper accepted for publication/ sent for publication to be eligible for the final exit examination.

During the training program, patient safety is of paramount importance, therefore skills are to be learnt and performed under supervision followed by performing independently in a phased and guided manner.

ASSESSMENT

Method for computing Program Outcome

Formative Assessment

It shall be continual and assess medical knowledge, patient care, procedural and academic skill, professionalism, self-directed learning and ability to practice in the system.

Internal assessment will be frequent covering all domains of Pathology and shall be used to provide feedback to improve learning. The internal assessment shall be conducted in theory and practical examination, twice in a year.

The assessment during the training of each student will be evaluated on day to day basis based on the following activities.

1. Periodic assessment of the performance of the student in each laboratory posting as well as mid-term theory and practical examination.
2. Interdepartmental discussions as and when required for the diagnosis of the patient.
3. Level of confidence while assessing the biopsy of the patient.
4. Willingness to learn new skill and acquire new knowledge

5. Adopting ethical principles and maintaining proper etiquette in dealing with patients, relatives or other health personnel
6. Method of communication skills to word reports and professional opinion
7. Self-motivated reading and learning
8. Punctuality in their work
9. Skill and willingness to teach others
10. Involvement in research and maintenance of departmental data
11. Interpersonal relationship and extracurricular activities

Summative Assessment

Essential pre-requisites for appearing for examination include

1) **Log book**
2) **At least two presentations at state/ national level conference. One paper (thesis/ non-thesis related work) published/ accepted/ publication draft in indexed journal.**

The summative assessment examination shall be held at the end of 3 years of training and shall include

A. Theory examination
B. Practical examination and Viva voce
C. Thesis

Thesis shall be submitted at least 6 months before Theory and Practical examination. The student shall be allowed to appear for Theory and Practical examination only after the acceptance of the Thesis by the examiners.

A minimum of 50% marks in Theory as well as Practical separately shall be mandatory for passing.

Theory Examination shall consist of four papers, each representing the four courses included in the program. Passing percentage shall be cumulatively 50% with a minimum of 40% marks in each theory paper.

Practical examination will be conducted for at least two days and will consists of

i. Clinical case discussion
ii. Clinico-pathological exercise pertaining to case
iii. Histopathology Slides: 12-15
iv. Grossing / Autopsy
v. Cytopathology Slides: 5-8
vi. Histo/ Cyto techniques
vii. Special stain exercise
viii. Hematology slides
ix. Hematology exercise including Blood bank and transfusion exercise
x. OSPE including electrophoretic strips, flow-cytometry graphs, coagulograms, immunopathology, EM

Final viva-voce shall be conducted by each examiner separately covering all broad aspects of Pathology with particular reference to recent advances.

Discussion on Thesis/ Project completed by the candidate and on research activities going on in the department may also be invoked at the discretion of the Board of Examiners. Comments on thesis/ project, assessment record (Log book) and credit points collected for courses attended will be considered at the time of final examination and the degree will only be awarded if these are satisfactory.

Successful candidates shall be declared passed. Ordinarily, there will not be any allotment of marks or grades in M.D examination. However, candidates(s) with consistent extraordinarily good overall performance may be credited by the board of examiners to have been awarded M.D. with Honors.

Method for computing Courses outcomes

Course I: Basic Science including general pathology, immunopathology, genetics, clinical pathology, tropical pathology and applied microbiology

Assessment of the student will be done on his/her performance in the following academic activities

1. Seminar presentation
2. Short topic presentation/ Tutorial presentation
3. Journal Clubs
4. Laboratory performance
5. Group discussion during the reporting hours
6. Interdepartmental case discussions
7. Invited faculty lectures to elaborate upon specific topics

Course II: Systemic Pathology including Surgical pathology and Cytopathology

Assessment of the student will be done on his/ her performance in the following academic activities

1. Seminars presentation on pathological diagnosis of the entity
2. Short topic presentation on the diagnosis and differential diagnosis of the disease entity
3. Case presentation during inter-departmental case conferences
4. Case presentation and Group discussion during reporting of the disease
5. Depth of knowledge about the different techniques for reaching the diagnosis
6. Finding solutions to the problems in interpretation of the results and trouble shooting in technical steps of the procedure
7. Willingness to learn new procedures and acquire new knowledge
8. Punctuality and responsibility in work in the laboratory
9. Involvement in research and data management
10. Self-motivation in learning new aspects
11. Willingness and skill to teach and train juniors and staff
12. Interpersonal relationship

Course III: Hematology including transfusion medicine and clinical biochemistry

Assessment of the student will be done on his/ her performance in the following academic activities

1. Seminars presentation on pathological diagnosis of the entity
2. Short topic presentation on the diagnosis and differential diagnosis of the disease entity
3. Case presentation during inter-departmental case conferences
4. Case presentation and Group discussion during reporting of the disease
5. Depth of knowledge about the different techniques for reaching the diagnosis
6. Trouble shooting in technical steps of the procedure
7. Finding solutions to the problems in interpretation of the results
8. Willingness to learn new procedures and acquire new knowledge
9. Punctuality and responsibility in work in the laboratory
10. Involvement in research and data management
11. Self-motivation in learning new aspects
12. Willingness and skill to teach and train juniors and staff
13. Interpersonal relationship

Course IV: Recent advances in pathology

1. Seminar presentation
2. Short topic presentation/ Tutorial presentation
3. Journal Clubs
4. Laboratory performance

Apart from all these he/she should be able to Demonstrate different methods of teaching-learning and assessments.

Engage and teach undergraduates and paramedical staff in the form of small group teaching and demonstrations.

Recommended Reading

Books (latest edition)

1) Robbin's Pathologic Basis of Disease
2) Sternberg's Diagnostic Surgical Pathology
3) Rosai and Ackerman's Surgical Pathology
4) Diagnostic Histopathology of Tumors
5) Lever's Dermatopathology
6) Novaks Gynecologic and Obstetric Pathology
7) MacSween's Pathology of the Liver
8) Iochim's Lymph Node Pathology
9) Odze and Goldblum Surgical pathology of GI tract, liver and biliary tract
10) Rosen Breast Pathology
11) Heptinstall's Pathology of Kidney
12) Enzinger's Soft tissue tumors
13) Manual and Atlas of Fine Needle Aspiration Cytology. Orell's et al
14) Gray's Diagnostic Cytopathology
15) Diagnostic Cytology and its Histopathologic Basis. Koss LG et al
16) Comprehensive Cytopathology. Bibbo M et al

17) Urinalysis and Body fluid. Strasinger et al
18) Dacie's Practical Hematology
19) Wintrobe's Clinical Hematology
20) Bone Marrow Pathology. Barbara Bain
21) Postgraduate Haematology. Hoffbrand et al
22) Theory and Practice of Histological techniques by Bancroft
23) Henry's Clinical diagnosis and management by laboratory methods
24) WHO Classification of Tumor Series

Journals

3-5 International Journals and 02 National Journals (all indexed)

1. American Journal of Clinical Pathology. https://academic.oup.com/ajcp?login=true
2. The American Journal of Pathology. https://ajp.amjpathol.org
3. Diagnostic Histopathology. https://www.diagnostichistopathology.co.uk
4. Journal of Clinical Pathology. https://jcp.bmj.com
5. Histopathology. https://onlinelibrary.wiley.com/journal/13652559
6. Modern Pathology. https://www.nature.com/modpathol/
7. Nature. https://www.nature.com
8. JournalofPathology. https://pathsocjournals.onlinelibrary.wiley.com/journal/10969896
9. NEJM. https://www.nejm.org
10. Archives of Pathology and Lab Medicine. https://meridian.allenpress.com/aplm
11. The Lancet. https://www.thelancet.com
12. CancerCytopathology. https://acsjournals.onlinelibrary.wiley.com/journal/19346638
13. Diagnostic Cytopathology. https://onlinelibrary.wiley.com/journal/10970339
14. Journal Acta Cytologica https://www.cytology-iac.org/journal-acta-cytologica
15. American Journal of Hematology. https://onlinelibrary.wiley.com/journal/10968652
16. Annals of Hematology. https://www.springer.com/journal/277
17. International Journal of Laboratory Hematology - Wiley https://onlinelibrary.wiley.com/journal/1751553x
18. British Journal of Haematology https://onlinelibrary.wiley.com/journal/1365214
19. Indian Journal of Pathology and Microbiology. https://www.ijpmonline.org
20. IndianJournalofHematologyandbloodtransfusion https://www.springer.com/journal/12288

E-learning resources

1. Clinical key access to various Pathology journals. https://www.clinicalkey.com
2. CAP protocols 2022. https://www.cap.org/protocols-and-guidelines/cancer-reporting-tools/cancer-protocol-templates
3. Libre Pathology. https://librepathology.org/wiki/Libre_Pathology
4. Pathology outlines. www.pathologyoutlines.com
5. Stanford University. https://surgpathcriteria.stanford.edu
6. WebPathology: A collection of Surgical Pathology Images. https://www.webpathology.com
7. UpToDate. https://www.uptodate.com
8. Jared Gardner MD. YouTube channel