MAHATMA GANDHI UNIVERSITY
of
MEDICAL SCIENCES & TECHNOLOGY
JAIPUR

Syllabus

MD – IMMUNOHAEMATOLOGY AND BLOOD TRANSFUSION (MD19)

(3 Years Post Graduate Degree Course)

Edition- 2022-23

Notice

1. Amendment made by the NMC in Rules/Regulations of Post Graduate Medical Courses shall automatically apply to the Rules/Regulations of the Mahatma Gandhi University of Medical Sciences & Technology (MGUMST), Jaipur.

2. The University reserves the right to make changes in the syllabus/books/guidelines, fees-structure or any other information at any time without prior notice. The decision of the University shall be binding on all.

3. The Jurisdiction of all court cases shall be Jaipur Bench of Hon'ble Rajasthan High Court only.

RULES & REGULATIONS
MD-IMMUNOHAEMATOLOGY AND BLOOD TRANSFUSION
(3 Years Post Graduate degree course)

TITLE OF THE COURSE:
It shall be called Doctor of Medicine.

ELIGIBILITY FOR ADMISSION:
No candidate of any category (including Management quota) shall be eligible for admission to MD/MS courses, if he or she has not qualified NEET PG (MD/MS) conducted by National Board of Examinations or any other Authority appointed by the Government of India for the purpose.

(1) General Seats
(a) Every student, selected for admission to postgraduate medical course shall possess recognized MBBS degree or equivalent qualification and should have obtained permanent Registration with the NMC, or any of the State Medical Councils or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled;
(b) Completed satisfactorily one year's rotatory internship or would be completing the same before the date announced by the University for that specific year as per NMC rules after passing 3rd professional MBBS Part II Examination satisfactorily.

CRITERIA FOR SELECTION FOR ADMISSION:

1. Out of total seats available for admission to the postgraduate courses 50% seats shall be year marked for All India Quota and 50% shall be state Quota seats.

2. Out of total seats available for admission to the postgraduate courses 15% shall be management Quota seats. Theses seats shall be part of All India Quota seats.

3. Remaining 35% seats shall be of All India Quota nature.

4. Preference shall be given to state domicile candidates on all categories of seats.

5. Reservation shall be applicable on all category of seats as per the state government policy.

Admissions to the Postgraduate MD/MS Courses shall be made on the basis of the merit obtained at the NEET conducted by the National Board of Examinations or any other Authority appointed by the Government of India for the purpose.
The admission policy may be changed according to the law prevailing at the time of admission.

COUNSELING/INTERVIEW:
(1) Candidates in order of merit will be called for Counseling/Interview and for verificationof original documents and identity by personal appearance.
(2) Counseling will be performed and the placement will be done on merit-cum-choice basis after application of roster by the Admission Board.
(3) RESERVATION:
Reservation shall be applicable as per policy of the State Government in terms of scheduled caste, scheduled tribe, back ward class, special back ward class, women and person with disability & EWS

ELIGIBILITY AND ENROLMENT:
Every candidate who is admitted to MD/MS course in Mahatma Gandhi Medical College & Hospital shall be required to get himself/herself enrolled and registered with the Mahatma Gandhi University of Medical Sciences & Technology after paying the prescribed eligibility and enrolment fees.

The candidate shall have to submit an application to the MGUMST through Principal of College for the enrolment/eligibility along with the following original documents and the prescribed fees within the prescribed period without late fees. Then after, students will have to pay applicable late fees as per prevailing University Rules –

(a) MBBS pass Marks sheet/Degree certificate issued by the University (Ist MBBS to Final MBBS)
(b) Certificate regarding the recognition of medical college by the Medical Council of India.
(c) Completion of the Rotatory Internship certificate from a recognized college.
(d) Migration certificate issued by the concerned University.
(e) Date of Birth Certificate
(f) Certificate regarding registration with Rajasthan Medical Council / NMC/ Other State Medical Council.

REGISTRATION

Every candidate who is admitted to MD/MS course in Mahatma Gandhi Medical College & Hospital shall be required to get himself/herself registered with the Mahatma Gandhi University of Medical Sciences & Technology after paying the prescribed registration fees.

The candidate shall have to submit application to the MGUMST through Principal of College for registration with the prescribed fees within the prescribed period without late fees. Then after, students will have to pay applicable late fees as per prevailing University Rules.

DURATION OF COURSE:

The course shall be of 3 years duration from the date of commencement of academic session.

PERIOD OF TRAINING:

(1) The period of training for obtaining Post graduate degrees (MD/MS) shall be threecompleted years including the period of examination.

MIGRATION:

No application for migration to other Medical Colleges will be entertained from the studentsalready admitted to the MD/MS course at this Institute.

METHODS OF TRAINING FOR MD/MS:

Method of training for MD/MS courses shall be as laid down by the NMC.

ONLINE COURSE IN RESEARCH METHODS

i. All postgraduate students shall complete an online course in Research Methods to be conducted by an Institute(s) that may be designated by the NMC by way of public notice, including on its website and by Circular to all Medical Colleges. The students shall have to register on the portal of the designated institution or any otherinstitute as indicated in the public notice.
ii. The students have to complete the course by the end of their 2nd semester.
iii. The online certificate generated on successful completion of the course and examinationthereafter, will be taken as proof of completion of this course
iv. The successful completion of the online research methods course with proof of its completion shall be essential before the candidate is allowed to appear for the final examination of the respective postgraduate course.
v. This requirement will be applicable for all postgraduate students admitted from theacademic year 2019-20 onwards

ATTENDANCE, PROGRESS AND CONDUCT:

(1) Attendance:

(a) 80% attendance in t h e s u b ject is compulsory. Any one failing to achieve this, shall not be allowed to appear in the University examination.
(b) A candidate pursuing MD/MS course shall reside in the campus and work in the respective department of the institution for the full period as a full time student. No candidate is permitted to run a clinic/work in clinic/laboratory/ nursing home while studying postgraduate course. No candidate shall

join any other course of study or appear for any other examination conducted by this university or any other university in India or abroad during the period of registration. Each year shall be taken as a unit for the purposeof calculating attendance.

(c) Every candidate shall attend symposia, seminars, conferences, journal review meetings, grand rounds, CPC, CCR, case presentation, clinics and lectures during each year as prescribed by the department and not absent himself / herself from work without valid reasons. Candidates should not be absent continuously as the course is a full time one.

(2) Monitoring Progress of Studies- Work diary/Log Book:

(a) Every candidate shall maintain a work diary in which his/her participation in the entire training program conducted by the department such as reviews, seminars, etc. has to be chronologically entered.

(b) The work scrutinized and certified by the Head of the Department and Head of the Institution is to be presented in the University practical/clinical examination.

(3) Periodic tests:

There shall be periodic tests as prescribed by the NMC and/ or the Board of Management of the University, tests shall include written papers, practical/clinical and viva voce.

(4) Records:

Records and marks obtained in tests will be maintained by the Head of the Departmentand will be made available to the University when called for.

THESIS:

(1) Every candidate pursuing MD/MS degree course is required to carry out work on research project under the guidance of a recognized post graduate teacher. Then such a work shallbe submitted in the form of a Thesis.

(2) The Thesis is aimed to train a postgraduate student in research methods & techniques.

(3) It includes identification of a problem, formulation of a hypothesis, designing of a study, getting acquainted with recent advances, review of literature, collection of data, critical analysis, comparison of results and drawing conclusions.

(4) Every candidate shall submit to the Registrar of the University in the prescribed format a Plan of Thesis containing particulars of proposed Thesis work within six months of the date of commencement of the course on or before the dates notified by the University.

(5) The Plan of Thesis shall be sent through proper channel.

(6) Thesis topic and plan shall be approved by the Institutional Ethics Committee beforesending the same to the University for registration.

(7) Synopsis will be reviewed and the Thesis topic will be registered by the University.

(8) No change in the thesis topic or guide shall be made without prior notice and permission from the University.

(9) The Guide, Head of the Department and head of the institution shall certify the thesis. Three printed copies and one soft copy of the thesis thus prepared shall be submitted by the candidate to the Principal. While retaining the soft copy in his office, the Principalshall send the three printed copies of the thesis to the Registrar six months before MD/MS University Examinations. Examiners appointed by the University shall evaluate the thesis. Approval of Thesis at least by two examiners is an essential pre-condition for a candidateto appear in the University Examination.

(10) Guide: The academic qualification and teaching experience required for recognition by this University as a guide for thesis work is as laid down by Medical Council of India/Mahatma Gandhi University of Medical Sciences & Technology, Jaipur.

(11) Co-guide: A co-guide may be included provided the work requires substantial contribution from a sister department or from another institution recognized for teaching/training by Mahatma Gandhi University of Medical Sciences & Technology, Jaipur/Medical Council of India. The co-guide shall be a recognized postgraduate teacher.

(12) Change of guide: In the event of a registered guide leaving the college for any reasonor in the event of death of guide, guide may be changed with prior permission from the University.

ELIGIBILITY TO APPEAR FOR UNIVERSITY EXAMINATION:

The following requirements shall be fulfilled by every candidate to become eligible to appearfor the final examination:

(1) Attendance: Every candidate shall have fulfilled the requirement of 80% attendance prescribed by the University during each academic year of the postgraduate course. (asper NMC rules)

(2) Progress and Conduct: Every candidate shall have participated in seminars, journal review meetings, symposia, conferences, case presentations, clinics and didactic lectures during each year as designed by the department.

(3) Work diary and Logbook: Every candidate shall maintain a work diary for recording his/her participation in the training program conducted in the department. The work diary and logbook shall be verified and certified by the Department Head and Head of the Institution.

(4) Every student would be required to present one poster presentation, to read one paper at a National/State Conference and to have one research paper which should be published/accepted for publication/ sent for publication to an indexed journal during the period of his/her post graduate studies so as to make him/her eligible to appear at the Post Graduate Degree Examination.

(5) Every student would be required to appear in and qualify the Pre-University Post graduate degree Mock examination. Post graduate students who fail to appear in or do not qualifythe Pre-University Post graduate degree Mock examination shall not be permitted to appear in the final examination of the University.

The certification of satisfactory progress by the Head of the Department/ Institution shallbe based on (1), (2), (3), (4) and (5) criteria mentioned above.

ASSESSMENT:

(1) The progress of work of the candidates shall be assessed periodically by the respective guides and report submitted to the Head of the Institution through the Head of the Department at the end of every six months. The assessment report may also be conveyedin writing to the candidate who may also be advised of his/her shortcomings, if any.

(2) In case the report indicate that a candidate is incapable of continuing to do the work of the desired standard and complete it within the prescribed period, the Head of the Institution may recommend cancellation of his/her registration at any time to the University.

(3) Formative Assessment:

(a) General Principles

i. The assessment is valid, objective, constructive and reliable.
ii. It covers cognitive, psychomotor and affective domains.
iii. Formative, continuing and summative (final) assessment is also conducted.
iv. Thesis is also assessed separately.

(b) Internal Assessment

i. The internal assessment is continuous as well as periodical. The former is based on the feedback from the senior residents and the consultants concerned. Assessment is held periodically.
ii. Internal assessment will not count towards pass/fail at the end of the program, but will provide feedback to the candidate.
iii. The performance of the Postgraduate student during the training period should be monitored throughout the course and duly recorded in the log books as evidence of the ability and daily work of the student.
iv. Marks should be allotted out of 100 as under
    1) Personal Attributes - 20 marks
        a. Behavior and Emotional Stability: Dependable, disciplined, dedicated, stable in emergency situations, shows positive approach.
        b. Motivation and Initiative: Takes on responsibility, innovative, enterprising, does not shirk duties or leave any work pending.
        c. Honesty and Integrity: Truthful, admits mistakes, does not cook up information, has ethical conduct, exhibits good moral values, loyal to the institution.
    2) Clinical Work - 20 marks

a Availability: Punctual, available continuously on duty, responds promptly on calls and takes proper permission for leave.
b Diligence: Dedicated, hardworking, does not shirk duties, leaves no work pending, does not sit idle, competent in clinical case work up and management.
c Academic Ability: Intelligent, shows sound knowledge and skills, participates adequately in academic activities and performs well in oral presentation and departmental tests.
d Clinical Performance: Proficient in clinical presentations and case discussion during rounds and OPD work up. Preparing Documents of the case history/examination and progress notes in the file (daily notes, round discussion, investigations and management) Skill of performing bed side procedures and handling emergencies.

3) Academic Activities - 20 marks
Performance during presentation at Journal club/ Seminar/Case discussion/Stat meeting and other academic sessions. Proficiency in skills as mentioned in job responsibilities.
4) End of term theory examination - 20 marks
End of term theory examination conducted at end of 1st, 2nd year and after 2 years 9 months.
5) End of term practical examination - 20 marks
a. End of term practical/oral examinations after 2 years 9 months.
b. Marks for personal attributes and clinical work should be given annually by all the consultants under whom the resident was posted during the year. Average of the three years should be put as the final marks out of 20.
c. Marks for academic activity should be given by the all consultants whohave attended the session presented by the resident.
d. The Internal assessment should be presented to the Board of examiners for due consideration at the time of Final Examinations.
e. Yearly (end of 1st, 2nd & 3rd year) theory and practical examination will be conducted by internal examiners and each candidate will enter details of theory paper, cases allotted (2 long & 2 short) and viva.
f. Log book to be brought at the time of final practical examination.

APPOINTMENT OF EXAMINERS:
Appointment of paper setters, thesis evaluators, answer books evaluators and practical & vivavoce examiners shall be made as per regulations of the National Medical Commission .

SCHEME OF EXAMINATION:
Scheme of examination in respect of all the subjects of MD/MS shall be as under :
(1) The examination for MD/MS shall be held at the end of three Academic Years.
(2) Examinations shall be organized on the basis of marking system.
(3) The period of training for obtaining MD/MS degrees shall be three completed yearsincluding the period of examination.
(4) The University shall conduct not more than two examinations in a year for any subject with an interval of not less than 4 months and not more than 6 months between the two examinations.
(5) The examinations shall consist of:
(a) Thesis :
i. Thesis shall be submitted at least six months before the main Theory examinations.
ii. The thesis shall be examined by a minimum of three examiners – one Internal and two External examiners who shall not be the examiners for Theory and Clinical/Practical.
iii. In departments where besides the two earmarked practical/clinical examiners no one else is a qualified P.G. teacher, in that case the Thesis shall be sent to the third external examiner who shall actually be in place of the internal examiner.
iv. Only on the acceptance of the thesis by any two examiners, the candidate shall be eligible to appear for the final examination.
v. A candidate whose thesis has been once approved by the examiners will not be required to submit the Thesis afresh, even if he/she fails in theory and/or practical of the examination of

the same branch.

vi. In case the Thesis submitted by a candidate is rejected, he/she should be required to submit a fresh Thesis.

(b) Theory papers:

i. There shall be four theory papers, as below:

Paper I: Basic sciences as applied to the subject

Paper II: Immunohematology, Immunogenetics, Transfusion transmitted infections, applied serology

Paper III: Blood donor organisation and management, blood components, Hematology,Clinical transfusion practices

Paper IV: Recent advances in the subject, Regulatory requirements, Quality management system, Information management, Automation.

ii. Each theory paper examination shall be of three hours duration.

iii. Each theory paper shall carry maximum 100 marks.

iv. The question papers shall be set by the External Examiners.

v. There will be a set pattern of question papers.
Every question paper shall contain 10 questions carrying 10 marks each. All the questions shall be compulsory, having no choice.

vi. The answer books of theory paper examination shall be evaluated by two External and two internal examiners. Out of the four paper setters, the two paper setterswill be given answer books pertaining to their papers and the answer books of the remaining two papers will be evaluated by two Internal Examiners. It will bedecided by the President as to which paper is to be assigned to which Internal Examiner for evaluation.

vii. A candidate will be required to pass theory and practical examinations separatelyin terms of the governing provisions pertaining to the scheme of examination in the post graduate regulations. The examinee should obtain minimum 40% marksin each theory paper and not less than 50% marks cumulatively in all the fourpapers for degree examination to be cleared as "passed" at the said Degree examination.

(c) Clinical/ Practical & Oral examinations:

i. Clinical/Practical and Oral Examination of 400 marks will be conducted by atleast four examiners, out of which two (50%) shall be External Examiners.

ii. A candidate will be required to secure at least 50% (viz. 200/400) marks in thePractical including clinical and viva voce examinations.

(6) If a candidate fails in one or more theory paper(s) or practical, he/she shall have toreappear in the whole examination i.e. in all theory papers as well as practical.

GRACE MARKS

No grace marks will be provided in MD/MS examinations.

REVALUATION / SCRUTINY:

No Revaluation shall be permitted in the MD/MS examinations. However, the student canapply for scrutiny of the answer books as per University Rules.

GUIDELINES FOR COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR MD IN IMMUNOHEMATOLOGY AND BLOOD TRANSFUSION

Preamble:

Transfusion medicine has emerged as a distinct specialty not confined to blood bank alone but has reached the patient's bed side. It is a diverse and multifaceted discipline concerned with the proper use of blood and blood components in the treatment of human diseases. Last few decades have witnessed rapid technological advances which have changed the scope and scenario of transfusion medicine services. It becomes important that MD students are trained in this specialty so that they are properly equipped to render special consultative service. The purpose of the course is to provide didactic education and practical training in all aspects of blood transfusion technology including pheresis donation and therapeutic apheresis, to develop the knowledge required to analyze Immunohematology problems, to provide expertise in blood centre administrative policies such as donor recruitment, collection, storage, preservation, administration of blood and components.

The rapid technological advances in transfusion practices, such as apheresis, stem cell transplantation, plasma exchange, molecular testing protocols, fractionation, have created a gap between users of the blood and BTS. Didactic training programs will help to resolve these problems. A well conceived training program will improve quality, efficiency, and effectiveness of BTS. IT will also help promote applied research in the field pertaining to the needs of the country.

The National Blood Policy of India has reiterated the importance of creation of trained manpower in this field in the country. It is, therefore, extremely essential to train medical specialists in the discipline of Transfusion Medicine who can actively and constantly interact with clinical colleagues for evolving a relevant and rational approach for provision of efficient and effective blood transfusion services.

SUBJECT SPECIFIC OBJECTIVES

Transfusion medicine specialists should have a combination of skills on completion of their course, and be equipped academically and practically to run a good blood centre, ensuring quality of blood products, in keeping with legislative and accreditation requirements. In addition, a good understanding of clinical situations, pathophysiology of the same, and knowledge of basic laboratory tests that will help guide transfusion practice is needed. Clinical laboratory interfacing and keeping abreast with recent developments in the specialty are critical to the development of a good and safe blood service.

Transfusion medicine has emerged as a distinct specialty which is not confined to blood bank alone but has reached the patient's bed side. It is a diverse and multifaceted discipline concerned with the proper use of blood and blood components in the treatment of human diseases. The objectives of the MD Course in Immunohematology and blood transfusion (Transfusion Medicine) are:

- to provide didactic education and practical training in all aspects of blood transfusion technology including apheresis donation and therapeutic apheresis,
- To provide comprehensive training in all aspects of transfusion medicine and immunohematology including donor recruitment, blood donation, screening, processing, storage, component preparation, immune-haematological procedures, apheresis techniques, molecular testing and transfusion management so that trainees are equipped for:
    - Managing a major academic department or hospital blood centre,
    - Functioning as a guide, teacher, and consultant, and for
    - beginning a career as a research investigator in the field of Transfusion Medicine.

  These specialists will be specifically trained for the following tasks:

    - Organization of the collection, preparation, storage, distribution and use of blood and blood products as part of periodical evaluation of the needs of the blood center and ensure adequate, safe and effective blood supply,
    - Organisation of diagnostic and therapeutic aspects of immunohematology, hematology, apheresis, histocompatibility, and related molecular biology,

- management of the medical laboratory and blood centre, including quality, safety, ethical and regulatory aspects,
- Organisation of the collection, processing, storage and provision of cell therapy products for transplantation purposes,
- Organization of a quality management system including implementation of appropriatequality control programs,
- Promotion of optimal use of blood and blood products and development of appropriate guidelines for rational clinical use and effective implementation of patient blood management.
- engaging policy-makers, other physicians, and other health professionals in transfusion medicine, and
- the advancement of the discipline through basic scientific and clinically applied research.

The National Blood Policy of India which was adopted in the year 2002 has reiterated the importance of creation of trained manpower in this field to: (a) ensure safe transfusion practices and blood safety (b) manage major academic departments to provide training in the field of transfusion medicine or hospital blood centres to create expertise among doctors and paramedical health professionals (lab technologists) and (c) function as a guide, teacher, and consultant in the field of Transfusion Medicine.

SUBJECT SPECIFIC LEARNING OBJECTIVES

The aim of this course is to train individuals in the art and science of transfusion medicine, in a holistic and comprehensive manner. Transfusion medicine specialists require an understanding and in depth knowledge of a combination of skills. Ensuring adequate blood supply, and voluntary blood donations, putting into place good manufacturing and good laboratory practices, adherence to legislative and accreditation requirements, and an in depth understanding of clinical scenarios to initiate appropriate and rational use of blood components are some of the responsibilities they will shoulder on completion of their course. To this end,

it is imperative that their training involves not just theoretical knowledge, but training in the psychomotor and affective domains as well.

Upon completion of the training and successfully qualifying the exanination for MD in Immunohematology & Blood transfusion, the student should be able to acquire and demonstrate:

1. **Theoretical knowledge:** The student should be able to demonstrate possession of basic knowledge in: (1) various branches of medical sciences such as Anatomy, Physiology, Biochemistry, Pathology, Microbiology, Pharmacology, Molecular Biology etc. as related to Immunohematology & Blood Transfusion.
2. **Teaching-Training:** The student should be able to:
    - plan educational programmes in Immunohematology & Blood Transfusion in association with his senior colleagues/faculty;
    - should be familiar with the modern methods of teaching and evaluation;
    - teach and/or deliver lectures to medical students, residents and other health professionals;
    - should be able to present and critically discuss in a seminar/symposium relevant topics on Immunohematology & Blood Transfusion;
    - summarise published articles in the field of Immunohaematology and Blood Transfusion according to prescribed instructions, critically evaluate and discuss the selected article/s.
3. **Clinical/Practical skills:** The student should understand and develop competence in performing procedures employed in diagnosis, investigations and management of conditions encountered in Transfusion Medicine.

    He/she should be able to:

    - practice and handle independently most of the day to day problems as encountered in a safe, effective and ethical manner.
    - plan a comprehensive management of the patient independently.
    - should be able to comprehensively interpret appropriate lab investigations that will further help guide appropriate use of blood

- be able to adapt to transfusion needs in different healthcare settings, including developing appropriate algorithms for referrals if required

Research: The student should be able to:

- recognise a research topic, state the objectives in terms of what is expected to be achieved in the end,
- plan a rational approach with full awareness of the statistical validity, spell out the methodology and carry out most of the technical procedures required for the study, accurately and objectively,
- record systematically the results and observations,
- analyse the data using appropriate statistical approach, interpret the observations based on existing knowledge and highlight how the study has advanced existing knowledge on the subject and what remains to be done,
- draw conclusions which should be reached by logical deduction and should be able to assess evidence both as to its reliability and its relevance,
- write a thesis in accordance with the prescribed instructions, and
- be familiar with the ethical aspects of research.

SUBJECT SPECIFIC COMPETENCIES

Predominant in the cognitive domain are: Organisation of Transfusion Services/ Blood donation centre

- Acquire knowledge of the clinical, socio-behavioural, and fundamental biomedical sciences relevant to effectively and ethically provide medical supervision to operate blood donor centres and/or blood transfusion laboratories.
- Acquire knowledge on blood donors - selection, donation, and testing, including process of allogeneic blood donation, including the medical history, donation process, adverse effects, and donor testing.
- Identify appropriate laboratory screening investigations for blood donors, including interpreting virology and microbiology test results.
- Be able to identify relevant scientific information to advise on introduction and implementation of new screening options for blood donors and donations.

- Acquire knowledge of good manufacturing practice (GMP) with respect to processing blood donations and the manufacture and distribution of blood components, products, plasma derivatives, recombinant products and alternatives.
- Acquire knowledge on equipment procurement, maintenance, performance, calibration, QC procedures, related to Transfusion Medicine,
- Acquire knowledge on the establishment of Rare blood group registry,
- Acquire competence to use apheresis technology for apheresis donations and for therapeutic purposes like plasma exchange, red cell exchange, stem cell collections, granulocyte apheresis
- Acquire competence regarding ethical practices and the process of confidentiality – both patient and donor confidentiality

Transfusion transmitted infections

- Acquire competence on **appropriate strategies for blood safety** with emphasis on TTI testing
- Be able to provide advice on the implementation of enhanced technologies for blood safety including NAT, Pathogen inactivation technologies.

Immunohaematology

- Acquire competence to evaluate data, interpret and resolve discrepant results in ABO/Rh blood grouping and pre-transfusion testing.
- Be able to select appropriate investigative tools to resolve serological problems encountered during compatibility testing, including molecular and genetic testing and interpret them appropriately in the clinical context.
- Acquire competence to provide immune-pharmacological evaluation and transfusion support to patient with disorders like thalassemia, Immune hemolytic anaemia, transfusion reactions, Abo mismatched transplants, exchange transfusions and intrauterine transfusions.
- Be able to advise on the introduction of new diagnostic options in the immune-hematology laboratory.
- Demonstrate knowledge of Granulocyte and platelet antigen system and antibodies and approach to the laboratory evaluation of patient with anti-red cell/anti-platelet/ anti granulocyte antibodies and their clinical implications.

Clinical Transfusion therapy

- Acquire competence to incorporate principles of blood safety and transfusion safety in all the processes in the blood centre.
- Acquire competence to effectively manage blood inventory.
- Acquire competence to implement principles of rational use of blood and patient blood management.
- Acquire competence to investigate transfusion – induced reactions.

- Acquire knowledge to Identify and plan transfusion requirements to support the various types of transplantation programs,
- Acquire competence to provide transfusion support to cases with massive blood loss.

Hematology

- Acquire competence to evaluate a case of anaemia with the help of appropriate laboratory investigations in a logical and stepwise manner.
- Acquire competence to evaluate a patient showing an abnormal bleeding tendency with the help of appropriate set of laboratory investigations in a logical and stepwise manner.
- Acquire competence to evaluate a patient with suspected leukaemia /bone marrow failure syndrome with the help of appropriate a battery of laboratory investigations in a logical and stepwise manner.
- Acquire knowledge on the role of various diagnostic modalities including interpretation of Hemogram, Bone marrow aspirate and biopsy, screening and specialised coagulation tests, Hb electrophoresis and HPLC, flow cytometry, genetic tests like karyotyping and FISH in the diagnosis of various haematological disorders.

Molecular diagnostics

- Acquire knowledge of the science of molecular genetics, including nucleic acid structure and function, mutations/variations, and use appropriate/accurate descriptive nomenclature.
- Acquire knowledge of standard molecular laboratory techniques.
- Acquire technical proficiency in nucleic acid extraction, electrophoresis, qualitative and quantitative amplification technologies.
- Be able to understand the clinical implications, methodology and limitations of testing for a wide range of clinical disorders, including malignant and non-malignant hemopoietic disorders, infectious diseases, coagulopathies, and inherited genetic disorders.

Histocompatibility

- Acquire competence to interpret the basic HLA testing procedures including HLA typing and cross-match.
- Acquire working proficiency of the principle, workflow, instrumentation and troubleshooting of technologies commonly used in histocompatibility laboratories including molecular techniques like PCR, SSP and SSOP for HLA typing and cross-matching by CDC and flow cytometry.
- Acquire familiarity with Luminex based assays, Sanger sequencing, NGS and fragment analysis.
- Be competent to explain and discuss the implications of HLA matching and mismatches in solid organ and bone marrow/stem cell transplantation.

- Be competent to discuss the factors involved in donor selection for bone marrow/solid organ transplantation.
- Acquire competence to judiciously use available cross-matches and antibody detection tests in different clinical scenarios.
- Acquire knowledge and be able to describe the role of the HLA system as it pertains to transplantation, the methods to select potential donors and recipients, and the role and function of various stem cell donor registries.
- Acquire knowledge and competence to understand the HLA associations with disease.
- Acquire knowledge of the policies and procedures regarding the collection and storage of hematopoietic stem cells from various sources.
- Acquire an understanding of relevant issues regarding solid organ procurement and transplantation.

Information management, automation, and regulatory systems

- apply the knowledge of applicable and relevant regulatory requirements in terms of documentation, process control for the functioning of blood centre.
- Comply with the requirements of licensing, regulatory and accreditation bodies.
- Assess the need for automation, evaluate and implement automation optimally for various activities at the blood centre.
- Acquire knowledge and be able to apply the principles of quality management system, quality control and quality assurance at all levels of functioning at the blood centre and for all the activities.
- Acquire knowledge of basic principles of laboratory management, including QC, QA, test validation, budgeting, personnel requirements, regulatory agencies and requirements, ethical issues, and laboratory and patient safety.
- Acquire knowledge and be able to manage the operations of blood bank information system for effective data management with appropriate integration of informatics into the testing laboratories ensuring data protection.

II. Predominant in the affective domain

B. Affective Domain:

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.

2. Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.

3. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

III. Predominant in the Psychomotor domain

The student should be able to perform the following:

Immunohaematology:

- ABO and Rh D blood grouping - forward and reverse grouping by tube method and by gel card and other methods.
- preparation of cell suspensions of appropriate concentration following cell washing techniques, correctly, grade and interpret antibody-antigen reactions according to the established criteria.
- interpret and resolve discrepant results in pre-transfusion testing, ABO/RhD grouping, red cell antibody screen, and antibody identification.
- cross match by conventional tube method and other advanced technologies of blood components as per department SOP.
- Perform direct and indirect antiglobulin test on appropriate specimens, grading and recording the results appropriately with the appropriate controls and "check cells".
- Perform trouble shoot in Antiglobulin testing by identifying sources of error in antiglobulin testing and resolve the errors in testing
- Perform antibody identification procedures by the use pf appropriate red cell panels and correctly interpret the results.
- Identification of clinically significant RBC antibodies from an antibody panel including multiple alloantibodies and mixtures of alloantibodies and autoantibodies; determine how difficult it will be to obtain blood for this patient, and effectively communicate these results to clinicians.
- Perform various immune-hematological tests including:
    - Titration of Anti D and Anti A and Anti B
    - Elution
    - Adsorption
    - Minor blood group typing
    - Saliva Inhibition Test
    - Resolution of ABO discrepancy and interpret them
- Preparation of appropriate reagents required for the specialized tests performed in Immunohematology lab, eg.,
    - Reagents required for Elution testing,
    - Reagents required for DTT treatment,
    - Reagents required for the Enzyme treatment.

- Be able to select suitable unit/s of blood for a patient with autoimmune haemolytic anaemia
- Perform Quality Control tests for immunohematology reagents and interpret the results thereof.
- Perform appropriate tests for transfusion reactions, evaluate them and recommend treatment plans for management.
- Conduct evaluation for irregular antibodies that are clinically significant in pregnancy and make appropriate recommendations for blood component transfusion.

Transfusion transmissible Infections

- Perform blood donor screening tests for transfusion-transmissible infections (TTIs) as per departmental SOP.
- Preparation and interpretation of *Levey-Jennings* (LJ) Chart and root cause analysis (RCA) and Corrective and Preventive action (CAPA) as and when required.
- Perform non-treponemal and treponemal antibody tests for diagnose of syphilis and interpret the data.
- Acquire competence for proper handling and disposal of biohazardous material as per regulatory requirements.
- Perform Gram staining of biological fluids.
- Perform Quality control testing of reagents and kits used for serological tests.
- Perform peripheral blood smear staining and identification of malarial parasite.
- Perform screening for malaria by various testing methods.

Blood donation

- Perform Hb estimation by various methods including Spectrophotometric and colorimetric techniques.
- Organise outdoor blood donation camps.
- Motivate blood donors / organizers for blood donation.
- Conduct donor screening based on eligibility criteria for whole blood donation and apheresis donation.
- Collect whole blood for preparation of blood components for transfusion.
- Prepare the phlebotomy site.
- Evaluate and manage adverse reactions associated with blood donation.
- Perform biomedical waste disposal as per protocols.

- Prepare blood components such as PRBC, FFP, Platelet concentrate and cryoprecipitate by centrifugation technique and by buffy coat technique.
- Perform Quality Control (QC) on the blood components and take corrective action to rectify failure of QC.
- Conduct Apheresis procedures like plateletpheresis and plasmapheresis.

Hematology

- Perform Hb estimation by various methods and interpret the complete hemogram.
- Prepare stained peripheral blood smear and interpret disease conditions like nutritional (Iron deficiency/Vit B12 and Folic acid deficiency) anemia, Haemolytic anaemia (Immune, Sickle Cell, Thalassemia, Microangiopathic), acute and chronic leukaemia, identification of Hemoparasites.
- Perform coagulation tests like prothrombin time, activated partial thromboplastin time (APTT), fibrinogen assay, thrombin time, mixing tests of PT and APTT, factor assays and interpret the results.
- Perform point-of-care testing for hemostasis including ROTEM/TEG and interpret the data.
- Interpret Hb electrophoresis data.

Molecular diagnosis and HLA typing

- Perform basic molecular laboratory techniques, such as nucleic acid extraction, both manual and automated, and techniques for quality assessment of DNA and troubleshoot in the event of a technical problem
- Interpret the results of various tests of HLA typing.
- interpret data of HLA cross-matching and HLA antibody detection assays, both by cell based and solid phase methods.

TEACHING LEARNING METHODS

General principles

Acquisition of competencies being the keystone of doctoral medical education, such training should be skills oriented. Learning in the program, essentially autonomous and self-directed, and emanating from academic and clinical work, shall also include assisted learning. The formal sessions are meant to supplement this core effort.

All students joining the postgraduate (PG) courses shall work as full-time (junior) residents during the period of training, attending not less than 80% of the training activity during the calendar year, and participating in all assignments and facets of the educational process. They shall maintain a log book for recording the training they have undergone, and details of the procedures done during laboratory and clinical postings in real time.

Teaching-Learning methods

This should include a judicious mix of demonstrations, symposia, journal clubs, clinical meetings, seminars, small group discussions, bed-side teaching, case-based learning, simulation-based teaching, self-directed learning, integrated learning, interdepartmental meetings and any other collaborative activity with the allied departments. Methods with exposure to the applied aspects of the subject relevant to basic/clinical sciences should also be used.

The suggested examples of teaching-learning methods are given below but are not limited to these. The frequency of various below mentioned teaching-learning methods can vary based on the subject's requirements, competencies, work load and overall working schedule of the department.

1. **Lectures**: Didactic lectures should be used sparingly. All postgraduate trainees will be required to attend these lectures. Didactic lectures in Physics related to Immunohaematology, instrumentation, data processing and quality control are suggested.

   Lectures also can cover topics such as:

   - Recent advances
   - Research methodology and biostatistics
   - Salient features of Undergraduate/postgraduate medical curriculum
   - Teaching and assessment methodology
   - Technical and ethical issues in clinical research and practice
   - Good laboratory practice
   - Good manufacturing practice

2. **Journal club**: Minimum of once in 1-2 weeks is suggested.

   Topics will include presentation and critical appraisal of original research papers published in peer reviewed indexed journals. The presenter(s) shall be assessed by faculty and grades recorded in the logbook.

3. **Student Seminar**: Minimum of once every 1-2 weeks is suggested.

Important topics should be selected as per subject requirements and allotted for in-depth study by a postgraduate student. A teacher should be allocated for each seminar as faculty moderator to help the student prepare the topic well. It should aim at comprehensive evidence-based review of the topic. The student should be graded by the faculty and peers.

4. Student Symposium: Minimum once every 3 months.

A broad topic of significance should be selected, and each part shall be dealt by one postgraduate student. A teacher moderator should be allocated for each symposium and moderator should track the growth of students during moderation. It should aim at complete evidence-based review of the topic. All participating postgraduates should be graded by the faculty and peers.

5. **Laboratory work / Bedside clinics**: Minimum - once every 1-2 weeks.

Laboratory work/Clinics/bedside teaching should be coordinated and guided by faculty from the department. Various methods like DOAP (Demonstrate, Observe, Assist, Perform), simulations in skill lab, and case-based discussions etc. are to be used. Faculty from the department should participate in moderating the teaching-learning sessions during clinical rounds.

6. Interdepartmental colloquium

Faculty and students must attend monthly meetings between the Department of Immunohematology & blood transfusion and other departments on topics of current/common interest or clinical cases.

G. a. Rotational clinical / community / institutional postings

The postgraduate trainees are to be posted in relevant departments/ units as per details given below: The aim would be to acquire more in-depth knowledge as applicable to the concerned specialty.

Apprenticeship/Rotation in:

Posting in various sections of Blood Centre for MD in Immunohematology and Blood Transfusion		
Title	**Content of training activities**	**Learning objective**
Orientation [1 month]	Brief orientation to computer system, bloodbank activities, teaching program	Be conversant with computer system & operation of blood bank activities.
Blood donation [3 months]	Donor recruitment & motivation, donorselection. Phlebotomy, post donation care of donor, outdoor blood donation.	Should be able to select the donor, perform phlebotomy with aspetic precautions, and manage donor reactions.
Apheresis – donor and therapeutic apheresis procedures [2 months]	Access evaluation, donor suitability, selection of machine, product manipulation,QC of product, donor observation for adverse effects and its management indications, contra-indications, replacement fluids, frequency, monitoring of TPE.	Should be able to perform the procedure independently, obtain quality product and manage any adverse effects. Should be able to select proper patient, machine, plan TPE, select replacement fluids and monitor the patient.
Component preparation & QC [5 months]	Preparation of blood components. Product manipulation such as Leucocyte removal orIrradiation. Storage & quality control.	Should be able to understand factors affecting quality of components.
Immuno-haematology [4 months]	Diagnosis & transfusion support in AIHA,PNH Evaluation of transfusion reaction. Investigations in antenatal serology. ABO-Rh typing, antibody screening, identification, evaluation of positive DAT	Should be able to interpret results of immune hematological tests.Should be able to provide consultation to physicians regarding transfusion management.
Pre-transfusion testing & cross match [4 months]	Investigation of difficult cross match, formalconsultation on transfusion support in complex cases, checking indications & dosage for blood components, emergent issue of blood, transfusion in special cases such as massive transfusion, organ transplantation, platelet refractoriness.	Should be able to provide consultation on transfusion therapy. Should be able to resolve difficult & complex cross matching problems. Ensure appropriate and judicial use of blood and components.
Transfusion transmitted infection screening [4 months]	Screening for various markers such as HIV,HCV, HBs Ag, Syphilis. Methodology such as Elisa, spot, rapid, automated analyzer NAT techniques such as PCR, TMA. Laboratory safety.	Should be able to understand blood screening principles and disposal of reactive units. Should be able to validate ELISA, maintain QC.
Quality control/ records [1 month]	Quality control of components, equipment, reagents. Quality assurance. Development ofdocuments, SOPs, Regulatory compliance.	Should be able to understand QC principles, recognize common management & regulatory issues, identify management strategies.

Peripheral blood stem cell transplantation (PBSCT) [1 month]	Processing, storage, thawing, infusion of PBSC. Immunohematological monitoring of ABO mismatch transplants, Transfusion support – irradiation, CMV issues.	Describe common procedures and basic concepts related to PBSCprocessing and cellular product therapies.
Note: The student should be posted for one month at the district hospital as per NMC guidelines		

Posting in other Laboratory sections for MD in Immunohematology and Blood Transfusion	
Section	**Skills**
Haematology: 3months	Complete hemogram Work up of : • hemolyticanemias • Reading peripheral smear • Bone marrow aspiration
Coagulation Laboratory: **2 months**	Coagulation tests – screening tests and special tests - procedure, interpretation, trouble shooting
HLA Laboratory: 1 month	HLA typing CDC crossmatch Flow cytometry crossmatch
Flow cytometry Lab: 1 month	Isolation of lymphocytes, CD4/ CD8 / CD 34 counts using flow cytometry, Immunofluorescence
Microbiology **laboratory:1 month**	ELISA, Western blot, PCR Bacteriology: Basic stains, Blood culture - aerobic,anaerobic, fungal
Molecular Biology **Lab: 1month**	Basics of molecular testing PCR NAT testing
Clinical Department subjects: **6weeks** (Pediatrics, neonatal, medicine, ICU, Anaesthesia)	Transfusion support for thalassaemia, haemophilia, leukemia, solid organ transplantation Platelet transfusion therapy and its monitoring Neonatal exchange transfusion Bed side management of transfusion reactions Intraoperative hemodilution, Use of Cell saver, Intraoperative Blood salvage

G b. Posting under "District Residency Programme" (DRP):

All postgraduate students pursuing MS/MS in broad specialities in all Medical Colleges/Institutions shall undergo a compulsory rotation of three months in District Hospitals/District Health System as a part of the course curriculum, as per the Postgraduate Medical Education (Amendment) Regulations (2020). Such rotation shall take place in the 3rd or 4th or 5th semester of the Postgraduate programme and the rotation shall be termed as "District Residency Programme" and the PG medical student undergoing training shall be termed as "District Resident".

Every posting should have its defined learning objectives. It is recommended that the departments draw up objectives and guidelines for every posting offered in conjunction with the collaborating department/s or unit/s. This will ensure that students acquire expected competencies and are not considered as an additional helping hand for the department / unit in which they are posted. The PG student must be tagged along with those of other relevant departments for bedside case discussion/basic science exercises as needed, under the guidance of an assigned faculty.

H. Teaching research skills

Writing a thesis should be used for inculcating research knowledge and skills. All postgraduate students shall conduct a research project of sufficient depth to be presented to the University as a postgraduate thesis under the supervision of an eligible faculty member of the department as guide and one or more co-guides who may be from the same or other departments.

In addition to the thesis project, every postgraduate trainee shall participate in at least one additional research project that may be started or already ongoing in the department. It is preferable that this project will be in an area different from the thesis work. For instance, if a clinical research project is taken up as thesis work, the additional project may deal with community/field/laboratory work. Diversity of knowledge and skills can thereby be reinforced.

I. Training in teaching skills

MEU/DOME should train PG students in education methodologies and assessment techniques. The PG students shall conduct UG classes in various courses and a faculty shall observe and provide feedback on teaching skills to the student.

J. Log book

During the training period, the postgraduate student should maintain a Log Book indicating the duration of the postings/work done in Wards, OPDs, Casualty and other areas of posting. This should indicate the procedures assisted and performed and the teaching sessions attended. The log book entries must be done in real time. The log book is thus a record of various activities by the student like: (1) Overall participation & performance, (2) attendance, (3) participation in sessions, (4) record of completion of pre-determined activities, and (5) acquisition of selected competencies.

The purpose of the Log Book is to:

a) help maintain a record of the work done during training,

b) enable Faculty/Consultants to have direct information about the work done and intervene, if necessary,

c) provide feedback and assess the progress of learning with experience gained periodically.

The Log Book should be used in the internal assessment of the student, should be checked and assessed periodically by the faculty members imparting the training. The PG students will be required to produce completed log book in original at the time of final practical examination. It should be signed by the Head of the Department. A proficiency certificate from the Head of Department regarding the clinical competence and skillful performance of procedures by the student will be submitted by the PG student at the time of the examination.

The PG students shall be trained to reflect and record their reflections in log book particularly of the critical incidents. Components of good teaching practices must be assessed in all academic activity conducted by the PG student and at least two sessions dedicated for assessment of teaching skills must be conducted every year of the PG program. The teaching faculty are referred to the NMC Logbook Guidelines uploaded on the Website.

K. Course in Research Methodology: All postgraduate students shall complete an online course in Research Methodology within six months of the commencement of the batch and generate the online certificate on successful completion of the course.

L. Other aspects

- The Postgraduate trainees must participate in the teaching and training program of undergraduate students and interns attending the department.
- Trainees shall attend accredited scientific meetings (CME, symposia, and conferences) at least once a year.
- Department shall encourage e-learning activities.
- The Postgraduate trainees must undergo compulsory training in Basic Cardiac Life Support (BCLS) and Advanced Cardiac Life Support (ACLS).
- The Postgraduate trainees must undergo training in information technology and use of computers.

During the training program, patient safety is of paramount importance; therefore, relevant clinical skills are to be learnt initially on the models, later to be performed under supervision followed by independent performance. For this purpose, provision of skills laboratories in medical colleges is mandatory.

ASSESSMENT

FORMATIVE ASSESSMENT, ie., assessment to improve learning

Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self-directed learning and ability to practice in the system.

General Principles

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills.

The Internal Assessment should be conducted in theory and practical/clinical examination, should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills.

Quarterly assessment during the MD training should be based on:

- Case presentation, case work up, case handling/management : once a week[#]
- Laboratory performance : twice a week
- Journal club : once a week

- Seminar : once a fortnight
- Interdepartmental case or seminar : once a month

Note: These sessions may be organized and recorded as an institutional activity for all postgraduates.

- Attendance at Scientific meetings, CME programmes (at least 02 each)

[#] The following points may be considered in the scheme for evaluation of case presentations.

- Topic selection
- Completeness of presentation
- Clarity and cogency of presentation
- Understanding of the subject and ability to convey the same
- Whether relevant references have been consulted
- Ability to convey points in favor and against the subject under discussion
- Proper use of audio-visual aids
- Ability to answer questions
- Time scheduling

The student is to be assessed periodically as per categories listed in the postgraduate student appraisal form (Annexure I).

SUMMATIVE ASSESSMENT, ie., assessment at the end of training:

Essential pre-requisites for appearing for examination include:

1. **Log book** of work done during the training period including rotation postings, departmental presentations, and internal assessment reports, should be submitted.

2. At least **two presentations** at national level conference. One research paper should be published / accepted in an indexed journal**. (It is suggested that the local or University Review committee assess the work sent for publication).**

The summative examination would be carried out as per the Rules given in the latest POSTGRADUATE MEDICAL EDUCATION REGULATIONS. The theory examination shall be held in advance before the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the commencement of the clinical/Practical and Oral examination**.**

The postgraduate examination shall be in three parts**:**

1. **Thesis**

   Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination. A post graduate student in broad specialty shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners**.**

2. **Theory examination**

   The examinations shall be organized on the basis of 'Grading'or 'Marking system' to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training, as given in the latest POSTGRADUATE MEDICAL EDUCATION REGULATIONS. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D./ M.S shall be held at the end of 3rd academic year.

   There shall be four theory papers (as per PG Regulations).

   Paper I: Basic sciences as applied to the subject

   Paper II: Immunohematology, Immunogenetics, Transfusion transmitted infections, applied serology

   Paper III: Blood donor organisation and management, blood components, Hematology, Clinical transfusion practices

   Paper IV: Recent advances in the subject, Regulatory requirements, Quality management system, Information management, Automation.

3. **Practical/clinical and Oral/viva voce examination**

   Practical examination

   Practical examination should be spread over **two** days and include various major components of the syllabus focusing mainly on the psychomotor domain. The duration of each exercise shall vary from 30 minutes to 1 hour. Each exercise or station shall be followed by Viva on the exercise.

   There shall be minimum of (a) 04 Hemotherapy exercises and administrative issues for each candidate (b) Clinical case discussion (4 per candidate), and spots (10).

Laboratory performance of the student is evaluated using the following criteria:

- Familiarity with the procedure,
- Setting up and performing the procedure (organizational skills),
- Appropriate specimens and reagents are obtained and utilized,
- Proper use of equipment, reagents, supplies and specimens,
- Proper labelling, handling and disposal of specimens, tubes, etc,
- Organization and performance of individual tasks,
- Completion of tests within a reasonable amount of time,
- Clean up of work area,
- Correct interpretation of results with recognition of discrepancies or abnormal results.
- Results are recorded and reported in appropriate format.

The candidate will be shown Power point presentation or video presentation of 5 clinical/ laboratory situations and 5 OSPE, per candidate. The candidate will be required to answer on each situation. For example, candidate may be shown picture of chest X-ray with pulmonary edema developing after FFP infusion. The candidate will be asked to give different possibilities and their investigations.

Oral/Viva voce examination on defined areas should be conducted by each examiner separately. Oral examination shall be comprehensive enough to test the post graduate student's overall knowledge of the subject focusing on psychomotor and affective domain.

Recommended Reading:

Books (latest edition)

1. Technical Manual (AABB). Cohn Claudia S Claudia S. Cohn, Meghan Delaney, Susan T. Johnson et al., AABB, 2020, Digital, ISBN 978-1-56395-370-5.
2. Mollison's Blood Transfusion in Clinical Medicine. Harvey G. Klein MD, David J. Anstee. Wiley-Blackwell; Online ISBN: 9781118689943
3. Cellular Therapy: Principles Methods and Regulations. Areman Ellen M; Loper Kathy, AABB Press.
4. Wintrobe's Clinical Hematology. Greer John P, Arber, Daniel A. Wolters Kluwer Health Inc (B)
5. Consultative Hemostasis and Thrombosis. *Kitchens*, *Craig* M. Kessler, Barbara A. Konkle, Michael B. Streiff, and David A. Garcia. Elsevier.

6. Hematology: Basic Principles and Practice. Hoffman Ronald. Elsevier (B).
7. Bethesda Hand Book of Clinical Hematology. Rodgers Griffin P;Young Neal S Wolters Kluwer. Health (India) Pvt. Ltd (B).
8. Modern Blood Banking and Transfusion Practices. Harmening Denise M. Jaypee Brothers (B).
9. Dacie and Lewis Practical Haematology. Bain Barbara J. Elsevier (B).
10. Haemoglobinopathy Diagnosis. Barbara J. Bain. ISBN: 9781119579953. John Wiley & Sons Ltd.
11. Postgraduate Haematology. Hoffbrand A Victor. Butterworths.
12. Williams Hematology. Beutler Ernest. Mcgraw-Hill Medical Publishing, New York.
13. Hemostasis and Thrombosis: Basic Principles and Clinical Practice. Colman Robert W. Lippincott Williams & Wilkins Philadelphia.
14. Introduction to Immunohematology. Bryant Neville J. Saunders.
15. Immunohaematology- Principles and Practices. Eva Quinley. Lippincott Williams and Wilkins.

Journals

03-05 international Journals and 02 national (all indexed) journals.

Annexure I

Student appraisal form for MD in Immunohematology and Blood Transfusion											
	Elements	**Less than Satisfactory**			**Satisfactory**			**More than satisfactory**			**Comments**
		1	2	3	4	5	6	7	8	9	
1	**Scholastic aptitude and learning**										
1.1	Has knowledge appropriate for level of training										
1.2	Participation and contribution to learning activity (e.g., Journal Club, Seminars, CME etc)										
1.3	Conduct of research and other scholarly activity assigned (e.g Posters, publications etc)										
1.4	Documentation of acquisition of competence (eg Log book)										
1.5	Performance in work based assessments										
1.6	Self-directed Learning										
2	**Work related to training**										
2.1	Practical skills that are appropriate for the level of training										
2.2	Respect for processes and procedures in the work space										
2.3	Ability to work with other members of the team										
2.4	Participation and compliance with the quality improvement										

	process at the work environment										
2.5	Ability to record and document work accurately and appropriate for level of training										
3	**Professional attributes**										
3.1	Responsibility and accountability										
3.2	Contribution to growth of learning of the team										
3.3	Conduct that is ethically appropriate and respectful at all times										
4	**Space for additional comments**										
5	**Disposition**										
	Has this assessment pattern been discussed with the trainee?	Yes	No								
	If not explain.										
	Name and Signature of the assesse										
	Name and Signature of the assessor										
	Date										

Subject Expert Group members for preparation of REVISED Guidelines for competency based postgraduate training programme for MD in Immunohematology and blood transfusion

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MODEL PAPER

MD-19301 **IHBT.-I**

MD Examination Month, Year
IMMUNOHAEMATOLOGY AND BLOOD TRANSFUSION
Paper – I

Basic sciences as applied to the subject

Time: Three Hours
Maximum Marks: 100

Attempt all questions
All questions carry equal marks. Draw diagrams wherever necessary.

Q.1 What are Regulatory T cells and discuss their role in Immune Tolerance. 10

Q.2 What is Zeta potential ? Discuss its applied aspects in red cell serology along with various factors / reagents which can reduces zeta potential to potentiate antigen – antibody reactions. 10

Q.3 Discuss Iron metabolism and biochemical markers of iron deficiency. 10

Q.4 Describe molecular structure of HIV I & II Virus. 10

Q.5 Discuss coagulation cascade. Discuss pathogenesis and management of hemophilia. 10

Q.6 Describe the mechanism of anemia of chronic renal failure and its management. 10

Q7. What is reticulated platelet? Describe methods of its detection and its relevance in Transfusion Medicine. 10

Q8. Discuss Pathophysiology of DIC. 10

Q.9 Discuss role of flow cytometry in diagnosis of Haematological malignancies. 10

Q.10 Discuss Human Neutrophil Antigen (HNA) system. Role of HNA antibodies in adverse effects of transfusion. 10

MODEL PAPER

MD-19302 **IHBT-II**

MD Examination Month, Year

IMMUNOHAEMATOLOGY AND BLOOD TRANSFUSION

Paper – II

Immunohaematology, Immunogenetics, Transfusion transmitted infections, applied serology

Time: Three Hours
Maximum Marks:100

Attempt all questions
All questions carry equal marks. Draw diagrams wherever necessary.

Q.1 Molecular basis of Bombay Phenotype. 10

Q.2 Resolution of a case of incompatible cross match with negative auto control. 10

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Q.3 Describe causes and resolution of ABO discrepancies. 10

Q.4 Discuss gene frequency of ABO blood groups and discuss its significance in population genetics. 10

Q.5 Investigations in case of suspected neonatal alloimmune thrombocytopenia. 10

Q.6 Discuss requirements for reagents Red Blood cell panels for antibody detection and identification in blood donors. 10

Q7. Discuss platelet antigens in detail. Elaborate on etiopathogenesis , investigations and management of platelet refractoriness. 10

Q.8 Discuss about chimerism. 10

Q.9 Enumerate serological investigations and its significance to be performed for diagnosis of autoimmune hemolytic anemia. 10

Q.10 Discuss HLA typing in transfusion medicine. 10

MODEL PAPER

MD-19303 **IHBT.-III**

MD Examination Month, Year

IMMUNOHAEMATOLOGY AND BLOOD TRANSFUSION

Paper – III

Blood Donor Organization and management, blood components, Hematology, Clinical transfusion practices

Time: Three Hours
Maximum Marks: 100

Attempt all questions
All questions carry equal marks. Draw diagrams wherever necessary.

Q.1 Define the triggers for Intrauterine transfusion. How will you select a unit of Blood for intrauterine transfusion. 10

Q.2 Write a note on photopheresis. 10

Q.3 Discuss role of Levy Jennings chart in Quality management of Blood Centre. 10

Q.4 Discuss utility of Donor lymphocyte infusion. 10

Q.5 Current preservation techniques in Blood Centres. 10

Q6. Discuss Principle and use of cell seperators. 10

Q.7 Cryoprecipitate: Indications and Preparation. 10

Q.8 Discuss about Quality Indicators in Blood Centre. 10

Q.9 Discuss about types and utility of audits in Transfusion Medicine. 10

Q.10 Donor notification and referral policy in India. 10

MODEL PAPER

MD-19404 **IHBT.-IV**

MD Examination Month, Year

IMMUNOHAEMATOLOGY AND BLOOD TRANSFUSION

Paper – IV

Recent Advances in the subject , Regulatory requirements , Quality Management system , Information management , Automation

Time : Three Hours
Maximum Marks : 100

Attempt all questions
All questions carry equal marks. Draw diagrams wherever necessary.

Q.1 Discuss about Red cell exchange in Sickle cell disease. 10

Q.2 Discuss NAT testing : Minipool vs ID. 10

Q.3 Describe principle of plasmapheresis using cascade filtration and its applications. 10

Q.4 Discuss methods and indications for Immunoadsorbtion Apheresis. 10

Q.5. CART – T cell therapy : Principle and methods. 10

Q6. Hemovigilance action plan in India. 10

Q.7. Types of Stem cell transplant and indications. 10

Q.8 Discuss Next generation sequencing and its role in transplant 10

Q.9. Patient Blood management in adult cardiac surgery. 10

Q.10 “Fresh whole blood is a better option than components for transfusion support in a trauma patient” Critically analyze the statement. 10