



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

Sector-01, Kamothe, Navi Mumbai - 410 209

Tel 022-27432471, 022-27432994, Fax 022 - 27431094

E-mail : registrar@mgmuhs.com | Website : www.mgmuhs.com

MGM 19 MD IHBT

Program Outcomes:

PO1. Who shall have mastered most of the competencies, retaining to the speciality that are required to be practiced at the secondary and tertiary levels of the healthcare delivery system.

PO2. Who shall recognize the health needs of the community and carry out professional obligation ethically and in keeping with the objectives of the national transfusion policy;

PO3. Who shall be aware of contemporary advances and developments in the discipline of IH & BT.

PO4. Who shall have acquired a spirit of scientific inquiry and oriented to the principles of research methodology and epidemiology

PO5. Who shall have acquired the basic skills in teaching of the medical and paramedical professionals.

PO6. Organize health teams / transfusion camps to provide care during natural or man-made calamities

SPECIFIC LEARNING OBJECTIVES

At the end of the course, the student should have acquired knowledge in the following:

A. Cognitive Domain

I. Basic Sciences (Immunology, Medical Genetics, Hemostasis & Physiology of Formed Elements of blood)

- Demonstrate familiarity with the current concepts of structure and function of the immune system, its aberrations and mechanisms thereof. The student should be able to demonstrate understanding of the basic principles of immunoglobulins, antigen, antibody and complement system, antibody development after immunization and infection.
- Understand the basic concepts and their clinical relevance of the following:
 - Mechanisms of acute inflammation
 - Healing and repair
 - Physiology of Immune System
 - Hypersensitivity reactions
 - Autoimmunity
 - Transplantation Immunology
- Demonstrate familiarity with the scope, principles, limitations and interpretations of the results of important procedures employed in clinical and experimental studies relating to immunology – this is inclusive of but not limited to:
 - ELISA techniques
 - Radioimmunoassay
 - HLA typing
 - Hybridoma technology
 - Isolation of T & B lymphocytes
 - CD4 / CD8 count
 - Microlymphocytotoxicity test
 - Cellular assays

- Electrophoresis and Immunofluorescence
- Understand the principles of basic genetics with regard to Mendelian Laws of Inheritance, phenotype / genotype and population genetics.
- Know the nomenclature, organization and polymorphism of the human major histocompatibility complex, including HLA class I, II, and III genes. Understand the role of HLA typing in organ and bone marrow/stem cell transplantation and association with disease.
- Understand the basic concept of haematopoiesis and bone marrow kinetics.
- Understand the basic physiology and biochemistry of red cells, platelets and leukocytes in terms of their kinetics, function, life span and antigenic systems. Know the membrane structure and function of red cells, platelets and leukocytes and be able to apply their implication in transfusion medicine
- Understand hemoglobin structure, synthesis, function, its aberrations and degradation including iron and bilirubin metabolism, laboratory diagnosis anemia and management.
- Learn the disorders of white blood cells, their laboratory diagnosis and management and the role of transfusion medicine in the management of these disorders.
- Understand the composition and function of plasma constituents.
- Know the pathophysiology and laboratory features of intravascular and extravascular hemolysis
- Understand the physiology of hemostasis with regard to role of platelets, coagulation pathway and fibrinolysis, its aberrations and mechanisms thereof such as coagulopathy of liver disease, vitamin K deficiency, disseminated intravascular coagulation & hemophilias (A, B, and C) etc.
- Understand hemodynamics of blood flow and shock; estimation of blood volume and be able to interpret the application of radionuclides tagging for blood volume estimation.
- Should understand the principles of Molecular Biology especially related to the understanding of disease processes and its use in various diagnostic tests.

II. Blood Collection/Blood Center/Component Processing

The student should be able to demonstrate understanding of the processes associated with Blood Donor motivation (motivation strategies), recruitment, selection and proper donor care in blood center as well as in outdoor blood donation camps and be able to understand importance of cold chain maintenance. The student should:

- Be able to understand donor counseling and notification (Pre- and Post-donation).
- Be familiar with various categories of blood donors including autologous and directed donors and be able to know their clinical relevance.
- Understand the process of apheresis and demonstrate proficiency in selection of apheresis machine, apheresis donor and be able to obtain apheresis product meeting quality standards
- Understand the mechanisms of adverse effects of blood / apheresis donation, its clinical features, management and prevention.
- Demonstrate understanding of various anticoagulants / preservatives used for collection and storage of blood and components.
- Be familiar with various “storage lesions” in blood components, factors affecting the storage lesions and its prevention.
- Be able to demonstrate understanding of various plasticizers used in blood banking and their clinical relevance.
- Understand the principles of component preparation by various methods, be familiar with preparation of modified components such as leukofiltered, irradiated or saline washed, pooled or volume reduced components following aseptic conditions.
- Be able to demonstrate understanding of the basic principles of preparation and composition of recombinant products such as Factor VII, Factor VIII, Factor IX, concentrate and hematopoietic growth factors.
- Understand the factors influencing quality of blood and blood components including quality of blood bag / apheresis.
- Be able to understand maintenance of quality of blood components as per recommended standards by various agencies (DGHS, DCGI, NABH, NACO, AABB, EC)
- Be able to identify problems in the blood/apheresis collection and component preparation area and offer viable solutions

III. Transfusion transmitted infection

- Be able to understand various strategies for improving blood safety in general and TTI testing in particular pertaining to Indian conditions.
- Be able to understand the typical time course of appearance and disappearance of serum antigens and antibodies used in screening of major transfusion transmitted infection, including HIV, hepatitis B, hepatitis C, syphilis and malaria and others.
- Be able to demonstrate understanding the principles of blood safety including testing for various transfusion transmitted infection (TTI), proper disposal of infectious waste, laboratory safety, personnel safety.
- Demonstrate understanding of newer technologies that are being introduced in the field of TTI testing. Understand the feasibility of NAT (Nucleic acid testing) in Indian blood transfusion services.
- Demonstrate understanding of the new emerging threats (including Prions, vCJD, Lyme Disease, West Nile Virus, Dengue, Chikungunya etc.) to blood supply in the country including bacterial contamination, their detection and prevention.

IV. Immunohematology / Blood Group Serology / Compatibility testing

- Demonstrate understanding of the knowledge of various major and minor blood group systems including their biosynthesis, antigen/antibodies, phenotype/genotype frequency, clinical significance.
- Demonstrate understanding of the various Immunohematological laboratory tests including its quality essentials.
- Demonstrate knowledge of principle of pretransfusion testing, including ABO/Rh testing, RBC antibody screen, and antibody identification. The student should also demonstrate understanding of resolution of discrepant results in ABO/Rh grouping and pre-transfusion testing and be able to provide solutions for the management of such cases.
- Demonstrate understanding of use of various potentiators and their applications in solving immunohematological problems such as polyagglutination, subgroups of ABO system, red cell antibody detection
 - Enzymes

- Lectins
- LISS / Albumin
- others
- The student should have knowledge of various advances in this field including automation and computerization.
- Be able to understand the pathophysiology, clinical features, lab diagnosis & management of various clinical conditions requiring immunhematological and transfusion support including
 - Multi-transfused patients such as thalassemia, sickle cell disease etc
 - Alloimmunized antenatal cases(HDN)
 - Transfusion reactions
 - Immune hemolytic anemias
 - ABO mismatched transplants (BMT / Solid organ)
- Be able to understand the pathophysiology, clinical features, lab diagnosis & management of Rh, ABO and other blood group incompatibility in antenatal patients including exchange transfusion / intra-uterine transfusion.
- Demonstrate knowledge regarding “rare blood group donor” including identification, cryo-preservation of rare blood and making their registry.

V. Clinical Transfusion Service

Demonstrate knowledge of the principles of patient/ unit identification and its importance in blood safety.

- Understand the principles of blood inventory management.
- Demonstrate understanding of the rational use of blood and components in various clinical conditions including monitoring of transfused patients.
- Recognize the symptoms and signs of hemolytic and non-hemolytic transfusion reactions and demonstrate knowledge of the pathophysiology, treatment, and prevention of these complications
- Demonstrate understanding of the major non-infectious complications of blood transfusions, including red cell alloimmunization, transfusion-related acute lung injury,

transfusion associated graft versus host disease, volume overload, post transfusion purpura, iron overload etc. and the risk of these complications, and strategies to prevent them. Student should have knowledge of pathophysiology, clinical features, diagnosis and management of these conditions.

- Demonstrate knowledge of pathophysiology, diagnosis & management of anemia
 - Iron deficiency anemia
 - Megaloblastic anemia
 - Aplastic anemia
 - Anemia of chronic diseases
 - Neonatal anemia
- Demonstrate understanding of pathophysiology, clinical / laboratory diagnosis and treatment of patients with bleeding disorders such as Hemophilia, von Willebrand's disease, thrombophilia, acquired coagulation disorders including DIC, liver disease etc.
- Demonstrate understanding of the pathophysiology, clinical features, lab diagnosis and platelet support in thrombocytopenic conditions such as aplastic anemia, ITP, NAIT, hematological malignancies etc. The student should also demonstrate understanding of complications of platelet transfusion including refractoriness to platelets, its diagnosis and management.
- Demonstrate understanding of the basic principles of neonatal transfusions including serological testing, type of transfusion support, exchange transfusion, intra uterine transfusion and monitoring.
- Demonstrate knowledge of the pathophysiology, diagnosis and transfusion support in acute blood loss including massive transfusion protocols, complications of massive transfusion and their prevention.
- Demonstrate understanding of the knowledge of various methods of blood conservation, including pre- and peri-operative autologous blood collection, and approaches to "bloodless" surgery.
- Demonstrate knowledge of the use of various point-of-care tests (TEG, ROTEM) for hemostasis & recommend component therapy depending on the results.
- Demonstrate knowledge of principles of transfusion support in general surgery and special procedures such as cardiac surgery or oncological surgery.

- Demonstrate knowledge of the principles of hematopoietic stem cell transplantation, including collection, processing, and storage of these stem cell products, and the indications for use (e.g., bone marrow, peripheral blood, and cord blood).
- Demonstrate understanding of guidelines for stem cell research by regulatory agencies like ICMR, DBT etc.

VI. Therapeutic Apheresis, Therapeutic Plasma Exchange and Cytapheresis

- Understand the principles of apheresis technology, including centrifugation, filtration, and immunoadsorption.
- Demonstrate knowledge of the indications for therapeutic apheresis including cytapheresis and of the appropriate replacement fluids to be used in various situations.

VII. Regulatory Skills / Quality Assurance/ Quality Control in blood transfusion

- Demonstrate knowledge concerning the requirements and applications of all applicable regulatory and accrediting agencies. [e.g., DCGI, NABH, AABB].
- Become familiar with the patient / blood donor privacy and data security requirements, including the use of Institutional Review Board (IRB) protocols for conducting clinical research, for conducting stem cell research- ICSCRT (Institutional Committee for Stem Cell Research and Treatment).
- Understand training, certification, licensing, and competency assessment standards for transfusion laboratory professionals, including medical laboratory technicians.
- Understand the importance of a comprehensive transfusion laboratory safety policy and programme.
- Understand how SOPs are used, developed, authored, and reviewed and their importance in mandatory laboratory inspection by various accrediting agencies.
- Understand development of quality manual.
- Understand the role of quality assurance, quality management, and process improvement principles in laboratory operation and planning.

- Understand the role of risk management in the transfusion laboratory and become familiar with the nature of, patient safety initiatives, and forensic testing such as paternity testing
- Demonstrate understanding of the elements of current good manufacturing practices as they apply to the collection, processing, and storage of all blood components / products
- Understand the principles & objectives of total quality management in transfusion service including premises, personnel, instruments / reagents, biosafety and external / internal quality control.
- Operational aspects: Understand the importance of EQAS in blood transfusion services.
- Understand the principles and objectives of equipment management including specification, equipment selection, installation, calibration/standardization / validation, and preventive maintenance.
- Know the fundamental concepts of medical statistics. Demonstrate familiarity with importance of statistical methods in assessing data from patient material and experimental studies e.g., correlation coefficients, expected versus observed, etc. and their interpretation.
- Understand principles of specimen collection (e.g., phlebotomy technique, safety, and specimen tubes) and specimen processing and traceability
- Demonstrate understanding of knowledge of error management in blood bank including root cause analysis and CAPA.
- Demonstrate knowledge of various records and their maintenance as per regulatory requirements.

B. Affective Domain

I. Basic Sciences (Immunology, Medical Genetics, Hemostasis & Physiology of Formed Elements of blood)

The student should:

- Demonstrate honesty and integrity in all interactions.
- Demonstrate responsibility and trustworthiness in the execution of all duties.

- Demonstrate the ability to accept criticism and to understand the limitations of one's own knowledge and skills.
- Demonstrate a commitment to excellence and ongoing professional development
- The student should demonstrate professionalism in taking a bleeding history from a patient.

II. Blood Collection/Blood Center/Component Processing

The student should:

- be able to function as a part of a team that is essential for the selection and management of a blood donor. She/He should therefore develop an attitude of cooperation with colleagues so necessary for this purpose. It is implied that she/he will, whenever necessary, interact with the blood donor, patient, clinician and other colleagues to provide the best possible blood transfusion support, diagnosis or opinion.
- demonstrate compassion and sensitivity in the care of patients and respect for their privacy and dignity.
- Show respect for donor / patient autonomy.
- Demonstrate professionalism during blood donor selection, counseling and notification. Always adopt ethical principles and maintain proper etiquette in her/his dealings with blood donors, outdoor camp organizers and other health personnel.
- Be able to obtain informed consent from donor.
- Respect the rights of the blood donor including the right to information and maintaining confidentiality.
- Develop communication skills not only to word reports and professional opinions but also to interact with blood donors, outdoor camp organizers, peers and paramedical staff.
- Always adopt principles of laboratory / personnel safety and respect documentation required as per law.

III. Transfusion transmitted infection

The student should:

- Respect the rights of the sero-positive blood donor including confidentiality, right to information.
- Adopt ethical principles and maintain proper documentation while interacting with other inter related labs such as ICTCs, counselor, state AIDS Control Societies etc.
- Follow all safety policies and adhere to the department's laboratory safety plan and personal hygiene plan.

IV. Immunoematology / Blood Group Serology / Compatibility testing

The student should:

- Should be able to interact with clinical colleagues in professional manner to provide best possible transfusion support and opinion in immunoematological problems.
- Demonstrate improvement in the affective traits of organizational skills, work habits, attitude, interpersonal skills, and problem-solving ability.
- The student should maintain a clean and orderly work area.

V. Clinical Transfusion Service

The student should:

- Be able to function as a part of a team that is essential for the diagnosis and management of a patient. She/he should therefore develop an attitude of cooperation with colleagues so necessary for this purpose.
- Be able to interact with clinical colleagues in professional manner to provide best possible transfusion support and opinion.
- Demonstrate improvement in the affective traits of organizational skills, work habits, attitude, interpersonal skills, and problem-solving ability.
- Maintain a clean and orderly work area.
- Accept constructive criticism as a learning process. Utilize constructive criticism to correct deficiencies and improve performance.

The student should demonstrate inquisitiveness by asking necessary questions concerning practical performance or theoretical application of laboratory procedures

VI. Therapeutic Apheresis, Therapeutic Plasma Exchange and Cytapheresis

- **The student should** communicate effectively with clinicians and patients regarding emergent or scheduled therapeutic apheresis procedures through conversations and writing of consult notes

C. Psychomotor Domain

At the end of the course, the student should acquire the following skills:

- Demonstrate competency in performing & interpretation of various methods of hemoglobin estimation and complete hemogram.
- The student should be able to demonstrate competency in preparation and interpretation of peripheral blood smear in health and disease conditions – inclusive of but not limited to:
 - Nutritional (Iron deficiency/Vit B12 and Folic acid deficiency) anemia
 - Hemolytic anemia (Immune , Sickle Cell, Thalassemia, Microangiopathic)
 - Thrombocytopenia
 - Acute leukemia
 - Chronic leukemia
 - Hemoparasites
 - Myelodysplastic syndromes
 - Myeloproliferative disorders
- Demonstrate competency in performing and interpretation of laboratory tests in coagulation and thrombosis such as prothrombin time, activated partial thromboplastin

time (APTT), fibrinogen, thrombin time, platelet function testing, mixing tests, factor assays, investigations in DIC etc.

- Demonstrate competency in interpretation of Hb electrophoresis/HPLC
- Demonstrate proficiency in performing and interpreting various laboratory immunological tests pertaining to transfusion science such as
 - isolation of T & B lymphocytes
 - immunoelectrophoresis
 - flow cytometry
 - CD4 / CD8 counts
- Demonstrate proficiency in HLA typing techniques, including serological methods, micro-cytotoxicity assays, nucleic acid assays and lymphocyte culture.
- Should be conversant with the steps of a Polymerase Chain Reaction (PCR) and should demonstrate competence in the steps and interpretation of Western Blot and Hybridization procedures.

Blood Collection/Blood Center/Component Processing

The student should:

- Be able to compare and contrast the eligibility requirements for allogeneic, autologous & apheresis blood donations.
- Demonstrate proficiency in selection of whole blood donors (minimum 500) and apheresis donors (minimum 25)
- Demonstrate competency in various types of autologous blood collection and their application in clinical transfusion service
- Demonstrate proficiency in collection of whole blood with regard to preparation of phlebotomy site, proper volume and sample collection in minimum 500 donors.
- Demonstrate proficiency in evaluating and managing minimum 25 adverse reactions associated with blood donation/phlebotomy (whole blood and apheresis donations).
- Demonstrate the proficiency in organization of at least 10 outdoor blood donation camps and demonstrate skills to motivate blood donors / organizers.

- Demonstrate knowledge of the indications for therapeutic phlebotomy and demonstrate proficiency in at least 05 cases.
- Demonstrate proficiency in preparation of following components 500 each as per department SOP
 - Packed red blood cells
 - Fresh Frozen Plasma
 - Platelet concentrate
 - Cryoprecipitate (Minimum 25)
- Understand the significance of storage of blood components at appropriate temperature and demonstrate proficiency in compatibility, labeling requirements of various components
- Proficient in donor notification and counseling (Pre- and Post- donation) and the donor look-back process.
- Demonstrate proficiency in various modifications of blood components such as irradiation, cell washing, volume depletion and leuko depletion
- Demonstrate proficiency in performing leuko-filtration in at least 05 blood components
- Demonstrate proficiency in selection of apheresis machine, blood donor and be able to obtain apheresis product meeting quality standards in at least 25 procedures.
- Demonstrate proficiency in performing quality control tests on at least 25 each blood components such as PRBC, FFP, Platelets, Cryoprecipitate.

Transfusion transmitted infection

The student should be able to:

- Compare & contrast various methodologies such as ELISA, rapid & chemiluminescence used in screening of transfusion transmitted infections.
- Demonstrate proficiency in performing, interpretation, documentation of at least 500 blood donor screening tests for TTIs as per departmental SOP.
- Demonstrate proficiency in preparation and interpretation of LJ Chart (5 nos.) and root cause analysis (RCA) and Corrective and Preventive action (CAPA) as and when required.

- Perform and be able to interpret non-treponemal and treponemal antibody tests used to diagnose syphilis.
- Demonstrate proficiency in proper handling and disposal of biohazardous material as per regulatory requirements.
- Demonstrate proficiency in the preparation and use of in-house external controls in transfusion transmitted infection screening.
- Demonstrate proficiency in Gram staining in at least 10 samples of biological fluids.

Immunohematology / Blood Group Serology / Compatibility testing

The student should be able to:

- Demonstrate proficiency in preparation of cell suspensions of appropriate concentration following cell washing techniques correctly & grade and interpret antibody-antigen reactions according to the established criteria.
- Demonstrate proficiency in performing ABO/Rh grouping in at least 500 donor / patient samples using department SOP.
- Demonstrate proficiency in performing, interpretation and resolving discrepant results in pre-transfusion testing, ABO/Rh grouping, red cell antibody screen, and antibody identification.
- Compare and contrast conventional cross matching versus type and screen using various advanced technologies. Demonstrate proficiency in performing at least 50 cross matches as per department SOP.
- Student should be able to differentiate between the direct and indirect antiglobulin tests and identify appropriate uses for each. The student should be able to perform direct and indirect antiglobulin test on appropriate specimens, grading and recording the results appropriately with the use of "check cells".
- Student should be able to identify sources of error in antiglobulin testing.
- Using a cell panel, perform antibody identification procedures and correctly interpret the results. Identify 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.

- Demonstrate proficiency in performing & interpretation of various immunohematological tests
 - Direct Antiglobulin test (50 tests)
 - Indirect Antiglobulin test (50 tests)
 - Red cell antibody detection and identification (25 tests)
 - Titration of Anti D and Anti A and Anti B (25 tests)
 - Elution (10 tests)
 - Adsorption
 - Minor blood group typing
 - Saliva Inhibition Test
 - Resolution of ABO discrepancy
- Demonstrate proficiency in selection of blood unit for a patient with auto immune hemolytic anemia in at least 5 cases.
- Demonstrate proficiency in cryo preservation of reagent red cells in minimum 5 cases.

Clinical Transfusion Service

The student should be able to:

- Demonstrate proficiency in evaluating and recommending treatment plans for minimum of 10 transfusion reactions.
- Be able to identify irregular antibodies in pregnant patients that are clinically significant and make appropriate recommendations for blood products. Demonstrate proficiency in preparation and transfusion of blood for intrauterine transfusion / exchange transfusion.
- Choose appropriate blood components and derivatives based on a thorough knowledge of the indications for transfusion.
- Demonstrate proficiency in the evaluation and appropriate transfusion therapy of thrombocytopenic patients (both adult and pediatric) including neonatal alloimmune thrombocytopenia.

- Demonstrate proficiency in provision of transfusion support in special patient populations (e.g., hematology/ oncology, pediatrics, thalassemia, hemophilia, transplantation, cardiac surgery and burn/trauma).
- Demonstrate proficiency in the appropriate use of blood components in several clinical conditions such as (inclusive of but not limited to) hemoglobinopathies, hemophilia, autoimmune hemolytic anemia, massive transfusion, obstetric conditions etc.
- Demonstrate familiarity with the appropriate use of highly specialized blood products (e.g., granulocytes, donor lymphocyte infusions, HLA-matched platelets, and coagulation factor concentrates).
- Demonstrate competence in the management of blood inventory and the ability to communicate effectively the hospital's needs to the blood donor recruiters, Triage and screen requests for blood components appropriately during inventory shortages.
- Demonstrate proficiency in evaluating effectiveness of platelet transfusion including patient's with refractoriness to platelet transfusions. Outline the principles of histocompatibility testing and platelet cross-matching and apply this knowledge in selecting appropriate platelet products when indicated.
- Demonstrate competency in providing transfusion and immunohematological support to patients with bone marrow / stem cell transplantation including cryo-preservation of stem cell, quality control and infusion.

Therapeutic Apheresis, Therapeutic Plasma Exchange and Cytapheresis

The student should be able to:

- Demonstrate proficiency in evaluating and preparing patients for therapeutic apheresis, including discussion with the patient of the risks and benefits associated with apheresis procedures and obtaining informed consent.
- Should be able to perform plasma exchange including calculation & type of replacement fluid to be used and monitoring patient for complications and efficacy of the procedure.
- Demonstrate proficiency in evaluating and treating adverse reactions associated with therapeutic apheresis.

- Demonstrate proficiency in the treatment of patients using specialized methods (e.g., photopheresis and immunoabsorption columns).

Regulatory Skills / Quality Assurance/ Quality Control in blood transfusion

The student should be able to:

- Demonstrate proficiency in preparing at least 05 SOP for the department.
- Be able to understand proper use of instrumentation and computerization in a transfusion laboratory.
- Compare and contrast the various means of performing blood utilization reviews.
- Explain the logistics required in determining appropriate blood inventory for a geographic region and the process of meeting daily, weekly and monthly collection goals.
- Recognize sources of pre-analytical variation and the role of biological variability in laboratory assessment.
- Be able to calculate means, standard deviation and standard error from the given experimental data.
- Demonstrate the proficiency in preparedness for getting accreditation.
- Ability to generate various reports required for the various regulatory authorities.
- Be able to perform root cause analysis in at least 5 cases.

Syllabus

Course contents:

I. History of transfusion medicine

- I.1 Scientific landmarks in its development
- I.2 Impact of world wars on its development
- I.3 Development of PVC bags.

II. Scientific basis of transfusion

- A. Biochemistry & physiology of elements of blood
 - 2.0 Process of cell production and life span

- 2.1 red cells
- 2.2 white blood cells
- 2.3 platelets
- 3.0 Red cells
 - 3.1 Hemoglobin structure & function
 - 3.2 Metabolic pathways
 - 3.3 Membrane structure & function
- 4.0 White cells
 - 4.1 Structure, function & kinetics
- 5.0 Platelets
 - 5.1 Structure, function & kinetics
- 6.0 Physiology of haemostasis
 - 6.1 Role of platelets
 - 6.2 Coagulation pathways
 - 6.3 Fibrinolysis
- 7.0 Hemodynamics of blood flow & volume
- 8.0 Iron metabolism
- 9.0 Bilirubin metabolism
- B. IMMUNOLOGY**
 - 10. Principles of basic immunology
 - 10.1 Antigen, antibody, complement, immunoglobulin
 - 10.2 Antigen antibody reaction
 - 10.3 Lymphocytes in humoral & cellular immunity
 - 11. Role of hybridoma technology in Immunoematology
 - 12. Immunology of transplantation
 - 13. HLA and genetic control of immune response
- C. GENETICS**
 - 14. Principles of basic genetics
 - 15. Genetics of blood groups
 - 15.1 Phenotype & genotype
 - 15.2 Principles of blood group inheritance

15.3 Population genetics of blood groups

III. Antigen systems in formed elements of blood

16. Red cell antigens

17. Leucocyte antigens

18. Platelet antigens

IV. Blood collection, processing, component

Preparation

A. Management of blood donation

19. Donor recruitment

19.1 Voluntary blood donation systems

19.2 Categories of blood donors

19.3 Education, awareness & information of prospective donor

19.4 Use of Information Technology for donor recruitment

19.5 Donor information programmes

20. Acceptability criteria of blood donor

21. Care of blood donor

21.1 Pre-donation

21.2 Mid-donation

21.3 Post-donation

21.4 Prevention & management of complications of blood donation

22. Blood collection

22.1 Anticoagulants & preservatives

22.2 Procedure

22.3 Blood donation camps

B. Blood components

23. Components

23.1 Types

23.2 Methods of preparation

23.3 Indications, dosage & administration

23.4 Leucodepletion

23.4.1 Various methods

23.4.2 Quality control

24. Storage of blood & components

24.1 Whole blood

24.2 Red cell concentrate

24.3 Plasma

24.4 Granulocyte

24.5 Cryoprecipitate

24.6 Stem cells

24.6.1 Peripheral blood stem cell

24.6.2 Cord blood

24.6.3 Dendritic cell

25. Plasma fractionation

25.1 Viral inactivation

25.1.1 Single donor

25.1.2 Pooling

25.2 Newer methods

V. Pre-transfusion testing

26. Compatibility testing

26.1 ABO grouping & Rh typing

26.2 Antibody screening

26.3 Cross matching methods

26.4 Newer methods of cross matching

26.4.1 Solid phase

26.4.2 Gel technology

27. Screening for transfusion transmitted infections

27.1 Methodology

27.2 Nucleic acid amplification techniques

27.3 Newer emerging pathogens

27.3.1 Prions

27.3.2 CJ disease

27.3.3 Lyme disease

27.3.4 Others

28. Selection of blood, components & plasma products for transfusion

VI. Adverse effects of blood transfusion

29. Clinical presentation, pathophysiology, investigations, management

29.1 Hemolytic transfusion reaction

29.2 Non- Hemolytic transfusion reaction

29.3 Allergic, anaphylactoid and anaphylactic reactions

29.4 Alloimmunization to various elements of blood

30. Transfusion transmitted infections

30.1 Bacterial

30.2 Viral

30.3 Parasitic

31. Transfusion associated graft versus host disease

32. Transfusion related acute lung injury

33. Others

33.1 Hemosiderosis

33.2 Volume overload

33.3 Post transfusion purpura

VII. Apheresis

34. Technology of apheresis, various equipment & disposables

35. Haemapheresis (platelets, granulocytes, plasma, stem cells)

35.1 Donor selection

35.2 Procedure

35.3 Complications

36. Therapeutic apheresis

36.1 Indication, procedure & complications

36.2 Plasma exchange, red cell exchange

36.3 Newer methods for immunoadsorption

VIII. Autologous transfusion

37. Basic principles, indication & contra indications

37.1 Pre deposit

- 37.2 Haemodilution
- 37.3 Intra operative blood salvage including equipment
- 37.4 Post operative blood salvage
- 37.5 Directed donation

IX. Antenatal and neonatal transfusion practice

- 38. Pathophysiology, diagnosis & management
 - 38.1 Rh incompatibility
 - 38.2 ABO & other blood group incompatibility
- 39. Exchange transfusion
 - 39.1 Indications, methodology & complications
- 40. Neonatal transfusion practice
 - 40.1 Strategies to reduce donor exposure
 - 40.2 Organised donor selection
 - 40.3 Intra uterine transfusion

X. Immunohaematology

- 41. Classification, diagnosis & management
 - 41.1 Immune hemolytic anemia
 - 41.2 Immune thrombocytopenia
 - 41.3 Immune neutropenia
- 42. Immunohaematological problems in multi transfused patients

XI. Hemotherapy

- 43. Pathophysiology, diagnosis & management of anemia
 - 43.1 Anemia
 - 43.1.1 Iron deficiency anemia
 - 43.1.2 Megaloblastic anemia
 - 43.1.3 Aplastic anemia
 - 43.1.4 Anemia of chronic diseases
 - 43.1.5 Neonatal anemia
 - 43.2 Hereditary anemia
 - 43.2.1 Thalassemia
 - 43.2.2 Sickle cell anemia

- 43.2.3 Enzymopathy
- 43.2.4 Others
- 44. Pathophysiology, diagnosis and management of hemostatic disorders
 - 44.1 Hemophilia
 - 44.2 Von Willebrand disease
 - 44.3 Platelet disorders
 - 44.3.1 Qualitative disorders
 - 44.3.2 Quantitative disorders
 - 44.4 DIC/TTP/HIT
 - 44.5 Acquired disorders
 - 44.5 Others
- 45. Pathophysiology, diagnosis and transfusion support in acute blood loss
 - 45.1 Shock
 - 45.2 Massive transfusion
- 46. Transfusion support in surgery
 - 46.1 General surgery
 - 46.2 Specialised surgery – Cardiopulmonary bypass/hemodialysis
- 47. Classification, diagnosis & transfusion support in oncology
 - 47.1 Hemopoietic malignancy
 - 47.2 Non-hemopoietic malignancy

XII. Transplantation

- 48. Transfusion support in transplantation
 - 48.1 Stem cell transplantation
 - 48.1.1 Harvesting
 - 48.1.2 Cryopreservation
 - 48.1.3 CD34 counting & quality control
 - 48.1.4 Infusion
 - 48.2 Bone marrow transplantation
 - 48.2.1 Harvesting
 - 48.2.2 Processing
 - 48.2.3 Immunohaematological problems in ABO mismatched BMT

48.2.4 Transfusion support BMT patients

48.3 Transfusion support in specialized conditions

48.3.1 Renal transplantation

48.3.2 Liver transplantation

48.3.3 Others

49. Irradiation of blood products

49.1 Indications, dosage, adverse effects

50. Tissue banking

51. Cord blood banking

XIII. Blood substitutes and hemopoietic agents

52. Crystalloids & colloids

53. Oxygen carrying compounds

54. Use of hematinics

55. Hemopoietic growth factors

56. Plasma products

XIV. Medicolegal considerations in transfusion medicine

57. Ethical and legal considerations pertaining to transfusion practice

58. Identification of blood stains

59. Paternity testing

60. Donor notification & counselling

61. Look back programme

62. Drugs & Cosmetics Act, Accreditation

63. Consumer protection Act

64. Others

XV. Total quality management

65. Development of Standard Operating Procedures (SOP) manual.

66. Quality control

66.1 Reagents & diagnostic kits

66.2 Instruments

66.3 Personnel

66.4 Blood & components

67. Quality assurance

67.1 Internal quality control

67.2 External quality control

Proficiency testing

68. Hospital Transfusion Committee

69. Medical audit

70. Turnaround time

71. ISO certification/GMP

XVI. Organisation & management of transfusion services

72. Organisation & function of blood services & hospital transfusion practice

72.1 Recruitment & motivation

72.2 Operation of blood mobile

72.3 Development of transfusion service

72.4 Inventory control

72.5 Development of forms, labels, records, etc.

XVII. Biosafety

73.1 Personnel

73.2 Laboratory

73.3 Equipment

73.4 Sterilization

73.5 Disposal of waste material

XVIII. Modern biological techniques

74. Principle, methods, relevance in transfusion medicine

74.1 Western blot

74.2 Polymerase chain reaction

74.2.1 SSCP

74.2.2 SSOP

74.3 Dot blot hybridization

74.4 Others – Animal experiments, museum techniques

74.5 Microarrays

74.6 Proteomics

74.7 Other new technique in Transfusion medicine

XIX. Automation & computerisation

- 75. Instrumentation
- 76. Automated blood group & processing
- 77. Automated infectious screening
- 78. Use of bar codes
- 79. Use of computer
- 80. Laboratory and hospital information system

General orientation- Bio-statistics, computers, medical ethics, scientific presentations, publications, leadership qualities, cost effectiveness, preparation of reagents, handling equipments, educational technology.



Dr. Rajesh B. Goel
Registrar

MGM INSTITUTE OF HEALTH SCIENCES
(DEEMED UNIVERSITY u/s 3 of UGC Act,1956)
NAVI MUMBAI- 410 209