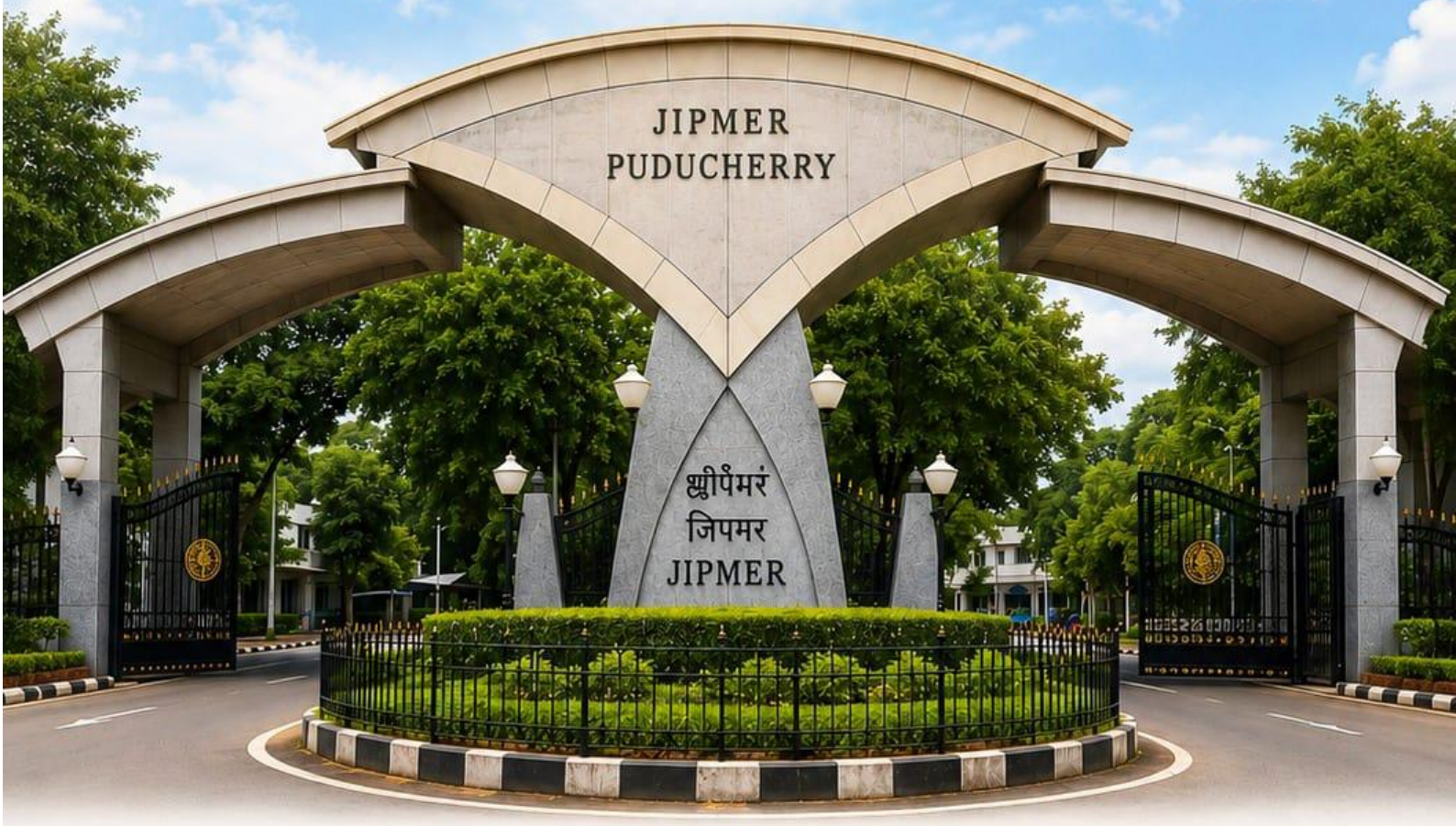
CURRICULUM

POSTGRADUATE

MD Immuno Haematology & Blood Transfusion

From July 2026 session



JAWAHARLAL INSTITUTE OF POSTGRADUATE MEDICAL EDUCATION AND RESEARCH (JIPMER),
PUDUCHERRY – 605 006.

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This curriculum was approved at the 19th meeting of the Standing Academic Committee held on 28th January 2026 and ratified at the 22nd meeting of the Governing Body and will be applicable for students joining MD Immuno Haematology & Blood Transfusion from the July 2026 session.

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GOAL OF THE COURSE

To create Transfusion medicine and Immunohematology specialists who are

a. Well-versed with Regulatory requirements,
b. Competent to establish transfusion services commensurate with international standards
c. Equipped to manage an adequate and safe blood supply
d. Capable of monitoring transfusion practices of fellow clinicians and advising them on the management of patients needing individualised transfusion requirements/services
e. Interact closely with clinicians in the hospital to ensure the optimal and appropriate use of blood and blood components and the availability of transfusion alternatives.

To produce honest and able physicians who can effectively diagnose, predict and treat patients requiring hemotherapy, therapeutic procedures like therapeutic phlebotomy, apheresis, cellular therapy, gene or immunotherapies etc., and other methods and to provide supportive and compassionate care to them, using best possible evidence in medicine and while striving towards bringing advancements in the science of transfusion and Immunohematology.

TERMINOLOGY

Key-capabilities

They refer to the practices carried out by the specialists as part of their professional services. They represent the services required from them by patients, students, other medical/paramedical staff or the society in general.
Thus, they refer to the specific tasks the postgraduate will be expected to complete after completing the course. For training, the tasks are broken down into units with distinct cognitive concepts unless they are predominantly procedural or attitude-based.

Core ideas in the practice of Key-capabilities

They refer to the ideas that underly the practice of the specialists. They include ideas and concepts about the structure and functioning of organs and organ systems in health and diseases, classification of diseases, equipment, tests, drugs, etc.

Key-capabilities

1. Organising blood bank activities, including blood donations, component separation and storage, appropriate use of blood and blood components
2. Understand the importance of blood and blood components as a precious, lifesaving resource and be competent in the judicious use of this resource.
3. Understand the need for transfusion safety and its importance in all aspects of medical care.
4. Act as the medical expert in providing advice and clinical decision-making with regard to the need for blood transfusion and work with clinical colleagues in formulating evidence- based guidelines
5. Function as a member of the health care team and coordinate with the team in critical situations, like working with surgeons and colleagues in anaesthesia to ensure that optimal care is given to all patients, especially with the support of blood and its products in resuscitation and

haemostasis

6. Understand the national and public health importance of safe blood components, including a sound knowledge of transfusion-transmitted Diseases (TTDs) and their testing methods.
7. Acquire up-to-date knowledge of Immunohematology and its application to ensure safe transfusion practices.
8. Acquire knowledge in laboratory haematology, automation and quality control and be able to interpret haematological tests in the clinical context and provide consultative services to clinicians for effective patient care.
9. Able to offer expert advice in histocompatibility and immunogenetics for stem cell and organ transplantation and to provide laboratory support to the transplant team
10. Incorporate comprehensive and evidence-based medicine into all areas of its discipline.
11. Apply knowledge of molecular biology in transfusion medicine
12. Apply knowledge of transfusion haematology to patient management
13. Contribute to the education of students, physicians, other health care professionals, and patients and their families
14. Communicate effectively with the public and media in matters relating to the national blood supply
15. Effectively use information technology for the smooth functioning of blood banks
16. Undertake accurate self-appraisal, develop a personal continuing education strategy and pursue lifelong mastery of transfusion haematology
17. Learn the diagnostic techniques required in the practice of haematology
18. Appreciate the value of research, audit and team working, which underpin haematology and transfusion practice
19. Understand the need for research and development in transfusion alternatives, molecular immunology and cellular therapy

COURSE CONTENT:

1. Key-capabilities in the practice of Immuno Haematology and Blood Transfusion (outline below, details in Annexure 1 (Part A))
2. Core ideas in the practice of key-capabilities (outline below, details in Annexure 1 (Part B))
3. Peripheral postings, details in Annexure 1(Part C) and under 'Educational strategy'

KEY CAPABILITIES	
1	Donor Selection and Blood Collection
2	Basic and Advanced Hematology
3	Molecular Work
4	Apheresis
5	Component Preparation
6	Transfusion Microbiology
7	Quality Audit and Regulatory Guidelines
8	Immunohematology
9	Clinical Transfusion
10	Teaching
11	IT Skills
12	Scholarship
13	Soft Skills
14	Organisational and Motivational Skills

CORE IDEAS IN THE PRACTICE OF KEY CAPABILITIES	
1	Basic Sciences and Principles of Transfusion Medicine and Immunohematology ● Immunology ● Medical Genetics ● Haemostasis & Physiology of Formed Elements of Blood ● Medical Statistics
2	Blood Collection/Blood Centre/Component Processing
3	Transfusion transmitted infections
4	Immunohematology / Blood Group Serology / Compatibility testing
5	Clinical Transfusion Service
6	Therapeutic Apheresis, Therapeutic Plasma Exchange and Cytapheresis
7	Regulatory Skills / Quality Assurance/ Quality Control in Blood Transfusion

LEARNING RESOURCES

Recommended learning Resources/books

Year I

1. WHO; Blood donor selection: guidelines on assessing donor suitability for blood donation
2. NACO: Handbook for counselling blood donors
3. NACO: Handbook on Component Preparation for BCSU
4. WHO; Screening donated blood for transfusion-transmissible infections: recommendations
5. WHO: The Clinical use of blood: a handbook
6. WHO: The Clinical use of blood in medicine, obstetrics, paediatrics, surgery and anaesthesia, trauma and burns
7. WHO: Safe blood and blood products: Manual on the management, maintenance and use of blood cold chain equipment
8. Technical Manual: DGHS
9. MITR: Manual for Immunohematology and Transfusion Residents

Year II

1. WHO; Educational modules on clinical use of blood
2. Modern Blood Banking & Transfusion Practices, Denise M Harmening, FA Davis Company, Philadelphia
3. Immunohematology: Principles and Practices, Eva D. Quinley, Lippincott Williams and Wilkins
4. Blood Banking and Transfusion Medicine: Basic Principles and Practices, C.D. Hillver Churchill Livingstone

Year III

1. AABB: Technical manual
2. Rossi's Principles of Transfusion Medicine
3. Mollison's Blood Transfusion in Clinical Medicine
4. WHO: Design guidelines for blood centres
5. WHO; The blood cold chain: guide to the selection and procurement of equipment and accessories
6. WHO: External quality assessment of transfusion laboratory practice: guidelines on establishing an EQA Scheme in blood group serology
7. MITR: A primer for exam preparations

Miscellaneous

Practical Statistics for Medical Research	Douglas G. Altman	Chapman & Hall/CRC
Medical Statistics at a Glance	Aviva Petrie & Caroline Sabin	Wiley Blackwell

Suggested Journals

S. No	Journal Title	Publication brought by	ISSN	Publisher
1	Transfusion	AABB	1537-2995	Wiley
2	Transfusion Medicine	BBTS	1365-3148	Wiley
3	Transfusion Medicine Reviews		0887-7963	Elsevier
4	Blood Transfusion	SIMTI	1723-2007	SIMTI servizi
5	International journal of clinical transfusion medicine		2253-3249	Dove press
6	Indian Journal of Hematology and Blood Transfusion	ISHBT	0971-4502	Springer
7	Lancet		0140-6736	Lancet
8	New England Journal of Medicine		0028-4793	Massachusetts Medical Society
9	Asian Journal of Transfusion Science	ISBTI and ISTM	1998-3565	Medknow Publications
10	Global Journal of Transfusion Medicine	Asian Association of Transfusion Medicine	2455-8893	Medknow Publications
11	Immunohematology	American Red Cross society	1930-3955	Sciendo
12	Transfusion and Apheresis Science	World Apheresis Association	1473-0502	Elsevier
13	Journal of Clinical Apheresis	American Society for Apheresis	0733-2459	Wiley
14	Vox Sanguinis	ISBT	1423-0410	Wiley
15	Blood Reviews		0268-960X	Elsevier
16	British Journal of Haematology	British Society for Haematology	1365-2141	Wiley
17	American Journal of Hematology		1096-8652	Wiley
18	Transfusion Clinique et Biologique	French Society of Blood Transfusion (SFTS)	1953-8022	Elsevier

EDUCATIONAL STRATEGY

Posting within Department

	1st Year (Months)		2nd Year (Months)		3rd year (Months)		Total duration (Months)
	Sem1	**Sem 2**	**Sem 3**	**Sem4**	**Sem 5**	**Sem6**	
Donor section	4			PERIPHERY	2		6
Component lab	1	1	1			1	4
TTI Lab	1	1	1			1	4
Pre-transfusion lab		1	1		2	1	5
Immunohematology		2	1		1	1	5
Apheresis		1	1		1		3
QC and Camps			1			1	2
Exams						1	1
Periphery							6
							36 Months

Title	Content of training activities	Learning objective
Pre-transfusion testing	Transfusion reactions	Recognise the symptoms and signs of haemolytic and non-hemolytic transfusion reactions and demonstrate knowledge of pathophysiology, treatment, and prevention of these complications.
Immunohematology	Advanced Immunohematology, platelet and leukocyte serology	Understand principles and demonstrate competency in the same
Quality control	Demonstrate knowledge concerning the requirements of all applicable regulatory and accrediting agencies. [e.g., DCI, NABH, AABB].	Understand training, certification, licensing, and competency assessment standards for transfusion laboratory professionals, including medical laboratory technicians.
Apheresis	Demonstrate proficiency in the selection of apheresis machines and blood donors and be able to obtain apheresis products meeting quality standards.	Donor evaluation and follow-up of autologous stem cell donors Usage of cord blood, stem cell donor registry.

Donor complex	Donor vigilance program	Know the clinical relevance of directed donation, Demonstrate proficiency in the organisation of outdoor blood donation camps and understand the importance of cold chain maintenance.

Additional skills

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

Peripheral posting

Title	Duration
Hematopathology and haemostasis	1 month
Medical Oncology and BMT	1 month
Microbiology + ART	2 weeks
Immunology (Clinical and Laboratory)	2 weeks
Anaesthesiology and critical care	2 +1 week
Emergency Medicine	1 week
HLA Typing	2 weeks
Nephrology	2 weeks
NICU/PICU	2 weeks
Medical Gastroenterology	1 week
Clinical Hematology#, MICU	1 week
# - Resident will attend all Clinical Hematology OPDs during the peripheral posting (6 months).	

Learning objectives for peripheral postings are present in Annexure I (Part C)

The postgraduate residents will be posted in different departments/divisions of the hospital/institute during the first two years of their course. The resident will be assessed for their knowledge, skills and performance in the department of peripheral posting. Respective departments will send attendance and feedback from these postings to Transfusion Medicine. (May include more departments as needed/available)

Learning/Teaching methods

	1st week	**2nd week**	**3rd week**	**4th week**
Monday	PG Seminar	PG Seminar	PG Seminar	PG Seminar
Tuesday	Lecture	Case discussion	Techno day	PDCC Session
Wednesday	Invited Talk	Grand Rounds/ Interdepartmental[$]	Bench side teaching	Grand Rounds/ Interdepartmental
Thursday	PG Seminar	PG Seminar	PG Seminar	PG Seminar
Friday	Departmental Research Review/ Journal Club	PG Test/Quiz	Journal Club	Technical meet/Staff sensitisation program
Saturday	Monthly Statistics/Audit	Monthly Statistics/Audit	Monthly Statistics/Audit	Monthly Statistics/Audit

* Every week, 1st Monday- 1st-year topics pertaining to 1 paper, similarly for 2 &3.4th Monday can be
rotated with recent advances topics covered for 4th paper.

$ Interdepartmental activities include BMT calendar discussion, Therapeutic apheresis review meetings, Multidisciplinary clinics, Procedural planning meet

Workshops, Masterclasses, Annual Foundation, Intermediate and Advanced courses in Transfusion and allied specialities for updates	Within the institution and outside
Other didactic classes as and when deemed necessary	As required

WORKPLACE OBSERVATION

Logbook

(Please refer to Annexure 2 for sample forms)

1. A consolidated record of the number of cases, done independently and with assistance, of each procedure type is entered as per the format in **Annexure 2.** Each entry is made with a date and is to be certified by faculty.
2. Detailed work-up of cases selected every month from posting in different workplaces (2 cases with different clinical diagnoses) will be maintained by the resident and entered in the logbook
3. Record of academic activities (at the department, Institute or outside institute level) to be entered in the logbook are as follows
    i. Presentation in departmental seminars
    ii. Presentations in journal clubs (with Title, Journal and Article reference)
    iii. Conferences attended – National/International
    iv. Papers presented at conferences with title, name of the conference, date of presentation (with abstract book)
    v. Papers published in the journal (with article reference)
    vi. Peripheral postings: Feedback forms/score sheets filled by faculties in other departments during the peripheral posting
4. Record of co-scholastic activities, if any

Workplace observation scheme

(Recorded 6 monthly – submitted along with internal assessment marks)

(Please refer to Annexure 2 for sample forms)

The resident's daily activities in practice and learning will be observed and recorded in the "workplace observation form" at pre-decided time instances.

Assessment of the logbook is to be done at the same time instances, and entry is made in the 'workplace observation form' by the faculty.

Feedback, as part of formative assessment, is given to residents by faculty during these time instances.

At the end of every posting, marks are given by the posting faculty in the workplace assessment form.

Dissertation

- A research project should be undertaken and dissertation must be submitted as per Postgraduate Research Monitoring Committee (PGRMC) guidelines of JIPMER.
- Two hard copies of the dissertation, prepared from the research project, should be submitted to the Dean (Academics) JIPMER, at two and half years of the course to

become eligible to appear for the final examination at the end of the course, as per the guidelines of JIPMER.

- Six monthly interim presentations of the dissertations will be done to monitor the progress of the research work and take corrective measures when faced with difficulties.
- **Please refer to Postgraduate Dissertation Regulations and Postgraduate Examination Regulations document for further details**

ASSESSMENT

Marks

Exam	Marks	Description
Theory exit examination	400 marks	This is the written exam at the end of the course. Four theory examination papers as given in the curriculum document of the course.
Practical exit exam	400 marks	This is the practical examination at the end of the course. The detailed scheme is given in the curriculum document of the course.
Internal Assessment	Internal assessment Theory: 50 marks	Two exams should be conducted - one at the end of first year and the other at the end of second year. Portions for the examination and pattern of the examination must be notified to the students at least one month in advance. The pattern of the internal assessment test will be similar to one paper of the theory exit examination. Two faculty members will evaluate the paper of each candidate in a blinded manner and the average of the 2 scores will be taken as the final score for the internal assessment. If a resident misses one of the tests due to medical reasons (medical certificate from a faculty member of the treating department and duly forwarded by the HoD to the Dean (Academic)), he/she can be permitted to appear in the test that is held for the next batch 6 months later. This can be permitted only once in the course period. If a resident does not attend an internal assessment test, or if he/she fails to attend the rescheduled test due to medical reasons, the score will be considered as 0 for the test. No retests or re-evaluation will be permitted under any circumstances.

Exam	Marks	Description
		The internal assessment marks should be communicated to the students within two months of conducting the exams. Internal assessment test marks will be added to the final aggregate to the tune of 100 marks (theory and practical). There is no cut off of internal assessment test scores for determining eligibility to appear in the exit examination or to decide pass/fail solely based on the internal assessment test scores. However, when a student secures less than 50% marks in the internal assessment or when any concern is formally raised by the student with the Dean office, a review board with at least 3 faculty members should be constituted to review the student's performance with the student, recommend appropriate remedial measures, document the remedial plan, and submit a signed copy of the document to the Dean's Office. Additional periodic assessments can be held as part of formative assessment. Scores of these tests will not be considered for internal assessment and will not be considered for replacing scores of any of the internal assessment tests. Information to be provided to the Dean Office, before the final examination. 1. Dates of internal assessment examinations conducted 2. Names of faculty members involved in assessment against each date 3. Marks obtained by students in theory, practical and workplace-based observation in each exam session 4. Internal assessment marks for each student for Theory, Practical and Workplace based assessment. An average of the two theory and practical tests will be used to calculate scores for 50 and 25 marks respectively. Cumulative workplace-based assessment scores will be determined for 25 marks. 5. Copy of review documentations for periods of low performance of a student, if any, with remedial measures suggested by the departmental committee.
Internal Assessment	Internal assessment	For practical examinations, all members of the faculty of the department, from Assistant Professor

Exam	Marks	Description
(Practical and Workplace-based assessment)	Practical: 25 marks Internal assessment Workplace-based assessment: 25 marks	to the senior-most faculty, shall participate in internal assessment on a rotating basis. The assessment shall be planned such that multiple faculty members are engaged for each student and different faculty members are engaged for the two assessments, wherever feasible. The pattern prescribed in the curriculum document shall be followed for practical assessments and the score shall be adjusted for 25 marks. Workplace-based assessment marks are given based on practice of the profession and affective domain attributes in the workplace and in the learning environment. Workplace observation proforma should be provided to students at the time of joining the department. The method of workplace observation should be explained to the students at the beginning of the course.
Dissertation	100 marks	Dissertation marks will be calculated by the average of the scores provided by 2 external examiners. Approval of the dissertation with more than 50% scores awarded by the external examiners will be one of the eligibility criteria for appearing for the exit examination of the discipline.
Total	1000 marks	**Criteria for PASS:** 1. (a) A candidate will need to pass the final Theory Exit Exam and Practical Exit Exam independently. (b) A minimum of 50% marks in 'Theory Exit exam' (a minimum of 40% in each of the four papers) and 50% in 'Practical Exit exam' separately shall be mandatory 2. A candidate should also score 50% or above in the final aggregate marks (500 out of 1000) to pass in the degree course. If a student secures a pass score in theory and practical examination but fails in the aggregate score, he/she can re-appear in the exit examination of the subsequent session. There is no provision to improve internal assessment or dissertation scores.
Please refer to Postgraduate Examination Regulations document for further details		

Syllabus for Exams

Theory Exit Exam

Theory papers: 100 Marks for each paper (400 Marks)

Paper I Applied aspects of Basic Sciences in relation to Transfusion Medicine
Paper II Immunohematology, Immunogenetics, and applied serology
Paper III Blood bank organisation, the technology of components, Clinical Hemotherapy.
Paper IV Recent advances & technology & Legislation in relation to Transfusion Medicine.

Practical Exit Exam

6 Stations, 50 Marks each station (300 Marks+ viva 100 marks)

The duration of each exercise shall vary from 30 min to 1 hour. Viva on the particular exercise shall follow each exercise or station.

STATION 1:

Assessment of clinical skills, including one of the following

1. Blood donor/apheresis donor selection
2. Stem cell donor selection and management
3. Patient blood management

STATION 2:

Assessment of Laboratory skills, including one of the following:

1. Blood processing/ component preparation
2. Antenatal serology
3. Immunohematology
4. Transfusion reaction management

STATION 3:

Assessment of communication/Counselling skills, including one of the following

1. Donor counselling
2. Patient counselling
3. Addressing gathering, media, multidisciplinary involvement

STATION 4 & 5:

Two Short exercises, including any of the following

1. Coagulation testing,
2. Basic haematology tests,
3. Transfusion-transmitted infection screening
4. Quality control of reagents, equipment, components
5. Stem cell cryopreservation

STATION 6:

1. There shall be 3-6 Hemotherapy exercises and administrative issues for each candidate. The candidate must assess the problem and come up with solutions.

a) Grand viva

Viva-Voce will include concepts and application of knowledge in the following areas: Hemotherapy, recent advances, policies, planning, Emergencies, Quality assurance, Medical Statistics, safety, equipment handling and maintenance and others.

b) Video reviews/Spotters

The candidate will be shown a PowerPoint presentation or video presentation of a minimum of 10 clinical / laboratory situations. The candidate will be required to answer on each situation. For example, the candidate may be shown a picture of a chest X-ray with pulmonary oedema developing after FFP infusion. The candidate will be asked to give different possibilities and their investigations.

Logbook discussion: A log book to be maintained of the various duties performed, procedures learnt, and skills acquired regularly with the initials of the concerned In-charge faculty and a consolidated log book submitted at the end of the course.

MODEL THEORY QUESTION PAPERS

Paper - I: Applied aspects of Basic Sciences in relation to Transfusion Medicine

Sl No	Question	Marks
1	Describe the contents and relations of various structures in the cubital fossa. Explain the phlebotomy-related injuries in blood donors.	5 5
2	Describe the pathophysiology of iron deficiency. What are the effects of iron depletion	5 5
3	Describe the pathways and regulation of energy metabolism in RBCs	7+3
4	Laboratory Diagnosis of Haemolytic anaemia	10
5	Describe the role of malaria in the selection of mutations and prevalence of blood group phenotypes	10
6	Classify RNA viruses. How are they different from DNA viruses? Describe the role of immunisation in the containment of infections by these viruses	4 3 3
7	What is Medical Negligence? Describe with examples concerning running Blood transfusion services What are the laws binding the practice of transfusion medicine in India	2 4 4
8	What are the various levels of disease prevention? Describe them in relation to the Haemolytic disease of the Fetus and Newborn.	2 8
9	What are haemostatic agents? Discuss their role in Patient Blood Management.	2 8
10	What are the differences between Regulatory, Accreditation and certifying bodies? Throw light on professional societies/patient-sponsored international forums in relation to Transfusion Medicine and Immunohematology and their role.	3 7

Paper - II: Immunohematology, Immunogenetics and Applied Serology

<table>
<tr><th>Sl No</th><th>Question</th><th>Marks</th></tr>
<tr><td>1</td><td>Differentiate type 1 and 2 precursor chains.
Describe why ABH antigen expression is diminished in newborns.
Explain why the ABO blood group is the most significant of all blood group systems</td><td>3
2
5</td></tr>
<tr><td>2</td><td>Describe the pathogenesis and pathology of McLeod Syndrome.
What are the other diseases associated with the gene associated with the same genes that cause the McLeod phenotype?</td><td>8
2</td></tr>
<tr><td>3</td><td>Describe the phenomenon of MHC restriction.
What are the serological and molecular techniques used to define HLA antigens?
How are their alleles named?</td><td>2
6
2</td></tr>
<tr><td>4</td><td>What are the agents for which no “donor screening” tests are available?
How do you tackle them in blood transfusion services?
Why does the interest remain high in these infections?</td><td>2
5
3</td></tr>
<tr><td>5</td><td>What are the limitations of compatibility testing?
What changes are adopted during compatibility testing in the following situations?
A. Massive transfusion
B. Emergency transfusion
C. Samples with prolonged clotting
D. Neonatal transfusion</td><td>2

2
1.5
1.5
3</td></tr>
<tr><td>6</td><td>List the differential diagnosis and methods to resolve the following grouping discrepancies
(i to iv).
<table>
<tr><th></th><th>Anti-A</th><th>Anti-B</th><th>Anti-D</th><th>A1 Cells</th><th>B cells</th></tr>
<tr><td>i</td><td>4+</td><td>1+</td><td>0</td><td>0</td><td>4+</td></tr>
<tr><td>ii</td><td>4+</td><td>4+</td><td>4+</td><td>0</td><td>0</td></tr>
<tr><td>iii</td><td>4+</td><td>0</td><td>4+</td><td>0</td><td>0</td></tr>
<tr><td>iv</td><td>0</td><td>0</td><td>4+</td><td>3+</td><td>0</td></tr>
</table></td><td>2.5
2.5
2.5
2.5</td></tr>
<tr><td>7</td><td>Immune neutrophil disorders</td><td>10</td></tr>
<tr><td>8</td><td>What are the various levels of disease prevention?
Describe them in relation to the Haemolytic disease of the Fetus and Newborn.</td><td>2
8</td></tr>
<tr><td>9</td><td>What are the causes for Rh D typing discrepancies?
How do you resolve them?
What are the necessary clinical considerations for RhD typing</td><td>3
4
3</td></tr>
<tr><td>10</td><td>Cryopreservation of RBCs</td><td>10</td></tr>
</table>

Paper - III: Blood Centre Operation, Hemotherapy and Technology of Components.

Sl No	Question	Marks
1	How do you treat thrombocytopenia in pregnancy?	10
2	Non-invasive foetal blood grouping	10
3	Resuscitation and Transfusion therapy in the care of the burns patient	3+7
4	Role of Voluntary Blood Donor Organisations in running a blood transfusion service	10
5	How does the correction of the anaemia lead to improvement of bleeding outcomes?	10
6	Plasma inventory management	10
7	Explain why a. A baseline assessment of the transfusion recipient is necessary b. Routine administration of prophylactic premedication before transfusion is not recommended c. Routine warming of blood components before transfusion is not advised	4 3 3
8	"Why give 2 when one will do?" campaign vs. a "single RBC transfusion is a wasted transfusion."	10
9	Throw light on controversies and science behind allowing LGBTQ for blood donation	10
10	Assessing Iron status in blood donors	10

Paper - IV: Recent Advances in Transfusion Technology and Hemotherapy

Sl No	Question		Marks
1	Explain mini-pool testing in relation to its	a. Feasibility b. Advantages c. Limitations d. Applications	2 2 2 4
2	What are low-titre group O donors? How do you identify them? What is their role in the current day practice of Transfusion medicine?		2 3 5
3	Explain Cord blood banking in relation to its:	a. Feasibility b. Advantages c. Limitations d. Applications	2 3 3 2
4	Quality of life in regular voluntary blood donors		10
5	Variables affecting the outcomes in Hematopoietic Stem cell Transplantation		10
6	FcRn: Role in health and diseases and as a therapeutic target		10
7	Tests for Neutralising antibodies		10
8	Stem cell and Mesenchymal cell therapy in COVID-19		10
9	Role of therapeutic Leukapheresis in current-day practice		10
10	Transfusion support in patients on ECMO (Extra Corporeal Membrane Oxygenation)		10

Annexure 1(Part A)

Levels of performance: 1-knows; 2-can do with strict supervision; 3- can do with loose supervision; 4-can do independently; 5-can teach

S. No	Key capabilities	Level of performance at the following time points in the course					
		6 months	12 months	18 months	24 months	30 months	36 months
1	**Donor Selection and Blood collection**						
	Performing and interpreting various methods of haemoglobin estimation and complete hemogram	1	2	3	4	5	
	Preparation and interpretation of peripheral blood smear in health and disease conditions	1	2		4	5	
	Performing and interpreting 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.		1	2	3	4	5
	Selection of whole blood donors	2	4	5			
	Collection of whole blood evaluating and managing adverse reactions associated with blood donation/phlebotomy	2	4	5			
	Autologous blood collection and its application in clinical transfusion service	1	2	3		4	5
	Therapeutic phlebotomy: Evaluation of patients and performing the procedure	1		2		3	4
	Donor notification and counselling (Pre- and Post- donation) and the donor look-back process	2	3			5	
2	**Basic and advanced Hematology**						
	Interpretation of Hb electrophoresis/HPLC			1	2		3
	Performing and interpreting various laboratory immunological tests pertaining to transfusion science, such as isolation of T & B lymphocytes, immunoelectrophoresis, flow cytometry, CD4 / CD8 counts				1		2
3	**Molecular work**						
	Proficiency in HLA typing techniques, including serological methods, micro-cytotoxicity assays, nucleic acid assays, and lymphocyte culture				1		2

S. No	Key capabilities	Level of performance at the following time points in the course					
	Demonstrate competence in Polymerase Chain Reaction (PCR) and interpretation of Western Blot and Hybridisation procedures.				1		2
4	**Apheresis**						
	Selection of apheresis donors	1	2	3	4	5	
	Managing collection and adverse reactions associated with apheresis donation		1	2	3	4	5
	Selection of apheresis machine					1	2
	Providing transfusion and immunohaematological support to patients with bone marrow/stem cell transplantation, including cryo-preservation of stem cells, quality control and infusion		1		2	3	4
	Evaluating and preparing patients for therapeutic apheresis, including discussion with the patient of the risks and benefits associated with apheresis procedures		1	2			4
	Perform plasma exchange, including calculation and type of replacement fluid to be used and monitoring the patient for complications and efficacy of the procedure.						
	Evaluating and treating adverse reactions associated with therapeutic apheresis.		1	2		3	4
	Treatment of patients using specialised methods (e.g., photopheresis and immunoadsorption columns).					1	2
5	**Component preparation**						
	Preparation of blood components	1	2			5	
	Compatibility, labelling requirements of various components	1	2			5	
	Modifications of blood components such as irradiation, cell washing, volume depletion, and leukodepletion	1	2			5	
	Performing quality control tests on each blood component such as PRBC, FFP, Platelets, Cryoprecipitate	1	2			4	5
6	**Transfusion Microbiology**						
	Performing, interpreting, and documentation of blood donor screening tests for TTIs	1	3			5	
	Preparation and interpretation of LJ Chart and root cause analysis (RCA)		1			3	4

S. No	Key capabilities	Level of performance at the following time points in the course					
	Corrective and Preventive Action (CAPA) as and when required.						
	Proper handling and disposal of biohazardous material as per regulatory requirements.	1				4	5
	Preparation and use of in-house external controls in transfusion- transmitted infection screening	1			3		5
	Proficiency in Gram staining		1		3		4
7	**Quality audit and regulatory guidelines**						
	Proficiency in preparing SOP					1	2
	Preparation for accreditation					1	2
8	**Immunohematology**						
	Preparation of cell suspensions of appropriate concentration following cell washing techniques correctly and grade and interpret antibody-antigen reactions according to the established criteria	4	5				
	Performing ABO/Rh grouping	4			2	3	4
	Performing, interpreting, and resolving discrepancies in pre- transfusion testing, ABO/Rh grouping, red cell antibody screen, and identification.	1	2	3	4	5	
	Performing cross matches	4	5				
	Perform direct and indirect antiglobulin tests on appropriate specimens, grading and recording the results appropriately with interpretation	3	4	5			
	Identify sources of error in antiglobulin testing	1	2	3		4	5
	Using a cell panel, Identify clinically significant RBC antibodies from an antibody panel, including multiple alloantibodies and mixtures of alloantibodies and autoantibodies, Determine the difficulty of obtaining blood for this patient, and effectively communicate these results to clinicians	1	2			3	4
	Selection of blood unit for a patient with autoimmune haemolytic anaemia	1		2		3	4
	Cryo preservation of reagent red cells			1		2	3
	Histocompatibility testing and platelet cross-matching and applying this knowledge in selecting appropriate platelet products when indicated.					1	2

S. No	Key capabilities	Level of performance at the following time points in the course					
9	**Clinical Transfusion**						
	Evaluating and recommending treatment plans for transfusion reactions.	1	2		3	4	5
	Preparation and transfusion of blood for intrauterine transfusion/exchange transfusion		1	2	4	5	
	Appropriate recommendations for blood products for patients/pregnant women with irregular antibodies	1	2		4	5	
	Transfusion support in special patient populations (e.g., haematology/ oncology, paediatrics, thalassemia, haemophilia, transplantation, cardiac surgery, and burn/trauma).		1	2	3	4	5
	Providing highly specialised blood products (e.g., granulocytes, donor lymphocyte infusions, HLA- matched platelets, and coagulation factor concentrates)			1		2	3
	Evaluating the effectiveness of platelet transfusion			1		2	3
	Performing blood utilisation reviews	1	2			3	4
10	**Teaching**						
	Workplace teaching	1	2	4			
	Large group teaching	1	2	4			
11	**IT skills**						
	Understand proper use of instrumentation and computerisation in a transfusion laboratory.	3	4				5
12	**Scholarship**						
	Dissertation writing					3	4
	Critiquing a research paper			2	3		
	Journal publication			2	3		
13	**Soft skills**						
	Typing		4				
14	**Organisational and motivational skills**						
	Demonstrate skills to motivate blood donors/organisers	1	2		3	4	5
	Organisation of outdoor blood donation camps	1				2	3
	Management of blood inventory and the ability to communicate the hospital's needs effectively to the blood donor recruiters, Triage and screen		1			2	3

S. No	Key capabilities	Level of performance at the following time points in the course					
	requests for blood components appropriately during inventory shortages						
	Handling psychosocial and ethical issues		1	2		3	4
	Professionalism, Medical Ethics, Patient safety and communication	1		2		3	4
	Teaching, Supervising and Teamwork capabilities			1		2	3

Learning Objectives for Key Capabilities

1A- Participation in Multi-Disciplinary Team (Inter-departmental) & Treatment Plan (departmental) meetings

i. Presents new cases to the MDT clearly and concisely, highlighting the relevant points and questions to be answered
ii. Understand the indications for all treatment options available for different types and stages of diseases, applying relevant guidelines and the most up-to-date evidence base to give an informed opinion
iii. Assesses the risks and benefits of treatment options for each patient, considering disease stage, biology and individual patient factors to formulate an appropriate personalised management plan
iv. Recognises the limitations of clinical guidelines in cases of uncertainty or complexity
v. Communicates views and recommendations clearly, promptly and effectively to all members of the MDT
vi. Respect the expertise, viewpoints and responsibilities of all MDT members and help foster a supportive and collaborative environment for open discussion
vii. Understands the local, regional/national MDT network and communicates effectively between the elements of the service

2A- Clinical Data & Research

i. Understand the importance of accurate and secure collection of clinical data every day.
ii. Actively participates in departmental Morbidity/Mortality and audit Meetings and contributes to clinical data collection.
iii. Ability to interpret clinical data and suggest improvement measures accordingly
iv. Understand the principles of research and academic writing
v. Demonstrates ability to carry out a critical appraisal of the literature
vi. Understands the role of evidence in clinical practice and demonstrates shared decision- making with patients

vii. Demonstrates appropriate knowledge of research methods, including qualitative and quantitative approaches in scientific enquiry
viii. Demonstrates appropriate knowledge of research principles and concepts and the translation of research into practice
ix. Follows guidelines on ethical conduct in research and consent for research
x. Participating in clinical research trials and developing guidelines and protocols to implement new combined modality regimens/techniques safely
xi. Understands and adheres to the laws, frameworks and guidelines which govern the set-up and delivery of clinical trials
xii. Understands and adheres to trial protocols
xiii. Understands and follows the correct safety reporting requirements, including reporting mechanisms for any deviations from protocol or adverse events
xiv. Understands the roles and responsibilities of regional/national/international organisations involved in donor registries and blood safety
xv. Understands public health epidemiology and global health patterns
xvi. Recognises potential of applied informatics, genomics, stratified risk and personalised medicine and seeks advice for patient benefit when appropriate
xvii. Demonstrates knowledge of available new techniques and potential benefits and risks
xviii. Completes a dissertation project under the supervision of a faculty
xix. Presents research work in state/ national/ international conference
xx. Participates in workshops, symposiums and other Continued Medical Education programmes

2B- Participation and presentation in journal club

i. Identification of PICOT, Understanding statistical analysis, identification of type of trials, Recognition of knowledge gaps and lacunae in current practice
ii. Formulation of questions to address the knowledge gap and lacunae
iii. Identification of sources of knowledge to answer the question
iv. Interpretation and critique of evidence
v. Determination of validity and risk of bias in evidence
vi. Application and potential integration of evidence into practice
vii. Formulation of research study design to answer question and Execution of research protocol
viii. Analysis and interpretation of research findings
ix. Dissemination of research findings in a conference presentation/journal publication

3A- Professionalism, Medical Ethics, Patient Safety and Communication

i. Aware of legal responsibilities, including safeguarding vulnerable groups like children, physically/mentally challenged, etc.
ii. Demonstrates ability to offer apology or explanation when appropriate
iii. Demonstrates ability to lead the clinical team in ensuring that medical-legal factors are considered openly and consistently
iv. Demonstrates ability to convey bad news professionally to donors, patients and their family

4A- Teaching, Supervising & Teamwork capability

i. Delivers effective teaching and training to medical students, junior doctors and other healthcare professionals
ii. Able to supervise less experienced trainees in their clinical assessment and management of patients
iii. Able to supervise less experienced trainees in carrying out appropriate practical procedures
iv. Able to act as a clinical supervisor to doctors in earlier stages of training

5A- Affective domain

The resident:

i. Should be able to function as 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.

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

iii. Aware of national legislation and legal responsibilities, including safeguarding vulnerable groups

iv. Behaves following ethical and legal requirements of the state and the nation

v. Demonstrates ability to lead the clinical team in ensuring that medical-legal factors are considered openly and consistently

vi. Develop good communication skills to word reports and professional opinions and interact with patients, relatives, peers and paramedical staff for effective teaching.

6. Medical Statistics

The resident should demonstrate the statistics knowledge necessary to:

- Understand the design of trials
- Read and use a trial protocol
- Present and interpret data
- Interpret results of clinical trials
- Critically review and evaluate papers

Part 1/2

i. Present and summarise individual variables

ii. Recognise categorical data (nominal, ordinal), discrete and continuous numerical data

iii. Recognise symmetric and skewed distribution

iv. Describe the normal distribution

ii. Interpret bar charts and histograms

iii. Define and apply measures of central tendency and Spread

iv. Describe the concept of a source population

v. Explain random sampling

vi. Explain the estimation of population statistics

vii. Describe the standard error of a sample mean and a proportion and their differences

viii. Define and use confidence intervals

ix. Explain reference ranges

x. Explain hypothesis testing and estimation

xi. Contrast Type I and II errors

xii. Interpret p-values and confidence intervals

xiii. Define and identify the difference between statistical and clinical significance

xiv. Explain the concept of and correction for multiple testing (e.g., false discovery rate, Bonferroni correction)

Part 2/2

i. Interpret tests comparing means and percentages
ii. Interpret the meaning of correlation and regression analysis

iii. Interpret the meaning of scatter plots

iv. Calculate and interpret the meaning of sensitivity, specificity, positive and negative predictive values and accuracy.

i. List types of time-to-event data
ii. Interpret and describe the principles of Kaplan-Meier and actuarial survival curves.
vii. Understand censorship

iii. Understand how the KM curves can be derived using algorithms and how to input the data

iv. Describe the possible methods of summarising survival data

v. Interpret and describe methods used to compare groups:
   a. Log-rank test for two or more groups, including ordered groups
   b. Cox's proportional hazards regression model
   c. Hazard ratios and their interpretation

vi. Compare the design and role of phases I-IV of clinical trials
vii. Explain the need for randomisation and the problems with non-randomised studies and historical controls

viii. Describe the methods of randomisation (simple, block, stratified, minimisation)

xiv. Explain the concepts of blinding/masking

ix. Describe the possible trial designs: parallel-group, cross-over, factorial

x. xvi. Describe the contents of a trial protocol

xi. Discuss the ethical basis for research of what constitutes informed consent and reporting adverse events

xii. Describe the possible measures of response, including:

a. Disease regression
b. Quality of life
c. Reactions and adverse events
d. Death
e. Cause-specific death
f. Disease-free survival
g. Progression-free survival

xiii. Outline the principles of:

a. sample size calculation
b. interim analyses
c. intent-to-treat analysis
d. early stopping rules
e. Outline the role and basic principles of meta-analysis and systemic reviews.
f. Contrast the design and interpretation of cross-sectional case-control and cohort studies. xxii. Define the principles, calculate and interpret odds ratios and risk ratios
g. Define incidence, prevalence, mortality rates and standardised mortality rates

7. Integrated Approaches to Clinical transfusion

The resident has to learn and comprehend

i. Basic Principles in the management of patients requiring transfusion.

ii. Role of Hemotherapy Therapy in the management of various haematological diseases

iii. iii. Knowledge of setting up a transfusion care facility, including planning infrastructure, equipment and local/national laws governing and regulating them.

iv. Understand Preventive measures, including risk reduction strategies/management of donors and patients with high risk of reactions.

v. Preventive measures, Epidemiology, National Registry

- Prevalence and Incidence of haematological disorders, blood phenotypes locally, in India and the World.
- Population-based and Hospital-Based Donor Registries in India
- National Centre for Disease Informatics and Research (NCDIR)
- Social programmes available in the country and worldwide assist in early diagnosis, prevention, and treatment of such patients, including

rehabilitation.

- National Programme and policies blood, blood disorders, TTIs
- Hemovigilance program of India

Investigation with reporting

1. Review medical history, clinical information, and prior findings; consult with referring providers; evaluate clinical indications considering appropriate use criteria and perform or direct pre-procedure patient evaluation and education.
2. Select the appropriate investigating modality/modalities for a given clinical condition.
3. Demonstrate skill in starting intravenous lines, emergency management, and sampling for appropriate specimens.
4. Design or alter an existing protocol and acquire the results, demonstrate knowledge of dose and timing of administering blood components, decide on further views based on clinical suspicion and direct the further course of action.
5. Demonstrate leadership and teamwork in working with technicians for all activities of the blood centre.
6. Differentiate from technical errors/artefacts.
7. Correlate findings with other investigating modalities
8. Interpret the results and provide a differential diagnosis.
9. Provide a written report to guide diagnosis/patient management and recommend additional course of action/investigation or evaluation.
10. Discuss the procedure, findings, and interpretation in scientific discussion within and outside the department.
11. Demonstrate knowledge of the limitations and potential fallacies of an investigation.

Therapeutic services

1. Evaluate the patient for suitability, screen for contraindications specific to various procedures
2. Devise a patient specific plan and arrange logistics to execute it
3. Monitor the patient during procedure, provide relevant post procedural advice and the necessary follow up if any.

Quality control of equipment

1. Select the appropriate equipment for a given condition/situation
2. Demonstrate knowledge of the use management/maintenance and calibration of equipment
3. Demonstrate leadership and teamwork in working with technicians to run transfusion services
4. Discuss the procedure, findings, and interpretation in scientific discussion within and outside the department.
5. Demonstrate knowledge of the limitations and potential fallacies of various modalities.

Quality audit and regulatory guidelines

1. Review and analysis of a clinical case(s) or event(s), including associated data and outcomes, to evaluate the quality of healthcare delivery
2. Analysis of any gap in desired outcomes
3. Description of a plan (including necessary resources and processes) to improve the delivery of care
4. Description of an evaluation process to determine the potential effectiveness of the proposed plan
5. Demonstrate knowledge of Drugs and Cosmetic Act guidelines

Scholarship

1. Recognition of knowledge gaps and lacunae in current practice
2. Formulation of questions to address knowledge gaps and lacunae
3. Identification of sources of knowledge to answer the question
4. Interpretation and critique of evidence
5. Determination of validity and risk of bias in evidence
6. Application and potential integration of evidence into practice

7. Formulation of research study design to answer question
8. Execution of research protocol
9. Analysis and interpretation of research findings
10. Dissemination of research findings in a conference presentation
11. Dissemination of research findings in journal publication

Investigating and selecting tests and further courses for clinical scenarios

1. Demonstrate knowledge of the pathophysiology of the condition
2. Demonstrate knowledge of differential diagnoses and conditions to be investigated
3. Demonstrate knowledge of the potential and limitations of these investigations
4. Construction of management strategy for clinical scenarios

Patient emergencies

1. Demonstration of knowledge of signs and symptoms of acute emergencies
2. Demonstration of knowledge of doses of pharmacological agents to treat acute emergencies
3. Demonstrate judgment in the institution of life-saving procedures and drugs
4. Demonstrate the ability to mobilise resources appropriately
5. Communicate effectively with physicians and other health care professionals for further management of the patient

Teaching

1. Ensure patient safety during bedside teaching.
2. Collaboratively identify learner's needs and establish expectations between teaching and learner in bench side and bedside teaching.
3. Establish expectations between teacher and learner
4. Provide appropriate supervision, constructive feedback, and coaching during bench and bedside teaching
5. Efficient use of teaching moments
6. Use best practices instructional methods for large group teaching
7. Evaluate teaching session
8. Provide effective role modelling by the teacher

Annexure I (Part B)

Syllabus Content (Semester wise)

Subject-Specific Theoretical Competencies

1st Semester

Subject	Course content
Blood donation	Motivating factors for donation. Whole blood donation Vs apheresis donation. Types: allogeneic, autologous and directed. Donor questionnaire and interview: Eligibility and deferral Criteria. Donor reactions and their management.
Blood component preparation composition & storage	Basic steps in component preparation and labelling. Composition: volume, cellular, plasma and clotting factor content. Storage conditions for components.
Pre-transfusion testing	Patient specimen labelling requirements. Patient/component identification requirements. ABO / Rh, Crossmatch

Title	Content of training activities	Learning objective
Orientation	A brief orientation to the computer system, blood bank activities, teaching program, and research methodology	Be conversant with computer systems and the operation of blood bank activities.
Blood donation	Donor recruitment & motivation, Donor selection, counselling Phlebotomy, Post donation care of donor, Outdoor blood donation along with a senior.	Should be able to select the donor, perform phlebotomy with aseptic precautions, and manage donor reactions
Component preparation	Preparation of blood components. Storage and quality control	Should be able to understand factors affecting the quality of components
Pre-transfusion testing	Checking indications and dosage for blood components, emergent issues of blood	Should be able to resolve difficult & Complex cross-matching problems. Ensure appropriate and judicial use of blood and components
Transfusion Transmitted infection screening	Screening for various markers, such as HIV, HCV, HBsAg, Syphilis. Methodology such as Elisa, Spot, rapid	Should be able to understand blood screening principles and disposal of reactive units

2nd Semester

Subject	Course content
Blood groups	The biochemical structure of major blood group antigens Clinically significant blood group antibodies Properties and significance of naturally occurring Vs unexpected antibodies
Blood component preparation Composition & Storage	Storage Lesions
Pre-transfusion testing	Red cell antibody screen and identification
Transfusion Transmitted	Bacterial, parasitic, viral, prions Current risk and Prevention Strategies
Hemolytic disease of new born	Red blood cells, Platelets, Plasma/Cryoprecipitate, Pathophysiology. Causative blood group antibodies. Treatment & Prophylaxis

Title	Content of training activities	Learning objective
Immunohematology	ABO-Rh typing	
Blood donation		Demonstrate professionalism in interactions with prospective donors.
Component preparation	Product manipulation, such as Leucocyte removal or Irradiation. Storage and quality control	

Immunohematology	Diagnosis and transfusion support in AIHA, PNH Evaluation of transfusion reaction. Investigations in antenatal serology. evaluation of positive DAT	Should be able to interpret immuno haematological tests. Should be able to provide consultation to physicians regarding transfusion management
Pre-transfusion testing	Investigation of a problematic cross match, formal consultation on transfusion support in complex cases, emergent issues 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	Screening for various markers, such as HIV, HCV, HBsAg, Syphilis. Methodology such as Elisa, Spot, rapid	Should be able to understand blood screening principles and disposal of reactive units
Apheresis	Understand the process of various donor apheresis- platelets, plasma	Compare and contrast the eligibility requirements for allogeneic, autologous and apheresis blood donations

3rd Semester

Subject	**Course content**
Blood component preparation	Quality control standards
Composition & storage	Specialised blood components – Irradiated, volume reduced, CMV free, HLA matched.
Immune hemolytic anemia	Warm, Cold, Drug-induced hemolytic anemia Compatibility testing issues Special transfusion needs

Hemoglobinopathy	Classification, Pathophysiology, Diagnosis and Transfusion therapy
Autologous blood	Preoperative autologous deposit Perioperative blood salvage Acute normovolemic hemodilution
Clotting factor disorders	Principle of hemostasis & coagulation Lab tests of coagulation status Selection and dosage of factor preparations Management of patients with inhibitors
Transfusion reactions	Diagnosis, Pathophysiology, Treatment, Prevention

Title	Content of training activities	Learning objective
Immunohematology	Diagnosis and transfusion support in AIHA, PNH Evaluation of transfusion reaction. Investigations in antenatal serology. evaluation of positive DAT	Should be able to interpret immune haematological tests. Should be able to provide consultation to physicians regarding transfusion management
Component laboratory	Product manipulation, such as Leucocyte removal or Irradiation. Storage and quality control	Demonstrate knowledge of the transfusion requirements of special patient populations. (e.g., haematology/ oncology, paediatrics, thalassemia, transplantation, cardiac surgery and burn/trauma).
Apheresis	Understand the process of various donor apheresis- platelets, plasma	Compare and contrast the eligibility requirements for allogeneic, autologous and apheresis blood donations

Title	Content of training activities	Learning objective
Quality control/ records	Quality control of components, equipment, and reagents. Quality assurance. Development of documents, SOPs, Regulatory compliance	Should be able to understand Q.C. principles Recognise common management and regulatory issues, Identify management strategies
TTI including Microbiology	Basic culture methods, Sampling for blood culture, staining for bacteria Viral Culture and Serology	Serological methods - ELISA, RIA, PCR and other advanced methods for Transfusion Transmitted Infections- HIV, hepatitis B, hepatitis C, cytomegalovirus, bacterial/fungal/protozoal infections and syphilis, Proper disposal of biohazardous material as per recommended standards
Pre-transfusion	Demonstrate proficiency in transfusion of blood for intrauterine transfusion/exchange transfusion.	Choose appropriate blood components and derivatives based on a thorough knowledge of the indications for transfusion.

4th Semester

Subject	Course Content
Thrombocytopenia	Immune thrombocytopenic purpura Thrombotic thrombocytopenic purpura Post transfusion purpura Foetal and neonatal thrombocytopenia
Plasma derivatives	Basic Principles of preparation & composition Recombinant clotting and hematopoietic growth factors

Transfusion therapy in special patients	Hematology / Oncology Paediatric/neonatal Obstetrics, including intrauterine Cardiac surgery with CPB Burn patients and Trauma patients Transplantation: Stem cell / Bone marrow, Liver, Kidney
Massive transfusion	Metabolic complications Dilutional coagulopathy

Title	Content of training activities	Learning objective
Medical Oncology and BMT	Transfusion support in Oncology patients.	Bone marrow transplantation - Donor/patient evaluation and follow-up.
Hematopathology and haemostasis	Workup of haemolytic anaemias, Coagulation lab	Reading and reporting peripheral smears and bone marrow Basic Haematological techniques, complete hemogram including advanced haematology (Flow cytometry
Microbiology	Basic culture methods, Sampling for blood culture, staining for bacteria Viral Culture and Serology. ART - HIV- Guidelines for management. Approach to. Counselling in HIV, Approach to treating HIV (2 weeks)	Serological methods - ELISA, RIA, PCR and other advanced methods for transfusion. Transmitted Infections- HIV, hepatitis B, hepatitis C, cytomegalovirus, bacterial/fungal/protozoal infections and syphilis, Proper disposal of biohazardous material as per recommended standards."
Immunology Lab (Clinical)	IV IG therapy, Selection of cases and management of adverse reactions. Basic genetics	Diagnostic approach to primary immunological disorders. Investigations for genotyping. PCR, immunoassays. Microarray assays dot blot assays.
Anaesthesiology and critical care	Transfusion practices in O.T. & ICU, Cell salvage practices, autologous transfusion, central line access and maintenance	Intraoperative transfusion practices in CTVS, Heart-lung machine operation and Hemodynamics. Intubation and airway management
HLA Lab		For HLA Typing and molecular lab. Karyotyping
Nephrology	Transplantation Principles of Dialysis	Approach to Haemodialysis and transfusion management. Pre-transplant workup, donor selection and management.

Title	Content of training activities	Learning objective
NICU/PICU	Neonatal & Paediatric Transfusion practices	Exchange transfusion, management of HDN.
Clinical Hematology	Evaluation and management of various Red Cell disorders, Transfusion support for thalassemia, haemophilia Approach to a patient with Bleeding, evaluation and management	Hemotherapy for various medical and haematological disorders Ward rounds, B.M. aspiration
Emergency Medicine	BLS/ACLS	Fluid management and emergency resuscitation
Medical Gastroenterology	Infective hepatitis G.I. Bleeds	Evaluation and management of Viral Hepatitis

5th Semester

Subject	Course Content
Laboratory management	Quality assurance and quality control Equipment procurement Writing policies and procedures Blood inventory management Look back Maximal surgical blood order schedule Hospital transfusion committee
Stem Cell Collection & Processing	Donor preparative regimen Collection technique and complications Cell count targets and engraftment monitoring Processing and storage

Subject	Course Content
Platelet refractoriness	Recognition and evaluation Calculation of CCI and platelet recovery Principles of HLA typing and platelet cross-match Selection of appropriate platelet product
Neutropenia	Classification, aetiology and treatment Granulocyte transfusion

Title	Content of training activities	Learning objective
Quality control/ records	Quality control of components, equipment, and reagents. Quality assurance. Development of documents, SOPs, and Regulatory compliance	Should be able to understand Q.C. principles, Recognise common management and regulatory issues, identify management strategies
TTI	Understand the feasibility of NAT in Indian blood transfusion services. Demonstrate proficiency in the preparation and use of internal control in transfusion transmitted infection screening.	Compare and contrast various methodologies such as ELISA, rapid and chemiluminescence used in the screening of transfusion-transmitted infections
Component laboratory	Demonstrate understanding of the elements of current good manufacturing practices as they apply to collecting, processing, and storing all blood components/products.	Understand the process of plasma fractionation and summarise critical steps in preparation, such as pooling, viral inactivation,
Pre-transfusion testing	Compare and contrast conventional cross-matching versus type and screen using various advanced technologies such as gel, solid phase, and column agglutination.	Demonstrate the ability to perform blood utilisation reviews. Triage and screen requests for blood components appropriately during inventory shortages.
Apheresis	Demonstrate proficiency in the treatment of patients using specialised methods (e.g., Photopheresis and immunoadsorption columns).	Demonstrate proficiency in evaluating and treating adverse reactions associated with therapeutic apheresis

6th Semester

Subject	Course Content
	Drugs and Cosmetics Act of India
	Licensing requirements
Regulatory / accreditation agencies	National blood policy, ISO / NABH, GMP
	Inventory management
Transfusion alternatives	Synthetic and natural volume expanders
	Haemoglobin solution, Perfluoro chemicals, Fibrin glue, Haemostatic agent

Annexure 1 (Part C)

Learning Objectives -Peripheral Posting

Will be attended by Junior Residents in 3rd 4th and 5th Semester Total Duration- 6 Months

Background:

The residents will attend this peripheral only after they pass a test in a related theory exam conducted by the parent department. This will help them to achieve the objectives of this posting optimally. The opportunities for training in procedural skills in acute care have remained inadequate for the residents. Hence, it would be extremely beneficial for the residents to undergo training in a high-volume situation.
Residents should maintain a log of all the diagnostic and therapeutic procedures and prescriptions done in the posting.

Department	Expected Learning objectives
Clinical Haematology & Medicine	Evaluation and management of various Red Cell disorders, bleeding disorders, Transfusion support for thalassaemia, haemophilia
Pathology (Haematology)	Complete hemogram Work up of haemolytic anaemias; Reading peripheral smear Bone marrow aspiration Coagulation work up
Anaesthesiology & CCU	Intubation and air way management, Intra operative transfusion practices in surgery, CTVS, Heart lung machine operation and Hemodynamics, Transfusion support in transplant surgery
Emergency medicine	Fluid management and emergency resuscitation
Paediatrics & Neonatology	Exchange transfusion, management of HDN, PICU, NICU
Obst. & Gynaecology	Antenatal clinic for alloimmunised pregnancy - Evaluation and management, intrauterine transfusion, Menorrhagia and peripartal bleeding
Clinical Immunology	Diagnostic approach to primary immunological disorders, IV IG therapy, Management of adverse reactions, HLA typing, Isolation of lymphocytes, Application of flow cytometry, Immunofluorescence, Irradiation of Blood components
Nephrology	Approach to Haemodialysis and transfusion management, Pre transplant workup, donor selection and management
Medical Gastroenterology	Evaluation and management of Viral Hepatitis, GI Bleeds
Anatomy	Karyotyping
Microbiology	Bacterial culture, Grams staining, Special molecular techniques
ART & ICTC	Counselling in HIV, Approach to treating HIV
Medical Oncology	Transfusion support in Oncology patients-leukaemias and solid tumours and BMT

Annexure 2

Consolidate list of procedures to be performed
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 tests on appropriate specimens, grading and recording the results appropriately with the appropriate controls and "check cells". Perform troubleshooting in Antiglobulin testing by identifying sources of error in antiglobulin testing and resolving the errors in testing Perform antibody identification procedures by the use of 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-haematological tests, including: o Titration of Anti D, Anti A and Anti B o Elution o Adsorption o Minor blood group typing o Saliva Inhibition Test o Resolution of ABO discrepancy and interpret them Preparation of appropriate reagents required for the specialized tests performed in the Immunohematology lab, eg., o Reagents required for Elution testing, o Reagents required for DTT treatment, o 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 diagnosis 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 parasites. 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 the failure of QC. Conduct Apheresis procedures like plateletpheresis and plasmapheresis.
Haematology
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) anaemia, Haemolytic anaemia (Immune, Sickle Cell, Thalassemia, Microangiopathic), acute and chronic leukaemia, identification of Haemoparasites. 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 haemostasis, 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.

Annexure 3

Sample forms for observation/assessment

Student appraisal form for MD in Transfusion Medicine											
	Elements	**Less than satisfactory**			**Satisfactory**			**More than satisfactory**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Remarks**
1	**Scholastic aptitude and learning**										
1.1	Has knowledge appropriate for the level of training										
1.2	Participation and contribution to a learning activity (e.g., Journal Club, Seminars, CME, etc.)										
1.3	Conduct research and other scholarly activity assigned (e.g. Posters, publications, etc.)										
1.4	Documentation of acquisition of competence (e.g. Logbook)										
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 workspace										
2.3	Ability to work with other members of the team										
2.4	Participation and compliance with the quality improvement process in the work environment										
2.5	Ability to record and document work accurately and appropriately for the level of training										
	Professional attributes										
3.1	Responsibility and accountability										
3.2	Contribution to the growth of learning of the team										
3.3	Conduct that is ethically appropriate and respectful at all times										
Space for additional comments											

Workplace assessment form

Place of posting: UNIT 1 / 2 / 3 **Reporting time: on time/late**

Number of leaves taken: authorised: **Unauthorised**

absenteeism, if any Duration of posting: From ……. To …….

Sl. No	**Scores**	**0**	**1**	**2**	**3**
	Score 0- Not attempting to meet expectations **Score 1-** Attempting to, but yet to meet expectations **Score 2-** meets expectations **Score 3-** Proficient, independently exhibits responsibility and standards beyond minimum expectations				
1	**Clinical Work- Donor area** a. Takes history and does a physical examination b. Assesses status, evaluates risk, and selects for donation c. Interprets and properly documents available Investigations for general and additional Work-up d. Identifies and Manages – Emergencies. Identifies and manages donor reactions. e. Co-ordinates with counsellors, nursing officers, technicians, and colleagues to execute the whole procedure f. Takes a holistic approach to providing care to maintain and improve the quality of life for regular donors g. Performs the procedure under aseptic conditions ➢ Identify Emergencies from symptoms and signs, Clinical exams and investigations. ➢ Initiate timely management of Emergencies based on examination, critical lab values				
2	**Clinical Work- Apheresis** a. Creates customised plans for donors to monitor and manage the procedures b. Defines frequency of visits c. Plan examination and investigation strategies during each visit d. Discusses with Primary physician in case of specific products or modifications e. Documents, informs and manages procedure-related complications, if any f. Performs the procedure under aseptic conditions g. Provides written informed consent h. Coordinates with residents from requesting departments for pre-treatment i. Creates Management plan – ● Identifies Intent and Indication for procedure ● Select the type of technique and preparative regimen ● Plans dose and schedule of collection and follow-up				

	● Prescribes and provide Symptomatic and requisite care ● Requests for appropriate investigations, prophylaxis and check-ups prior to administration/ initiation of any medication/ treatment ● Assigns appointments for administration/initiation of treatment				
3	**Clinical Work- Bedside Consultations** Discusses with seniors - findings, reports, and images and create a plan for further management ● Attends calls for transfusion reaction and prepares reports based on patient-reported signs/symptoms, Physical Examination, and Lab/Image Investigations. ● Prescribes appropriate management protocol ● Does transfusion dose modification based on renal/hepatic/other dysfunction ● Identifies and timely manage Critical lab values ● Prescribes Growth factors, transfusion, and haematinics based on lab values ● Prescribes post-reaction regimens and gives instructions ● Requests for investigations for response assessment and consults with primary physician and allied departments for further management ● Identifies reactions and other side effects based on Hemovigilance criteria and manages appropriately. ● Monitors patients during further treatment in association with the referring unit for optimal care. ● Assesses treatment response with patient-reported symptoms/signs, clinical examination and appropriate lab/imaging investigations at appropriate post-treatment interval				
4	**Clinical Work- Therapeutic** **Treatment response assessment and plan-** a. Takes history and does Physical Examination b. Performs the procedure under aseptic conditions c. Prescribes treatment based on examination, lab values and imaging d. Provides written informed consent e. Consult or send necessary referrals f. Maintains Monitoring charts for specific conditions g. Requests for appropriate investigations h. Monitors daily progress of patients and co-ordinates with ward team i. Monitors patients and prescribes post-treatment medication j. Gives instructions and appointment to patient for next visit/review k. Coordinates with Nursing, Primary Physician and Ward team l. Gives appointment for interim, pre-procedural investigations and next scheduled cycle				

5	**Laboratory Work- Immunohematology** a. Assess the requests for completeness, assign the tests to be performed by automated methods/technicians, and triage those needing further workup. b. Manages immunohematology laboratory with regard to stock, preparation and dispensing of reports c. Timely prescribes appropriate management in the wake of reports and schedules further tests.				
6	**Laboratory Work- TTI laboratory** a. Checks and enrols samples for appropriate testing b. Compares, validates, and documents findings and performs troubleshooting c. Check eligibility for further testing/confirmation if any d. Follows protocol for handling reactive samples, QC samples e. Ensures documentation				
7	**Laboratory Work- Components and QC** a. Identifies needs/requirements b. Import instructions from the donor area and inventory management resident c. Discusses with seniors about the plan and execution d. Follows specific SOPs and protocols e. Documentation and QC f. Coordinates and monitors TTIs testing and shifting products to inventory				
8	**Patient blood management and pre-transfusion testing** a. Identifies Indication, Intent of transfusion b. Triage patients based on need, urgency and critical findings c. Assign strategy for pre-transfusion testing and modification of components if any dosage for optimal transfusion. d. Evaluate plans and select the optimal plan for execution e. Gives written/printed/online instructions to referring units and the pre-transfusion technical officers f. Prescribes treatment and monitors patient at regular intervals for timely addressing needs based on disease progression/ tolerance g. Ensures Quality in every process				
9	**Research and Departmental projects** ➢ Identifies and Enrols participants and caretakers in decision-making				
10	**Attends and participates in Multi-disciplinary Clinics**				

11	**Displays adequacy of literature search and justifies rationale for management and surveillance**				
12	**Maintains Meticulousness and Comprehensiveness of Records- in** ➢ File and Digital data management				
13	**Communication with patient and caretaker** ➢ Explain and Counsel patients in terms of disease status, treatment options, expected benefits and side-effects of treatment, prognosis, need for further regular or SOS investigations, enrols in shared decision-making, discuss strategies to prevent, monitor and report for acute and late adverse events and effects, importance of treatment compliance.				
14	**Team-based work and Leadership** ➢ Coordinates with Seniors and Colleagues ➢ **Shows interest in teaching juniors**				
15	**Accepts feedback, self-reflects and demonstrates a willingness to change.**				
16	**Total marks (Either percentage or grades)**				