College of Physicians and Surgeons of Mumbai

Syllabus for CPS-PG-Course

DTM - DIPLOMA IN TRANSFUSION MEDICINE

College of Physicians and Surgeons of Mumbai

CPS House, Dr. E. Borges Marg, Parel, Mumbai – 400012.

DTM - DIPLOMA IN TRANSFUSION MEDICINE

GOAL

The goal of postgraduate medical education in Immunohaematology & Blood Transfusion, shall be to produce competent specialist.

i. 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;
ii. Who shall have mastered most of the competencies, retaining to the speciality that arerequiredtobepracticedatthesecondaryandtertiarylevelsofthehealthcaredelivery system.
iii. Who shall be aware of contemporary advances and developments in the discipline of IH (Immuno-haematology) & BT (Blood Transfusion).
iv. Who shall have acquired a spirit of scientific inquiry and oriented to the principles of research methodology and epidemiology.
v. Who shall have acquired the basic skills in teaching of the medical and paramedical professionals.
vi. Organize health teams / transfusion camps to provide care during natural or man-madeCalamities.

OBJECTIVES

At the end of the course a candidate must be able to-

(i) Understand and explain about the scientific basis of blood transfusion.
(ii) Understand the processes of blood collection, processing and component preparation.
(iii) Understand and explain the basis of pre transfusion testing.
(iv) Should be able to explain and diagnose the adverse effects of blood transfusion.
(v) Should be able to perform apheresis technique independently.
(vi) Should be able to carry out the antenatal and neonatal transfusion practice.
(vii) Should be able to plan, perform and report specific research projects.
(viii) Should be able to give advice on haemotherapy including stem cell transplantation and solve the immunohaematological discrepancies in blood transfusion.

COURSE DESCRIPTION

Eligibility:A candidate should possess MBBS degree/ equivalent degree as per provisions of Indian Medical Council Act.

Duration :2 Years

The aim of this course is to train the students of Medicine in the field of Immunohaematology & Blood Transfusion. Knowledge and practical skills shall be acquired by the candidates in the field.

TRAINING PROGRAM:

The candidates joining the course must work as full time residents during the whole period of their post-graduate training. They will be required to attend a minimum of 80% of training period. Candidate shall be given full time responsibility and assignments and their participation in all facets of the educational process assured. Post-graduate students must maintain a record book of the work carried out by them and the training undergone by them during the period of training. These record books shall be checked and assessed by the faculty.

TEACHING /LEARNING METHODS:

Learning in DTM. (Immunohaematology & Blood Transfusion) will essentially be self- learning.
Following teaching-learning methods shall be followed-

Group teaching sessions:

Journal review
Subject seminar presentation
Group discussion
Clinical case presentations pertaining to transfusion therapy.
Presentation of the findings of an exercise on any of the sub-specialties
Participation in CME programs and conferences

Hands on experience (practical training)

Practical training shall be imparted by posting the students in various sub-specialties (sections) as detailed in the intrinsic and extrinsic rotation. Student shall be actively

involvedindaytodayworkingofallthesections.He/shewillbetrainedundertheguidance of teachers in all the aspects of practice of transfusion therapy and basic blood banking techniques including blood collection, processing, storage of blood products, component preparation, pre-transfusion testing, apheresis, screening of blood products and haemotherapy, including stem cell transplantation.

Suggested schedule of rotation:

Intrinsic rotation:

The candidates will be rotated through various sections of the department as under:

A) Blood donor management **4 months**

Donor recruitment & motivation; Blood donor selection;
Phlebotomy; Post- donation care of donor; Outdoor blood donation camps

B) Component preparation, Aphereis & Quality Management **4 months**

Preparation of various blood components PRBC, FFP, PC, Cryo, Leuco – poor Irradiation of blood components; Storage & quality control; Apheresis - Donor apheresis; Therapeutic plasma exchange

C) Transfusion transmitted infection screening **3 months**

Screening of various markers - HIV, HCV, HBsAg, Syphilis; Methodology - ELISA, Spot, Rapid, Automated analyzer, Molecular techniques

D) Immunohematology **4 months**

Diagnosis & Transfusion support in AIHA; PNH; Transfusion reaction; Antenatal serology; Multi – transfused patients Secretor status; Minor red cell antigen typing; Antibody screening

E) Pre transfusion testing & Cross matching **3 months**

ABO grouping & Rh typing Du testing, genotyping; Irregular antibody screening & identification Cross – matching

F) Quality control / computers/records **1month**

Total :- **19 months**

Training in allied departments :

A) Dept of Pathology(Haematology division) **1month**

Complete haemogram; Reading of peripheral smear; Coagulation work up

B) Dept of Virology & Microbiology **1month**

Bacterial culture; Grams staining; CD4 / CD8 counts;
Special molecular techniques

C) Dept. of Clinical Haematology **1month**

D) Dept. of Anesthesiology **1month**

Intra-operative haemodilution; Operation of cell saver;
Intra operative transfusion

E) Institute of Immunohaematology, Mumbai & National Plasma Fractionation Centre, Mumbai

1month

HLA typing; Immunophenotyping including flowcytometry,Immunofluoresence;
Fractionation Advanced Serology

Total :- **5 months**

GRANDTOTAL: **24months**

Emergency duty:

Student shall be posted for managing emergency transfusion services in the department. He/she will deal with all the emergency investigations in transfusion medicine.

Teaching experience:

Student shall be actively involved in the teaching of undergraduate students / paramedical staff. He/she will be trained in teaching methods and use of audiovisual aids.

Syllabus

BROAD AREAS OF STUDY

I. HISTORY OF TRANSFUSION MEDICINE

- Scientific landmarks in itsdevelopment
- Impact of world wars on itsdevelopment
- Development of PVCbags

I. SCIENTIFIC BASIS OF TRANSFUSION

A. Biochemistry & Physiology of elements ofblood

(i) Process of cell production and lifespan:

- Red cells
- White blood cells
- Platelets

(ii) Redcells:

- Haemoglobin structure & function
- Metabolic pathways
- Membrane structure & function

(iii) Whitecells:

Structure, function &kinetics

(iv) Platelets

Structure, function & kinetics

(v) Physiology ofHaemostasis:

- Role of platelets
- Coagulation pathways
- Fibrinolysis

(vi) Hemodynamics of blood flow & volume:

(vii) Iron metabolism:

(viii) Bilirubin metabolism:

B. Immunology

(i) Principles of BasicImmunology

- Antigen, Antibody, Complement, Immunoglobulin
- Antigen/antibody reaction
- Lymphocytes in Humoral & Cellular immunity

(ii) Role of Hybridoma technology in Immunology

(iii) Immunology of transplantation

(iv) HLA & genetic control of immune response

C. Genetics

(i) Principles of basic genetics

(ii) Genetics of Bloodgroups

- Phenotypes & genotypes
- Principles of blood group inheritance
- Population genetics of blood groups

III . ANTIGEN SYSTEMS IN FORMED ELEMENTS OFBLOOD

- Red cell antigens
- Leucocyte antigens
- Platelet antigens

IV BLOOD COLLECTION, PROCESSING, COMPONENTPREPARATION

A. Management of blooddonation

(i) Donor recruitment:

- Voluntary blood donation system
- Categories of blood donors
- Education & awareness of prospective donors
- Acceptability **criteria of blood donor**:

(ii) Care of blooddonors:

- Pre-donation
- Mid-donation
- Post-donation
- Prevention & management of complications of blood donation

(iii) **Blood collection**:

- .Anticoagulants & preservatives
- Procedure
- Blood donation camps

B. BloodComponents

(i) **Components:**

- Types
- Methods of preparation
- Indications, dosage & administration
- Leuco-depletion
- Various Methods
- Quality Control

(ii) Storage of blood & components:

- Whole blood
- Red cell concentrate
- Plasma
- Granulocyte
- Cryoprecipitate
- Stem cells
- Peripheral blood stem cells
- Cord blood stem cells

(iii) Plasma fractionation:

V PRE-TRANSFUSION TESTING

C. Compatibilitytesting:

- ABO grouping & Rh typing

- Antibody screening
- Methods of cross matching
- Newer methods of cross matching
- Solid phase
- Gel technology

B. **Screening for Transfusion Transmitted Infections**:

- Methodology
- Nucleic acid amplification techniques
- Newer emerging pathogens
- Prions
- C J disease
- Lyme disease
- Others

C. Selection of blood, components & plasma products for transfusion:

VI ADVERSE EFFECTS OF BLOOD TRANSFUSION

A. Clinical presentation, pathophysiology, investigations, management:

- Hemolytic transfusionreactions
- Non hemolytic transfusionReactions

B. Transfusion Transmitted Infections:

C. Transfusion Associated- Graft versus Host Disease(TA-GVHD):

D. Transfusion Related Acute Lung Injury (TRALI):

E. Others:

- Haemosiderosis
- Volumeoverload

VII APHERESIS

A. **Technology of apheresis and various machines:**

B. **Haemapheresis (platelets, granulocytes, plasma):**

- Donor selection
- Procedure
- Complications

C. Therapeuticapheresis:

- Indications, procedure & Complications

- Plasma exchange, red cell Exchange
- Newer methods of Immuno-adsorption

VIII AUTOLOGOUSTRANSFUSION

Basic principles, indications, contra-indications:

- Pre-deposit
- Haemodilution
- Intra-operative blood salvage including equipments
- Directed donation

IX ANTENATAL & NEONATAL TRANSFUSIONPRACTICE

A. **Pathophysiology, diagnosis & management:**

- Rh - incompatibility
- ABO & other blood groupincompatibility

B. **Exchange transfusion**:

- Indications, methodology &complications
- Intrauterinetransfusion

C. **Neonatal transfusion practice**:

X IMMUNO-HEMATOLOGY

A. Classification, diagnosis and management:

- Immune haemolyticanaemia
- Immunethrombocytopenia
- Immuneneutropenia

B. **Immuno-haematological problems in multi-transfused patients:**

XI HEMOTHERAPY

A. **Pathophysiology, diagnosis and management of anaemia**:

- Anaemia
- Iron deficiencyanaemia
- Megaloblasticanaemia
- Aplasticanaemia

- Haemolytic anaemia including fragmentationsyndrome
- Anaemia of chronic diseases – liver disease, uremia, thyroiddisease

B. **Haemoglobinopathies**:

- Thalassaemia
- Sickle cell anaemia
- Other haemoglobinopathies

C. **Pathophysiology, diagnosis and management of haemostatic disorders:**

- Haemophilia
- Von Willebrand'sdisease
- Plateletdisorders
    - Qualitativedisorders
    - Quantitativedisorders
- DIC

D. **Pathophysiology, diagnosis and transfusion support in acute blood loss:**

- Shock
- Massivetransfusion

E. **Transfusion support in cardiac surgery:**

F. **Classification & transfusion support inOncology:**

- Leukaemia
- Lymphoma
- Marrow failure

XII TRANSPLANTATION

A. Transfusion support in transplantation:

- Peripheral blood stem cell transplantation:
- Harvesting
- Cryopreservation
- CD-34 counting

B. Bone marrowtransplantation:

- Processing
- Harvesting
- Immuno-haematological problems in ABO mis-matched BMT

C. Transfusion support in specializedconditions:

- Renal transplantation
- Liver transplantation
- Umbilical cord blood transplantation
- Collection
- Processing
- HLA typing & cross- matching

D. Irradiation of blood products

E. Indications, dosage, adverse effects

F. Tissue banking

XIII BLOOD SUBSTITUTE & HEMOOOIETICAGENTS

- Crystalloids & colloids
- Oxygen carrying compounds
- Haemopoietic growth factors
- Albumin

XIV MEDICOLEGAL CONSIDERATIONS INTRANSFUSION

- Ethical & legal considerations pertaining to transfusion practice
- Identification of blood stains
- Paternity testing
- Donor notification and counselling
- Look back programme
- Drugs & Cosmetics act, Accreditation

XV TOTAL QUALITYMANAGEMENT

A. Development of Standard Operating Procedures (SOP) manual:

B. Quality control:

- Reagents
- Instruments
- Personnel
- Blood & Components

C. **Quality assurance:**

- Internal quality control
- External quality control

D. **Medical audit:**

E. **Hospital transfusion committee:**

F. **Good manufacturing practice (GMP):**

G. Turn-around time:

H. **ISO 9000:**

XVI ORGANISATION & MANAGEMENT OF TRANSFUSIONSERVICES

A. **Organisation & function of blood services & hospital transfusion practice:**

- Donor recruitment & motivation
- Operation of blood mobile units
- Development of transfusion services
- Inventory control
- Development of forms, labels, records etc.
- Reports & Returns

B. **National Blood Transfusion Policy**:

XVIIBLOOD SAFETY

- Sterilization
- Disposal of bio-hazardous material

XVIII MODERN BIOLOGICALTECHNIQUES

- Principles, methods, relevance in transfusion medicine
- Western blot
- Polymerase chain reaction
- SSCP
- SSOP
- Dot blot hybridization

XIX AUTOMATION &COMPUTERIZATION

- Automated blood grouping & processing
- Instrumentation & use of bar codes

- Use of computers in blood banking including Implementation of blood banking software

EVALUATION SYSTEM

A. LOG BOOK (Workdiary)

The post-graduate students should include all their activites in the log book. The annual assessment based on the work diary shall be done by the guide, teacher in-charge of post-graduate teaching programme and HOD.

B. EXAMINATION

The examination will comprise of theory and practical. To be eligible to be declared as successful in the examination it is compulsory for the candidate to pass in theory and practical examination separately in the same attempt.

I) THEORY EXAMINATION: (TOTAL 300Marks)

a) PAPER – I (Duration – 3 hours)100marks

Topics covered: General and Basic Immuno-haematology and Blood Transfusion including History of Transfusion Medicine and Scientific basis of Transfusion.

b) PAPER – II (Duration – 3 hours)100marks

Topicscovered: SystemicImmuno-haematologyandBloodTransfusionincludingAntigen systems, Blood collection/processing/Component preparation, Pre-Transfusion testing, Adverse effects of Blood Transfusion, Apheresis, Autologous Transfusion, Ante-natal and Neonatal Transfusion practice, Immuno-haematology, Haemotherapy, Medicolegal Considerations in Transfusion Medicine, Organisation and Management of Transfusion Services, BloodSafety.

c) PAPER – III (Duration – 3 hours)100marks

Topics covered: Newer concepts of Immuno-haematology and Blood Transfusion including Stem cell Transplantation, Blood Substitutes & Haemopoietic agents, Total Quality Management, Modern Biological techniques and Automation & Computerisation. Recent advances in Immuno-haematology and Blood Transfusion.

DTM : DIPLOMA IN TRANSFUSION MEDICINE

EXAMINATION PATTERN

Theory Examination:

PAPER I	PAPER II	PAPER III
General and Basic Immuno-haematology and Blood Transfusion including History of Transfusion Medicine and Scientific basis of Transfusion	Systemic Immuno-haematology and Blood Transfusion including Antigen systems, Blood collection/processing/Component preparation, Pre-Transfusion testing, Adverse effects of Blood Transfusion, Apheresis, Autologous Transfusion, Ante-natal and Neonatal Transfusion practice, Immuno-haematology Haemotherapy, Medicolegal Considerations in Transfusion Medicine, Organisation and Management of Transfusion Services, Blood Safety	Newer concepts of Immuno-haematology and Blood Transfusion including Stem cell Transplantation, Blood Substitutes & Haemopoietic agents, Total Quality Management, Modern Biological techniques and Automation & Computerisation. Recent advances in Immuno-haematology and Blood Transfusion.
Section I	**Section I**	**Section I**
Q.1. 10 Marks Q.2. 10 Marks Q.3. 10 Marks Q.4. 10 Marks Q.5. 10 Marks **Total 50 Marks**	Q.1. 10 Marks Q.2. 10 Marks Q.3. 10 Marks Q.4. 10 Marks Q.5. 10 Marks **Total 50 Marks**	Q.1. 10 Marks Q.2. 10 Marks Q.3. 10 Marks Q.4. 10 Marks Q.5. 10 Marks **Total 50 Marks**
Section II	**Section II**	**Section II**
Q.6. 10 Marks Q.7. 10 Marks Q.8. 10 Marks Q.9. 10 Marks Q.10. 10 Marks **Total 50 Marks**	Q.6. 10 Marks Q.7. 10 Marks Q.8. 10 Marks Q.9. 10 Marks Q.10. 10 Marks **Total 50 Marks**	Q.6. 10 Marks Q.7. 10 Marks Q.8. 10 Marks Q.9. 10 Marks Q.10. 10 Marks **Total 50 Marks**
Section I + II = 100	Section I + II = 100 Marks	Section I + II = 100
Total Theory = 300 Marks, Passing = 150 (i.e. 50 %) Marks aggregate in Theory		

II) PRACTICAL EXAMINATION: (Total 200Marks)

Duration – 2 days (if candidates are more than 6, then the days of practical examination should be increased proportionately)

1st DAY

1. Long Immuno-haematology exercise: (One) – Total 50marks

Shall include following.

Antenatal serology, Allo-antibody & Auto-antibnody detection & identification, Transfusion reaction work-up, Massive transfusion and their management; This will be followed by viva-voce.

2. Short exercises (Two of 20 marks each) – Total 40marks

Shall consist of the following:

a) Operation of Blood Transfusion Services (Donor management, inventory, apheresis, Transfusion Transmitted InfectionsScreening)

b) Short exercise (Reagents, Blood group discrepancy, Component Preparation, Quality Control); Both the exercises will be followed byviva-voce.

3. Clinical discussion (Two of 15 marks each): Total 30marks

Haemotherapy exercises

2 nd DAY

1. Short exercises (total 2) – Total 30marks

consisting of:

a) Basic haematology – Hb, Hct, Platelet count, PBS examination, WBCCount, BT/CT, PT/APTTetc.

b) Specialized techniques – component preparation, stem cell isolation, preservation, automationetc.

Both exercises will be followed by viva-voce.

2. SPOTS – Total 20marks

3. Grand Viva– Total 30marks

Student will be examined by all the examiners together, about students' subject knowledge, comprehension , analytical approach , expression and interpretation of data.

lll) INTERNAL ASSESSMENT OF THECANDIDATE

Periodic internal assessment of the candidate by the department.

Final marking scheme for DTM examination

Heads of Passing	**Maximum Marks**	**Minimum marks for**
Theory	300	150
Practical and viva-voce	200	100
Total marks	500	250

Student's Record Book

DTM (Transfusion Medicine)

DEPARTMENT OF PATHOLOGY

Name of the Student: Dr._____

Name of the Institute & Address:

_____

_____

_____

ABOUT THE LOG BOOK:

The log book has been prepared to maintain a record of academic and service activities of post-graduates and to provide an account of progress made by him/her. Maintenance of such log books will also allow a review of training programme and incorporation of improvements in the programme. Postgraduates are required to carry the log book and get the entries made regularly. Faculty is requested to countersign. Log books have to be submitted to the head of the department before submitting the final examination form.

Books:

1. Mollison P.L, Blood transfusion in clinical medicine, published by Oxford, ELBS & Blackwell Scientific Publication.
2. Saran R.K., Transfusion medicine technical manual, published by WHO.
3. Jeffrey McCullough, Transfusion Medicine, published by McGraw-Hill Professional
4. Paul D. Mintz, Transfusion Therapy: Clinical Principles and Practice, published by AABB.
5. Christopher D. Hillyer, Leslie E. Silberstein, Paul M. Ness, Blood Banking and Transfusion Medicine: Basic Principles and Practice, published by ChurchillLivingstone.
6. SallyV.Rudmann,TextbookofBloodBankingandTransfusionMedicine,publishedby Saunders.
7. DeniseM,Harmening,ModernBloodBankingandTransfusionPractices,publishedby JaypeeBrothers.
8. Mary Louise Turgeon, Fundamentals of Immunohematology, Theroy and Technique, published by Williams & Wilkins.
9. Lawrence D. Petx, Scott N. Swisher, steven Kleinman,et al. Clinical Practice of Transfusion Medicine, published by Churchill Livingstone.
10. Technical manual of American Association of Blood Banks, published by AABB.
11. Michael F. Murphy, Derwood H, Pamphilion, Practical Transfusion Medicine, published by Blackwell Publishing.
12. Bruce D. Spiess, Richard K. Spence, Aryeh Shander, Perioperative Transfusion Medicine, published by lIppincott Williams & Wilkins.
13. Robert M. Winslow, Blood Substitutes. Published by Academic Press.
14. Kerry Atkinson, Richard Champlin, Jerome Ritz, Willem E. Fibbe, et al. Clinical Bone marrow and Blood stem cell transplantation, published by Cambridge University Press.
15. Hal E. Broxmeyer, Cellular Characteristics of Cord Blood and Cord Blood Transplantation, publishsed by AABB Press.
16. Harold B. Anstall, Paul M. Urie, A manual of Hemotherapy, published by John Wiley & Sons.
17. A.B.Dutta, Blood Banking and Transfusion, published by CBS Publishers & distributors.
18. Gundu HR Rao, Ted Eastlund, Latha Jagannathan, Handblook of Blood Banking & Transfusion Medicine, published by Jaypee Brothers.
19. Toby L Simon, Walter N Dzik, Edward L Snyder et al. Rossi's Principles of Transfusion Medicine, published by Lippincott Williams & Wilkins.
20. The clinical Use of Blood Handbook, Published by WHO.
21. Eva D Quinley, Immunohematology: Principles and Practice, published by Lippincott

Williams & Wilkins.

22. Mark E. Brecher, Larry C. Lasky, Linda A. Issitt, Hematopoietic Progenitor Cells: Processing, Standards and Practice, published by S Karger Pub.

Journals:

1. Transfusion, published by Blackwell Synergy.
2. Vox Sanguinis, published by Blackwell Synergy.
3. Transfusion Medicine, published by BlackwellPublishing.
4. Stem Cells, published by AlphaMedPress.
5. Immunohematology, published by American RedCross.
6. Current Issues in Transfusion Medicine, published by The University of Texas M. D. Anderson Cancer Center.
7. Journal of Clinical Apheresis, published by WileyInter-Science.
8. Bone marrow transplantation, published by Nature publishinggroup.
9. Blood, published by American Society ofHaematology

PERSONAL BIO-DATA

Name of the Student:

_____

Date of joining:

_____

Probable date of appearing for Examination:

_____

Date of Birth:

_____

M.B.B.Sfrom:

_____

Year ofpassingMBBS:

_____

Name of the State MedicalCouncil:

_____

Registration No.withdate:

_____

Permanent Address:

_____

_____

PIN: _____

Phone No. _____, _____

LocalGuardian'sAddress :

_____

_____

PIN: _____

Phone No. : _____, _____

POSTING SCHEDULE:

SECTION	MONTH & YEAR		REMARKS	SIGNATURE OF SECTION I/C
	From…	To…..		
Blood Donation Centre				
Component laboratory				
Immuno-haematology laboratory				
Screening laboratory				
Blood Bank				
Quality control / Computers / Records				
Dept of Pathology				
Dept of Microbiology				

ATTENDANCE AT P.G. TEACHING SESSIONS:

Month &Year	No. of TeachingProgrammes held	No. of TeachingProgrammes attended	Remarks	Signature of P.G. Teaching I/C

PARTICIPATION IN P.G. TEACHING ACTIVITY :

Subject Seminars presented:

Date	Topic	Remarks	Signature of faculty

Journal Articles presented:

Date	Topic	Remarks	Signature of faculty

Group discussion of clinical cases:

Date	Topic	Remarks	Signature of faculty

Seminars presented/participated:

Date	Topic	Remarks	Signature of faculty

SCIENTIFIC CONTRIBUTIONS

CME/ Workshops attended:

Sr. No.	Name of CME/ Workshop	Held at	Dates

Conferences attended:

Sr. No.	Name of Conference	Paper presented Yes/No	If yes, title of paper

Publications:

1. _____
2. _____

Awards:

_____

_____

CERTIFICATE

This is to certify that

Dr. …….

has completed the tenure for D.T.M. satisfactorily.

P.G.Teacher. **P.G.Teaching** **Professor &Head.**
Programme Incharge **Department of Immunohaematology**