Curriculum for DNB (Immunohematology and Transfusion medicine)

I. HISTORY OF TRANSFUSION MEDICINE

Scientific landmarks in its development

Impact of world wars on its development

Development of PVC bags.

II. SCIENTIFIC BASIS OF TRANSFUSION

A. Biochemistry & physiology of elements of blood

2.0 Process of cell production and life span

- 2.1 red cells
- 2.2 white blood cells
- 2.3 platelets

3.0 Red cells

- 3.1 Hemoglobin structure & function
- 3.2 Metabolic pathways
- 3.3 Membrane structure & function

4.0 White cells

- 4.1 Structure, function & kinetics

5.0 Platelets

- 5.1 Structure, function & kinetics

6.0 Physiology of hemostasis

- 6.1 Role of platelets
- 6.2 Coagulation pathways
- 6.3 Fibrinolysis

7.0 Hemodynamics of blood flow & volume

8.0 Iron metabolism

9.0 Bilirubin metabolism

B. IMMUNOLOGY

10. Principles of basic immunology
    Antigen, antibody, complement, immunoglobin
    Antigen antibody reaction
    Lymphocytes in humoral & cellular immunity

11. Role fof hybridoma technology in immunohaematology

12. Immunology of transplantation

13. HLA and genetic control of immune response

C. GENETICS

14. Principles of basic genetics

15. Genetics of blood groups
    Phenotype & genotype
    Principles of blood group inheritance
    Population genetics of blood groups

III. ANTIGEN SYSTEMS IN FORMED ELEMENTS OF BLOOD

16. Red cell antigens

17. Leucocyte antigens

18. Platelet antigens

IV. BLOOD COLLECTION, PROCESSING, COMPONENT PREPARATION

A. Management of blood donation

19. Donor recruitment
    Voluntary blood donation systems

Categories of blood donors
Education, awareness & information of prospective donor
Use of Information Technology for donor recruitment
Donor information programmes

20. Acceptability criteria of blood donor
21. Care of blood donor
Pre donation
Mid donation
Post donation
Prevention & management of complications of blood donation

22. Blood collection
Anticoagulants & preservatives
Procedure
Blood donation camps

B. Blood components
23. Components
Types
Methods of preparation
Indications, dosage & administration
Leucodepletion
Various methods
Quality control

24. Storage of blood & components
Whole blood
Red cell concentrate
Plasma
Granulocyte

Cryoprecipitate

Stem cells

peripheral blood stem cell

cord blood

dendritic cell

25. Plasma fractionation

Viral inactivation

Single donor

Pooling

Newer methods

V. PRE-TRANSFUSION TESTING

26. Compatibility testing

26.1 ABO grouping & Rh typing

26.2 Antibody screening

26.3 Cross matching methods

26.4 Newer methods of cross matching

26.4.1 Solid phase

26.4.2 gel technology

27. Screening for transfusion transmitted infections

27.1 Methodology

27.2 Nucleic acid amplification techniques

27.3 Newer emerging pathogens

27.3.1 Prions

27.3.2 CJ disease

27.3.3 Lyme disease

27.3.4 Others

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

VI. ADVERSE EFFECTS OF BLOOD TRANSFUSION

29. Clinical presentation, pathophysiology, investigations, management
    Hemolytic transfusion reaction
    Non- Hemolytic transfusion reaction
30. Transfusion transmitted infections
    Bacterial
    Viral
    Parasitic
31. Transfusion associated graft versus host disease
32. Transfusion related acute lung injury
33. Others
    Hemosiderosis
    Volume overload

VII. APHERESIS

34. Technology of apheresis, various equipment & disposables
35. Hemapheresis (platelets, granulocytes, plasma, stem cells)
    Donor selection
    Procedure
    Complications
36. Therapeutic apheresis
    Indication, procedure & complications
    Plasma exchange, red cell exchange
    Newer methods for immunoadsorption.

VIII. AUTOLOGUOS TRANSFUSION

37. Basic principles, indication & contra indications
    Pre deposit
    Hemodilution
    Intra operative blood salvage including equipment
    Directed donation

IX. ANTENATAL AND NEONATAL TRANSFUSION PRACTISE

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

X. IMMUNOHAEMATOLOGY

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

XI. HEMOTHERAPY

43. Pathophysiology, diagnosis & management of anemia
    - Anemia
        - Iron deficiency anemia
        - Megaloblastic anemia
        - Aplastic anemia
        - Anemia of chronic diseases
        - Neonatal anemia
    - Hereditary anemia
        - Thalassaemia
        - Sickle cell anemia
        - Enzymopathy

Others

44. Pathophysiology, diagnosis and management of hemostatic disorders
    Hemophilia
    Von Willebrand disease
    Platelet disorders
        Qualitative disorders
        Quantitative disorders
    DIC
    Acquired disorders
    Others
45. Pathophysiology, diagnosis and transfusion support in acute blood loss
    Shock
    Massive transfusion
46. Transfusion support in surgery
    General surgery
    Specialised surgery – Cardiopulmonary bypass
47. Classification, diagnosis & transfusion support in oncology
    Hemopoietic malignancy
    Non-hemopoietic malignancy

XII. TRANSPLANTATION

48. Transfusion support in transplantation
    Stem cell transplantation
        Harvesting
        Cryopreservation
        CD34 counting & quality control
    Bone marrow transplantation
        Harvesting
        Processing

Immunohaematological problems in ABO mismatched BMT

Transfusion support specialized conditions

Renal transplantation

Liver transplantation

Others

49. Irradiation of blood products

Indications, dosage, adverse effects

50. Tissue banking

XIII. BLOOD SUBSTITUTES AND HEMOPOIETIC AGENTS

51. Crystalloids & colloids
52. Oxygen carrying compounds
53. Use of hematinics
54. Hemopoietic growth factors
55. Plasma products

XIV. MEDICOLEGAL CONSIDERATIONS IN TRANSFUSION MEDICINE

56. Ethical and legal considerations pertaining to transfusion practice
57. Identification of blood stains
58. Paternity testing
59. Donor notification & counseling
60. Look back programme
61. Drugs & Cosmetics Act, Accreditation
62. Consumer protection Act
63. Others

XV. TOTAL QUALITY MANAGEMENT

64. Development of Standard Operating Procedures (SOP) manual.
65. Quality control

Reagents & diagnostic kits

Instruments

Personnel

Blood & components

66. Quality assurance

Internal quality control

External quality control

Proficiency testing

67. Hospital Transfusion Committee

68. Medical audit

69. Turnaround time

70. ISO certification

XVI. ORGANISATION & MANAGEMENT OF TRANSFUSION SERVICES

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

Donor recruitment & motivation

Operation of blood mobile

Development of transfusion service

Inventory control

Development of forms, labels, records, etc.

XVII. BIOSAFETY

72.1 Personnel

72.2 Laboratory

72.3 Equipment

72.4 Sterilization

72.5 Disposal of waste material

XVIII. MODERN BIOLOGICAL TECHNIQUES

73. Principle, methods, relevance in transfusion medicine

73.1 Western blot

73.2 Polymerase chain reaction

73.2.1 SSCP

73.2.2 SSOP

73.3 Dot blot hybridization

73.4 Others – Animal experiments, museum techniques

XIX. AUTOMATION & COMPUTERISATION

74. Instrumentation
75. Automated blood group & processing
76. Automated infectious screening
77. Use of bar codes
78. Use of computer

TRAINING PROGRAMME :

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

A. Blood donor management — 5 months
- Donor recruitment & motivation
- Donor selection
- Phlebotomy
- Post donation care of donor
- Apheresis
  - Donor apheresis
  - Therapeutic plasma exchange
- Outdoor blood donation camps

B. Component preparation & quality control — 5 months
- Preparation of various components
- PRBC, FFP, PC, Cryo, Leuco poor
- Irradiation of blood components
- Storage & quality control

C. Transfusion Transmitted infection screening — 5 months
- Screening for various markers
  - HIV, HCV, HBsAg, Syphilis
- Methodology
  - Elisa, spot, rapid, automated analyzer
- Molecular techniques

D. Immunohaematology — 5 months
- Diagnosis & transfusion support in
  - AIHA
  - PNH
  - Transfusion reaction
  - Antenatal serology
  - Multi transfused patients
- Secretor status
- Minor red cell antigen typing

E. Pretransfusion testing & cross match — 5 months
- ABO group & Rh type
- Du testing, genotype
- Irregular antibody screening
- Cross match

F.	Quality control/ computers/ records	2 months
	Total	**27 months**

Training in allied departments:

Students should be sent for training for 9 months including following subjects

Laboratory areas subjects :

- Complete hemogram
- Reading peripheral smear
- Coagulation work up
- HLA typing
- Hematological disorders
- Isolation of lymphocytes
- CD4/ CD8 counts
- Immunofluorescence
- PBSCT
- Bacterial culture
- Grams staining
- Special molecular techniques

Clinical Department subjects :

- Transfusion support for thalassaemia, haemophilia, leukemia
- Transfusion support in transplantation
- Platelet transfusion therapy and its monitoring
- Intraoperative hemodilution
- Use of Cell saver
- Intraoperative Blood salvage
- Fractionation

Examination pattern –

Theory papers :

Paper I – Basic applied aspects related to Transfusion Medicime

Paper II – Immunohaematology, immunogenetics, applied serology

Paper III – Blood donor organization, Technology of components, clinical hemotherapy.

Paper IV – Recent advances & technology.

Question paper – 10 questions, no choice.

Dissertation – Guidelines as per NBE norms.

Practical examination pattern for approval –

A] Laboratory and clinical skill: Minimum of 6 exercises (*stations)* covering all aspects of Transfusion Medicine including

- blood donor / apheresis donor selection,
- blood processing,
- component preparation,
- immunohematology,
- antenatal serology
- transfusion reaction management
- quality control of reagents, equipment, components
- coagulation testing,
- basic hematology tests,
- transfusion transmitted infection screening
- stem cell transplantation

shall be given to each candidate. The duration of each exercise shall vary from 30 min to 1 hour. Each exercise or *Station* shall be followed by Viva on the particular exercise.

B] Clinical case discussion (6 / candidate)

There shall be minimum 6 Hemotherapy exercise and administrative issues for each candidate. The candidate is required to make his own assessment of the problem and come out with solutions.

C] **Spots** (minimum 10)

D] **Thesis defense**

E] **Log book discussion**

G] **Grand Viva Voce**

RECOMMENDED BOOKS ON TRANSFUSION MEDICINE

A. BOOKS

1- Blood transfusion in clinical medicine.
Ed. Pl mollison, 8th edition, Blackwell Sci. Pub. Oxford.

2- Transfusion Medicine
Ed. WH churchill, SR Kurtz, Blackwell Sci, Pub, Oxford, 1988

3- Clinical Practice of Transfusion Medicine
Ed. L Petx, Swisher, 2nd edition, Curchill Livingstone, New York, 1989

4- Blood transfusion therapy: A problem oriented approach
Ed. JAF napier, John Willey & sons, Chichester, 1987

5- Principles of transfusion medicine
Ed. EC Rossi, TL simon, GS Moss, William & Wilkins, Tokyo 1991

6- Modern blood banking & transfusion practices.
Ed. Denise M Harmonge, 4th edition, FA Davis, PA 1994

7- Transfusion Immunology & Medicine
Ed. Carel J van Oss, Marcel Dekker, New York, 1990

8- Blood separation & plasma fractionation
Ed. J Robinson, Harris, Willey Liss, New York, 1990

9- Blood groups in man
Ed. RR Race, R Singer, Blackwell Scientific Pub, Oxford, 8th edition

10- Applied blood group serology
Ed. PD Issit, Montogmerry Sci. Pub Florida, 1994

11- Practical blood transfusion
Ed. DW Huestis, JR Bove, J Case, Little Brown & com, Boston 1987

12- Progress in transfusion medicine
Ed. JD Case, Vil I, II, III, Churchill Livingstone, London

13- Blood component therapy in clinical practice
Ed RW Beal, JP Isbister, Blackwell Science Pub, Oxford

14- Transfusion Medicine: Recent technological advances
Ed K Murawski, F Poetooni, Blackwell Sci Pub, Oxford

15- Clinical Blood Transfusion
Ed LA Kay, ER Huehns, Churchill Livingstone, London 1986

16- Blood transfusion (Methods in Hematology, Vol 17)
Ed TJ Greenwalt, Churchill Livingstone, London 1986

17- Blood transfusion: A conceptual approach

Ed. JG Kelton, N Heddle, M Blajchman, churchill Livingstone, 1984

18- The Human blood groups
Ed PH Anderson, CC Thomas, Springfield, USA

19- Plasma fractionation & Blood transfusion
Ed CTS Sibinga, PC Das, S Seidl, Martinus Nijhoff Pub, Boston 1985

20- Transplantation & blood transfusion
Ed CTS Sibinga, PC Das, G Opel, Martinus Nijhoff Pub, Boston, 1985

21- Future developments in blood banking
Ed. CTS Sibinga, PC Das, TJ Greenwalt, Martinus Nijhoff Pub, Boston 1984

22- Quality assurance in blood banking & its impact.
Ed. CTS Sibinga, PC Das, HF Tassel, Martinus Nijhoff Pub Boston, 1984

23- Microbiology in blood transfusion
Ed JJ Barbara, PSG Wright, Bristol 1983

24- The human Blood groups
Ed. C Salmon, Year Book Medical Pub, New York 1984

25- The text book of blood sciences
Ed. CM Zmijewaski, WE Haesler, Appleton Century Crofts, New York 1982

26- Transfusion therapy: Principles & procedures
Ed. RC Rutman, WV Miller, Aspen Publication Rockville, 1985

27- Fundamentals og immunohematology: Theory & techniques
Ed. ML Turgeon, Lea & Febiger, PA 1989

28- Transfusion transmitted infections
Ed. DM Smith, RY Dodd,

29- Blood loos replacement
Ed M Marshall, T Bird

30- Modern trasfusion therapy
Ed. JP Dutcher, Vol I & II

31- Bone marrow & stem cell processing : A manual of current techniques
Ed. EM Areman, HJ Deeg, RA Sacher, FA Davis PA, 1994

32- Scientific basis of transfusion medicine: Implications for clinical practice Ed Anderson, PM Ness, Saunders, 1994

BOOKS FROM AMERICAN ASSOCIATION OF BLOOD BANKS (AABB)

1- Technical manual, ed FK Widman

2- Donor room procedures, ed TS Green , D Steckler

3- Blood transfusion therapy: A physicians handbook, ed EL Snyder, MS Kennedy

4- Accreditation requirement manual, ed RE Klein

5- Standards for blood banks & transfusion service, ed PV Hollan, PJ Schmidt

6- Therapeutic apheresis, ed J Kolins, JM Jones

7- Legal issues in transfusion medicine, ed GM Clark

8- New frontiers in blood banking, ed CH Wallas, LJ McCarthy

9- Autologous transfusion, ed SG Sandler, AJ Slivergleid

10- Autologous transfusion & hemotherapy, ed HF Tasswell, AA Pineda

11- Platelets, ed DM Smith, SH Summers

12- Blood groups system: Rh ed W Tyler, SR Pierce

13- Blood groups system: MN, ed BL Fryer, J Levitt, C Daniel

14- Blood groups system: Duffy, Kidd, Lutheran, ed SR Pierce, CR Macpheroo

15- Computer in blood banks, ed LK Wilson, DM Eliot

16- Competition in blood services, ed GM Clark

17- Educational programmes in transfusion medicine, ed CH Wallas, TL Simon

18- Plasmapheresis, ed Y Nose, J Smith, RS Krakeur

LIST OF JOURNALS

1- Lancet

2- Nature

3- British Medical Journal

4- British Journal of Hematology
5- Blood
6- Journal of clinical pathology
7- American journal of clinical pathology
8- Annals of Hematology
9- American journal of hematology
10- Vox Sanguinis
11- Transfusion
12- Transfusion medicine review
13- Transfusion Medicine
14- Transfusion Science
15- Journal of clinical apheresis
16- Thrombosis & hemostasis
17- Seminars in hematology
18- Seminars in thrombosis & hemostasis
19- European journal of hematology