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DEACONESS MEDICAL
CENTER



BRIGHAM AND
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CHILDREN'S HOSPITAL,
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HARVARD MEDICAL
SCHOOL

HARVARD MEDICAL SCHOOL FELLOWSHIP PROGRAM IN TRANSFUSION MEDICINE

CORE CURRICULUM

Upon completion of clinical training, fellows are expected to demonstrate understanding of the following aspects of Transfusion Medicine, organized by Competency:

I. PATIENT CARE

A. Blood Donation

1. Criteria for acceptability of individuals for blood donation
2. Process of donor interview, arm inspection and physical examination
3. Presentation and management of complications of blood donation
4. Clinical significance of product storage lesions

B. Blood Group Serology/Biochemistry

1. Clinically significant vs. insignificant red cell alloantibodies
 - a) Serologic specificity
 - b) Isotype
 - c) Thermal amplitude
2. Direct Antiglobulin Test in evaluating:
 - a) transfusion reaction
 - b) hemolytic disease of the newborn
 - c) autoimmune hemolytic anemia
 - d) drug induced hemolytic anemia

C. Blood Transfusion Practices

1. Clinical indications and dose/response for transfusion of:
 - a) Packed Red Blood Cells
 - b) Fresh Frozen Plasma
 - c) Cryoprecipitate
 - d) Platelets
 - e) Granulocytes
 - f) Coagulation factors
 - (1) FVIII
 - (2) FIX

- (3) Prothrombin Complex Concentrates (FEIBA, Autoplex)
- (4) rFVIIa (NovoSeven)
- (5) Humate P for von Willebrand Disease
- g) RhIg
- h) Other plasma derivatives e.g. albumin, IVIg, etc.
- 2. Product administration
 - a) infusion rate
 - b) time to expiration after pooling or preparation
- 3. CMV-safe blood products: indications and methods
- 4. Leukoreduction: indications and methods
- 5. Irradiated blood products: indications and methods
- 6. Compatibility testing requirements
 - a) ABO/Rh
 - b) Antibody screen
 - c) Abbreviated v. full crossmatch
- 7. Emergency transfusion protocols
- 8. Massive transfusion
 - a) metabolic abnormalities
 - b) dilutional coagulopathy
 - c) hypothermia
- 9. Autoimmune hemolytic anemia (AIHA)
 - a) Classes
 - (1) Warm AIHA
 - (2) Cold AIHA
 - (3) Paroxysmal Cold Hemoglobinuria
 - (4) Atypical AIHA
 - (a) DAT-negative AIHA
 - (b) Combined warm + cold AIHA
 - b) Pathophysiology
 - c) Clinical presentation
 - d) Laboratory evaluation
 - e) Selection of blood for transfusion
- 10. Inventory management during shortages

D. Adverse Effects of Blood Transfusion

1. Noninfectious complications of transfusion: presentation, pathophysiology, differential diagnosis, laboratory workup, management and prevention of:

- (1) Immune-mediated transfusion reactions
 - (a) Hemolytic reactions
 - (i) Acute
 - (ii) Delayed
 - (b) Febrile Nonhemolytic Transfusion Reaction
 - (c) Allergic
 - (d) Urticarial
 - (e) Anaphylactic

- (f) Transfusion-Related Acute Lung Injury (TRALI)
- (g) Transfusion-associated graft-versus-host disease
- (h) Post-transfusion purpura
- (2) Non-immune mediated transfusion reactions
 - (a) Volume overload
 - (b) Hypotensive reaction
 - (c) Citrate toxicity
 - (d) Hyperkalemia
 - (e) Hypothermia
 - (f) Nonimmune hemolysis (hypotonic solutions, pumps, etc.)
- 2. Infectious complications of transfusion: disease associations, significance, Incidence, per unit risk, pathophysiology, signs/symptoms, prevention, donor screening, management of:
 - (1) Viral infections
 - (a) Hepatitis B Virus
 - (b) Hepatitis C Virus
 - (c) HIV I/II
 - (d) HTLV I/II
 - (e) West Nile Virus
 - (f) CMV
 - (g) EBV
 - (2) Bacterial infections
 - (3) Parasitic infections
 - (a) Syphilis
 - (b) Malaria
 - (c) Babesia
 - (d) Chagas Disease
 - (4) Prion diseases
 - (a) Creutzfeldt-Jakob Disease
 - (b) Variant Creutzfeldt-Jakob Disease

E. Apheresis: indications, anticoagulation, timing of procedures, replacement fluids, venous access, recognition and management of adverse events for:

- 1. Component collection
 - a) Platelets
 - b) Red cells
 - c) Granulocytes
 - d) Plasma
- 2. Therapeutic Apheresis procedures
 - a) Plasma Exchange
 - b) Red Cell Exchange
 - c) Leukoreduction
 - d) Red Cell Depletion
 - e) LDL apheresis (Liposorber)

- f) Photopheresis
- 3. Peripheral Blood Stem Cell collections

II. MEDICAL KNOWLEDGE

A. Blood Donation

- 1. Laboratory tests performed on donated blood.
- 2. Methodology, and sensitivity/specificity of infectious disease markers
- 3. Donor deferral criteria
- 4. Deferred donor registry

B. Blood Component Manufacturing and Storage

- 1. Preparation of blood components from whole blood
- 2. Products that may be collected using hemapheresis procedures
- 3. Blood product anticoagulant/preservatives
- 4. Storage conditions/expiration dates for each blood component.
- 5. Preparation of components which require pooling/thawing
- 6. Special processing techniques of leukoreduction/washing/volume reduction/irradiation
- 7. Metabolic changes that occur during storage
- 8. Plasma derivatives that are prepared commercially

C. Blood Transfusion Practice

- 1. Transfusion “triggers”
 - a) Red cell
 - b) Platelet
 - c) Plasma
- 2. Refractoriness to platelet transfusion
- 3. Blood conservation strategies
- 4. Pediatric transfusion practice
- 5. Neonatal transfusion practice
- 6. Surgical transfusion support

D. Blood Group Serology/Biochemistry

- 1. Immunologic principles
 - a) Immunoglobulin structure and genetic basis for antibody diversity
 - b) Red cell alloantibodies vs. red cell autoantibodies
 - c) Primary and secondary immune responses to red cell antigens
 - d) “Naturally occurring” antibodies vs those requiring prior immunization
 - e) Mechanisms of red cell sensitization
 - f) Mechanisms of red cell destruction
 - (1) Complement activation
 - (2) Intravascular vs extravascular immune hemolysis

2. Red cell blood group antigens: biochemistry, genetic inheritance, immunogenicity, clinical significance, common phenotypes of:
 - a) Carbohydrate blood group antigens
 - (1) ABH
 - (2) Lewis
 - (3) P
 - (4) I/i
 - b) Protein blood group antigens
 - (1) Rh
 - (2) Kell
 - (3) Duffy
 - (4) Kidd
 - (5) MNS
 - c) High frequency antigens
 - d) Low frequency antigens
3. Disease associations with the “null” phenotypes for ABO, Rh, Kell
4. Serologic Testing
 - a) Parameters affecting in vitro detection of antigen-antibody reactions
 - b) Testing formats
 - (1) Tube
 - (2) Gel
 - (3) Solid phase
 - c) Indications, reagents, methods and interpretation of:
 - (1) ABO/RhD typing
 - (2) Weak D testing
 - (3) Antibody screen
 - (4) Antibody panel identification
 - (5) Crossmatching Tests
 - (a) Abbreviated
 - (b) Full
 - (6) Enhancement techniques
 - (a) Enzymes
 - (b) LISS, PEG
 - (7) Adsorption techniques
 - (a) Autologous
 - (b) Heterologous
 - (8) Elution techniques
 - (9) Neutralization techniques
 - (a)
 - (10) Direct Antiglobulin Test (DAT)
 - (11) Donath-Landsteiner Test
 - (12) Hemolytic Disease of the Newborn
 - (a) Rosette Test
 - (b) Kleihauer-Betke Test
 - (c) Antibody Titration Studies

- (13) Electronic crossmatching
 - (a) Information system requirements
 - (b) Procedural requirements
 - (c) Advantages/disadvantages
- 5. Hematopoietic Stem Cell Transplantation
 - a) Diseases treated with stem cell transplantation
 - b) Stem cell biology
 - (1) Bone marrow-derived stem cells
 - (2) Peripheral blood stem cells
 - (3) Cord blood stem cells
 - c) Mobilization of stem cell donors
 - d) Stem Cell Collection
 - e) Stem Cell Processing
 - f) Thawing and Infusion
 - g) Engraftment
 - h) Transfusion support of stem cell transplantation patients
 - (1) Product support
 - (2) ABO mismatched transplants
 - (3) TA-GVHD
 - (4) CMV
- 6. HLA
 - a) Genetics
 - b) Structure of the HLA complex, Biochemistry
 - c) Clinical relevance to transfusion medicine e.g. management of platelet refractoriness
 - d) Testing methods
- 7. Therapeutic Apheresis
 - a) Principles
 - b) Indications/rationale for use in:
 - (1) Hematologic diseases, e.g.:
 - (a) TTP
 - (b) Acute leukemia/hyperleukocytosis
 - (c) Hyperviscosity syndromes
 - (d) Sickle Cell Disease
 - (2) Neurologic diseases, e.g.:
 - (a) Cryoglobulinemia
 - (b) Myasthenia Gravis
 - (c) Guillain-Barre Syndrome

III. PRACTICE-BASED LEARNING & IMPROVEMENT

- A. Application of current Transfusion Medicine literature to clinical decisions
- B. Mastery of available information technology resources
- C. Education of students, residents, techs

IV. INTERPERSONAL AND COMMUNICATION SKILLS

- A. Development of therapeutic relationships with patients
- B. Foster effective working relationships with MDs and technical staff
- C. Provide effective consultation to physicians from other services

V. PROFESSIONALISM

- A. Competent, conscientious, ethically sound practice
- B. Sensitivity to culture, gender, age issues

VI. SYSTEMS-BASED PRACTICE

- A. Prospective, concurrent and retrospective auditing of blood product transfusion
- B. Hospital Transfusion Committees
- C. Development of hospital transfusion policies
- D. Roles of regulatory agencies whose oversight directly impacts Transfusion Service operation
 - 1. FDA
 - 2. AABB
 - 3. JCAHO
 - 4. FACT
 - 5. DPH
- E. Informed Consent for Transfusion
- F. Crossmatch/Transfusion ratio
- G. MSBOS (Maximum surgical blood ordering schedule)
- H. "Lookback"
- I. Blood product inventory management
- J. Budgeting
- K. Blood bank information systems