

# BLOOD BANKING and TRANSFUSION DIPLOMA



SUBSPECIALTIES PROGRAMS



2016

البحر العربي



SAUDI DIPLOMA  
BLOOD BANKING and TRANSFUSION CURRICULUM

## PREPARATION

### Curriculum Scientific Group

DR. ALI AL-SHANGITI  
DR. MOHAMED OSMAN ZAYED  
DR. SHEREEN AHMED FATHY NOSAIR  
MR. ALI IBRAHEEM ALSHEREEF

## SUPERVISION

### Curriculum Specialist

PROF. ZUBAIR AMIN  
DR. SAMI ALSHAMMARI

## REVIEWED & APPROVED

### Scientific Laboratory Committee

DR. SALWA HINDAWI  
DR. HIND AL HUMAIDAN  
**CLINICAL LABORATORY SCIENCES SUBCOMMITTEE**  
**SCIENTIFIC BOARD FOR APPLIED MEDICAL SCIENCES**

### **COPYRIGHT AND AMENDMENTS**

All rights reserved. © 2016 Saudi Commission for Health Specialties.

This material may not be reproduced, displayed, modified, or distributed without prior written permission of the copyright holder. No other use is permitted without prior written permission of the Saudi Commission for Health Specialties.

Any amendment to this document shall be approved by the Specialty Scientific Council and the Executive Council of the commission and shall be considered effective from the date of updating the electronic version of this curriculum published on the commission website unless different implementation date has been mentioned.

For permission, contact the Saudi Commission for Health Specialties, Riyadh, Kingdom of Saudi Arabia.

This program is approved by:  
Members of the Clinical Laboratory Sciences Committee, SBAMS, and SCHS.

**Correspondence:**

P.O. Box: 94656

Postal Code: 11614

Consolidated Communication Center: 920019393

International Contact Call: 00-966-114179900

Fax: 4800800

Extension: 1322

Website: [www.scfhs.org.sa](http://www.scfhs.org.sa)

**Formatted and Designed by:** [Manoj Thomas Varghese, CMT/Salem Al Tamimi \(SCFHS\)](#)

## TABLE OF CONTENTS

### TABLE OF CONTENTS

<b>SAUDI DIPLOMA</b>	<b>i</b>
<b>TABLE OF CONTENTS</b>	<b>iii</b>
<b>ACKNOWLEDGEMENTS</b>	<b>vi</b>
<b>INTRODUCTION</b>	<b>7</b>
<b>EDUCATIONAL GOALS, OBJECTIVES, AND COMPETENCIES</b>	<b>10</b>
Goals And Objectives	10
Blood TRANSFUSION Competencies	10
<b>PROGRAM FRAMEWORK</b>	<b>11</b>
General Training Requirements	11
Structure of the Training Program	11
Program Supervision	12
Chairperson of the scientific committee (Program Coordinator)	12
Program director at the training center (Supervisor)	12
Training center board of instructors	12
Minimum Training Requirements	13
Candidates acceptance criteria	13
<b>DESCRIPTION OF TRAINEE ROTATIONS</b>	<b>14</b>
Program Rotations and Diagnostic Experience	14
Service and Duties	14
Orientation Course (Two weeks)	15
Topics Covered	15
Blood Transfusion R1 Main Course	15
Blood donor management	15
Aphaeresis Procedures	17
Blood Components	19
Immunohematology	20
Blood transfusion R2 Main Course	22
Transfusion Reactions	23
Special Transfusion Preparation And Management	24
Organization And Management Of Transfusion Services	26

Continuous Quality Management	27
<b>TEACHING AND ACADEMIC ACTIVITIES</b>	<b>30</b>
<b>Universal Topics</b>	<b>30</b>
<b>Module 1: Introduction</b>	<b>30</b>
Hospital Acquired Infections (HAI)	31
Sepsis, SIRS, DIVC	31
Blood Transfusion	31
<b>Module 2: Ethics and Healthcare</b>	<b>31</b>
Occupational Hazards of Health Care Workers (HCW):	31
Ethical Issues: Transplantation/Organ Harvesting; Withdrawal of Care:	32
Ethical Issues: Treatment Refusal; Patient Autonomy	32
<b>Internal Educational Material</b>	<b>32</b>
First year main course (for r1 trainee)	32
Aphaeresis Procedures	33
Second Year Main Course (For R2 Trainee)	36
<b>External Educational Material</b>	<b>40</b>
Suggested Activities	40
Other activities:	43
Optional Activities	43
<b>ASSESSMENT, EXAMINATION CRITERIA, AND CERTIFICATION</b>	<b>44</b>
<b>Proposed Assessment</b>	<b>44</b>
<b>Purpose</b>	<b>44</b>
<b>General Principles</b>	<b>44</b>
<b>360° Evaluation</b>	<b>44</b>
<b>Portfolios</b>	<b>44</b>
<b>Logbook</b>	<b>45</b>
<b>Dissertation</b>	<b>45</b>
<b>Module Examination</b>	<b>45</b>
<b>Summative Continuous Evaluation</b>	<b>45</b>
Promotion Examinations	45
Final examination (R2)	46
<b>Certification</b>	<b>46</b>

## TABLE OF CONTENTS

---

<b>SUGGESTED REFERENCES AND READING RESOURCES</b>	<b>47</b>
Books	47
Websites and Internet Resources	47
<b>SCFHS POLICIES AND PROCEDURES</b>	<b>48</b>
Rules and regulations	48
Privacy and confidentiality	49
Registration for training	49
Monitoring of training and mentoring	49
SCFHS guidelines for mentoring	49
<b>VACATIONS/LEAVE OF ABSENCE/EDUCATIONAL LEAVE</b>	<b>50</b>
Annual Leave	50
Withdrawal of training	50
Suspension or interruption of training	50
Transfer from and to the program	50
References	50
<b>APPENDICES</b>	<b>51</b>
Appendix 1	51
Appendix 2	51
Appendix 3	56
Appendix 4	57
Appendix 5	58
Appendix 6	60
Appendix 7	63
Appendix 8	65
Appendix 9	68
Appendix 10	69

### ACKNOWLEDGEMENTS

The Blood TRANSFUSION Curriculum and Training Manual team acknowledge the valuable contributions and feedback from the scientific committee members. We would like to extend our special appreciation and gratitude to Dr. Salwa Hindawi, MD, FRCPath, and Dr. Hind Al Humaidan, MD, FRCPA for all of their help and support in creating this document.

Special thanks to Dr. Amin Zubair and Dr. Sami Alshamarri for their contribution to the goals, objectives, and competencies of the Blood TRANSFUSION rotation.

We would also like to acknowledge that the CanMEDS framework is the copyright of the Royal College of Physicians and Surgeons of Canada, and many of the descriptions and clinical biochemistry competencies have been acquired from their resources with permission.

This work could not have been accomplished without the support of all of the above-mentioned individuals as well as organizations.



### INTRODUCTION

#### Saudi Commission for Health Specialties (SCFHS)

The Saudi Commission for Health Specialties provides a training program followed by certification in the specialty of Blood Transfusion. SCFHS runs the Blood TRANSFUSION Examinations as part of its residency training program. Success in these, and the required pre-examination training, qualifies the medical graduate to practice as a consultant/specialist in the specialty of Blood Transfusion.

To ensure adequate training; the scientific committee of the Saudi Diploma of Blood TRANSFUSION(SDBTM) in SCFHS offers advice, subject and sub-discipline outlines, mentoring, and training accreditation to help graduates and their supervisors cover the large amount of work required to prepare for examinations.

This booklet provides clinical laboratory graduates, and supervisors, with information on applications, training, examination, and qualification requirements.

#### Blood Transfusion: Definition

Blood TRANSFUSION is one of the major medical subspecialties. A certified specialist in this field is in charge of running and supervising a blood bank. There is a clear deficiency of highly qualified medical laboratory technologists specializing in this area, both nationally and internationally. Moreover, the demand for specialists in this field is continuously increasing, particularly with the great revolution in medical services in the Kingdom of Saudi Arabia. Furthermore, the interest of medical laboratory school graduates specializing in this area has increased in recent years; thus, the availability of a nationally certified and recognized program would encourage more medical laboratory school graduates to specialize in Blood Transfusion. Blood TRANSFUSION is the study of immunology, hematology, and Blood Transfusion.

Specialists in Blood TRANSFUSION are supervisors of blood banks. They are required to master the areas of donor selection, blood collection, blood component separation, blood grouping, antibody screening, and antibody identification, crossmatching, and continuous quality management of the blood bank. Accordingly, the need for competent, dedicated, and safe Blood TRANSFUSION specialists cannot be overemphasized.

Tables 1 and 2 below show that there are approximately 302 blood banks in all governmental and private hospitals (Table 1) in the Kingdom of Saudi Arabia, which collect approximately 500,000 blood units. Of these, 60% comprise remunerated donations while the remaining 40% comprise voluntary unremunerated donations. Therefore, due to the severe deficiency of qualified personnel in the Saudi Arabian blood transfusion service, as in all countries, we require additional staffing. There is, therefore, an attendant necessity to implement a scientific curriculum for the technicians and technologists who are or will staff blood banks, in order to apply all of the above requirements and other emerging procedures in the blood banking field. We hope to achieve the purpose for which this curriculum has been prepared, with sincere thanks and appreciation to all who have contributed and cooperated in its preparation, and to all of whom we wish progress and success.

The program is run under the supervision and accreditation of the Saudi Council for Health Specialties, referred to hereafter as SCFHS. Therefore, the rules and regulations governing the program are those of SCFHS, and all parts of this training and syllabus are explained according to SCFHS regulations.

## INTRODUCTION

The duration of the training program is two academic years, unless the trainee is exempted from part of the training by the Scientific Committee for Applied Medical Sciences (SBAMS). The program recruits medical and nonmedical (Applied Medical Science and Blood Transfusion) graduates. Upon completion of this training program and satisfying the examiners, the graduate will be granted the certificate in Saudi Diploma in Medical Sciences-Blood TRANSFUSION(SBMS-TM). This entails a degree of competency and experience that is considered adequate to independently practice Blood TRANSFUSION and become eligible for the post of scientist and consultant following the required years of experience. The graduate will act as: a consultant to technologists regarding test selection and interpretation; an educator of trainees and staff; a researcher to develop methods and discover technicalities of Blood Transfusion; and a leader in the implementation of continuous quality improvements in the blood bank.

The program is centered on the core competencies outlined by CanMEDS. Through extensive hands-on clinical and technical sessions, mentoring, didactic lectures, and guided research opportunities, the program aims to provide trainees with the necessary foundation and confidence to reach a correct and accurate diagnosis, which is truly the cornerstone of patient care.

The overarching aim is to help our trainees build careers of lifelong learning and commitment, based on the ethics and regulations of the medical profession.

**Table 1**

Type of blood bank entity	Central blood bank	Peripheral blood bank	Transfusion center	Total
M.O.H.	24	104	67	195
OTHER GOVERNMENTAL HOSPITALS	10	12	18	40
PRIVATE HOSPITALS	0	23	44	67
Total No. of Blood Banks	34	139	129	302

**Table 2**

Type of donor entity	Total no. Of donors	Voluntary donors	%	Replacement donors	%
M.O.H.	(61%) 274,408	93,753	34%	180,655	66%
OTHER GOVERNMENTAL HOSPITALS	(31%) 140,000	68,320	49%	71,680	51%
PRIVATE HOSPITALS	(8%) 35,000	13,615	39%	21,385	61%
TOTAL	449,408	175,688	39%	273,720	61%

### **Vision**

The vision of this program is to empower technologists in blood banks in the Kingdom of Saudi Arabia by equipping them with the most up-to-date theoretical and practical knowledge and skills in order to achieve confidence and superiority in their performance and thus to provide services of the highest level of safety and quality.

### **Mission**

Our mission is to provide a state of the art and comprehensive training program through which we produce confident Blood TRANSFUSION specialists who will provide high caliber diagnostic and clinical services and be competitive at the level of accredited international standards in order to ensure the fulfillment of the needs of both blood donors and patients.

## EDUCATIONAL GOALS, OBJECTIVES, AND COMPETENCIES

### Goals And Objectives

The aim of the program is to enroll trainees in a well-structured comprehensive training program in Blood TRANSFUSION certified by SCFHS. After successful completion of training, and passing the final certification examination, graduates will serve as independent specialists in this field.

Graduates will be able to interpret submitted results efficiently and accurately in a timely fashion. They will be competent at utilizing, whenever available, appropriate ancillary studies and, finally, convey their opinions in a clear and concise manner to the treating physician. They will be able to demonstrate the requisite knowledge, skills, and attitudes for effective patient-centered care and service to a diverse population. In all aspects of specialist practice, graduates must be able to address issues of gender, age, culture, ethnicity, and ethics in a professional manner.

### Blood TRANSFUSION Competencies

Upon completion of this training, residents will have acquired the following competencies and will function effectively as per the following CanMEDS roles framework competencies:

- Medical expert
- Communicator
- Collaborator
- Manager
- Health advocate
- Scholar
- Professional
- Expert

## PROGRAM FRAMEWORK

### General Training Requirements

- Admission to the program is in accordance with the Commission Training Rules and Regulations.
- Trainees shall abide by the training regulations and obligations established by SCFHS.
- Training is a full-time commitment. Residents shall be enrolled in full-time, continuous education for the entire duration of the program.
- Training is to be conducted in institutions accredited for training by the Central Accreditation Committee and the SDBTM.
- Training shall be comprehensive and include all areas of Blood Transfusion.
- Trainees shall be actively involved in working up a patient's specimen to reach a diagnosis with gradual progression of responsibility in clinical and technical aspects.
- Trainees shall abide by the training regulations and obligations set by SCFHS.

### Structure of the Training Program

- This is a structured two-year postgraduate training program in Blood Transfusion, which is divided into two parts: the first year (R1) and the second year (R2).
- The first year is designed to provide training in blood donor management and aphaeresis procedures, together with rotations in immune hematology and blood components.
- During the second year, after passing the PART 1 EXAM, trainees are allocated various responsibilities in special transfusion preparation and management and transfusion reactions. Trainees are expected to rotate responsibilities in the organization and management of transfusion services and continuous quality management.
- Trainees are required to complete the allocated rotations satisfactorily for a given year and pass the end-of-year evaluation exam, both written and practical, as well as obtaining a satisfactory end of year evaluation before passing from one academic year to the next.
- The sequence of rotations will be directed by the regional training committee.
- Each trainee must participate in at least 10 observations, and perform each procedure and item in the curriculum both under supervision (5 times) and independently (3 times).
- After successful completion of all program requirements throughout the two-year training period, and upon obtaining the Final In-Training Evaluation Report (FITER), candidates will receive a training completion certificate issued by the regional supervising training committee. The candidate will then be eligible to undertake the Final Saudi Diploma Certification Examination in Blood Transfusion.

## Program Supervision

The residency program is supervised by various levels of authority, including the following:

### Chairperson of the scientific committee (Program Coordinator)

The Program Coordinator should be a full-time Consultant in Blood Transfusion, a member of the departmental Residency Training Committee (RTC), and have served in this capacity for a minimum of five years. He/she should also be approved by SCFHS via SBAMS and be able to:

- Demonstrate commitment to the specialty.
- Show the interest, authority, and commitment required to fulfill teaching responsibilities in order to develop, implement, and achieve the educational objectives of the program.
- Maintain active involvement in the practice of and research in Blood Transfusion.
- Pursue continuing professional development and education in Blood Transfusion.

### Program director at the training center (Supervisor)

The supervisor should be a member of the teaching staff and a full-time Consultant in Clinical Biochemistry. He/she should also be approved by the RTC and SBAMS, and be able to:

- Demonstrate commitment to the specialty.
- Show an interest in and commitment to full-time teaching and technical responsibilities.
- Complete evaluation forms in consultation with the senior registrar, etc.
- Guide the residents on their performance, and help them to prepare assignments.
- Report the ongoing performance of resident(s) to the program coordinator.

### Training center board of instructors

The functions of the training center board of instructors are:

- To enforce the general policy for training (selection, admission, evaluation, withdrawal, etc.) in accordance with the Rules and Regulations of SCFHS.
- To suggest program changes (if necessary) to be discussed by the department concerned, before submission to SBAMS.
- To supervise the implementation of all program regulations.

The committee should meet regularly, with a minimum of ONE meeting per rotation, to review the performance of the residents. The Program Coordinator should report to the committee on the performance of all residents.

Other personnel involved in the administration of the program include the following:

- Director of the regional supervisory committee (Chair of local committees)
- SDBTM secretary (Coordinator)
- See Section “SCFHS policies and procedures” for more details.

### Minimum Training Requirements

SCFHS requires two years of training for eligibility to sit the Saudi Diploma in Blood TRANSFUSION(SDBTM) exam. The Saudi Diploma in Blood TRANSFUSION is a joint program and involves rotations in different regional hospitals. Please see Table 3 for Blood TRANSFUSION training rotation blocks.

### Candidates acceptance criteria

Applicants to this training is preferred have completed a two years' experience in an approved post(s), preferably in General Laboratory Practice, including Blood Transfusion. The objective is to gain wide experience in the field of Clinical Laboratory Practice. Candidates for the training program are selected based on an interview with the national and/or regional committee. The following are required:

- A written examination and interview to evaluate each candidate.
- Graduation from an appropriate and recognized college of applied medical sciences/Medical Laboratory.
- Classification as a specialist by SCFHS
- Certain preference will be given to candidates with prior work experience in the field of Blood TRANSFUSION in a recognized hospital.
- Good command of speaking, writing, and comprehension in both the Arabic and English languages
- Committed to the whole period of the program as a full time resident, Please see Table 3 for Blood TRANSFUSION training rotation blocks.

## DESCRIPTION OF TRAINEE ROTATIONS

**Table 3: Rotation Schedule**

Rotation	Duration(Weeks)	Rotation	Duration(Weeks)
Blood Donor Management	8	Aphaeresis Procedures	8
Blood Components	8	Cases of Adverse Reaction to Transfusion: Investigation and Prevention	8
Immunochemistry	8	Special Transfusion Preparation and Management	8
Organization and Management of Transfusion Services	8	Research	8
Continuous Quality Management	8	Round According to Student Choice	8

### Program Rotations and Diagnostic Experience

The residents will rotate through different hospitals, as arranged by the local supervising committee. On each rotation, the resident will gain unique clinical and technical experience.

### Service and Duties

The following should comprise a significant portion of the resident's development and education:

- Sufficient time during which supervising consultants can teach and advise trainees must always be made available during the performance of these duties.
- The trainee should be able to conduct the routine procedures conducted during a specific rotation set by the department.
- Senior trainees may supervise junior residents in carrying out their duties under the direct supervision of the consultant.
- In each rotation, the trainee should gain the maximum benefit and meet the rotation goals and objectives.
- Each resident must select and present a minimum of one case.
- Each resident must give a minimum of one journal club/article presentation.

Please refer to the section on teaching and academic activity for further details and guidelines.



### Orientation Course (Two weeks)

The goal of the orientation course is to prepare trainees to commence various rotations/modules safely, and to become familiar with rules and regulations and basic knowledge of research procedures.

### Topics Covered

- Professional and ethical principles in transfusion medicine
- An overview of the curriculum
- Learning methods and training materials
- Brief description and some legal aspects of national policy
- Main constituents and functions of circulating blood
- Types and principles of equipment used in blood banks
- Practical hands-on experience with common equipment
- Safety regulations in Blood Transfusion
- IT applications in Blood Transfusion

### Blood Transfusion R1 Main Course

The first year is designed to provide training in blood donor management and aphaeresis procedures, together with rotations in immune hematology and blood components.

The objectives of the first year are as follows:

- Equip the trainee with the knowledge, skills, and attitudes necessary for proper donor selection, blood collection, and preparation of high quality safe blood components.
- Prepare trainees to share with the clinician in the implementation of the proper guidelines for blood transfusion.
- Obtain professional communication skills.
- Provide safe, proper, and essential components in good time for patients.
- Master all the technical procedures in immunohematology.

### Blood donor management

#### Medical Expert

#### Knowledge Competencies

- Demonstrate proficiency in organization of outdoor blood donation camp and understand the importance of cold chain maintenance.
- Compare and contrast the eligibility requirements for allogeneic and autologous blood donations.
- Describe donor selection criteria, methods for their recruitment and retention, and methods to measure donor satisfaction.
- Describe the factors that influence the motivation of volunteers to donate blood.
- Explain the operational logistics required to determine appropriate blood inventory for a geographic region/hospital, and the process of meeting daily, weekly, and monthly collection targets.
- Understand how to interact professionally with prospective donors.

## DESCRIPTION OF TRAINEE ROTATIONS

---

- Provide the results of donor screenings, and determine if the donor is eligible to donate, temporarily deferred, or permanently deferred.
- Provide the results of donor physical examinations, and determine whether the donor is eligible to donate.
- Describe the confidential unit exclusion procedure and list the four self-exclusion facts that must be provided to the donor.
- Understand various types of autologous blood collection and their application in clinical transfusion services.
- Demonstrate proficiency in collection of whole blood with regard to preparation of phlebotomy site, proper volume, and sample collection.
- Discuss the clinical relevance of directed donation and enumerate the advantages and risks of directed donations.
- Demonstrate knowledge of the evaluation and management of adverse reactions associated with blood donation/phlebotomy.
- Identify different laboratory tests that should be conducted on donor blood prior to release.

### Technical competencies

- Prepare a donation program and deal with the factors that affect volunteer motivation to donate blood.
- Determine if the donor is eligible to donate, temporarily deferred, or permanently deferred.
- Describe the clinical relevance of directed donation.
- Describe indications for therapeutic phlebotomy.
- Perform phlebotomy and swabbing process.
- Counsel donors about the benefits and risks of donating blood products.
- Receive informed consent from blood product donors.
- Prepare successful blood donation campaigns.
- Recognize adverse events related to blood donation and manage them appropriately.

### Communicator

- Develop rapport, trust, and professional relationships with other physicians and allied health care workers and patients and families (as required).
- Accurately elicit and synthesize relevant information and perspectives of blood donors and their families and friends.
- Accurately convey relevant information and explanations about blood donation to prospective donors.
- Be able to speak in public, and present to different types of people in a clear language that matches the audience level.

### Collaborator

- Respect team ethics and confidentiality.
- Engage in team meetings with other workers when requested.
- Minimize misunderstanding and maximize team functions to best utilize interpersonal interactions for donor care.

### Leader

- Serve in administrative and leadership roles, as appropriate.

- Work effectively and efficiently in mobile campaigns.
- Participate in activities that contribute to the effectiveness of blood donation organizations and systems.
- Manage practice and career effectively.

### Health Advocate

- Recognize and reinforce to the public and the medical profession the essential contribution and benefits of blood donation.
- Participate in various types of voluntary work in nonprofit organizations to promote and educate the community about the importance of blood donation.
- Promote the health of individual donors, communities, and populations.
- Use knowledge, skills, and expertise to advance health and blood donation within the community.

### Scholar

- Maintain and enhance professional activities through ongoing learning.
- Develop and implement a personal continuing educational strategy.
- Contribute to the development of new knowledge through research, and review the literature as necessary.

### Professional

- Perform and abide by the codes of ethics at all times.
- Deliver the highest quality of care with integrity, honesty, and compassion.
- Respect the health and well-being of individuals and society through ethical practice and professionalism.

## Aphaeresis Procedures

### Clinical and practical competencies

#### Medical Expert

##### Knowledge Competencies:

- Define the term “aphaeresis” and understand the process of platelets, plasma, and red blood cells collection.
- Summarize the principles of aphaeresis technology, including centrifugation, filtration, and immunoadsorption.
- Demonstrate proficiency in selection of aphaeresis machine and blood donors and be able to obtain aphaeresis products that meet quality standards.
- Demonstrate knowledge of the indications for therapeutic.
- Demonstrate knowledge of the evaluation and management of adverse reactions associated with aphaeresis donations.
- Demonstrate knowledge of the evaluation and management of adverse reactions associated with therapeutic aphaeresis.
- Identify different laboratory tests that should be conducted on aphaeresis donors/patients prior to commencing the setting.

## DESCRIPTION OF TRAINEE ROTATIONS

---

- Demonstrate knowledge of the indications for therapeutic aphaeresis and of the appropriate replacement fluids for use in various situations.
- Communicate effectively with clinicians regarding emergent or scheduled therapeutic aphaeresis procedures through conversations and writing of consult notes.
- Demonstrate knowledge of the principles of hemopoietic stem cell transplantation, including collection, processing, and storage of these stem cell products, and indications for use.
- Demonstrate knowledge of considerations in evaluating and preparing patients for therapeutic aphaeresis, including discussion with the patient of the risks and benefits associated with aphaeresis procedures.

### **Technical competencies**

- Become familiar with aphaeresis machines and perform aphaeresis collections independently.
- Request, perform, and interpret indicated laboratory tests on donated aphaeresis blood products.
- Recognize adverse events related to aphaeresis blood product donation and manage them appropriately.
- Be able to deal appropriately with patients and machines, plan TPE, select replacement fluids, and monitor patients.
- Describe common procedures and basic concepts behind PBSC processing and cellular product therapies.
- Be able to collect, process, store, and thaw PBSC.

### **Communicator**

- Communicate effectively with medical colleagues, nursing staff, and technical staff, both verbally and in written reports.
- Develop a common understanding of issues and problems with colleagues and other professionals in order to develop a shared plan of care in the best interests of patients and families.
- Convey effective oral and written information regarding aphaeresis procedures; issue comprehensive, clear, concise, accurate, and timely aphaeresis reports that include all the relevant data important for patient management and further diagnostic work-up.
- Clearly explain to patients and relatives procedures such as platelets aphaeresis, including advantages and disadvantages.

### **Collaborator**

- Advise on the appropriateness of plasma and RBCs exchange for patient prognosis, teaching, and research purposes, and advise on further appropriate investigations.
- Collaborate with colleagues by providing support in patient management, education and training, research, and community health promotion. Should be able to display good team spirit and interpersonal skills.
- Participate effectively and appropriately in an inter-professional health care team

### **Leader**

- Manage time to maximize educational resources and opportunities.
- Develop general idea on how to allocate finite health care and health education resources effectively to optimize donor care and life-long learning.

- Participate in activities that contribute to the effectiveness of the organization's health care system.

### Health Advocate

- Follow all safety precautions in the blood bank facility, and strive to implement and follow all rules and regulations at all times.
- Recognize and reinforce to the public and to the medical profession the essential contribution of laboratory medicine to health.

### Scholar

- Participate in rounds, conferences, and teaching sessions.
- Maintain and enhance professional activities through ongoing learning.
- Contribute to the creation, dissemination, application, and translation of new medical knowledge and practices.

### Professional

- Deliver the highest quality of care with integrity, honesty, and compassion.
- Act professionally towards patients, donors, and colleagues alike.
- Respond quickly to urgent requests and night calls.

## Blood Components

### Clinical and practical competencies

#### Medical Expert

##### Knowledge competencies

- Describe the factors influencing quality of blood bag for whole blood collection.
- Outline the characteristics of blood product anticoagulants/preservatives.
- Summarize the steps in blood component preparation by different methods.
- Explain the various factors affecting the quality of blood components.
- Recognize the significance of storage of blood components at appropriate temperatures and demonstrate proficiency in compatibility and labeling requirements of various components.
- Discuss the methods of preparation of components that require pooling/thawing.
- Demonstrate proficiency in maintaining quality of blood components as per recommended standards by various agencies (AABB, EC, and ISO).
- Understand the process of plasma fractionation and summarize critical steps in preparation, such as pooling and viral inactivation.

##### Technical Competencies

- Prepare, process, store, release, and quality control for blood components.
- Manage and participate actively in all processes required for safe and effective manufacturing and storage of blood components.
- Recognize plasma derivatives that are prepared commercially.
- Explain the metabolic changes that occur during storage.

### Communicator

- Exhibit the need for effective, timely, clear, and accurate communication with colleagues.
- Demonstrate the use of various types of communication and when each is required (verbal, written, other).
- Participate in multidisciplinary team meetings and contribute to the continuous education of physicians and other team members.

### Collaborator

- Seek appropriate consultation from other health professionals, recognizing the limits of their expertise.
- Work effectively within a team.
- Provide the time and effort when required by others for the sake of patient care.

### Leader

- Become familiar with quality control procedures in preparation of blood components.
- Collaborate effectively with other organizations.
- Take decisions in regard to acceptable versus unnecessary requests for blood components.
- Prioritize urgent cases in a timely fashion.

### Health Advocate

- Identify areas for improvement, promotion, and advocacy.
- Respond to individual patient health needs and issues as part of patient care.

### Scholar

- Demonstrate the ability to mentor others and share learned information (health care and non-healthcare personnel), each at their level of understanding.
- Capable of self-directed study using appropriate texts and information sources.
- Recognize personal gaps in knowledge and how to tackle them.
- Critically evaluate information and its sources, and apply this appropriately to practice decisions.

### Professional

- Practice commitment to best quality of care.
- Identify and appropriately respond to ethical issues.
- Respect patients' rights and confidentiality.

## Immunohematology

### Clinical and practical competencies

#### Medical Expert

##### Knowledge competencies

- Describe the basic principles of immunoglobulin's antigens, antibodies, and complements.
- Describe complement activation pathways and their role in transfusion medicine.
- Describe the development of antibodies after immunization and infection.
- Describe the principles of antigen/antibody reaction and factors affecting those reactions.

- Describe the antigen systems of formed elements of blood, such as red cells, platelets, and leukocytes, and be able to explain their implications in transfusion medicine.
- Describe the principles of structural and functional evaluation of B cells, T cells, and NK cells.
- Describe the principles of classification of primary immunodeficiency diseases, including defects in humeral and cellular immunity.
- Describe the principles of basic genetics with regard to the Mendelian law of inheritance, phenotype/genotype, and population genetics.
- Explain the nomenclature, organization, and polymorphism of the human major histocompatibility complex, including HLA class I, II, and III genes.
- Describe the role of HLA typing in organ and bone marrow/stem cell transplantation and how HLA antigens mismatch results in allogeneic reactions in recipients.
- Explain HLA typing techniques, including serological methods, microcytotoxicity assays, nucleic acid assays, and lymphocyte culture techniques.
- Describe the physiology of hemostasis with regard to the role of platelets, coagulation pathways, and fibrinolysis.
- Describe the general principles and clinical utility of platelet function testing.
- Describe the clinical utility of coagulation and thrombosis testing.
- Describe the general principles of screening coagulation tests (e.g., prothrombin time, activated partial thromboplastin time, fibrinogen, and thrombin time).
- Demonstrate knowledge of the principles of patient/unit identification and pretransfusion testing, including ABO/Rh testing, RBC antibody screening, and antibody identification.
- Compare and contrast conventional crossmatching versus type, and screen using various advanced technologies, such as gel, solid phase, and column agglutination.
- Demonstrate a working knowledge of the principles of homeostasis and coagulation and proficiency in the initial treatment of patients with bleeding disorders.
- Identify clinically significant RBC antibodies from an antibody panel, including multiple alloantibodies and mixtures of alloantibody and autoantibodies. Determine the level of difficulty in obtaining blood for such patients, and effectively communicate these results to clinicians.
- Demonstrate proficiency in evaluating patients' refractory to platelet transfusions.
- Outline the principles of histocompatibility testing and platelet crossmatching and apply this knowledge to the selection of appropriate platelet products when indicated.

### **Technical Competencies**

- Conduct identification and pre-transfusion testing of patient/unit, including ABO/Rh testing, RBC antibody screening, and antibody identification.
- Perform crossmatch of minor, major, and direct antiglobulin tests, rapid spin, type, and screen.
- Perform histocompatibility testing and platelet crossmatching.
- Perform thrombosis and screening coagulation tests (e.g., prothrombin time, activated partial thromboplastin time, fibrinogen, and thrombin time).
- Perform HLA typing techniques, including serological methods, microcytotoxicity assays, nucleic acid assays, and lymphocyte culture techniques.

### Communicator

- Communicate effectively with different levels of clinical and technical colleagues, including technicians, technologists, supervisors, clinical scientists, and consultants, both verbally and in written reports.
- Develop rapport, trust, and professional relationships with other sections, departments, and allied healthcare workers.

### Collaborator

- Work effectively with other health professionals to diagnose, prevent, and resolve any transfusion case, blood group, and antibody problems.

### Leader

- Manage time to maximize educational resources and opportunities.
- Acquire general knowledge on how to allocate finite healthcare resources appropriately.
- Serve in administrative and leadership roles, as appropriate.

### Health Advocate

- Explain and follow all safety precautions in the laboratory facility, and strive to implement and follow all rules and regulations at all times.

### Scholar

- Contribute to growth of medical and technical knowledge through research.
- Participate in rounds, conferences, and teaching sessions.

### Professional

- Demonstrate commitment to excellence and ongoing professional development.
- Deliver the highest quality of care with integrity, honesty, and compassion.
- Practice laboratory medicine in an ethical manner and with a sensitivity to diversity of patient results, with confidentiality and integrity.

## Blood transfusion R2 Main Course

During the second year of training, the trainee is expected to develop a broad knowledge regarding the preparation and management of various special transfusions and transfusion reactions, the organization and management of transfusion services, and continuous quality management.

The objectives of the second year are as follows:

- Discuss basic knowledge of various special transfusions.
- Differentiate between various types of transfusion reaction and interpret the results of investigation.
- Demonstrate the organization and management of transfusion services.
- Develop the required skills of reporting quality results and communicate effectively with other medical care providers.



## Transfusion Reactions

### Clinical and practical competencies

#### Medical Expert

##### Knowledge Competencies

- Recognize the symptoms and signs of hemolytic and nonhemolytic transfusion reactions and demonstrate knowledge of the pathophysiology, investigation, and prevention of these complications.
- Identify the major noninfectious complications of blood transfusions, including red cell alloimmunization, transfusion-related acute lung injury, transfusion associated graft versus host disease, volume overload, post transfusion purpura, iron overload, etc., the risks associated with these complications, and strategies to prevent them.
- Describe the typical time course of appearance and disappearance of serum antigens and antibodies used in the screening of major transfusion transmitted infections, including:
  - HIV, hepatitis B, hepatitis C, cytomegalovirus, bacterial/fungal/protozoal infections, and syphilis.
- Describe and interpret nontreponemal and treponemal antibody tests used to diagnose syphilis.
- Compare and contrast various methodologies, such as ELISA, rapid and chemiluminescence, used in the screening of transfusion transmitted infections.
- Describe the feasibility of NAT in blood transfusion services.
- Describe the indications and techniques of confirmatory tests.
- Explain the importance of sensitivity, specificity, evaluation, and validation of the assays.

##### Technical Competencies

- Investigate cases of adverse transfusion reactions.
- Perform various methodologies such as ELISA, chemiluminescence, and rapid assays used in the screening of transfusion transmitted infections.
- Perform NAT testing and interpret the results.
- Demonstrate proficiency in the preparation and use of internal control in transfusion transmitted infection screening.
- Perform various methodologies, such as western blot, neutralization, and RIBA testing used in confirmation of transfusion transmitted infection and interpret the results.
- Evaluate and validate the different assays.

#### Communicator

- Assist in communicating with blood bank technologists and other members of blood bank staff within and outside the blood bank by participating in meetings, conferences, and case presentations.
- Communicate with the responsible physicians and consultants to develop an effective network of friendships for the sake of reporting critical results.

#### Collaborator

- Advise on the appropriateness of diagnostic tests and teaching and research purposes, and advise on further additional laboratory investigations.

### Leader

- Utilize time and resources effectively to balance patient care, budget restrictions, professional expectations, and personal life.

### Health Advocate

- Participate in various types of voluntary work in nonprofit organizations, such as International HIV Day, to promote and educate the community about the importance of screening and early detection of AIDS. He/she should be familiar with the role of other methods and symptoms to screen for the disease.

### Scholar

- Contribute to the development of new knowledge through research.
- Participate in rounds, conferences, and teaching sessions.
- Maintain and enhance professional activities through ongoing learning.

### Professional

- Deliver the highest quality of care with integrity, honesty, and compassion.
- Practice TRANSFUSION in an ethical manner and with a sensitivity to the diversity of patient results with confidentiality and integrity.

## Special Transfusion Preparation And Management

### Clinical and practical competencies

#### Medical Expert

##### Knowledge Competencies

- Describe various modifications of blood components, such as irradiation, cell washing, volume depletion, and leukoreduction.
- Discuss the indications and methods of leukoreduction.
- Discuss the indications and methods of blood product irradiation.
- Discuss the indications and methods of blood washing.
- Discuss the indications and methods of frozen RBCs
- Discuss the indications and methods of blood component inactivation.
- Develop basic understanding of hemostatic and thrombotic disorders.
- Describe laboratory evaluations of disseminated intravascular coagulation.
- Describe the general principles of screening coagulation tests (e.g., prothrombin time, activated partial thromboplastin time, fibrinogen, and thrombin time).
- Apply the principles of a massive transfusion protocol.
- Develop an understanding of blood substitutes and hemopoietic agents.

##### Technical competencies

- Perform all types of leukoreduction.
- Perform all types of blood washing.
- Perform all types of RBC freezing.
- Perform all types of irradiation.
- Perform all types of blood component inactivation.

## DESCRIPTION OF TRAINEE ROTATIONS

---

- Investigate cases of DIC.
- Manage cases of massive transfusion.

### Communicator

- Communicate effectively with different levels of clinical and technical colleague, including technicians, technologists, supervisors, clinical scientists, and consultants, both verbally and in written reports.
- Communicate effectively with physicians to help them in selecting the appropriate type of blood and blood components unit.
- Develop rapport, trust, and professional relationships with other sections, departments, and allied health care workers.

### Collaborator

- Contribute effectively to interdisciplinary team activities by participating in the regular NBS committee meetings.
- Work with other team members, including nurses, consultants, and laboratory coordinators, to make the NBS program more efficient.

### Leader

- Use laboratory and institution resources appropriately.
- Allocate finite health care resources wisely.

### Health Advocate

- Explain and follow all safety precautions in the blood bank facility, and strive to implement and follow all rules and regulations at all times.

### Scholar

- Practice independent lifelong learning to stay up to date in all aspects of Blood TRANSFUSION and other markers of knowledge and skills like attending symposiums, conferences, etc.
- Help others in learning and improve knowledge for patients, community, and health care workers.

### Professional

- Deliver care of the highest quality with integrity, honesty, and compassion.
- Demonstrate the maturity and responsibility expected of all professionals.
- Exhibit appropriate personal and interpersonal professional behavior.
- Respond quickly to urgent requests and night calls.

## Organization And Management Of Transfusion Services

### Clinical and practical competencies

#### Medical Expert

##### Knowledge competencies

- Describe how SOPs are used, developed, authored, and reviewed, and their importance in mandatory laboratory inspection by various accrediting agencies.
- Describe the various means of performing blood utilization reviews.
- Explain the logistics required in determining an appropriate blood inventory for a geographic region and the process of meeting daily, weekly, and monthly collection targets.
- Explain fundamental concepts of medical statistics.
- Appropriately describe the process of triage and screen requests for blood components during inventory shortages.
- Demonstrate the ability to perform blood utilization reviews.
- Explain the major regulations and guidelines that are applicable to the collection, processing, storage, and release of blood and other cellular therapeutic products
- Describe how to develop new policies and procedures or change existing policies and procedures based on a review of the literature or issuance of new guidelines by regulatory agencies.
- Outline the necessary steps in donor notification and counseling associated with positive infectious disease testing results, and the donor look-back process.
- Describe competence in the management of blood inventory and ability to communicate effectively the hospital's needs to the blood supplier.
- Explain the process of hospital transfusion/blood usage committee meetings.

##### Technical competencies

- Develop new policies and procedures or change existing policies and procedures based on a review of the literature or issuance of new guidelines by regulatory agencies.
- Compare and contrast the various means of performing blood utilization reviews.
- Explain the logistics required in determining an appropriate blood inventory for a geographic region and the process of meeting daily, weekly, and monthly collection targets.
- Interpret the statistics and daily report system.
- Appropriately triage and screen requests for blood components during inventory shortages.
- Demonstrate an understanding of and ability to interpret major regulations and guidelines that are applicable to the collection, processing, storage, and release of blood and other cellular therapeutic products.
- Perform the necessary steps in donor notification and counseling associated with positive infectious disease testing results, and the donor look-back process.
- Demonstrate competence in the management of blood inventory and the ability to communicate effectively the hospital's needs to the blood supplier
- Demonstrate the ability to discuss the process of the hospital transfusion/blood usage committee meeting.

#### Communicator

- Participate in transfusion committee meetings and contribute to the continuous education of physicians and nurses regarding blood transfusion services.

- Communicate with donors to help in donor notification and counseling.

### Collaborator

- Contribute effectively to other interdisciplinary team activities.
- Collaborate with phlebotomists and nurses on how to obtain appropriate specimens for blood sampling.

### Leader

- Demonstrate an understanding of and be familiar with both the authorizing body management structure and the blood bank management structure and the relationship between them.
- This includes knowledge of the organizational structure of the blood bank, effective skills in dealing with blood bank employees, and familiarity with the current system of data coding, storage, and specimen requirements.

### Health Advocate

- Participate in promoting the health of patients as individuals as well as communities. He/she should be able to take opportunities for health promotion and disease prevention and try to play an active role in them.
- Develop and implement a personal continuing educational strategy.
- Apply the principles of critical appraisal to sources of blood bank information.
- Contribute to the development of new knowledge through research.
- Participate in rounds, conferences, and teaching sessions.

### Professional

- Personal standards of behavior should be inspired by manners in Islam and he/she must strive to develop the best manners within him/her self, such as:
  - Truthfulness
  - Honesty and integrity
  - Humility and respect for others
  - Patience
  - Passion and love
  - Moderation and fairness.
- Professionalism is to be practiced towards both patients and colleagues alike.

## Continuous Quality Management

### Clinical and practical competencies

#### Medical Expert

##### Knowledge competencies

- Explain the different definitions in quality systems.
- Describe the importance of total quality management and quality elements and factors affecting the quality system.
- Describe the factors influencing quality of blood bag for whole blood collection.

- Demonstrate proficiency in maintaining the quality of blood components as per recommended standards by various agencies (AABB, EC, and ISO).
- Describe the importance of a comprehensive transfusion laboratory safety policy and program.
- Describe the role of quality assurance, quality management, and process improvement principles in blood bank operation and planning.
- Describe proper use of instrumentation and computerization in transfusion services.
- Describe the elements of current good manufacturing practices as they apply to the collection, processing, and storage of all blood components/products.
- Describe the principles and objectives of total quality management in transfusion services, including premises, personnel, instruments/reagents, biosafety, and external/internal quality control.
- Recognize sources of pre-analytical variation and the role of biological variability in transfusion laboratory assessment.
- Demonstrate the ability to prepare and present quality assurance and other types of report at the Transfusion Committee and other meetings, as requested.

### Technical competencies

- Understand proper use of instrumentation and computerization in a transfusion laboratory.
- Demonstrate the elements of current good manufacturing practices as they apply to the collection, processing, and storage of all blood components/products.
- Perform all the steps of quality control for blood and blood components.
- Perform all the steps of quality control for blood bags, reagents, and diagnostic kits.
- Prepare validation, calibration, installation, and maintenance plan.
- Prepare for internal or external assessment plan.
- Develop a process flowchart.

### Communicator

- Establish the ability to communicate with technical, senior, and laboratory supervisor to conduct daily quality control and troubleshoot if required.
- Demonstrate the use of various types of communication and understand when each is required (verbal, written, other).
- Exhibit the need for effective communication with blood bank quality administration officers.
- Establish the ability to understand internal and external quality control reports as a tool of communication.

### Collaborator

- Participate in a multidisciplinary team of quality officers.
- Demonstrate a respectful attitude towards other colleagues and members of a professional team.
- Work with other professionals to prevent conflicts.
- Acquire skills to establish a professional bond with the team staff, collaborative professionals, learners, and the community.
- Demonstrate the use of various types of communication and understand when each is required (verbal, written, other).

## DESCRIPTION OF TRAINEE ROTATIONS

---

- Exhibit the need for effective, timely, clear, and accurate communication and the requirement difference of different agencies and professionals.

### Leader

- Describe the principles of workload requirements and time management.
- Demonstrate a knowledge of laboratory safety for all personnel.
- Describe the principles of laboratory information systems.
- Describe the principles of quality assurance, quality control, and quality improvement.
- Have knowledge of the regulations pertaining to the safety, e.g., storage, of chemicals.

### Health Advocate

- Describe and demonstrates the role of the blood banker in providing accurate results due to the application of quality regulations.
- Describe and demonstrate the role of all necessary safety precautions when dealing with dangerous materials for laboratory officers and others as a health advocate.

### Scholar

- Recognize the importance of scholars.
- Recognize the importance of research and continuous medical education.
- Demonstrate knowledge of basic quality.
- Demonstrate the ability to objectively read quality control reports by attending dedicated courses and reading related books.
- Recognize the importance of attending symposia, conferences, and lectures dedicated to quality programs.
- Attend courses related to laboratory safety programs on a regular basis.

### Professional

- Recognize own limitations and seek assistance when required.
- Demonstrate a collegial manner at all times.
- Recognize professional limits and seek advice and assistance from appropriate individuals in a timely manner.
- Respond appropriately to criticism or notification.
- Demonstrate punctuality.
- Demonstrate an example of competency, integrity, and honesty.
- Respect confidentiality regarding any information obtained as a result of occupation.

## TEACHING AND ACADEMIC ACTIVITIES

Teaching and learning will be structured and programmatic, with more responsibility for self-directed learning.

### General Principles

The general principles of teaching are to:

- Give all students equal attention in class and equal access to advice outside of class.
- Give all students equal amounts of helpful and honest support.
- Not prejudge students' capabilities.
- Monitor classroom dynamics to ensure that no students become isolated.

### Universal Topics

#### Intent

These are high value, interdisciplinary topics of utmost importance to the trainee. The reason for delivering the topics centrally is to ensure that every trainee receives high quality teaching and develops essential core knowledge. These topics are common to all specialties. The topics included here meet one or more of the following criteria:

- Impactful: these are topics that are common or life-threatening.
- Interdisciplinary: hence, topics that are difficult to teach by a single discipline.
- Orphan: topics that are poorly represented in the undergraduate curriculum.
- Practical: topics that trainees will encounter in hospital practice.

#### Development and delivery

Core topics for the PG curriculum will be developed and delivered centrally by the Commission through the e-learning platform. A set of preliminary learning outcomes for each topic will be developed. Content experts, in collaboration with the central team, may modify the learning outcomes.

These topics will be didactic in nature with a focus on practical aspects of care. These topics will be more content-heavy as compared to workshops and other face-to-face interactive sessions. The suggested duration of each topic is 1.30 hours. The topics will be delivered in a modular fashion. At the end of each Learning Unit, there will be an on-line formative assessment. After completion of all topics, there will be a combined summative assessment in the form of a context-rich MCQ. All trainees must attain minimum competency in the summative assessment.

Alternatively, these topics can be assessed in a summative manner together with the specialty examination. The assessment may include: case studies, high quality images, worked examples of prescribing drugs in disease states, and internet resources.

### Module 1: Introduction

- 1) Hospital acquired infections
- 2) Sepsis; SIRS; D/IVC
- 3) Blood transfusion



### Hospital Acquired Infections (HAI)

At the end of the Learning Unit, you should be able to:

- a) Discuss the epidemiology of HAI with special reference to HAI in Saudi Arabia.
- b) Recognize HAI as one of the major emerging threats in healthcare.
- c) Identify the common sources and set-ups of HAI.
- d) Describe the risk factors of common HAIs, such as ventilator associated pneumonia, MRSA, CLABSI, Vancomycin Resistant Enterococcus (VRE).
- e) Identify the role of healthcare workers in the prevention of HAI.
- f) Determine appropriate pharmacological (e.g., selected antibiotic) and nonpharmacological (e.g., removal of indwelling catheter) measures in the treatment of HAI.
- g) Propose a plan to prevent HAI in the workplace.

### Sepsis, SIRS, DIVC

At the end of the Learning Unit, you should be able to:

- a) Explain the pathogenesis of sepsis, SIRS, and DIVC.
- b) Identify patient-related and non-patient-related predisposing factors of sepsis, SIRS, and DIVC.
- c) Recognize a patient at risk of developing sepsis, SIRS, and DIVC.
- d) Describe the complications of sepsis, SIRS, and DIVC.
- e) Apply the principles of management of patients with sepsis, SIRS, and DIVC.
- f) Describe the prognosis of sepsis, SIRS, and DIVC.

### Blood Transfusion

At the end of the Learning Unit, you should be able to:

- a) Review the different components of blood products available for transfusion.
- b) Recognize the indications and contraindications of blood product transfusion.
- c) Discuss the benefits, risks, and alternatives to transfusion.
- d) Undertake consent for specific blood product transfusion.
- e) Perform steps necessary for safe transfusion.
- f) Develop an understanding of special precautions and procedures necessary during massive transfusions.
- g) Recognize transfusion associated reactions and provide immediate management.

### Module 2: Ethics and Healthcare

- 1) Occupational hazards of HCW
- 2) Ethical issues: transplantation/organ harvesting; withdrawal of care
- 3) Ethical issues: treatment refusal; patient autonomy

### Occupational Hazards of Health Care Workers (HCW):

At the end of the Learning Unit, you should be able to:

- a) Recognize common sources and risk factors of occupational hazards among the HCW.
- b) Describe common occupational hazards in the workplace.

- c) Develop familiarity with legal and regulatory frameworks governing occupational hazards among the HCW.
- d) Develop a proactive attitude to promoting workplace safety.
- e) Protect yourself and your colleagues against potential occupational hazards in the workplace.

### **Ethical Issues: Transplantation/Organ Harvesting; Withdrawal of Care:**

At the end of the Learning Unit, you should be able to:

- a) Apply key ethical and religious principles governing organ transplantation and withdrawal of care.
- b) Be familiar with the legal and regulatory guidelines regarding organ transplantation and withdrawal of care.
- c) Counsel patients and families in light of applicable ethical and religious principles.
- d) Guide patients and families to make informed decisions.

### **Ethical Issues: Treatment Refusal; Patient Autonomy**

At the end of the Learning Unit, you should be able to:

- a) Predict situations where a patient or family is likely to decline prescribed treatment.
- b) Describe the concept of a "rational adult" in the context of patient autonomy and treatment refusal.
- c) Analyze key ethical, moral, and regulatory dilemmas in treatment refusal.
- d) Recognize the importance of patient autonomy in the decision making process.
- e) Counsel patients and families declining medical treatment in light of patients' best interest.

## **Internal Educational Material**

### **Mandatory Activities**

Each institution is requested to provide or allow the resident to attend the following educational activities that are arranged by the local committees:

#### **First year main course (for r1 trainee)**

##### **Blood Donor Management**

###### **List of Lectures**

- Donor registration (manual and electronic systems)
- Communications skills and brainstorming
- Donation types: Voluntary donation, family replacement, directed donation, and autologous donation
- Criteria for donor selection (questionnaire): Medical history, examination, and informed consent
- Education, awareness, and information about prospective donor
- Pre-donation laboratory tests
- Donor recruitment and recall: Policy, methodology, and documentation
- Use of information technology for donor recruitment
- Donor information programs

- Autologous blood donation: Definition, types, clinical applications
- Blood donor program
- Motivating factors for donation
- Types of blood bag, anticoagulant, and preservative
- Phlebotomy procedure and sample collection
- Care of blood donor: Pre-donation, mid-donation, and post-donation
- Donor reactions and their management

### **Practical Training**

- Communication skills
- Blood campaign preparation
- Completing donor questionnaire, physical examination, and interpretation of the results
- Pre-donation laboratory tests
- Recruitment and donor recall
- Donation format
- Educational material and informed consent
- Phlebotomy and sampling
- Blood donation care
- Donor reactions and their management

### **Aphaeresis Procedures**

#### **List of Lectures**

- Principles of aphaeresis technology
- Various equipment and disposables
- Whole blood donation vs aphaeresis donation
- Advantages of automated blood collection
- Donor criteria and selection
- Platelets aphaeresis
- Other component collection: Red cells, plasma, and granulocytes
- Peripheral blood stem cell collection
- Stem cell indications, processing, and storage
- Types of therapeutic aphaeresis: Indication and procedures
- Technical principles of therapeutic aphaeresis: Anticoagulation, timing of procedures, replacement fluids, and venous access
- Recognition and management of adverse events
- Plasma exchange
- Red cells exchange
- Leukoreduction
- LDL aphaeresis (Liposorber)
- Pediatric considerations for therapeutic aphaeresis

### **Practical Training**

- Access evaluation
- Donor suitability
- Selection of machine

- Hands-on experience of each procedure
- Product manipulation
- Quality control of product
- Donor observation for adverse effects and their management
- Indications, contraindications
- Replacement fluids, frequency, monitoring of TPE
- Care of donor or patient
- Stem cell collection and processing: Collection technique and complications, cell count targets and engraftment monitoring, processing, and storage

### List of Lectures:

- Principles of aphaeresis technology
- Various equipment and disposables
- Whole blood donation vs aphaeresis donation
- Advantages of automated blood collections
- Donor criteria and selection
- Platelets aphaeresis
- Other component collection: Red cells, plasma, and granulocytes
- Peripheral blood stem cell collections
- Stem cell indications, processing, and storage
- Types of therapeutic aphaeresis: Indication and procedures
- Technical principles of therapeutic aphaeresis: Anticoagulation, timing of procedures, replacement fluids, and venous access
- Recognition and management of adverse events
- Plasma exchange
- Red cells exchange
- Leukoreduction
- LDL aphaeresis (Liposorber)
- Pediatric considerations for therapeutic aphaeresis

### Practical Training

- Access evaluation
- Donor suitability
- Selection of machine
- Hands-on experience of each procedure
- Product manipulation
- Quality control of product
- Donor observation for adverse effects and their management
- Indications, contraindications
- Replacement fluids, frequency, monitoring of TPE
- Care of donor or patient
- Stem cell collection and processing: Collection technique and complications, cell count targets and engraftment monitoring, processing, and storage

## Blood Components

### List of Lectures

- Main constituents and functions of circulating blood:
  - Hematopoiesis
  - Red cells (formation, function, life span, and destruction)
  - White cells (formation, function, life span, and destruction)
  - Platelets (formation, function, life span, and destruction)
  - Plasma (formation, function, life span, and destruction)
- Types of blood bag system
- Types of anticoagulant and preservative
- Principles of component preparation
- Steps in blood component and blood derivative preparation
- Quality monitoring for blood components
- Blood/blood components: Indications, dosage, and administration
- Methods to increase plasma transfusion safety
- Proper labeling of various components: PRBC, FFP, Plt, Cryo
- Storage of blood and blood components
- Transport and shipping
- Proper cold chain
- Storage lesions
- Plasma fractionation (Preparation, indications, dose)

### Practical Training

- Preparation of various components: PRBC, FFP, Plt, Cryo
- Thawing and pooling
- Storage of various components: PRBC, FFP, Plt, Cryo
- Quality monitoring for blood components
- Proper labeling of various components: PRBC, FFP, Plt, Cryo
- Transport and shipping

## Immunohematology

### List of Lectures

- Principles of basic immunology: Antigen, antibody, complement, immunoglobulin
- Antigen-antibody reaction
- Lymphocytes in humeral and cellular immunity
- Principles of basic genetics
- Genetics of blood groups: Phenotype and genotype
- Principles of blood group inheritance
- ABO blood group and Rh system
- Other blood groups: Lewis. Ii, MNS, Kell, Duffy, Kid, P
- High and low frequency antigens
- Sample/Patient/Component identification requirements
- Detection of antigen–antibody reaction (AHG test and other methods)
- Antibody screening

- Antibody identification
- Crosshatching, typing, and screening of minor, major, and direct antiglobulin tests
- Enhancement techniques
- Interpretation of antibody screening and crosshatching
- Principle of homeostasis and coagulation
- Lab tests of coagulation status
- Platelets and granulocyte antigen and antibodies
- Alloimmunization to platelet antigens and prevention
- HLA system, function, genes, antigens, antibodies. Platelet crossmatching

### Practical Training

- ABO group and Rh type: Slide, tube, gel, and other
- Du testing, genotype
- Irregular antibody screening
- Antibody Identification
- Crossmatching, typing, and screening of minor, major, and direct antiglobulin tests
- Abbreviating compatibility testing in emergencies
- Lab test coagulation status
- HLA system
- Enzyme, adsorption, and elution techniques

## Second Year Main Course (For R2 Trainee)

### Transfusion Reactions

#### List of Lectures

- Blood and blood component safety
- Hemovigilance
- Transfusion adverse reactions:
  - Acute and delayed
  - Clinical presentation, pathophysiology, investigations, management
  - Hemolytic transfusion reaction
  - Nonhemolytic transfusion reaction
  - Transfusion associated graft versus host disease
  - Transfusion related acute lung injury
  - Hemosiderosis
  - Volume overload
  - Transfusion transmitted infections
    - Bacterial: Current risk and prevention strategies
    - Viral: Current risk and prevention strategies
    - Parasitic: Current risk and prevention strategies
    - Prions: Current risk and prevention strategies
- Screening assays:
  - Enzyme Linked Immuno Sorbent Assays (ELISA):
    - Antiglobulin EIA
    - Competitive
    - Sandwich

- Antibody capture
- Combination Ag/Ab assays
- o Microparticle assays
- o Chemiluminescence assays
- o Particle agglutination assays
- o Simple rapid assays
- Nucleic acid amplification techniques (NAT):
  - o Polymerase Chain Reaction (PCR).
  - o Transcription Mediated Amplification (TMA)
- Confirmatory testing:
  - o Western blot
  - o Neutralization
  - o Reba test
  - o TPHA
  - o Thick and thin films for malaria
- Selecting screening assay:
  - o Sensitivity
  - o Specificity
  - o Evaluation and validation of assay

### Practical Training

- Cases of transfusion adverse reaction: Investigations and prevention
- Methods of identification for bacterial infected blood or platelets bags
- ELISA assays (Different types)
- Microparticle assays
- Chemiluminescence assays
- Particle agglutination assays
- Simple rapid assays
- Nucleic acid amplification techniques (NAT)
- Western blot
- Neutralization
- Reba test
- Evaluation and validation of assays

### Special Transfusion Preparation And Management

#### List of lectures

- Leukoreduction:
  - o Principles and indication of uses; methods of leukoreduction: Pre-storage, lab, and bedside
  - o Factors affecting filter performance
  - o Optimal timing of leukoreduction
  - o Cost effectiveness
- Irradiation:
  - o Principles and indication of uses
  - o Irradiation instruments
  - o Components to be irradiated

- Effect of irradiation on storage of blood components
- Blood washing
  - Principles and indication of use
  - Techniques
  - Effect of washing on storage of blood components
- Blood freezing
  - Principles and indication of use
  - Cryoprotective agents
  - High and low concentrations of glycerol
  - Thawing and deglycerolizing RBCs
- Massive transfusion
  - Definition, causes, and organization
  - Timetable for delivery of blood components
  - Switching blood groups
  - Risks of massive transfusion
- Disseminated Intravascular Coagulation (DIC):
  - Definition, causes, and mechanisms
  - Clinical phases and predisposing factors
  - Hemostatic variables in DIC
  - Lab. investigations
    - Basic
    - Special diagnosis
    - Supplementary special diagnosis
- Components Pathogen Inactivation
  - Heat treatment
  - Solvent detergent
  - Mythelene blue with ultraviolet irradiation
  - Nanofiltration
- Maximal surgical blood order schedule
- Blood substitutes and hemopoietic agents:
  - Crystalloids and colloids
  - Oxygen carrying compounds
  - Use of hematinics
  - Hemopoietic growth factors
  - Plasma products

### **Practical Training**

- Leukoreduction
- Washing
- Irradiation
- Freezing
- Inactivation of blood components
- Cases of DIC, massive transfusion, and MSBOS



### Organization and management of transfusion services

#### List of Lectures

- Organization and function of blood services and hospital transfusion
- Development of transfusion service
- Organizational structure and role of the manager
- Job descriptions, responsibilities, and delegation
- Estimation of needs, goals, and plans
- Statistics and daily report system
- Inventory control and stock management
- Disaster plan
- Ethical and legal considerations pertaining to transfusion practice
- Interpersonal and communication skills
- Donor notification and counseling
- Look back program
- Hospital Transfusion Committee
- Policies and procedures
- Development of forms, labels, records, etc.
- Selection of indicators to assess performance

#### Practical Training

- Writing policies and procedures
- Applying look back program
- Writing a job description
- Training in blood inventory control and stock management
- Developing a disaster plan
- Uses of forms, labels, records, etc.
- Sharing in donor notification and counseling
- Sharing in hospital transfusion committee
- Sharing in interpreting statistics and the daily report system

### Continuous Quality Management

#### List of Lectures

- Quality Awareness:
  - What is quality?
  - Quality elements
  - Quality tools
  - Importance of quality
  - Factors affecting quality
- Safety regulations:
  - Introduction to hygiene and safety
  - The safety manual/plan
  - Hand washing
  - Work design and exposure prevention
  - Using personal protective equipment
  - Transportation for bio hazardous material

- Waste management and waste reduction
- Safety and minimizing risks
- Documentation:
  - Documentation in quality system
  - Document control
  - Storage duration of different documents
- Assessment within quality system:
  - Validation
  - Error management
  - Audit and auditing
  - Audit process
- Accreditation and the role of regulatory agencies
- Instruments and equipment used in blood bank:
  - Types and principles
  - Validation, calibration, installation, and maintenance plan
- Supplier and customer issues:
  - Quality of the product provided
  - Delivery performance
  - Service and maintenance provided
- Deviations and nonconformance
- Internal and external assessment
- Continuous improvement
- Quality control of blood and blood components
- Quality control of reagents and diagnostic kits
- Good manufacturing practices (GMP)

### Practical Training

- Quality control of reagent, kits, blood, and blood components
- Sharing in validation, calibration, installation, and maintenance process
- Sharing in audit plan
- Developing a process flowchart

## External Educational Material

### Suggested Activities

#### Take online CAP team member inspector course.

- Review and be familiar with ASCP Laboratory Management Course material.
- Attend American Association of Blood Banks annual meeting.
- Conduct thorough review of the Laboratory Safety Manual from at least one CAP accredited hospital.

**CEP will be supplemented with other types of practice-based learning (PBL) such as:**

#### Case presentations outlining the following:

- Presenting symptoms, clinical differential diagnosis

- Laboratory data for interpretation
- Additional suggested laboratory tests

### Journal clubs

#### Guidelines for Blood TRANSFUSION Club

##### Goals of Journal Club:

- Teach critical appraisal
- Keep current with the medical literature
- Provide a foundation for evidence-based practice
- Review landmark or controversial papers

##### Characteristics of successful journal clubs:

- Presented by residents and actively supervised by staff
- Attendance is mandatory for trainees
- Meetings last for less than 60 minutes
- Supported and endorsed by Program Director and departmental leaders

#### Critically Reviewing Articles

##### Problem - Based Learning:

- Choose 1 - 2 relevant journal articles that are related to the specialty.
- Present each paper for 20 minutes followed by 10 minutes of critique.
- To select appropriate topics for discussion, ask:
  - “So what?”
  - Will it change my practice?
  - Is the question important?

##### Purpose:

- Identify research question, study objective, and specific hypothesis.
- Do the authors provide a clear and specific question and hypothesis?
- Is the research objective clear and unambiguous?

##### Methodology:

- Is the study design appropriate for the research question?
- What are the pros and cons of this design?
- What are the pros and cons of alternative methodologies?
- What are the advantages and disadvantages of the chosen methodology?
- What is the level of evidence?
- Check for confounding, bias, and validity.

##### Study Population:

- What are the characteristics of the study population?
- Who are the participants?
- What is the time and place?
- Is the study population appropriate?

- What are the characteristics of the sample?
- Is random or convenience sampling used?
- Is the population similar to my patients?
- What are the specific inclusion and exclusion criteria?
- Are these criteria appropriate?
- Is there a selection bias?

### Measurement Issues and Bias:

- How are variables measured?
- Is there a misinformation bias?
- Is there a detection bias?
- Are masking or blinding evident?

### Statistical Analysis:

- How were the data analyzed?
- Were the tests appropriate?
- What are the P values versus sizes and 95% confidence intervals (more informative)?
- What were the NS versus actual P values?
- Were multivariable methods used?
- Was regression analysis conducted?

### Sample Size and Power:

- Was the sample size calculated a priori?
- Did the investigators specify a clinically important difference they wanted to detect?
- Were there Type I ( $\alpha$  or alpha) or Type II ( $\beta$  or beta) errors (Power=1 - type II error)?

### Results:

- What are the results?
- Are they clearly presented and understandable?
- How were the results interpreted?
- Are the interpretations appropriate?
- Are there any threats to validity?
- Is there any loss to follow - up?
- Is there any missing information?
- Is confounding controlled for?
- Are there any issues of bias?

### Discussion:

- Are the conclusions supported by the data?
- Are the findings related to other studies in the medical literature?
- Do the authors "stretch" too far?
- What are the strengths of the study?
- What are the weaknesses or flaws of the study?
- Do the authors recognize these strengths and weaknesses?
- Come back to the key question: "So what?"

- Will it change how we practice?
- Will it change how we counsel patients?

### Conclusions:

- Where to from here?
- Do the findings contribute to our knowledge of the subject?
- How could we do better?
- What additional questions does the study raise?

### Other activities:

- The trainee should be encouraged to attend the self (MOCK)
- AABB inspection
- Other Continuous Medical Education activities

\* All educational activities should be documented and the following information should appear in the QC sheet: date, title, names of residents attending the session, name of clinical biochemist giving the session.

\* Trainee is required to attend at least 75% of all educational activities held at the institute where he/she is training.

### Optional Activities

Each institution must encourage residents in the following educational activities:

- To present at least once a year at a local, national, or international Blood TRANSFUSION meeting.
- To review the department teaching file.
- To attend any national educational activities (symposia, workshops, review courses, etc.).

## ASSESSMENT, EXAMINATION CRITERIA, AND CERTIFICATION

### Proposed Assessment

The academic performance of a trainee must be evaluated with a careful and deliberate review, including documentation of the resident's performance with respect to relevant exam scores, clinical diagnosis and judgment, medical knowledge, technical ability, interpretation of data, patient management, communication skills, and interactions with blood donors and other healthcare professionals, professional appearance and demeanor, and/or motivation and initiative. The trainee and supervisor must meet together to review the portfolio and logbook once every two months and at the given rotation. All recorded evaluations of a trainee's performance are accessible to the trainee.

### Purpose

The purposes of assessment during the training are as follows:

- Support learning
- Develop professional growth
- Monitor progression
- Competency judgment and certification
- Evaluate the quality of the training program

### General Principles

- Judgment should be based on holistic profiling of a trainee rather than individual traits or instruments.
- Assessment should be continuous in nature.
- The trainee and faculty must meet to review the trainee's performance.
- Assessment should be strongly linked to the curriculum and course content.
- Trainees' evaluations and assessment throughout the program are undertaken in accordance with the Commission's training and examination rules and regulations.
- The practical exam is noncompensatory, i.e., passing this segment of the exam is mandatory for an overall pass.

### 360° Evaluation

This consists of questionnaires or similar tools completed by multiple individuals in the training sphere of influence that assess the performance of the trainee. It is considered most useful to assess interpersonal/communication skills, professional behavior, systems-based practice, and some aspects of patient care.

### Portfolios

A portfolio is a collection of products prepared by the trainee that provides evidence of achievement relative to the curriculum and demonstrates performance, growth, and effort. It may include written documents or video-/audio-recordings, photographs, and the like. In clinical practice, this can include

computer slide case presentations (case conferences), written materials prepared for journal club, materials generated for morning report, and, in particular, laboratory procedures that the trainee has written, revised, or reviewed. It may also contain copies of anonymized patient reports, chart notes, and other clinical interpretations. A portfolio is more than a trainee scrapbook—it is most powerful when coupled with trainee self-reflection. It is a tool to promote self-knowledge and self-esteem and at the same time it can be used to identify areas of strength and areas that require improvement.

### Logbook

All trainees will have a log book for continuous evaluation and attendance, which will be signed by the instructor and students on a regular basis. The logbook serves as a record of overall clinical exposure that can be used to assure adequate breadth of experience for the trainee. Supervisor review of the logbook, either in the setting of a morning report or on an individual basis, is recommended to determine learning gaps.

### Dissertation

Students must select a thesis within four months of joining, and submit protocol and obtain approval within six months. The thesis must be submitted three months prior to the final exam.

### Module Examination

There will be a written quiz and practical examination following each module, which will cover all topics studied in each. A successful grade is necessary to move forward to the next module. The promotion of the trainee from one module to another will be determined by:

- Passing of final in-training examination
- Overall performance of the trainee
- Approval of local supervisor and the RTC

### Summative Continuous Evaluation

This is a summative continuous evaluation report prepared for each trainee at the end of each academic year.

### Promotion Examinations

These examinations are held at the end of first year of the program. The successful completion of these examinations will enable the trainee to graduate to the second year of the training program. The promotion examinations will consist of the following:

#### 1. Written Examination

The main objective of this exam is to assess the trainees' theoretical knowledge and critical thinking skills in relation to topics and clinical experience covered during the first training year.

The examination blueprint and format (including the number of questions, eligibility, and the scores required to pass) will be based on the Saudi Commission Examination Rules and Regulations, available from the Saudi Commission Website: [www.scfhs.org.sa](http://www.scfhs.org.sa) .

### 2. Practical and Oral Examination

The objectives of this examination are to assess the trainees' clinical skills, including data gathering, patient management, communication, and counseling. This examination will include a specific number of exercises (stations) designed to achieve the training objectives completed in the first year. The examination blueprint and format (including the number of questions, eligibility, and the scores required to pass) will be based on the Saudi Commission Examination Rules and Regulations, available from the Saudi Commission Website, [www.scfhs.org.sa](http://www.scfhs.org.sa) .

### Final examination (R2)

The end-of-program examinations are comprehensive. The trainee will be awarded his or her diploma certificate once he/she has successfully completed these examinations.

#### 1. Final Written Examination

This exam assesses the trainees' theoretical, clinical knowledge and critical thinking skills in relation to all of the topics covered during the program. The examination blueprint and format (including the number of questions, eligibility, and the scores required to pass) will be based on the Saudi Commission Examination Rules and Regulations, available from the Saudi Commission Website, [www.scfhs.org.sa](http://www.scfhs.org.sa) .

#### 2. Final practical and oral Examination

This examination is to assess the trainees' clinical skills, including data gathering, patient management, communication, and counseling. This examination will include a specific number of stations designed to achieve the training objectives. The examination blueprint and format (including the number of questions, eligibility, and scores required to pass) will be based on the Saudi Commission Examination Rules and Regulations, available from the Saudi Commission website, [www.scfhs.org.sa](http://www.scfhs.org.sa) .

### Certification

Trainees who completed all program requirement successfully and passed final examination will receive the “**Saudi Diploma in Blood Transfusion**” certificate.



## SUGGESTED REFERENCES AND READING RESOURCES

### Books

- 1) Technical Manual of AABB.
- 2) Blood Banking and Transfusion Medicine, second edition, by Sally V. Rudman.
- 3) Basic and Applied Concepts of Blood Banking and Transfusion Practices by Kathy D. Blaney and Paula R. Howard.
- 4) Modern Blood Banking and Transfusion Practices by Denise M. Harmening, PhD, MT(ASCP), CLS(NCA).
- 5) Mollison's Blood Transfusion in Clinical Medicine by Harvey G. Klein and David J. Anstee.
- 6) Aphaeresis: Principles and Practice by AABB Press.
- 7) Handbook of TRANSFUSION by Christopher D. Hillyer, M.D., Krista L. Hillyer, M.D., Frank J. Strobl, M.D., PhD, Leigh C. Jefferies.
- 8) Handbook of Pediatric TRANSFUSION by Christopher D. Hillyer, M.D., Ronald G. Strauss, M.D., and Naomi L.C. Luban, M.D.

**Note: The latest edition of each book is recommended**

### Websites and Internet Resources

American association of blood banks [www.aabb.org](http://www.aabb.org)

## SCFHS POLICIES AND PROCEDURES

### Rules and regulations

Please follow the links below to familiarize yourself with SCFHS rules and regulations of residency training.

- 1) Main page. Publications related to SCFHS regulations in Arabic  
<http://www.scfhs.org.sa/Reglations/Pages/default.aspx>
- 2) Main page. Publications related to SCFHS regulations in English  
<http://www.scfhs.org.sa/en/Reglations/Pages/default.aspx>
- 3) Rules and regulations of the scientific council and committees, Arabic  
<http://www.scfhs.org.sa/Reglations/Documents/اللائحة%20التنفيذية%20للمجالس%20واللجان%20العلمية.pdf>
- 4) Rules of procedure for training of Saudi Board, Arabic  
<http://www.scfhs.org.sa/Reglations/Documents/اللائحة%20العامية%20للتدريب%20لبرامج%20شهادة%20الاختصاص%20السعودية.pdf>
- 5) Rules of procedures for training of Saudi Board, English  
<http://www.scfhs.org.sa/en/Reglations/Documents/Rules%20of%20Procedure%20for%20Training%20of%20Saudi%20Board%20Specialties.pdf>
- 6) SCFHS examination regulations  
<http://www.scfhs.org.sa/Reglations/Documents/النظم%20والقواعد%20العامية%20لامتحانات%20الهيئة%20السعودية%20للتخصصات%20الصحية.pdf>
- 7) Trainees' rights and obligations  
<http://www.scfhs.org.sa/MESPS/TrainingProgs/RegulationBoard/Documents/Saudi%20Commission.pdf>
- 8) Code of Ethics for health care practitioners  
<http://www.scfhs.org.sa/Media/OtherPublications/Documents/%d8%a3%d8%ae%d9%84%d8%a7%d9%82%d9%8a%d8%a7%d8%aa%20%d8%a7%d9%84%d9%85%d9%85%d8%a7%d8%b1%d8%b3%20%d8%a7%d9%84%d8%b5%d8%ad%d9%8a.pdf>
- 9) Introduction to clinical research  
[http://www.scfhs.org.sa/Media/OtherPublications/Documents/Introduction%20to%20Clinical%20Research%20for%20Residents%20\(16.9.14\)%20Hani%20Tamim%20\(FC1\).pdf](http://www.scfhs.org.sa/Media/OtherPublications/Documents/Introduction%20to%20Clinical%20Research%20for%20Residents%20(16.9.14)%20Hani%20Tamim%20(FC1).pdf)

## Privacy and confidentiality

Any personal information provided by Trainees to SCFHS staff is strictly confidential. It will never be disclosed to any advertisement groups or any third party. Accredited training centers, members of the training program, committees, examiners, and supervisors will be given the necessary information for the purpose of training and examinations only. Exam results will be disclosed to the candidate only by methods described under the examination section. Please follow the link below for further details:

<http://www.scfhs.org.sa/Reglations/Documents/>

[النظم%٢٠%والقواعد%٢٠%العامه%٢٠%لامتحانات%٢٠%الهيئة%٢٠%السعودية%٢٠%للتنخصصات%٢٠%الصحية.pdf](#)

On the other hand, residents are required to provide accurate information about themselves as required when applying to the program. It is the responsibility of each applicant to update his/her contacts regularly and whenever necessary. The program declares no responsibility for any lack of communication or untoward results affecting the residents adversely due to inaccurate/incomplete/outdated personal data.

## Registration for training

Please refer to SCFHS training manual for full details.

<http://www.scfhs.org.sa/Reglations/Documents/>

[اللائحة%٢٠%العامه%٢٠%للتدريب%٢٠%لبرامج%٢٠%شهادة%٢٠%الاختصاص%٢٠%السعودية.pdf](#)

<http://www.scfhs.org.sa/en/Reglations/Documents/Rules%20of%20Procedure%20for%20Training%20of%20Saudi%20Board%20Specialties.pdf>

## Monitoring of training and mentoring

Each resident will have a logbook and checklist to be reviewed by the supervisor and the program directors by the end of each rotation. It is the responsibility of each supervisor to ensure the completeness of the training requirement each year for his allocated resident and forward a letter to the program director confirming that completion. Otherwise, the rotations for the following year must be modified according to their needs.

Each local program director must review the logbook and checklist of his allocated residents to ensure completeness of training for the final exam and notify the program director of that at least six months before the diploma examination date.

It is advisable for the resident to have a mentor throughout the five-year training. The mentor will follow up the completion of required training during the five-year program and before entering for the final exam. Alterations can be made if/as required and according to availability.

## SCFHS guidelines for mentoring

<http://www.scfhs.org.sa/Media/OtherPublications/Documents/%D8%AF%D9%84%D9%8A%D9%84%20%D8%A7%D9%84%D8%A5%D8%B1%D8%B4%D8%A7%D8%AF%20%D8%A7%D9%84%D8%A3%D9%83%D8%A7%D8%AF%D9%8A%D9%85%D9%8A.pdf>

## VACATIONS/LEAVE OF ABSENCE/EDUCATIONAL LEAVE

### Annual Leave

According to Saudi commission rules and regulation candidate are allowed to apply for different types of vacation for more information please see link below

<http://www.scfhs.org.sa/Reglations/Documents/اللائحة%20العامه%20%التدريب%20%للتدريب%20%لبرامج%20%شهادة%20%الاختصاص%20%السعودية.pdf>

<http://www.scfhs.org.sa/en/Reglations/Documents/Rules%20of%20Procedure%20for%20Training%20of%20Saudi%20Board%20Specialties.pdf>

### Withdrawal of training

A written report should be submitted to the RTC for withdrawal from the program for periods of less than ONE YEAR collectively. If withdrawal is intended to be for more than ONE YEAR, re-application for the program is mandatory through the SBAMS.

<http://www.scfhs.org.sa/Reglations/Documents/اللائحة%20العامه%20%التدريب%20%للتدريب%20%لبرامج%20%شهادة%20%الاختصاص%20%السعودية.pdf>

### Suspension or interruption of training

Interruption of training will be permitted for sickness or for justifiable and convincing social reasons. Applications must be made in writing and discussed with and approved by the RTC. The maximum permitted interruption is one year with justified reasons and supporting documents. The application must be approved by the RTC.

<http://www.scfhs.org.sa/Reglations/Documents/اللائحة%20العامه%20%التدريب%20%للتدريب%20%لبرامج%20%شهادة%20%الاختصاص%20%السعودية.pdf>

### Transfer from and to the program

Transfer from other training programs outside clinical biochemistry programs is not permissible. If a candidate from a different program wishes to apply to the Clinical Biochemistry program, he/she should follow the same policy and procedure to apply as a new candidate to the program.

<http://www.scfhs.org.sa/Reglations/Documents/اللائحة%20العامه%20%التدريب%20%للتدريب%20%لبرامج%20%شهادة%20%الاختصاص%20%السعودية.pdf>

### References

- 1) Saudi Diploma in Blood TRANSFUSION Information Booklet.
- 2) SCFHS regulation manuals. <http://www.scfhs.org.sa/en/Reglations/Pages/default.aspx>

## APPENDICES

## Appendix 1

## About CanMEDS:

As described on the website of the Royal College of Canada (<http://www.royalcollege.ca/portal/page/portal/rc/resources/aboutcanmeds>), CanMEDS is an educational framework that identifies and describes the seven roles that lead to optimal health and health care outcomes: medical expert (central role), communicator, collaborator, leader, health advocate, scholar, and professional.

The overarching goal of CanMEDS is to improve patient care. The model has been adapted around the world in the health profession and other professions.

## Appendix 2

Blood Bank Competency Log Book (instructor and student signatures)					
Student Name: _____					
Student ID Number: _____					
Rating:		Satisfactory (S)	Unsatisfactory (Un)		
R1	Observe	Performed		Supervisor	
		Under supervision	Independently	Rating	Signature
<b>A- Blood Donor Management</b>					
Communication skills	(10 Times)	(5 Times)	(3 Times)		
Training in blood campaign preparation	(2 Times)	(1 Time)	(1 Time)		
Donor questionnaire filling, physical examination, and interpretation of results	(10 Times)	(5 Times)	(3 Times)		
Pre-donation laboratory tests	(10 Times)	(5 Times)	(3 Times)		

APPENDICES

Recruitment and donor recall	(3 Times)	(2 Times)	(2 Times)		
Donation format	(3 Times)	(2 Times)	(2 Times)		
Educational material and informed consent	(3 Times)	(2 Times)	(2 Times)		
Phlebotomy and sampling	(10 Times)	(5 Times)	(3 Times)		
Blood donation care	(10 Times)	(5 Times)	(3 Times)		
10- Donor reactions and their management.	(2 Times)	(1 Time)	(1 Time)		
<b>B- Apheresis Procedures</b>					
Access evaluation	(3 Times)	(2 Times)	(2 Times)		
Donor suitability	(3 Times)	(2 Times)	(2 Times)		
Selection of machine	(3 Times)	(2 Times)	(2 Times)		
Hands-on experience of each procedure	(3 Times)	(2 Times)	(2 Times)		
Product manipulation	(3 Times)	(2 Times)	(2 Times)		
QC of product	(3 Times)	(2 Times)	(2 Times)		
Donor observation for adverse effects and their management	(2 Times)	(1 Time)	(1 Time)		
Indications and contraindications	(3 Times)	(2 Times)	(2 Times)		
Replacement fluids, frequency, and monitoring of TPE.	(3 Times)	(2 Times)	(2 Times)		
Care of the donor or patient	(3 Times)	(2 Times)	(2 Times)		
Stem cell collection, processing, and storage	(2 Times)	(1 Time)	(1 Time)		
<b>C- Blood Components</b>					
Preparation of various components: PRBC, FFP, Plt, Cryo	(10 Times)	(5 Times)	(3 Times)		
Thawing and pooling	(10 Times)	(5 Times)	(3 Times)		

APPENDICES

Storage of various components: PRBC, FFP, Plt, Cryo	(10 Times)	(5 Times)	(3 Times)		
Quality monitoring for blood components	(10 Times)	(5 Times)	(3 Times)		
Proper labeling of various components: PRBC, FFP, Plt, Cryo	(10 Times)	(5 Times)	(3 Times)		
Transport and shipping	(10 Times)	(5 Times)	(3 Times)		
<b>D- Immunohematology</b>					
ABO group and Rh type: Slide, Tube, Gel, and other	(10 Times)	(5 Times)	(3 Times)		
Du testing, genotype	(3 Times)	(2 Times)	(2 Times)		
Irregular antibody screening	(10 Times)	(5 Times)	(3 Times)		
Antibody Identification	(3 Times)	(2 Times)	(2 Times)		
Crossmatching minor and major	(10 Times)	(5 Times)	(3 Times)		
Direct antiglobulin test (DAT)	(10 Times)	(5 Times)	(3 Times)		
Abbreviation of compatibility testing in emergency	(3 Times)	(2 Times)	(2 Times)		
Lab tests of coagulation status	(3 Times)	(2 Times)	(2 Times)		
HLA system	(3 Times)	(2 Times)	(2 Times)		
10- Enzyme, adsorption, and elution techniques	(3 Times)	(2 Times)	(2 Times)		
11- Neonatal transfusion policy	(3 Times)	(2 Times)	(2 Times)		
12- Selection of blood/ component for transfusion	(10 Times)	(5 Times)	(3 Times)		

APPENDICES

R2	Observed	Performed		Supervisor	
		Under supervision	Independently	Rating	Signature
<b>A- Transfusion Reaction</b>					
Cases of transfusion adverse reaction: Investigation, prevention	(2 Times)	(1 Time)	(1 Time)		
Methods of identification for bacterial infected blood and platelets bags	(2 Times)	(1 Time)	(1 Time)		
Cases of transfusion adverse reaction: Investigation, prevention	(2 Times)	(1 Time)	(1 Time)		
Methods of identification for bacterial infected blood and platelets bags	(2 Times)	(1 Time)	(1 Time)		
ELISA assays (Different types)	(2 Times)	(1 Time)	(1 Time)		
Microparticles assays	(2 Times)	(1 Time)	(1 Time)		
Chemiluminescence assays	(2 Times)	(1 Time)	(1 Time)		
Particles agglutination assays	(2 Times)	(1 Time)	(1 Time)		
Simple rapid assays	(2 Times)	(1 Time)	(1 Time)		
10- Nucleic Acid Amplification Techniques (NAT)	(2 Times)	(1 Time)	(1 Time)		
11- Western blot	(2 Times)	(1 Time)	(1 Time)		
12- Neutralization	(2 Times)	(1 Time)	(1 Time)		
13- Reba Test	(2 Times)	(1 Time)	(1 Time)		
14- Evaluation and validation of assays	(2 Times)	(1 Time)	(1 Time)		
<b>B- Special Transfusion Preparation and Management</b>					
Leukoreduction	(2 Times)	(1 Time)	(1 Time)		
Washing	(2 Times)	(1 Time)	(1 Time)		



APPENDICES

Irradiation	(2 Times)	(1 Time)	(1 Time)		
Freezing	(2 Times)	(1 Time)	(1 Time)		
Inactivation of blood components	(2 Times)	(1 Time)	(1 Time)		
Cases of DIC, Massive Transfusion, and MSBOS	(2 Times)	(1 Time)	(1 Time)		
<b>C- Organization and Management of Transfusion Services</b>					
Write policies and procedures	(3 Times)	(2 Times)	(2 Times)		
Apply look back program	(3 Times)	(2 Times)	(2 Times)		
Write a job description	(3 Times)	(2 Times)	(2 Times)		
Train in blood inventory control and stock management	(3 Times)	(2 Times)	(2 Times)		
Develop a disaster plan	(3 Times)	(2 Times)	(2 Times)		
Uses of forms, labels, records, etc.	(3 Times)	(2 Times)	(2 Times)		
Share in donor notification and counseling	(3 Times)	(2 Times)	(2 Times)		
Share in hospital transfusion committee	(3 Times)	(2 Times)	(2 Times)		
Share in interpreting statistics and the daily report system	(3 Times)	(2 Times)	(2 Times)		
<b>D- Continuous Quality Management</b>					
Quality control of reagent, kits, blood, and blood components	(3 Times)	(2 Times)	(2 Times)		
Share in validation, calibration, installation, and maintenance process	(3 Times)	(2 Times)	(2 Times)		
Share in audit plan	(3 Times)	(2 Times)	(2 Times)		
Develop a process flowchart	(3 Times)	(2 Times)	(2 Times)		

### Appendix 3

#### Blood TRANSFUSION Training Rotations

Weeks	1	6	12	18	24	30	36	42	48
Year 1 (R 1)	The first year is designed to provide training in blood donor management and aphaeresis procedures, together with rotations in immune hematology and blood components.								
Year 2 (R 2)	During this part of the training, the trainee is expected to develop a broad knowledge of the preparation and management of various special transfusions and transfusion reactions, the organization and management of transfusion services, and engage in continuous quality management.								

## Appendix 4

Resident Presentation Evaluation by Staff Supervisor (example)					
Resident Name: _____					
Level: _____					
Staff Supervisor: _____					
Date of Presentation: _____					
Topic: _____					
Evaluation Scale:	Very Weak	Weak	Acceptable	Good	Very Good
	1	2	3	4	5
Medical Expert	1	2	3	4	5
-Demonstrated thorough knowledge of the topic					
-Presented at appropriate level and with adequate detail					
Communicator					
-Provided objectives and an outline					
-Presentation was clear and organized					
-Used clear, concise, and legible materials					
-Used an effective method/style of presentation					
-Established good rapport with the audience					
Collaborator					
-Invited comments from learners and led discussion					
-Worked effectively with staff supervisor in preparing the session					

## APPENDICES

Health advocate					
-Managed time effectively					
-Addressed preventive aspects of care, if relevant					
Scholar					
-Posed an appropriate learning question					
-Accessed and interpreted the relevant literature					
Professional					
-Maintained patient confidentiality, if clinical material was used					
-Identified and managed relevant conflicts of interest					
TOTAL SCORE					

### Appendix 5

Activity Evaluation Form (Example)				
Title of session: _____				
Speaker: _____				
Presentation objective(s): _____				
NOTE: Please choose only one number for the evaluation score if applicable.				
<b>Evaluate the program content on these criteria:</b>				
1 (Minimally)	2	3	4	5 (Excellently)
<b>Met Objectives</b>				
<b>Met Professional needs</b>				
<b>Gained new information</b>				
<b>Evaluate the presenter's ability to meet these criteria:</b>				
<b>Preparation</b>				
1 (Unprepared)	2	3	4	5 (prepared)

APPENDICES

<b>Held my interest</b>				
1 (Very little)	2	3	4	5 (Very much)
<b>Method of preparation</b>				
1 (Poor)	2	3	4	5 (Excellent)
<b>Quality and use of audiovisual materials</b>				
1 (Poor)	2	3	4	5 (Excellent)
<b>Rate the overall quality of this presentation:</b>				
1 (Poor)	2	3	4	5 (Excellent)
<b>Comments:</b>				
<b>Strengths:</b>				
<b>Weaknesses:</b>				
<b>Future recommended speaker/topic (if any):</b>				
<b>NOTE: Receipt of this completed and signed form is necessary for receiving CME credit.</b>				
Badge Number (required): _____				
Name (optional): _____				
Saudi Council (required): _____				
Expiration Date: _____				

## Appendix 6

### EXAMPLE

ENTER NAME OF CENTER TO PERSONALIZE THE FORM

Department of Pathology and Laboratory Medicine

Blood TRANSFUSION Section

### TRAINING CENTER ROTATION EVALUATION

DURATION: \_\_\_\_\_

#### Program Leadership

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The Residency Training Committee is effective at meeting the educational needs of residents.					
The Residency Training Committee is receptive to resident input.					
The Program Director is available to residents.					
The Program Director is approachable.					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
My annual individual meetings with the Program Director are useful.					
Orientation to the overall program is of high quality.					
Administrative support is adequate.					
I am kept informed of issues within the Training Program (may include meetings of Program Director with the resident body; meetings with chief resident(s); and other communications from the Residency Program Committee or from admin staff).					
I can easily communicate my concerns, ideas, and/or suggestions to the Residency Program Committee.					
<b>Please provide comments, particularly on areas you see as being in need of improvement. Examples, constructive suggestions, and ideas are very welcome!</b>					

Educational Curriculum					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The rotation effectively explains and teaches the CanMEDS Roles.					
The rotation effectively evaluates the CanMEDS Roles.					
There is a good Service/Education balance in the daytime rotations.					
There is opportunity for elective experiences.					
The formal academic program (e.g., ½ day) is useful.					
Staff participation in teaching sessions is adequate.					
<b>Please provide comments, particularly on areas you see as being in need of improvement. Examples, constructive suggestions, and ideas are very welcome!</b>					
Resident Well-being					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Resident well-being is important in our program.					
Collegiality of Department					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Departmental (or divisional) consultants are helpful to residents.					
Informal mentoring is available from Departmental (or divisional) consultants.					
There is support from fellow residents.					
Fellow residents are sensitive to resident cultural differences.					
The Program is sensitive to resident cultural differences.					
The Program allows residents to express their opinions and concerns without fear of retaliation.					
The Program is responsive to residents' issues, suggestions, and complaints.					
<b>Please provide comments, particularly on areas you see as being in need of improvement. Examples, constructive suggestions, and ideas are very welcome!</b>					

APPENDICES

Career Guidance and Planning						
	Not Applicable	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Career guidance is clearly available.						
The educational experiences this year prepare you well for your ongoing career development.						
<b>Please provide comments, particularly on areas you see as being in need of improvement. Examples, constructive suggestions, and ideas are very welcome!</b>						
Professional Development						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
There are opportunities for involvement in administrative work (e.g., hospital committees, resident committees).						
There are opportunities to participate in research.						
There are opportunities to participate in teaching.						
There is access to the internet (not necessarily in personal office).						
There is access to computers (not necessarily in personal office).						
There is access to library services.						
<b>Please provide comments, particularly on areas you see as being in need of improvement. Examples, constructive suggestions, and ideas are very welcome!</b>						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
*I would recommend this rotation site to medical students.						
<b>***Aggregate data that will not identify respondents will be presented to training committees on an annual basis.</b>						



## Appendix 7

Department of Pathology and Laboratory Medicine						
Blood TRANSFUSION Section						
Lecture: _____						
Academic Day: _____						
Session: _____						
Topic: _____						
Date: _____						
Presenter (Initial): _____						
<b>1. Please rate the presenter</b>						
	N/A	Poor 1	Needs Work 2	Good 3	Very Good 4	Excellent 5
Enthusiasm						
Interaction with the audience						
Preparation of the topic						
<b>2. Please rate the presentation</b>						
	N/A	Poor 1	Needs Work 2	Good 3	Very Good 4	Excellent 5
Information was presented in an organized manner						
Related information presented to practical problems						
Quality of audiovisual aids						
<b>3. Please rate the content of the presentation</b>						
	N/A	Poor 1	Needs Work 2	Good 3	Very Good 4	Excellent 5
Volume and complexity of the information presented was appropriate						
Related content to current evidence in the literature						
Content was relevant to your practice						

APPENDICES

---

<b>4. Please rate the content in terms of the CanMEDS roles</b>						
	N/A	Poor 1	Needs Work 2	Good 3	Very Good 4	Excellent 5
Medical Expert						
Scholar						
Professional						
Health Advocate						
Communicator						
Collaborator						
Leader						
<b>Comments, suggestions, or feedback?</b>						

## Appendix 8

## Exam Blueprint

PROMOTION EXAMS - WRITTEN COMPONENT					
R (1) Question Distribution					
R1		Essay questions	MCQs	Practical	Oral
Modules	Topics				
Blood Donor Management	Recruitment and motivation	2 - 3 Questions	6 – 8 questions	1 - 2 questions	One session 4 questions
	Donor selection and types		6 – 8 questions		
	Phlebotomy and donor reactions		6 – 8 questions		
	Post donation care		6 – 8 questions		
Aphaeresis Procedures	Principles and types of machines	2 - 3 Questions	6 – 8 questions	1 - 2 questions	One session 4 questions
	Automated blood collection		6 – 8 questions		
	Therapeutic aphaeresis		6 – 8 questions		
	Stem cell collection and processing		6 – 8 questions		
Blood Components	Preparation	2 - 3 Questions	6 – 8 questions	1 - 2 questions	One session 4 questions
	Types and storage		6 – 8 questions		
	Usages		6 – 8 questions		
	Components QC		6 – 8 questions		
Immuno-hematology	Principles of basic immunology	2 - 3 Questions	6 – 8 questions	1 - 2 questions	One session 4 questions
	Blood grouping and discrepancy		6 – 8 questions		
	AB Screening and identification		6 – 8 questions		
	Direct and indirect Coombs test		6 – 8 questions		

APPENDICES

R (2) Question Distribution					
R2		Essay questions	MCQs	Practical	Oral
Modules	Topics				
Transfusion Reactions	Acute transfusion reactions	2 - 3 Questions	6 – 8 questions	1 - 2 questions	One session 4 questions
	Delayed transfusion reactions		6 – 8 questions		
	Transfusion transmitted diseases		6 – 8 questions		
	Screening and NAT Testing and confirmatory tests		6 – 8 questions		
Special Transfusion Preparation and Management	Leukoreduction and washing	2 - 3 Questions	3 - 4 questions	1 - 2 questions	One session 4 questions
	Component inactivation		3 - 4 questions		
	Irradiation		3 - 4 questions		
	Frozen blood		3 - 4 questions		
	Massive transfusion		3 - 4 questions		
	Maximal surgical blood order schedule		3 - 4 questions		
	Blood substitutes		3 - 4 questions		
Organization and Management of Transfusion Services	Blood inventory management	2 - 3 questions	6 – 8 questions	1 - 2 questions	One session 4 questions
	Look back program		6 – 8 questions		
	Hospital transfusion committees		6 – 8 questions		
	Interpersonal and communication skills		6 – 8 questions		

APPENDICES

Continuous Quality Management	Reagents and diagnostic kits	2 - 3 questions	4 – 6 questions	1 - 2 questions	One session 4 questions
	Instruments		4 – 6 questions		
	Personnel		4 – 6 questions		
	Internal and external QC		4 – 6 questions		
	Safety		4 – 6 questions		
	Documentation		4 – 6 questions		
	Accreditation		4 – 6 questions		

## Appendix 9

<b>SAUDI SPECIALTY DIPLOMA IN BLOOD TRANSFUSION</b>			
<b>Final in-Training Evaluation Report (FITER)</b>			
Name of Resident and ID No: _____			
Evaluation Period: _____			
In the view of the Residency Local Committee, this resident has acquired the competencies of the specialty as prescribed in the Objectives of Training and is competent to practice independently.			
YES		NO	
The following were used as evidence of competence:			
End of rotation evaluation			
Feedback from staff consultants			
Completion of research project			
COMMENTS:			
Date	Name of Program Director		Signature
Date	Name of Local Committee Chair		Signature
Date	Name of Resident		Signature
RESIDENT'S COMMENTS			
Note: If during the period from the date of signature of this document to the completion of training, the Residency Local Committee decides that the candidate's performance is inadequate, this document can be considered null and might be replaced with an updated FITER.			

## Appendix 10

## Journals

S.No.	Name of Journal	Subject	Periodicity	Publisher	Website
1	Vox Sanguinis	Transfusion Medicine	Monthly	Blackwell Publishing	<a href="http://www.blackwellpublishing.com">www.blackwellpublishing.com</a>
2	Transfusion	Transfusion Medicine	Monthly	Blackwell Publishing	<a href="http://www.blackwellpublishing.com">www.blackwellpublishing.com</a>
3	Transfusion Medicine	Transfusion Medicine	Bimonthly	Blackwell Publishing	<a href="http://www.blackwellpublishing.com">www.blackwellpublishing.com</a>
4	Blood	Hematology	Monthly	American Society of Hematology	<a href="http://www.bloodjournal.org">www.bloodjournal.org</a>
5	Indian Journal of Hematology and Blood Transfusion	Hematology/ Transfusion Medicine	Monthly	Indian Society of Hematology and Transfusion Medicine	
6	Lancet	Covers most of specialty	Weekly		<a href="http://www.thelancet.com">www.thelancet.com</a>
7	Journal of Clinical Apheresis	Transfusion Medicine	Monthly		
8	Asian J. of Transfusion Sciences	Transfusion Medicine	Six monthly	Medknow Publications	<a href="http://www.journalonweb.com/ajts">www.journalonweb.com/ajts</a>
9	Blood Transfusion	Transfusion Medicine			<a href="http://www.bloodtransfusion.it">www.bloodtransfusion.it</a>
10	Transfusion and Apheresis Science		Bimonthly	Elsevier	
11	Transfusion Alternatives in Transfusion Medicine				
12	Blood Transfusion, Italy				

