

**Oman Medical Specialty Board**

**Post graduate Training Programme**  
**in**  
**Hematology**



**Booklet of information**  
**&**  
**Outline of the training programme**

**Adult Clinical Hematology Course**

**!9<sup>th</sup> December 2007**

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## **1. Introduction**

Hematological disorders contribute significantly to morbidity and mortality of people living in Oman. At present the skilled medical care necessary to alleviate these disorders at its' best are unavailable to the people due to a dearth of trained specialists in this discipline. Therefore the Oman Medical Specialty Board felt the need to train such personnel and initiated the formation of the Board in Hematology whose task was to develop a training programme to ensure that Oman has its' own cadre of specialists trained in Oman with a component of training overseas in the discipline of Haematology. With the vision of reducing the present morbidity and mortality of hematological disorders in Oman.

The Board comprised of adult and Paediatric Hematology committees and developed 3 training programmes listed below with the respective curricula.

### **1. Adult Hematopathology curriculum**

### **2. Adult Clinical Hematology Curriculum**

### **3. Paediatric Hematology Curriculum**

**The hematopathology** training focuses on the laboratory aspects of hematology with clinical hematology inputs in adult and paediatric hematology. These specialists will be primarily hematopathologists able to manage clinical hematology aspects of the discipline.

**The clinical hematology** training begins with a base of training of four years in general medicine and qualification of the exit examination of the medicine board initially followed by some inputs of clinical and laboratory hematology. Hence these specialists will be primarily physicians with a special interest and training in hematology.

## **2. Specialty Board Admission Requirements**

1. Successful completion of four years of structured residency in Internal medicine or Pediatrics
2. Successful completion of Oman Board, MRCP, American or Canadian Board, Arab Board or equivalent
3. Pass a written entrance examination if deemed necessary by the Scientific Committee.
4. Pass an interview

## **3. General Objectives**

To develop a graduate in clinical hematology who will be able to:

- diagnose and interpret investigations related to hematological diseases
- manage common hematological disorders
- train medical and paramedical personnel in the discipline of haematology
- conduct research which will benefit the community
- work as a team person liaising with the laboratory staff and the policy makers
- uphold professional ethical and moral values of the highest standards

Special emphasis will be on the following:

- a. Management of specific blood diseases with a multidisciplinary approach
- b. Learning of specific laboratory skills relevant to clinical hematology
- c. Clinical experience of inpatient, outpatient and consultation .hematology
- d. Counseling of patients and families

#### **4. Structure of Training Program**

##### Duration of Program

The total duration of the program is three years

First two years: Clinical and basic laboratory training

Third year will be a consolidation of clinical training with an option for specialization.

##### Outline of Rotations:

###### YEAR 1 (R-1)

Laboratory Hematology	3 months
Adult Clinical Service	5 months
Pediatric Clinical Service	3 months
Leave	1 month

###### YEAR 2 (R-2)

Adult Clinical Service	6 months
Transfusion Medicine	2 months
Bone Marrow Transplant Service	3 months
Leave	1 month

###### YEAR 3 (R-3)

Adult Clinical Service	6 months
Oncology and Radiation Therapy	2 months
Research	3 months
Leave	1 month

## **5. Objectives and Contents of Each Rotation**

### ***YEAR 1***

#### **Laboratory Hematology**

##### **OBJECTIVES**

This rotation is designed to groom the trainee in the relevant aspects of laboratory hematology which will complement his or her role in functioning as a clinical hematologist. This will specifically include an understanding of routine procedures in general hematology, hemostasis, hemoglobinopathy, molecular biology laboratories and blood bank. Emphasis will be placed on training the fellow to systematically analyze and interpret a blood film, bone marrow aspirate & biopsy and cellular body fluid. During this period the fellow will plan an initiate a research project which will be completed by the second year.

##### **DURATION**

The duration of this rotation in the first year will be 12 weeks.

##### **INSTITUTION**

SQUH and RH

##### **DETAILS**

###### **Week 1**

1. Blood sample collection, transport and storage
2. Laboratory safety
3. Introduction to cell counting and hemoglobin measurement and quality control
4. Blood film and bone marrow aspirate smear preparation and staining

###### **Weeks 2-4**

1. Examination and interpretation of blood film and CSF
2. Differential white cell count

###### **Weeks 5-7**

1. Examination and interpretation of bone marrow aspirate and biopsy
2. Demonstration of flowcytometry and interpretation of results
3. Demonstration of techniques for molecular diagnostics of hematological diseases

#### Week 8-10

1. Demonstration of sickle cell, hemoglobin electrophoresis and HPLC
2. Work-up of hemolytic anemia and Hemoglobinopathies
3. Demonstration of automated and manual techniques in hemostasis testing
4. Workup of patient with abnormal hemostasis: hemophilia and thrombophilia

#### Weeks 11-12

1. Reporting of blood films and bone marrows under supervision
2. Data interpretation

### **Adult Clinical Service**

#### **OBJECTIVES**

Fellows will function at senior registrar level to take responsibility of outpatients as well as their assigned inpatients. During this period they will gain experience in the presentation and clinical manifestations of hematological disease, efficiently use laboratory and medical imaging techniques to work up patients, learn to interpret results and to manage patients based on evidence based medicine. Consultative hematology will be a major part of this rotation. Knowledge gained in the laboratory rotation will be used by the trainee to see and interpret blood films and bone marrow slides of his or her patients.

#### **DURATION**

The duration of this rotation in the first year will be 20 weeks

#### **INSTITUTIONS**

SQUH and ROYAL HOSPITAL

#### **DETAILS**

##### Weeks 1-20

1. In Patient Service
2. Outpatient Clinics
3. Thalassemia Unit and Genetic Counseling.
4. Consultations

## ***Pediatric Hematology***

### **OBJECTIVES**

The adult clinical hematologist is expected to be able to manage older children and to offer consultation to the pediatric service for patients with hematological disorders. It is necessary for the trainee to be familiar with hereditary diseases which are especially common in the region in terms of both diagnosis and management in particular primary immunodeficiency syndromes.

### **DURATION**

The duration of this rotation in the first year will be 12 weeks.

### **INSTITUTION**

SQUH and ROYAL HOSPITAL

### **DETAILS**

Weeks 1-12

1. In Patient Service.
2. Out patient service.
3. Consultation.

## ***YEAR 2***

### ***Adult Clinical Service***

### **OBJECTIVES**

This rotation is designed to give the trainee independence in the management of patients with all hematological disorders. He or she will function at a consultative level in the ward or outpatient as preparation for future responsibilities.

### **DURATION**

The duration of this rotation in the first year will be 24 weeks.

### **INSTITUTION**

SQUH and Royal Hospital

## **DETAILS**

Weeks 1-24

1. Inpatient.
2. Outpatient
3. Consultations
4. Teaching medical students

### ***Transfusion Medicine***

## **OBJECTIVES**

During this training period the trainee will become familiar with the detailed functioning of a blood transfusion service and its requirements, acquire skills in carrying out specific tests related to cross matching and immuno-hematology, gain competence in data interpretation and investigation of incompatibility and understand the principles of component preparation, processing and apheresis.

## **DURATION**

The duration of this rotation will be 8 weeks

## **INSTITUTION**

Central Blood Bank, Royal Hospital and SQUH

## **DETAILS**

Week 1

Safe Blood Donation

1. Recruitment of blood donors, donor selection and deferral
2. Blood collection process from donation to final product
3. Donor phlebotomy
4. Medical problems related to voluntary donors
5. Autologous blood donation and transfusion
6. Donor counseling

Weeks 2-3

Basic Principles and Techniques in Blood Banking

1. Basic principles of transfusion
2. Molecular techniques in transfusion medicine
3. Essential immunology for transfusion medicine
4. Blood Group Genetics

5. Human platelet and neutrophil antigens
6. Basics of red cell immunology and compatibility testing
7. ABO blood groups and antibodies
8. RhD antigen and antibody
9. Red cell antigen-antibody reactions and their detection
10. Other red cell antigen/antibody systems
11. Compatibility procedures
12. ABO-incompatible red cell transfusion

Weeks 4-5

#### Immunoematology

1. Serologic Principles and Transfusion Medicine
2. Pretransfusion Testing
3. Initial Detection and Identification of Allo-antibodies to Red Cell Antigens
4. The DAT (Direct Antiglobulin Test)
5. Immune-mediated Hemolysis
6. Serologic Problems with Auto-antibodies
7. Drug-induced Immune Hemolytic Anemia

Week 6-8

#### Infection screening and transfusion complications.

1. Diagnosis and management of transfusion complications
2. Screening blood for transfusion transmissible infections
3. Storage and quarantine at the Central Blood Bank
4. Issue of blood and blood components at the Central Blood Bank

#### Component preparation and clinical use of blood and blood components

1. Component processing
2. Manufacture of plasma derivatives
3. Clinical Considerations in Transfusion Practice
4. Indications and Administration of Blood and Components

#### Blood Transfusion in Infancy

1. Perinatal Issues in Transfusion Practice
2. Neonatal and Paediatric Transfusion Practice

#### Apheresis and Cryopreservation

1. Principles of apheresis and functioning of apheresis machines
2. Apheresis for blood components
3. Therapeutic apheresis

4. Cryopreservation of marrow and peripheral blood stem cells
5. Cord Blood banking
6. Data interpretation

## ***Bone Marrow Transplantation***

### **OBJECTIVES**

During this rotation the trainee will learn the principles of hematopoietic stem cell transplantation (allogeneic and autologous) and stem cell harvesting, be actively involved in the planning and implementation of conditioning regimens and manage infections and specific transplant related complications. Outpatient follow up of patients will be a major component of this rotation.

### **DURATION**

The duration of this rotation 12 weeks.

### **INSTITUTION**

SQUH

### **DETAILS**

Weeks 1-12

1. Pre transplant workup including HLA typing
2. Stem cell harvesting: Peripheral blood and marrow
3. Stem cell laboratory: cryopreservation, blood bank, chimerism
4. BMT in patient service
5. BMT outpatient service: Routine follow -up and post transplant Immunization

### **YEAR 3**

Area of Interest

#### **OBJECTIVES**

This rotation gives the fellow the opportunity to train in an area of his interest either within the country or abroad.

1. Hemoglobinopathies
2. Bone Marrow Transplantation
3. Hemostasis
4. Molecular biology
5. General Hematology

#### **DURATION**

The duration of this rotation in the third year will be 6 months

### ***Oncology and Radiation Therapy***

#### **OBJECTIVES**

Radiation therapy is used in the management of some patients with hematological diseases. The trainee is expected to be familiar with the principles of radiation therapy, methods of delivery, safety aspects and indications. As the oncology service also treats lymphoma this rotation will serve also to gain more experience in the management of lymphoma.

#### **DURATION**

The duration of this rotation in the first year will be 8 weeks

#### **INSTITUTION**

Royal Hospital, National Oncology Center.

#### **DETAILS**

Week 1-4

1. Radiation Therapy

Weeks 5-8

1. Oncology service for management of lymphoma
2. Palliation and pain therapy

### ***Research***

#### **OBJECTIVES**

During this period the trainee expected to do a research project to complement his or her training as a hematologist. The project could have been initiated at any time during his course and completed during this time. Alternatively the project may be started and completed at this time.

#### **DURATION**

The duration of this rotation in the first year will be 12 weeks.

#### **INSTITUTION**

SQUH

#### **DETAILS**

Weeks 1-12

#### **Research**

The trainee is expected to read and research articles pertaining to a research project of his/her interest, formulate a title, methodology, means of collecting data and of analysis and commence on the project work

## 6. Academic Seminars

### LIST OF REPRESENTATIVE SEMINARS TO BROADLY COVER THE SYLLABUS.

1. Topics can be modified at the discretion of the program directors
2. Major seminars (2 hours) will be held once every 4 weeks
3. Mini seminars (1 hour) will be held once every 2 weeks
4. Attendance compulsory for all trainees

### Basic Sciences

#### Seminar 1

#### **Hematopoiesis**

- a. Stem cell model
- b. Erythropoiesis
- c. Granulopoiesis and monocytopoiesis
- d. Thrombopoiesis

#### Seminar 2

#### **Immune system in Hematology**

- a. Overview of immune system
- b. B, T and NK cell development
- c. Approach to the diagnosis of a patient with primary immunodeficiency

#### Seminar 3

#### **Hemostasis**

- a. Molecular basis of blood coagulation
- b. Molecular basis of platelet function

#### Seminar 4

#### **General Principles in Oncology**

- a. Epidemiology of cancer in childhood
- b. Molecular biology of Cancer

### **Benign Hematological Disorders**

#### Seminar 5

#### **Bone Marrow Failure**

- a. Aplastic Anemia
- b. Inherited forms of marrow failure
- c. Paroxysmal Nocturnal Hemoglobinuria
- d. Pure Red Cell Aplasia

Seminar 6

**Neonatal Hematology**

- a. Approach to Fetal and Neonatal Anemia
- b. Causes and Management

Seminar 7

**Immune Hemolytic Disease in the Neonate.**

- a. Pathogenesis of maternal Rh immunization
- b. Rh Hemolytic disease
- c. Maternal alloantibodies causing fetal hemolytic disease

Seminar 8

**Disorders of Bilirubin Metabolism**

- a. Diseases associated with unconjugated hyperbilirubinemia of the newborn
- b. Conjugated hyperbilirubinemia of the newborn

Seminar 9

**Nutritional Anemias**

- a. Iron deficiency anemia
- b. Megaloblastic anemia

Seminar 10

**Thalassemia**

Seminar 11

**Sickle Cell Disease**

Seminar 12

**Hemolytic Anemias**

- a. Overview and basis
- b. Auto-immune hemolytic anemia
- c. RBC enzymopathies

Seminar 13

**Primary Immunodeficiency I**

- a. Classification and spectrum of primary immunodeficiency syndromes
- b. Approach to the diagnosis of primary immunodeficiency

Seminar 14

**Primary Immunodeficiency II**

- a. Molecular biology and diagnosis of chronic granulomatous disease
- b. Management of chronic granulomatous disease

Seminar 15

**Primary Immunodeficiency III**

- a. Molecular biology and diagnosis of Familial Hemophagocytic Lymphohistiocytosis
- b. Management of familial HLH

**Malignant Hematological Disorders**

Seminar 16

**Acute Myeloid Leukemia.**

- a. Laboratory investigations
- b. Management of Pediatric AML
- c. Management of Adolescent and Adult AML

Seminar 17

**Lymphoblastic Leukemia**

- a. Laboratory investigations.
- b. Management of Pediatric ALL.
- c. Management of Adolescent and Adult ALL.

Seminar 18

**Chronic\_Lymphocytic Leukemia**

- a. Molecular basis
- b. Diagnosis and management

Seminar 19

**Plasma Cell Disorders**

- a. Pathogenesis of plasma cell dyscrasias
- b. Diagnosis and prognostic features of Multiple Myeloma
- c. Management of Multiple Myeloma

Seminar 20

**Plasma Cell Disorders**

- a. MGUS
- b. POEM Syndromes

Seminar 21

**Myeloproliferative Disorders**

- a. Overview, classification and differences in children and adults
- b. Chronic Myeloid Leukemia
- c. Polycythemia Vera
- d. Myeloproliferative Disorders in Childhood

Seminar 22

**Myelodysplastic Syndromes**

- a. Molecular basis
- a. Myelodysplastic Syndromes in Adults: Diagnosis and Management
- b. Myelodysplastic Syndromes in Childhood: Diagnosis and Management

Seminar 23

**Hodgkin Lymphoma**

- a. Classification
- b. Hodgkins Lymphoma in Adults
- c. Hodgkins Disease in Children

Seminar 24

**Non-Hodgkin Lymphoma**

- a. Classification and Differences between Adult and Pediatric Lymphoma
- b. Non Hodgkins Lymphoma in Adults
- c. Non Hodgkins Lymphoma in Children

Seminar 25

**Non Hodgkin Lymphoma**

- a. Atypical lymphoproliferative disorders
- c. Diagnosis and Management

Seminar 26

**Lymphohistiocytic Diseases**

- a. Molecular biology and diagnosis of Langerhans cell histiocytosis
- b. Management of LCH

Seminar 27

**Pediatric Malignant Solid Tumors.**

- a. Epidemiology of Cancer in Childhood
- b. Molecular biology of cancer

Seminar 28

**Pediatric Malignant Solid Tumors I**

- a. Molecular biology and diagnosis of Neuroblastoma
- b. Management of Neuroblastoma

Seminar 29

**Pediatric Malignant Solid Tumors II**

- a. Molecular biology and diagnosis of Wilms Tumour
- b. Management of Wilm's tumour

Seminar 30

**Storage Diseases of the reticuloendothelial system**

- a. General concepts, classification and approach
- b. Gaucher's Disease
- c. Mucopolysaccharidosis

**Hematopoietic Stem Cell Transplantation**

Seminar 31

**Hematopoietic Stem Cell Transplantation I**

- a. General principles in HSCT
- b. Outcome of HSCT for leukemia, lymphoma and benign hematological diseases

Seminar 32

**Hematopoietic Stem Cell Transplantation II**

- a. Complications following HSCT
- b. Infections in HSCT

**Supportive Care**

Seminar 33

**Infection**

- a. Approach to management of infections in immunocompromised host
- b. Antimicrobials in hematology

Seminar 34

**Pain management and Palliative Care**

- a. Concepts and institutional protocols
- b. Pharmacology of drugs used in pain management

Seminar 35

**Psychological Aspects of Hematologic Malignancy**

- a. Counseling
- b. End of life issues

**Hemostasis and Thrombosis**

Seminar 36

**Evaluation of Hemostatic Disorders**

- a. Clinical evaluation of hemostatic disorders
- b. Laboratory evaluation of hemostatic disorders

Seminar 37

**Hereditary Disorders of Coagulation**

- a. Hemophilia
- b. Von Willebrand Disease

Seminar 38

**Thrombosis**

- a. Evaluation of thrombophilia
- b. Venous thromboembolism
- c. Arterial thromboembolism

**Transfusion Medicine**

Seminar 39

**Blood group antigens and antibodies**

- a. Molecular basis
- b. Blood group systems
- c. Laboratory detection

Seminar 40

**Principles of Blood transfusion**

- a. Red cell transfusion
- b. Platelet transfusion
- c. Granulocyte transfusion

Seminar 41

**Complications of blood transfusion**

- a. Transfusion reactions
- b. Transfusion transmitted diseases and prevention

## **Consultative Hematology**

Seminar 42

### **Consultative Hematology I**

- a. Overview and role of hematology consultant in internal and pediatric
- b. The surgical patient
- c. The pregnant patient

Seminar 43

### **Consultative Hematology II**

- a. Intensive care consultations
- b. Renal and hepatic disease

## **Laboratory Hematology**

Seminar 44

### **General Laboratory**

- a. Laboratory Information System
- b. Quality assurance in hematological laboratory practice
- c. Estimation of reference ranges

Seminar 45

### **Automation in the hematology laboratory**

- a. Automated cell counters
- b. Automated coagulation machines

Seminar 46

### **Flowcytometry**

- a. Principles of flowcytometry
- b. Clinical application in hematological and non hematological practice

Seminar 47

### **Cytogenetics**

- a. Principles and techniques of karyotyping and FISH
- b. Clinical applications

Seminar 48

### **Molecular Biology**

- a. Molecular techniques in diagnostic hematology
- b. Gene expression profiling and its clinical application

7. Contents of the Program and Detailed Syllabus of the Training Program.

**8.1 CLINICAL HEMATOLOGY**

The trainee will be competent in the following:

1. **Red Cell Disorders**

- a) Anemias due to deficiency (iron, B12, folate) or chronic disease
- b) Pure red cell aplasia, Parvovirus B19 infection and sideroblastic anemia
- c) Thalassemias and sickle cell disease
- d) Spherocytosis and G6PD deficiency
- e) Other congenital hemolytic anemias
- f) Acquired hemolytic anemias
- g) Erythrocytosis

**Bone Marrow Failure**

- a) Constitutional anemias like Fanconi's anemia
- b) Acquired aplastic anemia
- c) Paroxysmal nocturnal hemoglobinuria

**Non Malignant White Blood Cell Disorders**

- a) Hereditary and acquired disorders of granulocytes and macrophages
- b) Hereditary and acquired disorders of lymphocytes

**Hematological Neoplastic Disorders**

- a) Chronic myeloid leukemia
- b) Polycythemia Vera
- c) Chronic idiopathic Myelofibrosis
- d) Hypereosinophilic syndrome
- e) Mastocytosis
- f) Essential thrombocythemia
- g) Acute leukemias/ lymphoblastic lymphomas
- h) MDS
- i) B-cell lymphomas (Follicular, large-cell, marginal zone, mantle-cell, lymphoplasmacytic, Burkitt)
- j) B-cell lymphomas (other subtypes, including post-transplant EBV-related lymphomas)
- k) Hodgkin disease
- l) Peripheral T-cell lymphomas
- m) Other T-cell and natural killer lymphoproliferative disorders

- n) Histiocytic neoplasm
- o) Dendritic cell neoplasm
- p) B-CLL, hairy-cell leukemia, and prolymphocytic leukemia
- q) Multiple myeloma, plasmacytoma and monoclonal gammopathy of unknown significance
- r) Amyloidosis
- s) Castleman disease

### **Stem Cell Transplantation**

- a) Indications, risks and benefits of autologous and allogeneic transplants
- b) Conditioning regimens
- c) Cell source and donor selection.
- d) Managing autologous transplant patients
- e) Managing allogeneic transplant patients
- f) Mobilization of Peripheral Blood Progenitor Cells. (PBPC) and harvesting of BM progenitors
- g) Collection and manipulation of progenitor cells
- h) Prevention & management of complications of autologous transplant
- i) Prevention & management of complications of allogeneic transplant

### **Platelet Disorders**

- a) Acquired platelet function disorders
- b) Immune thrombocytopenia
- c) Other peripheral thrombocytopenia
- d) Inherited Platelet Disorders

### **Treatment of Hematological Disorders**

- a) Chemotherapy (mechanism of action, pharmacology, drug resistance)
- b) Radiotherapy (mechanism of action, interactions, resistance)
- c) Monoclonal antibodies
- d) immunosuppressive agents
- e) Growth factors
- f) Gene therapy
- g) Novel therapeutic developments
- h) Short and long-term complications of treatment of hematological disorders (infertility, secondary neoplasias)
- i) Management of hematological malignancies in pregnancy

## **Supportive and Emergency Care**

The trainee will receive specialized training in:

- a) Tumor lysis syndrome
- b) Spinal cord compression
- c) Disseminated Intravascular Coagulation
- d) Thrombotic thrombocytopenic purpura and microangiopathic disorders
- e) Hyperleukocytosis
- f) Hyperviscosity
- g) Superior vena cava syndrome
- h) Prevention, diagnosis and treatment of infectious complications
- i) Transfusion (indications, potential benefits and complications)
- j) Mucositis
- k) Vomiting
- l) Neurological and psychiatric disturbances
- m) Pain
- n) Nutrition (enteral and parenteral)
- o) Venous access management
- p) Palliative and end-of-life care

## **Miscellaneous**

- a) Splenomegaly
- b) Lymph node enlargement
- c) Numerical abnormalities of blood cells, including pancytopenia
- d) Dysglobulinemia
- e) Iron overload
- f) Hematological manifestations of congenital metabolism disorders
- g) Hematological changes in pregnancy
- h) Hematological changes associated with HIV /other infectious diseases
- i) Interpretation of results of genetic and molecular biology tests for diagnosis, prognosis and assessment of minimal residual disease

## **Pediatric Hematology**

The trainee will receive specialized training in:

- a) Basic principles of inheritance of hematological disorders
- b) Genetic counseling
- d) Embryonic and fetal hematopoiesis. Post natal changes
- e) Neonatal alloimmune thrombocytopenia

- f) Acquired and inherited bleeding disorders
- g) Hemolytic disease of the newborn
- h) Normal hematological values
- i) Juvenile myelomonocytic leukemia
- j) Hemophagocytic lymphohistiocytosis
- k) Fetal Transfusion
- l) Neonatal Transfusion
- m) Transfusion in Children

## **GENERIC SKILLS**

For any specialty, the acquisition of generic skills is an important aspect of training. We have listed here some of the skills and competencies that we consider essential for a specialist in hematopathology.

### **Clinical Trails/Good Clinical**

Trainees should have the opportunity to actively participate in the clinical trial process. Junior doctors should have attended at least one course in good clinical practice and national legislation. The aspects described below also include an understanding of appropriate statistical analysis.

The trainee will be able to:

- a) discuss the process of randomization and is able to explain it to patients.
- b) explain study aims and objectives to patients with different language skills and different social or cultural backgrounds
- c) treat and manage patients according to protocol requirements and know when to diverge from protocols
- d) evaluate and explain different regulations about giving information and obtaining informed consent, including from minors or incapacitated adults
- e) define, recognize and report self assessment exercises done by patients, as well as suspected/unexpected severe adverse reactions
- f) identify the different phases, types and purposes of clinical trials
- g) identify and explain the significant differences, advantages or disadvantages between: single centre / multi-centre and pharmaceutical / academic clinical trials

- h) Identify and describe the principles of patient selection and recruitment.
- i) record and analyze study data.
- j) identify and discuss the current versions of clinical trial related guidelines and legislation, such as: International Conference on Harmonization-Good Clinical Practice guidelines, European Union Directive on clinical trials, European Commission Directive on Good Clinical Practice and World Medical Association Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects. This includes awareness of national regulatory authorities and their function.
- k) define and explain the role of principal investigator and co-investigator.
- l) Use and interpret major quality of life instruments.

### **Pharmacovigilance**

Trainees should understand the activities involved in the detection, assessment, understanding, and prevention of adverse effects or any other drug-related problems

The trainee will be able to:

- a) Define and understand terms relevant to drug-related harm (adverse event, adverse drug reaction, adverse drug event, medication error, side effect)
- b) Recognize and treat adverse drug events
- c) Document adverse drug events, including the severity of the event, the causal association between use of the drug and the event, and dosing variables
- d) Understand and adhere to national and EU legislation regarding pharmacovigilance systems and to identify such systems operating in accordance with national and EU legislation
- e) Understand the different activities involved in reporting of serious, unexpected adverse drug reactions to national pharmacovigilance centers, pharmaceutical industry, and national as well as European regulatory agencies

### **Evidence Based Medicine/ Critical Appraisal**

A doctor in training should have access to a computer with internet access. It is recommended that during training a doctor actively participates in a journal club, either locally or via the internet. The parts recommended below also include a knowledge of appropriate statistics. It is essential that a junior specialist can read and understand research data, and draw appropriate conclusions.

The trainee will be able to:

- a) Use of computer and relevant applications
- b) Use search engines to find information on the internet (medical libraries)
- c) Understand the use of medical databases in clinical decision making from a single case point of view
- d) Read scientific literature and critically evaluate information
- e) Understand the principles of evidence based medicine
- f) Comprehend the basic function of simple electronic databases

### **Communication Skills**

A trainee should demonstrate skills appropriate and necessary to provide professional communication. If necessary, we recommend participation in a training course.

The trainee will be able to:

- a) identify the principles of personnel management
- b) effectively communicate within a multi-disciplinary team
- c) communicate hematological diagnosis and treatment
- d) manage strong emotions
- e) communicate with patients with different cultural backgrounds
- f) utilize patient centered communication techniques

- g) identify when involvement of psychosocial specialist resources are required
- h) discuss with patients and their families changes in goals during the course of the disease
- i) extend support for the consequences of the various phases of the disease

### **Psychosocial Issues**

The trainee should be offered opportunities to experience and integrate the psychosocial aspects of hematology. This may include specific training courses.

The trainee will be able to:

- a) comprehend the impact of hematological disorders in patients and their families and consequently be able to deal with normal psychological reactions to these diseases
- b) recognize and manage psychological distress and provide for the appropriate counseling of patients
- c) identify available resources for psychosocial/psychiatric support
- d) appropriately address social and economic needs and resources based on solid practical experience
- e) identify patient's rights according to national legislation
- f) provide appropriate responses to specific needs of patients of different cultural origins, and their families

### **Ethics**

Ethical competence is an essential component of the specialty of hematology.

The trainee will be able to:

- a) demonstrate a practical understanding of the ethical issues that confront patients, their families and caregivers within the context of disease management options and outcome
- b) identify duties to patients in dealing with unintended harm

- c) participate in and initiate multi-professional discussion about ethical dilemmas and conflict of interest
- d) explain principles of medical ethics, such as primacy of patient welfare, respect of patient autonomy, promotion of social justice
- e) discuss principles of moral reasoning
- f) comprehend the relationship between healthcare providers and the pharmaceutical industries, including guidelines and legislation
- g) comprehend the relationship between healthcare providers and national authorities, tissue banks, insurance companies, incl. legislation

### **End of Life**

A trainee should be familiar with the fact that the threat of death and dying is an integral part of hematology in all patients.

The trainee will be able to:

- a) communicate with patients and family about death and dying.
- b) manage patients approaching death based on experience with medical and psychosocial care.
- c) address quality of life issues in patients approaching death.
- d) collaborate with the multi-professional team to enhance patient and family understanding and cooperation.
- e) use effective symptomatic treatment for patients approaching death.
- f) inform and counsel patients and families about palliative and hospice facilities available.
- g) meet and communicate effectively and compassionately with family members after death of the patient

### **RESEARCH**

The trainee will have a sound grasp of methods of researching an idea for a research project and subsequently formulating an appropriate title, method, collection of data, analysis of data and writing the project for presentation and publication. He/she is also expected to abide by existing professional and ethical standards pertaining to scientific research and authorship.

## **LABORATORY HEMATOLOGY**

### Transfusion Medicine

#### Blood Donation

- a) International norms of donor eligibility
- b) Epidemiology of infectious diseases in the area
- c) Donor preparation and venesection
- d) Donation screening
- e) Donation-associated side effects
- f) Preparation and preservation of standard and special blood components: Whole Blood; Red cells; Plasma; Platelets. Cryoprecipitate; irradiated; leukocyte depleted; washed; filtered; Pediatric Units
- g) Viral inactivation and quarantine

#### **Compatibility Testing**

- a) Blood Antigens and Antibodies
- b) Blood Grouping:  
ABO and D grouping, Complete Phenotype, Rhesus and Kell testing, Antibody screening, Cross-match.
- c) Serologic Principles and investigations in transfusion medicine.
- d) Detection and identification of red cell antibodies (allo and auto).
- e) Drug induced immune hemolytic anemia
- f) Auto and allo adsorption techniques for antibody identification
- g) Platelet and granulocyte antibodies: laboratory investigation & clinical significance

#### **Preparation Indication & Use of Blood & Blood Components**

- a) Whole Blood
- b) Red Cells

- c) Alternatives to allogeneic blood transfusion
- d) Autologous blood; use of r-huEPO, iron etc
- e) Volume; Number of required platelets
- f) Quality testing; management of refractoriness
- g) Fresh Frozen Plasma
- h) Cryoprecipitate
- i) Factors VII, VIII and IX; Fibrinogen
- j) Immunoglobulins
- k) Granulocytes
- l) Blood irradiation
- m) Use of CMV negative blood products
- n) Leukodepletion and use of appropriate leukodepletion procedures

#### **Administration of the Transfusion**

- a) Information for the patient
- b) Routine vs. emergency transfusions
- c) Proper identification of the recipient
- d) Rate and conditions of administration and monitoring

#### **Adverse Reactions**

- a) Identification of transfusion reactions
- b) Investigation and reporting
- c) Management

### **Special Conditions and Procedures**

- a) Hemolytic disease of the newborn
- b) Neonatal thrombocytopenia
- c) Laboratory work-up of the autoimmune hemolytic anemias
- d) Apheresis
- e) Therapeutic apheresis
- f) Plasmapheresis
- g) Red cell exchange
- h) Plateletpheresis
- i) Leucopheresis (therapeutic)
- j) Donation by apheresis
- k) Donor lymphocyte infusion
- l) Therapeutic phlebotomy

**8. COURSES, CONFERENCES, WORKSHOPS REQUIRED**

1. Trainees should attend and participate in departmental meetings.
2. Trainees are encouraged to attend at least one international meeting per year.
3. Trainees should participate actively in weekly educational seminars.
4. Trainees are encouraged to present papers in national seminars and workshops.

**9. PARTICIPATING TRAINING CENTERS**

1. Sultan Qaboos University Hospital
2. The Royal Hospital
3. Central Blood Bank, Ministry of Health

**10. ELECTIVES**

In the final year the candidate is given an opportunity to spend 6 months in an area in hematology which he or she chooses to specialize in. This should be approved by the committee and could be done locally or abroad on a competitive basis.

**11. RESEARCH REQUIREMENTS**

*Refer to item 7.3.9 in the Adult Clinical Haematology Curriculum book*

## 12. MEMBERS OF TEACHING FACULTY

### *Sultan Qubose University Hospital*

#### **Adult Hematology**

Dr. Salam Al Kindi  
Dr. David Dennison  
Dr. Shahina Daar  
Dr. Anil Pathare  
Dr. Naglaa Abdulaziz Saleh Sawaz  
Dr. Chao Ho Hung

#### **Pediatric Hematology**

Dr. Yasser Wali  
Dr. Zakia Al Lamki  
Dr. Mathew Zachariah  
Dr. Wafa Bashir

#### **Senior Laboratory Staff**

Mr. Stuart Donaldson  
Mr. Shoaib Al Zadjali  
Mr. David Gravel

### *Royal Hospital*

#### **Adult Hematology**

Dr. Muhanna Al Muslahi  
Dr. Arudathi Kurukulasuriya  
Dr. J.P. Prakash  
Dr. Sunil Dabadgo  
Dr. Sulaima Al Lamki

#### **Pediatric Hematology**

Dr. Eileen Tomas  
Dr. Nagwa El Banna  
Dr. Dipali Bhuyan

#### **Senior Laboratory Staff**

Mr. Alex ender George Rowan  
Mr. Hussain Ali Al Salhi  
Mr. Abeer Ahmed Al Belushi

### *Central Blood Bank*

Dr. Shahnaz Al Belushi  
Dr. Thamina Ashraf

13. **BOARD EXAMINATIONS**

**There will be *ONE* summative board examination for the entire program:**

**OMSB Clinical Adult Hematology Examination**

1. To be taken at the end of second year (R2)
2. Held in the month of October
3. There will be no limits to the number of attempts for each exam

**DETAILS**

**DAY 1**

**Theory**

Paper 1: 3 hours

Content: Essays, short answers and MCQs

Pass Mark: 60%

**DAY 2**

**Dry Practical**

3 hrs: Case Scenarios with morphology, data interpretation and management

Pass Mark 60%

**DAY 3**

**Clinical**

Two hours: Long Cases

One hour: Viva

Pass or Fail

**END OF YEAR EXAMINATION**

End of year examinations will be conducted to assess the achievement of the candidate in the rotations they have done at the end of each year. These examinations will be held in the month of June each year.

14. **EVALUATION**

Evaluation by both the supervisors and trainee as per OMSB regulation.

Six month Evaluation: February

End of Year Evaluation: September

## 15. EXIT QUALIFICATIONS

Upon successful completion of the program trainee will receive the following:

1. Oman Fellowship in Clinical Adult Hematology.
2. Certificate of completion of training by OMSB.

## 16. READING LIST

1. BLOOD  
PL Mollison, CP Englefriet, Marcela Contreras  
Blackwell science  
10th edition
2. TRANSFUSION THERAPY  
Clinical principles and practice  
Paul D Mintz  
aa press ISBN 1-56395-185-1  
bb
3. COLOR ATLAS OF HEMOGLOBIN DISORDERS  
A compendium Based on proficiency Testing  
By CAP Hematology and Clinical Microscopy Resource Committee  
James D.Hoyer, Steven H.Kroft  
2003 USA  
ISBN: 0930304802
4. BLOOD CELLS- A Practical (Fourth Edition)  
Barbara J. Bain
5. ESSENTIAL GUIDE TO BLOOD GROUPS  
Geoff Daniels  
Imelda Bromilow
6. MOLLISON'S Blood Transfusion in Clinical Medicine  
11<sup>th</sup> Edition-2005 or 12<sup>th</sup> Edition  
Harvey G. Klein  
David J. Anstee
7. PRACTICAL TRANSFUSION MEDICINE  
Second Edition-2005  
Micheal F. Murphy  
Derwood H. Pamphilon

8. POST-GRADUATE HAEMATOLOGY  
5<sup>th</sup> Edition 2005  
A. Victor Hoffbrand  
Daniel Catovsky  
Edward GD Tuddenhan
  
9. TEXT BOOK OF BLOOD BANKING AND TRANSFUSION MEDICINE  
Sally V. Rudmann