# EUROPEAN HEMATOLOGY CURRICULUM

## Forward by Professor Ulrich Jäger, President EHA

*Keeping apace with the speed of change in hematology, whilst striving to provide a harmonized education for trainees, who can in turn deliver the best possible care for patients, is no small task. After 14 European hematologists and 2 educationalists had been incarcerated for 48 hours in Stresa, Italy in 2010, they emerged with the fleshed bones of a new European Hematology Curriculum, fully supported by the muscle of the national societies who have contributed to its development since 2004. National societies of hematology in Europe have now had the opportunity to comment on and approve the curriculum, as laid out here in the aptly labeled "CV Passport", before lending their signatures of endorsement to this highly important educational tool, thus acknowledging its validity across Europe and enabling trainee hematologists to broaden their horizons. The 27 endorsements are just reward for the herculean labours of all those involved in the production of this document and testament to its potential for success.*

### *I. THE EUROPEAN HEMATOLOGY ASSOCIATION CURRICULUM PROJECT*

This document describes the European Curriculum for training in hematology, which is an educational tool of the European Hematology Association (EHA) and reflects the organization's mission statement:

*MISSION STATEMENT OF THE EUROPEAN HEMATOLOGY ASSOCIATION (EHA)*

*"The European Hematology Association (EHA) aims to promote excellence in clinical practice, research and education in European hematology."*

*DEFINITION OF A HEMATOLOGIST*

For EHA a hematologist is a physician who specializes in the diagnosis, treatment, prevention, and/or investigation of disorders of the hematopoietic, hemostatic, and lymphatic systems, and disorders of the interaction between blood and blood vessel wall. Hematology contains both clinical and laboratory competences.

*THE EHA CURRICULUM COMMITTEE*

The EHA Curriculum Committee (see Appendix I) was founded to develop a harmonized European curriculum in hematology. The Committee's activity is developed in close relation with the EHA Board, EHA Members and national hematology societies throughout Europe. The Committee is appointed by the board of EHA and consists of physicians involved in various aspects of clinical and diagnostic hematology. Working in close collaboration with the Committee is the network of national representatives, the so-called *linkers*, who are appointed by their respective national societies.

*THE ROLE OF EUROPEAN COMMISSION FUNDING*

The start of the Hematology Curriculum was the EC Leonardo da Vinci (LdV) funded project "The European Council for Accreditation in Hematology" or ECAH 2004-2006, with EHA as the leading organization. This project resulted in three main achievements - the EHA Curriculum, the EHA CME system, and the restoration of hematology as an EU-recognized specialty. ECAH also led to the establishment of the network of national *linkers*. The Curriculum Committee and the network remained active after the end of the ECAH project and jointly developed the basis for the subsequent LdV-funded project, H-Net 2008-2011.

*H-NET*

The major aim of H-Net is to harmonize and improve training in hematology by creating a platform for targeted education, based on identified competence gaps in individuals, countries and regions and a new system of training and communication. The EHA European Curriculum plays an important role in this project.

*THE EUROPEAN CURRICULUM FOR TRAINING IN HEMATOLOGY, THE "CV PASSPORT"*

The Curriculum Committee employs the term "Passport" to demonstrate that its program is intended to promote harmonization of the specialty, as well as professional mobility within the European community. It also aims to improve the quality of patient care. It describes the skills and competences of a junior specialist in hematology and should be considered as a set of recommendations.

The first version of the European Curriculum for Hematology was created through a "bottom-up'' process and first published in May 2006. The CV Passport consists of sections of hematological competences and, within each section, a list of items. For each item, a recommended level of competence is agreed upon. All the national societies listed in Appendix II of this document reviewed the 2006 version of the hematology curriculum, as laid out in the CV Passport, and contributed to its content.

The 2011 version of the CV Passport was updated by a broad group of hematologists (see Appendix III) appointed by the Curriculum Committee and the EHA Board. To ensure continuity, a number of these were selected from the initial group. The updated version was then reviewed by the national societies mentioned above. Both the previous and the present version of the curriculum were endorsed by national societies for hematology throughout Europe.

*FURTHER UPDATES*

The curriculum will be reviewed periodically by the EHA Board and Curriculum Committee, in collaboration with the national hematology associations throughout Europe.

## *II. THE UPDATED CV PASSPORT*

*THE SCOPE OF THE CV PASSPORT*

The CV Passport focuses on hematology as a mono-specialty including clinical and diagnostic aspects. It also defines the degree of competence in internal medicine that is required to be a hematologist, but does not focus on the details of this specialty. Likewise, it does not discuss the non-hematological parts of education in pediatric hematology. Moreover, it should be used with reference to differences in disease incidences and patient care within Europe. In such instances, national adaptations may be appropriate. Finally, the CV Passport includes general skills with relevance to hematological practice. It should be underlined that the CV Passport defines the levels of competence for basic education in hematology (junior specialist). Continuous professional development, maintenance of competence, as well as sub-specialization, are not addressed in the CV Passport.

*RECOMMENDED LENGTH OF TRAINING*

Given the scope of the discipline of hematology, as described in the Hematology Curriculum, and considering the results of the 2010 European survey, conducted as part of the H-Net project, H-Net believes it can support the European Union by recommending that the minimum training requirement for Hematology be five years, or three years when previous training encompassed the equivalent of at least two years in internal medicine. The 2010 survey shows that the median length of training is 62 months in specialist training and 30 months in hematology training. However, there is a marked variation between countries – 46-90 months in the former and 13-51 months in the latter.

*MAJOR CHANGES IN THE 2011 VERSION*

- The clinical part of the CV Passport has expanded from one to four sections – benign hematology, myeloid malignancies, lymphoid malignancies, and stem cell transplantation and special therapy. Together with diagnosis, thrombosis and hemostasis, transfusion medicine, and general skills, the CV Passport now consists of eight sections.
- New items of hematological knowledge, incorporated into routine care since the 2006 version, have been added. Other items have been removed or simplified.

## *III. AVAILABILITY OF THE CV PASSPORT*

An individual undergoing training in Hematology may download a web version of the CV Passport from the EHA website at www.ehaweb.org. A printed version is also available to order from EHA.

## *IV. USE OF THE CV PASSPORT*

*HOW TO CARRY OUT AN ASSESSMENT USING THE CV PASSPORT*

Each item in the CV Passport can be assessed at three levels of competence. To decide which level to choose, the following guidance should be read carefully.The CV Passport contains different types of items. Some items (especially in Sections 1-4 of the CV Passport) refer to clinical conditions and the competence levels refer to the ability to manage these conditions. Some items refer to knowledge needed by the hematologist (for example of guidelines); some to the skills needed (for example communication); and some refer to the skills involved in performing and interpreting diagnostic procedures. The individual making an assessment should refer to the level descriptor which is most appropriate to the item being assessed.

## *V. DEFINITIONS OF THE LEVEL DESCRIPTORS*

***Level 1 descriptors:*** The trainee can:

| | |
|---|---|
| Patient management | identify the correct categorisation of the condition and recognise a patient who may fall into this categorisation *[NOTE: may not have seen a patient with condition]* |
| Laboratory skills and diagnosis | describe the general range of tests available and relevant to specific hematological conditions |
| Transfusion medicine | identify the clinical indications for a transfusion, of whichever blood component |
| Knowledge of professional issues | describe what is meant by a specific issue and explain why this issue is important for the hematologist |
| General professional skills | describe what is meant by a specific item and explain why these skills are important for the hematologist |

***Level 2 descriptors:*** The trainee can:

| | |
|---|---|
| Patient management | • describe in basic terms the pathogenesis, epidemiology, and clinical features associated with the condition<br>• identify symptoms and tests required to diagnose condition and interpret test results correctly<br>• describe prognosis<br>• in relation to common conditions with established treatment protocols, identify correct referral routes OR initiate appropriate treatment *[NOTE: will normally have seen patients with condition instead of their test results]*<br>• in relation to rare conditions, particularly those with potentially life-threatening debut symptoms, identify the need for and establish urgent consultation with subspecialist |
| Laboratory skills and diagnosis | • in relation to specific lab tests, explain: indications; principles; sensitivity and specificity; limitations; and costs |
| Transfusion medicine | • manage a transfusion reaction<br>• determine expected post-transfusion modifications of blood parameters<br>• perform blood collection<br>• interpret immunohematology report |
| Knowledge of professional issues | • define and explain key terms in relation to the issue and demonstrate how they are applied in own practice |
| General professional skills | • demonstrate flexible skills under a range of conditions in own practice (e.g. patients with reduced autonomy, patients from different backgrounds, seriously ill patients, etc) |

***Level 3 descriptors:*** The trainee can:

| | |
|---|---|
| Patient management | • describe in more detail the pathogenesis, epidemiology and clinical features associated with the condition<br>• identify symptoms and tests required to diagnose condition and interpret test results correctly (as Level 2)<br>• decide on management / treatment and manage the patient during treatment *[NOTE: for most disorders this includes managing first-line treatment including clinical trials, and identifying treatment failure and need for second-line management] [NOTE: will have seen and managed an appropriate number of patients, taking into account the incidence of the condition]* |
| Laboratory skills and diagnosis | • in relation to specific laboratory tests, interpret raw results and report/apply them<br>• in relation to specific tests, and recognising variation in professional roles across Europe, perform tests |
| Transfusion medicine | • manage special requirements (e.g. platelet refractoriness, allo-immunisation)<br>• select and administer special components (e.g. cryo-preserved stem cells, autologous transfusion)<br>• provide consultation on transfusion needs in invasive procedures; massive transfusion (e.g. in pregnancy, surgery, trauma) |
| Knowledge of professional issues | • fulfil all the requirements of Levels 1 and 2, and in addition<br>seek out and integrate new knowledge and thinking on the specific issue<br>• explain issue in appropriate language to non-specialist audience (e.g. patient) |
| General professional skills | • fulfil all the requirements of Levels 1 and 2, and in addition<br>recognise and plan how to improve own limitations in skill areas and demonstrate that this has happened |

# 1 CLINICAL HEMATOLOGY: BENIGN

## 1A: RED CELL DISORDERS

*The trainee has received training in:*

a) Anemias due to deficiency (iron, B12, folate) {level 3}

b) Anemia of chronic disease {level 3}

c) Anemia due to toxic exposure {Level 2}

d) Pure red cell aplasia {Level 2}

e) Thalassemia {level 3}

f) Sickle cell disease and other hemoglobinopathies {Level 3}

g) Red blood cell membrane disorders (e.g.Spherocytosis) {Level 2}

h) Red blood cell enzymopathy (e.g. G6PD) {Level 2}

i) Acquired immune hemolytic anemias {Level 3}

j) Acquired non-immune hemolytic anemias {level 3}

k) Other congenital anemias (CDA, sideroblastic anemia) {level 1}

l) Erythrocytosis (other than PV) {level 3}

m) Primary hemochromatosis {level 3}

n) Secondary hemochromatosis {level 3}

o) Porphyria {level1}

## 1B: BONE MARROW FAILURE

*The trainee has received training in:*

a) Acquired aplastic anemia {level 3}

b) Paroxysmal nocturnal hemoglobinuria {level 2}

c) Fanconi's anemia {level 1}

d) Other inherited bone marrow failure syndromes (e.g. Blackfan-Diamond, Schwachman) {level 1}

**1C: NON MALIGNANT WHITE BLOOD CELL DISORDERS**

*The trainee has received training in:*

a) Granulocyte dysfunction disorders {level 1}

b) Granulocytopenia/agranulocytosis {level 3}

c) Lymphopenia and lymphocyte dysfunction syndromes {level 2}

d) Inherited immune deficiency syndromes {level 2}

e) Hemophagocytic lymphohistiocytosis {level 2}

f) Secondary leukocytosis {level 3}

**1D: PLATELET DISORDERS AND ANGIOPATHIES**

*The trainee has received training in:*

a) Acquired platelet function disorders {level 2}

b) Immune thrombocytopenia {level 3}

c) Thrombotic thrombocytopenic purpura) {level 3}

d) Pseudothrombocytopenia {level 3}

e) Disorders with teleangiectasias*(e.g. Rendu-Osler-Weber disease) {level 2}*

(For other platelet disorders see section Coagulation)

**1E: CONSULTATIVE HEMATOLOGY**

*The trainee has received training in:*

a) Genetic counseling {level 2}

b) Hematological manifestations of congenital metabolism disorders {level 2}

c) Hematological manifestations of non hematological disorders {level 3}

d) Hematological manifestations related to pregnancy {level 3}

e) Hematological manifestations in HIV and other infectious diseases {level 3}

## 2 CLINICAL HEMATOLOGY: MYELOID MALIGNANCIES

### 2A: MYELOPROLIFERATIVE AND MYELODYSPLASTIC NEOPLASMS

*The trainee has received training in:*

a) Chronic myeloid leukemia {level 3}

b) Polycythemia vera {level 3}

c) Primary myelofibrosis {level 3}

d) Essential thrombocythemia {level 3}

e) Chronic eosinophilic leukemia {level 2}

f) Mastocytosis {level 2}

g) Neoplasms with eosinophilia and abnormalities of PDGFR and/or FGFR1 {level 2}

h) CMML {level 3}

i) MDS low risk disease {level 3}

j) MDS intermediate and high risk disease {level 3}

k) Other Myeloproliferative and Myelodysplastic disorders including pediatric disorders (e.g. JMML) {level 2}

### 2B: ACUTE MYELOID LEUKEMIA AND LEUKEMIA'S OF AMBIGUOUS LINEAGE

*The trainee has received training in:*

a) AML with recurrent genetic abnormalities {level 3}

b) AML with MDS related changes {level 3}

c) Therapy related AML and MDS {level 3}

d) Other AML {level 3}

e) Myeloid proliferations related to Down syndrome {level 2}

f) Acute leukemia of ambiguous lineage {level 2}

## 3 CLINICAL HEMATOLOGY: LYMPHOID MALIGNANCIES AND PLASMA CELL DISORDERS

### 3A: B-CELL NEOPLASMS

*The trainee has received training in:*

a) Acute lymphoblastic leukemia/lymphoblastic lymphoma of B-cell origin {level 3}

b) Diffuse large B-cell lymphoma {level 3}

c) Burkitt´s lymphoma {level 3}

d) Other aggressive B-cell lymphomas (e.g. unclassifiable, primary mediastinal large B-cell lymphoma, intravascular, plasmablastic, ALK+ large B-cell lymphoma) {level 3}

e) Mantle cell lymphoma {level 3}

f) Follicular lymphoma {level 3}

g) Other indolent B-cell lymphomas (e.g. lymphoplasmacytic lymphoma/Waldenström´s macroglobulinemia, hairy cell leukemia) {level 3}

h) Marginal Zone lymphomas (e.g. MALT, SMZL) {level 3}

i) Chronic lymphocytic leukemia/small lymphocytic lymphoma/monoclonal B cell lymphocytosis {level 3}

### 3B: T-CELL LYMPHOMAS AND NK-CELL NEOPLASMS

*The trainee has received training in:*

a) Acute lymphoblastic leukemia/lymphoblastic lymphoma of T-cell origin {level 3}

b) Peripheral T-cell lymphoma, NOS {level 3}

c) Anaplastic large cell lymphoma {level 3}

d) Other T- and NK-cell lymphomas (incl. AILT, T-PLL, T-LGL, NK-cell lymphoma/leukemia) {level 2}

### 3C: HODGKIN LYMPHOMA

*The trainee has received training in:*

a) Nodular lymphocyte predominant HL {level 3}

b) Classical HL {level 3}

**3D: OTHER SPECIAL ENTITIES**

*The trainee has received training in:*

a) Lymphomas in immunodeficient patients (incl. PTLD, HIV-associated lymphomas) {level 2}

b) Cutaneous lymphomas {level 2}

c) Primary CNS lymphoma {level 2}

d) Histiocytic and dendritic cell neoplasms {level 2}

**3E: PLASMA CELL NEOPLASMS**

*The trainee has received training in:*

a) Monoclonal gammopathy of undetermined significance (MGUS) {level 3}

b) Solitary plasmacytoma {level 3}

c) Plasma cell myeloma (Multiple myeloma) {level 3}

d) Monoclonal immunoglobulin deposition diseases (amyloidosis) {level 2}

## 4. CLINICAL HEMATOLOGY: STEM CELL TRANSPLANTATION AND SPECIAL THERAPY

Training within the field of stem cell transplantation should ideally be done at a JACIE accredited unit

### 4A: STEM CELL TRANSPLANTATION

*The trainee has received training in:*

a) Indications, risks and benefits of autologous and allogeneic transplants {level 3}

b) Criteria for selection of myeloablative or reduced dose preparative regimens {level 2}

c) Administration of high-dose therapy {level 3}

d) Identification and selection of HPC source {level 1}

e) Acute and chronic graft versus host disease {level 2}

f) Pulmonary complications, veno-occlusive disease of the liver, and hemorrhagic cystitis {level 2}

g) Evaluation of chimerism {level 2}

h) Mobilization, collection and manipulation of hemopoeitic stem cells {level 2}

### 4B: CELL AND GENE THERAPY

*The trainee has received training in:*

a) Clinical potential and limits of embryonic and adult stem cell therapy. Ethical considerations {level 1}

b) Clinical potential and limits of gene therapy {level 1}

c) Mesenchymal cells and NK cell therapy {level 1}

d) Tumor vaccines {level 1}

### 4C: TREATMENT OF HEMATOLOGICAL DISORDERS

*The trainee has received training in:*

a) Drug therapy including targeted drugs: mechanisms of action, pharmacology and drug resistance {level 1}

b) Administration of standard chemotherapy {level 3}

c) Short and long term complications of chemotherapy and radiotherapy (including infertility and secondary neoplasias) {level 3}

d) Administration of immunosuppressive agents and growth factors {level 3}

e) Hematological malignancies in pregnancy {level 2}

**4D: INFECTIOUS COMPLICATIONS**

*The trainee has received training in:*

a) Neutropenic fever {level 3}

b) Bacterial disease {level 3}

c) Fungal disease {level 3}

d) Cytomegalovirus (CMV) infection {level 3}

e) Other viral infections in immunocompromised hosts {level 1}

**4E: SUPPORTIVE AND EMERGENCY CARE**

*The trainee has received training in:*

a) Hyperleukocytosis, hyperviscosity, and tumor lysis syndrome {level 3}

b) Spinal cord compression {level 3}

c) Superior vena cava syndrome {level 3}

d) Mucositis, vomiting, and pain {level 3}

e) Neurological and psychiatric disturbances {level 2}

f) Venous access management (except surgical aspects) {level 3}

g) Nutrition {level 2}

# 5 LABORATORY DIAGNOSIS

## 5A: BASIC CONCEPTS

*The trainee has received training in:*

a) Hematopoiesis {level 2}

b) Stem cell biology {level 2}

c) Chromosome and gene structure {level 2}

d) The role of deoxyribonucleic acid (DNA), ribonucleic acid (RNA) and proteins in normal cellular processes {level 2}

e) Basic concepts of transcription and translation, epigenetic regulation, signal transduction, cell cycle regulation and apoptosis {level 2}

f) Integrating data from various laboratory investigations, relating them to the clinical picture and formulating a diagnosis {level 3}

## 5B: GOOD LABORATORY PRACTICE

*The trainee has received training in:*

a) Principles of laboratory management and organization {level 1}

b) Laboratory quality management (incl. internal and external quality control) {level 1}

c) Hazards and safety {level 1}

d) Normal ranges of laboratory values, with relevance to gender, age and ethnicity {level 3}

## 5C: BLOOD COUNT AND MORPHOLOGY

The trainee should be familiar with the procedures, reporting and clinical evaluation of blood cell counts and morphology in order to formulate and communicate a plan of action.

*The trainee has received training in:*

a) Automated complete blood count with white blood cell differential; “flagging”; causes of erroneous blood counts {level 3}

b) Performing aspiration and biopsy of bone marrow, lumbar puncture and lymph node fine needle aspiration and preparation of slides, touch preparations and trephine rolls {level 3}

c) Preparation, fixation, staining, reading and reporting of peripheral blood smears and bone marrow aspirates {level 3}

d) Examination of blood and bone marrow smears for RBC parasites {level 2}

e) Cytochemical and special stains of blood and bone marrow smears {level 3}

f) Histopathology in regard to hematological conditions. Review of trephine biopsy, pathological lymph node and other tissue biopsies for diagnosis with a pathologist {level 2}

g) Immunostaining in hematological malignancies (lymphoid-lineage, myeloid-lineage and differentiation markers) {level 2}

**5D: OTHER LABORATORY TECHNIQUES**

*The trainee has received training in:*

a) Hemoglobin analyses (e.g. hemoglobin electrophoresis) {level 1}

b) Other red blood cell laboratory techniques (e.g. sickling process, oxygen affinity, red blood cell enzyme assays – pyruvate kinase, glucose-6-phosphate dehydrogenase) {level 1}

c) Laboratory work-up on iron metabolism and vitamin deficiencies {level 2}

d) Detection of immunoglobulin abnormalities (e.g. protein electrophoresis, immunoelectrophoresis/ immunofixation, cryoglobulin detection, light chain assays) {level 2}

**5E: IMMUNOPHENOTYPING BY FLOW CYTOMETRY**

The trainee should be familiar with the interrelated stages of multi-parameter flow cytometry (FCM) analysis from the initial medical decision to the final diagnosis including integration with relevant clinical and laboratory information.

*The trainee has received training in:*

a) Pre-analytical and analytical phase of flow cytometry of blood, bone marrow, and body fluids (e.g. specimen processing, surface vs. intracytoplasmic staining, acquiring data, gating strategies) {level 2}

b) Essential cellular markers applied in the diagnosis of hematological conditions (e.g. lineage, progenitor and differentiation markers) {level 3}

c) General principles of disease-oriented antibody panels {level 2}

d) Post-analytical phase (data analysis and determination of the lineage of cells of interest, clonality and specific subtype of hematological condition) {level 2}

e) Applications, limitations and prognostic impact for diagnosis and classification, evaluation of minimal residual disease, stem cell quantification {level 3}

**5F: GENETICS AND MOLECULAR BIOLOGY**

The trainee should be familiar with the interrelated stages of genetic and molecular studies from the initial medical decision of the most appropriate methodological approach in a particular hematological condition, to the final diagnostic and prognostic interpretation, including integration with relevant clinical and laboratory information.

The trainee has to use the definitions of chromosomal abnormalities according to the International Nomenclature of aberrations (e.g. reciprocal translocation, deletion, inversion, monosomy, trisomy, etc.) and/or their molecular counterparts.

*The trainee has received training in:*

a) Karyotyping (e.g. conventional cytogenetics and fluorescence in situ hybridization) {level 2}

b) Polymerase chain reaction for the detection of gene mutations, fusion genes, clonality assessment, and gene expression (e.g. reverse transcription-polymerase chain reaction, qualitative and quantitative, sequencing) {level 2}

c) Other techniques for detection of genetic and epigenetic aberrations (e.g. Western blot, CGH, SNP, gene expression profiling, high-throughput sequencing, microRNA assays, methylation studies and proteomics) {level 1}

d) ) Applications, limitations and prognostic impact of genetic and molecular aberrations for diagnosis and classification of hematological disorders, and for evaluating minimal residual disease {level 3}

# 6 THROMBOSIS AND HEMOSTASIS

The practice of clinical hemostasis and thrombosis requires a combination of diagnostic laboratory and clinical expertise. As in other areas of clinical hematology there is a major overlap with general internal medicine. Therefore a holistic approach to disease management requires adequate training in general internal medicine as well as in hemostasis and thrombosis.

## 6A: LABORATORY MANAGEMENT

*The trainee has received training in:*

a) Techniques for assessing coagulation and platelets {level 2}

b) Assays for inhibitors (e.g. anti-phospholipid antibodies) {level 2}

c) Establishing ranges, including relevance to gender and age {level 2}

## 6B: ACQUIRED BLEEDING DISORDERS

*The trainee has received training in:*

a) Massive bleeding in obstetrics, trauma and surgery {level 2}

b) Disseminated intravascular coagulation (DIC) {level 3}

c) Bleeding associated with renal and liver disease {level 2}

d) Bleeding related to anticoagulants and antithrombotic therapy {level 3}

e) Acquired bleeding disorders in adults (inhibitors to F VIII and vWF) {level 2}

f) Acquired bleeding disorders in children {level 1}

g) Adverse effects of treatment used in acute bleeding (blood products, pro-haemostatic drugs) {level 2}

## 6C: CONGENITAL BLEEDING DISORDERS

*The trainee has received training in:*

a) Mechanisms in hemostasis {level 2}

b) Taking a relevant bleeding history (previous challenges and family history) with a focused clinical examination {level 3}

c) Hemophilia A & B {level 3}

d) Von Willebrand disease {level 3}

e) Other bleeding disorders (e.g. deficiency of factor XIII, XI, X, VII, V and II, and hypofibrinogenaemia) {level 2}

f) Considerations in carriers of hemophilia in relation to pregnancy and management of neonates with hemophilia {level 2}

g) Safety of treatment with blood products and factor concentrates {level 2}

**6D: PLATELET DISORDERS**

*The trainee has received training in:*

a) Platelet structure, function and vessel wall interactions {level 2}

b) Congenital platelet disorders, (e.g. Bernard-Soulier syndrome) {level 2}

c) Heparin-induced thrombocytopenia {level 3}

d) Thrombocytopenia in pregnancy {level 3}

**6E: THROMBOTIC DISORDERS**

*The trainee has received training in:*

a) Mechanisms and risk-factors in arterial and venous thromboembolism {level 3}

b) Venous thromboembolism {level 3}

c) Laboratory monitoring and dosing of anticoagulants {level 3}

d) Post-thrombotic complications {level 3}

e) Thrombophilia (e.g. F V Leiden, II G20210A) {level 3}

f) Acquired thrombotic tendency, (e.g. APS, HIT, PNH and MPN) {level 2}

g) Treatment and prophylaxis of venous thromboembolism in pregnancy {level 2}

h) Specific therapy in thrombotic disorders (e.g. caval filters) {level 2}

i) Purpura fulminans {level 1}

j) Adverse drug reactions to anticoagulant, antiplatelet and thrombolytic therapy {level 3}

# 7 TRANSFUSION MEDICINE

## 7A: BLOOD DONATION

*The trainee has received training in:*

a) Council of Europe and other relevant regulations for donor eligibility {level 2}

b) Epidemiology of infectious diseases in the area {level 2}

c) Donor preparation; venesection, donation screening, donation associated adverse events {level 2}

d) Preparation and preservation of standard and special blood components (Whole blood; Red cells; Plasma; Platelets. Cryoprecipitate; irradiated; leukocyte depleted; washed; pathogen reduced; Pediatric Units) {level 2}

## 7B: IMMUNOHEMATOLOGY

*The trainee has received training in:*

a) Cross matching, direct and indirect antiglobulin (Coombs) tests, ABO and Rh typing of red blood cells {level 3}

b) HLA typing and anti-HLA antibody detection {level 2}

c) Minor red cell antigens and antibodies {level 1}

## 7C: GUIDELINES AND REGULATIONS FOR USE OF BLOOD AND BLOOD COMPONENTS

*The trainee has received training in:*

a) Red Cells, Platelets, Plasma {level 3}

b) Granulocytes {level 1}

c) Blood derivatives (incl. immunoglobulins) {level 2}

d) Alternatives to allogeneic blood transfusion (autologous blood; use of r-huEPO, iron etc) {level 2}

e) Massive transfusion (in surgery, trauma, pregnancy, etc) {level 2}

## 7D: ADMINISTRATION OF TRANSFUSION AND MANAGEMENT OF COMPLICATIONS

*The trainee has received training in:*

a) Information to the patient {level 3}

b) Routine vs. emergency transfusions {level 3}

c) Proper identification of the unit and recipient {level 3}

d) Rate and conditions of administration and monitoring {level 3}

e) Fetal, neonatal and pediatric transfusion {level 2}

f) Transfusion reactions and complications (non-hemolytic, hemolytic, allergic, transfusion-related acute lung injury TRALI, transfusion associated GvHD) {level 3}

g) Hemovigilance programs {level 1}

**7E: MANAGEMENT OF SPECIAL CONDITIONS**

*The trainee has received training in:*

a) Hemolytic disease of the newborn {level 2}

b) Neonatal thrombocytopenia and neutropenia {level 2}

c) Laboratory work-up of immune hemolytic anemias {level 2}

d) Plasmapheresis {level 2}

e) Red cell exchange {level 2}

f) Plateletpheresis {level 2}

g) Leukapheresis (therapeutic) {level 2}

h) Donation by apheresis {level 2}

i) Multi-component collection {level 2}

j) Performing therapeutic phlebotomy {level 3}

k) Special components (Leukoreduced, CMV safe, washed, gamma irradiated, pathogen reduced, cryopreserved) {level 2}

# 8 GENERAL SKILLS

For any specialty, the acquisition of general skills is an important part of training. The core concepts and practical skills listed here are essential for a specialist in hematology and should be a part of the training either in medical school or as part of specialty training. Naturally, there are other general skills which are not listed here.

## 8A: EVIDENCE BASED MEDICINE / CRITICAL APPRAISAL

The trainee should have daily access to internet. 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 understanding of appropriate statistics.

*The trainee has received training in:*

a) Fundamental principles of evidence based medicine {level 2}

b) Using scientific literature and critically evaluating information {level 2}

c) Biostatistics that will allow the trainee to interpret published literature {level 2}

d) Definition and disclosure of conflict of interest as well as current conflict-of-interest policies, (e.g., standards of conduct in collaboration between physicians and industry) {level 2}

e) Promotion by the industry and its effect on the rational use of diagnostic and therapeutic strategies {level 3}

f) Applying evidence based practice to the management of the individual patient {level 3}

g) Strategic and economic implications of combining drugs and clinical biomarkers (personalized medicine) {level 2}

h) Problem based learning techniques {level 2}

## 8B: GOOD CLINICAL PRACTICE / CLINICAL TRIALS

The trainee should have the opportunity to actively participate in the clinical trial process and take part in 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 has received training in:*

a) Identifying the different phases, types and purposes of clinical trials (e.g., phase 1-4, observational studies) as well as understanding the differences between industry-driven and investigator-driven clinical trials {level 3}

b) Applying the current versions of clinical trial related guidelines and legislation (Directive 2001/20/EC on the implementation of Good Clinical Practice in Clinical Trials, World Medical Association Declaration of Helsinki (2008) on Ethical Principles for Medical Research Involving Human Subjects) {level 3}

c) Applying the Appendix 2 to the Guideline on the evaluation of Anticancer Medicinal Products in Man on confirmatory studies in hematological malignancies (European Medicines Agency) {level 3}

d) Informing patients with various social, cultural, religious etc. backgrounds of all aspects related to clinical trials {level 3}

e) Obtaining the informed consent according to current regulations {level 3}

f) Treating and managing patients according to protocol requirements and knowing when to diverge from the protocol {level 3}

**8C: PHARMACOVIGILANCE**
The trainee should understand the activities involved in the detection, assessment, understanding, and prevention of adverse effects or any other drug-related problems.

*The trainee has received training in:*

a) Using terms relevant to drug-related harms (e.g., serious adverse event, adverse drug reaction, risk-benefit ratio, toxicity and medication error) {level 3}

b) Recognizing, documenting and treating adverse drug events {level 3}

c) National and EU legislation regarding pharmacovigilance systems {level 2}

d) Procedures and systematic post-marketing surveillance studies aimed at assessing the full safety profile of drugs (e.g., risk management plan, risk evaluation mitigation strategy, post-authorization safety studies) {level 2}

**8D: ETHICS AND LAW**

*The trainee has received training in:*

a) Principles of medical ethics central to the physician-patient relationship (e.g., principle of primacy of patients' welfare, patients' autonomy, social justice) {level 3}

b) The purpose and function of the Research Ethics Committee (ERC) and other regulatory bodies that oversee the conduct of clinical investigations {level 2}

c) Professional responsibilities (e.g., respect for patient's autonomy, non-maleficence, beneficence, justice) {level 3}

d) Multidisciplinary discussion about ethical dilemmas in clinical practice (e.g., managing patients with reduced autonomy) {level 3}

e) The relationship between healthcare providers and national and European authorities, tissue banks, insurance companies, including legislation {level 2} [subject to change]

f) Cost-effectiveness reasoning and just allocation of scarce resources (e.g. rationalization, rationing, prioritization) {level 2}

g) Assessing quality of life measures {level 2}

h) Current moral understanding of non-discrimination principles and human rights {level 2}

**8E: COMMUNICATION SKILLS**
The trainee should have the opportunity to take part in at least one course on communication skills

*The trainee has received training in:*

a) Communication with patients with hematological disorders (including communicating sad, bad and difficult information and managing patients with different cultural backgrounds) {level 3}

b) Communication with patients' relatives {level 3}

c) Communication within a multi-disciplinary team {level 3}

d) Presentation of clinical cases {level 3}

**8F: PSYCHOSOCIAL ISSUES** [subject to change after expert review]

*The trainee has received training in:*

a) Responding to normal psychological reactions to hematological diseases {level 2}

b) Recognizing psychological distress, socio-economic problems, and identifying the need for specialist resources {level 3}

c) Patients' rights according to national legislation {level 2}

**8G: HEMATOLOGICAL CARE IN THE ELDERLY PATIENT**

*The trainee has received training in:*

a) The effects of specific changes associated with aging and their impact on normal hematologic processes {level 3}

b) The impact of age on the pharmacodynamics, pharmacokinetics and risks of drugs used to treat hematologic disorders {level 3}

c) Patients' care based on a geriatric assessment {level 3}

**8H: END OF LIFE**

*The trainee has received training in:*

a) Communication with patients and family about death and dying {level 3}

b) Decision making related to end-of-life situations {level 2}

c) Recognizing physical, psychological, social or spiritual distress and identifying the need for specialist palliative care {level 2}

d) Potential indicators of the quality of end-of-life care {level 2}

e) Collaboration of the multi-professional team with patients and family {level 3}

f) Best practice in the last hours and days of life, including use of effective symptomatic treatment for patients approaching death {level 3}

g) The national legal requirements regarding euthanasia {level 3}

## APPENDICES

### Appendix I:

**EHA Curriculum Committee: (Chair underlined)**

| | |
|---|---|
| Eva Hellström-Lindberg | Karolinska University Hospital Huddinge, Sweden |
| Nancy Hamilton | European School of Haematology |
| Ambjörn Naeve | Uppsala University Learning Lab (ULL), Sweden |
| Paolo Rebulla | Foundation Ospedale Maggiore Policlinico, Mangiagalli e Regina Elena, Italy |
| Janet Strivens | University of Liverpool / The Centre for Lifelong Learning, UK |
| Cheng-Hock Toh | Royal Liverpool University Hospital, UK |
| Laurent Degos | Haute Autorité de Santé, France |
| Wolf-Dieter Ludwig | Helios Klinikum Berlin-Buch - Klinik für Hämatologie, Onkologie und Tumorimmunologie, Germany |

### Appendix II:

**National Societies/Project Partners in H-Net:**

Austrian Society of Hematology and Oncology
Belgian Hematology Society
British Society of Hematology
Bulgarian Society of Clinical and Transfusion Hematology
Czech Hematology Society (a member of the Czech Medical Society)
Danish Society of Hematology
Dutch Society of Hematology
Estonian Society of Hematology
European Hematology Association (coordinator)
European School of Haematology (ESH)
French Society of Hematology
German Society of Hematology and Oncology
Haematology Association of Ireland
Hellenic Society of Hematology
Hungarian Society of Hematology
Italian Society of Hematology (SIE)
Norwegian Society of Hematology
Polish Society of Hematology and Transfusion Medicine
Portuguese Society of Hematology
Romanian Society of Hematology
Slovak Society of Hematology and Transfusiology of Slovak Medical Association
Spanish Society of Hematology and Hemotherapy

Swedish Society of Hematology
Turkish Society of Hematology
University of Liverpool/The Centre of Lifelong Learning
Uppsala University/Uppsala Learning Lab (ULL)

**Associate partners:**
Croatian Hematology and Blood Transfusion Society
Israeli Society of Hematology and Blood Transfusion
Swiss Society of Hematology

**Appendix III:**

**Curriculum Update Working Group:**

| Member | Section | Role | Country |
|---|---|---|---|
| Eva Hellström-Lindberg | 1, 2 | hematology | Sweden |
| Gert Ossenkoppele | 1, 2 | hematology | The Netherlands |
| Ulrich Jäger | 3 | hematology | Austria |
| Tomas Navarro | 3 | hematology | Spain |
| Alvaro Urbano | 4 | hematology | Spain |
| Hamdi Akan | 4 | hematology | Turkey |
| Margarita Guenova | 5 | hematology | Bulgaria |
| Birgitta Sander | 5 | hematopathology | Sweden |
| Margareta Holmström | 6 | hematology/coagulation | Sweden |
| Cheng-Hock Toh | 6 | hematology/coagulation | UK |
| Paolo Rebulla | 7 | transfusion medicine | Italy |
| Charis Matsouka | 7 | hematology | Greece |
| Wolf-Dieter Ludwig | 8 | hematology | Germany |
| Dominique Bron | 8 | hematology | Belgium |
| Janet Strivens | all | Educational advisor | UK |
| Ambjörn Naeve | all | Educational advisor | Sweden |
| Carin Smand | all | EHA Executive Office | The Netherlands |
| Thom Duyvené de Wit | all | EHA Executive Office | The Netherlands |
| Gareth Evans-Jones | all | EHA Executive Office | The Netherlands |
| Victoria Chuvakova | all | EHA Executive Office | The Netherlands |
| Nina Straathof | all | EHA Executive Office | The Netherlands |

**Appendix IV:**

**The European Hematology Curriculum has been endorsed by the:**

Austrian Society of Hematology and Oncology
Belgian Hematology Society
Bulgarian Society of Clinical and Transfusion Hematology
Czech Hematology Society (a member of the Czech Medical Society)
Danish Society of Hematology
Dutch Society of Hematology
Estonian Society of Hematology
Finnish Association of Hematology
French Society of Hematology
German Society of Hematology and Oncology
Haematology Association of Ireland
Hellenic Society of Hematology
Hungarian Society of Hematology
Israeli Society of Hematology and Blood Transfusion
Italian Society of Hematology (SIE)
Latvian Hematology Society
Macedonian Society of Hematology
Norwegian Society of Hematology
Polish Society of Hematology and Transfusion Medicine
Portuguese Society of Hematology
Romanian Society of Hematology
Slovak Society of Hematology and Transfusiology of Slovak Medical Association
Slovenian Society of Hematology
Spanish Society of Hematology and Hemotherapy
Swedish Society of Hematology
Swiss Society of Hematology
Turkish Society of Hematology