The Royal Australasian College of Physicians

Haematology

Advanced Training Curriculum

Adult Medicine Division

Paediatrics & Child Health Division

Australian & New Zealand Society of Blood Transfusion Ltd

HSANZ

The Royal Australasian College of Physicians

Physician Readiness for Expert Practice (PREP) Training Program

Haematology Medicine Advanced Training Curriculum

TO BE USED IN CONJUNCTION WITH:

Basic Training Curriculum – Adult Internal Medicine

Basic Training Curriculum – Paediatrics & Child Health

Professional Qualities Curriculum

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The process was managed by the Curriculum Development Unit within the College's Education Deanery, who designed the document, drafted content material, organised and facilitated writing workshops, developed resource materials, and formatted the final document.

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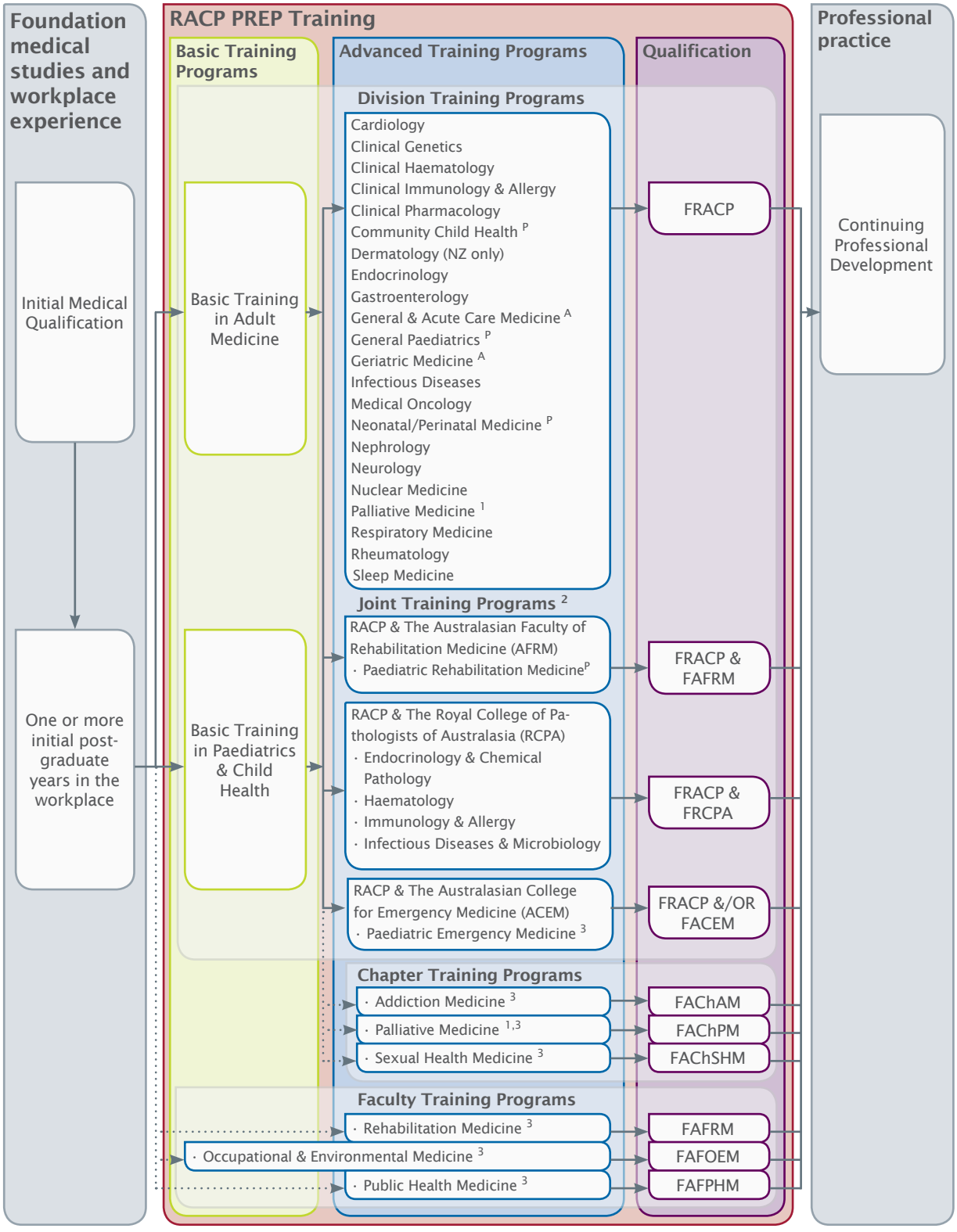
Please note: No Domains, Themes or Learning Objectives have been updated for this edition; design changes ONLY.

RACP FELLOWSHIP TRAINING PATHWAYS AND THE CONTINUUM OF LEARNING



P Trainees must complete Basic Training in Paediatrics & Child Health to enter this program.
A Trainees must complete Basic Training in Adult Medicine to enter this program.
1 Trainees who have entered Advanced Training in Palliative Medicine via a RACP Basic Training Program will be awarded FRACP upon completion and may subsequently be awarded FAChPM. Trainees who have NOT entered Advanced Training in Palliative Medicine via a RACP Basic Training Program will only be awarded FAChPM upon completion.
2 The Child & Adolescent Psychiatry Joint Training Program with the Royal Australian and New Zealand College of Psychiatrists (RANZCP) is currently under review by the RACP and RANZCP and closed to new entrants at present.
3 Alternative entry requirements exist for these training programs; please see the corresponding PREP Program Requirements Handbook for further information.

NB1: This diagram only depicts training programs that lead to Fellowship. Please see the RACP website for additional RACP training programs.
NB2: For further information on any of the above listed training programs, please see the corresponding PREP Program Requirements Handbook.

OVERVIEW OF THE SPECIALTY

Haematology is an integrated discipline incorporating clinical and laboratory aspects of diseases of the blood and blood-forming organs. This diverse specialty encompasses the investigation and treatment of a wide range of neoplastic and benign diseases, including leukaemias and lymphoproliferative disorders, inherited and acquired coagulation abnormalities, abnormalities of haemoglobin and red cells, haemopoietic stem cell transplantation and transfusion medicine.

Key features of the specialty and its practice include:

- clinical, translational and basic research as a significant component of practice for many haematologists. They contribute to the substantial advances in cell and molecular biology, therapeutics, and patient management
- the diversity of working environments, including salaried positions in hospitals or private laboratories, private practice and academic or research positions
- the provision for a clinical-laboratory interface of knowledge, skills and judgement
- the opportunity for long-term relationships with patients and their families
- consulting on medical problems across the entire range of medical subspecialties
- the opportunity for teaching in undergraduate and graduate medical programs, as well as in post-graduate advanced medical training
- the status of haematology at the forefront of the molecular understanding of the basis of disease, as well as translation into clinical practice and improved outcomes.

The requirement for the services provided by haematologists is expected to increase, with the growth in consumer demand due to population growth, ageing, the increasing incidence of haematological malignancies, and the expanding treatment options.

As with any other profession, haematologists need to respond to evolving societal, workplace, legislative and technological developments.

Some of the currently identified emerging developments include the:

- advances in medical technology
- expected increase in availability of complex and expensive investigative tests and procedures
- need for haematologists to provide expert interpretative analysis and opinion
- growth in consumer demand specifically with the increasing incidence of haematological malignancies
- expected technological advances in chemotherapy and immunotherapy
- increased use of powerful and expensive drugs which will increase requirement for haematologists and higher levels of medical supervision.

CURRICULUM OVERVIEW

Haematology Medicine – Advanced Training Curriculum

This curriculum outlines the broad concepts, related learning objectives and the associated theoretical knowledge, clinical skills, attitudes and behaviours required and commonly utilised by haematology medicine physicians within Australia and New Zealand.

The purpose of Advanced Training is for trainees to build on the cognitive and practical skills acquired during Basic Training. At the completion of the Haematology Medicine Advanced Training Program, trainees should be competent to provide, at consultant level, unsupervised comprehensive medical care in haematology medicine.

Attaining competency in all aspects of this curriculum is expected to take three years of training. It is expected that all teaching, learning and assessment associated with the Haematology Medicine Advanced Training Curriculum will be undertaken within the context of the physician's everyday clinical practice and will accommodate discipline-specific contexts and practices as required. As such it will need to be implemented within the reality of current workplace and workforce issues and the needs of health service provision.

There may be learning objectives that overlap with or could easily relate to other domains; however, to avoid repetition, these have been assigned to only one area. In practice, it is anticipated that within the teaching/learning environment, the progression of each objective would be explored.

Note: The curricula should always be read in conjunction with the relevant College Training Handbook available on the College website.

Professional Qualities Curriculum

The Professional Qualities Curriculum (PQC) outlines the range of concepts and specific learning objectives required by, and utilised by, all physicians, regardless of their specialty or area of expertise. It spans both the Basic and Advanced Training Programs and is also utilised as a key component of the Continuing Professional Development (CPD) program.

Together with the various Basic and Advanced Training Curricula, the PQC integrates and fully encompasses the diagnostic, clinical, and educative-based aspects of the physician's/paediatrician's daily practice.

Each of the concepts and objectives within the PQC will be taught, learnt and assessed within the context of everyday clinical practice. It is important, therefore, that they be aligned with, and fully integrated into, the learning objectives within this curriculum.

EXPECTED OUTCOMES AT THE COMPLETION OF TRAINING

Graduates from this training program will be equipped to function effectively within current and emerging professional, medical and societal contexts. At the completion of the Advanced Training Program in Haematology Medicine, as defined by this curriculum, it is expected that a new Fellow will have developed the clinical skills and have acquired the theoretical knowledge for competent haematology medicine practice. It is expected that a new Fellow will be able to:

- diagnose and treat haematological disorders and manage haematology laboratories
- function as a competent clinician, understanding the principles and the interpretation of a wide range of laboratory procedures, based upon a sound knowledge of the basic sciences, the relevant aspects of biochemistry, genetics, immunology, pathology, pharmacology, and pathophysiology of haematological and malignant diseases
- develop and apply appropriate management, communication and patient advocacy skills
- be aware of the haematological changes that occur during pregnancy, the neonatal period and childhood
- obtain bone marrow samples for diagnostic purposes
- diagnose and manage general medical problems, such as infections and disorders of the heart, lungs, liver and kidney
- demonstrate an understanding of biomedical ethics in the investigation and care of patients
- apply the principles of quality assurance to clinical care and laboratory medicine, as well as in the critical appraisal of the medical literature
- contribute to the education of colleagues, students, junior medical officers and other health care workers, through teaching and professional leadership
- encourage and sustain a harmonious team approach to patient care
- apply knowledge practically to basic science, laboratory skills and management and clinical skills and management
- process new knowledge through actively participating in clinical and/or basic research.

CURRICULUM THEMES AND LEARNING OBJECTIVES

Each of the curriculum documents has been developed using a common format, thereby ensuring a degree of consistency and approach across the spectrum of training.

Themes

The themes identify and link more specific aspects of learning into logical or related groups.

Learning Objectives

The learning objectives outline the specific requirements of learning. They provide a focus for identifying and detailing the required knowledge, skills and attitudes. They also provide a context for specifying assessment standards and criteria as well as providing a context for identifying a range of teaching and learning strategies.

LEARNING OBJECTIVES TABLES

Theme 1	Laboratory Management and Technical Procedures
Learning Objectives	
1.1	Develop efficient laboratory management procedures
1.2	Develop efficient technical procedures
Theme 2	Anaemia
Learning Objectives	
2.1	Diagnose and manage anaemia
Theme 3	Haemoglobinopathies
Learning Objectives	
3.1	Construct/generate laboratory diagnosis of haemoglobinopathies and abnormal haemoglobins
3.2	Manage individuals with haemoglobinopathies
Theme 4	Bone Marrow Syndromes and White Cell Disorders
Learning Objectives	
4.1	Diagnose and manage bone marrow failure syndromes
Theme 5	Acute Leukaemia
Learning Objectives	
5.1	Describe the principles of diagnosis and management of the acute leukaemias

Theme 6	Lymphoproliferative Disorders
Learning Objectives	
6.1	Diagnose and manage Hodgkin's and non-Hodgkin's lymphoma
Theme 7	Plasma Cell Disorders
Learning Objectives	
7.1	Diagnose and manage plasma cell and related disorders
Theme 8	Myeloproliferative Disorders
Learning Objectives	
8.1	Diagnose and manage myeloproliferative disorders
Theme 9	Stem Cell Transplantation
Learning Objectives	
9.1	Describe the principles and practice of autologous and allogeneic haemopoietic stem cell transplantation
Theme 10	Inherited Bleeding Disorders
Learning Objectives	
10.1	Diagnose and manage patients with inherited coagulation disorders
Theme 11	Acquired Bleeding Disorders
Learning Objectives	
11.1	Diagnose and manage patients with acquired bleeding
Theme 12	Thrombotic Disorders
Learning Objectives	
12.1	Evaluate and diagnose patients with thrombotic disorders
12.2	Diagnose, treat and advise patients requiring antithrombotic therapy
Theme 13	Platelet Disorders
Learning Objectives	
13.1	Diagnose and manage patients with congenital and acquired platelet disorders

Theme 14	Clinical Blood Transfusion Practice
Learning Objectives	
14.1	Outline and direct the safe and appropriate use of blood and blood components
14.2	Diagnose and manage possible adverse effects related to transfusion
Theme 15	Apheresis and Venesections
Learning Objectives	
15.1	Recognise and manage the use of therapeutic apheresis
Theme 16	Iron Overload
Learning Objectives	
16.1	Recognise and manage iron overload disorders
Theme 17	Paediatrics
Learning Objectives	
17.1	Diagnose and manage paediatric haematology conditions
Theme 18	Obstetrics and Gynaecology
Learning Objectives	
18.1	Develop an understanding of normal and abnormal haematology in obstetrics and gynaecology
Theme 19	Radiation Principles and Use
Learning Objectives	
19.1	Describe the principles of radiation therapy
19.2	Manage the risks and safety issues associated with diagnostic and therapeutic radiation
Theme 20	Palliative Care
Learning Objectives	
20.1	Outline the principles and timely application of palliative care

Teaching and Learning

1. Lectures
2. Tutorials and seminars
3. Demonstrations/observation
4. Task performance/practice/observation
5. Assignments/projects
6. Research, including audits
7. Conferences/workshops
8. Journal clubs
9. Clinics/tailored clinical experiences
10. Ward rounds
11. Grand rounds
12. Committee/multidisciplinary meetings
13. Mentoring
14. Coaching
15. Simulations (computer/virtual reality)
16. Interactive multimedia, including audio/video conferencing
17. Role play exercises
18. Critical incident analysis
19. Case studies
20. Online mediated/tutor monitored discussion groups

Assessment

1. Practical skills tests/exams
2. Written (knowledge-based) tests/exams
3. Multiple choice questionnaires
4. Short answer questions
5. Extended match questions
6. Written essays
7. Written assignments/projects
8. Oral tests
9. Case studies/presentations
10. Observation e.g. mini-CEX

11. Presentations
12. Record/log of attendance (at procedures)
13. Clinical skills assessments e.g. Objective Structured Clinical Examination (OSCE)
14. Simulations
15. Discussion/debriefing sessions
16. Case note reviews
17. Tutorial records
18. Reflective task, e.g. on critical incident
19. Peer assessment
20. Multi-source Feedback
21. Online delivery of assessment

Theme 1	Laboratory Management and Technical Procedures
Learning Objective 1.1	Develop efficient laboratory management procedures
Knowledge	**Skills**
• describe the principles of administration and governance of a haematology laboratory.	• explain the administrative issues involved in running a typical haematology laboratory, including accreditation, quality assurance, document control and conflict resolution.

Theme 1	Laboratory Management and Technical Procedures
Learning Objective 1.2	Develop efficient technical procedures
Knowledge	**Skills**
• describe the procedures and risks of performing bone marrow biopsies and lumbar punctures in patients with haematological disorders.	• perform bone marrow aspirates and trephine biopsies from the posterior iliac crest and sternum in adults • perform bone marrow biopsies in children • perform lumbar punctures in adults and in children (paediatric trainees).

Theme 2	Anaemia
Learning Objective 2.1	Diagnose and manage anaemia

Knowledge	Skills

• describe the mechanisms of erythropoiesis
• define the less common causes of anaemia, such as:
  • red cell aplasia (see bone marrow failure)
  • red cell membrane disorders
  • metabolic enzyme deficiencies
• define and identify the appropriate modalities of treatment of anaemia
• explain the pathophysiology of anaemia, including:
  • the nutritional causes of anaemia and the pathophysiology
  • iron deficiency
  • B12
  • folate deficiency
• define the causes and characteristics of anaemia in chronic disease
• define the investigative techniques required for the investigation of anaemia, including:
  • clinical
  • pathological
  • radiological.
	• discuss the mechanisms of erythropoiesis, including the role of erythropoietin and the ontogeny of red cell precursors
	• identify the appropriate clinical situations in which these diagnoses should be investigated and perform the appropriate investigations
	• explain the diagnosis of anaemia to patients and their families
	• apply the appropriate treatment for anaemia according to its pathophysiology, including supportive treatment such as transfusion
	• explain the treatment to patients and their families
	• interpret the nutritional causes of anaemia and the pathophysiology, including:
	  • iron deficiency
	  • B12
	  • folate deficiency
	• interpret the causes and characteristics of anaemia of chronic disease
	• identify the characteristics of haemoglobinopathies as a cause of anaemia, including:
	  • thalassemia
	  • sickle cell anaemia
	  • unstable haemoglobins
	• explain the diagnosis of anaemia to patients and their families
	• identify the causes of haemolysis, including:
	  • autoimmune haemolytic anaemia
	  • metabolic enzyme deficiencies
	  • red cell membrane disorders
	  • microangiopathic haemolytic anaemias
	• identify primary marrow causes of anaemia, such as:
	  • refractory anaemias and
	  • myelodysplastic syndromes
	• evaluate the signs of anaemia clinically by history and examination

Theme 2	Anaemia
Learning Objective 2.1	Diagnose and manage anaemia

	• perform appropriate investigations and evaluate results, such as:
	  • full blood count
	  • assays of haematinic factors
	  • bone marrow examination
	• explain investigations to patients and families, including possible morbidities
	• communicate the results of investigations and their implications to patients and their families.

Theme 3	Haemoglobinopathies
Learning Objective 3.1	Construct/generate laboratory diagnosis of haemoglobinopathies and abnormal haemoglobins
Knowledge	**Skills**

• identify blood film features and haematological parameters associated with haemoglobinopathies
• describe laboratory diagnosis of haemoglobinopathies and abnormal haemoglobins, including:
  • haemoglobin electrophoresis
  • high-performance liquid chromatography (HPLC) approaches to diagnosis
  • sickle testing
  • testing for unstable haemoglobins
• outline the molecular basis of haemoglobinopathies
• state the prevalence and geographic distribution of haemoglobinopathies.
	• recognise red cell changes in thalassaemias and haemoglobinopathies, including sickle cell disease
	• perform haemoglobin electrophoresis, HPLC and identify and interpret abnormal patterns
	• perform and interpret sickle tests and stability testing
	• explain the cause and implications of thalassaemia to patients and their families.

Theme 3	Haemoglobinopathies
Learning Objective 3.2	Manage individuals with haemoglobinopathies
Attitudes	Exhibit understanding and sensitivity when considering the psychological impact of the diagnosis of a haemoglobinopathy on a patient and their family

Knowledge	Skills

• outline the management of individuals with thalassaemia major, including:
  • transfusion
  • chelation therapy
  • diagnosis and management of the complications of iron overload
  • management of splenectomised individuals
  • psychological aspects of chronic illness
• describe the management of the patient with sickle cell disease in terms of:
  • transfusion regimens
  • approaches to minimise sickling
  • management of sickling crisis
• delineate principles of genetic counselling in families with haemoglobinopathies
• describe the principles of prenatal diagnosis of haemoglobinopathies.
	• evaluate the adequacy of chelation therapy in patients with thalassaemia major
	• perform assessments for endocrine and other complications of iron overload
	• explain the diagnosis of thalassaemia to patients and families
	• communicate the consequences of inadequate chelation therapy to patients and their families
	• evaluate the adequacy of prophylaxis in patients with sickle cell disease
	• manage a sickling crisis
	• provide advice regarding the genetics of sickle cell disease
	• explain the genetic issues associated with haemoglobinopathies
	• explain the procedure and implications of prenatal testing for thalassaemia syndromes.

Theme 4	Bone Marrow Syndromes and White Cell Disorders
Learning Objective 4.1	Diagnose and manage bone marrow failure syndromes

Knowledge	Skills
• define and explain the causes of pancytopenia • define the causes of bone marrow failure, including aplastic anaemia • describe the myelodysplastic syndromes and their haematological sequelae • explain the natural history, pathophysiological mechanisms, and morphological classification of the myelodysplastic syndromes, including the International Prognostic Scoring System (IPSS) and WHO system, and their clinical significance, including the importance of cytogenetic and molecular analyses • describe the clinical manifestations of bone marrow failure and pancytopenia • explain the investigations that are required to diagnose the cause of bone marrow failure • discuss and explain the treatment modalities of bone marrow aplasia.	• define and explain the causes of pancytopenia • differentiate between the primary (idiopathic) and secondary causes of bone marrow aplasia, including drugs, radiation, viruses • explain the diagnosis of bone marrow aplasia to patients and their families • explain the diagnosis of myelodysplastic syndromes to patients and their families • evaluate the clinical signs and sequelae of bone marrow failure • explain the diagnosis and sequelae of bone marrow failure to patients and their families • discuss, perform and evaluate the appropriate investigations for bone marrow failure, including full blood counts and morphology, bone marrow examination, cytogenetic and molecular analyses, and viral serology • explain the investigations of bone marrow failure and the results to patients and their families • discuss and apply the appropriate treatment for bone marrow aplasia, including the cessation of causative drugs, antithymocyte globulin, and cyclosporin, other immune modulators, and stem cell transplantation for aplastic anaemia • evaluate the efficacy and toxicities of these treatments • explain the appropriate treatment, and the morbidities and mortalities, for bone marrow failure to patients and their families.

Theme 5	Acute Leukaemia
Learning Objective 5.1	Describe the principles of diagnosis and management of the acute leukaemias

Knowledge	Skills

• define normal haematopoiesis and stem cell biology. This should include as a minimum knowledge of:
  • intrinsic and extrinsic regulators of blood cell development
  • hierarchical ordering of blood cell development from stem cell to mature blood cell
• classify acute leukaemias integrating:
  • morphology
  • cytochemistry
  • immunophenotyping
  • cytogenetics
  • molecular biology
• outline pathophysiology and natural history of leukaemia
• state the principles of induction, consolidation and maintenance cytotoxic chemotherapy, including attendant side effects
• define the principles of targeted, non-cytotoxic therapies including retinoic acid, arsenic, imatinib, rituxumab
• outline the principles of adjusting dose, schedule and regimens of therapy according to organ dysfunction and comorbidities
• delineate the principles of palliative care
• describe principles of supportive care, including:
  • prevention and management of opportunistic infection
  • use of blood components
  • appropriate use of haemostatic agents, anti-emetics and analgesics
• explain outcomes of leukaemia according to classification, prognostic indices and treatment strategy
• recall principles of determining prognosis using validated objective criteria.
	• explain the process of normal marrow function and how these processes are disrupted in acute leukaemia and by therapy
	• communicate these concepts in non-technical language to patients with acute leukaemia
	• recognise how new knowledge in basic haematopoietic biology may underpin current therapy, and influence future therapies for acute leukaemia
	• integrate diagnostic information to classify acute leukaemia into lymphoblastic and myeloid and their subtypes, according to WHO criteria
	• differentiate between the different modes of clinical presentation and various complications of acute leukaemia
	• interpret patterns of organ dysfunction directly or indirectly due to acute leukaemia or its complications
	• convey explanation of consequences of disease process to patients and their families
	• evaluate treatment protocols in common use for major forms of acute leukaemia, and the major side effects associated with these
	• communicate the goals and aims of treatment to patients, their families and other health professionals
	• discuss pertinent clinical, social, cultural and financial considerations in selection of therapeutic options for patients
	• communicate the side effects, and their short- and long-term consequences to patients, their families and other health professionals
	• accurately calculate and prescription of appropriate doses of chemotherapy and other anti-leukaemia therapies
	• select appropriate palliative modalities for patients with haematological disease

Theme 5	Acute Leukaemia
Learning Objective 5.1	Describe the principles of diagnosis and management of the acute leukaemias

Knowledge	Skills
	• select the appropriate components of supportive care for acute leukaemia patients • communicate with colleagues, other health professional, patients and their families about supportive treatments • recognise the urgency of management of infections in immunocompromised patients • articulate the range of therapeutic outcomes for acute leukaemias • assess prognosis in newly diagnosed patients according to clinical and laboratory indices • convey to patients and their families the likely outcomes of treatment, including prognostic uncertainty.

Theme 6	Lymphoproliferative Disorders
Learning Objective 6.1	Diagnose and manage Hodgkin's and non-Hodgkin's lymphoma

Knowledge	Skills

• define the normal anatomy and physiology of the lymphoid system as a basis for understanding disease
• describe natural history, classification and molecular biology of Hodgkin's and non-Hodgkin's lymphoma and related disorders
• define current staging and prognostic systems
• recognise disease specific presentations and complications
• outline appropriate management principles, including:
  • watch and wait
  • choice of specific chemotherapy regimens, for initial treatment, relapse and salvage therapy
  • disease-specific complications
  • place of radiotherapy, indications for high dose therapy
  • clinical trials
  • palliative care
• outline the current histological classification(s)
  • WHO classification.
	• explain lymphocyte molecular biology, cluster differentiation (CD) classification, immunoglobulin and functional assays
	• recognise the importance of understanding 'normal' parameters/findings
	• recognise presenting features and conduct history and examination competently
	• use clinical findings, laboratory, radiological and nuclear medicine investigations to establish a diagnosis, stage and determine prognosis of the disease
	• manage patients throughout the course of their illness
	• formulate an overall management plan for the initial presentation
	• manage relapse
	• evaluate the need for high dose therapy and assesses patient suitability
	• identify long-term complications of the disease and therapy, including second malignancies and their management and implications for fertility
	• manage end-of-life issues
	• interact with other relevant specialists, such as radiation oncology and palliative medicine
	• communicate the management options to patients and their families
	• explain the use of transplantation and its limitations to patients and their families
	• recognise indications for consultation with other appropriate clinicians in patient management
	• interpret histopathological reports
	• collaborate with anatomical pathologists and related specialists in the diagnosis and assessment of patients

Theme 6	Lymphoproliferative Disorders
Learning Objective 6.1	Diagnose and manage Hodgkin's and non-Hodgkin's lymphoma

	• • interpret bone marrow biopsy/trephine specimens in lymphoma patients • evaluate consequences of correct and incorrect interpretation of laboratory reports in lymphoma (include cytogenetic and molecular).

Theme 7	Plasma Cell Disorders
Learning Objective 7.1	Diagnose and manage plasma cell and related disorders
Attitudes	Act with empathy in discussing diagnosis and treatment with patient and family

Knowledge	Skills

• define the normal anatomy and physiology of the relevant aspects of the immune system
• outline the natural history, classification and molecular biology of myeloma and the other plasma cell dyscrasias
• describe clinical manifestations and current staging and prognostic systems
• identify disease specific complications
• explain the distinction between monoclonal gammopathy of uncertain significance, smouldering myeloma and symptomatic myeloma
• define management principles, including:
  • management of disease-specific complications
  • observation only
  • choice of specific chemotherapy regimes
  • place of radiotherapy
  • indications for high dose therapy
  • clinical trials
  • palliative care.
	• discuss normal anatomy and physiology as a basis for understanding of disease, including:
	  • lymphocyte molecular biology
	  • CD classification
	  • immunoglobulin assays
	  • functional assays
	• recognise the importance of understanding 'normal' parameters and findings
	• recognise presenting features and conduct history and examination competently
	• recognise disease-specific and treatment complication
	• use appropriate investigations and findings to establish diagnosis stage and determine the prognosis of the disease
	• recognise the importance of clinical assessment
	• recognise disease-specific complications and their relevance, including indications for urgent and semi-urgent intervention
	• recognise the importance of appropriate investigations
	• distinguish between the various plasma cell disorders using clinical and laboratory criteria
	• recognise the relevance and importance of the distinction between these clinical presentations

Theme 7	Plasma Cell Disorders
Learning Objective 7.1	Diagnose and manage plasma cell and related disorders

Knowledge	Skills

	• interpret bone marrow biopsy and trephine specimens in patients with plasma cell disorders
	• interpret relevant laboratory reports in relation to plasma cell disorders, including cytogenic and molecular assays
	• manage patients throughout the course of their illness, including:
	  • formulate overall management plan for the initial presentation.
	  • manage acute and chronic specific complications, e.g. hypercalcaemia, bone disease, hyperviscosity and the role of plasmapheresis
	  • monitor for relapse
	  • assess suitability for, and manage, high dose therapy
	• explain and monitor for long-term complications of disease and therapy, including second cancers and their management, and implications for fertility
	• manage end-of-life issues with compassion and collaboration
	• interact with other relevant specialists such as radiation oncology and palliative medicine
	• provide a full explanation of management options to patient and family, including:
	  • consequence of no treatment
	  • disease complications
	  • benefits and side effects of therapy
	• explain use of haematopoetic stem cell transplantation and its limitations to patient and family
	• recognise indications for consultation with appropriate specialties in patient management.

Theme 8	Myeloproliferative Disorders
Learning Objective 8.1	Diagnose and manage myeloproliferative disorders

Knowledge	Skills
• outline the criteria for each phase of chronic myeloid leukaemia (CML), i.e. chronic, accelerated, blast crisis • state the factors associated with prognosis in CML and the commonly used methods of clinical assessment, e.g. Hasford score • explain pathophysiology of CML on a genetic level • describe the methods used to monitor disease progress in CML including type of test, preferred specimen and optimal interval • outline current treatment options for CML with consideration of issues such as efficacy, availability, toxicity, cost effectiveness, age appropriateness, role of transplantation and any other relevant information • describe the diagnostic criteria and major differential diagnoses of polycythaemia vera (PV) • outline treatment plan for patients with PV, including venesection, radio-isotope and pharmacological means as appropriate • state venesection cut-off criteria for different polycythaemia groups and justify management plan • describe the diagnostic criteria of essential thrombocythaemia (ET) • outline the treatment strategies for ET, including treatment initiation points and agents for various groups and alternative strategies • outline non-surgical management of massive splenomegaly • define the diagnostic criteria for MF • outline a treatment strategy for MF, including all possible modalities that might be required such as surgical, pharmacological and radioisotopes. Be prepared to compare and reconsider these treatments • identify the common and serious complications of PV, ET and MF e.g. thrombosis, haemorrhage, leukaemia. Be aware of the differences in incidence of these complications between the types of myeloprofolic disorders (MPD) and the interaction of treatment on these complications.	• recognise presenting features and conduct history and examination competently • use appropriate clinical findings, laboratory, radiological and nuclear medicine investigations to establish diagnosis and stage, and determine prognosis of the disease • communicate information about diagnosis and treatment to patients and their families in a caring manner • evaluate treatment effectiveness regularly and at appropriate intervals • communicate with members of other teams (radiotherapy, surgery) regarding management of patients who need multidisciplinary care, e.g. PV and myelofibrosis (MF) • manage patients throughout the course of their illness.

Theme 9	Stem Cell Transplantation
Learning Objective 9.1	Describe the principles and practice of autologous and allogeneic haematopoietic stem cell transplantation
Attitudes	Recognise, respect and protect the rights and needs of donors
	Involve and consult the multidisciplinary team in management of graft vs. host disease (GVHD)
	Consult colleagues, other health professionals, patients and families about supportive treatments
	Convey compassionately and accurately to patients and families the likely outcomes of treatment, including prognostic uncertainty
	Display empathy when discussing prognosis, complications and imminent death

Knowledge	Skills

• define normal haematopoiesis and stem cell biology
• describe the mechanisms of stem cell mobilisation
• compare the biology of different stem cells sources
• differentiate the patterns of haematopoietic reconstitution following stem cell transplantation
• clearly delineate the indications for allogeneic stem cell transplantation (SCT):
  • standard indications
  • experimental indications
• clearly delineate the indications for autologous SCT:
  • standard indications
  • experimental indications
  • potential toxicity, side effects of cytokines for mobilisation
• outline the principles of:
  • histocompatibility
  • donor-recipient matching
  • GVHD
  • graft vs. leukaemia (GVL) effect
• describe the principles of:
  • donor health assessment
  • stem cell collection:
  • bone marrow harvesting
  • peripheral blood mobilisation
  • leucapheresis
  • umbilical cord blood collection and storage
	• use chemotherapy and cytokines appropriately to mobilise stem cells into the peripheral blood
	• communicate these concepts in non-technical language to patients who are candidates for stem cell transplantation
	• interpret the pattern of haematopoietic reconstitution following transplantation
	• recognise how new knowledge in basic haemopoietic biology influences future improvements in SCT
	• recognise the importance of selection of appropriate stem cell source
	• communicate the curative potential of allogeneic and autologous transplantation in different disease settings
	• recognise the patterns of treatment failure related to disease or complications of transplantation
	• apply the prognostic indicators of disease responsiveness and treatment-related mortality to decision making
	• appropriately select and refer patients for consideration of SCT
	• effectively communicate with patients the possible role of SCT in their care
	• explain to the patient/donor the side effects of cytokines used in stem cell mobilisation and manage these side effects

Theme 9	Stem Cell Transplantation
Learning Objective 9.1	Describe the principles and practice of autologous and allogeneic haematopoietic stem cell transplantation

- stem cell manipulation:
  - T cell depletion
  - cryopreservation
- define the principles of:
  - conditioning chemo- and radio- therapy
  - immunosuppression
  - acute toxicities of high dose chemotherapy and chemoradiotherapy on organ systems, including:
    - veno-occlusive disease
    - interstitial pneumonitis
    - diagnosis and management of GVHD
- identify the principles of supportive care (to be read in conjunction with acute leukaemia section) with special focus on:
  - prevention and management of opportunistic infection
  - use of blood components
  - appropriate use of haemostatic agents, anti-emetics and analgesics
  - diagnosis and treatment of late toxicities from SCT
- justify the outcomes of SCT considering the causes and incidences of transplant-related mortality for:
  - autologous transplants
  - allogenic transplants.

- identify suitable allogeneic donors
- communicate the relative risks of severe acute GVHD
- recognise potential for GVL effect
- communicate the suitability of siblings, family members or unrelated volunteers as donors
- assess volunteer donors and explain process of stem cell collection, including risks
- identify appropriate stem cell sources for different clinical scenarios
- prescribe the appropriate doses of chemotherapy and immunosuppressive therapies
- diagnose veno-occlusive disease and interstitial pneumonitis
- recognise the differences in efficacy and toxicity of autologous and allogeneic transplantation manage GVHD
- apply and use the relevant components of supportive care for stem cell transplant (SCT) patients:
  - during the neutropenic phase
  - following engraftment
  - during long-term immunosuppression
- recognise the urgency of management of infections in immunocompromised patients
- recognise the long-term toxicity and quality of life issues in long-term survivors
- effectively articulate the range of therapeutic outcomes for SCT
- assess prognosis in patients with multi-organ failure.

Theme 10	Inherited Bleeding Disorders
Learning Objective 10.1	Diagnose and manage patients with inherited coagulation disorders
Attitudes	Exhibit understanding and sensitivity when considering the psychological impact of the diagnosis of an inherited bleeding disorder when managing patients and their families

Knowledge	Skills
• describe the pathophysiology of normal haemostasis • describe the natural history, presentation, diagnostic strategies and complications of inherited coagulation disorders in particular deficiencies of Factor VIII (FVIII), Factor IX (FIX) and Von Willebrand factor (VWF) • describe the diagnostic methods used in assessment of inherited coagulation disorders, including specific assays • outline the use of molecular biological techniques to identify genetic disorders • identify the natural history, presentation, diagnostic strategies and complications of coagulation factor inhibitors • outline the mechanism of action, indications for use and side effects of available coagulation factor concentrates and relevant haemostatic agents.	• relate theoretical knowledge to patient management, including risks and benefits of therapy • demonstrate competence in taking history and performing examination of patients • formulate and implement appropriate management plan • recognise impact of the condition on patients and their families • interpret and apply laboratory results to patient management • relate laboratory information to patient • formulate management plan for patient with inhibitors, including liaison with clinical team • advise on appropriate prophylaxis and treatment of inherited coagulation disorders.

Theme 11	Acquired Bleeding Disorders
Learning Objective 11.1	Diagnose and manage patients with acquired bleeding

Knowledge	Skills

• describe normal haemostasis and fibrinolytic mechanisms
• describe pathophysiology of acquired bleeding disorders, including:
  • disseminated intravascular coagulation (DIC)
  • massive transfusion
  • renal disease
  • hepatic disease
  • obstetric complications
  • acquired Factor deficiency, especially FVIII coagulant (FVIIIc) and VWF
• describe mechanism of action, indications for use and adverse effects of available haemostatic agents, including blood and coagulation factor products, Desmopressin (DDAVP), anti-fibrinolytics, and other adjunctive agents.
	• demonstrate competence at evaluating patients with possible bleeding tendency
	• relate theoretical knowledge to patients
	• apply appropriate clinical and laboratory methods to define the bleeding disorder(s)
	• formulate an appropriate plan of management in these disorders
	• relate theoretical knowledge to patient management
	• advise on appropriate use of haemostatic agents in acquired bleeding disorders
	• relate theoretical knowledge to patient, including risks and benefits of therapy.

Theme 12	Thrombotic Disorders
Learning Objective 12.1	Evaluate and diagnose patients with thrombotic disorders
Attitudes	Act with empathy in discussing diagnosis and treatment with patients and their families

Knowledge	Skills
• describe pathophysiology of arterial and venous thrombosis, including epidemiology and molecular basis of thrombophilia • explain natural history, presentation, diagnostic strategies and complications of inherited and acquired thrombophilia • state the techniques for the measurement of recognised laboratory thrombophilia • describe appropriate diagnostic imaging techniques to investigate thrombosis • outline the changes to haemostasis during pregnancy • describe the natural history, presentation, diagnostic strategies of pregnancy-associated thrombotic disease and its management.	• evaluate inherited and acquired risk factors and associations in patients with thromboembolic disease • relate theoretical knowledge to patient, including genetic counselling • request and interpret appropriate clinical and laboratory methods to diagnose thromboembolic disease and possible causative factors • contribute to patient management especially during perioperative and peripartum periods • interpret and apply laboratory results to patient management • display appropriate ordering of radiological investigations • manage venous thromboembolism in pregnant patients • advise patients on the issues relating to prothrombotic states and their implications and management during pregnancy.

Theme 12	Thrombotic Disorders
Learning Objective 12.2	Diagnose, treat and advise patients requiring antithrombotic therapy

Knowledge	Skills
• describe mechanism of action, clinical indications and dosing for the use of heparins, oral anticoagulants, antiplatelet and fibrinolytic agents • differentiate between different models of anticoagulant control • describe adverse effects of antithrombotic therapies and their management • explain the use of antithrombotic therapy in pregnancy • describe appropriate diagnostic imaging techniques used to investigate thrombosis • outline perioperative management of patients on antithrombotic therapy.	• evaluate risks and benefits of antithrombotic therapy, including potential adverse effects • competently initiate and control heparin and oral anticoagulant therapy • explain risks and benefits of therapy • competently advise on the follow-up of patients receiving anticoagulants • work effectively as part of a multidisciplinary team • recognise and advise on the management of over-anticoagulation • recognise and advise on heparin-induced thrombocytopenia • advise in clear comprehensive manner on antithrombotic management in pregnancy • display appropriate ordering of radiologic investigations and liaison with other clinical teams • competently advise and manage patients in the use of antithrombotic therapy in the perioperative period.

Theme 13	Platelet Disorders
Learning Objective 13.1	Diagnose and manage patients with congenital and acquired platelet disorders

• outline platelet structure and function • define the techniques for, and limitations of measuring platelet number and function • describe aetiology, natural history, diagnosis and management of congenital and acquired disorders of platelet number and/or function • describe mechanism of action and adverse effects of medications/compounds with antiplatelet activity.	• interpret and apply laboratory results to patient management • formulate diagnostic and management plans for patients with platelet disorders, both inherited and acquired • provide appropriate clinical advice on the use of antiplatelet agents in medical and surgical contexts.

Theme 14	Clinical Blood Transfusion Practice
Learning Objective 14.1	Outline and direct the safe and appropriate use of blood and blood components
Learning Objective 14.2	Diagnose and manage possible adverse effects related to transfusion

Knowledge	Skills

• outline the main blood components, including their content, storage, preparation, administration and any specific precautions
• describe the indications for use of blood components to patients and their families
• outline the criteria for appropriate use of blood components
• define transfusion support in complex clinical situations
• manage complex clinical situations, including:
  • major blood loss
  • autoimmune haemolytic anaemia
  • fetal/neonatal alloimmune thrombocytopenia
  • cytopenias
  • bone marrow transplantation
  • haemoglobinopathies
• describe the adverse effects and risks of blood transfusion and the methods by which they can be reduced
• describe the principles of pre-transfusion testing
• describe the management of adverse effects of transfusion
• define alternatives to homologous transfusion
• describe principles of quality systems and clinical governance for clinical transfusion
• describe the principles of appropriate processing of specimens for pre-transfusion testing.
	• describe the appropriate use of blood components
	• appropriately use blood components
	• apply the recommendations in national guidelines for use of blood and specifically for each blood component.
	• discuss the options for blood component support for complex clinical situations with patients and their families
	• appropriately use modified blood products
	• demonstrate an understanding of the major categories of adverse effects associate with blood transfusion, including the most common risks, and ways in which adverse effects can be reduced
	• demonstrate an understanding the principles of pre-transfusion testing
	• discuss the main risks and benefits of blood transfusion with patients and their families
	• manage acute and delayed transfusion reactions
	• discuss the management of adverse effects of transfusion with patients and their families
	• provide alternatives to homologous transfusion, including:
	  • various types of autologous transfusion
	  • `bloodless surgery' techniques
	• discuss possible alternatives to transfusion with patients and their families
	• participate in the function of the hospital transfusion committee, the role of audit in transfusion and methods which can be used to improve clinical transfusion practice
	• use the criteria for acceptance/validity of pre-transfusion specimens.

Theme 15	Apheresis and Venesections
Learning Objective 15.1	Recognise and manage the use of therapeutic apheresis

Knowledge	Skills
• describe the principles of automated apheresis techniques in therapy or collection of components • describe the use of apheresis, including the therapeutic removal of plasma and cellular elements, provision of specific blood components and processing of harvested bone marrow • describe indications in which apheresis can be used • describe the standards for the collection of cellular products and their storage • define the possible adverse effects of apheresis • describe the adverse clinical effects associated with apheresis.	• evaluate patients referred for apheresis, including the principles of informed consent • appropriately use apheresis to treat specific diseases and collect cellular components.

Theme 16	Disorders of Iron Metabolism
Learning Objective 16.1	Recognise and manage iron overload disorders

Knowledge	Skills
• describe iron metabolism and causes of iron overload • outline the causes of iron deficiency.	• investigate and manage iron overload, including therapeutic venesection, chelation therapy and monitoring • investigate and manage iron deficiency.

Theme 17	Paediatrics
Learning Objective 17.1	Diagnose and manage paediatric haematology conditions

Knowledge	Skills

• define the concepts and consequences of age related developmental changes in normal results for:
  • full blood examination (FBE) parameters
  • coagulation assays
  • haemoglobin chain synthesis
  • miscellaneous haematology investigations
• delineate the common causes, diagnosis and principles of management of anaemia in neonates and children, including:
  • neonatal haemolysis
  • red cell membrane disorders
  • red cell enzymopathies
  • autoimmune haemolysis
  • nutritional deficiencies
• outline the common causes, diagnosis, and principles of management of leucopenia in neonates and children, including:
  • sepsis
  • congenital immunodeficiencies
  • congenital neutropenias
  • alloimmune neutropenia
• identify the common causes, diagnosis, and principles of management of thrombocytopenia in neonates and children, including:
  • idiopathic thrombocytopenic purpura (ITP)
  • congenital thrombocytopenic disorders
  • alloimmune thrombocytopenia
• state the common causes, presentation, diagnosis, and principles of management of disturbances of haemostasis in neonates and children, including:
  • congenital bleeding disorders
  • acquired inhibitors of coagulation
  • congenital platelet function disorders
  • molecular diagnosis of congenital bleeding disorders
• identify the common causes, presentation, diagnosis, and principles of management of bone marrow failure in neonates and children, including:
  • aplastic anaemia
  • acute leukaemia
  • congenital bone marrow failure syndromes
	• request and interpret:
	  • FBE and film
	  • coagulation assays
	  • haemoglobin electrophoresis and high performance liquid chromatography (HPLC)
	  • other haematological investigations
	• request and interpret haematological investigations, including:
	  • FBE and film
	  • tests for haemolysis
	  • iron
	  • folate
	  • vitamin B12 assays
	• perform clinical assessment by history and examination
	• explain the investigations, results and management of anaemia to patients and their families
	• interpret haematological tests including:
	  • FBE and film
	  • neutrophil compatibility testing
	  • genotyping
	  • immunological investigations
	• provide genetic counselling regarding alloimmune neutropenia
	• explain the investigations, results and management of leucopenia to patients and their families
	• interpret haematological tests, including:
	  • FBE and film
	  • platelet compatibility testing
	  • genotyping
	  • immunological investigations
	• perform clinical assessment by history and examination
	• explain the investigations, results and management of thrombocytopenia to patients and their families
	• provide genetic counselling regarding alloimmune thrombocytopenia

Theme 17	Paediatrics
Learning Objective 17.1	Diagnose and manage paediatric haematology conditions

- describe the common causes, presentation, diagnosis and principles of management of malignant disorders in neonates and children, including:
  - acute leukaemia
  - lymphoproliferative disorders
  - histiocytic disorders
  - myeloproliferative disorders
  - metastatic solid tumours
- outline the common indications for and provision of appropriate blood products for transfusion in neonates and children, including:
  - transfusion of premature neonates
  - exchange transfusion
  - directed donation
  - massive transfusion
- explain the presentation, diagnosis, and principles of management of disorders of haemoglobin in neonates and children, including:
  - neonatal screening programs
  - sickle cell disease
  - major thalassaemia syndromes.

- interpret laboratory assays of haemostasis, including global tests, factor assays, inhibitor assays and platelet function tests
- assess by history and clinical examination
- explain the investigations, results and management of haemostatic disorders to patients and their families
- provide genetic counselling regarding hereditary bleeding disorders
- perform and interpret bone marrow biopsies, interpret cytogenetic tests, flow cytometry and molecular studies
- perform clinical assessment by history and examination
- explain the investigations, results and management of bone marrow failure to patients and their families
- perform and interpret bone marrow biopsies, interpret cytogenetic tests, flow cytometry and molecular studies
- elicit history and perform clinical examination
- explain the investigations, results and management of malignant disorders to patients and their families
- apply national guidelines for blood component transfusion in neonates and children
- interpret red cell compatibility testing and genotyping
- explain the investigations, results and management of transfusion to patients and their families
- request and interpret haemoglobinopathy tests, including HPLC, haemoglobin electrophoresis, solubility and stability
- interpret molecular tests for haemoglobinopathies
- explain the investigations, results and management of haemoglobinopathies to patients and their families.

Theme 18	Obstetrics and Gynaecology
Learning Objective 18.1	Develop an understanding of normal and abnormal haematology in obstetrics and gynaecology

Knowledge	Skills

• describe the haematological changes of normal pregnancy:
  • physiological anaemia of pregnancy
  • effect of normal pregnancy on haemostasis
  • effect of normal pregnancy on iron, folate and vitamin B12 stores
• outline haemostasis in obstetrics and gynaecology, including:
  • management of congenital bleeding disorders in pregnancy
  • management of menorrhagia due to congenital bleeding disorders
  • effect of hormonal therapies (contraceptive, hormone replacement therapy, anti-tumour and gonadotropic therapies) on haemostasis
  • prenatal diagnosis of congenital bleeding disorders
• describe thrombosis in obstetrics and gynaecology
• diagnosis, investigation, treatment and prophylaxis of:
  • thromboembolic disorders in pregnancy, post-partum, peri-operatively and in women with gynaecological malignancy
  • management of thrombophilia, including indications for screening in pregnancy, peri-partum, peri-operatively
  • relationship of thrombophilia and adverse obstetric outcome
• describe the specific issues related to the diagnosis, assessment and management of the following conditions in pregnancy:
  • anaemia
  • thrombocytopenia
  • massive haemorrhage and disseminated intravascular coagulation (DIC)
  • haemoglobinopathies
• describe the therapeutics used in obstetrics and gynaecology with specific regard to potential effects on both mother and fetus, through pregnancy, labour and post-partum.
	• apply pregnancy-specific reference ranges and differentiate normal from abnormal results in pregnancy
	• use therapeutic interventions, both pharmacological and blood-product based
	• apply prenatal diagnosis and molecular biological techniques available for diagnosis
	• explain investigations, results and management to patients and their families
	• provide genetic counselling to patients and their families
	• request and interpret imaging and laboratory investigations in the diagnosis of thrombosis.
	• interpret thrombophilia screening, including genetic implications and requirements for therapy
	• define the requirement for treatment or prophylaxis of thrombosis and prescribe appropriate therapy
	• explain the investigation, results and management of thrombosis and thrombophilia to patients and their families
	• provide genetic counselling to patients and their families
	• interpret relevant investigations in pregnant patients
	• prescribe blood products and anti-D to pregnant patients in accordance with national guidelines
	• explain the indications for and side effects of the drugs used for haematological disorders in obstetrics and gynaecology to patients and their families.

Theme 19	Radiation Principles and Use
Learning Objective 19.1	Describe the principles of radiation therapy
Learning Objective 19.2	Manage the risks and safety issues associated with diagnostic and therapeutic radiation
Links	Medical Oncology Curriculum

Knowledge	Skills
• describe the principles underlying radiation therapy • describe risks and safety associated with diagnostic and therapeutic radiation.	• consult and use nuclear medicine investigations and radiation therapy in the management of haematological malignancies • minimise exposure to radiation.

Theme 20	Palliative Care
Learning Objective 20.1	Outline the principles and timely application of palliative care
Links	Medical Oncology Curriculum

Knowledge	Skills
• describe the principles of caring for a dying patient • describe the challenges of changing the intent of care from disease control to symptom control.	• recognise circumstances under which discussions about palliative care should commence • conduct family meetings focused on prognosis, death and dying • consult with palliative care professionals.