Pediatric Hematology-Oncology
Content Outline

In-Training, Initial Certification, and
Maintenance of Certification Exams

Effective for exams administered beginning April 1, 2019

THE AMERICAN BOARD *of* PEDIATRICS

Table of Contents

Overview

This content outline was developed to serve as the blueprint for the ABP's pediatric hematology-oncology examinations. This outline identifies for all important stakeholders (eg, prospective candidates, diplomates, the public, training programs, professional associations, employers) the knowledge areas being measured by these exams.

This outline takes effect on April 1, 2019. All pediatric hematology-oncology in-training, certification, and maintenance of certification (MOC) examinations administered after this date will adhere to the specifications within this outline.

Development of the Pediatric Hematology-Oncology Content Outline

The initial draft of this content outline was developed by the ABP's Pediatric Hematology-Oncology Subboard, which is comprised of a diverse, representative panel of practicing pediatric hematologist-oncologists. The panel identified the knowledge required of pediatric hematologists-oncologists in clinical practice and categorized that knowledge into content domains and subdomains. All board certified pediatric hematologist-oncologists (N = 2,264) were then invited to provide feedback via an online survey. A total of 445 pediatric hematologist-oncologists (19.7%) rated the frequency and criticality of the content domains and subdomains. The survey also collected open-ended comments from respondents in order to identify any important content areas that were not included in the initial draft.

The survey results were used to make final revisions to the outline and to inform the assignment of exam weights (ie, the percentage of exam questions associated with each content domain). The content domains that were rated as highly critical and frequently required in practice have been weighted more heavily than the domains rated as less critical and/or less frequently required. Establishing the exam weights in this manner helps to ensure that ABP's pediatric hematology-oncology exams are measuring the full breadth of knowledge required for clinical practice, while also placing an appropriate amount of emphasis on the content domains that were identified by practicing pediatric hematologist-oncologists as being critically important.

Content Domains

The knowledge for safe and effective practice as a pediatric hematologist-oncologist has been categorized into 11 content domains, presented in the table below. A more detailed breakdown of the knowledge within each domain is reflected in the detailed content outline, beginning on page 4. Each exam question (also referred to as an *item*) included on a pediatric hematology-oncology exam is classified according to the content domain to which it is most closely aligned. If an item does not align with one of the content domains, it is removed from the question pool and is not included on an exam.

Pediatric Hematology-Oncology Content Domains
1. Erythrocytes
2. Leukocytes
3. Platelets
4. Hemostasis/Thrombosis
5. Bone Marrow Failure
6. Transfusion Medicine
7. General Oncology Issues
8. Hematologic Malignancies
9. Solid Tumors
10. Hematopoietic Stem-Cell Transplant (HSCT)
11. Core Knowledge in Scholarly Activities

Universal Tasks

To help ensure the clinical relevance of the pediatric hematology-oncology exams, the pediatric hematology-oncology subboard identified a set of four *universal tasks* that reflect the primary ways in which medical knowledge can be applied in clinical practice: (1) basic science and pathophysiology, (2) epidemiology and risk assessment, (3) diagnosis, and (4) management and treatment. Each item is classified according to the universal task to which it is most closely aligned. If an item does not align with one of the universal tasks, it is removed from the item pool and is not included on an exam. The universal tasks are described more fully below:

Universal Tasks for Pediatric Hematology-Oncology	
Universal Task	Description
1. Basic Science and Pathophysiology	Understanding the basic science and pathophysiologic basis of pediatric hematological-oncological conditions in an age-specific developmental context
2. Epidemiology and Risk Assessment	Recognizing patterns of health and disease and understanding the variables that influence those patterns, including risk factors for conditions and for poorer outcomes
3. Diagnosis	Using available information (eg, patient history, physical examination) to formulate differential diagnoses, choose appropriate tests, and interpret test results to reach a likely diagnosis
4. Management and Treatment	Formulating comprehensive management and/or treatment plans, including reevaluation and long-term follow-up, considering multiple options for care

Development and Classification of Exam Questions

Although the field of pediatric hematology-oncology is continually evolving, the content domains and subdomains within this outline should be viewed as broad categories of knowledge that are likely to remain relatively stable over time. The detailed knowledge within the content domains and subdomains, however, is likely to change as the field continues to advance. Because exam questions may assess a pediatric hematologist-oncologist's knowledge of a specific element within a content domain/subdomain, it is important to note that it is the responsibility of the test taker to ensure that his or her knowledge within each knowledge area is current and up to date.

In order to ensure all pediatric hematology-oncology exam questions are current and up to date, the ABP follows a rigorous item development and approval process. Each item is written by a board-certified practitioner or academician who has received training on how to write high-quality exam questions. Each item is classified according to the content domain/subdomain to which it is most closely aligned and according to the universal task to which it is most closely aligned. Questions that do not align with a content domain/subdomain and a universal task are not included in either the question pool or on an exam.

Once an item has been written, it is then reviewed and revised, if necessary, by the Subboard of Pediatric Hematology-Oncology, a large, diverse panel of practicing pediatric hematologist-oncologists. During the revision process, each question is also reviewed by a medical editor to ensure accuracy and by ABP staff editors who standardize question style, format, and terminology; correct grammar; and eliminate ambiguity and technical flaws, such as cues to the answer.

Once the subboard has approved an item, it is included in the item pool and is made available for future exams. All approved items in the pool, including items that have been used previously on an exam, are reviewed periodically for accuracy, currency, and relevance.

Sample Question

To illustrate how exam items are classified, consider the following sample question:

A 5-year-old boy with recurrent ear infections is treated with trimethoprim-sulfamethoxazole. Two weeks later, he is evaluated because of jaundice and a hemoglobin concentration of 5 g/dL. The reticulocyte count is 7% and the direct antiglobulin test is positive for C3 and negative for IgG.

Which of the following is the most likely cause of this patient's hemolytic anemia?

A. Donath-Landsteiner IgG antibodies
B. Drug-associated immune hemolysis
C. G6PD deficiency
D. Unstable hemoglobin

Correct answer = Donath-Landsteiner IgG antibodies

The question above would most likely be classified as shown in the table below.

Item Classification	
Content Domain/ Subdomain*	1. Erythrocytes B. Hemolytic anemias 2. Antibody/complement-mediated
Universal Task	3. Diagnosis

*Note: Content domain/subdomain 1.B.2 can be found on page 4 of this document (within the detailed content outline section).

Exam Weights

The tables below indicate the exam weights (ie, the percentage of exam questions associated with each content domain and with each universal task) for the ABP's pediatric hematology-oncology in-training, initial certification, and maintenance of certification exams. Please note that the weights reflect the content of a typical exam and are approximate; actual content may vary.

The exam weights listed in the first column of the table below reflect that all versions of the in-training and initial certification exams adhere to the same set of content domain weights. Diplomates have three options, however, when registering for the MOC exam: (1) a hematology/oncology-focused exam, (2) a hematology-focused exam, or (3) an oncology-focused exam. The content domain weights for each of those options are also specified in the table below.

Content Domain	Exam Weights			
	In-training & Initial Certification	Maintenance of Certification		
		Hematology-Oncology	Hematology-focused	Oncology-focused
1. Erythrocytes	13%	13%	16%	6%
2. Leukocytes	4%	4%	8%	2%
3. Platelets	7%	7%	11%	3%
4. Hemostasis/Thrombosis	10%	10%	16%	5%
5. Bone Marrow Failure	5%	5%	8%	4%
6. Transfusion Medicine	5%	5%	8%	5%
7. General Oncology Issues	14%	14%	7%	21%
8. Hematologic Malignancies	11%	11%	6%	18%
9. Solid Tumors	17%	17%	8%	20%
10. Hematopoietic Stem-Cell Transplant (HSCT)	9%	9%	7%	11%
11. Core Knowledge in Scholarly Activities	5%	5%	5%	5%
	100%	100%	100%	100%

The exam weights listed in the universal table below reflect that the universal task weights are consistent across all exam types (in-training, initial certification, and maintenance of certification).

Universal Task	Exam Weights
1. Basic Science and Pathophysiology	17%
2. Epidemiology and Risk Assessment	13%
3. Diagnosis	37%
4. Management and Treatment	33%
	100%

Detailed Content Outline

Domain 1: Erythrocytes

A. The erythron
   1. Developmental changes of the erythron
   2. Normal erythrocytes
   3. Erythrocyte physiology
   4. Approach to anemia

B. Hemolytic anemias
   1. General features
   2. Antibody/complement-mediated
   3. Membrane/cytoskeleton/ion channel
   4. Enzymopathies
   5. Unstable hemoglobin
   6. Fragmentation

C. Hemoglobin S and sickling syndromes
   1. General features of sickle cell anemia (HbSS), sickle-hemoglobin C disease (HbSC), sickle-β thalassemia, and sickle cell trait
   2. Central nervous system complications
   3. Other acute complications
   4. Chronic complications
   5. Treatment, including supportive care

D. Other disorders of hemoglobin
   1. Hemoglobin E
   2. Other hemoglobin disorders

E. Thalassemia syndromes
   1. General features
   2. α-Thalassemia
   3. β-Thalassemia

F. Iron disorders
   1. Iron deficiency anemia
   2. Anemia of chronic disease and disorders of iron metabolism
   3. Transfusional and congenital iron overload

G. Megaloblastic anemia
   1. Nutritional deficiencies: folate and B_{12}
   2. Metabolic disorders and drugs

H. Erythrocytosis
   1. Primary or secondary

Domain 2: Leukocytes

A. Normal leukocytes: morphology, development, function
   1. Neutrophils
   2. Eosinophils/basophils/mast cells
   3. Monocytes/macrophages/dendritic cells
   4. Lymphocytes

B. Disorders of granulocytes
   1. Acquired neutropenia
   2. Morphologic abnormalities
   3. Neutrophilia

4. Neutrophil dysfunction
5. Eosinophilia

C. Disorders of lymphocytes
1. Mononucleosis
2. Immunodeficiencies with hematologic or oncologic implications
3. Autoimmune lymphoproliferative syndrome and other immunoregulatory diseases

D. Disorders of the reticuloendothelial system
1. Splenomegaly
2. Hemophagocytic lymphohistiocytosis (HLH)

Domain 3: Platelets

A. Normal physiology of platelets
1. Platelet production, kinetics, and function
2. Thrombocytopenia: general considerations

B. Disorders of platelet number and function
1. Thrombocytopenia in the newborn period
2. Immune thrombocytopenia
3. Other acquired thrombocytopenic states
4. Inherited disorders of platelet function and/or number
5. Acquired disorders of platelet function
6. Thrombocytosis

Domain 4: Hemostasis/Thrombosis

A. Normal physiology of coagulation factors and vessel wall
1. Procoagulant factors
2. Anticoagulant factors
3. Fibrinolytic system
4. Role of vessel wall in regulation of hemostasis

B. Inherited disorders of coagulation
1. Approach to bleeding
2. Congenital Factor VIII and Factor IX deficiency
3. von Willebrand disease
4. Abnormalities of other proteins, circulating and vascular

C. Acquired disorders of coagulation
1. Disseminated intravascular coagulation (DIC), vitamin K deficiency, and liver disease
2. Lupus anticoagulants and coagulation inhibitors
3. Coagulopathy associated with vascular malformations
4. Other acquired coagulopathies

D. Thrombotic disorders
1. Approach to thrombosis
2. Inherited thrombophilia
3. Acquired risk factors for thrombosis
4. Anticoagulation: unfractionated heparin, low molecular-weight heparin, vitamin K antagonists, direct thrombin inhibitors, and other anticoagulants
5. Thrombolysis
6. Post-thrombotic syndrome

Domain 5: Bone Marrow Failure

A. Hematopoiesis
   1. Normal hematopoiesis
   2. Abnormal hematopoiesis
   3. Approaches to pancytopenia
B. Acquired bone marrow failure
   1. Idiopathic aplastic anemia
   2. Secondary marrow suppression
C. Inherited bone marrow failure
   1. Fanconi anemia
   2. Dyskeratosis congenita
   3. Shwachman-Diamond syndrome
   4. Congenital neutropenia
   5. Diamond-Blackfan anemia
   6. Congenital thrombocytopenia
   7. Other inherited bone marrow failure syndromes

Domain 6: Transfusion Medicine

A. Collection and storage characteristics
   1. Erythrocytes
   2. Platelets
   3. Granulocytes
   4. Plasma and cryoprecipitate
B. Typing and crossmatching for transfusion
   1. Erythrocytes
   2. Platelets
C. Indications for and administration of transfusion
   1. Erythrocytes
   2. Platelets
   3. Granulocytes
   4. Plasma and cryoprecipitate
   5. Therapeutic apheresis
   6. Directed donors
D. Attributes/special processing
   1. Irradiation
   2. Leukoreduction
   3. Plasma reduction
E. Complications of blood and blood product transfusions
   1. Transfusion-transmitted disease
   2. Transfusion reactions
   3. Rh-incompatible transfusion

Domain 7: General Oncology Issues

A. Anti-neoplastic therapy
   1. Principles of chemotherapy
   2. Principles of radiation therapy
   3. Cytotoxic chemotherapy, including alkylating agents, anti-metabolites, intercalating agents, DNA-breaking agents, mitotic inhibitors, and glucocorticoids
   4. Differentiating agents

5. Targeted therapies
6. Epigenetic modifiers
7. Immunotherapy and adoptive cellular therapies
8. Immune checkpoint inhibitors
9. Anti-angiogenic agents
10. Radioisotope therapy

B. Supportive care
1. Oncologic emergencies
2. Anti-emetic management
3. Infections in the immunocompromised host
4. Pain management
5. Palliative and end-of-life care

C. Cancer predisposition
1. Genetic disorders predisposing to malignancy

D. Survivorship and adolescent and young adult (AYA) oncology
1. Biologic, epidemiologic, and psychosocial considerations of the AYA
2. Late effects of therapy
3. Fertility preservation

Domain 8: Hematologic Malignancies

A. General considerations: diagnostic tests
1. Peripheral blood smears and bone marrow aspirate/biopsy
2. Imaging
3. Cerebrospinal fluid analysis
4. Immunological markers
5. Cytogenetics and molecular markers

B. Acute lymphoblastic leukemia (ALL)
1. Pre-B cell
2. Infant ALL
3. T-cell
4. Burkitt leukemia
5. Bi-phenotypic leukemia
6. Sanctuary sites
7. Relapsed ALL

C. Acute myelogenous leukemia (AML)
1. Myeloid leukemias
2. Promyelocytic leukemia (M3)
3. Megakaryocytic leukemia (M7)
4. Extramedullary disease
5. Relapsed AML

D. Myelodysplastic syndrome (MDS) and myeloproliferative disorders
1. MDS
2. Myeloproliferative neoplasms (MPN), including CML and JMML
3. Transient abnormal myelopoiesis (TAM)

E. Lymphoma
1. Hodgkin lymphoma
2. Non-Hodgkin lymphoma (NHL)
3. Lymphoproliferative disorders

F. Histiocytic neoplasms
1. Langerhans cell histiocytosis (LCH)

Domain 9: Solid Tumors

A. General considerations
   1. Clinical presentations
   2. Diagnostic imaging
   3. Pathology
   4. Other laboratory tests
B. Sarcomas
   1. Osteosarcoma
   2. Ewing sarcoma and Ewing family of tumors
   3. Rhabdomyosarcoma
   4. Non-rhabdomyosarcoma soft-tissue sarcomas
C. Neuroblastoma and related tumors
   1. Neuroblastoma
   2. Ganglioneuroma
   3. Paraganglioma/pheochromocytoma
D. Renal tumors
   1. Wilms tumor
   2. Other primary renal tumors
E. Liver tumors
   1. Hepatoblastoma
   2. Hepatocellular carcinoma
F. Brain tumors
   1. Medulloblastoma
   2. Low-grade glioma
   3. High-grade glioma
   4. Ependymoma
   5. Central nervous system germ-cell tumors
   6. Rare brain tumors
G. Rare tumors
   1. Germ-cell tumors
   2. Retinoblastoma
   3. Vascular tumors and malformation
   4. Other rare tumors in childhood and adolescence

Domain 10: Hematopoietic Stem-Cell Transplant (HSCT)

A. Principles and products
   1. Collection, processing, and storage
   2. Stem-cell source and dose
   3. Donor selection
   4. Contraindications
B. Conditioning therapy
   1. Autologous HSCT
   2. Allogeneic HSCT
C. Complications
   1. Graft failure
   2. Graft-versus-host disease (GVHD)
   3. Infections
   4. Non-infectious complications
D. Disease-specific indications and outcomes

1. Hematologic malignancies
2. Solid tumors
3. Sickle cell disease and thalassemia
4. Immunodeficiency
5. Bone marrow failure
6. Other nonmalignant disorders

Domain 11: Core Knowledge in Scholarly Activities

A. Principles of biostatistics in research
   1. Types of variables
   2. Distribution of data
   3. Hypothesis testing
   4. Common statistical tests
   5. Measurement of association and effect
   6. Regression
   7. Diagnostic tests
   8. Systematic review and meta-analysis
B. Principles of epidemiology and clinical research design
   1. Study design, performance, and analysis (internal validity)
   2. Generalizability (external validity)
   3. Bias and confounding
   4. Causation
   5. Incidence and prevalence
   6. Screening
   7. Cost benefit, cost effectiveness, and outcomes
   8. Measurement
C. Ethics in research
   1. Professionalism and misconduct in research
   2. Principles of research involving human subjects
   3. Principles of consent and assent
D. Quality improvement
   1. Project design
   2. Data and measurement