Pediatric Infectious Diseases
Content Outline

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

Effective for exams administered beginning November 1, 2019

THE AMERICAN BOARD *of* PEDIATRICS

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Overview

This content outline was developed primarily to serve as the blueprint for the pediatric infectious diseases in-training, initial certification, and maintenance of certification examinations. This outline identifies for all important stakeholders (eg, prospective candidates, diplomates, the public, training programs, professional associations) the knowledge areas being assessed by these exams.

This outline takes effect on November 1, 2019. All pediatric infectious diseases examinations administered after this date will adhere to the specifications within this outline.

Development of the Pediatric Infectious Diseases Content Outline

The initial draft of this content outline was developed by a diverse, representative panel of 11 practicing pediatric infectious diseases subspecialists. The panel identified the knowledge required of pediatric infectious diseases subspecialists in clinical practice and categorized that knowledge into content domains and subdomains. All board certified pediatric infectious diseases subspecialists (N = 1,282) were then invited to provide feedback via an online survey. A total of 313 pediatric infectious diseases subspecialists (24.4%) 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 establish the 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 infectious diseases 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 infectious diseases subspecialists as being critically important.

Content Domains

The knowledge for safe and effective practice as a pediatric infectious diseases subspecialist has been categorized into 8 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 included on a pediatric infectious diseases exam (in-training, initial certification, and maintenance of certification) is classified according to the content domain and subdomain to which it is most closely aligned. If an exam question does not align with one of the content subdomains, it is removed from the question pool and is not included on an exam.

Pediatric Infectious Diseases Content Domains	
1.	Organ System Infections/Clinical Infectious Entities
2.	Infections in Special Circumstances
3.	Infections in High-Risk Hosts
4.	Virulence Mechanisms, Microbial Communities, and Host Defense
5.	Antimicrobial Principles
6.	Stewardship
7.	Prevention and Containment of Infectious Diseases
8.	Core Knowledge in Scholarly Activities

Universal Tasks

To help ensure the clinical relevance of the pediatric infectious diseases exams, the practice analysis panel identified a set of two *universal tasks* that reflect the primary ways in which medical knowledge can be applied in clinical practice: (1) epidemiology and diagnosis and (2) management. Each exam question that falls within content domain 1 (organ system infections/clinical infectious entities), 2 (infections in special circumstances), or 3 (infections in high-risk hosts) is classified according to the universal task to which it is most closely aligned. If a test question within those domains does not align with one of the universal tasks, it is removed from the question pool and is not included on an exam. The universal tasks are described more fully below.

Universal Tasks for Pediatric Infectious Diseases	
Universal Task	Description
1. Epidemiology and Diagnosis	Using available information (eg, patient history, epidemiologic factors, physical examination) to formulate differential diagnoses, choose appropriate tests, and interpret test results to identify or exclude a likely etiologic agent
2. Management	Formulating a comprehensive management and/or treatment plan, including appropriate consultation, reevaluation, discharge planning, and long-term follow up

Development and Classification of Exam Questions

Although the field of pediatric infectious diseases 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 infectious diseases subspecialist'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 infectious diseases exam questions are current and up to date, the ABP follows a rigorous question development and approval process. Each exam question is written by a Board-certified practitioner or academician who has received training on how to write high quality exam questions. Each question is classified according to the content domain/subdomain to which it is most closely aligned. Questions that fall within content domains 1-3 (organ system infections/clinical infectious entities, infections in special circumstances, and infections in high-risk hosts) are also classified according to the universal task to which it is most closely aligned.

Once a question has been written, it is then discussed and revised, if necessary, by the Pediatric Infectious Diseases Subboard, a large, diverse panel of practicing pediatric infectious diseases subspecialists. During the revision process, each question is also reviewed multiple times by a medical editor to ensure accuracy and by ABP 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 a question, it is included in the question pool and is made available for future exams. All approved questions in the pool are reviewed periodically for accuracy, currency and relevance.

Sample Question

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

A 12-year-old patient has a 7-day history of fever, pharyngitis, fatigue, and diffuse lymphadenopathy.

Which of the following laboratory findings would be most suggestive of a specific diagnosis?

A. Absolute neutropenia
B. Atypical lymphocytosis
C. Lymphopenia
D. Neutrophilia

Correct answer = B. Atypical lymphocytosis

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

Question Classification	
Content Domain/ Subdomain*	1. Organ system infections/clinical infectious entities P. Nonspecific systemic infections 5. Systemic viral syndromes
Universal Task	1. Epidemiology and diagnosis

*Note: Content subdomain 1.P.5 can be found on page 5 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 infectious diseases 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.

Content Domains		Exam Weight
1. Organ System Infections/Clinical Infectious Entities *		38%
A. Upper respiratory tract infections	2.5%	
B. Lower respiratory tract infections	3.5%	
C. Central nervous system infections	3.5%	
D. Urinary tract infections	2.0%	
E. Cardiovascular infections	3.0%	
F. Bone and joint infections	3.0%	
G. Skin/soft tissue/muscle infections	2.5%	
H. Gastrointestinal/intra-abdominal infections	2.5%	
I. Lymphoid tissue infections	1.0%	
J. Hepatic/biliary infections	2.0%	
K. Ocular infections	1.5%	
L. Reproductive system infections	1.0%	
M. Noninfectious inflammatory diseases	2.5%	
N. Postinfectious inflammatory diseases	2.0%	
O. Postinfectious syndromes causing organ dysfunction	1.0%	
P. Nonspecific systemic infections	3.5%	
Q. Recurrent infections	1.0%	
2. Infections in Special Circumstances *		11%
3. Infections in High-Risk Hosts *		12%
4. Virulence Mechanisms, Microbial Communities, and Host Defense		6%
5. Antimicrobial Principles		12%
6. Stewardship		6%
7. Prevention and Containment of Infectious Diseases		10%
8. Core Knowledge in Scholarly Activities		5%
** Questions that fall within content domains 1-3 are also classified to a universal task (see below).*		100%

Universal Tasks *	Exam Weight
1. Epidemiology and Diagnosis	53%
2. Management	47%
** Universal task classifications and exam weights only apply to questions within content domains 1-3.*	100%

Detailed Content Outline

Domain 1: Organ System Infections/Clinical Infectious Entities

- *Each question that falls within this domain is classified according to the domain/subdomain and the universal task to which it is most closely aligned.*

A. Upper respiratory tract infections
   1. Sinusitis
   2. Odontogenic infections
   3. Stomatitis
   4. Pharyngitis
   5. Mastoiditis and other complications of otitis media
   6. Parapharyngeal infections (peritonsillar, retropharyngeal, Ludwig)
   7. Otitis externa
   8. Parotitis
   9. Tracheitis, epiglottitis, and laryngotracheobronchitis
   10. Upper respiratory tract infections not otherwise specified (eg, pertussis, mucopurulent rhinorrhea)

B. Lower respiratory tract infections
   1. Acute pneumonia
   2. Chronic or recurrent pneumonia
   3. Aspiration pneumonia
   4. Empyema and pleural effusions
   5. Pulmonary abscess/necrotizing pneumonia
   6. Bronchiolitis

C. Central nervous system infections
   1. Acute bacterial meningitis
   2. Aseptic meningitis
   3. Subacute, chronic, recurrent meningitis
   4. Encephalitis
   5. Brain abscess
   6. Parameningeal infections (subdural/epidural abscess)
   7. Myelitis/neuritis/neuropathy

D. Urinary tract infections
   1. UTI (cystitis/pyelonephritis)
   2. Renal and perinephric abscess
   3. Asymptomatic bacteriuria

E. Cardiovascular infections
   1. Endocarditis
   2. Myocarditis
   3. Pericarditis
   4. Septic thrombophlebitis (eg, Lemierre syndrome)

F. Bone and joint infections
   1. Osteomyelitis
   2. Infectious arthritis
   3. Diskitis

G. Skin/soft tissue/muscle infections
   1. Superficial skin infections (recurrent infections)
   2. Skin abscess/cellulitis
   3. Pyomyositis/myositis/fasciitis

H. Gastrointestinal/intra-abdominal infections

1. Gastroenteritis/infectious colitis
2. Antibiotic-associated colitis
3. Appendicitis
4. Peritonitis
5. Intra-abdominal abscess

I. Lymphoid tissue infections (lymphadenitis, lymphangitis, lymphadenopathy)
J. Hepatic/biliary infections
   1. Viral hepatitis
   2. Ascending cholangitis/cholecystitis
   3. Hepatic abscess
K. Ocular infections
   1. Periorbital cellulitis
   2. Orbital cellulitis
   3. Endophthalmitis
   4. Keratitis
   5. Chorioretinitis
L. Reproductive system infections
   1. Sexually transmitted infections
   2. Tubo-ovarian abscess/pelvic inflammatory disease
   3. Genital vesicular disease
M. Noninfectious inflammatory diseases
   1. Kawasaki disease
   2. Periodic fevers and autoinflammatory syndromes
   3. Miscellaneous (eg, hemophagocytic lymphohistiocytosis, macrophage activation syndrome, chronic recurrent multifocal osteomyelitis, vasculitis, autoimmune encephalitis)
N. Postinfectious inflammatory diseases (eg, acute rheumatic fever, reactive arthritis, acute disseminated encephalomyelitis)
O. Postinfectious syndromes causing organ dysfunction (eg, Reye syndrome, hemolytic-uremic syndrome)
P. Nonspecific systemic infections
   1. Prolonged fever without source
   2. Sepsis and systemic inflammatory response syndrome (SIRS)
   3. Toxic shock
   4. Bacteremia
   5. Systemic viral syndromes (eg, mononucleosis, adenovirus, measles)
   6. Systemic fungal infections
Q. Recurrent infections

Domain 2: Infections in Special Circumstances

- *The questions in this domain focus on the recognition of unique epidemiologic risk factors associated with special circumstances and/or how those factors affect the diagnosis, management, and prevention of infectious diseases.*
- *Each question that falls within this domain is classified according to the domain/subdomain and the universal task to which it is most closely aligned.*

A. Health care-associated infections
   1. Infections associated with medical devices (eg, catheters, prosthetic materials)
   2. Surgical site infections (eg, mediastinitis)
   3. Ventilator-associated infections (eg, pneumonia)

4. *Clostridioides difficile*
5. Laboratory exposures

B. Endemic exposures (foreign, domestic)
1. Food exposures (eg, traveler's diarrhea, ascariasis)
2. Mosquito-borne illnesses (eg, West Nile, Zika, malaria, dengue, La Crosse)
3. Tick-borne infections (eg, Rocky Mountain spotted fever, ehrlichiosis, babesiosis, Lyme disease, anaplasmosis)
4. Other vector-borne illnesses (eg, leishmaniasis, schistosomiasis, strongyloidiasis)
5. Endemic fungi (eg, coccidioidomycosis, blastomycosis, histoplasmosis)
6. Tuberculosis

C. Zoonoses
1. Direct contact (eg, avian influenza, toxocariasis, psittacosis, Q fever)
2. Ingestion (eg, *Campylobacter*, *Salmonella*, toxoplasmosis, *Trichinella*)
3. Bite/scratch (eg, cat-scratch disease, rat-bite fever, rabies)
4. Vector-borne illnesses (eg, plague)

D. Exposure to bodily fluids
1. Human milk
2. Needle sticks
3. Sexual assault
4. Blood products

E. International adoption, immigrant and refugee children
1. Screening laboratory evaluation
2. Catch-up immunizations

F. Recreational exposures
1. Water (eg, swimming pools, water parks, lakes, oceans)
2. Other (eg, camping, hiking, intravenous [IV] drug use)

G. Trauma, including contaminated wounds (eg, burns, tetanus, *Sporothrix*)

H. Bioterrorism agents (eg, poxviruses, tularemia, anthrax)

I. Infections raising concern for abuse

Domain 3: Infections in High-Risk Hosts

- *The questions in this domain focus on the recognition of unique host risk factors and/or how those factors affect the diagnosis, management, and prevention of infectious diseases.*
- *Each question that falls within this domain is classified according to the domain/subdomain and the universal task to which it is most closely aligned.*

A. Primary immunodeficiencies (adaptive, innate)
1. Antibody deficiencies
2. T cell immunodeficiencies or combined immunodeficiencies
3. Innate
    a. Complement deficiencies
    b. Phagocytic deficiencies
    c. Microbial pattern recognition and natural killer cell defects (eg, interleukin 12, interferon gamma, toll-like receptor)
    d. Anatomic and physiologic barriers (eg, cystic fibrosis, ciliary dyskinesia)

B. Acquired immunodeficiencies
1. Human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS)
2. Immunosuppressed patients (eg, chemotherapy, corticosteroid use, biologic response modifier use)
3. Stem cell transplantation
4. Solid organ transplantation
5. Asplenia (surgical, traumatic)

6. Other chronic diseases (eg, malnutrition/obesity; hematologic, pulmonary, renal, or hepatic disorders; inborn errors of metabolism)

C. Fetus and neonate
   1. Premature, low-birth-weight infants
   2. Intrauterine infections (eg, parvovirus, congenital cytomegalovirus infection, congenital syphilis, HIV)
   3. Intrapartum/immediate postnatal exposures and infections (eg, neonatal herpes simplex virus infections, HIV, hepatitis B and C, varicella)
   4. Postnatal infections (eg, neonatal conjunctivitis, omphalitis, early and late-onset sepsis, neonatal meningitis)

Domain 4: Virulence Mechanisms, Microbial Communities, and Host Defense

- *The questions in this domain focus on "basic science" principles that are critical for the practice of pediatric infectious diseases medicine.*

A. Core diagnostic microbiology principles (eg, classification systems, specimen collection, identification through stains and structural features, molecular diagnostic testing)
B. Susceptibility testing
C. Virulence and pathophysiology concepts
   1. Bacterial virulence mechanisms and host recognition (eg, adherence, latency, toxin production, biofilms, protective factors)
   2. Viral virulence mechanisms (eg, tropism, latency, reactivation, oncogenesis, immune subervsion)
   3. Fungal virulence mechanisms (eg, angioinvasion, adherence, cell wall)
D. Microbial communities/microbiome
E. Host defense (eg, activated eosinophils, neutrophils, macrophages)

Domain 5: Antimicrobial Principles

- *For the antimicrobials that fall within the domains/subdomains listed below, the questions may assess any of the following knowledge areas: (1) mechanism of action and resistance, (2) pharmacokinetics and pharmacodynamics, (3) therapeutic drug monitoring, (4) drug interactions, side effects, and adverse events, or (5) allergic reactions.*

A. Antibacterials
   1. Beta-lactams (+/- beta-lactamase inhibitors)
   2. Aminoglycosides
   3. Macrolides/lincosamides
   4. Glycopeptides
   5. Fluoroquinolones
   6. Tetracyclines
   7. Sulfonamides
   8. Metronidazole
   9. Oxazolidinones, lipopeptides, streptogramins
   10. Polymyxins
B. Antimycobacterials
   1. Routine tuberculosis (TB) and latent TB infection treatment
   2. Multidrug-resistant TB treatment
   3. Nontuberculous mycobacteria treatment
C. Antivirals
   1. RNA viruses (eg, influenza, HIV, hepatitis C, enterovirus, respiratory syncytial virus, etc.)
   2. DNA viruses (eg, herpesvirus family, hepatitis B, etc.)

D. Antifungals
   1. Amphotericin
   2. Azoles
   3. Echinocandins
E. Antiparasitics
   1. Antimalaria
   2. Albendazole
   3. Ivermectin
   4. Metronidazole

Domain 6: Stewardship

A. Diagnostic stewardship principles
   1. Appropriate test utilization (eg, drug concentrations when stopping therapy, *C difficile* testing without diarrhea, group A streptococcal testing)
   2. Implementation of guidelines and tiered testing (eg, encephalitis testing based on history/exposure)
   3. Implementation of new diagnostic tests (eg, molecular testing for resistance patterns, rapid diagnostics)
   4. Cost-conscious care (eg, avoiding rapid diagnostic panels [gastrointestinal pathogen panel, respiratory pathogen panel] in otherwise healthy children)
B. Antimicrobial stewardship principles
   1. Core strategies of antimicrobial stewardship (prospective audit, prior approval)
   2. Empiric versus targeted therapy (eg, escalation based on hospital antibiogram and/or laboratory and culture results)
   3. Implementation of guidelines and tiered treatment (eg, community-acquired pneumonia, otitis media, urinary tract infection)
   4. Cost-conscious care (eg, utilization of older, more narrow agents, over newer, broader, and more expensive options)
   5. Patient safety (eg, IV to oral conversions when equivalent and appropriate related to infection site and severity, and patient factors)
   6. Dose optimization (eg, population pharmacokinetics, continuous infusions, lowest effective dose for indication and to minimize toxicity)
   7. Drug safety in special populations (eg, neonates, pregnant, breast-feeding, cystic fibrosis, drug interactions)
   8. Considerations for combination therapy (eg, antagonism, synergy, additive toxicity risk, cost-benefit evaluations)
   9. Source control (eg, abscess drainage, catheter removal) for effective therapy
   10. Drug allergy (eg, accurate diagnosis, use of alternative antibiotics)

Domain 7: Prevention and Containment of Infectious Diseases

A. Active immunization principles
   1. T cell independent and dependent antigens
   2. Immunization of immunocompromised patients
   3. Effect of active immunization on carriage of related microorganisms
   4. Factors affecting vaccine response (eg, adjuvants, mucosal immunity)
   5. Amnestic response to vaccination
   6. Vaccine contraindications and precautions (eg, previous anaphylaxis, pregnancy)
B. Active immunizations
   1. Live attenuated virus (eg, measles, mumps, and rubella [MMR], varicella, rotovirus)
   2. Inactivated vaccines (eg, influenza, hepatitis A, rabies)

3. Recombinant (eg, hepatitis B, human papillomavirus)
4. Toxoids (eg, diphtheria and tetanus; tetanus, diphtheria, and acellular pertussis)
5. Live attenuated bacteria (eg, typhoid, cholera, Bacillus Calmette-Guérin)
6. Bacterial polysaccharide (eg, *Streptococcus pneumoniae*, typhoid)
7. Bacterial polysaccharide-protein conjugate (eg, *S. pneumoniae*, *Neisseria* meningitidis)

C. Passive immunization principles
1. Indications for immune globulin therapy
2. Risks associated with antibody-containing products
3. Effects of passive immunization on live vaccines

D. Passive immunoprophylaxis (with and without immunizations)
1. Hepatitis A
2. Hepatitis B
3. Measles
4. Varicella
5. Rabies
6. Respiratory syncytial virus
7. Tetanus

E. Antimicrobial prophylaxis
1. Surgical prophylaxis
2. Endocarditis prophylaxis
3. Chemoprophylaxis in special populations (eg, *Pneumocystis jirovecii* pneumonia, cytomegalovirus)

F. Epidemiology and principles of infection control
1. Modes of transmission (eg, airborne, droplet, contact, common vehicle)
2. Principles of outbreak investigations and outbreak management
3. Infection control in hospitalized children
4. Child care and school health (eg, return to school)
5. Prophylaxis following exposure

Domain 8: Core Knowledge in Scholarly Activities

A. Principles of Biostatistics in Research
1. Types of variables (eg, continuous, ordinal, nominal)
2. Distribution of data (eg, mean, standard deviation, skewness)
3. Hypothesis testing (eg, type I and type II errors, P values, statistical power)
4. Common statistical tests (eg, ANOVA, chi-square, nonparametric tests)
5. Measurement of association and effect (eg, correlation, relative risk, odds ratio)
6. Regression (eg, linear, logistic, survival analysis)
7. Diagnostic tests (eg, sensitivity and specificity, predictive values, disease prevalence, receiver operating characteristic [ROC] curves)
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 (eg, validity, reliability)

C. Ethics in Research
   1. Professionalism and misconduct in research (eg, conflicts of interest, falsification)
   2. Principles of research involving human subjects
   3. Principles of consent and assent

D. Quality Improvement
   1. Project design (eg, models, aims, key drivers, tools, Plan-Do-Study-Act [PDSA] cycle)
   2. Data and measurement (eg, outcomes, balancing measures, run charts, control charts, common cause and special cause variation)