Pediatric Sonography Review

A Q&A Review for the ARDMS Specialty Exam

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1-2-3 STEP
Ultrasound Education & Test Preparation

Step 1 Review text
Step 2 Mock examination
Step 3 Q&A memory skills flashcard drill

SDMS-Approved 12 CME Credits
Pediatric Sonography Review
A Q&A REVIEW FOR THE ARDMS PEDIATRIC SONOGRAPHY EXAM

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PEDIATRIC SONOGRAPHY is quickly increasing in popularity as a focused discipline within the imaging spectrum. The American Registry for Diagnostic Medical Sonography (ARDMS) created the Pediatric Sonography (PS) registry exam in response to the evolving pediatric field, and testing began in 2015. While studying for the new PS exam, we realized that we had to rely solely on textbooks and saw the need for a Q&A registry review mock examination.

Combined, we have 37 years of experience in sonography, and we hope that by writing this book, we will have left a little legacy behind in the field we love so much. We knew that working at Arnold Palmer Medical Center, an imaging center accredited by the American College of Radiology, we were in the right environment to create a great teaching tool.

Our intention is to provide a review book that will serve as a comprehensive mock test covering all the clinical tasks outlined by the ARDMS for the PS registry exam—plus supporting diagrams, text to explain the answers and subtleties of the items, and clear ultrasound images. Beyond this, we wanted to provide sonographers with a tool both to introduce them to pediatric sonography and to help them expand their current knowledge.

**Important note:** Although many of our colleagues have remarked on similarities between our questions and those of the actual exam, do not be misled into thinking you should memorize these questions and answers. They are here to give you practice, to teach you things you may not know, and to reveal your strengths and weaknesses so that you know where to put your energy as you prepare for the exam. They also provide a means of assessing your progress as you study.

Writing this book took a great deal of time and commitment. We were fortunate to work with exceptional mentors and would not have been able to realize our project without the help of Dr. Lennard D. Greenbaum and Dr. John B. Campbell. Their time and expertise were critical to our success, and it is an honor to have worked with them on the development of the book.

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We want to thank our families for their unwavering support, care, and patience during our year of writing and research. You cheered us on and helped us stay focused. Thank you for understanding our passion for this project and providing the momentum to bring it to a reality.

Finally, you—the budding or cross-training pediatric sonographer—have not only our best wishes for success but also our admiration for taking this big and important step in your career!

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Publisher’s Note

This mock exam is a question/answer/reference review of Pediatric Sonography for those candidates who plan to take the specialty examination for the Registered Diagnostic Medical Sonographer (RDMS) credential, administered by the American Registry for Diagnostic Medical Sonography (ARDMS). It is designed as an adjunct to your regular study and as a means of helping you determine your strengths and weaknesses so that you can study more effectively. This mock exam is also considered a CME activity; an SDMS-approved CME quiz worth 12 credits will be found in Part 20 of this book.

Facts about Pediatric Sonography Review

- This mock exam covers the material on the ARDMS exam content outline in effect as of 2019. Readers are advised to check the ARDMS website, www.ardms.org, for the latest updates. The mock exam itself is continuously updated and revised as necessary, and readers can check Davies’ website for the latest Study Alerts and other product updates at http://www.daviespublishing.com/Product-Updates-C220.aspx.

- The mock exam focuses exclusively on the PS specialty exam to ensure thorough coverage of even the smallest subtopic on the exam. (For those preparing for the Sonography Principles and Instrumentation exam, see Davies’ Ultrasound Physics Review: SPI Edition, available in both print and interactive formats at www.daviespublishing.com.)

- In preparing this mock exam, the authors have referred to the current ARDMS content outline as a guideline for coverage. At the same time, they have organized the content using a comprehensive, subject-driven approach to ensure that all important topics are fully addressed. The ARDMS exam content outline provides a generalized categorical overview together with very specific clinical tasks, but it can omit and assume the mastery of key intermediate topics you must know to pass the examination. Hence this hybrid approach gives you the best of both worlds.

- This mock exam contains 623 questions, many of which are accompanied by sonographic and other images, anatomic illustrations, and schematics—more than 250 in all.

- The answer key located in Part 19 contains not only the answers but also concise explanations that are abundant, clear, and authoritatively referenced for further study. We recommend that you have a standard pediatric ultrasound review text at your side when using this mock exam to study for the PS exam; you will see several of these referenced in the answer section and the “Suggested Readings” in Part 21.

- This mock examination has been approved by the Society of Diagnostic Medical Sonography (SDMS) as a CME activity. A CME application form, quiz, and full submission instructions are included in Part 20. Passing this quiz will qualify the applicant for 12 CME credits. A modest administrative processing fee applies at the time of submission, and more than one sonographer may use the forms to complete this activity for CME credit. These credits are accepted by ARDMS, its companion council the Alliance for Physician Certification and Advancement (APCA), the American Registry of Radiologic Technologists (ARRT), and other
organizations toward meeting their CME requirements. Some credentials carry stipulations regarding specialty areas in which CME credits may be earned. Always check with the organization that governs your credential(s). All the credits in this activity may be applied to maintain the ARDMS PS credential.

- The expanded ARDMS exam content outline appears in Part 22. Under each task we have indexed mock exam questions related to that task, for your convenience in targeting your study on specific exam topics.

**ARDMS Advanced Item Type (AIT) Questions**

All the ARDMS exams now include Advanced Item Type (AIT) questions that assess practical sonography instrumentation skills. For the PS specialty exam, these AIT questions include what ARDMS calls “Hotspot” questions. Hotspot items display an image with the question and ask you to indicate the correct answer by marking directly on the image using your cursor. (To learn how to use the interface during the exam you can visit a handy YouTube video posted by ARDMS.) This type of question is called “advanced” because it involves a higher level of thinking and processing than you perform when answering a conventional multiple-choice question. In Davies’ mock exam, similar questions are identified as “AIT—Hotspot” questions. These items ask you to identify what an arrow in the image is pointing at or to indicate the label on an image that corresponds to the correct answer.

Another type of AIT question, the Semi-Interactive Console (SIC) item, requires the examinee to use a semi-interactive console to correct a problem with the image presented. Currently these items do not appear on the PS exam, but as a bonus feature we have identified similar items as “AIT—SIC” questions.

Finally, PACSim items—case-based Picture Archive and Communication Simulation questions—are not included in this PS mock exam because currently this type of question is limited to the Ob/Gyn exam and the Physician in Vascular Interpretation (PVI) exam.

**How to Use This Mock Exam**

*Pediatric Sonography Review* effectively simulates the content of the PS exam. Current ARDMS standards call for 170 multiple-choice questions to be answered during a three-hour period. That is, you will have an average time of approximately one minute to answer each question. Timing your practice sessions according to the number of questions you need to finish will help you prepare for the pressure experienced by PS candidates taking this exam. It also helps to ensure that your practice scores accurately reflect your strengths and weaknesses so that you can study more efficiently in the limited time you are able to devote to preparation.

ARDMS test results are reported as a “scaled” score that ranges from a minimum of 300 to a maximum of 700. A scaled score of 555 is the passing score—the “passpoint” or “cutoff score” for all ARDMS examinations. Also known as the Angoff method, scaled scoring takes the difficulty of each question into account, which helps ensure the fairness of the exam.

We include below and strongly recommend that you read *Taking and Passing Your Exam*, by Don Ridgway, RVT, who offers practical tips for passing the ARDMS examinations.
Contents

Reviewers v
Authors’ Preface vii
Publisher’s Note ix
Taking and Passing Your Exam xi
Color Plates xxiii

PART 1 Head 1

Embryology and development

Normal anatomy
Newborn skull
Brain lobes
Ventricular system
Posterior fossa
Choroid plexus
Cavum septi pellucidi
Corpus callosum
Basal ganglia
Circle of Willis
Tentorium cerebelli
Massa intermedia
Cerebral peduncles
Middle cerebral artery
Ependyma
White matter
Gray matter

Associated lab values and hormones

Ultrasound prep and protocol

Normal ultrasound appearance

Pathology
Congenital
Chiari malformation
Dandy-Walker complex
Holoprosencephaly
Schizencephaly
Lissencephaly
Hydranencephaly
Agenesis of the corpus callosum
Absent septum pellucidum
Colpocephaly
Septo-optic dysplasia

**Obstruction abnormalities**
Congenital aqueductal stenosis
Hydrocephalus

**Cystic abnormalities**
Arachnoid cyst
Choroid plexus cyst
Connatal cyst
Subependymal cyst
Porencephaly
Cystic encephalomalacia

**Solid masses**
Benign
- Cerebellar astrocytoma
- Choroid plexus papilloma
Malignant
- Ependymoma
- Glioma

**Infection and inflammation**
TORCH infections
Meningitis

**Vascular abnormalities**
Intracranial hemorrhage
Extracranial hemorrhage
Vein of Galen malformation
Lenticulostriatal vasculopathy

**Injury and trauma**
Hypoxic-ischemic event
Periventricular leukomalacia
Caput succedaneum
Hematoma
- Cephalohematoma
- Subgaleal hematoma
- Epidural hematoma
- Subdural hematoma

**Diseases and syndromes**

**Miscellaneous**

**Procedures**
*Extracorporeal membrane oxygenation (ECMO)*
PART 2  Spine  27

Embryology and development

Normal anatomy
  Spinal cord
  Conus medullaris
  Filum terminale
  Cauda equina
  Ventriculus terminalis

Associated lab values and hormones
  Alpha-fetoprotein

Ultrasound prep and protocol

Normal ultrasound appearance

Pathology
  Congenital
    Filar cyst
  Spinal dysraphism
    Non–skin-covered
    Skin-covered
  Occulta
  Tethered cord
    Caudal regression syndrome
    Diastematomyelia
    Sacrococcygeal teratoma

Obstruction abnormalities

Cystic abnormalities
  Syringomyelia
  Hydromyelia
  Syringohydromyelia

Solid masses
  Benign
    Lipoma
  Malignant
    Sacrococcygeal teratoma

Infection and inflammation

Vascular abnormalities

Injury and trauma
  Cord compression
  Cord displacement

Diseases and syndromes

Miscellaneous
  Pseudomass
  Pilonidal sinus

Procedures
  Lumbar puncture
PART 3  Neck and Face  37

Embryology and development

Normal anatomy
  Salivary glands
    Parotid
    Submandibular
    Sublingual
  Thyroid gland
  Parathyroid glands

Associated lab values and hormones
  Thyroid-stimulating hormone (TSH)
  Parathyroid hormone (PTH)

Ultrasound prep and protocol

Normal ultrasound appearance

Pathology
  Congenital
    Branchial cleft anomaly
    Lymphangiomas
    Fibromatosis colli
  Obstruction abnormalities
  Cystic abnormalities
    Ranula
    Duplication cyst
    Thyroglossal duct cyst
  Solid masses
    Benign
      Colloid follicles
      Thyroid nodules
      Thyroid adenoma
      Parathyroid adenoma
    Malignant
      Papillary thyroid carcinoma
      Follicular carcinoma
  Infection and inflammation
    Parotitis
    Lymphadenopathy
  Vascular abnormalities
    Hemangioma
  Injury and trauma
  Diseases and syndromes
    Hashimoto’s thyroiditis
    Graves’ disease
    Primary hyperparathyroidism
    Secondary hyperparathyroidism
Miscellaneous
  Sialolithiasis
  Goiter

Procedures
  Biopsies
  Percutaneous drainage

PART 4 Chest 49

Embryology and development

Normal anatomy
  Thymus
  Diaphragm
  Pleura

Associated lab values and hormones

Ultrasound prep and protocol

Normal ultrasound appearance

Pathology
  Congenital
    Congenital pulmonary airway malformation (CPAM)
    Bronchopulmonary sequestration
    Bochdalek hernia
    Morgagni hernia
  Obstruction abnormalities
  Cystic abnormalities

Solid masses
  Benign
    Thymoma
  Malignant
    Lymphoma

Infection and inflammation
  Lung consolidation

Vascular abnormalities

Injury and trauma
  Diaphragmatic paralysis

Miscellaneous
  Pleural effusion
  Atelectasis
  Gastroesophageal reflux

Procedures
  Thoracentesis
Embyology and development

Normal anatomy

Segments
Lobes
Bile ducts
Hepatic veins
Portal veins
Hepatic artery

Associated lab values and hormones

Alanine transaminase (ALT)
Aspartate transaminase (AST)
Alkaline phosphatase (ALP)
Albumin
Bilirubin

Ultrasound prep and protocol

Normal ultrasound appearance

Pathology

Congenital
Hepatic fibrosis
Obstructive abnormalities
Cystic abnormalities
Liver cysts
Polycystic liver
Solid masses
Benign
Hemangiomas
Hemangioendothelioma
Adenomas
Mesenchymal hamartomas
Focal nodular hyperplasia
Malignant
Hepatoblastoma
Hepatocellular carcinoma
Undifferentiated embryonal sarcoma
Metastases
Infection and inflammation
Liver abscesses
Granuloma
Vascular abnormalities
Budd-Chiari
Portal vein hypertension
Portosystemic collaterals
Portal vein thrombosis
Cavernous transformation of the portal vein
Veno-occlusive disease
Arteriovenous malformations

Injury and trauma
Hematomas

Diseases and syndromes
Hepatitis
Cirrhosis

Miscellaneous
Steatosis
Hepatomegaly
Portal venous gas

Procedures
Liver transplant
Biopsies
Percutaneous drainage
Elastography

PART 6 Gallbladder and Biliary Ducts 71

Embryology and development

Normal anatomy
Segments
Bile ducts

Associated lab values and hormones
Direct bilirubin
Indirect bilirubin
Alkaline phosphatase (ALP)

Ultrasound prep and protocol

Normal ultrasound appearance

Pathology
Congenital
Biliary atresia
Obstructive abnormalities
Choledocholithiasis
Jaundice
Cystic abnormalities
Choledochal cyst
Solid masses
Benign
Polyps
Malignant
Rhabdomyosarcoma
Infection and inflammation
  Cholecystitis
  Cholangitis
Vascular abnormalities
Injury and trauma
Diseases and syndromes
  Caroli disease
  Alagille syndrome
Miscellaneous
  Gallbladder hydrops
  Air in the gallbladder
  Cholelithiasis
  Biliary sludge

Procedures
  Endoscopic retrograde cholangiopancreatography (ERCP)
  Kasai procedure

PART 7  Pancreas  85

Embryology and development
Normal anatomy
  Segments
  Ducts
  Vascular landmarks

Associated lab values and hormones
  Exocrine
  Endocrine

Ultrasound prep and protocol
Normal ultrasound appearance
Pathology
  Congenital
    Congenital cysts
    Annular pancreas
    Pancreatic divisum
    Ectopic pancreas
    Congenital hyperinsulinism/nesidioblastosis
Obstruction abnormalities
Cystic abnormalities
  Pseudocyst
Solid masses
  Benign
    Insulinoma
    Lymphangioma
Malignant
  Adenocarcinoma
  Pancreatoblastoma
Infection and inflammation
  Pancreatitis
Vascular abnormalities
Injury and trauma
Diseases and syndromes
  Cystic fibrosis
  Schwachman-Diamond syndrome
Miscellaneous
Procedures
  Endoscopic retrograde cholangiopancreatography (ERCP)
  Percutaneous drainage

PART 8  Spleen  95

Embryology and development
Normal anatomy
Associated lab values and hormones
Ultrasound prep and protocol
Normal ultrasound appearance
Pathology
  Congenital
    Polysplenia
    Asplenia
    Accessory spleen
    Wandering spleen
  Obstruction abnormalities
    Splenic vein thrombosis
  Cystic abnormalities
    Splenic cysts
  Solid masses
    Benign
      Lymphangioma
      Hemangioma
    Malignant
      Lymphoma
Infection and inflammation
  Abscesses
Vascular abnormalities
  Infarct
  Sequestration
Injury and trauma
  Hematomas
  Rupture/splenosis
Diseases and syndromes
  Sickle cell disease
Miscellaneous
  Calcifications
  Splenomegaly

Procedures
  Biopsies
  Percutaneous drainage

PART 9 Urinary Tract 101

Embryology and development

Normal anatomy
  Kidneys
  Ureters
  Bladder
  Vasculature

Associated lab values and hormones
  Blood urea nitrogen (BUN)
  Creatinine (CR)
  BUN/CR ratio

Ultrasound prep and protocol

Normal ultrasound appearance

Pathology
  Congenital
    Lobulated kidney
    Hypertrophied column of Bertin
    Junctional parenchymal defect of the kidney
    Dromedary hump
    Renal hypoplasia
    Renal agenesis
    Renal ectopia
    Horseshoe kidney
    Crossed-fused renal ectopia
    Duplex kidney
    Medullary sponge kidney
    Multicystic dysplastic kidney
    Polycystic kidney disease
    Ectopic ureter
    Vesicoureteral reflux
    Bladder extrophy
Posterior urethral valves
Urachal abnormalities
Cloacal anomalies

**Obstruction abnormalities**
Hydronephrosis
Megaureter
Ureteropelvic junction obstruction
Megacystis

**Cystic abnormalities**
Renal cyst
Ureterocele

**Solid masses**
Benign
Angiomyolipoma
Mesoblastic nephroma
Cystic nephroma
Bladder diverticula
Malignant
Wilms tumor
Renal cell carcinoma
Lymphoma
Nephroblastomatosis
Rhabdoid tumors

**Infection and inflammation**
Pyelonephritis
Pyonephritis
Pyonephrosis
Xanthogranulomatous pyelonephritis
Fungal infections
Glomerulonephritis

**Vascular abnormalities**
Renal vein thrombosis
Renal artery stenosis
Renal artery pseudoaneurysm
Acute tubular necrosis

**Injury and trauma**
Urinoma
Fractured kidney
Shattered kidney

**Diseases and syndromes**
Eagle-Barrett syndrome
Tuberous sclerosis
Von Hippel–Lindau syndrome
Acute renal failure
Chronic renal failure
Miscellaneous
  Nephrocalcinosis
  Urolithiasis
  Neurogenic bladder

Procedures
  Biopsies
  Percutaneous drainage
  Renal transplant

PART 10  Adrenal Glands  127

Embryology and development

Normal anatomy

Associated lab values and hormones
  Cortisol
  Aldosterone
  Catecholamines

Ultrasound prep and protocol

Normal ultrasound appearance

Pathology
  Congenital
    Congenital adrenal hyperplasia
  Obstruction abnormalities
  Cystic abnormalities
  Solid masses
    Benign
      Pheochromocytoma
    Malignant
      Neuroblastoma
      Adrenocortical tumors
      Ganglioneuroblastoma
  Infection and inflammation
  Vascular abnormalities
  Injury and inflammation
    Adrenal hemorrhage
    Abscess
  Diseases and syndromes
    Wolman disease
    Cushing disease
  Miscellaneous

Procedures
  Biopsies
  Percutaneous drainage
PART 11  GI Tract and Mesentery  

Embyology and development

Normal anatomy
  Esophagus
  Stomach
  Small intestine
  Large intestine
  Appendix
  Omentum
  Mesentery

Associated lab values and hormones

Ultrasound prep and protocol

Normal ultrasound appearance

Pathology
  Congenital
    Hypertrophic pyloric stenosis
    Duodenal atresia
    Midgut malrotation
    Imperforate anus
  Obstruction abnormalities
    Volvulus
    Bezoars
    Intussusception
      Small bowel
      Large bowel
  Cystic abnormalities
    Duplication cysts
  Solid masses
    Benign
      Polyps
    Malignant
      Lymphoma
  Infection and inflammation
    Appendicitis
    Necrotizing enterocolitis
  Vascular abnormalities
    Median arcuate ligament syndrome (MALS)

Injury and trauma

Diseases and syndromes
  Crohn disease
  Hirschsprung disease

Miscellaneous
  Meckel’s diverticulum
  Pylorospasm

Procedures
  Air reduction enema
PART 12 Pediatric Hip 145

Embryology and development
Normal anatomy
Associated lab values and hormones
Ultrasound prep and protocol
Normal ultrasound appearance
Pathology
  Congenital
    Developmental dysplasia of the hip
  Obstruction abnormalities
  Cystic abnormalities
Solid masses
  Benign
  Malignant
Infection and inflammation
  Transient synovitis
  Osteomyelitis
  Hip effusion
Vascular abnormalities
  Avascular necrosis
Injury and trauma
Diseases and syndromes
  Proximal femoral focal deficiency (PFFD)
Miscellaneous
Procedures
  Percutaneous drainage

PART 13 Female Pelvis 155

Embryology and development
Normal anatomy
  Uterus
  Ovaries
  Fallopian tubes
Associated lab values and hormones
  Estrogen
  Progesterone
  Follicle-stimulating hormone (FSH)
  Luteinizing hormone (LH)
  Alpha-fetoprotein (AFP)
Ultrasound prep and protocol
Normal ultrasound appearance
Pathology

**Congenital**
- Mullerian anomalies

**Obstruction abnormalities**
- Hydrocolpos
- Hematocolpos
- Hydrometrocolpos
- Hematometrocolpos

**Cystic abnormalities**
- Gartner’s duct cyst
- Peritoneal inclusion cyst
- Ovarian cysts
  - Follicular cyst
  - Corpus luteal cyst
  - Hemorrhagic cyst
  - Paraovarian cyst

**Solid masses**
- Benign
  - Dermoid/teratoma
  - Cystadenoma
- Malignant
  - Rhabdomyosarcoma
  - Dysgerminoma
  - Malignant dermoid/teratoma
  - Endodermal sinus tumor
  - Granulosa cell tumor
  - Sertoli-Leydig tumor

**Infection and inflammation**
- Pelvic inflammatory disease (PID)
- Hydrosalpinx
- Pyosalpinx
- Tubo-ovarian abscess
- Tubo-ovarian complex

**Vascular abnormalities**
- Torsion

**Injury and trauma**

**Diseases and syndromes**
- Polycystic ovary syndrome (PCOS)
- Gonadal dysgenesis
- Intersex disorders

**Miscellaneous**
- Precocious puberty
- Amenorrhea

**Procedures**
- Biopsies
- Percutaneous drainage
PART 14  Male Pelvis, Scrotum, and Testes  167

Embryology and development

Normal anatomy
  Scrotum
  Testes

Associated lab values and hormones
  Testosterone

Ultrasound prep and protocol

Normal ultrasound appearance

Pathology
  Congenital
    Cryptorchidism
    Anorchidism
    Monorchidism
    Appendix testis
    Hypospadias
    True hermaphroditism
  Obstruction abnormalities
  Cystic abnormalities
    Epididymal cyst
    Seminoma
  Solid masse
    Benign
      Leydig cell tumor
      Sertoli cell tumor
      Benign teratoma
    Malignant
      Gonadoblastoma
  Infection and inflammation
    Orchitis
    Epididymitis
  Vascular abnormalities
    Testicular torsion
    Torsion of the appendix testis
    Varicocele
  Injury and trauma
    Testicular rupture
  Miscellaneous
    Hydrocele
    Microlithiasis

Procedures
  Biopsies
  Percutaneous drainage
PART 15  Soft Tissue  181

Normal ultrasound appearance
  Dermis
  Subcutaneous tissue
  Fascia
  Muscle
  Joints

Use of the standoff pad
Imaging the contralateral side

Pathology
  Congenital
    Hernia
  Cystic abnormalities
    Popliteal cyst
    Ganglion cyst
    Pilonidal cyst
  Solid mass
    Lipoma
  Infection and injury
    Cellulitis
    Abscess
    Lymphadenopathy
    Hematoma
    Sports injury
  Vascular abnormalities
    Hemangiomas
  Miscellaneous
    Foreign bodies

PART 16  Vasculature of the Extremities  189

Normal anatomy
  Upper extremity
  Lower extremity
  Superficial venous system
  Deep venous system

Pathology
  Deep venous thrombosis (DVT)
  Arteriovenous malformation (AVM)
  Arteriovenous fistula
PART 17  Physics and Instrumentation  193
- Transducer selection
- Image optimization
- Harmonics
- M-mode imaging
- 3D/4D imaging
- Doppler imaging
  - Color Doppler
  - Power Doppler
  - Spectral Doppler
- Artifacts
  - Gray-scale artifacts
  - Color Doppler artifacts
  - Spectral Doppler artifacts

PART 18  Patient Care and Management  199
- Patient communication
- Physician communication
- Reporting and archiving
- Sterile procedure
- Infection control

PART 19  Answers, Explanations, and References  203

PART 20  Application for CME Credit  569

PART 21  Suggested Readings  605

PART 22  ARDMS Exam Content Outline: Tasks Cross-Referenced to Mock Exam Questions  607
201. Arteries traveling toward the liver in a preprandial patient should display:
   A. Hepatofugal high-resistance flow
   B. Hepatofugal low-resistance flow
   C. Hepatopetal high-resistance flow
   D. Hepatopetal low-resistance flow

202. What is the most likely diagnosis for this mass (arrows) in a 1-year-old with symptoms of abdominal mass, jaundice, and anorexia?

![Image of liver with arrows indicating mass]

   A. Focal nodular hyperplasia (FNH)
   B. Hepatoblastoma
   C. Cirrhosis
   D. Undifferentiated embryonal sarcoma

**AIT—Hotspot**

203. What noninvasive procedure measures liver stiffness?
   A. Elastography
   B. Contrast-enhanced ultrasound
   C. Abdominal vascular study
   D. Liver function tests
204. Which structure is marked with the number 2?

A. Gallbladder  
B. Common bile duct  
C. Inferior vena cava  
D. Portal vein

**AIT—Hotspot**

205. This incidental finding (arrow) in a 14-year-old male during an abdominal ultrasound is most likely:

A. Hemangioendothelioma  
B. Hemangioma  
C. Hepatoblastoma  
D. Mesenchymal hamartoma

**AIT—Hotspot**
206. Which technical issue would NOT be a cause of an absent Doppler signal?
   A. High wall filter
   B. High pulse repetition frequency (PRF)
   C. Low Doppler gain
   D. 30-degree vessel-beam angle

*AIT—SIC*

207. Which hepatic neoplasm is associated with preexisting metabolic liver disease?
   A. Adenoma
   B. Hamartoma
   C. Hemangioma
   D. Lymphoma

208. Which vessel is indicated by the number 2?

A. Main portal vein
B. Left portal vein
C. Right portal vein
D. Posterior branch of the right portal vein

*AIT—Hotspot*

*Questions marked AIT—SIC are similar to ARDMS Advanced Item Type (AIT) questions called "Semi-Interactive Console" items. These require you to use your cursor to adjust controls on an onscreen console to correct a problem with the image presented. The console is "semi-interactive" because only some of the controls can be "adjusted." AIT—SIC items are currently limited to the Sonography Principles and Instrumentation (SPI) examination and as of this printing do not appear on the Pediatric Sonography exam, but as a bonus feature we have identified similar items in this mock exam.*
209. Which type of liver abnormality will appear thick-walled and contain air?
   A. Hemangioma
   B. Lymphoma
   C. Hepatic cyst
   D. Pyogenic abscess

210. Which of the following is NOT a cause of hepatomegaly?
   A. Inflammation
   B. Portal vein thrombosis
   C. Vascular congestion
   D. Biliary obstruction

211. Name the condition caused by obstruction of small sublobular hepatic veins that is not normally visualized with ultrasound:
   A. Portal hypertension
   B. Arteriovenous malformation
   C. Budd-Chiari syndrome
   D. Veno-occlusive disease

212. The hypoechoic, focal liver masses in this infant’s liver are most likely:
   A. Hemangioendotheliomas
   B. Hemangiomas
   C. Hepatoblastomas
   D. Polycystic liver
PART 6

Gallbladder and Biliary Ducts

Embryology and development

Normal anatomy

Associated lab values and hormones

Ultrasound prep and protocol

Normal ultrasound appearance

Pathology

Procedures

Note: The main topics of Part 6 are listed. For a complete study outline by topics and subtopics, see pages xxi–xxii of the table of contents. The clinical tasks on the ARDMS exam outline are cross-referenced to the entire text of this mock exam starting on page 607.
213. Which enzyme, when elevated, may indicate gallbladder or liver problems?
   A. Amylase
   B. Alkaline phosphatase (ALP)
   C. Albumin
   D. Aldosterone

214. What is the name of the hyperechoic linear structure located between the gallbladder and the right portal vein?
   A. Ligamentum teres
   B. Ligamentum venosum
   C. Interlobar fissure
   D. Cystic duct

215. What is the term for the folding of the gallbladder fundus, seen here?
   A. Junctional fold
   B. Septate gallbladder
   C. Gallbladder fissure
   D. Phrygian cap

216. What is the most common indication for pediatric gallbladder and biliary tree imaging?
   A. Jaundice
   B. Abdominal pain
   C. Nausea and vomiting
   D. Family history of gallstones
217. Which hepatic vein courses in the same plane as the gallbladder fossa?
   A. Right hepatic vein
   B. Middle hepatic vein
   C. Left hepatic vein
   D. Left portal vein

218. An infant is scanned for persistent jaundice. A fluid-filled structure (arrow) is seen within the porta hepatis and continuous with the common bile duct. What is the most likely diagnosis?

   A. Choledocholithiasis
   B. Fluid filled duodenum
   C. Choledochal cyst
   D. Hydropic gallbladder

See Color Plate 2 on page xxxiii.

   A. Choledocholithiasis
   B. Fluid filled duodenum
   C. Choledochal cyst
   D. Hydropic gallbladder

**AIT—Hotspot**

219. What is the primary cause of acalculous cholecystitis?
   A. Cholestasis
   B. Trauma
   C. Gallstones
   D. Cholangitis

220. Which patient positions are most commonly used for imaging the gallbladder?
   A. Supine and right lateral decubitus
   B. Supine and left lateral decubitus
   C. Supine and prone
   D. Supine and right posterior oblique
PART 19

Answers, Explanations, and References

Head
Spine
Neck and face
Chest
Liver
Gallbladder and biliary ducts
Pancreas
Spleen
Urinary tract
Adrenal glands
GI tract and mesentery
Pediatric hip
Female pelvis
Male pelvis, scrotum, and testes
Soft tissue
Vasculature of the extremities
Physics and instrumentation
Patient care and management
201. D. Hepatopetal low-resistance flow.

Arteries traveling toward the liver in a preprandial state, such as the proper hepatic artery, should display continuous hepatopetal flow with a low resistance. After a meal (postprandially), vasoconstriction can occur, leading to high-resistance flow. The decrease of diastolic blood flow will cause an increase in the resistive index of the hepatic artery. Note should be made of the patient’s NPO status so as to not mistake the elevated RI with liver disease. Hepatopetal flow would be coursing toward the liver. Hepatofugal flow indicates blood flow away from the liver.


202. B. Hepatoblastoma.

Hepatoblastoma is the most common malignant liver tumor of childhood. Less than 10% of cases are seen over the age of 5, and most occur in the first 2 years of life. Clinically hepatoblastomas are often asymptomatic, but symptoms can include abdominal mass, pain, anorexia, weight loss, and jaundice. Levels of alpha-fetoprotein (AFP) are elevated in 90% of patients. Signs of precocious puberty may be present with the release of chorionic gonadotropins. Hepatoblastoma is associated with Beckwith-Wiedemann syndrome. On ultrasound, a hepatoblastoma will appear as a large, well-defined focal mass in the right lobe of the liver (arrows). The tumor can be echogenic or heterogeneous and contain calcium or necrotic areas. Vascular invasion is most often seen into the portal system. Treatment is chemotherapy and partial hepatectomy. Focal nodular hyperplasia (FNH,
usually seen in adult females) and undifferentiated embryonal sarcoma (in children over the age of 5) are rare occurrences in young children. Cirrhosis can occur in children with existing hepatobiliary disease; however, it is a diffuse parenchymal disease of the liver and not a focal neoplasm.


203. A. Elastography.

Elastography is a noninvasive test performed with ultrasound to measure liver stiffness. On newer software systems, the vibrations of elastic shear waves can be measured and averaged. The velocity of the shear waves relates to the stiffness of the liver. An increase in shear wave velocity is equal to an increase in liver stiffness or fibrosis. An abdominal vascular study is an ultrasound Doppler test that evaluates the flow direction, velocity, and resistive index of abdominal vessels to evaluate for liver function, portal hypertension, and obstruction. Liver function tests consist of a panel of enzymes obtained from bloodwork; in the presence of liver disease these enzymes will be elevated. Contrast-enhanced ultrasound (CEUS) is used primarily to improve liver mass detection or to differentiate focal liver lesions.


204. D. Portal vein.
The portal triad consists of the common bile duct, hepatic artery, and portal vein and is located within the porta hepatis, which is a deep fissure or hilum of the liver. In a longitudinal scan plane (as seen in this image), the portal vein (2) is seen anterior to the inferior vena cava (1). The portal vein is then demonstrated in the transverse plane.


205. B. Hemangioma.

Hemangiomas account for almost 40% of liver masses. This mass is typically solitary and hypovascular with slow blood flow. On ultrasound, hemangiomas (arrow) are moderately echogenic or hyperechoic and homogeneous, with well-defined borders. Smaller hemangiomas tend to be more echogenic and larger hemangiomas can appear more complex. Larger hemangiomas that demonstrate blood-filled vascular spaces are referred to as cavernous hemangiomas. Hemangiomas are an uncommon cause of abdominal masses in neonates and infants and more likely to be seen in children and adolescents. The older age of the patient in this example rules out hemangioendothelioma, hepatoblastoma (not benign), and mesenchymal hamartoma—which all occur under the age of 5.

206. D. 30-degree vessel-beam angle.

To accurately calculate velocity and flow within a vessel, there should be as small a vessel-beam angle as possible, ideally 60 degrees or less. At a perpendicular angle of 90 degrees, no flow can be detected toward or away from the transducer, so there will not be a detectable Doppler shift. Pediatric vessels generally have lower flow within them than do adult vessels. Setting the pulse repetition frequency (PRF) and the wall filter as low as possible (less than 5 MHz) will best demonstrate presence or absence of flow. Having the Doppler gain down too low will also hinder signal identification.

207. A. Adenoma.

Pediatric hepatic adenomas are rare unless they accompany metabolic liver disease. Hepatic adenomas in children are associated with glycogen storage disease type 1, oral contraceptive use, and anabolic steroid therapy for Fanconi’s anemia. Hepatic adenomas have such a varying appearance and are so nonspecific that imaging modalities such as ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) have a difficult time discriminating between adenomas and other hepatic malignancies. Hamartomas, hemangiomas, and lymphomas do not have any association with preexisting metabolic liver disease.
208. C. Right portal vein.

**A** The main portal vein enters the liver and divides into the left portal vein (1) and the right portal vein (2). This division takes place within the porta hepatis. The left portal vein then branches into an anterior and a more cephalad branch. The right portal vein branches into an anterior (3) and a posterior (4) branch. Portal venous blood flow is continuous, monophasic, and hepatopetal (toward the liver/transducer).

**B** Color Doppler imaging demonstrates the hepatopetal flow of the main portal vein. In a normal liver, the only vessel not showing antegrade flow on color Doppler should be the posterior branch of the right portal vein because it travels away from the transducer. The walls of the portal vein are thicker and more echogenic than those of the inferior vena cava.

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See Color Plate 19 on page xl.

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Pyogenic abscesses usually occur in immunocompromised children or cases of septic spread from other organs. On ultrasound, pyogenic abscesses appear round with thickened, irregular walls and can contain small air bubbles that cause artifacts such as reverberation (ring-down) artifacts. Their complex internal appearance can vary and include debris, fluid levels, and septations. Most are located in the posterior right lobe of the liver. The most common cause in neonates is the bacterium Escherichia coli (E. coli). In infants and children, Staphylococcus aureus (S. aureus) is the main cause. Hemangioma, lymphoma, and hepatic cysts do not have thick walls or contain air.


Portal vein thrombosis is the restriction of blood flow into the liver. The slow flow into the liver causes blood stasis or accumulation and blocks the flow. Collaterals may form in the hepatic, splenic, or renal hilum to help get blood into the liver. This backup in blood flow can cause splenomegaly, not hepatomegaly. Hepatomegaly is the enlargement of the liver. Inflammation, infection, storage diseases, tumors, congestion of blood in the liver (Budd-Chiari), and biliary obstruction are all possible causes.


211. D. Veno-occlusive disease.

Veno-occlusive disease is the term used for the obstruction of small sublobular hepatic veins and is not usually diagnosed by ultrasound. This obstruction is associated with chemotherapy, radiation, toxins, and bone marrow transplant. Ultrasound signs preceding veno-occlusive disease include slow or reversed
portal venous and hepatic artery blood flow, monophasic waveforms of the hepatic veins, and/or an elevated resistive index of the hepatic artery. Filling defects or thrombus may be present in the hepatic veins. The caudate lobe can become enlarged. Ascites, gallbladder wall thickening, and hepatomegaly may also be present. Portal hypertension, arteriovenous malformation (AVM), and Budd-Chiari syndrome can all be demonstrated by ultrasound.

212. A. Hemangioendotheliomas.

Hemangioendothelioma is the most common childhood benign liver tumor. Only 15% of cases occur after 6 months of age, making it predominantly an infantile condition. This mass is typically found on a screening ultrasound for asymptomatic hepatomegaly. Hemangioendotheliomas can be single or multiple. Single masses tend to be larger and complex with well-defined, round or lobular borders. When multiple smaller masses are present—as seen in this image—they are round, homogeneous, and hypoechoic. Hemangioendotheliomas will typically regress and involute, therefore requiring only medical management.
PART 6

Gallbladder and Biliary Ducts

213. B. Alkaline phosphatase (ALP).

Alkaline phosphatase (ALP) is an enzyme found within the liver, bile ducts, and bone. An increase in ALP may indicate liver or gallbladder inflammation or disease. Amylase is an enzyme that assists in turning starch into sugar and is associated with the pancreas. Albumin is a protein made in the liver that is decreased in the presence of liver disease. Aldosterone is a hormone produced by the adrenal gland that helps conserve sodium and stabilize blood pressure.


214. C. Interlobar fissure.

The interlobar fissure is located anterior to the right portal vein and courses medially toward the neck of the gallbladder. It appears linear and hyperechoic. This fissure is a landmark for locating the gallbladder. The ligamentum teres and ligamentum venosum are associated with the left branch of the portal vein. The cystic duct drains the gallbladder and joins the common hepatic duct to form the common bile duct. The cystic duct would not appear hyperechoic.


The folding of the gallbladder fundus is a normal anatomic variant known as the Phrygian cap. Junctional folds are present at the junction of the body and neck of the gallbladder. Gallbladder folds can produce a shadowing artifact that may cause concern for a gallstone. To rule out a stone, it is important to scan the patient in multiple positions and from different angles. A septate gallbladder is a congenital anomaly that causes a honeycomb appearance within the gallbladder. Gallbladder fissure is not an anatomic term.


216. A. Jaundice.

Jaundice is the most common indication for pediatric gallbladder and biliary tree imaging. Most common causes of pediatric cholestasis and jaundice include biliary atresia, neonatal hepatitis syndrome, and choledochal cyst. These can commonly be identified on ultrasound. Abdominal pain, nausea and vomiting, and a family history of gallstones are other reasons for performing gallbladder ultrasound.


217. B. Middle hepatic vein.

The middle hepatic vein and the gallbladder fossa course along the same plane. Locating the middle hepatic vein can help identify the gallbladder fossa. The middle hepatic vein also lies within the interlobar fissure and on ultrasound visually divides the liver into right and left lobes. The right hepatic vein lies within the right hepatic fissure. The left hepatic vein is always located anterior to the left portal vein, which courses away from the gallbladder fossa.


218. C. Choledochal cyst.

The congenital abnormality consisting of a dilated common bile duct associated with biliary obstruction is known as a choledochal cyst (arrow). One theory of causation is that cyst formation occurs when cholangitis weakens the bile duct wall. There are multiple classifications of choledochal cysts based on their location and severity. The most common clinical sign is jaundice, but abdominal mass and pain can occur. More than half of the diagnoses of choledochal cysts will occur before age 10. If the cyst becomes large enough, duodenal obstruction can occur. Other complications include ascending cholangitis, stone formation, pancreatitis, biliary cirrhosis, and abscess. On ultrasound a well-defined cystic structure can be seen in the porta hepatis separate from the gallbladder but continuous with the extrahepatic bile ducts. Intrahepatic biliary duct dilatation visualized in this image can be seen in half of the cases. Choledocholithiasis is a stone within a biliary duct. A hydropic gallbladder would not be continuous with the common bile duct. A fluid-filled duodenum would be located inferior and medial to the gallbladder.


219. A. Cholestasis.

Cholestasis is the primary cause of acalculous cholecystitis. Over a prolonged period of time, the bile thickens and leads to obstruction of the cystic duct. Bacteria within the gallbladder can cause inflammation of the mucosa and wall. Clinical symptoms are fever, right upper quadrant (RUQ) pain, and vomiting. The sonographic appearance is the same as that of acute cholecystitis, but without gallstones (acalculous). Acalculous cholecystitis is an uncommon condition associated with burn victims, recent surgery, sepsis, and debilitating conditions. Trauma of the gallbladder usually results in contusion, laceration, or perforation. Cholangitis is an infection of the bile ducts.


220. B. Supine and left lateral decubitus.

The most common scanning positions for gallbladder imaging are supine and left lateral decubitus. Rolling a patient onto the left side will demonstrate the mobility of gallstones or sludge. The left posterior oblique position may also be used. It is important to image in two positions in case there are gallstones located too inferior to be seen in the supine position. Longitudinal and transverse views of all gallbladder segments should be obtained. Patients should be held NPO to better visualize the distended gallbladder and its contents. For larger patients a low-frequency transducer may be necessary to allow for greater beam penetration to the region of interest.


221. D. Bilirubin.

Bilirubin is the end product of the metabolic breakdown of hemoglobin. It is the substance produced by the breakdown of old red blood cells within the liver. Bilirubin is excreted in stool and gives feces color. Increased levels of bilirubin cause jaundice. Unconjugated or indirect bilirubin is carried to the
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