Training for ARDMS and APCA Item Writers
Objectives

During this training, volunteers will:

- Gain a general understanding of the Exam Development Process
- Learn Best Practices in Item Writing and be able to create items that follow ARDMS and APCA Guidelines
- See a live-demo of the EPIC Remote Item Writing (RIW) portal
- Be prepared to create high quality items which Measure Knowledge necessary for an entry level sonographer (neither too easy nor too difficult)
Test Development Process

1. Job/Task Analysis
2. Content Outline
3. Write/Code Items
4. Review Items
5. Build Forms
6. Review Forms
7. Administer the Test
8. Pass/Fail Decisions
9. Set Passing Standard
10. Analyze Data
Test Development Process

Job/Task Analysis

Content Outline

Write/Code Items

Review Items

Build Forms

Review Forms

Pass/Fail Decisions

Administer the Test

Set Passing Standard

Analyze Data
# Content Outlines

<table>
<thead>
<tr>
<th>Topic ID</th>
<th>Abdomen (AB) Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong></td>
<td>Anatomy and physiology 30%</td>
</tr>
<tr>
<td><strong>1.A.</strong></td>
<td>Normal anatomy and physiology</td>
</tr>
<tr>
<td>1.A.1.</td>
<td>Evaluate anatomic structures of the liver</td>
</tr>
<tr>
<td>1.A.2.</td>
<td>Evaluate anatomic structures of the biliary system</td>
</tr>
<tr>
<td>1.A.3.</td>
<td>Evaluate anatomic structures of the pancreas</td>
</tr>
<tr>
<td>1.A.4.</td>
<td>Evaluate anatomic structures of the spleen</td>
</tr>
<tr>
<td>1.A.5.</td>
<td>Evaluate anatomic structures of the urinary system (i.e., kidneys, ureters, bladder)</td>
</tr>
<tr>
<td>1.A.6.</td>
<td>Evaluate anatomic structures of the peritoneal cavity</td>
</tr>
<tr>
<td>1.A.7.</td>
<td>Evaluate anatomic structures of the retroperitoneum (e.g., great vessels and branches)</td>
</tr>
<tr>
<td>1.A.8.</td>
<td>Evaluate anatomic structures of the scrotum and contents (e.g., testes, epididymides)</td>
</tr>
<tr>
<td>1.A.9.</td>
<td>Evaluate anatomic structures of the penis</td>
</tr>
<tr>
<td>1.A.10.</td>
<td>Evaluate anatomic structures of the prostate</td>
</tr>
<tr>
<td>1.A.11.</td>
<td>Evaluate anatomic structures of the glands of the neck (i.e., thyroid, parathyroid, salivary)</td>
</tr>
<tr>
<td>1.A.12.</td>
<td>Evaluate anatomic structures of the other superficial structures (e.g., subcutaneous)</td>
</tr>
<tr>
<td><strong>1.C.</strong></td>
<td>Perfusion and function</td>
</tr>
<tr>
<td>1.C.1.</td>
<td>Evaluate liver for function and/or perfusion</td>
</tr>
<tr>
<td>1.C.2.</td>
<td>Evaluate biliary system for function and/or perfusion</td>
</tr>
<tr>
<td>1.C.3.</td>
<td>Evaluate urinary system (i.e., kidneys, ureters, bladder) for function and/or perfusion</td>
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<tr>
<td>1.C.4.</td>
<td>Evaluate retroperitoneum (e.g., great vessels and branches) for function and/or perfusion</td>
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<tr>
<td>1.C.5.</td>
<td>Evaluate scrotum and contents (i.e., testes, epididymides) for function and/or perfusion</td>
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<tr>
<td>1.C.6.</td>
<td>Evaluate glands of the neck (i.e., thyroid, parathyroid, salivary) for function and/or perfusion</td>
</tr>
<tr>
<td><strong>2.</strong></td>
<td>Pathology 40%</td>
</tr>
<tr>
<td><strong>2.A.</strong></td>
<td>Abnormal perfusion and function</td>
</tr>
<tr>
<td>2.A.1.</td>
<td>Evaluate urinary system (i.e., kidneys, ureters, bladder) for vascular abnormalities (e.g., renal artery stenosis)</td>
</tr>
<tr>
<td>2.A.2.</td>
<td>Evaluate retroperitoneum (e.g., great vessels and branches) for abnormalities (e.g., aneurysm, dissection, thrombus)</td>
</tr>
<tr>
<td>2.A.3.</td>
<td>Evaluate liver for transjugular intrahepatic portovenous shunt (TIPS)</td>
</tr>
<tr>
<td>2.A.4.</td>
<td>Evaluate liver for vascular abnormalities (e.g., Budd-Chiari, arteriovenous fistula, portal vein thrombosis, and collateralization)</td>
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</table>
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Job/Task Analysis → Content Outline → Write/Code Items → Review Items

Review Items → Build Forms → Review Forms → Administer the Test

Administer the Test → Pass/Fail Decisions → Set Passing Standard → Analyze Data

Outline

Write/Code Items

Review Items

Build Forms

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Pass/Fail Decisions

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Write/Code Items

Content Outline

Job/Task Analysis
Test Development Process

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3. Write/Code Items
4. Review Items

- Analyze Data
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- Build Forms

5. Set Passing Standard
6. Pass/Fail Decisions
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Flow:
- Job/Task Analysis → Content Outline → Write/Code Items → Review Items → Build Forms
- Administer the Test → Review Forms
- Analyze Data
- Set Passing Standard
Test Development Process

Job/Task Analysis → Content Outline → Write/Code Items → Review Items

Analyze Data → Administer the Test → Review Forms → Build Forms

Set Passing Standard → Pass/Fail Decisions
Anatomy of an Item

STEM
The question part of an item

KEY
The correct response to the stem

DISTRACTORS
Plausible, but incorrect responses to the stem
Item Writing 101

- Write items in a multiple-choice question and answer format ({}).
- Craft four answer options: **one key + three plausible distractors**.
- Use language and terminology that is unambiguous and concrete.
- Focus on critical knowledge required in daily clinical practice.
- Test understanding, interpretation and problem solving skills.
- Use proper grammar, punctuation and spelling.
- Use proper nouns (the patient), NOT personal pronouns (I, you, he, she, we).
Cognitive Levels

- Evaluation
- Synthesis
- Analysis
- Application
- Comprehension
- Knowledge
Cognitive Level Examples

**RECALL/COMPREHENSION**

Identify what the needle is showing in this image?

- A. The amount of gas in the gas tank
- B. The amount of air in the tires
- C. The amount of oil in the oil tank
- D. The amount of coolant in the engine

**APPLICATION/ANALYSIS**

If a driver were to see this image, which action should the driver take?

- A. Drive to a gas station and fill up
- B. Go see a mechanic
- C. No problem, keep driving
- D. Buy some antifreeze
Cognitive Level Examples

**RECALL/COMPREHENSION**

What is an artifact?

**APPLICATION/ANALYSIS**

What is the best way to correct an artifact?
Cognitive Level Action Verbs

<table>
<thead>
<tr>
<th>Synthesis/ Evaluation</th>
<th>Develop, Integrate, Perform, Plan, Produce, Organize, Create, Assess, Evaluate, Choose, Select, Analyze, Apply concepts, Judge, Propose, Prove, Support, or Synthesize.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application/ Analysis</td>
<td>Apply, Show, Use, Analyze, Classify, Differentiate, Examine, Outline, Distinguish, Categorize, Modify, or Organize</td>
</tr>
<tr>
<td>Knowledge/ Comprehension</td>
<td>Identify, Describe, Recall, Conclude, Demonstrate, Discuss, Explain, Interpret, Review, Report, Arrange, Calculate, Define, List, Label, Illustrate, Match, or Measure</td>
</tr>
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</table>
Item Writing Basics

1. Use Proper Formatting
2. Focus the Item
3. Avoid Giving Away the Key
4. Place Common Wording in Stem
5. Be Positive
6. Avoid Excessive Use of Measurements and Numerical Values
Use Proper Formatting

✓ Stems – must be complete sentences in a question format
  • Do not submit items with stems formatted as:
    ◦ Fill-in-the-blank
    ◦ True/False

✓ Keys and Distractors – must be separate plausible answers
  • Do not submit items with keys or distractors formatted as:
    ◦ All of the above
    ◦ None of the above
    ◦ A or B
    ◦ True or False
    ◦ Both or Neither
This twin gestation description is consistent with one placenta.

A. Monochorionic, diamniotic
B. Dichorionic, diamniotic
C. Both A and B
D. None of the above

Which twin gestation description is consistent with one placenta?

A. Monochorionic, diamniotic
B. Dichorionic, diamniotic
C. Dizygotic male and female
D. Presence of intertwin membrane

✅ Use Q & A format
✅ Create new plausible distractors.
✅ Do not use neither, both, none of the above, all of the above, A or B for response options
Focus the Item

A well-written stem allows a candidate to formulate an answer before reading the responses.

- Avoid adding unnecessary information to the stem.
- Items should test a candidate’s ability to apply knowledge.
- Ensure information is relevant.
- Don’t say, “Which of the following...”
Which risk factor is associated with premature coronary artery disease?

A. Increased arterial elasticity
B. Elevated low density lipoprotein
C. Decreased arterial pressure
D. Elevated high density lipoprotein

✓ Eliminate unnecessary information in the stem.
✓ Ensure distractors are plausible.
✓ Don’t use “Which of the following...?”
Avoid Giving Away the Key

Sophisticated candidates can detect inadvertent clues and select the correct key although they do not know the answer.

✓ Avoid use of similar words in the stem and key.
✓ Avoid making the key the longest or shortest response option.
✓ Avoid giving unintended clues about the correct response.
✓ Ensure responses are plausible. Do not give obviously wrong distractors.
Which Key Stands Out?

A. Color Doppler
B. Power Doppler
C. Pulsed Wave Doppler
D. Reverberation

A. The ultrasound transducer with the optimal frequency range should be selected to best visualize the target nerves.
B. Adjust the Gain
C. Adjust the Depth
D. Adjust the Focus

What are blood platelets’ functions?
A. Clotting of the blood
B. Carrying oxygen to cells
C. Carrying food to cells
D. Fighting disease
Place Common Wording in the Stem

Avoid unnecessary repetition of material in the responses by including as much information as possible in the stem.
The Doppler waveform seen with a normal carotid artery is:

A. A Triphasic Doppler waveform which occurs in three phases.
B. A Biphasic Doppler waveform which occurs in two phases.
C. A Monophasic Doppler waveform which is related to a moment of activity that has only one phase.
D. A Blunted Doppler waveform which demonstrates absence of flow in diastole.

Which Doppler waveform is consistent for a normal external carotid artery?

A. Triphasic
B. Biphasic
C. Monophasic
D. Blunted

- Avoid unnecessary repetition of material in the responses.
- Use Q & A format
Be Positive

Positively written stems evaluate a candidates knowledge and actions while limiting unnecessary confusion.

Avoid using words such as:

- No
- Not
- Never
- None
- Neither
- Nor
- Less likely
Be Positive
Weak Example

Which would not cause the commonly recognized two-dimensional and Doppler findings associated with vascular stenosis?

A. Post-stenotic dilatation
B. Narrowed vessel lumen
C. Fast acceleration during systole
D. Increased velocity in the area of stenosis

Be Positive
Strong Example

Which finding is associated with arterial stenosis?

A. Pre-stenotic dilatation
B. Increased vessel lumen
C. Systolic acceleration
D. Decreased diastolic flow

✓ Avoid negative stems.
✓ Use correct terminology.
Avoid Excessive Use of Measurements and Numerical Values

Correct answers can only be determined when there are absolute standards.

It is best to avoid responses with measurements or numerical values especially those which lack a published and professionally accepted absolute standard.
<table>
<thead>
<tr>
<th>Avoid Excessive use of Measurements</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Weak Example</td>
<td>Strong Example</td>
</tr>
<tr>
<td>What are the normal measurements of a uterus?</td>
<td>A uterine measurement of 8 cm long, 5 cm wide and 4 cm thick corresponds with which patient profile?</td>
</tr>
<tr>
<td>A. 6 cm long, 5 cm wide, and 4 cm thick</td>
<td>A. Nulliparous</td>
</tr>
<tr>
<td>B. 8 cm long, 5 cm wide, and 4 cm thick</td>
<td>B. Postpartum</td>
</tr>
<tr>
<td>C. 8 cm long, 6 cm wide, and 2 cm thick</td>
<td>C. Pre-pubertal</td>
</tr>
<tr>
<td>D. 10 cm long, 8 cm wide, and 5 cm thick</td>
<td>D. Post-menopausal</td>
</tr>
</tbody>
</table>

✓ Avoid responses with measurements or numerical values.
Item Writing Best Practices

1. Keep Items Independent
2. Mention Images in Stem
3. Submit New Items to Mentor
4. Do Not Plagiarize
5. Provide References and Rationales
Keep Items Independent

• Don’t write an item which requires information in a previous item.
  
  Example: *The following scenario applies to the next two questions.*

• All items on the exam are randomized, therefore items cannot be dependent.

• Obtaining the correct answer to one item should not be dependent upon obtaining the correct answer to another item.

• Avoid allowing one item to provide clues to the answer of other items.
Obtain Permission to Submit Media

Permission to submit media must be obtained prior to submission and media must not be obtained from published material.

In addition, all media must be HIPAA compliant and free of any private patient information prior to submission to ARDMS/APCA.
Mention Images in Stem

• Briefly refer to the existence of an image somewhere in the stem when developing items involving an image.

  What does the sonographic finding in this image most likely represent?

  This will provide an indicator to the candidate to expect to see an image.

• Images should be placed below the written stem.
REFERENCES ARE MANDATORY.

All items written for ARDMS/APCA are required to have at least one reference. Items without a reference will not be accepted.

Use credible sources commonly accepted in the subject area.

Recently published articles and pending research are likely to contain material not yet commonly accepted or known in the field. Therefore, they will not be accepted as appropriate or credible references.

DO NOT PLAGIARIZE.

Copying exact language from textbooks and/or journal articles constitutes plagiarism even when a reference is provided.
Provide Rationales

Rationales are optional and useful to justify applied knowledge.
Mentors

- New writers submit all items to their assigned mentor for approval
- Mentors review the items and provide feedback within a week.
- Writer reviews the mentor’s feedback and makes edits
- Writers are asked to submit **10 items** per quarter (3 months).
Evaluation

Mentors will evaluate Item Writers on the following criteria:

✓ How well the writer followed ARDMS/APCA Guidelines for Item Writing.

✓ How well the items demonstrate an appropriate level of knowledge and application.

✓ Whether the item writer has improved their skills during the writing project.

✓ Whether the item writer has advanced enough to write independently.
Next Steps

Within one week...

• You will be placed in a Writing Project.
• You will be paired with a Mentor
• You will receive an email with the EPIC RIW login and your Mentor’s contact info.
• You may begin writing!
“There can be no greater gift than that of giving one’s time & energy to help others without expecting anything in return.”

Nelson Mandela

Thank you for the gift of your valuable time and for your dedication to our organization, our staff and to those who take our examinations.

Holly Batts: BR, PS, VT, PVI
Hannah Gibson: FE, PE, OB, MW
Mischa Truong: AB, AE, SPI, MSK-P, MSK-S
Bronwen Sandor: Item Development Coordinator