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Sonography Principles and Instrumentation Examination Content Outline
(Outline Summary)

#	Domain	Subdomain	Percentage
1	Clinical Safety, Patient Care, and Quality Assurance	Patient Care Quality Assurance New Technologies	10%
2	Physical Principles	Physical Principles	15%
3	Ultrasound Transducers	Transducers	16%
4	Imaging Principles and Instrumentation	Instrumentation	28%
5	Doppler Imaging Concepts	Hemodynamics	31%

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ARDMS SPI Exam Syllabus Topics:

Topic	Details
Topic 1	<ul style="list-style-type: none"> Apply Doppler Concepts: This section of the exam measures skills of Vascular Sonographers and evaluates understanding and application of Doppler ultrasound principles. It includes knowledge of Doppler angle, flow dynamics, and color and spectral Doppler imaging. The section also covers eliminating aliasing, interpreting waveforms, applying continuous and pulsed wave Doppler, and optimizing Doppler gain and scale to accurately measure blood flow and velocity within vessels.
Topic 2	<ul style="list-style-type: none"> Perform Ultrasound Examinations: This section of the exam measures skills of Sonographers and covers how to conduct ultrasound procedures while ensuring patient safety and diagnostic accuracy. It includes understanding of imaging protocols, ergonomics, patient care, and the interaction between sound and tissue. Candidates are expected to demonstrate abilities to manage patient encounters, apply 3D and 4D and contrast imaging concepts, identify and correct artifacts, and follow confidentiality and privacy standards throughout the scanning process.
Topic 3	<ul style="list-style-type: none"> Provide Clinical Safety and Quality Assurance: This section of the exam measures skills of Clinical Ultrasound Supervisors and focuses on maintaining safety and quality standards in ultrasound practice. It includes infection control protocols, transducer and machine integrity checks, and quality assurance testing using tissue-mimicking phantoms. The section also requires familiarity with statistical parameters like sensitivity and specificity to evaluate diagnostic performance and ensure consistent, reliable imaging outcomes.
Topic 4	<ul style="list-style-type: none"> Optimize Sonographic Images: This section of the exam measures skills of Diagnostic Medical Sonographers and assesses their ability to enhance image quality using advanced optimization techniques. It includes understanding axial, lateral, elevational, and temporal resolution, as well as manipulating gain, depth, magnification, and dynamic range. Examinees are expected to apply harmonic imaging, spatial compounding, and gray-scale techniques to produce clear, accurate diagnostic images.

Topic 5	<ul style="list-style-type: none"> • Manage Ultrasound Transducers: This section of the exam measures skills of Ultrasound Technicians and focuses on the management and proper use of different types of transducers. It evaluates knowledge of transducer components, frequency selection, and application of various 2D, 3D, 4D, and nonimaging transducer concepts. Candidates must show they can choose the appropriate transducer for specific examinations and make necessary frequency adjustments to ensure image quality.
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ARDMS Sonography Principles and Instrumentation Sample Questions (Q160-Q165):

NEW QUESTION # 160

Which adjustment can maintain the same frame rate when the depth is increased?

- A. Increase frequency
- B. Increase number of focal zones
- C. Decrease persistence
- **D. Decrease image width**

Answer: D

Explanation:

When the depth of imaging is increased, the time it takes for the ultrasound pulses to travel to and from the deeper structures also increases, which can reduce the frame rate. To maintain the same frame rate, one effective adjustment is to decrease the image width. Narrowing the image width reduces the number of scan lines required to create each frame, allowing the system to maintain a higher frame rate despite the increased depth.

ARDMS Sonography Principles and Instrumentation guidelines

Krenkau, F. W. (2015). Diagnostic Ultrasound: Principles and Instruments.

NEW QUESTION # 161

Which change would allow low velocities to be displayed in this spectral Doppler image?

- A. Decrease compression
- B. Increase transmitted frequency
- C. Increase sample volume size
- **D. Decrease wall filter**

Answer: D

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

In the spectral Doppler display shown, the wall filter setting determines the lower limit of velocity signals that are displayed. A high wall filter removes low-velocity signals (such as end-diastolic flow or slow venous flow), while a lower wall filter allows both high and low velocities to be visualized.

According to the official Principles and Instrumentation documents:

"The wall filter eliminates low-frequency Doppler shifts, which correspond to low-velocity blood flow or motion artifacts. Decreasing the wall filter allows display of low-velocity flow components that may otherwise be filtered out." Decreasing compression (A) adjusts dynamic range but does not influence velocity detection.

Increasing sample volume size (B) affects spatial resolution and signal amplitude but not velocity thresholds.

Increasing transmitted frequency (C) may improve sensitivity but does not directly control the display of low velocities. Therefore, the correct answer is D: Decrease wall filter.

NEW QUESTION # 162

What adjustment is needed to optimize the image below?

A close-up of a medical scan Description automatically generated

□

- A. Decrease scale
- B. Raise focal zone
- C. Steer the box
- D. Increase wall filter

Answer: C

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

In the displayed image, the color box is not aligned parallel to the direction of blood flow in the vessel. Color Doppler is angle-dependent; when the color box is not properly steered to align with flow, the Doppler shift is reduced, and less color filling occurs. Steer the box to align the ultrasound beam more parallel to flow to maximize Doppler shift and improve color filling.

According to sonography instrumentation reference:

"Steering the color box aligns the Doppler beam with blood flow direction, optimizing the Doppler angle and improving flow visualization." Therefore, the correct answer is B: Steer the box.

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NEW QUESTION # 163

Which action would increase the frame rate?

- A. Increasing the number of lines per frame
- B. Decreasing the logarithmic compression
- C. Decreasing the number of focal zones
- D. Increasing the sector width

Answer: C

Explanation:

The frame rate in ultrasound imaging is influenced by several factors, including the number of focal zones. Each focal zone requires additional transmission and reception cycles, thus decreasing the frame rate. By decreasing the number of focal zones, the system requires fewer cycles per frame, which increases the frame rate. This enhances the temporal resolution, making it easier to capture fast-moving structures in real-time imaging.

Reference:

ARDMS Sonography Principles & Instrumentation Guidelines

Hagen-Ansert SL. Textbook of Diagnostic Ultrasonography. 8th ed. St. Louis, MO: Mosby; 2017.

NEW QUESTION # 164

What does compression affect in the ultrasound image?

- A. The temporal resolution
- B. The number of lines displayed
- C. The shades of gray displayed
- D. The elevational resolution

Answer: C

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

Compression reduces the dynamic range of the returning echoes, which alters how many shades of gray are displayed. It compresses the range of signal amplitudes to fit into the grayscale display range.

"Compression alters the dynamic range, adjusting how many shades of gray are displayed to optimize image contrast." Therefore, the correct answer is B: The shades of gray displayed.

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