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Revised SPI Sonography Principles and Instrumentation Course

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ARDMS SPI Exam Syllabus Topics:

Topic	Details
Topic 1	<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• 4D and contrast imaging concepts, identify and correct artifacts, and follow confidentiality and privacy standards throughout the scanning process.

Topic 2	<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 3	<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.
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"> 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.

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ARDMS Sonography Principles and Instrumentation Sample Questions (Q40-Q45):

NEW QUESTION # 40

Which describes the reflected frequency when a reflector is moving toward the sound source?

- A. Attenuated
- B. Increased**
- C. Unchanged
- D. Decreased

Answer: B

Explanation:

When a reflector (such as red blood cells) is moving toward the sound source, the frequency of the reflected sound waves increases. This phenomenon is known as the Doppler effect. The frequency shift occurs because the motion of the reflector compresses the sound waves, leading to a higher frequency than the emitted frequency. This increased frequency is what the Doppler ultrasound system detects and uses to calculate the velocity of the moving reflector.

Reference:

ARDMS Sonography Principles and Instrumentation guidelines

Hoskins, P. R., Thrush, A., Martin, K., & Whittingham, T. A. (2010). Diagnostic Ultrasound: Physics and Equipment.

NEW QUESTION # 41

What reduces speckle and increases visualization of specular reflectors and attenuated structures?

- A. Elastography
- B. Extended field of view
- C. Pixel interpolation
- D. **Spatial compounding**

Answer: D

Explanation:

Spatial compounding involves acquiring multiple frames from different angles and averaging them. This technique reduces speckle noise, which is a granular interference pattern, and enhances the visualization of specular reflectors (smooth surfaces that reflect sound in a single direction) and attenuated structures (structures that reduce the intensity of the sound beam). By averaging frames from different angles, spatial compounding improves image quality and contrast resolution.

Reference:

ARDMS Sonography Principles and Instrumentation guidelines

Hedrick, W. R., Hykes, D. L., & Starchman, D. E. (2005). Ultrasound Physics and Instrumentation.

NEW QUESTION # 42

Which control should a sonographer use to change contrast resolution?

- A. **Dynamic range**
- B. Reject
- C. Gain
- D. Output power

Answer: A

Explanation:

* Reject: This control eliminates low-level noise and weak signals, affecting image quality but not primarily used for contrast resolution.

* Output Power: This adjusts the intensity of the transmitted ultrasound waves but does not directly change contrast resolution.

* Gain: This control amplifies all signals equally, affecting brightness but not specifically the contrast resolution.

* Dynamic Range: Adjusting the dynamic range changes the range of grayscale that the ultrasound system displays, which directly affects the contrast resolution by altering how many shades of gray are visible between the black and white extremes.

References:

"Understanding Ultrasound Physics" by Sidney K. Edelman

ARDMS Sonography Principles and Instrumentation study materials

NEW QUESTION # 43

Based on the table in this image, what is the sensitivity?

□

- A. 32/33
- B. 45/48
- C. 45/46
- D. **32/35**

Answer: D

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

Sensitivity measures the test's ability to correctly identify true positives. It is calculated using the formula:

Sensitivity = True Positives / (True Positives + False Negatives)

From the table:

True Positives (TP) = 32 (Noninvasive test positive & Gold Standard positive) False Negatives (FN) = 3 (Noninvasive test negative but Gold Standard positive) Thus:

Sensitivity = 32 / (32 + 3)

Sensitivity = 32 / 35

According to sonography instrumentation reference:

"Sensitivity represents the proportion of actual positive cases correctly identified by the test." Therefore, the correct answer is B: 32/35.

NEW QUESTION # 44

Which technique averages image frames over time to reduce noise?

- A. Demodulation
- B. Compression
- C. Time gain compensation
- D. Persistence

Answer: D

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

Persistence is a post-processing technique that averages multiple consecutive image frames to reduce random noise and improve image smoothness. This is especially useful for reducing speckle and enhancing the clarity of stationary or slow-moving structures. According to official sonography Principles and Instrumentation documentation:

"Persistence uses frame averaging, combining data from several sequential frames to reduce noise, enhance image quality, and stabilize the appearance of stationary structures."

* Demodulation (A) is part of signal processing that extracts the Doppler frequency shift.

* Compression (C) alters the dynamic range of the image but does not reduce noise through frame averaging.

* Time gain compensation (D) adjusts amplification at various depths to equalize brightness but does not perform frame averaging. Therefore, the correct answer is B: Persistence.

NEW QUESTION # 45

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