

# Examination Information (continued)

## Examination Content Outline

### 1. Principles of Ultrasound

- A. Nature of Ultrasound: Compression and Rarefaction
- B. Frequency, Wavelength, Tissue Propagation Velocity
- C. Properties of Ultrasound Waves
- D. Ultrasound/Tissue Interactions

### 2. Transducers

- A. Piezoelectric Effect
- B. Crystal Thickening and Resonance
- C. Damping
- D. Sound Beam Formation
- E. Focusing
- F. Axial and Lateral Resolution
- G. Arrays

### 3. Equipment, Infection Control, and Safety

- A. Clinical Dosimetry
- B. Biological Effects of Ultrasound
- C. Electrical and Mechanical Safety
- D. Infection Control
- E. Transesophageal Echocardiographic Probe Insertion and Manipulation
- F. Contraindications to Transesophageal Echocardiography
- G. Complications of Transesophageal Echocardiography

### 4. Imaging

- A. Instrumentation
- B. Displays
- C. Imaging Modalities
- D. Signal Processing and Related Factors

### 5. Principles of Doppler Ultrasound

- A. Doppler Effect
- B. Doppler Equation
- C. Doppler Shift Frequencies and Influencing Factors
- D. Nyquist Limit
- E. Spectral Analysis and Display Characteristics
- F. Pulsed-Wave Doppler
- G. Continuous-Wave Doppler
- H. Color Flow Doppler
- I. Color M-Mode

### 6. Quantitative M-Mode and Two-Dimensional Echocardiography

- A. Edge Recognition
- B. Temporal Resolution
- C. Global Function

### 7. Quantitative Doppler

- A. Types of Velocity Measurements
- B. Volumetric Measurements and Calculations
- C. Valve Gradients and Areas
- D. Estimation of Pressures in the Cardiac Chambers and Great Vessels

### 8. Valvular Spectral Doppler Profiles

- A. Tricuspid Valve and Right Ventricular Inflow
- B. Pulmonic Valve and Right Ventricular Outflow
- C. Mitral Valve and Left Ventricular Inflow
- D. Aortic Valve and Left Ventricular Outflow

### 9. Cardiac Chamber Anatomy

- A. Imaging Planes
- B. Cardiac Chambers and Walls
- C. Cardiac Cycle and Relation of Events Relative to ECG

### 10. Global Ventricular Systolic Function and Pathology

- A. Assessment of Left Ventricular Systolic Function
- B. Abnormal Left Ventricular Systolic Function
- C. Assessment of Right Ventricular Function
- D. Cardiomyopathies

### 11. Segmental Left Ventricular Systolic Function and Pathology

- A. Myocardial Segment Identification (17-Segment Model)
- B. Coronary Artery Distribution and Flow
- C. Normal and Abnormal Segmental Function
- D. Left Ventricular Aneurysm
- E. Left Ventricular Rupture
- F. Ventricular Septal Defect Post Myocardial Infarction
- G. Left Ventricular Pseudoaneurysm

### 12. Cardiac Valves – Anatomy and Pathology (Excludes Spectral Doppler)

- A. Tricuspid Valve
- B. Pulmonic Valve
- C. Mitral Valve
- D. Aortic Valve and Root
- E. Acquired Valve and Annular Diseases

### 13. Intracardiac Masses and Devices

- A. Intracardiac Masses
- B. Devices and Foreign Material

### 14. Pericardium and Extracardiac Structures – Anatomy and Pathology

- A. Pericardium and Pericardial Space
- B. Pulmonary Arteries
- C. Pulmonary Veins
- D. Vena Cavae and Systemic Veins
- E. Coronary Arteries
  - 1. Anatomical position of coronary ostia
  - 2. Flow patterns
  - 3. Reimplantation buttons
- F. Aorta and Great Vessels
- G. Pleural Space and Lung
- H. Other Structures

### 15. Assessment of Perioperative Events

- A. Causes of Cardiovascular Instability
- B. Cardiopulmonary Bypass, including Minimally Invasive Management
- C. Ventricular Assist Devices and Intra-aortic Balloon Pumps
- D. Transplantation Surgery (Heart, Lung, Liver)
- E. Assessment related to Coronary Surgery
- F. Assessment related to Valve Surgery
- G. Assessment related to Aortic Surgery (Aneurysm)

### 16. Congenital Heart Disease

- A. Identification of Morphologic Left and Right Structures
- B. Assessment Post Surgical Repair
- C. Atrial Septum
- D. Ventricular Septum
- E. Pulmonic Valve and Right Ventricular Outflow Tract Abnormalities
- F. Aortic Valve and Left Ventricular Outflow Tract Abnormalities
- G. Coronary Artery Anomalies
- H. Patent Ductus Arteriosus
- I. Coarctation of the Aorta
- J. Ebstein's Anomaly
- K. Persistent Left Superior Vena Cava
- L. Tetralogy of Fallot
- M. Transposition of the Great Arteries
- N. Atrioventricular Septal Defect
- O. Single Ventricular Procedures
- P. Truncus Arteriosus
- Q. Cor Triatriatum

### 17. Artifacts and Pitfalls

- A. Two-dimensional Imaging Artifacts
- B. Doppler Artifacts and Errors in Measurement
- C. Pitfalls (Normal Anatomy/Variants Mistaken for Pathology)

### 18. Related Diagnostic Modalities

- A. Epiaortic Scanning
- B. Epicardial Scanning
- C. Contrast Echocardiography
- D. Utility of TEE Relative to Other Diagnostic Modalities

### 19. Ventricular Diastolic Filling and Function

- A. Basic Principles
- B. Echocardiographic Assessment of Left Ventricular Diastolic Function
- C. Grading of Left Ventricular Diastolic Function
- D. Estimates of Left Ventricular Diastolic Filling Pressures
- E. Right Ventricular Diastolic Function

### 20. Transesophageal Echocardiography for Interventional/Hybrid Procedures

- A. Intracardiac and Extracardiac
- B. Endovascular

## Reference Statement

NBE does not endorse or recommend any third-party review course or material. Any text in cardiovascular techniques and evaluation, cardiac patient care, and management may be used. Current standards and guidelines endorsed by professional societies are also appropriate.