

CARDIOVASCULAR NURSE PRACTITIONER SUBSPECIALTY CARDIOLOGY BOARDS CERTIFICATION EXAMINATION AND PREPARATION

The American Board of Cardiovascular Medicine Subspecialty Examination in Cardiovascular Disease “The CVNP Boards.”

The function of the American Board of cardiovascular medicine (ABCM) is to enhance the quality of healthcare by maintaining standards for certifying nurse practitioners and other nurses holding masters degrees.

Beginning in 2007, the ABCM certification and recertification subspecialty examination in cardiovascular diseases will be held annually in March. The Board exams are also available through the use of regional proctors five days per week, excluding national holidays.

The CVNP Subspecialty Cardiology Boards:

This examination consists of several hundred questions answered over a one-day period. The examination includes a section of single best answer type questions, and electrocardiographic (ECG) component, and a cardiovascular imaging component. Most questions are based on the presentation of clinical vignettes into outpatient, emergency department, and in coronary care settings. The presentations are meant to stimulate real-life situations and may be very detailed.

Also included on the examination are questions on basic cardiac and vascular physiology and pharmacology. These questions are usually directly applicable to clinical management of patients, said as the mode of action of antiarrhythmic agents, cholesterol metabolism, and vascular wall biology. Disease diagnosis, pathophysiology, and patient management—rather than isolated facts about cardiology—or stressed. The indications for and potential complications associated with cardiac procedures are emphasized rather than the technical aspects of the procedures. The clinical applications lessons learned from the major cardiology trials are important. Correct management of emergency situations is frequently tested and, in many cases, is considered a core competence.

In general, a moderately conservative approach to the invasive investigations and treatments is appropriate. The guidelines of the American College of Cardiology/American Heart Association for specific cardiology investigations and treatments should be now in detail.

Candidates are expected to be able to interpret complex ECG's and pacemaker strips, hemodynamic recordings, coronary angiograms, ventriculograms, chest radiographs, and echocardiograms (including Doppler examinations).

Basic electrophysiologic recordings, including His bundle electrograms, may be tested. Basic computed tomographic scans, positron emission tomographic scans, nuclear scans, and classic endomyocardial biopsy specimens may also be shown as part of the clinical vignette.

A list of normal laboratory values is supplied with the examination. Several weeks before the examination, candidates received an information booklet that provides a detailed description of all questioned types and any new changes the Board has made in the examination format.

It is extremely important to study the ECG answer sheet supplied with a booklet, because the ABCM may change the ECG answer codes from year-to-year.

Frequently Asked Questions About the CVNP Subspecialty Boards

Is there an oral or clinical component of the examination?

No. the CVNP subspecialty boards is a comprehensive, multiple-choice, written examination. The ABCM determined that it would be logistically difficult to schedule oral or clinical examinations and that the fairness and reliability of oral examinations could not be guaranteed.

How is the Passing Grade for the CVNP Examination?

The ABCM Board members discuss the minimal acceptable knowledge base for a candidate to be competent in each area of cardiology. *These judgments are combined to derive a minimum overall passing score. The standard for passing is maintained constant between examinations by comparing the scores from similar questions in current and previous examinations.* Scores are adjusted to ensure a common examination standard regardless of the year the examination is taken.

What are Core and Non-core Questions and How Can They be Differentiated?

The nurse practitioner cardiology subspecialty boards has core and non-core components, with separate standards for each component. A candidate must pass both components to pass the examination. Generally, core questions are one's that test an important area cardiology competence or require management they frequently encountered clinical situation and are questions that a clinical cardiovascular nurse practitioner would be expected to answer correctly. Most candidates who fail the core questions also fail the non-core ones. The core questions are distributed throughout the test. It is not possible for candidates to reliably distinguish between core and non-core questions. From a practical point, candidates should concentrate on answering all questions and not try to identify likely core questions, because it only wastes time. Candidates cannot compensate for a poor score on the core questions by a good performance on the non-core questions.

Are There Negative Grades for Wrong Answers (Negative Scoring)?

In the multiple-choice section, wrong answers are not subtracted from correct ones; therefore, if you do not know the answer, guess. However, in the ECG and cardiovascular imaging sections of the examination, a negative marking system issues, and guessing answers in the sections is not advised.

Does the AMCM Provide or Endorse Any Courses or Textbooks for Candidates?

The ABCM does not participate and does not endorse any specific cardiovascular course or textbook.

What is the Question Format Used on the CVNP Subspecialty Cardiology Boards?

The question format is single best answer. Questions with double negatives and type questions (1 and 3 correct, 2 and 4 correct, etc.) are not used on the examination.

What is the Cardiovascular Imaging Component of the CVNP Subspecialty Cardiology Boards?

This component is misnamed because it uses still-frame echocardiograms, ventriculograms, and angiograms to test competence in cardiovascular imaging. This section is a source of complaint by many nurse practitioners. To prepare for this section, candidates should accustom themselves to looking at still-frame images of common cardiovascular conditions. Generally, most of the images that are shown have obvious abnormalities and have the “classic” attributes of the condition featured. The assessment of regional wall motion abnormalities from still-frame ventriculograms has been difficult in the examination.

How Are CVNP Subspecialty Cardiology Board Questions Set?

The ABCM maintains a large bank of cardiology questions that are updated regularly. Board certified cardiovascular nurse practitioners are invited to submit questions to the data bank. Submitted questions are reviewed by the ABCM for scientific accuracy, clarity of meaning, and clinical importance. There needs to be broad agreement by a panel of experts about the correctness of an answer. Before a question is included in the examination, it is reviewed both by clinicians and by ABCM examination reviewers.

What Is the Ideal CVNP Subspecialty Cardiology Board Question?

The ideal examination question should have a single scientific answer, be written in unambiguous language, be clinically important, and differentiate between stronger and weaker candidates. If the question is either obvious or too difficult, it will be rejected.

Can CVNP Subspecialty Cardiology Board Questions Be Answered by “Gaming Techniques?”

The answer is probably not. By gaming, we mean using strategies that require no medical knowledge but depend on finding clues to the answer in the question itself. One of the assignments and the ABCM examination reviewers is to eliminate any non-medical clues to the correct answer.

What Are the “Lethal” Errors That May Befall CVNP Subspecialty Cardiology Board Candidates?

Lethal errors include “time errors,” when a candidate does not complete a significant portion of the examination, and “out-of-sequence errors,” in which a candidate mismatches the question number and the answer number. This usually occurs when a candidate skips from question to question. All questions should be answered sequentially to avoid the possibility of out-of-sequence errors. In general, there is a mild time pressure on the CVNP Subspecialty Boards: it is perilous to ignore the time factor.

Should Unknown Questions Be Guessed Immediately or Left Until Last?

Candidates many strategies and examinations, and there is no best option. If questions are left to be answered at the end of the examination, no more than 10% should remain for the last round.

Are All Questions Graded Equally?

The scheme the ABCM is confidential, but the principle of equal grades for equal question time applies.

Are All Questions Graded?

The performance of individual questions as well as candidate performance is assessed why the ABCM. A question with a very high number of correct answers or incorrect answers may be discarded after the examination and not graded. A question with a high dispersion score (i.e., all possible answers are selected in nearly equal amounts) may suggest that candidates are guessing the answer to the question. The correlation between the overall performance of candidates and their performance on a specific question is examined. If candidates with high overall scores consistently failed to answer correctly a specific question, it suggests that the question is worded unfairly or ambiguously.

How Should Ethical Questions Be Answered?

Frequently, candidates think ethical questions are ambiguous and difficult to answer. The ABCM does not endorse the ethical standards of a particular culture or religion but asks questions that require knowledge of acceptable standards of ethical behavior. Important areas for ethical questions are decisions about resuscitation, withdrawal of life support, and consent for

clinical trials. Generally the answer that respects the independence of a competent patients is usually correct.

How Should Long Questions Be Answered?

Long questions may be more than one page in length take up to five minutes to read. Long questions usually encompass the patient's history, physical examination findings, and results of numerous investigations. These questions are meant to evaluate a candidate's ability to find the "needle in the haystack."

A strategy for long questions is to read the last paragraph of the question and the possible answer choices. This may obviate reading the question and its entirety and save time. If the rest of the question is not obvious at this stage, the entire question must be read. Frequently, the heart of the question is in the last paragraph. Watch for clinical use to the cardiac diagnosis.

What Procedural Skills Are Required for CVNP Subspecialty Boards?

The following procedural skills are required for CVNP Subspecialty Board certification: advanced cardiac life support (ACLS), including cardioversion; ECG, including ambulatory monitoring, and exercise testing; echocardiography; insertion of arterial catheters; and catheterization of the right side of the heart, including insertion and management of temporary pacemakers.

What Information Does the ABCM Provide to CVNP Fellowship Program Directors?

The ABCM forwards the individual pass/fail results to the program Director of the candidates taking the examination for the first time. A report of the complete examination score is provided to the program Director if the candidate authorizes it.

What Is CVNP Board Recertification?

The requirements for recertification are:

1. maintaining a valid unrestricted nurse practitioner license
2. initial certification in cardiovascular nursing by an ABCM approved certification body
3. verification of clinical competence
4. successful performance on the mini evaluation

Recertification of the CVNP Subspecialty Boards does not require recertification in cardiovascular nursing. There are three steps for recertification:

1. assessment of clinical competence by local peer group
2. 50 CE credit hours obtained over three years
3. mini examination every three years with updates in cardiology

The self-evaluation process is an at-home, open-book self-evaluation examination. Each module comprises 60 questions that emphasize problem-solving rather than knowledge recall.

Candidates are required to take and pass a minimum of three modules in cardiology, one module in general internal medicine, and one elective module. The board requires peer assessment of clinical performance at the local level for recertification. Diplomats need a valid and unrestricted license and a current basic life-saving or advanced cardiac life-Board certificate. The last step in the recertification program is a one-day, supervised, multiple-choice examination to be administered every three years. This examination will contain any new updates in cardiology over the past three years. In addition diplomats will need to maintain 50 continuing education hours of credit and cardiovascular topics every three years that must be submitted with the application for recertification.

Cardiovascular Nurse Practitioner Subspecialty Cardiology Boards

Topics Covered in the Boards:

Physical Examination:

General Appearance

Palpation of Precordium

- Apex, Lower Sternum
- Left Upper Sternum
- Right Upper Sternum

Jugular Veins

- Hepatojugular Reflux Sign

Arterial Pulse

- Carotid Pulse
- Femoral Pulse

Heart Sounds

- First Heart Sound (S1)
 - Factors influencing the intensity of S1
- Systolic Ejection Sounds (Clicks)
- Mid-Late Nonejection Clicks (Systolic Clicks)
- Second Heart Sounds
 - Splitting of S2
 - Paradoxical Splitting of S2
 - Intensity of S2
- Opening Snap
- Third Heart Sound (S3)
- Fourth Heart Sound (S4)

Cardiac Murmurs

- Systolic Murmurs
- Innocent Systolic Murmurs
- Diastolic Murmurs
 - Aortic Regurgitation (AR)
 - Austin Flint Murmur
 - Pulmonary Regurgitation
 - Mitral Stenosis
 - Tricuspid Stenosis
 - Mid-Diastolic Flow Murmurs
 - Continuous Murmurs
- Bedside Physiologic Maneuvers to Differentiate Different Types of Murmurs
- Miscellaneous sounds

Cardiovascular Reflexes and Humoral Control of Circulation

Cardiovascular Reflexes

Local and Circulating Humoral Systems

Vasodilatory, Natriuretic, and Antimitogenic Systems

Natriuretic Peptides

Endothelium-Derived Relaxing Factor (Nitric Oxide)

Vasoconstrictor, Antinatriuretic, and Mitogenic Systems

Renin-Angiotensin-Aldosterone System

Endothelin

Left Ventricular Systolic Function

Cellular Aspects of LV Contraction

Microanatomy

Excitation and Contraction Coupling

Mechanisms of Contraction

Determinants of Contraction of the Intact LV

Wall Stress, Preload, Afterload, and Contractility

Factors Affecting LV Systolic Performance

Physiologic Measures of LV Systolic Function

Ejection Fraction

Contractility

Myocardial Relaxation

Ventricular Compliance

Left Ventricular Diastolic Function

Hemodynamic Phases of Diastole

LV Diastolic Properties

LV Relaxation

LV Passive Diastolic Properties

Measuring LV Diastolic Properties

LV Relaxation

LV Passive Properties

LV Diastolic Properties in Cardiac Disease States

Relationship of LV Systolic and Diastolic Function

LV Diastolic Filling Pressures

LV Filling Patterns

At Rest and With Exercise and Aging

Filling Patterns in Disease States

Noninvasive Evaluation of LV Diastolic Function

Therapy for Diastolic Dysfunction

Cardiac Cellular Electrophysiology

The Action Potential

Mechanisms of Arrhythmias

Disorders of Impulse Formation

Normal Automaticity

Abnormal Automaticity

Triggered Activity/Afterdepolarizations

Arrhythmias Related to Abnormal Impulse Conduction

Two or More Functional Pathways for Conduction

Unidirectional Block in One Pathway

Slow Conduction Down the Second Pathway

Abnormal Impulse Formation and Conduction

Basic Electrophysiology and Pharmacology

Pathophysiology of Atherosclerosis and the Endothelium

Prevalence of Coronary Artery Disease

Arterial Wall Structure

Elastic Arteries

Muscular Arteries

Endothelium

Intima

Media

Adventitia

The Atherosclerotic Plaque

Fatty Streak

Late Atherosclerotic Plaque

Platelets

Macrophages

Lipids and Atherosclerosis

LDL

Lp(a) Lipoprotein

HDL

Regression of Coronary Atherosclerosis

Acute Coronary Syndromes

Unstable Angina

Non-Q-Wave Myocardial Infarction

Q-Wave Myocardial Infarction

Hyperlipidemia

Cholesterol and Coronary Artery Disease

Treatment Strategies and Goals for Therapy

Primary Prevention

Secondary Prevention

Familial Hyperlipidemia

Lp(a)

Homocystinuria

Regression of Atherosclerosis

Antioxidant Therapy

Lipid-Lowering Agents

Resins and Bile Acid-Binding Sequestrants

Niacin

Gemfibrozil

Probucol

Statins

Combination Therapy

Side Effects/Drug Interactions

Platelet Inhibitors and Thrombolytics

Arterial Thrombosis

Platelet Adhesion

Coagulation-Factor Activation

Coagulation Amplification

Thrombus Propagation

Thrombus Maturation

Tissue Factor Pathway Inhibitor

Protein C

ATIII

Fibrinolysis

Plasminogen-Activator Inhibitor

Risk Factors for Arterial Thrombosis

Homocysteine

Lp(a)

Hemostatic Factors and Coronary Artery Disease

Treatment

Antiplatelet Agents

Thrombin Inhibitors

Low-Molecular-Weight Heparin

GPIIb/IIIa Inhibitors

Integrelin

Fibrinolytic Agents

Anisoylated Plasminogen Streptokinase Activator Complex

Staphylokinase

Complications of Thrombolysis

Essentials of Interventional cardiology

Mechanism of Coronary Angioplasty (PTCA)

Complications of Coronary Angioplasty

- Abrupt Vessel Closure
- Restenosis Following PTCA
- Internal Mammary Artery

Interventional Devices

- Atherectomy
 - Directional Coronary Atherectomy
 - TEC (Transluminal Extraction Atherectomy)
 - Rotoblator (Rotational Atherectomy)
- Excimer Laser Coronary Angioplasty (ELCA)
- Intracoronary Stents
 - Major Randomized Stent Studies
 - Stents and Anticoagulation

Unstable Angina

Pathophysiology

Natural History

Definition of Unstable Angina

Evaluation of Unstable Angina

Physical Examination of Unstable Angina

The ECG During Unstable Angina

Initial Risk Stratification

Initial Laboratory Testing

Initial Medical Treatment

Cardiac Catheterization and Myocardial Revascularization

Patient Counseling and Risk Factor Modification

STEMI, NSTEMI, And Unstable Angina

Acute Coronary Syndromes

- Unstable Angina
- Stable Angina

Coronary Angioplasty in MI

Primary Angioplasty

Advantages

Disadvantages

Thrombolysis

Contributions of Primary PTCA

Primary Angioplasty Trials

Management of Specific Myocardial Infarction Scenarios

Distant or Remote Geographic Location

Hypertension

Prior Coronary Artery Bypass Grafting (CABG)

ST Depression Myocardial Infarction

Left Bundle Branch Block

Stroke

Elderly Patients

Coronary Angioplasty in Cardiogenic Shock

RESCUE Angioplasty

RESCUE Trial

CORAMI Study

Elective Angioplasty Following Thrombolytic Therapy for Myocardial Infarction

Management of Acute Myocardial Infarction

Risk Stratification

Determinants of Mortality After Infarction

A Practical Approach to Risk Stratification After Infarction

Mechanical and Conduction Complications of Myocardial Infarction

Right Ventricular Infarction

Diagnosis

Management

Rupture of the Ventricular Free Wall

Rupture of the Ventricular Septum

Acute Mitral Regurgitation

Heart Block

First Degree Heart Block

Second-Degree Heart Block Type I (Wenckebach)

Second –Degree Heart Block Type II (Mobitz II)

Second-Degree Heart Block Type III, Left Bundle Branch Block and Complete AV Block

Atherosclerosis and the Endothelium

Pathogenesis of Atherosclerosis

Role of Endothelium in Regulation of Vascular Tone

Endothelin

Atherosclerotic Vascular Disease

Ischemic Syndromes

Coronary Flow Reserve

Endothelium-Dependent Mechanism

Endothelium-Independent Mechanisms of Coronary Vasodilatation

Assessing the Severity of Coronary Artery Stenosis

Coronary Artery Physiology

Normal Physiology

Myocardial Oxygen Consumption

Coronary Blood Flow

Autoregulation of Coronary Blood Flow

Coronary Flow Reserve

Endothelial Function

Altered Coronary Physiology

Obstructive Coronary Disease

Nonobstructive Coronary Artery Disease

Endothelial Dysfunction

Overload States

Intravascular Ultrasonography

Catheter Technology

Image Recognition on Intravascular Ultrasonography

Clinical Utility of Intravascular Ultrasonography

Intracoronary Doppler

Doppler Technology

Indications for Coronary Intravascular Doppler Studies

Intermediate Coronary Stenosis

Diastolic-to-Systolic Velocity Ratio

Proximal-to-Distal Velocity Ratio

Coronary Flow Reserve

Chest Pain and Normal Coronary Arteries

Intracoronary Pressure Measurements

Pressure Guidewires

Fractional Flow Reserve

Clinical Studies

Anatomy of the Heart and Great Vessels

Mediastinum

Pericardium

Great Veins

Cardiac Chambers

Right Atrium

Left Atrium

Comparison of Atria

Right Ventricle

Left Ventricle

Comparison of Ventricles

Myocyte Response to Injury

Cardiac Valves

Atrioventricular Valves

Tricuspid Valve

Mitral Valve

Semilunar Valves

Pulmonary Valve

Aortic Valve

Fibrous Cardiac Skeleton

Great Arteries

Pulmonary Arteries

Aorta

Coronary Circulation

Coronary Veins

Cardiac Lymphatics

Cardiac Conduction System

Sinus Node

Internodal Tracts

Atrioventricular Node

Atrioventricular Bundle

Bundle Branches

Cardiac Innervation

Cardiac Radiology

Cardiac Silhouette/Chambers

- Posteroanterior (PA) Projection
- Lateral Projection
- Heart Size
- Generalized Enlargement
- Left Atrial Enlargement
- Left Ventricular Enlargement
- Right Atrial Enlargement
- Right Ventricular Enlargement

Pulmonary Vasculature

- Normal Pulmonary Blood Flow
- Increased Pulmonary Flow
- Decreased Pulmonary Flow
- Increased Resistance to Pulmonary Flow
- Pulmonary Venous Hypertension
- Pulmonary Arterial Hypertension

Pericardial Disease

- Pericardial Effusion
- Pericardial Calcification
- Pericardial Defects

Cardiac Masses

Aortic Disease

Echocardiography

Transthoracic Echocardiography

Transesophageal Echocardiography

Stress Echocardiography

Assessment of Ventricular Function (Systolic, Diastolic, Global, and Regional)

Hemodynamic Assessment

Evaluation of Specific Disorders

Aortic Stenosis

Mitral Stenosis

Aortic Regurgitation

Mitral Regurgitation

Prosthetic Valves

Chest Pain/Acute Myocardial Infarction

Hypertrophic Cardiomyopathy

Infectious Endocarditis

Pericardial Disease

The Thoracic Aorta

Sources of Embolus

Intraoperative Echocardiography

Nuclear Cardiology and Stress Testing

Basics of Radionuclide Imaging

Isotopes and Detector Equipment

Photon Detection (Imaging Chain)

Imaging Equipment

Imaging Techniques

Radionuclide Angiography

²⁰¹Tl and Sestamibi Imaging

Thallium-201

⁹⁹Tc (Sestamibi)

Positron Emission Tomography

Stress Techniques

Infarct Pyrophosphate Imaging

Sensitivity and Specificity of Nuclear Cardiac Imaging

Prognosis in Coronary Artery Disease

Imaging Variables

Radionuclide Angiography

Myocardial Perfusion Imaging

Clinical Disease Entities

Myocardial Infarction

Unstable Angina

Chronic Ischemic Disease

Preoperative Risk Assessment

Assessment of Cardiac Risk and Prognosis

Assessment of Myocardial Viability

Other Conditions

Hypertrophic Cardiomyopathy

Restrictive Cardiomyopathies

Congenital Heart Disease in Adults

Post-Transplant Cardiac Disease

Valvular Heart Disease

Magnetic Resonance Imaging, Computed Tomography, and Positron Emission Computed Tomography of the Heart and Great Vessels

Magnetic Resonance Imaging

Basic Principles of MRI

Technique of MRI

Application of MRI

Limitation of MRI

X-Ray Computed Tomography

Method of CT Scanning

Applications of CT Imaging

Limitations of CT Scanning

Positron Emission Computed Tomography

Method of PET Scanning

Instrumentation of PET Scanning

Applications of PET Scanning

Cardiac Catheterization: Hemodynamics

Cardiac Output

- Fick Method
- Indicator Dilution Method
- Doppler Cardiac Output

Pressure and Resistance

- Pressures
- Resistance

Intracardiac Shunts

- Two Methods of Intracardiac Shunt Detection
- Saturations-Left-to-Right
- Dye Curves-Left-to-Right
- Evaluation of Arterial Desaturation

Stenotic Valvular Lesions

- Hemodynamic Assessment of Mitral Stenosis
- Hemodynamic Assessment of Aortic Stenosis

Regurgitant Valvular Lesions

- Injections of Contrast Media
- Regurgitant Fractions

Diagnostic Coronary Angiography

Coronary Angiography

- Indications for Coronary Angiography
- Contraindications to Coronary Angiography
- Vascular Access for Angiography
- Risks of Coronary Angiography
- Arrhythmias During Angiography
- Rare Complications (Less Than 1% of Patients)
- Contrast Reactions
- Renal Failure After Angiography
- Protamine Reactions
- Precatheterization Evaluation
- Cannulation of the Coronary Arteries
- Contrast Agents
- Coronary Artery Anomalies
 - Begin Coronary Artery Anomalies
 - Clinically Significant Anomalies
 - Coronary Fistula
- Angiographic Veins
- Coronary Artery Lesions
- Limitations of Coronary Angiography
- Special Interventions

Left Ventriculography

- Technique
- Indications for Ventriculography
- Contraindications to Ventriculography
- Assessment of Ejection Fraction and Wall Motion

Peripheral Vascular Disease

Peripheral Arterial Occlusive Disease

- Clinical Features of Peripheral Vascular Disease
- Natural History of Peripheral Vascular Disease
- Diagnosis of Peripheral Vascular Disease
- Treatment of Peripheral Vascular Disease

Cardiac Risk and Vascular Surgery

Carotid Artery Disease

Cerebral Embolism

Spontaneous Dissection of Cephalic Arteries

Acute Arterial Occlusion

Aneurysmal Disease

- Thoracic Aortic Aneurysms
- Abdominal Aortic Aneurysm

Aortic Dissection

- Etiology
- Classification
- Clinical Features
- Laboratory Tests
- Diagnosis
- Treatment

Penetrating Aortic Ulcer

Incomplete Aortic Rupture

Uncommon Type of Occlusive Arterial Disease

- Thromboangiitis Obliterans (Buerger's Disease)
- Popliteal Artery Entrapment
- Thoracic Outlet Compression Syndrome
- Heparin Induced Thrombocytopenia
- Vasospastic Disorders
- Raynaud's Phenomenon
- Livedo Reticularis
- Chronic Pernio
- Erythromelalgia

Edema

Lymphedema

Venous Disease

Leg Ulcer

Hypertension

Definition

Classification and Staging

Epidemiology

Diagnosis

Evaluation

Treatment

Special Concerns and Situations

The J-Curve Hypothesis

Resistant Hypertension

Left Ventricular Hypertrophy in Hypertension

Hypertensive Urgencies and Emergencies

Detection, Evaluation, and Treatment of Selected Secondary Hypertension

Renovascular Hypertension

Primary Aldosteronism

Pheochromocytoma

Congenital Heart Disease

Atrial Septal Defect

- Secundum ASD
 - Physical Examination
 - Electrocardiography
 - Chest Radiography
 - Diagnosis and Management
- Primum ASD
 - Electrocardiography
 - Diagnosis
 - Management
- Sinus Venous ASD
 - Diagnosis

Ventricular Septal Defect

Patent Ductus Arteriosus

- Physical Examination
- Therapy
- Differential Diagnosis

Pulmonary Stenosis

- Physical Examination
- Electrocardiography
- Chest Radiography
- Diagnosis and Management

Coarctation of the Aorta

- Physical Examination
- Electrocardiography
- Chest Radiography
- Complications
- Diagnosis
- Treatment

Ebstein's Anomaly

- Physical Examination
- Chest Radiography
- Electrocardiography
- Diagnosis and Management
- Surgical Repair

Cyanotic Heart Disease

- Eisenmenger's Syndrome
 - Physical Examination
 - Electrocardiography
 - Chest Radiography
 - Diagnosis

Tetralogy of Fallot

Physical Examination
Chest Radiography
Electrocardiography
Diagnosis and Management

Other Causes of Cyanosis

Pulmonary Atresia With Ventricular Septal Defect
Transposition of the Great Arteries
Tricuspid Atresia
Single Ventricle
Truncus Arteriosus
Total Anomalous Pulmonary Venous Drainage
Corrected Transposition With Ventricular Septal Defect and Pulmonary Stenosis
Electrocardiography
Chest Radiography
Surgical Treatment

Syndromes Associated With Congenital Heart Disease

The Electrocardiogram in ASD

AHA Recommendations for Endocarditis Prophylaxis

Cardiomyopathies

Prevalence of Cardiomyopathy

Characteristic Features of Cardiomyopathies

Dilated Cardiomyopathy

Etiology of Dilated Cardiomyopathy
Hypertrophic Cardiomyopathy
Pathophysiology of Hypertrophic Cardiomyopathy
Clinical Presentations of Hypertrophic Cardiomyopathy
Physical Examination in Hypertrophic Cardiomyopathy
Echocardiography in Hypertrophic Cardiomyopathy
Diagnostic Dysfunction in Hypertrophic Cardiomyopathy
Diseases That Imitate Hypertrophic Cardiomyopathy
Natural History of Hypertrophic Cardiomyopathy
Management of Hypertrophic Cardiomyopathy

Restrictive Cardiomyopathy

Definition and Etiology
Clinical Presentation of Restrictive Cardiomyopathy
Physical Examination in Restrictive Cardiomyopathy
Echocardiography in Restrictive Cardiomyopathy
Treatment of Restrictive Cardiomyopathy

Pericardial Disease

Function of Pericardium

Congenital Absence of the Pericardium

Pericardial Cyst

Acute Pericarditis

Electrocardiography in Acute Pericarditis

Treatment of Acute Pericarditis

Transient Constrictive Phase of Acute Pericarditis

Pericardial Effusion/Tamponade

Hemodynamics of Pericardial Tamponade

Pulsus Paradoxus

Echocardiographic Diagnosis of Pericardial Effusion/Tamponade

Treatment of Cardiac Tamponade

Pericardial Effusion Due to Malignancy

Pericarditis in Acute Myocardial Infarction

Tamponade Related to Aortic Dissection

Constrictive Pericarditis

Pericardial Calcification

Echocardiography in Constrictive Pericarditis

Pericardial Thickness in Constrictive Pericarditis

Hemodynamic Findings in Constrictive Pericarditis

Restriction Versus Constriction

Infiltrative Cardiomyopathy

Noninfiltrative Restrictive Cardiomyopathy

Respiratory Variation in Ventricular Filling

Diagnostic Strategy to Differentiate Restrictive Cardiomyopathy From
Constrictive Pericarditis

Pregnancy and the Heart

Physiology

- Normal Pregnancy
- Labor and Delivery
- Postpartum

Cardiac Disease in Pregnancy

- Management
- Prognosis
- Congenital Heart Disease in Pregnancy
- Peripartum Cardiomyopathy

Cardiac Contraindications to Pregnancy

Cardiovascular Drugs in Pregnancy

- Pharmacologic Management of Arrhythmias During Pregnancy
- Pharmacologic Management of Heart Failure During Pregnancy
- Anticoagulants
- Endocarditis Prophylaxis

Contraception

Noncardiac Surgery

Impact of Coronary Artery Disease

Preoperative Cardiac Risk Indices

Nonvascular Versus Vascular Surgery

Valvular Heart Disease

Hypertrophic Obstructive Cardiomyopathy

Preoperative Cardiovascular Functional Assessment

Preoperative Functional Assessment of Patients Unable to Exercise

Clinical Approach to Preoperative Assessment and Management

Preoperative Hemodynamic Assessment and Intraoperative Hemodynamic Monitoring

Assessment of Preoperative Medications

Arrhythmias and Conduction Disturbances

Approach to Patients Requiring Chronic Oral Anticoagulation

Electrocardiography

General Features

- Normal ECG
- Borderline Normal ECG or Normal Variant
- Incorrect Electrode Placement
- Artifact

Sinus Rhythms

- Sinus Rhythm
- Sinus Arrhythmia
- Sinus Bradycardia
- Sinus Tachycardia
- Sinus Arrhythmia
- Sinus Pause or Arrest
- Sino-Atrial Block
- Sick Sinus Syndrome

Atrial Rhythms

- Ectopic Atrial Rhythm
- Wandering Atrial Pacemaker
- Atrial Premature Beats Conducted Normally
- Atrial Premature Beats Conducted With Aberration
- Atrial Premature Beats Non-Conducted
- Atrial Tachycardia
- Multi-Focal Atrial Tachycardia
- Atrial Flutter
- Atrial Fibrillation

Junctional Rhythms

- Junctional Escape Beats
- Junctional Premature Beats
- Junctional Rhythm
- Accelerated Junctional Rhythm
- Junctional Tachycardia

Ventricular Rhythms

- Ventricular Escape Beats
- Ventricular Premature Beats
- Multiform Ventricular Beats
- Ventricular Rhythm
- Parasystole
- Accelerated Idio-Ventricular Rhythm
- Ventricular Tachycardia
- Ventricular Fibrillation

Atrioventricular Interactions in Arrhythmias

- Fusion Beats
- Reciprocal (echo) Beats
- Ventricular Capture Beats
- AV Dissociation

AV Conduction Abnormalities

- First Degree AV Block
- Second Degree AV Block Type I (Wenckebach or Mobitz I)
- Second Degree AV Block Type II (Mobitz II)
- High Grade AV Block
- Complete AV Block

Congenital Conduction Anomalies

- Wolff-Parkinson-White Syndrome (WPW)
- Lown-Ganong-Levine Syndrome (LGL)

Intraventricular Conduction Disturbances

- Right Bundle Branch Block
- Incomplete Right Bundle Branch Block
- Left Bundle Branch Block
- Left Anterior Hemiblock
- Left Posterior Hemiblock
- Intermittent (Rate Dependent) Bundle Branch Block
- Right Bundle Branch Block and Combined Anterior Hemiblock
- Right Bundle Branch Block and Combined Posterior Hemiblock
- SVT with Bundle Branch Aberration (Left, Right, and Hemiblock)
- Identifying Ischemia or Injury in Bundle Branch Block
- Clinical Importance of Bundle Branch Blocks and Hemiblocks

P-Wave Abnormalities

- Right Atrial Abnormality
- Left Atrial Abnormality
- Nonspecific Atrial Abnormality

QRS Abnormalities

- Normal QRS Morphology in the 12-Lead ECG
- Abnormal QRS Morphology
 - Low Voltage
 - Increased Voltage
 - Wide-QRS

Axis Deviations

- Normal P, QRS, and T Wave Axis
- Left Axis
- Right Axis
- No-Man's Land or Northwest Axis
- Causes of Abnormal Axis Shifts
- Clinical Importance of Axis Deviations

Ventricular Hypertrophy

- Left Ventricular Hypertrophy
- Right Ventricular Hypertrophy
- Diastolic Overload
- Systolic Overload
- Combined Ventricular Hypertrophy
- Combined Atrial and Ventricular Hypertrophy

Transmural Myocardial Myocardial Infarction

- Anterolateral
- Anterior
- Anteroseptal
- Septal
- Lateral
- Inferior
- Inferolateral
- Inferior and Right Ventricular
- Posterior
- Inferoposterior

ST, T, and U Wave Abnormalities

Normal ST Segments

Abnormal ST Segments

ST Depression

ST Elevation

Down-Sloping ST-T

Up-Sloping ST-T

ST-T in Conduction Disturbances

ST-T in Ventricular Hypertrophy

ST-T in Arrhythmias

ST-T in Electrolyte Disturbances

ST-T in Pacemaker Rhythms

Normal Variants

Early Repolarization

Juvenile T Waves

Non-Specific ST-T Wave Abnormality ST-T Abnormalities in Myocardial Ischemia and Infarction

ST-T Suggestive of Acute Pericarditis

Normal T Waves

Abnormal T Waves

Low Voltage

Increased Voltage

T Waves in Conduction Disturbances

T Waves in Ventricular Hypertrophy

T Waves in Arrhythmias

T Waves in Myocardial Ischemia and Injury

T Waves in Electrolyte Disturbances

T Waves in Pacemaker Rhythms

Post Extrasystolic T Wave Changes

Prolonged QT Interval

Normal U-Waves

Abnormal U-Waves

U-Waves in Hypokalemia

U-Waves in Myocardial Ischemia

Pacemaker Function and Rhythm

- Atrial and Coronary Sinus Pacing
- Ventricular Demand Pacing
- AV Sequential Pacing
- Fixed Rate Pacing
- Dual Chambered Pacing
 - Normal Function
 - Abnormal Function
- Hysteresis in Pacing
- Troubleshooting Pacemaker Function

Suggested or Probable Clinical Disorders

- Digitalis Effect and Toxicity
- Antiarrhythmic Drug Effects and Toxicity
- Secundum Atrial Septal Defect
- Primum Atrial Septal Defect
- Dextrocardia
- Mitral Valve Disease
- Chronic Lung Disease
- Acute Cor Pulmonale
- Pulmonary Embolus
- Pericardial Effusion
- Acute Pericarditis
- Hypertrophic Cardiomyopathy
- Coronary Artery Disease
- Central Nervous System Disorder
- Myxedema
- Hypothermia

Supraventricular Tachycardia: ECG, Diagnosis, and Management

Atrial Fibrillation

- Stroke Prevention
- Control of Ventricular Response
- Prevention of Recurrent
 - Nonpharmacologic Approaches
 - Catheter Ablation Techniques
 - Surgical Procedures

Atrial Flutter

Multifocal Atrial Tachycardia

Short RP Tachycardias

- AV Nodal Reentrant Tachycardia
 - Esophageal Recordings

AV Reentrant Tachycardia

- Esophageal Recordings

Nonparoxysmal Junctional Tachycardia

Long RP Tachycardias

- Sinus Tachycardia
- Sinus Node Reentrant Tachycardia

Atrial Tachycardia

- Permanent Junctional Reciprocating Tachycardia**
- Unusual Form of AV Nodal Reentrant Tachycardia**
- Atypical AV Reentrant Tachycardia**

Ventricular Tachycardia

Wide-QRS Complex Tachycardia: Differential Diagnosis

Ventricular Tachycardia

- Coronary Artery Disease
- Dilated Cardiomyopathy
- Hypertrophic Cardiomyopathy
- Arrhythmogenic Right Ventricular Dysplasia
- Ventricular Tachycardia in Patients With a Normal Heart

Long QT Syndrome and Polymorphic Ventricular Tachycardia

Indications for Electrophysiologic Testing

Technical Aspects

- Catheters
- Definition of EP Conduction Times
- Indications for EP Testing
 - Ventricular Tachycardia/Cardiac Arrest
 - Syncope
 - Wide-QRS Tachycardias
 - Implantable Cardioverter Defibrillator Testing
 - Radio-Frequency Catheter Ablation
 - Second Degree AV Block Type II or Higher
 - Hypertrophic Cardiomyopathy
 - Unestablished Indications
- Indication for Head-Up Tilt Test
- Complications of Electrophysiology Study

Cardiac Electrophysiology

The Heart's Electrical System

- Histology
- Intra-Atrial Pathways
- His-Purkinje System

Tissue Electrophysiologic Properties

- Fast Action Potentials
- Slow Action Potentials
- Tissue Refractoriness
- Tissue Innervation

Normal Rhythm Generation

Abnormal Rhythm Generation

Arrhythmias Related to Abnormal Impulse Conduction

- AV Conduction
- Reentry: General Considerations
- Clinically Occurring Reentrant Arrhythmias

Pacemakers

Indications for Permanent Pacing

- Class I
- Class II
- Class III

Acute Myocardial Infarction

- Inferior Myocardial Infarction
- Anterior Myocardial Infarction

Pacing Modes and Nomenclature

Pacemaker Syndrome

Permanent Pacing Leads

Troubleshooting

- Lead Abnormalities
- Crosstalk
- Pacemaker-Mediated Tachycardia

Miscellaneous Considerations

- Electromagnetic Interference (EMI) in the Hospital Environment
- EMI in the Non-Hospital Environment

Future Indications for Pacing

Temporary Pacing

Implantable Cardioverter-Defibrillators

Cardioversion-Defibrillation Plus Bradycardia Pacing

Antitachycardia Defibrillators

Indications for Placement of ICDs

Nonthoracotomy Lead Systems

Shock Waveforms

Size

Diagnostic Features

Complications of ICDs

Efficacy of ICDs

Contraindications and Warnings

Clinical Trials Involving ICDs

MADIT

MUSTT

AVID

CIDS

CASH

SCD-HeFT

CABG-Patch

Antiarrhythmic Drugs

Drug Classifications

Proarrhythmia

Drug Considerations for Each of the Following Agents

Hemodynamics

Drug Interactions

Side Effects

Proarrhythmia

Quinidine (Class IA)

Procainamide (Class IA)

Disopyramide (Class IA)

Lidocaine (Class IB)

Mexiletine (Class IB)

Tocainide (Class IB)

Phenytoin (Class IB)

Moricizine (Class IC)

Flecainide (Class IC)

Propafenone (Beta-Adrenergic Antagonists and Beta-Blocker Properties)

Amiodarone (Class III) – IV Administration

Sotalol (Class III)

Bretylum (Class III)

ibutilide (Class III)

Adenosine (Unclassified)

Valvular Stenosis

Aortic Stenosis

Definition and Cause

Subvalvular Aortic Stenosis

Supravalvular Aortic Stenosis

Clinical Presentation

Laboratory Tests

Electrocardiography

Radiology

Echocardiography

Natural History and Treatment

Controversial Issues

Asymptomatic Patients With Severe Aortic Stenosis

Definition of “Severe” Aortic Stenosis

Low-Output/Low-Gradient Aortic Stenosis

Mitral Stenosis

Definition and Cause

Pathophysiology

Clinical Presentation

Testing Modalities

Natural History

Treatment

Valvular Regurgitation

Mitral Regurgitation

Anatomy

Alteration of Mitral Leaflets, Commissures, or Annulus

Defective Tensor Apparatus

Alterations of Left Ventricular and Left Atrial Size and Function

Pathophysiology

Acute Stage

Chronic Compensated Stage

Chronic De-compensated Stage

Clinical Syndrome

Acute

Chronic

Evaluation

Natural History

Treatment

Aortic Regurgitation

Anatomy

Intrinsic Valvular Disease

Diseases of the Ascending Aorta

Pathophysiology

Clinical Syndrome

Evaluation

Natural History

Treatment

Tricuspid Regurgitation

Anatomy and Physiology

Right Ventricular, Right Atrial, and Tricuspid Annular Dilation

Abnormal Tricuspid Valve Leaflets, Chordae, and Papillary Muscles

Pathophysiology

Clinical Syndrome

Evaluation

Natural History

Treatment

Pulmonary Regurgitation

Etiology

Pathophysiology

Clinical Syndrome

Evaluation

Treatment

Infections of the Heart

Native Valve Infectious Endocarditis

- Pathogenesis
- Pathologic Changes
- Renal Complications of Infectious Endocarditis
- Mycotic Aneurysms
- Clinical Manifestations
 - Peripheral Lesions in Endocarditis
 - Emboic Events
 - Neurologic Complications
- Infectious Endocarditis in Intravenous Drug Users
- Laboratory Findings in Infectious Endocarditis
 - Blood Culture
 - Echocardiography
- Diagnostic Criteria
- Microbiology
 - Streptococcal Endocarditis
 - Staphylococcal Endocarditis
 - Gram-Negative Endocarditis
- Cardiac Surgery in Infectious Endocarditis

Prosthetic Valve Endocarditis

- Pathogenesis of Prosthetic Valve Endocarditis
- Valve-Ring Abscess
- Clinical Manifestations of Prosthetic Valve Endocarditis
- Laboratory Findings in Prosthetic Valve Endocarditis
- Diagnostic Criteria
- Microbiology
- Treatment

Prophylaxis of Infectious Endocarditis

Pacemaker Infections

Chagas' Disease

Heart Involvement in Patients With Human Immunodeficiency Virus Infections (HIV)

- Myocardial Involvement at Autopsy
- Pericardial Involvement at Autopsy
- Endocardial Involvement at Autopsy
- Clinical Manifestations
- Pathogenesis

Prosthetic Heart Valves

Valve Types

Valve Selection

Homografts

Complications

Thromboembolism

Prosthetic Valve Endocarditis

Diagnosis of Prosthetic Valve Dysfunction

History

Physical Examination

Radiography

Echocardiography

Aortic Prosthesis

Effective Orifice Area of Prosthetic Valve

Pitfalls of Echocardiographic Assessment of Prosthetic Heart Valves

Assessment of Prosthetic Aortic Valve

Assessment of Prosthetic Mitral and Tricuspid Valves

Laboratory Tests and Hemolysis

Invasive Hemodynamics

Therapy

Heart Failure

Acute Heart Failure

Initial Evaluation of Acute Pulmonary Edema

Initial Evaluation of Cardiogenic Shock

Acute Decompensation of Chronic Heart Failure

Chronic Heart Failure

Congestive Heart Failure

Diastolic Heart Failure

Asymptomatic Left Ventricular Dysfunction

Epidemiology

Heart Failure with Normal Systolic Function

Systolic Ventricular Dysfunction

Diastolic Ventricular Dysfunction

Prognosis of Heart Failure

Clinical Presentation of Heart Failure

Evaluation of Heart Failure

Nonpharmacologic Therapy

Dietary Restrictions

Activity Guidelines

Routine Laboratory Evaluation for Heart Failure or Systolic Dysfunction

Functional Classifications for Heart Failure Based on Vo2max

Physical Findings in Heart Failure

Symptoms of Heart Failure

Framingham Criteria for Diagnosis of Heart Failure

New York Heart Association Functional Classifications for Heart Failure

Medical and Surgical Therapy for Circulatory Failure, Including Transplant and Myoplasty

Medical Therapy

- Approach to Patients with Circulatory Failure
- Angiotensin Converting Enzyme Inhibitors and Other Vasodilators
 - Angiotensin Converting Enzyme Inhibitors
 - Hydralazine Plus Isosorbide Dinitrate
 - Calcium Channel Blockers
- Digitalis Glycosides
- Diuretics
- B-Blockers
- Oral Inotropic Agents
- Intermittent and Continuous Intravenous Inotropic Therapy
- Other Durgs
 - Angiotensin II Receptor Blockers
 - Endothelin Receptor Blockers
- Other Therapeutic Issues
 - Rhythm Control
 - Anticoagulation
 - Exercise

Surgical Therapy

- Conventional Surgery
 - Coronary Artery Bypass Graft
 - Valve Replacement and Repair
 - Congenital Heart Disease Repair
 - Transplantation
- Mechanical Ventricular Assist and Replacement Devices
- Cardiac Myoplasty and Ventricular Resection

Pulmonary Hypertension

Definition

Etiology

Pulmonary Venous Hypertension

Hypoxic Pulmonary Hypertension

Arterial Obstructive Pulmonary Hypertension

Pulmonary Hypertension Due to Left-to-Right Shunts

Primary Pulmonary Hypertension

Diagnostic Procedures

Physical Examination

Chest Roentgenography

Electrocardiography

Echocardiography

Radionuclide Studies

Pulmonary Artery Imaging

Hemodynamic Studies

Pulmonary Biopsy

Clinical Course

Treatment

Pulmonary Thromboembolism

Etiology

Clinical Features

Diagnostic Tests

- Chest Radiography
- Electrocardiography
- Blood Gases
- D-Dimer
- Echocardiography
- Ventilation/Perfusion (V/Q) Scan
- Ultrafast Computed Tomography
- Magnetic Resonance Imaging
- Pulmonary Angiography

Treatment

Inferior Vena Caval Interruption

Prophylaxis

Complications

Special Forms of Embolism

- Recurrent Pulmonary Embolism
- Massive PE
- Septic Embolism
- Amniotic Fluid Embolism
- Fat Embolism Syndrome
- Sickle-Cell Disease
- Air Embolism
- Paradoxical Embolism
- Hereditary Hemorrhagic Telangiectasia
- Miscellaneous Forms of Emboli

Medical Ethics

Principles of Medical Ethics

Autonomy

Substituted Judgment
Surrogate Decision Maker
Living Will
Disclosure
Informed Consent
Confidentiality
Group-Specific Beliefs

Beneficence and Nonmaleficence

Implied Consent
Treatment of Minors

Incurable Disease and Death

Control of Pain
Nonabandonment
Conflict of Interest

Conscientious Objection by the Physician

Justice

Triage

Managed Care

"Do Not Resuscitate" (DNR)

Withholding and Withdrawing Life Support

Persistent Vegetative State

Definition of Death

Cardiac Tumors

Clinical Features of Cardiac Tumors
Familial Cardiac Tumors
Lipomatous Hypertrophy of the Atrial Septum
Mesothelioma of the Atrioventricular Node
Papillary Fibroelastoma
Metastatic Cardiac Tumors

Cardiac Rehabilitation

Basic Physiology of Exercise
Training Effect (Response to Chronic Exercise)
Rehabilitation After Myocardial Infarction
Risk Stratification After Myocardial Infarction
Exercise Training and Heart Failure
METS (Metabolic Equivalent System)

Systemic Disease and the Heart

Neurologic Disease

- Friedreich's Ataxia
- Duchenne Muscular Dystrophy
- Myotonic Muscular Dystrophy
- Other Neurologic Disorders

Endocrine Disease

Rheumatic Disease

- Rheumatoid Arthritis
- Systemic Lupus Erythematosus
- Polymyositis
- Ankylosing Spondylitis
- Scleroderma
- Relapsing Polychondritis
- Reiter's Syndrome
- Behcet's Disease
- Churg-Strauss Syndrome
- Polyarteritis Nodosa

Hematology/Oncology Diseases

- Anemia
- Thalassemia
- Sickle Cell Disease
- Primary Hemochromatosis

Cardiac Radiation Damage

Cardiac Trauma

Penetrating Cardiac Injury

Blunt Cardiac Injury

Medical Cardiac Injury

Diagnosis of Cardiac Injury

Treatment of Cardiac Injury

Damage to Intracardiac Structures

Injury to the Aorta and Great Vessels

Cardiac Emergencies

Pulmonary Edema

Aortic Dissection

Pericardial Tamponade

Ventricular Tachycardia

Torsade de Pointes

Paroxysmal Supraventricular Tachycardia

Atrial Flutter or Fibrillation with Rapid Ventricular Response

Reciprocating Tachycardia Complicating Wolff-Parkinson-White Syndrome

Pulseless Ventricular Tachycardia or Ventricular Fibrillation

Asystole

Pulseless Electrical Activity (Electromechanical Dissociation)

Multifocal Atrial Tachycardia

Digoxin Toxicity and Overdose

B-Blocker Overdose

Calcium Channel Blocker Overdose

Hypertensive Emergencies

Pacemaker-Mediated Tachycardia

Unstable Angina

Myocardial Infarction

Pulmonary Thromboembolism

Hyperkalemia

|