



STUDY GUIDE FOR THE PREPARATION OF LEVEL I CARDIOVASCULAR NURSING BOARD CERTIFICATION EXAMS

“FOR NON-ACUTE CARDIOVASCULAR NURSING PRACTICE SETTINGS”

CVN Level I or Non-Acute Cardiovascular Nursing

The ACCN has designated course numbers for the study of various categories within cardiovascular nursing. Non-acute practice courses are designated as 100 levels. Acute practice courses are designated as 200 levels. This reference covers CVN Level I for non-acute practice. This reference will utilize those course numbers to separate the categories of study.

Whether one is preparing for a career in Cardiovascular Nursing Practice or studying for their Level I CVRN Board Certification Exams, these guidelines should be of assistance. The ACCN recommends several reference books to further the study and are now in the process of developing online training to cover most of these topics areas in this document.

CVN 101

The Normal Heart, its Hemodynamics, and the Anatomy of Cardiovascular Diseases and Conditions

Includes the list of cardiovascular disease processes covered in CVN Level I practice. The student should be able to:

- Define each of the cardiovascular disorders listed below
- Identify cardiac anatomy and physiology of the heart and its conduction system
- Identify the basic hemodynamics of the heart
- Identify the etiology, incidence, pathophysiology, physical findings, differential diagnosis, diagnostic testing, and currently recommended treatment of the following cardiovascular or pulmonary related diseases or conditions:
 - Acute Coronary Syndromes: Stable and Unstable
 - Aortic Aneurysm and Dissection
 - Atherosclerosis (Coronary Artery Disease)
 - Cardiomyopathy
 - Congenital Heart Disease
 - Diabetes and Coronary Artery Disease
 - Heart Failure
 - Hypertension
 - Hyperlipidemia
 - Left Ventricular Systolic and Diastolic Dysfunction
 - Myocarditis, Pericarditis, Endocarditis
 - Renal Insufficiency and Coronary Artery Disease

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- Shock
- Tamponade
- Thrombosis: Deep Vein, Pulmonary Thromboembolism
- Transplant
- Vascular Disease
- Valvular Disease
- Venous and Arterial Insufficiency

CVN 102

Physical Assessment of the Cardiac Patient

Includes preparation to identify the components of a thorough cardiovascular assessment including the areas of listening to the heart and the demonstration of a standard technique.

The student should be able to:

- Identify the components of a thorough physical assessment of the cardiac patient including technique and purpose for the following systems:

- Cardiovascular
- Pulmonary
- Neurological
- Eyes, Ears, Nose, and Throat
- Gastrointestinal
- Musculoskeletal
- Genitourinary

- Identify the components of a non-invasive assessment of hemodynamic status:

- Overview of major fluid and electrolyte compartments
- Auscultation of heart sounds
- Assessment of neck veins

- Identify the hemodynamic concept of having “two hearts” venous and arterial:

- Right heart
- Left heart
- Lungs between

- Identify the role each of the following plays in maintaining adequate circulatory response:

- Vasomotor center
- Osmoreceptor response
- Pressoreceptor (baroreceptor) response
- CNS ischemic response
- Chemoreceptors
- Bainbridge reflex
- Renin-angiotensin mechanism
- Hypothalamic response
- Thyroid hormones
- Adrenal cortical response
- Adrenal medullar response

- Identify the components of cardiac output and their normal ranges

- Identify the components of blood pressure

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■ Identify the expected relationship between BP and HR in specific hemodynamic states such as:

- Hypovolemia
- Hypervolemia
- Increased intracranial pressure

■ Identify what is meant by Korotkoff sounds

■ Discuss the role of atrial contribution in the overall hemodynamic status of the patient

■ Explain invasive and non-invasive criteria used to clinically evaluate a patient's MVO₂ status

■ Identify the four areas of auscultation of the heart and the proper assessment positions and techniques for auscultation

CVN 103

Electrocardiography and Patient ECG Monitoring

Includes basic ECG interpretation and bedside ECG monitoring skills. The student should be able to:

■ Identify monitoring protocols depending upon patient presentation and the differential diagnosis

■ Demonstrate proper lead placement with three, five, and six wire systems for telemetry

■ Demonstrate proper lead placement with a 12-lead ECG machine

■ Demonstrate the 10-step analysis skill when interpreting ECG rhythm strips

■ Identify the normal components of the cardiac cycle

■ Identify the following:

1. Sinus rhythms

- Sinus rhythm
- Sinus bradycardia
- Sinus tachycardia
- Sinus arrhythmia
- Sinus pause
- Sinus arrest

2. Atrial rhythms

- Atrial premature beats conducted normally, aberrantly, or non-conducted (APB's)
- Atrial tachycardia
- Atrial flutter
- Atrial fibrillation

3. Junctional rhythms

- Junctional premature beats (JPB's)
- Junctional escape beat or rhythm with and without aberration
- Junctional rhythm

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- Junctional tachycardia

4. Ventricular rhythms

- Ventricular premature beats (VPB's from left and right ventricle)
- Ventricular escape beats
- Ventricular rhythm
- Accelerated idioventricular rhythm (AIVR)
- Ventricular tachycardia

5. AV blocks

- First degree AV block
- Second degree AV block type I
- Second degree AV block type II
- High grade AV block
- Complete or third degree AV block

6. Normal 12-lead ECG

7. Ischemia and injury seen in the 12-lead

- Inferior wall ischemia and injury
- Inferior-lateral wall ischemia and injury
- Anterior wall ischemia and injury
- Anterior and lateral wall ischemia and injury
- Posterior wall ischemia and injury
- Right ventricular wall ischemia and injury
- Global ischemia and injury
- Myocardial mimics

8. Bundle branch blocks

- Right bundle branch block (incomplete and complete)
- Left bundle branch block (incomplete and complete)
- Supraventricular tachycardia with right bundle branch block
- Supraventricular tachycardia with left bundle branch block

9. Electrolyte disturbances (potassium and calcium)

- Hypokalemia
- Hyperkalemia
- Hypocalcaemia
- Hypercalcaemia

10. Bedside monitoring principles and practice

- Use of three wire telemetry systems in bedside monitoring
- Use of five wire telemetry systems (conventional) in bedside monitoring
- Use of six wire telemetry systems (conventional) in bedside monitoring
- When to use which lead for patient monitoring
- Monitoring wide-QRS patterns
- Monitoring the patient with ischemia and or injury
- Monitoring the patient during and after special diagnostics and procedures

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- Monitoring the patient during cardiac surgery and interventional procedures
- Is one lead ever enough
- When to use the 12-lead for bedside monitoring
- Monitoring the patient in chest pain observation units
- Monitoring the patient being transported by emergency personnel
- Importance of getting the right point of view the first time

In addition to the above ECG topics, this course also presents cardiopulmonary life support measures in the management of cardiac emergencies. The student should be able to:

- Identify clinical signs and symptoms of cardiac and respiratory arrest
- Identify the appropriate techniques in airway management
- Identify the correct and effective mouth-to-mouth and/or bag-to-mask and /or bag-to-ETT techniques
- Identify the correct technique of ventilation
- Identify and feel the carotid artery for a pulse
- Identify the correct and effective compression technique
- **Recognize and demonstrate ability to effectively manage the following arrest situations:**
 - Ventricular fibrillation
 - Ventricular tachycardia
 - Asystole
 - Pulseless electrical activity
 - Bradycardias
- Identify the principles and technique of defibrillation
- Identify potential complications of defibrillation
- Troubleshoot the failure of equipment to defibrillate
- **Identify the principles and application technique of applying an external pacemaker device**
- Identify and analyze alterations in physiologic parameters presented and identify the interventions needed
- **Effectively anticipate and manage the following common cardiac emergencies:**
 - Myocardial injury and ischemia
 - Pulmonary embolism
 - Pericarditis
 - Wide-QRS tachycardias
 - Panic level electrolyte disorders
 - Sick sinus syndromes
 - Advanced AV block

CVN 104

Pulmonary Assessment

Includes physical assessment of the pulmonary system, including the analysis of arterial blood gases and assessment of oxygenation status. The student should be able to:

- Identify the normal anatomy and physiology of the pulmonary system
- Demonstrate proper auscultation techniques for lung assessment
- Identify a systematic approach to arterial blood gas sampling and analysis
- Identify the arterial blood figures associated with the presence of:
 - Acute, sub-acute, or chronic respiratory acidosis
 - Acute, sub-acute, or chronic respiratory alkalosis
 - Chronic metabolic acidosis
 - Chronic metabolic alkalosis
- Identify the requirements for adequate oxygenation
- List four major causes for each of the acid base disturbances above
- Discuss the major impact acid-base imbalance has on fluid and electrolyte status
- Identify normal PaO₂, SaO₂, and CaO₂ levels
- State the conditions necessary for normal oxygen transport
- Explain the oxyhemoglobin dissociation curve
- Explain impaired O₂ extraction/utilization
- Identify the clinical parameters for the classification of hypoxemia: mild, moderate, or severe
- Discuss the impact of hypoxia on the multiple organ system complex
- Compare and contrast clinical parameters reflecting the status of external versus internal respiration
- List major causes of acid-base disturbances
- Discuss the impact of acid base imbalance has on the fluid and electrolyte status of the patient
- Explain the clinical parameters for the classification of hypoxemia (i.e., mild, moderate, and severe)
- Compare the contrast clinical parameters reflecting the status of external versus internal respiration
- Identify the clinical picture of the patient with adult respiratory distress syndrome (ARDS)

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- State the clinical indications for the use of capnograms and plethysmography in monitoring respiratory status and what can be learned from each

CVN 105

Cardiovascular Pharmacology

Includes the most common cardiovascular pharmacologic agents used in the management of a variety of cardiovascular diseases or conditions and be able to identify the following with respect to each agent:

- Mechanism of action
- Indications
- Dosage
- Side effects
- Contraindications
- Specific considerations
- Patient teaching considerations
- Classification
- Chronotropy
- Inotropy
- Dromotropy
- Afterload
- Preload
- QRS conduction
- Half life
- Interactions
- Contractility: negative and positive inotropic

CVN 105 also presents the management protocols for patients with the following cardiovascular diseases or conditions:

- Acute coronary syndromes
- Heart failure
- Left ventricular systolic and diastolic dysfunction
- Hypertension
- Pulmonary hypertension

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- Diabetes and coronary artery disease
- Myocarditis
- Infective endocarditis
- Pericardial disease
- Cardiomyopathy
- Vascular disease and pulmonary thromboembolism
- Renal insufficiency and coronary artery disease
- Valvular heart disease
- Congenital heart disease

The CVN 105 students should also be able to:

- State the four determinants of cardiac output
- Identify pharmacologic agents used to regulate cardiac output
- Identify pharmacologic agents used to balance myocardial oxygen supply and demand
- Identify a standard emergency cardiac treatment protocol for basic life support measures

Pharmacologic agents covered in CVN 105:

- Antiarrhythmics
- Beta-blockers
- Calcium channel-blockers
- Drugs that block the rennin-angiotensin system
- Antihypertensive agents
- Diuretics
- Nitrates
- Inotropic agents
- Vasoactive agents
- Agents that alter blood clotting
- Lipid lowering agents
- Agents used in managing the cardiac emergency: cardiac life support measures

CVN 106

Pacemaker Therapy

Includes basic pacemaker and intra-cardiac defibrillator function and troubleshooting. The student should be able to demonstrate a basic knowledge of the normal function and timing cycles of pacemakers and automatic internal defibrillator/cardioverters (AICD's). Students should be prepared to perform a standard routine interpretation of a given ECG rhythm strip of patient with these devices. The student should be able to:

- Identify advanced degrees of SA and AV block that lead to the insertion of temporary and permanent pacemaker implantation
- Identify the ICHD code letters and their meaning
- Identify the indications and contraindications for the use of a magnet with the implanted pacemaker
- Value of a chest X-ray in troubleshooting pacemakers and ICD's
- Identify the modes of operation in the single and dual chambered pacemaker
- Identify the timing cycles and programmable features of single and dual chambered pacemaker devices
- Identify the troubleshooting technique for standard assessment of pacemaker function
- Demonstrate an ability to identify and manage loss of capture and sensing in the pacemaker device
- Identify a normally functioning AICD
- Troubleshooting the AICD: antitachycardia pacing, and high energy cardioversion and defibrillation
- Nursing responsibility when patient develops VT/VF and AICD fails to convert the rhythm
- Identify patient teaching needs for the patient receiving a permanent implanted pacemaker and AICD

CVN 107

Interventional Cardiovascular Nursing Care

This course includes a multitude of non-invasive and invasive diagnostic tests and procedures used in the diagnosis and management of cardiovascular diseases and conditions. It includes the common diagnostic and interventional procedures associated with the management of heart disease. The student should be able to:

- Identify the indications, complications, nursing interventions pre and post procedure, and patient and family teaching needed for those undergoing a variety of non-invasive and invasive cardiac diagnostic and therapeutic procedures including:

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- Cardiac catheterization and angioscopy
- Cardioversion
- Coronary angioplasty
- Multivessel and complex coronary angioplasty
- Gender differences and outcomes after PTCA
- Coronary artery bypass grafting
- Minimal invasive coronary bypass
- Cardioversion and Defibrillation
- Directional coronary atherectomy
- Atherectomy
- Electrocardiography
- Echocardiography
- Holter monitoring
- Stent implantation
- Transmyocardial revascularization
- MRI of the myocardium
- Nuclear medicine: scintigraphy
- Doppler ultrasound
- Intravascular ultrasound
- Pressure monitoring
- Pulmonary artery catheterization
- Overdrive pacing
- Gene therapy
- Race and outcome after PTCA
- Vascular brachyther