

**STUDY GUIDE FOR THE PREPARATION OF LEVEL II  
CARDIOVASCULAR NURSING BOARD  
CERTIFICATION EXAMS**  
“FOR ACUTE AND INTERVENTIONAL CARDIOVASCULAR  
NURSING PRACTICE SETTINGS”

**CVN Level II or Acute/Interventional Cardiovascular Nursing Practice Core Curriculum**

CVN Level II or Acute and Interventional Practice guidelines will provide the nursing staff of acute and interventional practice areas with standards of education and practice and include the following areas:

- Coronary Care Unit
- Cardiovascular Surgical Intensive Care Unit
- Cardiac Catheterization Lab
- Invasive Procedures Lab
- Cardiovascular Surgical Unit
- Cardiac Recovery Room

Level II Core Curriculum Courses are designated as level 200 courses. The ACC and will utilize the following level 200 course numbers to separate the categories of study.

The cardiac nurse employed in level II practice must possess the diagnostic skills and knowledge base of the cardiologist, and the healing touch of the nurse, while also playing medical technician with many types of equipment and procedures. It is therefore, extremely important that we demonstrate a well-developed and keen sense of observation, physical assessment, listening skills, and possess the scientific ability to integrate the data at hand into a probable diagnosis, and finally form a plan of action.

Cardiovascular Nurses must therefore have a thorough knowledge base of the pathophysiology and mechanisms of action of the major cardiovascular diseases and disorders, their likely complications, related nursing and medical care, management, and any patient and family educational and rehabilitation needs for each cardiovascular condition presented.

## **CVN 201**

**Includes the identification and management of the list of cardiovascular disease processes listed below:**

- Acute Coronary Syndromes
- Myocardial Mimics
- Aortic Dissection
- Hypertension
- Heart Failure
- Cardiomyopathy
- Congenital Heart Disease
- Cardiac Emergencies
- Valvular Heart Disorders
- Endocarditis, Myocarditis, Pericarditis
- Cardiac Tamponade
- Chronic Obstructive Lung Disease
- Adult Respiratory Distress Syndrome
- Diabetes and Heart Disease

## **CVN 202**

### **Assessment of heart sounds including:**

- First heart sounds
- Second heart sounds
- Third heart sounds
- Fourth heart sounds
- Summation gallop
- Ejection click
- Mid systolic click
- Systolic Murmurs
- Diastolic Murmurs
- Continuous Murmurs
- Proto-Diastolic Gallop
- Ejection Click of Aortic Stenosis
- Mid Diastolic Rumble of Mitral Stenosis
- Quadruple Rhythm
- Systolic Murmur of Mitral Regurgitation VS. the Ejection Murmur of Aortic Stenosis

## **CVN 203**

### **12-18 Lead Electrocardiography includes:**

- Normal Shapes of P-QRS-T, U Waves in Each Lead of the 12-Lead ECG
- Zones of the heart including:
  - Anterior
  - Inferior
  - Lateral
  - Anterior-Lateral
  - Septal
  - Inferior-Lateral
  - Inferior-Right Ventricular
  - Inferior-Posterior
- Employ the use of the 12-18 lead electrocardiograms in making the above diagnoses of zones of injury versus ischemia.
- Determine when it is necessary to obtain the right sided chest leads and posterior chest leads, and why.
- Identify for patterns adjusted of myocardial injury warranting further investigation
- Identify eight patterns suggestive of myocardial ischemia more Gene further investigation
- Relate the coronary anatomy to the zones of the heart that are reflected in the 12 - 15 and 18 lead electrocardiograms.
- Identify the six most common myocardial mimics of acute myocardial infarction and State how to differentiate between each mimic including:
  - Aortic Dissection
  - Pulmonary Embolus
  - Cardiomyopathy
  - Hyperkalemia
  - Pericarditis
  - Ventricular Hypertrophy
- Identify the gold standard leads for monitoring cardiac patients with arrhythmias and or ischemia versus injury in non-acute, acute, and interventional cardiovascular services.
- Differentiate between the 4 most common causes of wide-QRS patterns and state the clinical significance of each.

- Identified bi-fascicular block patterns and state their clinical significance.
- Calculate the electrical axis of the QRS, utilizing the “Handy” and “Exact” degree methods of axis determination, and state the clinical indications of varying abnormal axes and how axis determination can often be of assistance in determining the origin of arrhythmias.
- Identify hypokalemia and hyperkalemia in the 12 lead ECG and state their likely clinical picture.
- Identify sick sinus syndrome in the ECG and state the clinical significance.
- Identify advanced degrees of AV block.

## **CVN 204**

### **Mechanical Ventilation:**

The student should be prepared to identify safe and adequate care of a patient along a mechanical ventilator and be prepared to discuss their blood gases and oxygenation levels. The student should be able to collect and analyze arterial blood gases and clinically integrate their findings issued further be prepared to identify any abnormal signs and interpret their physical findings. They should be also prepared to discuss the pathophysiology, EDI which he, incidence, signs and symptoms, bedside differential diagnoses, diagnostic tests and their findings, and the possible management and treatment of each disorder mentioned below.

- Identify the pathophysiology and clinical picture associated with adult respiratory distress syndrome (ARDS).
- identify the clinical significance of capnograms and plethysmography in differential diagnosis of acute and chronic respiratory distress.
- Identify the component parts of the plethysmograph waveform and any abnormal patterns presented.

- Identify the various diagnostic applications and capabilities of the plethysmograph waveform:
  - Heart rate monitor
  - Systolic abnormalities
  - Diastolic abnormalities
  - Shock and peripheral blood flow deficits
  - Intra-aortic balloon pump performance
  - Pulsus paradoxus
  
- Identify the value of capnography in bedside diagnoses
  
- Demonstrate clinical integration skills in the interpretation of arterial blood gas reports
  
- Identify the mechanisms of hypoxemia:
  - Low inspired oxygen tension
  - Alveolar hypoventilation
  - Ventilation-perfusion deficits (V/Q abnormalities)
  - Diffusion defects
  - Shunting right to left
  
- Identify Fick law of tissue oxygenation
  
- State the determine and seven normal myocardial oxygen consumption
  
- Explain the physiologic basis for shifts in the oxyhemoglobin dissociation curve
  
- Identify the three factors that determine oxygen supply to the tissues
  
- Identify the for mechanisms that augment cardiac output to
  
- Identify normal and abnormal ranges of SVO<sub>2</sub> and their clinical significance
  
- Identify the major causes of decreased oxygen consumption
  
- Calculate several sets of arterial blood gases presented and state their clinical significance
  
- Identify a properly placed and though tracheal tubes in x-ray films
  
- Identify the normal chest x-ray
  
- Identify any specific precautions and interventions in the use of the mechanical ventilator

- Identify how to determine individualized ventilatory patterns
- Identify relevant criteria for adjusting ventilator support

## **CVN 205**

### **Cardiovascular Pharmacology**

The student should be prepared to identify the physiologic basis of action, the indications, and most common side effects of the following types of cardiovascular agents:

- Sympathomimetic agents
- Vasodilators
- Vasopressors
- Inotropic agents

#### **In addition they should be able to identify:**

- Pure alpha stimulators, their normal actions, dosages, and side effects
- Pure beta-stimulators, their actions, dosages, and side effects
- Agents with both Alpha and Beta properties, their actions, dosage and side effects
- Agents with vasodilators and properties, their actions, dosages, side effects, and precautions
- Inotropic agents, their actions, loading dosages, maintenance infusion, side effects, and precautions
- The patient acceptability for thrombolytic therapy
- Importance of early vessel patency and door to treatment time
- Dosages for the use of thrombolytic agents
- The recent recommendations made by the ACC/AHA with regard to the treatment of patient with myocardial infarction
- ASA and heparin protocols in the treatment of acute infarction

- The benefits afforded the patient with the use of intravenous Beta blockers in acute infarction states
- Other agents used in the treatment of acute myocardial infarction such as Ace inhibitors, magnesium, nitrates calcium, channel blockers, and prophylactic lidocaine
- The current treatment protocol for pulmonary embolism
- The current treatment protocol for pericarditis
- The current treatment protocol for aortic dissection
- Several electrocardiography changes associated with class won a drugs
- The current treatment protocol for the wide QRS tachycardias including:
  - Ventricular tachycardia
  - Supraventricular tachycardia with and without ventricular aberration including AV nodal reentrant
  - Anti-dromic tachycardia
  - Orthodromic Tachycardia
- The treatment protocol for Torsade de Pointes
- The treatment protocol for digitalis induced arrhythmias
- The emergency treatment protocol for electrolyte disturbances including:
  - Hypokalemia
  - Hyperkalemia
  - Hypocalcaemia
  - Hypercalcaemia
- The treatment protocol for sick sinus syndromes
- The treatment protocols for the AV blocks:
  - First degree
  - Second degree type 1
  - Second degree type 2
  - High grade
  - Third degree

■ The indications, contraindications, complications, and recommended dosages for the following types of pharmacologic agents:

- Anti-arrhythmics
- Beta blockers
- Calcium channel blockers
- Agents that block the rennin- angiotensin system
- Anti-hypertensive
- Diuretics
- Nitrates
- Inotropic agents
- Vasoactive agents
- Agents that alter blood clotting
- Anti-lipid agents
- Agents used in the management of cardiac emergencies

## **CVN 206**

### **Pacemaker and Internal Cardio-Defibrillator Devices**

The student should master the procedure for a systematic evaluation of the pacemaker and internal cardio-defibrillator devices. In level to the nurse and nurse practitioner may be the only person in the acute setting capable of understanding the normal and abnormal function of these devices, therefore it is essential that they become more prepared than the usual house physician with regard to the following:

- Identifying the troubleshooting strategies and techniques recommended for pacemaker interpretation
- Evaluating single and dual chambered device is for normal and abnormal pacing, sensing, and capture
- Identifying over sensing
- Identifying under sensing
- Identifying normal pacing and the absence of pacing
- Identifying normal capture and loss of capture
- Identifying the emergency measures that may be necessary in the presence of pacemaker failure
- Identifying normal pacing intervals in the single chambered device
- Identifying normal pacing intervals in the dual chambered device

- Identifying a variety of programmable features in pacemaker devices and their physiologic basis
- Identifying patient teaching needs for the person receiving a permanent and temporary pacemaker implant
- Identifying the postoperative complications most common in the early hours after implant:
  - Pneumothorax
  - Lead perforation
  - Pocket hematoma
  - Lead this lodgment
  - Primary pulse generator component failure
- Identifying the late complications associated with pacemaker implants:
  - Infection
  - Erosion of lead or pacemaker
  - Thrombosis
  - Exit block or development of high thresholds
  - Lead insulation failure
  - Twiddler's syndrome
- Identify the main problems associated with VVI pacemaker modes
- Identify the main problems associated with AAI pacemaker modes
- Identify the main problems associated with VDD pacing modes
- Identify the main problems associated with DDD pacing modes
- Identify the for modes of operation in inherent to dual chambered pacemaker devices
- Identify patient population for internal cardio-defibrillator implantation
- Identify the basic components of and internal cardio-defibrillator system
- Identify the common arrhythmias treated with internal cardio-defibrillator therapy
- Described the tiered therapy offered by an internal cardio defibrillator
- Identify emergency measures needed in the event the internal cardio-defibrillator fails to discharge when indicated
- Identify the emergency measures needed in the event the internal cardio-defibrillator in-appropriately delivers shocks to the patient

- Identify complications related to the subclavian vein stick, pulse generator its self, leads the, and other problems with internal cardio-defibrillators
- Identify routine patient care post implant for pacemakers and internal cardio-defibrillators
- Identify patient and family education needs for the patient receiving an internal cardio-defibrillator
- Identify follow-up care needed for patients receiving pacemakers and internal cardio-defibrillator therapy

## **CVN 207**

### **Interventional Procedures**

The student should be prepared to answer integrated questions involving multiple data related to the procedures, their indications and complications, and emergency management needed for any of the following interventional procedures:

- Cardiac catheterization and angiography
- 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 brachytherapy

**The student should further be prepared to identify:**

- Signs and symptoms associated with acute coronary closure (restenosis) post procedure
- Identify patient education needed for those undergoing interventional procedures
- Identify appropriate ECG monitoring needs during and immediately post procedure for each of the above procedures

**CVN 208**

**Hemodynamic Monitoring**

The student should be prepared to build on the basic hemodynamic principles and be prepared to meet the following objectives with regard to the invasive hemodynamic monitoring the student will need to demonstrate the ability to clinically integrate the hemodynamic data below.

- The components of an invasive assessment of hemodynamic status
  - Arterial lines
  - “Trends” associated with specific clinical scenarios
- Demonstrate the ability to gather and integrate clinical assessment data from a variety of sources, and further analyze the data and provide a final determination of the clinical significance of the findings
- Demonstrate transducer and line preparation for priming
- Demonstrate and discuss the zeroing and calibration of transducers
- Demonstrate lying management including
  - Monitoring and interpretation of patients parameters
  - Troubleshooting
  - Precautions
  - Blood collection from arterial line (mixed venous)
- Demonstrate an understanding of implications actions and safety aspects of pulmonary artery catheters
- Obtained a correct pulmonary capillary wedge pressure reading
- Assemble equipment for the performance of cardiac output
- Perform cardiac output measurements
- Demonstrate an understanding of the thermodilution method of calculation of cardiac output
- Demonstrate an understanding of the normal range of cardiac output and the implications and likely management of the following abnormalities:
  - systemic vascular resistance
  - pulmonary vascular resistance
  - oxygen delivery, extraction, and consumption
  - A-a gradient
  - SVO<sub>2</sub> monitoring
  - continuous cardiac output measurement
  - use of bedside central monitors
- List five major components of oxygen demand
- Identifying normal pressures in the various chambers of the heart

- Identify abnormal pressures and be prepared to give an integrated assessment of information provided
- Identify proper use of the bedside central monitors

## **CVN 209**

### **Managing the Patient with the Left Ventricular Assist Device Therapy**

The student will be responsible for all aspects of management of the patients on left ventricular assist device therapy. Superior knowledge of the hemodynamics of the cardiovascular system is critical to the understanding of the intra-aortic balloon pump. Students should be prepared to:

- Described the location of the properly positioned intra aortic balloon catheter
- Described the hemodynamic benefits of proper timing of balloon pumps
- List two contraindications for use of the balloon pump
- List three indications for utilizing the balloon pump
- Discuss the correct basic patient management and troubleshooting for intra aortic balloon pump patients
- Identify the components of inflation timing
- Identify the diastolic time pressure index
- Identify factors related to poorer augmentation
- Identify the components of deflation timing
- Identifying timing considerations for various arterial lines:
  - central lumen
  - radial line
  - femoral line
- Identify various timing errors
- Described the components of hemodynamic assessment
- Identify the correct positioning for the patient with a balloon pump in place

- Identify signs and symptoms of lead ischemia
- Identify the normal balloon pressure wave-form and its normal variations
- Identify what is meant by trigger signals and identify three possible triggers
- Identify the causes of helium alarms sounding:
  - Purge failure
  - high pressure
  - helium loss

Troubleshoot alarm conditions or potential clinical problems