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# Nuclear Cardiology Technology Study Guide

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If anyone is serious about passing the NMTCB's nuclear cardiology technology examination, acquiring further knowledge of nuclear cardiology, or just obtaining some continuing education units, this study guide is certainly the one to purchase. It is quite informative and leaves no aspect of nuclear cardiology behind. The authors are virtually a who's who of experts in the nuclear cardiology field, and even though the price tag is a bit high, it is certainly worth the money.

The 211-page, 16-chapter soft-cover study guide, published by the SNM in 2010, is designed to help technologists who want to enhance their career by earning the esteemed credentials NCT to put after their name and on their resume. It includes every aspect of the on-demand NMTCB examination: instrumentation/procedures/processing, anatomy/physiology/pathology, radiopharmaceuticals/interventional drugs, nonpharmacologic (exercise) stress testing, and patient care. It also includes a comprehensive color atlas, a total of 14 continuing education units that are optional but affordable (\$14.21 per credit), and a 140-question mock examination with the answers to boot! Not to mention that every chapter ends with follow-up questions to make sure the reader absorbs the information being presented.

The guide begins by introducing the reader to basic cardiac anatomy and physiology. It discusses the heart chambers; electrophysiology; coronary artery distribution; heart valves, including the great vessels; cardiac diseases; and normal and abnormal physiologic responses to stress. The second chapter is an excellent complement to the first chapter as it segues from anatomy and physiology to the most basic of cardiac tests, the electrocardiogram. The electrocardiography chapter discusses the leads and which wall of the heart each lead records, the QRS complex, 8 steps to interpreting the electrocardiogram, and how to recognize the different rhythms of the heart and their origin, and the chapter finishes with the different disorders and disruptions of normal conduction. Because many programs do not focus on electrocardiograms and interpretation, this chapter really does make comprehension of electrocardiograms easier for even the most experienced technologist. The third chapter moves from the simplest of cardiac tests, the electrocardiogram, to other cardiac examinations that do not fall under the myocardial perfusion umbrella.

These examinations include equilibrium radionuclide angiocardiology or multigated acquisitions, the first-pass study, myocardial infarction, myocardial viability, and bi-directional cardiac shunt studies. This is also a great chapter that introduces some of the more obscure myocardial agents such as  $^{18}\text{F}$ -FDG, metaiodobenzylguanidine, BMIPP ( $\beta$ -methyl-*p*-iodophenylpentadecanoic acid), and  $^{111}\text{In}$ -antimyosin, as well as the more traditional in vivo or in vitro red blood cell tagging techniques.

The next chapter transitions the reader from all ancillary nonmyocardial perfusion studies to the introduction of what technologists generally think of when nuclear cardiology is mentioned: myocardial perfusion imaging (MPI). The fourth chapter introduces readers to indications, protocols, and different acquisitions of the MPI study. This chapter discusses various indications for the examination, patient preparation, the numerous pharmaceuticals involved with correctly preparing a patient for the examination, the types of imaging protocols (1 or 2 d), the radiopharmaceuticals used for non-PET MPI studies, acquisition parameters, gating with myocardial wall motion and thickening abnormalities, an excellent description of the stunned and hibernating myocardium, a discussion on transient ischemic dilation, and an introduction into the importance of following the American Society of Nuclear Cardiology recommendations. The chapter (like all others) ends with 10 follow-up questions, which really do not touch on all the important aspects of this information-packed chapter. The fifth chapter discusses PET MPI studies. The chapter touches on the physics of PET, resolution, attenuation correction with PET/CT, all other PET MPI tracers and their respective tracer-specific protocols, and myocardial metabolism tracers and protocols. Because of the short half-life of all the PET tracers, not many technologists nationwide can encounter the wonderful world of PET cardiac studies. Even though the chapter is short, the all-inclusive nature of the information provided is ample to cover all the criteria that the NCT examination includes. Chapter 6 discusses pharmacologic stress agents, pharmacologic stress adjuncts, the countless cardiac medications and the class each one falls under, and cardiac emergencies. Many technologists who have exposure only to injecting and scanning cardiac patients at their facility will find this chapter to be extremely informative, as it provides information pertaining to the all-important pharmacologic aspect of cardiology. Chapter 7 provides an in-depth discussion on all non-PET radiopharmaceuticals. These radiopharmaceuticals have been dis-

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cussed in previous chapters, but this chapter certainly provides everything necessary for the NCT examination.

Chapters 8–10 focus on aspects of MPI unrelated to direct patient care. Chapter 8 discusses basic processing and reconstruction techniques. The topics include filtered back-projection, iterative reconstruction, image formation, filtering, reorientation, analysis of processed data, artifacts in quantitation, correct patient database selection, and suggested systematic interpretation of both perfusion and function data. One valuable aspect of this chapter includes the in-depth review of filtering and the suggested approach to making sure the interpreting physician has the best images possible. These 2 aspects emphasize the core priority of producing the best images possible. Once the basics for processing images are established, chapter 9 focuses on advanced aspects of processing, which include analysis of the features of specific image processing systems and some key components they provide. The components discussed are the 17- versus 20-segment score, the walls affected in each displayed axis, the summed stress score, ejection fraction, lung-to-heart ratio, aspects of left ventricular ejection fraction, gating, transient ischemic dilation, and sources of errors in analysis. The tenth chapter completes the final aspect of image processing with a discussion of standardized image interpretation. This chapter lists what the American Society of Nuclear Cardiology recommends, as well as presenting an example of a report that can be used for standardizing dictations at any facility. Excellent images and uniform reports would not be possible without proper quality assurance, which is discussed in chapter 11. The topics discussed include the types and frequencies of recommended quality control procedures, resolution, uniformity testing, many quality control issues, attenuation, and quality assurance for nonimaging equipment.

Chapters 12 and 13 give an extensive overview of stress testing. Chapter 12 focuses on all aspects of the exercise stress test. These aspects include the Duke treadmill score

and risk classification, measurements available from the treadmill test, physiologic concepts of treadmill exercise testing, patient preparation, testing endpoints, safety risks, maximum predicted heart rate, target heart rate, considerations for different patient classifications, and the pros and cons of different types of exercise testing protocols. Chapter 13 provides an extensive discussion on all aspects of pharmacologic stress agents and their respective protocols. Chapter 14 wraps up the endpoint of all stress testing and discusses the reliability of each prognosis. It also includes an overview of risk stratification and identifies scintigraphic variables that are important to risk.

Every imaging test has artifacts that may obscure the image; chapter 15 discusses these. It is an image-intensive chapter that helps identify abnormalities and what causes them. This chapter covers not only myocardial perfusion images but also attenuation correction errors and first-pass and equilibrium radionuclide angiocardiology study artifacts. Additionally, a 40-page color atlas helps to drive home the information discussed in every chapter. Finally, because this study guide is designed for preparation for the NMTCB's NCT examination, chapter 16 provides tips for test taking and is followed by the mock 140-question NCT examination.

*Nuclear Cardiology Technology Study Guide* has everything a potential NCT candidate could want in preparing for the examination. The authors not only are some of the brightest minds in nuclear cardiology but also collectively share their knowledge in one complete text. If anyone practicing nuclear cardiology needs comprehensive information, this would certainly be the starting point.

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