J of Nuclear Medicine Technology, first published online March 10, 2016 as doi:10.2967/jnmt.116.175018

Nuclear Cardiology Technology Study Guide 2nd Edition

Nuclear Cardiology Technology Study Guide 2nd Edition by Sara G. Johnson, Mary Beth Farrell, Ann Marie Alessi, and Mark Hyun offers a complete study of nuclear cardiology from basic cardiac anatomy to advanced processing and quantitative analysis. The material is presented in a logical sequence, following the NMTCB nuclear cardiology specialty exam content specifications, with many complex topics addressed and explained in a way that is easy for students or seasoned technologists to understand. It begins by augmenting the reader's fundamental knowledge of anatomy, pathophysiology, and electrocardiography. This study guide discusses first-pass, gated wall motion, and shunt studies before progressing to myocardial perfusion studies. Each topic relating to myocardial perfusion is simplified into manageable sections including indications/contraindications, patient preparation, radiopharmaceuticals, stress protocols, acquisition protocols, processing techniques, quality control, and image artifacts and case reviews. SPECT, SPECT/CT, and PET are included in this discussion.

Chapter 1: Cardiac Anatomy and Physiology

Chapter one begins with a complete review of the structure and function of the heart, coronary arteries, the conduction system, common pathologies and an explanation of cardiac catheterization. This chapter not only serves as a useful review but also as a good introduction to topics discussed in the book.

Chapter 2: Electrocardiography

Chapter two expands on the electrical conduction of the heart mentioned in the first chapter. Topics covered include proper placement of ECG leads, explanations of each section of an electrocardiogram waveform, and a very easy to follow 8 step guide to interpreting electrocardiograms. This section also includes high quality images of various arrhythmias with detailed text on the pathology causing the abnormality and how to recognize it on an ECG.

Chapter 3: Non-Myocardial Perfusion Imaging Indications and Protocols

A useful review of non-myocardial perfusion cardiovascular examinations, this chapter covers Equilibrium Radionuclide Angiography, First-Pass Angiography, Left-To-Right Shunt, Right-To-Left Shunt, Myocardial Infarct, Myocardial Viability, mIBG, and ^{123}I-BMIPP studies. Each study reviewed includes the patient preparation, radiopharmaceuticals, data acquisition, patient positioning, processing, and associated mathematical formulas. High quality full-color and black-and-white procedural images are included.

Chapter 4: Myocardial Perfusion Imaging Indications, Protocols, and Acquisition Procedures.

Chapter four focuses on all the components needed to acquire high quality images by covering the indications, patient preparation and data acquisition of non-PET myocardial perfusion imaging. Useful tables are included that effectively summarize medications, beverages, and foods that must be discontinued before the procedure. This chapter explains the differences in protocols including 2 day Technetium, 1 day Rest/Stress, 1 day Stress/Rest, Dual Isotope, ^{201}Tl Distribution, and gating protocols including a chart that easily summarizes the information included in the text. Other topics covered in

this chapter includes appropriate injection-to-scan times, patient positioning, pixel size, energy window setting, camera orbits, collimators, projection and orbit selections, gating, and attenuation correction. The chapter ends with explanations of myocardium stunning verses hibernation and TID values along with clear full colored images of each.

Chapter 5: Myocardial PET

Beginning with an advantageous review of the physics of positron emission tomography, this chapter focuses on the physics and radiopharmaceuticals used in myocardial PET imaging. Spatial resolution and attenuation correction are included as well as a breakdown of myocardial perfusion and myocardial metabolism imaging tracers.

Chapter 6: Cardiac Medications and Emergencies in the Cardiac Stress Laboratory

This is a comprehensive review of all cardiac medications and common medical emergencies a technologist may encounter in a cardiac stress laboratory, including tables summarizing drug classes with the use and mechanism of action. The cardiovascular medications included in this chapter include angiotensin-converting enzymes (ACE) inhibitors, antiarrhythmics, anticoagulants, antiplatelet drugs, beta-blockers, calcium channel blockers, antilipemics, cardiac glycosides, diuretics, sympathomimetic drugs, and vasodilators. The most life-threatening and most common medical emergencies are explained along with tips for recognizing a medical emergency in your patient and how to effectively and appropriately manage a medical emergency or emergent condition.

Chapter 7: Radiopharmaceuticals Used in Myocardial Imaging

Chapter seven provides a complete overview of non-PET radiopharmaceuticals currently used for myocardial imaging. Each radiopharmaceutical discussed features unique preparation guidelines, contraindications, mechanisms of action, biodistributions, recommended dosages, and tips for imaging.

Chapter 8: Basic Myocardial Processing Techniques

Chapter eight begins with general principles and acquisition considerations before moving on to more complex processing techniques. The author provides a complete review of the reconstruction process using filtered back projection and iterative reconstruction. A detailed explanation of filters is given in a simple and easy to understand manner including considerations for choosing appropriate filters. An overview of orientation and nomenclature, analysis of processed data, and interpretation of quantitative data is also given.

Chapter 9: Advanced Processing and Quantitative Analysis

In chapter nine, the author explains the three part integrated analysis of quantification applicable to myocardial perfusion imaging in a simple way and includes numerous full color images that makes it

easy for the reader to understand. Some of the topics covered are 17 and 20 segment score systems, myocardial wall motion and thickening, diastolic function, phase analysis, lung/heart ration, transient ischemic dilation, quantitation of myocardial blood flow, and sources of technical error. The overview of commercially available software at the beginning of the chapter helps to make this material easily understandable to any technologist.

Chapter 10: Interpretation, Reporting, and Appropriateness of Studies

It is important for a responsible and competent technologist to understand the appropriate use of nuclear cardiology studies as well as the elements needed to accurately interpret and report the data provided. This chapter does just that by providing a simple description and step by step process of image interpretation and reporting. This chapter ends with an overview of appropriate use criteria, as well as a simple “how to use” guide.

Chapter 11: Quality Assurance and Quality Control

Chapter eleven provides a detailed survey of equipment quality control as well as the importance of following a well-designed quality assurance program. The author provides a useful overview and simple explanation of the quality control procedures performed for SPECT, SPECT/TCT, SPECT/CT, and non-imaging instruments as well as the frequency and importance of each procedure.

Chapter 12: Exercise Stress Testing

Chapter twelve begins with a detailed review of the important concepts associated with exercise stress testing. Patient preparation, various exercise protocols, safety risks, calculating maximum predicted and target heart rates, and considerations for special patient populations are all discussed in depth.

Chapter 13: Pharmacologic Stress Agents

Virtually all aspects of pharmacological stress agents is discussed in this chapter. Topics include indications for a pharmacological exam as well as the patient preparation, dosage, mechanism of action, administration protocol, common side effects, contraindications and anecdote of each agent.

Chapter 14: Using Myocardial Perfusion Imaging for Optimal Patient Management

Chapter fourteen offers a concise study of the concepts of risk stratification and patient management. The author begins the chapter by reviewing manifestations of ischemia and the diagnostic accuracy of various noninvasive exams before introducing the concepts of identifying risk and the important role that myocardial perfusion imaging plays in the accuracy of risk assessment and patient management.

Chapter 15: Identifying Image Artifacts

Dosing, image acquisition time, patient positioning, contamination, patient motion, gating, arrhythmias, attenuation, patient pathologies, equipment and processing related artifacts are thoroughly discussed in this last chapter of the text. A plethora of images are included, aiding the reader in both the understanding and later application of the information.

This full comprehensive text includes many useful summary tables and full color images that aid the reader in understanding the material and provide a quick reference for continued use of the text. The authors also include ten focused review questions at the end of each chapter as well as a 125 question cumulative mock exam at the end of the book.

Nuclear Cardiology Technology Study Guide 2nd Edition is the perfect text for educators, students, residents, physicians, or anyone seeking more understanding of nuclear cardiology. This should be the go-to resource for technologists studying for the NMTCB nuclear cardiology specialty exam!

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