Course Number and Title: NMT 201 Nuclear Medicine I

Campus Location:
Wilmington

Effective Date:
2018-51

Prerequisite:
BIO 121, ENG 102, NMT 222

Co-Requisite(s):
NMT 224, NMT 295

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NMT 224, NMT 295

Course Credits and Hours:
4.00 credits
4.00 lecture hours/week
0.00 lab hours/week

Course Description:
This course is the study of current uses of radiopharmaceuticals for organ visualization and function, evaluation of results, and pathology.

Required Text(s):
Obtain current textbook information by viewing the campus bookstore - https://www.dtcc.edu/bookstores online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:
Nuclear Medicine Program Policy Manual Allied Health/Science Department Program Student Policy Manual

Schedule Type:
Classroom Course

Disclaimer:
None

Core Course Performance Objectives (CCPOs):

1. Differentiate and explain the radiopharmaceutical and/or pharmaceutical needed for each in-vivo and in-vitro nuclear medicine procedure. (CCC 5, 6 ; PGC 1)
2. Identify and recognize indications for each procedure. (CCC 6; PGC 1)
3. Identify anatomy, physiology, and cross-sectional anatomy for each procedure. (CCC 1, 2; PGC 1, 2)
4. Evaluate and select data acquisition parameters and processing for each in-vivo and in-vitro procedure. (PGC 1, 2)
5. Describe patient positioning and anatomical landmarks. (CCC 6; PGC 1)
6. Describe patient preparation for each in-vivo and in-vitro procedure. (CCC 1, 2, 3; PGC 1, 4)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):
Upon completion of this course, the student will:

1. Differentiate and explain the radiopharmaceutical and/or pharmaceutical needed for each in-vivo and in-vitro nuclear medicine procedure.
    1. Explain primary photon energies used for imaging.
    2. Justify the rationale for radiopharmaceutical selection.
    3. Discuss method of localization.
    4. Define biologic, effective, and physical half-life.
    5. Explain the mode of uptake for radionuclide liver compounds: Tc-99m SC (technetium-99mm sulfur colloid) and Tc-99m RBC (red blood cells).
    6. Describe phagocytosis.
    7. List the ingredients given to a patient tested for gastric emptying of liquids and solids.
    8. Discuss and compare the common categories of pharmaceuticals that cardiac patients are administered.
    9. List five radiopharmaceuticals used in the past or present (or both) for performing heart studies.
    10. Explain and discuss sensitivity and specificity of Tc-99m pyrophosphate and Tl-201 chloride, Cardiolite, dual isotope, CardioTec,

and Myoview as myocardial imaging agents.
11. Recognize the physical characteristics of Tl-201 chloride, Cardiolite, dual isotope, CardioTec, and Myoview.
12. Compare and contrast Tc-99m albumin with the Tc-99m RBC as blood pool radiopharmaceuticals.
13. Describe three methods of labeling RBCs.
14. Describe the biomechanism of dipyridamole, dobutamine Tc-99m, and adenosine.
15. Determine patient doses and how they are administered for persantine, dobutamine, and adenosine.
16. Identify the hemodynamic changes for persantine, dobutamine, and adenosine.
17. Discuss, describe, and recognize the adverse drug effects of dobutamine, persantine, and adenosine.
18. Identify the pharmaceutical and the amount needed for managing patient drug reactions for each of the following: persantine, dobutamine, and adenosine.
19. Discuss and recall precaution and contraindications for persantine, dobutamine, and adenosine.
20. Explain and analyze the gastric reflux study radiopharmaceuticals.
21. Describe the use of radiopharmaceuticals in esophageal transit imaging.
22. Name three infarct-avid radiopharmaceuticals.

2. Identify and recognize indications for each procedure.
    1. Name four disease states of the liver, and describe how they appear on a Tc-99m sulfur colloid liver image.
    2. Differentiate between focal disease and diffuse liver disease.
    3. Name and describe four focal disease states of the liver.
    4. List three non-nuclear medicine procedures for evaluating the liver.
    5. Differentiate between chronic and acute cholecystitis as they appear on a Tc-99m Iminodiacetic acid (IDA) image.
    6. Discuss the normal transit times of Tc-99m IDA's through the biliary tree after the administration of cholecystokinin.
    7. Describe the physiological rationale for the presence of a Meckel's diverticulum and the use of pertechnetate to visualize the diverticulum.
    8. Compare normal and abnormal times for gastric emptying.
    9. Compare normal and abnormal transit times.
    10. List three indications for the performance of infarct-avid and myocardial perfusion procedures.
    11. List three indications for the performance of nuclear angiographic or function studies or both.
3. Identify anatomy, physiology, and cross-sectional anatomy for each procedure.
    1. Identify the anatomical position of the liver.
    2. Describe the blood supply to the liver.
    3. State the function of the Kupffer cells, parenchymal cells, and hepatic sinusoids.
    4. Compare the relationship among the common hepatic duct, cystic duct, and common bile duct.
    5. List five major functions of the liver.
    6. State the location and function of the gallbladder.
    7. Describe the anatomical location of the spleen.
    8. Describe the normal anatomical appearance of the esophagus and the stomach.
    9. Name the main anatomical structures of the heart.
    10. Discuss the function of the heart.
    11. Describe the pathway through which blood travels through the heart.
    12. Describe the essential electrophysiologic features of the heartbeat.
    13. Demonstrate, analyze, and discuss how the heart is supplied with blood.
    14. Define the terms *cardiac cycle*, *systole*, *and diastole.*
    15. Relate the normal events during the cardiac cycle with an electrocardiogram (EKG) tracing and pressure-volume curves.
    16. Define *blood pressure,* and state normal values.
    17. Determine a heart rate in two ways.
    18. Determine whether a heart rate is regular using an EKG tracing.
    19. Define and discuss the terms *stroke volume*, *cardiac output*, *ejection fraction*, and *ejection velocity*.
    20. Draw and label position of cardiac chambers and great vessels in the anterior, left lateral, and left anterior oblique (LAO) views.
4. Evaluate and select data acquisition parameters and processing for each in-vivo and in-vitro procedure.
    1. Discuss, analyze, and illustrate instrumentation parameters for routine liver/spleen, liver hemangioma, hepatobiliary, cholecystokinin-hydroxy iminodiacetic acid (CCK-HIDA), esophageal, stomach, intestines, and cardiac imaging.
    2. Explain instrumentation requirements for routine liver/spleen, liver hemangioma, hepatobiliary, CCK-HIDA, esophageal, stomach, intestines, and cardiac imaging.
    3. Discuss and illustrate imaging parameters for routine liver/spleen, CCK-HIDA, hepatobiliary, esophageal, stomach, intestines, and cardiac.
    4. Discuss, analyze, and demonstrate single photon emission computed tomography (SPECT) imaging of the liver.
    5. Describe and illustrate the procedure for eliminating breast shadow for liver imaging.
    6. Describe the proper techniques for liver SPECT hemangioma studies.
    7. For Tc-99m pyrophosphate imaging, resting Tl-201 chloride imaging and stress-rest Tl-201 chloride imaging, Cardiolite, dual isotope, CardioTec, and Myoview, demonstrate the technique for performing myocardial imaging procedures to include dose-to-scan time, instrument parameters, and filming protocols.
    8. Discuss instrument resolution and sensitivity requirements for the performance of T1-201 chloride imaging, Cardiolite, dual isotope, CardioTec, and Myoview.
    9. Discuss the technical problems associated with the imaging of low-energy photons from Tl-201, Cardiolite, dual isotope, CardioTec, and Myoview.
    10. Compare and contrast the use of parallel hole, focusing, and slant hole collimators for myocardial imaging.
    11. Describe one computer method of data manipulation for the quantitative evaluation of T1-201 chloride, Cardiolite, dual isotope,

CardioTec, and Myoview cardiac images.
12. For the performance of nuclear angiographic and nuclear cardiac function studies, discuss, analyze and use instrument requirements to include resolution, count rate capacity, and field of view.
13. State the requirements of physiological monitoring equipment necessary for use as a gating device for equilibrium-gated blood pool studies.
14. Explain the computer capabilities necessary for the performance of equilibrium-gated blood pool, multiple equilibrium-gated blood pool, and first-pass techniques.
15. Describe a technique for evaluating left ventricular ejection fraction and an angiographic (first pass) technique for the evaluation of intracardiac shunt and detection of aneurysm including instrumentation parameters, data collection, data storage, data manipulation, and data display.
16. Analyze and break down two problems that can arise during the use of an EKG R-wave triggering device.
17. Compare and contrast pharmacological stress testing and treadmill stress testing.

5. Describe patient positioning and anatomical landmarks.
    1. List and demonstrate the anatomical markings for each of the following procedures: routine liver/spleen, SPECT liver and hemangioma, CCK-HIDA and routine hepatobiliary imaging, esophageal transit, Barrette's esophageal, gastric emptying and reflux, gastrointestinal (GI) bleed and cardiac.
    2. Discuss the use of point sources during imaging.
    3. List probable artifacts for each procedure.
    4. Discuss the difference between lateral views and cross-table views.
    5. Define and discuss the following terms and their relationship with each procedure: *anterior*, *posterior*, *left lateral* (LL), *right lateral* (RL), *left anterior oblique* (LAO), *right anterior oblique* (RAO), *left posterior oblique* (LPO), *right posterior oblique* (RPO), *transverse*, *transaxial*, *coronal*, *sagittal*, *horizontal long axis*, and *vertical long axis*.
6. Describe patient preparation for each in-vivo and in-vitro procedure.
    1. Explain all procedures to the patient prior to the beginning of the exam.
    2. Evaluate and verify every procedural order.
    3. Prepare and obtain consent when necessary.
    4. Evaluate and verify the possibility of pregnancy for all women between the ages of 10 and 55.
    5. Identify and verify patient's name.
    6. Evaluate and verify the correct syringe and dose for each patient.
    7. Explain the importance of removing all metal from each patient.
    8. Discuss probable drug interactions and side effects for each procedure.
    9. Discuss the interference of body fluids for each procedure.

Evaluation Criteria/Policies:
Students must demonstrate proficiency on all CCPOs at a minimal 75 percent level to successfully complete the course. The grade will be determined using the Delaware Tech grading system:

92	**–**	**100**	**=**	**A**
83	**–**	**91**	**=**	**B**
75	**–**	**82**	**=**	**C**
0	**–**	**74**	**=**	**F**

Students should refer to the Student Handbook - https://www.dtcc.edu/handbook for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):

1. Integrate principles of theoretical knowledge and demonstrate entry-level skills pertaining to nuclear medicine in-vivo and in-vitro procedures, radiation safety, quality control, quality assurance, NRC regulations, patient care, radiopharmaceutical preparation and administration, instrumentation and medical informatics.
2. Exhibit verbal, nonverbal, and written communication skills during patient care, research, and professional scope of practice.
3. Competently perform all in-vivo and in-vitro procedures.
4. Abide by the profession’s code of ethics as stated in the American Registry of Radiologic Technologists (ARRT) and Nuclear Medicine Technology Certification Boards (NMTCB).
5. Exhibit critical thinking and problem solving skills during the practice of nuclear medicine.
6. Perform all entry-level procedural computer analysis.

Disabilities Support Statement:
The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the disabilities services - https://www.dtcc.edu/disabilitysupport web page or visit the campus Advising Center.