Course Number and Title: NMT 115 Intro to NMT with Clinical Lab

Campus Location:
Wilmington

Effective Date:
2018-51

Prerequisite:
NMT 101, SSC 100 or concurrent

Co-Requisites:
None

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

Course Description:
This course introduces quality control, radiation measurement, appropriate venipuncture techniques, application of infection control and safety procedures, and computer applications for nuclear medicine. Clinical instruction includes 80 hours of intravenous (IV) training and nuclear medicine procedures.

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:
Uniform, lab coat, goggles, syringe shield, and film badge

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. Explain the types of radiation and their application to nuclear medicine procedures, radiation safety, and quality assurance (QA). (CCC 5, 6; PGC 1, 2)
2. Analyze and explain nuclear medicine instrumentation and radiopharmaceuticals. (CCC 6; PGC 1, 2)
3. Assist in in-vivo and in-vitro routine nuclear medicine procedures. (CCC 1, 3; PGC 1, 2)
4. Explain and perform the proper technique of venipuncture, intradermal, and intramuscular (IM) injections. (CCC 1, 2, 3; PGC 1)
5. Demonstrate and explain the basic concepts of communication, personal and patient interaction, professional behavior, and the legal implications in this environment. (CCC 1, 2, 3, 4; PGC 3, 4, 6)
6. Describe the methods for handling and storing radioactive waste and materials. (CCC 1; PGC 1)
7. Describe background radiation, and identify its sources and annual exposure levels. (CCC 2, 6; PGC 1)
8. Identify and discuss the functional roles of agencies responsible for controlling radiation exposure. (CCC 6; PGC 1)

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. Explain the types of radiation and their application to nuclear medicine procedures, radiation safety, and quality assurance (QA).
    1. Distinguish among the alpha, beta, and gamma particles.
    2. Describe different instruments to identify radiation:
        1. Body dosimetry
        2. Geiger-Mueller (GM)/ionization counter
        3. Gamma scintillation cameras
    3. Demonstrate how radiation is detected.
    4. Explain QA and its purpose in an imaging department.
    5. Review and employ the guidelines of the radiation safety training program provided by the radiation safety officer (RSO).

6. Describe and follow safety measures when injecting radiopharmaceuticals.
7. Interpret, review, and practice Nuclear Regulatory Commission (NRC) and State of Delaware radiation regulations.
8. Analyze, identify, and adhere to hazardous materials (HAZMAT) and Department of Transportation (DOT) regulations.

2. Analyze and explain nuclear medicine instrumentation and radiopharmaceuticals.
    1. Discuss and list quality control on instruments.
    2. Define and practice hand monitoring.
    3. Describe and calculate windows width and multi-windows.
    4. Explain radioactive energy peaks of an isotope and how they apply to the scintillation camera.
    5. List the different collimators used on gamma cameras.
    6. Break down and recall the composition of the collimators.
    7. Describe and define various matrix sizes: *hextant, quadrant,* and *full frame.*
    8. Identify and describe the components of acquisition, processing, and utility regions in the computer.
    9. Discuss menu selections and preset protocols.
    10. Explain flood uniformity.
    11. Describe a photomultiplier tube.
    12. List and define common processing commands.
    13. List and discuss generators and radiopharmaceuticals.
    14. Define, distinguish, and prepare radioactive kit compounding.
    15. Define, discuss, and practice regulations of U.S. Pharmacopeia USP797.
    16. Calculate patient doses.
    17. Calculate kit volume and activity.
3. Assist in in-vivo and in-vitro routine nuclear medicine procedures.
    1. Assist with all patient care.
    2. Apply all hospital safety manual information during patient procedures.
    3. Identify and discuss the modes of transmission of infection and methods for prevention.
    4. Identify and follow procedures for collection and disposal of bio-hazardous specimens.
    5. Discuss in detail and practice asepsis techniques.
4. Explain and perform the proper technique of venipuncture, intradermal, and IM injections.
    1. Identify potential sites for venipuncture and skin puncture.
    2. Describe and employ the steps necessary to prepare a puncture site.
    3. List the effects of the tourniquet, hand squeezing, and heating pads on capillary puncture and venipuncture.
    4. Identify the equipment needed to collect various blood specimens by venipuncture.
    5. Identify and explain the preparation and types of equipment needed to inject a newborn infant.
    6. Explain and demonstrate needle insertion and withdrawal techniques, including direction, angle, depth, and appropriate disposal.
    7. Identify various types of anticoagulants used in blood collection.
    8. Name and explain the most frequent causes of phlebotomy complications.
    9. Identify criteria for rejection and /or extravasation of a patient's dose.
    10. Identify alternative venipuncture sites, and describe the limitations and precautions of each.
    11. Identify and demonstrate the steps necessary to perform a venipuncture and skin puncture.
5. Demonstrate and explain the basic concepts of communication, personal and patient interaction, professional behavior, and the legal implications in this environment.
    1. Correctly identify a patient for a prescribed procedure.
    2. Use the correct procedure and radiopharmaceutical for complying with a physician's request.
    3. Explain procedures for all ordered exams.
    4. Discuss questionnaires and consents for exams.
    5. Explain procedures for documenting accidents that occur during injection procurement and handling.
    6. Support confidentiality of a patient's records and ethical behavior.
    7. Discuss the procedures for patient chart documentation.
    8. Define, discuss, and apply all regulations and rules in the nuclear medicine technology program student manual.
6. Describe the methods for handling and storing radioactive waste and materials.
    1. Describe the conditions requiring a radioactive materials label on a container and the information placed on the label.
    2. Describe the proper procedures to follow when receiving a radioactive shipment and when determining whether a shipment is contaminated.
    3. Describe the proper procedure to follow when handling and disposing of radioactive materials.
    4. Describe the procedures for disposal of radioactive liquid and gaseous waste.
    5. Describe the role of radioactive decay in waste management and accountability.
    6. Define *radionuclide accountability.*
    7. Describe the significance of maximum permissible possession limit.
    8. Summarize the data required for record keeping for radionuclide ordering, receipt, use, disposal, and transfer.
    9. Describe the concepts of time, distance, and shielding in radiation protection.
    10. Describe the procedures for limiting internal exposure by inhalation, ingestion, and absorption.
    11. Describe the conditions that determine the selection of type and thickness of shield for different radionuclides.
    12. Calculate exposures using distance and shielding formulas.
    13. Describe the methods for area surveys using GM monitor, ionization chamber, film badges, and thermoluminescent (TLD) dosimeters.
    14. Describe protective clothing used in nuclear medicine.
    15. Differentiate between radiation survey for external exposure measurement and contamination check.

16. Select a proper method for a given radiation survey.
17. Distinguish between acceptable and unacceptable levels of contamination using a wipe test.
18. List the areas to monitor in an area survey.
19. Demonstrate the use of a GM monitor and wipe test to check for contamination.
20. Describe precautions and regulations for patients receiving nuclear medicine (NM) therapy.
21. Describe the procedures when unacceptable contamination levels are detected.
22. Plan the procedures to follow for a major and minor radionuclide spill.
23. Demonstrate decontamination procedures using appropriate monitoring equipment.

7. Describe background radiation and identify its sources and annual exposure levels.
    1. Define *maximum permissible levels* of radiation.
    2. Describe maximum permissible levels of radiation for persons over age 18 in one calendar quarter caused by occupational and nonoccupational exposure to whole body, hands, forearms, and skin.
    3. Describe maximum permissible levels of radiation for persons under age 18 in one calendar quarter caused by occupational and nonoccupational exposure to whole body, hands, forearms, and skin.
    4. Define *restricted area* and *unrestricted area.*
    5. Identify the amount of radioactivity required to post the following radiation signs: Radiation Area, High Radiation Area, and Caution: Radioactive Materials.
    6. Discriminate between acceptable and unacceptable levels in external exposure measurement in a restricted and unrestricted area.
    7. Define *radioactive waste.*
8. Identify and discuss the functional roles of agencies responsible for controlling radiation exposure.
    1. Analyze the purpose of regulatory agencies, including Nuclear Regulatory Commission (NRC), State Occupational Safety and Health Association (OSHA), Food and Drug Administration (FDA), National Council on Radiation Protection (NRCP), Department of Transportation (DOT), as well as Radiation Safety Officer (RSO) and Radiation Safety (RS) committees.
    2. Differentiate among types of medical licenses.
    3. Justify the tasks required to satisfy NRC or state radionuclide accountability regulations or both.
    4. Describe the basic content of Code of Federal Regulations, Title 10, Part 19, 20 30 and 35 (10CFR 19, 20, 30, 35).

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.