

NMED-2301: NUCLEAR MEDICINE PROCEDURES II

Cuyahoga Community College

Viewing: NMED-2301 : Nuclear Medicine Procedures II

Board of Trustees:

2014-06-19

Academic Term:

Fall 2020

Subject Code

NMED - Nuclear Medicine Technology

Course Number:

2301

Title:

Nuclear Medicine Procedures II

Catalog Description:

Study of diagnostic nuclear medicine procedures relating to the central nervous, genitourinary, and cardiovascular systems as well as tumor imaging. This course includes anatomy and physiology, pathophysiology, and protocols for routine and non-routine nuclear medicine procedures.

Credit Hour(s):

3

Lecture Hour(s):

3

Requisites

Prerequisite and Corequisite

NMED-1301 Nuclear Medicine Procedures I and NMED-1603 Nuclear Radiopharmacy and Pharmacology, and NMED-1501 Radiation Physics.

Outcomes

Course Outcome(s):

Analyze general disorders and disease states of the nervous, genitourinary, and cardiovascular systems as they will apply to Nuclear Medicine.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Relate the anatomy and physiology of the nervous, genitourinary, and cardiovascular systems to nuclear medicine methodologies.
2. Describe general disorders and disease states of the nervous, genitourinary and cardiovascular systems including pediatric specific disorders.
3. Discuss general disorders and diseases of the cardiovascular, central nervous and genitourinary systems as they would apply to the nuclear medicine department.

Course Outcome(s):

Analyze and differentiate various types of tumors as they will apply to Nuclear Medicine.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Identify the characteristics of neuroendocrine tumors, non-hodgkins/hodgkins lymphoma, lymphoscintigraphy and breast cancer and metastatic disease for each disease stated.
 2. Compare the different diagnostic imaging procedures used for each disease.
 3. Explain the use of the Positron Emission Tomography in each disease diagnosis.
 4. Relate which radiopharmaceutical is most effective when imaging each disease.
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Course Outcome(s):

Explain procedures for performing nuclear medicine studies.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Relate the anatomy and physiology of the nervous, genitourinary, and cardiovascular systems to nuclear medicine methodologies.
 2. Describe procedures, protocols, and acquisition parameters for the nervous, genitourinary, and cardiovascular systems including imaging of tumors and pediatric patients.
 3. Discuss general disorders and diseases of the cardiovascular, central nervous and genitourinary systems as they would apply to the nuclear medicine department.
 4. List radiopharmaceuticals that would be used in imaging the nervous, genitourinary, and cardiovascular systems.
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Course Outcome(s):

Explain planar and dynamic acquisitions and the use of Single Positron Emission Computed Tomography (SPECT) when performing nuclear medicine procedures.

Objective(s):

1. List radiopharmaceuticals that would be used in imaging the nervous, genitourinary, and cardiovascular systems.
 2. Discuss the use of Single Positron Emission Computed Tomography (SPECT) in nuclear medicine procedures.
 3. Describe planar and dynamic acquisitions in nuclear medicine procedures.
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Methods of Evaluation:

1. Quizzes
2. Exams
3. Midterm
4. Final Exam
5. Written assignments
6. Case studies
7. participation

Course Content Outline:

1. Central Nervous System
 - a. Anatomy and Physiology
 - b. Disorders, diseases and pathology as related to imaging including but not limited to:
 - i. Dementia
 - ii. Alzheimer"s
 - iii. Depression
 - iv. Brain death
 - v. Transient ischemic attack
 - vi. Cerebrovascular accident
 - vii. Stroke
 - viii. Cerebral spinal fluid leak
 - ix. Chronic migraines
 - x. Epilepsy
 - xi. Seizure disorders
 - xii. Brain cancer
 - xiii. Glioblastoma

- xiv. Neuroendocrine tumors
 - xv. Hydrocephalus
 - xvi. Chronic drug use/abuse
 - xvii. Alcoholism
 - xviii. Bipolar disorder
 - xix. Schizophrenia
 - xx. Parkinson's disease
 - c. Radiopharmaceuticals
 - i. ^{99m}Tc Sodium pertechnetate
 - ii. ^{99m}Tc pentetate/DTPA
 - iii. ^{99m}Tc bismate/ECD
 - iv. ^{99m}Tc exametazime/HMPAO
 - v. Iodine-123 ioflupane datscan
 - vi. Indium-111 Pentetate (DTPA)
 - vii. F-18 Florbetapir/ F18 Florbetaben
 - viii. F-18 Fluorodeoxyglucose (FDG)]
 - ix. Newly approved radiopharmaceuticals; F18 Flutemetamol
 - d. Methodology including preparation, procedures, and acquisition parameters
 - i. Brain flow
 - ii. Brain death
 - iii. Brain imaging, planar
 - iv. Brain imaging, Single photon emission tomography (SPECT)
 - v. Brain Positron Emission Tomography (PET)
 - vi. Cisternogram
 - vii. cerebral spinal fluid (CSF) leak
 - viii. CSF shunt patency
 - ix. DaT Scan (dopamine transmitters)
 - x. Pediatric considerations
 - xi. Advancing technologies and emerging protocols.
2. Genitourinary System
- a. Anatomy and Physiology
 - b. Disorders, diseases and pathology as related to imaging including but not limited to:
 - i. Glomerulonephritis
 - ii. Polycystic kidney disease
 - iii. Hydronephrosis
 - iv. Urinary tract infections
 - v. Vesicoureteral reflux
 - vi. Renal artery stenosis
 - vii. Renal hypertension
 - viii. Renal cancer
 - ix. Kidney stones
 - x. Acute renal failure
 - xi. Chronic renal failure
 - xii. Obstruction
 - xiii. Polycystic kidney disease
 - c. Radiopharmaceuticals
 - i. ^{99m}Tc pentetate/DTPA (Diethylene Triamine Pentacetic Acid).
 - ii. ^{99m}Tc mertiatide/MAG3 (mercapto acetyl tri glycine)
 - iii. ^{99m}Tc succimer/DMSA (meso-2,3-dimercaptosuccinic acid)
 - iv. I123 MIBG (meta-iodobenzylguanidine)
 - v. I131 MIBG
 - vi. Enalaprilat
 - vii. Captopril
 - viii. Furosemide
 - ix. Newly approved drugs
 - d. Methodology including preparation, procedures, and acquisition parameters
 - i. Cystogram, direct
 - ii. Effective renal plasma flow (ERPF)

- iii. Glomerular filtration rate (GFR)
 - iv. Renal anatomy, planar
 - v. Renal anatomy, SPECT
 - vi. Renal flow
 - vii. Renal perfusion
 - viii. Renal morphology
 - ix. Renogram
 - x. Pediatric considerations
 - xi. Advancing technologies and emerging protocols
- 3. Cardiovascular System
 - a. Anatomy and Physiology
 - b. Disorders, diseases and pathology as related to imaging including but not limited to:
 - i. Angina
 - ii. Hypertension
 - iii. Congestive heart failure
 - iv. Cardiomyopathy
 - v. Transient ischemic dilatation
 - vi. Arrhythmias
 - vii. Aortic stenosis
 - viii. Aneurysm
 - ix. Endocarditis
 - x. Left ventricular hypertrophy
 - xi. Pulmonary hypertension and right ventricular hypertrophy
 - xii. Ischemia
 - xiii. Infarction
 - xiv. Myocarditis
 - xv. Rheumatic fever
 - xvi. Shingles
 - xvii. Valvular diseases
 - xviii. Mitral valve prolapse
 - xix. Coronary artery bypass
 - xx. Cardiovascular stenting
 - xxi. Pacemakers
 - xxii. Chemotherapy toxicity
 - xxiii. Effects of drug abuse
 - c. Radiopharmaceuticals
 - i. Tc99m pyrophosphate/PYP
 - ii. Tc99m sestamibi/MIBI
 - iii. Tc99m tetrofosmin
 - iv. Tc99m labeled RBCs
 - v. Tl201 thallous chloride
 - vi. F18 FDG
 - vii. N13 ammonia
 - viii. Rb82 chloride
 - ix. Oxygen-15
 - x. Carbon-11
 - xi. Newly approved radiopharmaceuticals: I-123 MIBG
 - d. Methodology including preparation, procedures, and acquisition parameters
 - i. Myocardial perfusion, planar
 - ii. Myocardial perfusion, SPECT, SPECT/CT
 - iii. Myocardial perfusion, gated SPECT
 - iv. Myocardial perfusion PET
 - v. Pharmacological stress testing
 - 1. Dipyridamole/persantine
 - 2. Adenosine
 - 3. Regadenoson/lexiscan
 - 4. Dobutamine

- 5. Atropine
 - 6. Aminophylline
 - vi. First pass for ejection fraction (EF) and wall motion
 - vii. Gated cardiac blood pool, rest
 - viii. Gated cardiac blood pool, stress
 - ix. Gated cardiac blood pool, SPECT
 - x. Cardiac shunt
 - xi. Cardiac viability with PET
 - xii. Pediatric considerations
 - xiii. Advancing technologies and emerging protocols
4. Tumor Imaging
- a. Anatomy and Physiology
 - b. Disorders, diseases and pathology as related to imaging including but not limited to:
 - i. Neuroendocrine tumors
 - ii. Non-hodgkins lymphoma
 - iii. Hodgkins disease
 - iv. Primary cancers
 - v. Metastatic disease
 - vi. Cancer staging
 - vii. Peptide receptor tumors
 - c. Radiopharmaceuticals
 - i. Gallium-67
 - ii. Iodine-131
 - iii. 99mTc sestamibi
 - iv. Tc99m sulfur colloid
 - v. F-18FDG
 - vi. In111 labeled MAB (capromab pendetide)
 - vii. In111 ibritumomab tiuxetan
 - viii. Newly approved radiopharmaceuticals: Ga68 Dotatate; I125 Seeds
 - d. Methodology including preparation, procedures, and acquisition parameters
 - i. Lymphoscintigraphy for breast cancer
 - ii. Lymphoscintigraphy for melanoma
 - iii. Tumor Imaging with Gallium (planar and SPECT)
 - iv. I-131 Whole Body imaging for Thyroid Cancer/Metastatic Survey
 - v. Positron Emission Tomography
 - vi. Positron emission Tomography fused with Computed tomography
 - vii. Peptide receptor imaging
 - viii. Somatostatin receptor imaging
 - ix. Monoclonal antibodies
 - x. Pediatric considerations
 - xi. Advancing technologies and emerging protocols: Liver lung shunt mapping

Resources

Bolus, N., & Glasgow, K.W., (Eds.). (2018) *Review of Nuclear Medicine Technology (5th Ed.)*, Reston, VA: Society of Nuclear Medicine and Molecular Imaging.

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Lee, K.H. (2015) *Basic Science of Nuclear Medicine: Bare Bone Essentials*, Reston, VA: Society of Nuclear Medicine and Molecular Imaging.

Mettler, F. & Guiberteau, M. (2018) *Essentials of Nuclear Medicine Imaging*, Philadelphia, Pa.: W.B. Saunders.

Prekeges, J. (2013) *Nuclear Medicine Instrumentation (2nd ed.)*, Sudbury, MA: Jones and Bartlett Publishing.

Shackett, P., (Ed.). (2008) *Nuclear Medicine Technology: Procedures and Quick Reference (2nd ed.)*, Philadelphia, Pa.: Lippincott, Williams, and Wilkins.

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