

NMED-1302: NUCLEAR MEDICINE PROCEDURES I

Cuyahoga Community College

Viewing: NMED-1302 : Nuclear Medicine Procedures I

Board of Trustees:

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Academic Term:

Fall 2024

Subject Code

NMED - Nuclear Medicine Technology

Course Number:

1302

Title:

Nuclear Medicine Procedures I

Catalog Description:

Methods of performing patient organ visualization procedures in nuclear medicine. Review of anatomy, physiology and pathology of the various organs, radiopharmaceuticals, applicable instrumentation, methodologies, and techniques utilized, including radiation safety techniques, patient care, patient preparation, and patient imaging for nuclear studies.

Credit Hour(s):

2

Lecture Hour(s):

2

Requisites

Prerequisite and Corequisite

Concurrent enrollment in NMED-130L Nuclear Medicine Laboratory I and departmental approval: admission to program.

Outcomes

Course Outcome(s):

Discuss general disorders and disease states of the skeletal, respiratory, gastrointestinal, lymphatic and endocrine systems as they apply to Nuclear Medicine.

Objective(s):

1. Describe general disorders, disease states, and pathology of the skeletal system and include pediatric diseases.
2. Define general disorders, disease states, and pathology of the respiratory systems and include pediatric diseases.
3. Describe general disorders, disease states, and pathology of the gastrointestinal and reticuloendothelial system and include pediatric diseases.
4. Describe general disorders, disease states, and pathology of the lymphatic system and include pediatric diseases.
5. Describe general disorders, disease states, and pathology of the endocrine system and include pediatric diseases.

Course Outcome(s):

Apply knowledge of proper 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. Explain the anatomy and physiology of the skeletal, respiratory, gastrointestinal, and endocrine systems.
2. List radiopharmaceuticals that would be used for the respiratory, skeletal, gastrointestinal, thyroid, salivary glands, parathyroid, and pediatric procedures.

3. Describe positioning and views for the respiratory, skeletal, gastrointestinal, thyroid, salivary glands, parathyroid and pediatric procedures.

Methods of Evaluation:

1. Participation and discussion
2. Quizzes
3. Midterm and final exam
4. Written assignments and case studies

Course Content Outline:

1. Skeletal System
 - a. Anatomy and Physiology
 - b. Skeletal disorders, diseases and pathology as related to imaging including but not limited to:
 - i. Arthritic disorders
 - ii. Osteomyelitis
 - iii. Trauma
 - iv. Sports injuries including stress fractures
 - v. Prosthesis imaging
 - vi. Paget's Disease
 - vii. Osteosarcomas
 - viii. Metastatic Disease
 - ix. Necrosis
 - x. Metabolic bone diseases/disorders
 - c. Radiopharmaceuticals for skeletal imaging
 - i. ^{99m}Tc - MDP (methylene diphosphonate)
 - ii. ^{99m}Tc - HDP (hydroxymethylene diphosphonate)
 - iii. ^{18}F -Sodium Fluoride
 - iv. Newly approved radiopharmaceuticals
 - d. Methodology including preparation, procedures, and acquisition parameters
 - i. Whole Body Bone scan
 - ii. Partial/Limited
 - iii. 3 and 4 phase
 - iv. SPECT and SPECT/CT(single photon emission tomography and computed tomography)
 - v. PET and PET/CT (positron emission tomography)
 - vi. Pediatric considerations
 - vii. Advancing technology and emerging protocols.
2. Gastrointestinal System
 - a. Anatomy and Physiology
 - b. Gastrointestinal disorders, diseases and pathology as related to imaging including but not limited to:
 - i. Gastric motility diseases and disorders including gastroparesis and swallowing disorders
 - ii. Gastric/esophageal reflux
 - iii. Gastrointestinal/rectal bleeding
 - iv. Hemangioma
 - v. Diseases and disorders of the gallbladder and cholecystectomy
 - vi. Shunting including peritoneal and hepatic shunts
 - vii. Cirrhosis
 - viii. Cancers of the gastrointestinal system
 - ix. Meckel's diverticulum
 - c. Radiopharmaceuticals for gastrointestinal imaging
 - i. $^{99m}\text{TcO}_4^-$ Sodium pertechnetate
 - ii. ^{99m}Tc MAA (micro aggregated albumin) for shunt patency
 - iii. ^{99m}Tc DTPA (Diethylenetriaminepentaacetic acid)
 - iv. In-111 DTPA
 - v. ^{99m}Tc sulfur colloid
 - vi. ^{99m}Tc disofenin/mebrofenin

- vii. ^{99m}Tc labeled red blood cells/Ultratag
- viii. Newly approved radiopharmaceuticals
- d. Methodology including preparation, procedures, and acquisition parameters
 - i. Esophageal motility/transit
 - ii. Gastric emptying (liquid/solid)
 - iii. Gastroesophageal reflux
 - iv. Gastrointestinal/rectal bleeding
 - v. Hemangioma
 - vi. Hepatobiliary (HIDA scan)
 - vii. Gall bladder ejection fraction
 - viii. Morphine studies
 - ix. Biliary leak
 - x. Peritoneal venous shunt patency
 - xi. Hepatic pump patency
 - xii. Liver-spleen imaging, planar and SPECT
 - xiii. Meckel's diverticulum study
 - xiv. SPECT and SPECT/CT for gastrointestinal imaging
 - xv. Pediatric considerations
 - xvi. Advancing technology and emerging protocols
- 3. Respiratory system
 - a. Anatomy and physiology
 - b. Disorders, diseases, and pathology as related to imaging, including but not limited to:
 - i. Pulmonary embolism
 - ii. Pulmonary carcinomas
 - iii. Chronic obstructive lung disease
 - iv. Pneumothorax
 - v. Emphysema
 - vi. Pneumonectomy
 - vii. Pleural Effusions
 - c. Radiopharmaceuticals for respiratory system
 - i. ^{99m}Tc DTPA aerosol
 - ii. Xenon 133 gas
 - iii. ^{99m}Tc MAA particles
 - d. Methodology including preparation, procedures, and acquisition parameters
 - i. Ventilation with aerosol or gas
 - ii. Perfusion
 - iii. Quantitative lung analysis
 - iv. Pediatric considerations
 - v. Advancing technology and emerging protocols.
- 4. Lymphatic system and Infection imaging
 - a. Anatomy and physiology
 - b. Disorders, diseases, and pathology as related to imaging, including but not limited to:
 - i. Sentinel node and lymphatic/tumor drainage
 - ii. Parasitic, bacterial, and fungal infections
 - iii. Abscesses
 - iv. Diabetes as it relates to infection
 - v. Sarcoidosis
 - vi. Leukopenia
 - vii. Fever of unknown origin
 - viii. Sepsis
 - ix. Inflammatory bowel disease
 - c. Radiopharmaceuticals
 - i. ^{99m}Tc Sulfur colloid
 - ii. ^{99m}Tc lymphoseek
 - iii. ^{67}Ga citrate
 - iv. In-111 oxine labeled leukocytes
 - v. ^{99m}Tc Examtazime/HMPAO (hexamethylpropyleneamine oxime) labeled leukocytes

- vi. 18F-FDG for infection imaging (flourideoxyglucose)
- vii. Newly approved radiopharmaceuticals
- d. Methodology including preparation, procedures, and acquisition parameters
 - i. Lymphoscintigraphy/sentinel lymph node localization
 - ii. Ga67 infection imaging
 - iii. Tagged WBC imaging
 - iv. Whole body scans
 - v. Limited and delayed imaging
 - vi. SPECT and SPECT/CT
 - vii. PET and PET/CT
 - viii. Pediatric considerations
 - ix. Advancing technology and emerging protocols
- 5. Endocrine System
 - a. Anatomy and Physiology
 - b. Disorders, diseases, pathology as related to imaging, including but not limited to:
 - i. Hyperthyroidism, Hypothyroidism, Euthyroid
 - ii. Diffuse Toxic Goiter (Graves' Disease)
 - iii. Hot vs. Cold nodules
 - iv. Multinodular glands
 - v. Thyroiditis
 - vi. Thyroid carcinoma
 - c. Radiopharmaceuticals
 - i. I123
 - ii. 99mTc O4
 - iii. I131
 - d. Methodology including preparation, procedures, and acquisition parameters
 - i. Percent Thyroid uptake
 - ii. Factors and medication affecting Iodine uptake
 - iii. Thyroid therapy and ablation
 - iv. normal and abnormal thyroid scan results including ectopic thyroid tissue
 - v. Whole body thyroid scans
 - vi. Dual isotope parathyroid studies
 - vii. Parathyroid adenoma localization

Resources

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Prekeges, Jennifer. *Nuclear Medicine Instrumentation*. 1st ed. Sudbury, MA: Jones and Barlette Publishing, 2011.

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Metler and Guiberteau. *Essentials of Nuclear Medicine and Molecular Imaging*. 7th ed. Elsevier, 2019.

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