NMED-1301: NUCLEAR MEDICINE PROCEDURES I

Cuyahoga Community College

Viewing: NMED-1301 : Nuclear Medicine Procedures I

Board of Trustees:
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Academic Term:
Fall 2023

Subject Code
NMED - Nuclear Medicine Technology

Course Number:
1301

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):
3

Lecture Hour(s):
3

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 state, 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:

a. Participation and discussion
b. Quizzes
c. Midterm and final exam
d. Written assignments and case studies

Course Content Outline:

a. Skeletal System
   i. Anatomy and Physiology
   ii. Skeletal disorders, diseases and pathology as related to imaging including but not limited to:
      1. Arthritic disorders
      2. Osteomyelitis
      3. Trauma
      4. Sports injuries including stress fractures
      5. Prosthesis imaging
      6. Paget's Disease
      7. Osteosarcomas
      8. Metastatic Disease
      9. Necrosis
      10. Metabolic bone diseases/disorders
   iii. Radiopharmaceuticals for skeletal imaging
      1. 99mTc- MDP (methylene diphosphonate)
      2. 99mTc- HDP (hydroxymethylene diphosphonate)
      3. 18F-Sodium Fluoride
      4. Newly approved radiopharmaceuticals
   iv. Methodology including preparation, procedures, and acquisition parameters
      1. Whole Body Bone scan
      2. Partial/Limited
      3. 3 and 4 phase
      4. SPECT and SPECT/CT(single photon emission tomography and computed tomography)
      5. PET and PET/CT (positron emission tomography)
      6. Pediatric considerations
      7. Advancing technology and emerging protocols.
b. Gastrointestinal System
   i. Anatomy and Physiology
   ii. Gastrointestinal disorders, diseases and pathology as related to imaging including but not limited to:
      1. Gastric motility diseases and disorders including gastroparesis and swallowing disorders
      2. Gastric/esophageal reflux
      3. Gastrointestinal/rectal bleeding
      4. Hemangioma
      5. Diseases and disorders of the gallbladder and cholecystectomy
      6. Shunting including peritoneal and hepatic shunts
      7. Cirrhosis
      8. Cancers of the gastrointestinal system
      9. Meckel's diverticulum
   iii. Radiopharmaceuticals for gastrointestinal imaging
      1. 99mTcO4- Sodium pertechnetate
      2. 99mTc MAA (micro aggregated albumin) for shunt patency
      3. 99mTc DTPA (Diethylenetriaminepentaacetic acid)
      4. In-111 DTPA
      5. 99mTc sulfur colloid
      6. 99mTc disofenin/mebrofenin

7. 99mTc labeled red blood cells/Ultratag
8. Newly approved radiopharmaceuticals

iv. Methodology including preparation, procedures, and acquisition parameters

1. Esophageal motility/transit
2. Gastric emptying (liquid/solid)
3. Gastroesophageal reflux
4. Gastrointestinal/rectal bleeding
5. Hemangioma
6. Hepatobiliary (HIDA scan)
7. Gall bladder ejection fraction
8. Morphine studies
9. Biliary leak
10. Peritoneal venous shunt patency
11. Hepatic pump patency
12. Liver-spleen imaging, planar and SPECT
13. Meckel's diverticulum study
14. SPECT and SPECT/CT for gastrointestinal imaging
15. Pediatric considerations
16. Advancing technology and emerging protocols

c. Respiratory system

i. Anatomy and physiology

ii. Disorders, diseases, and pathology as related to imaging, including but not limited to:

1. Pulmonary embolism
2. Pulmonary carcinomas
3. Chronic obstructive lung disease
4. Pneumothorax
5. Emphysema
6. Pneumonectomy
7. Pleural Effusions

iii. Radiopharmaceuticals for respiratory system

1. 99mTc DTPA aerosol
2. Xenon 133 gas
3. 99mTc MAA particles

iv. Methodology including preparation, procedures, and acquisition parameters

1. Ventilation with aerosol or gas
2. Perfusion
3. Quantitative lung analysis
4. Pediatric considerations
5. Advancing technology and emerging protocols.

d. Lymphatic system and Infection imaging

i. Anatomy and physiology

ii. Disorders, diseases, and pathology as related to imaging, including but not limited to:

1. Sentinel node and lymphatic/tumor drainage
2. Parasitic, bacterial, and fungal infections
3. Abscesses
4. Diabetes as it relates to infection
5. Sarcoidosis
6. Leukopenia
7. Fever of unknown origin
8. Sepsis
9. Inflammatory bowel disease

iii. Radiopharmaceuticals

1. 99mTc Sulfur colloid
2. 99mTc lymphoseek
3. 67Ga citrate
4. In-111 oxine labeled leukocytes
5. 99mTc Examtazime/HMPAO (hexamethylpropyleneamine oxime) labeled leukocytes

6. 18F-FDG for infection imaging (flourideoxyglucose)
7. Newly approved radiopharmaceuticals

iv. Methodology including preparation, procedures, and acquisition parameters
1. Lymphoscintigraphy/sentinel lymph node localization
2. Ga67 infection imaging
3. Tagged WBC imaging
4. Whole body scans
5. Limited and delayed imaging
6. SPECT and SPECT/CT
7. PET and PET/CT
8. Pediatric considerations
9. Advancing technology and emerging protocols

e. Endocrine System
i. Anatomy and Physiology
ii. Disorders, diseases, pathology as related to imaging, including but not limited to:
1. Hyperthyroidism, Hypothyroidism, Euthyroid
2. Diffuse Toxic Goiter (Graves' Disease)
3. Hot vs. Cold nodules
4. Multinodular glands
5. Thyroiditis
6. Thyroid carcinoma

iii. Radiopharmaceuticals
1. I123
2. 99mTc O4
3. I131

iv. Methodology including preparation, procedures, and acquisition parameters
1. Percent Thyroid uptake
2. Factors and medication affecting Iodine uptake
3. Thyroid therapy and ablation
4. normal and abnormal thyroid scan results including ectopic thyroid tissue
5. Whole body thyroid scans
6. Dual isotope parathyroid studies
7. Parathyroid adenoma localization

Resources

Early, Paul J. and D. Bruce Sodee, eds. *Principles and Practices of Nuclear Medicine.* 2nd ed. St. Louis, MO: Mosby, 1995.

Mettler, Fred Jr. and Milton Guiberteau, eds. *Essentials of Nuclear Medicine Imaging.* 6th ed. Philadelphia, PA: W.B. Elsevier Saunders, 2013.

Schackett, Pete. *Nuclear Medicine Technology: Procedures and Quick Rerference.* 2nd ed. Philadelphia, PA: Lippincotte, Williams and Wilkins, 2008.

Wagner, Jr., Henry, Zsolt Szabo, and Julia Buchanan, eds. *Principles of Nuclear Medicine.* 2nd ed. Philadelphia, PA: W.B. Saunders, 1995.

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

Ziessman, Harvey A., O'Malley, Janis P., and Thrall, James H. *Nuclear Medicine the Requisites.* 4th ed. Philadelphia, PA: Elsevier Saunders, 2014.

Waterstram-Rich, K., and Gilmore, D. (2016) *Nuclear Medicine and PET/CT Technology and Techniques*, St Louis: Mosby.

Seeram and Brennan. *Radiation Protection in Diagnostic X-ray Imaging*. Jones and Bartlett Learning, 2017.

Bushong. *Radiologic Science for Technologists*. 11th ed. Elsevier, 2017.

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

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