Nuclear Radiology

This exam content assesses the candidate’s knowledge and skills related to the clinical practice of nuclear radiology. The domain encompasses diagnostic planar, SPECT/CT, and PET/CT imaging using a variety of radiopharmaceuticals. The domain includes oral radioiodine therapy for hyperthyroidism and thyroid cancer.

Included in this document:

- Domain Critical Concepts
- Domain Blueprint
- Domain Overview

**Domain Critical Concepts**

1. **Central Nervous System**
   a. Recognize presence or absence of cerebral blood flow on brain scan
   b. Differentiate dementias on FDG PET/CT
2. **Cardiovascular & Lymphatic Systems**
   a. Distinguish ischemia from scar on myocardial perfusion SPECT
   b. Understand lymphatic pathways and apply to pre-operative imaging
3. **Pulmonary System**
   a. Apply interpretation criteria in diagnosis of acute and chronic pulmonary embolism on V/Q scan
4. **Gastrointestinal System**
   a. Recognize and localize active hemorrhage on gastrointestinal bleeding scan
   b. Differentiate acute and chronic gallbladder disease, and recognize biliary complications on IDA scan
5. **Genitourinary System**
   a. Recognize kidney and urinary tract pathology on DMSA and MAG3 scans
6. **Musculoskeletal System**
   a. Differentiate benign and malignant skeletal diseases on skeletal scintigraphy
7. **Endocrine System**
   a. Localize overactive parathyroid gland(s) on planar and SPECT/CT imaging
8. **Infection & Inflammation**
   a. Identify sources of infection and inflammation on planar and SPECT/CT imaging
9. **Neoplasms**
   a. Differentiate physiological from pathological biodistribution in oncologic FDG PET/CT
10. **Therapy & Theranostics**
    a. Integrate thyroid imaging with uptake and laboratory values to plan radioiodine therapy in hyperthyroidism
    b. Integrate whole-body imaging with laboratory values and surgical staging to plan radioiodine therapy in thyroid cancer
11. **Technical & Quality**
    a. Recognize altered radiopharmaceutical biodistribution
    b. Recognize imaging artifacts
    c. Recognize pitfalls in quantitative analysis
Domain Blueprint

1. Central Nervous System (CNS): 8%-9%
2. Cardiovascular & Lymphatic (CV & L) Systems: 8%-9%
3. Pulmonary System: 4%
4. Gastrointestinal (GI) System: 12%-13%
5. Genitourinary (GU) System (including Breast): 8%-9%
6. Musculoskeletal (MSK) System (including Integument): 6%
7. Endocrine System: 6%
8. Infection & Inflammation (I & I): 4%
9. Neoplasms: 25%
10. Therapy & Theranostics: 10%
11. Technical & Quality (excluding Physics & RISE): 6%

Domain Overview

1. Central Nervous System (CNS)
   1. Brain viability
   2. Dementias & behavioral disorders
   3. Movement disorders
   4. Seizure focus
   5. Cerebrovascular disease
   6. Cerebrospinal fluid (CSF)
2. Cardiovascular & Lymphatic (CV & L) Systems
   1. Myocardial perfusion imaging, coronary artery disease
   2. Myocardial perfusion imaging, non-coronary artery disease
   3. Myocardial metabolism & viability
   4. Multigated acquisition (MUGA)/gated cardiac blood pool imaging
3. Pulmonary System
   1. Ventilation & perfusion (thromboembolism; non-thromboembolism; airways)
4. Gastrointestinal (GI) System
   1. Liver & spleen
   2. Biliary
   3. Bowel (GI bleed; GI motility)
5. Genitourinary (GU) System
   1. Renal perfusion & function (native kidneys)
   2. Renal diuretic challenge (native kidneys)
   3. Renal cortex (native kidneys)
   4. Renal transplant
   5. Urinary leak (native & transplant kidneys)
   6. Bladder/nuclear cystogram
6. **Musculoskeletal (MSK) System (including Integument)**
   1. Tumor-like or associated conditions
   2. Metabolic & vascular conditions
   3. Trauma
   4. Extra-skeletal processes (on skeletal scintigraphy)

7. **Endocrine System**
   1. Thyroid gland
   2. Parathyroid gland

8. **Infection & Inflammation (I & I)**
   1. CNS
   2. CV & L
   3. Pulmonary
   4. GI
   5. GU (including Breast)
   6. MSK (including Integument)

9. **Neoplasms (benign; malignant primary; malignant metastatic)**
   1. CNS
   2. CV & L
   3. Pulmonary
   4. GI
   5. GU (including Breast)
   6. MSK (including Integument)
   7. Endocrine

10. **Therapy & Theranostics**
    1. GI, parenteral ($^{90}\text{Y}$ microspheres: pre-mapping, post-imaging)
    2. Endocrine, oral ($^{131}\text{I}$ NaI)

11. **Technical & Quality (patient issues/preparation; radiopharmaceutical issues/contamination; imaging issues/protocols/processing/artifacts)**
    1. CNS
    2. CV & L
    3. Pulmonary
    4. GI
    5. GU
    6. MSK
    7. Endocrine
    8. I & I
    9. Neoplasms
    10. Therapy & Theranostics