# 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

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 ($^{90}$Y microspheres: pre-mapping, post-imaging)
    2. Endocrine, oral ($^{131}$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