Curriculum for

Post-Doctoral Fellowship Course

in

Nuclear Medicine

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**SRI AUROBINDO UNIVERSITY**

SAIMS HOSPITAL CAMPUS, Indore Ujjain, State Highway, Bhawrasla, Indore, Madhya Pradesh 453555

**Syllabus:**

* **Part 1. Basics:**
* **Mathematics and Statistics ⎯ Errors and distributions; ⎯ P values; ⎯ Sensitivity, specificity, positive predictive value, negative predictive value; ⎯ Bayes’ theorem; ⎯ ROC curves; and ⎯ Clinical trial design and analysis.**
* **Instrumentation ⎯ Spectrometry; ⎯ Gas detectors; ⎯ Film badges, thermoluminescent dosimeter and optically stimulated luminescence dosimetry; and ⎯ Personal dosimeters. Principles of Radionuclide Therapy ⎯ Relationship between absorbed dose and exposure; ⎯ Relative biological effectiveness; ⎯ Concept of dose equivalence; and ⎯ Internal dosimetry. Natural, Medical and Professional Radiation Exposures ⎯ Elements of radiation toxicity; and ⎯ Nuclear accidents and incidents, mitigation, and consequences.**
* **Principles of Tracer Kinetics ⎯ Data acquisition in nuclear medicine; ⎯ Compartmental analysis; ⎯Non-compartmental analysis; and ⎯ Fitting models (parameter optimization).**
* **Basic Radiopharmacy and Radiochemistry ⎯ Production of radioactive isotopes: o Bombardment with neutrons; and o Bombardment of charged particles. ⎯ Generators; ⎯ Cyclotron production of radioisotopes; and ⎯ Compounding and dispensing radiopharmaceuticals. Principles of Quality Management Systems ⎯ Preparation of standard operating procedures; ⎯ Regulatory and compliance requirements; and ⎯ Clinical audits.**
* **Quality Control and Regulatory Issues of Radiopharmaceuticals ⎯ Compounding; ⎯ Quality control (QC) testing including equipment (e.g. dose calibrator) and generators; ⎯ QC of radiolabelled blood cells; ⎯ Quality assurance program; and**
* **Part. 2**
* **Diagnostic Clinical Nuclear Medicine For each study, the trainee should have a detailed understanding of the physiology and anatomy of the specific organ/region being study, as well as the cross-sectional imaging, including all available tracers, methodology, and preparation. The trainee should fully understand the relevant findings and be able to formulate an appropriate differential diagnosis.**
* **Clinical Application: Thyroid ⎯ Hyperthyroidism: Clinical, US and biological evaluation; Radioiodine treatment; and Other treatments. ⎯ Other benign thyroid conditions; and ⎯ Differentiated and non-differentiated thyroid carcinoma: Clinical, radiological and biological evaluation; Therapeutic of well-differentiated thyroid cancer; Radioiodine treatment of thyroid cancer; and Clinical management and follow-up of thyroid patient. Parathyroid ⎯ Hyperparathyroidism, parathyroid adenoma and hyperplasia: Detection and localization (ectopic, transplanted glands); and Intraoperative probe localization. Adrenal Gland ⎯ Pheochromocytoma and neuroblastoma; and ⎯ Characterization of adrenal masses. BONE AND JOINTS DISEASES ⎯ Rheumatological diseases; ⎯ Trauma; ⎯ Prostheses; ⎯ Infection; and ⎯ Metabolic disease.**
* **CARDIOLOGY ⎯ ECG interpretation; ⎯ Myocardial perfusion studies: Coronary artery disease; Cardiomyopathy; and Congestive heart failure. ⎯ Stress tests: Exercise; and Pharmacological. ⎯ Gated blood pool studies: Cardiotoxicity (chemotherapy, radiotherapy and immunotherapy); and Congestive heart failure. ⎯ Inflammation; ⎯ Other nuclear medicine techniques for cardiovascular diseases: First pass studies, including right ventricular ejection fraction. ⎯ Other modalities: Computed tomography angiography; Coronary angiography; Ultrasound; and Cardiac magnetic resonance imaging.**
* **LUNG DISEASES ⎯ Ventilation-perfusion scintigraphy: Pulmonary embolism; Pulmonary hypertension; and Preoperative evaluation. ⎯ Other nuclear medicine techniques for lung diseases: Vascular permeability studies; Shunt studies; and Inflammatory disorders.**
* **GASTROINTESTINAL DISEASES I Salivary Gland ⎯ Obstruction; and ⎯ Sjogren’s.Oesophagus⎯ Reflux; Tumor and ⎯ Motility. Stomach ⎯ Gastroparesis; ⎯ Post-operative; and ectopic gastric mucosa: Meckel’s diverticulum.**
* **Small and Large Bowel ⎯ Gastrointestinal bleeding.**
* **Hepatobiliary ⎯ Acute and chronic cholecystitis; ⎯ Biliary leak; ⎯ Biliary dyskinesia; and ⎯ Neonatal hyperbilirubinemia.**
* **NEPHRO- UROLOGY ⎯ Dynamic scan: Evaluation of hydronephrosis and obstruction; Furosemide - various protocols; Split and differential function; Renal graft evaluation; Acute or chronic renal failure; Renovascular hypertension; Quantitative and qualitative interpretation; and Vesicoureteral reflux. Cortical renal scintigraphy: Urinary tract infections; Malformation pathology; and Parenchymal infarction. ⎯ Direct and indirect cysto-scintigraphy: Reflux; and Urinary leak.**
* **NEUROLOGY ⎯ Brain perfusion: Epilepsy; Dementia; and Brain death. ⎯ Neurotransmission: Movements disorders. ⎯ Cerebrospinal fluid studies: Shunts; Leaks; and Normal pressure hydrocephalus.**
* **HAEMATOLOGY ⎯ Evaluation of bone marrow; and ⎯ Splenic tissue detection.**
* **INFECTION/INFLAMMATION ⎯ Musculoskeletal infections: Acute and chronic bone infection; and Soft tissue infection. ⎯ Cardiovascular infections: Vascular graft infection; Infectious endocarditis; and Infection of cardiac implantable electronic devices. Inflammatory bowel disease; Sarcoidosis; and Fever of unknown origin.**
* **PAEDIATRICS ⎯ General concepts of handling children; ⎯ Physiologic, anatomic considerations (organ maturation, growth, etc.); ⎯ Specificity of different pathologies;**
* **MISCELLANEOUS ⎯Dacryoscintigraphy; ⎯ Peripheral lymphoscintigraphy; ⎯ Radionuclide venography; ⎯ Testicular studies; and ⎯ Intraperitoneal distribution.**
* **Therapeutic Nuclear Medicine The trainee should understand the general principles of treatment using radiopharmaceuticals. Therapy using unsealed radioactive sources includes the theranostic approach, for personalized medicine.**
* **Additional Competencies ⎯ Legal and regulatory requirements; ⎯ Quality management apply to nuclear medicine; ⎯ Departmental and hospital operations; and ⎯ Education and training. Complementary Skills ⎯ Communication skills (e.g. negotiation, public speaking); ⎯ Teamwork; ⎯ Patient support and advocacy; ⎯ Analytical thinking and summarising; ⎯ Public presentation; and ⎯ Medical writing.**