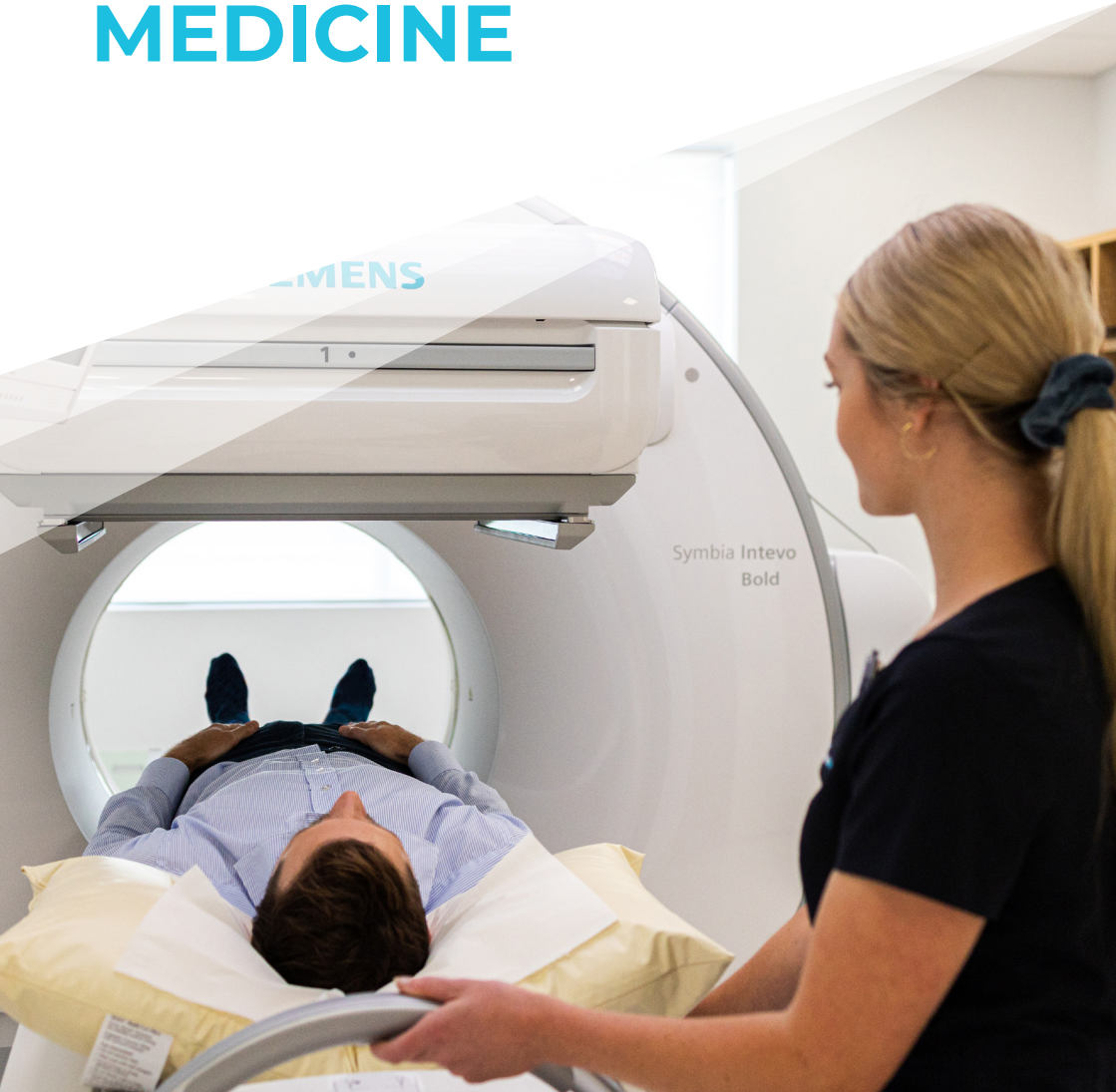


GUIDE TO NUCLEAR MEDICINE





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NUCLEAR MEDICINE STUDIES EXPLAINED

What is a Bone Scan?

A bone scan is used to map osteoblastic activity. Typically whole body imaging is performed followed by localised SPECT/CT of one or more areas of concern/interest. Bone scanning demonstrates fractures, infection, prosthetic loosening, AVN, RSD, metastatic disease, inflammation, joint dysfunction and more. It is an effective imaging tool for multiple ailments with no side-effects.

Tip: With back pain ask for SPECT/CT as it has higher sensitivity and specificity.

What is a Gallium Scan?

Now typically used for diagnosing chronic infections.

What is a Renal Perfusion Scan?

A renal perfusion scan, also known as a DTPA or MAG3 scan, is used to investigate suspected urinary obstruction in adults and children and determine renal function.

What is a Myocardial Perfusion Study?

Also known as a perfusion or pharmacological cardiac stress test, this scan is used to investigate chest pain. It can demonstrate ischemic heart disease and differentiate between blood flow versus electrical conductivity issues.

What is a Gated Heart Pool Scan?

An alternative, bulk billed test instead of echocardiography, e.g. for patients with heart failure to determine ejection fractions and assess wall motion abnormality.

What is a V/Q Lung Scan?

To diagnose acute pulmonary embolism. This scan is as sensitive as a CT Pulmonary Angiogram (CTPA) and preferred in pregnant women due to its lower radiation dose or in patients with contrast allergy.

What is a Cerebral Perfusion Study?

Used in dementia diagnosis. Especially early diagnosis of Alzheimer's and differentiating types, e.g. Alzheimer's vs fronto-temporal dementia vs vascular dementia. Also used to assess stroke, transient Ischaemia, epilepsy and Parkinson's disease.

What is a HIDA Scan?

For investigation of suspected biliary cause of abdominal pain. To rule out acalculous cholecystitis or biliary dyskinesia.

What is a Parathyroid Scan?

To detect parathyroid adenomas, often used in conjunction with US and 4D-CT.

What is a Dacroscentigraphy?

Used for investigation of epiphora.

What is a Gastric Emptying Study?

Indicates if patient has gastroparesis.

What is a Colonic Transit Scan?

For investigation of constipation.

What is Lymphoscintigraphy?

Used for lymph node mapping prior to breast or melanoma surgery. Used to assess lymphoedema of extremities.

What is PET/CT?

Positron Emission Tomography (PET) imaging uses injectable tracers that are mildly radioactive. These tracers are metabolised by the body and remain temporarily trapped in cells. While trapped, a PET scanner can detect the radiation emitted and take an image, demonstrating the tracer's distribution within the body. Certain diseases can alter the way in which your body metabolises these tracers. Abnormal collections of the tracer can be measured to assess the extent of disease.

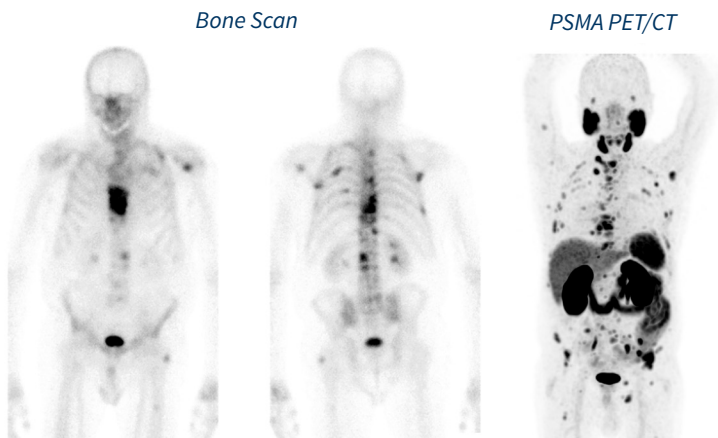
What is Theranostics?

Similar to nuclear medicine and PET imaging, theranostics uses tracers that are mildly radioactive. These tracers are also metabolised by the body and remain temporarily trapped in cells. However, the type of radiation used has therapeutic properties. Thus, once the tracer has been metabolised, it goes to work treating the diseased cells.

NUCLEAR MEDICINE SERVICES

Oncological

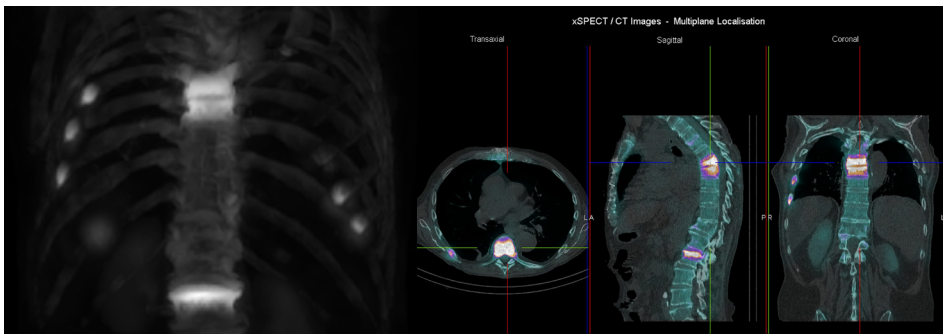
Condition/Clinical Presentation	Examination to Request
Tumour localisation	Bone Scan ▷ Primary bone cancer ▷ Bony metastases PET/CT Scan
Tumour staging	Bone Scan, PET/CT Scan ▷ Primary bone cancer ▷ Colon ▷ Prostate ▷ Renal and thyroid ▷ Breast ▷ Melanoma ▷ Lung PSMA PET/CT Scan ▷ Prostate DOTATATE PET/CT Scan ▷ Neuroendocrine tumours
Identify metastatic sites	Bone Scan PET/CT
Judge response to therapy	Bone Scan PET/CT
Sentinel node localisation in Breast Cancer/ Melanoma	Lymphoscintigraphy



Same patient scanned 1 week apart

Orthopaedic

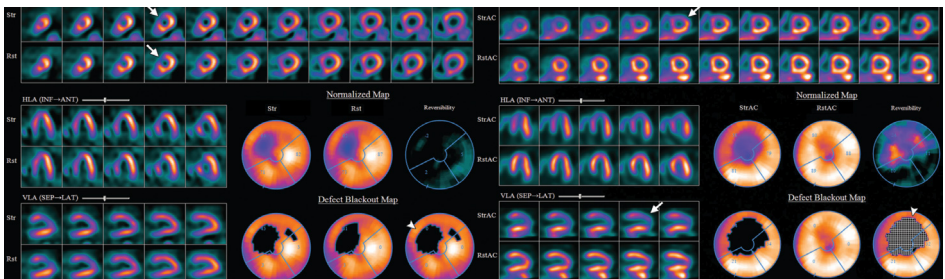
Condition/Clinical Presentation	Examination to Request
Diagnose trochanteric bursitis	Bone Scan
Confirm & localise facet joint activity	Bone Scan
Identify occult bone trauma (sports injuries)	Bone Scan
Diagnose osteomyelitis	Bone Scan +/- Gallium +/- Tc-99m labelled white blood cell Scan +/-
Evaluate arthritic activity and extent	Bone Scan
Distinguish between prosthetic joint infection and loosening	Bone Scan +/- Tc-99m labelled white cell scan and bone marrow study
Detection of stress fractures and shin splints	Bone Scan
Suspected occult fracture e.g. scaphoid	Bone Scan
Investigate elevated serum ALP	Whole Body Bone Scan



Bone scan of spinal injury

Cardiac

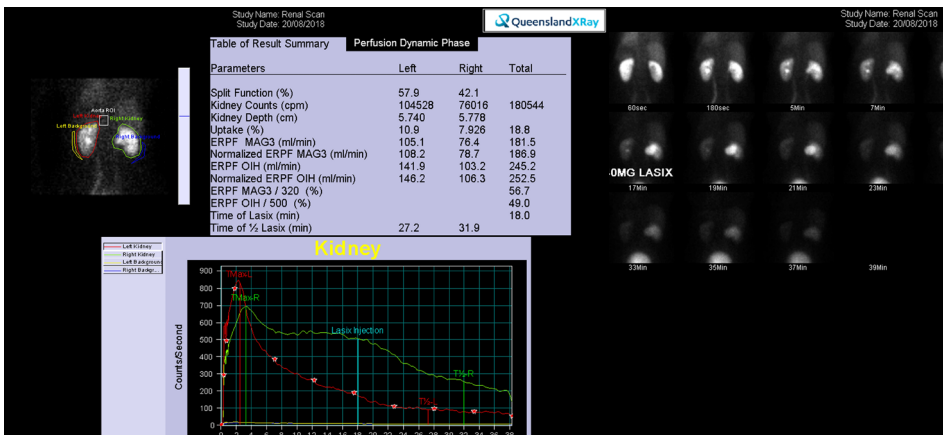
Condition/Clinical Presentation	Examination to Request
Investigation of chest pain	Myocardial Perfusion Study
Risk stratification of known coronary artery disease	Myocardial Perfusion Study
Diagnose coronary artery disease	Myocardial Perfusion Study
Monitor effectiveness of bypass surgery/stenting	Myocardial Perfusion Study (Tc-99m Sestamibi/Tetrofosmin, Thallium) PET/CT Scan
Preoperative cardiac risk assessment of high risk patients	Myocardial Perfusion Study PET/CT Scan
Monitor effectiveness of therapy for heart failure	Gated Heart Pool Scan
Identify right heart failure	Gated Heart Pool Scan
Measure chemotherapy cardiac toxicity	Gated Heart Pool Scan
Evaluate non valvular heart disease	Gated Heart Pool Scan
Identify shunts and quantify them	Qp:Qs Shunt Study (left to right shunt)



Myocardial Perfusion Scan (MPI)

Renal

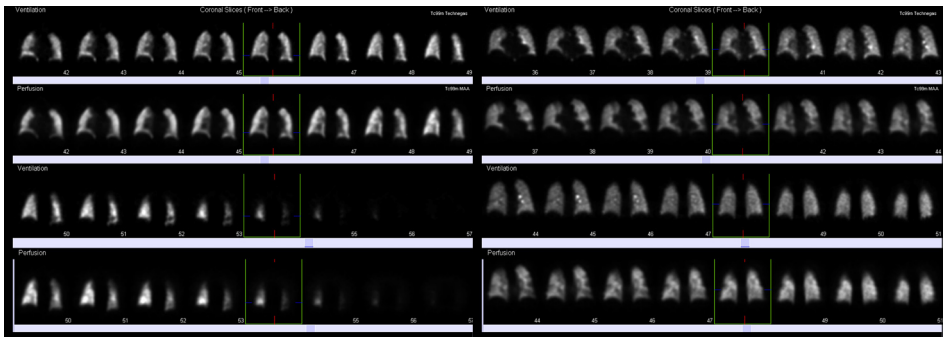
Condition/Clinical Presentation	Examination to Request
Assessment of possible vesico-ureteric reflux	Indirect MCU (Requires bladder control. Not suitable for young children)
Detect urinary tract obstruction	Tc-99m DTPA or Mag3 Scan with Lasix
Diagnose renovascular hypertension	Tc-99m DTPA or Mag3 Scan with Captopril
Measure differential renal function	Tc-99m DMSA or Tc-99m DTPA or Mag3 Scan
Detect renal transplant rejection	Tc-99m DTPA or Mag3 Scan
Detect pyelonephritis	Tc-99m DMSA
Detect renal scars	Tc-99m DMSA



Renal Perfusion Scan (DTPA/MAG3)

Pulmonary

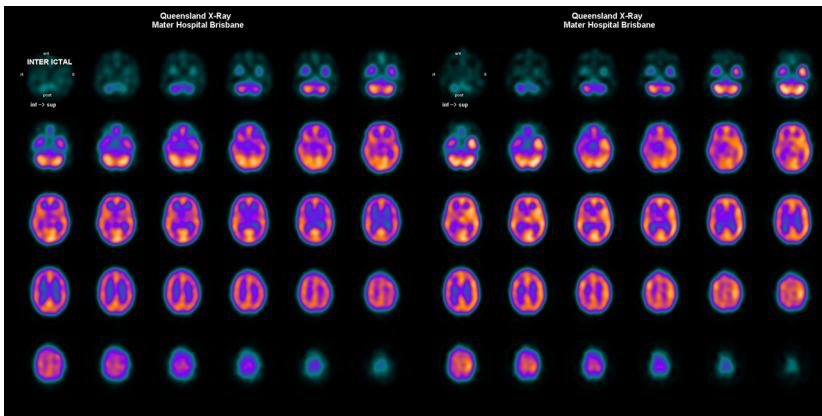
Condition/Clinical Presentation	Examination to Request
Investigation of pulmonary hypertension	V/Q Lung Scan
Diagnose pulmonary emboli	V/Q Lung Scan
Detect pulmonary complications of AIDS	Gallium Scan
Quantify lung ventilation and perfusion for lung reduction surgery	V/Q Lung Scan
Detect active pulmonary alveolitis/fibrosis/sarcoid	Gallium Scan PET/CT Scan



VLQ Lung Scan

Neurological

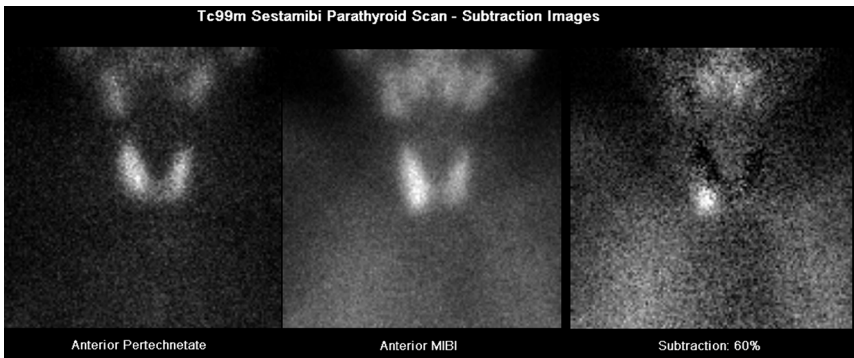
Condition/Clinical Presentation	Examination to Request
Diagnose stroke	Cerebral Perfusion Study (Neurolite/Ceretec)
Diagnose Alzheimer's disease	Cerebral Perfusion Study (Neurolite/Ceretec) PET/CT Scan
Demonstrate changes in AIDS dementia	Cerebral Perfusion Study (Neurolite/Ceretec) PET/CT Scan
Evaluate patient for carotid surgery, assessment of significance of carotid stenosis	Cerebral Perfusion Study (Neurolite/Ceretec) with Diamox (Acetazolamide) Challenge
Localise seizure foci	Cerebral Perfusion Study (Neurolite/Ceretec) PET/CT Scan
Evaluate post-concussion syndrome	Cerebral Perfusion Study (Neurolite/Ceretec)
Diagnose multi-infarct dementia	Cerebral Perfusion Study (Neurolite/Ceretec) PET/CT Scan



Brain imaging during seizure and during rest

Other

Condition/Clinical Presentation	Examination to Request
Investigation of thyrotoxicosis (Graves, toxic nodule, subacute thyroiditis) Diagnose thyroid disease (multi-nodular goitre, function of suspicious thyroid nodules)	Tc-99m Pertechnetate Thyroid Scan
Detect acute or chronic cholecystitis and biliary dyskinesia	HIDA Scan with fatty meal
Detect acute gastrointestinal bleeding	Tc-99m labelled red blood cell scan
Diagnose and assess inflammatory bowel disease	Tc-99m labelled white blood cell scan
Detect occult infections (PUO)	Gallium Scan PET/CT Scan
Detect parathyroid adenoma	Parathyroid Scan
Investigate epiphora	Dacryoscintigraphy
Investigate epigastric discomfort and bloating	Gastric Emptying Study
Investigate constipation	Colonic Transit Scan
Investigate limb swelling/ diagnose lymphoedema	Lymphoscintigraphy
Assess gastro-oesophageal reflux or aspiration	Oesophageal reflux study/ aspiration study



Positive Parathyroid Scan

Therapies

Condition/Clinical Presentation	Examination to Request
Toxic thyroid nodule Graves' disease	I-131 Capsule
Advanced prostate cancer	Theranostics Lu-177 PSMA
Chronic synovitis of the knee	Y-90 Synovectomy

RADIATION DOSE EXPLAINED

Natural levels of radiation

Radiation is naturally occurring and is everywhere, e.g. sand at the beach, the stones in the ground, the food that we eat, the light from the sun. All have some amount of radiation being emitted from it. Every day we are exposed to small amounts of radiation and we don't even know it.

Is radiation safe?

Radiation can be dangerous in large quantities. In nuclear medicine the amount of radiation that is received by the patient can be between 1 – 5mSv's.

The amount of radiation that is deemed to be dangerous are doses above 100mSv in one event.

Activity	Radiation Dose
Daily natural background radiation in Australia (From minerals in the ground, and light from the sun etc.)	0.0055mSv
Annual natural background radiation in Australia (From minerals in the ground, and light from the sun etc.)	2mSv
Cosmic radiation exposure during a return flight to the UK (Radiation from space that would normally be blocked by the earth's atmosphere)	0.200mSv
Patient dose for a nuclear medicine or PET/CT scan	1-5mSv

Queensland X-Ray employs a number of highly experienced nuclear medicine specialists across the state.

Please feel free to contact them to discuss results or the best imaging pathways for your patients.



Dr Myles Webb
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MBBS, FRACP, FAANMS

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Dr Webb graduated from the University of Queensland in 1993. He completed his medical registrar training and advanced physician training in nuclear medicine at Royal Brisbane and Women's Hospital. Dr Webb is a fellow of the Australasian Association of Nuclear Medicine Specialists (AANMS) and has PET credentials and full accreditation with RACP JSAC Nuclear Medicine. Dr Webb joined Queensland X-Ray in 2008.

AREAS OF SPECIAL INTEREST:

Nuclear medicine, oncology imaging, nuclear cardiology, PET/CT and theranostics.



To find a full list of our highly experienced nuclear medicine specialists, please scan the QR code or visit www.qldxray.com.au/services/nuclear-medicine



NUCLEAR MEDICINE LOCATIONS



Brisbane



Toowoomba



Townsville



Gold Coast



Mackay



Cairns



For detailed information on locations and billing,
please scan the QR code or visit
qldxray.com.au/billing-guide

For fast and direct access to Queensland X-Ray,
please contact our Referrer Help Desk on
1800 77 99 77

