Australian Government
Australian Radiation Protection and Nuclear Safety Agency

arpansa

Australian national diagnostic reference levels for nuclear medicine and PET

Comparing your facility's doses to the DRLs

You should determine your Facility Reference Level (FRL) for a particular procedure and compare that dose/activity to the DRL.

For the **CT component of hybrid imaging**, your FRL is the median dose delivered to a sample of patients. The sample should be representative of the normal patient cohort (with regards to gender, weight and age) and ideally should include 10 or more patients. A CT DRL comparison is scanner specific; a separate FRL should be calculated for each scanner that is regularly used to perform a given scan.

For **general nuclear medicine DRL** comparisons, a facility can define their FRLs using either its prescribed activity or the median activity administered to a sample of patients (analogous to the CT comparison above). In cases where a facility has a patient specific prescribed activity (for example based on weight), the latter approach should be used.

For **PET DRL** comparisons, facilities can choose to compare against either the fixed or variable DRL. If a facility uses a fixed prescribed activity, then it may compare that activity directly against the fixed DRL. Similarly, if a facility's prescribed activity can be expressed in terms of MBq/kg, then the prescribed activity can be compared against the variable DRL.

In cases where a variable activity is prescribed that cannot be expressed in MBq/kg, a facility should collect administered activities from a sample of patients. The median activity delivered to the sample may be compared against the fixed DRL or (preferably) the administered activity per body weight for each patient in the sample can be calculated and the percentage of patients administered an activity below the weight specific DRL can be determined. In the latter case, if 50% or more of patients received an activity below the DRL then the facility can consider its activities to be below the DRL. Note that only patients in the weight range of 50 and 120 kg should be included in the comparison.

Interpreting DRL comparison results

The national DRLs should not be interpreted as recommended doses or as dose limits. Rather, they indicate the dose that three quarters of facilities that participated in the survey would consider sufficient (or excessive) to achieve diagnostic quality images for a particular scan.

If your FRL exceeds the DRL for a particular protocol, it is an indication that you are delivering a higher dose than 75% of Australian imaging facilities for that procedure. You should consider whether you can safely reduce the dose that you deliver without adversely affecting diagnostic capability.

For the CT portion of hybrid scans, if you exceed the DLP DRL, but not the $CTDI_{vol}$ DRL, it is an indication that your scan length is longer than that normally used by most Australian imaging providers. Conversely, if your $CTDI_{vol}$ is above the DRL, it is an indication that your scans are higher quality than customarily used.

The ARPANSA website provides additional statistics relating to each of the procedures that have been issued with a DRL. This includes tables of the interquartile dose ranges and histograms of FRL distributions, providing greater context regarding how a facility compares to the national dataset.

To view the additional statistics, or to download an excel spreadsheet template to aid your DRL comparison, visit **www.arpansa.gov.au/nmdrl**. To contact the National Diagnostic Reference Level Service **email ndrld@arpansa.gov.au**.

Table 1. Australian diagnostic reference levels for general nuclear medicine

Category	Scan		Pharmaceuticals*	DRL (MBq)
Cardiovascular	Gated blood pool scan		Pertechnetate, RBCs	1000
	MPI 1-day:	1st phase (rest)	Tetrofosmin, MIBI	350
		2nd phase (stress)	Tetrofosmin, MIBI	1150
	MPI 2-day:	1st phase	Tetrofosmin, MIBI	600
		2nd phase	Tetrofosmin, MIBI	600
Endocrine	Thyroid		Pertechnetate	200
	Parathyroid:	without subtraction	MIBI	800
		with subtraction	MIBI	900
		thyroid subtraction	Pertechnetate	220
Gastrointestinal	Gastric emptying (solid phase)		Colloid, DTPA	40
	Colonic transit		^{67}Ga Citrate	22
Genitourinary	MAG3 Renal scan		MAG3	300
	DMSA Renal scan		DMSA	200
	Renal Imaging DTPA (not GFR)		DTPA	500
Hepatobiliary	Hepatobiliary		HIDA, DISIDA, Mebrofenin	200
Infection	Infection		^{67}Ga Citrate	220
Lymphatic	Sentinel node (breast)†:	Same day surgery	Colloid	40
		Delayed	Colloid	80
	Sentinel node (melanoma)†		Colloid	52
Nervous system	Brain		ECD, HMPAO	800
Pulmonary	Lung perfusion		MAA	220
Skeletal	Bone scan		MDP, HDP	900

**Unless otherwise specified, all pharmaceuticals are labelled with ^{99m}Tc.*

† Quoted DRL is for the total dose delivered, not per injection. The most common approach reported was 4 x 10 MBq injections for same day surgery.

Table 2. Australian diagnostic reference levels for the CT component of SPECT/CT

Category	Region	DRL	
		$CTDI_{vol}$ (mGy)	DLP (mGy.cm)
Cardiac	Chest (heart)	2.1	50
Lymphatic (breast ca.)	Chest	3.8	135
Neurological	Brain	-	255
Parathyroid	Neck/Chest	7.2	240
Pulmonary	Chest (lung)	4.6	150
Skeletal*	Single width	4.8	200
	Double width	4.8	365

*$CTDI_{vol}$ – volume computed tomography dose index | DLP – dose length product | *Excludes scans of the extremities*

Table 3. Australian diagnostic reference levels for PET administrations

Scan	Pharmaceutical	DRL	
		MBq/kg*	MBq
Whole body†	^{18}F FDG	3.5	270
Parkinsonian/Alzheimer's	^{18}F FDG	-	230
NETs	^{68}Ga DOTA-TATE	2.2	200
Prostate cancer	^{68}Ga PSMA	2.2	200
	^{18}F DCFPyL	3.7	270

** Variable DRLs only applicable for patients weighing between 50 and 120 kg.*

† Includes oncology, infection, inflammation and vasculitis scans

Table 4. Australian diagnostic reference levels for the CT component of PET/CT

Region	Arm position	DRL	
		$CTDI_{vol}$ (mGy)	DLP (mGy.cm)
Brain vertex to prox./ mid thighs	Up	4.2	430
	Down	5.3	555
Brain vertex to toes	Up	3.9	675
	Down	4.6	825
Brain	Down	-	325

$CTDI_{vol}$ – volume computed tomography dose index

DLP – dose length product