Australian Government
Australian Radiation Protection and Nuclear Safety Agency

NDRL Newsletter 2015 Vol. 1

The Australian National Diagnostic Reference Level Newsletter

Welcome to the first edition of the new look NDRL Newsletter for 2015!

What is the NDRLS?

The National Diagnostic Reference Level Service, or NDRLS, is a free web based service run by the Australian Radiation Protection and Nuclear Safety Agency, ARPANSA, which allows facilities nation wide to compare their doses with the Australian National Diagnostic Reference Levels.

Currently the web based service allows for comparison of doses for Multi Detector Computed Tomography, MDCT, only. Once registered for the service, facilities can log in and complete individual dose surveys for specific protocols and age groups.

Last year surveys were also launched to collect data to review Diagnostic Reference Levels, DRLs, for Nuclear Medicine and PET and establish DRLs Image Guided Interventional Procedures, IGIP. These surveys are being conducted in the form of Excel spreadsheets which are distributed and returned via email. More information on these surveys can be found on page 7 of this newsletter.

What are the Australian DRLs?

Australia currently has DRLs established for MDCT. DRL values for six adult and three paediatric MDCT protocols were established in 2012 and are published on the ARPANSA website, tables are also provided on the last page of this newsletter). The DRL values are defined in terms of Dose Length Product (DLP, mGy.cm) and Volume Computed Tomography Dose Index ($CTDI_{vol}$, mGy).

The current Nuclear Medicine and PET and IGIP surveys will collect data to establish DRLs for some procedures in these modalities.

How were the Australian DRLs calculated?

The Australian adult DRLs for MDCT were calculated by taking the 75th percentile of the spread of all Facility Reference Levels, FRLs, generated in the first year of the service. An FRL is the median dose value from an individual compliant survey. (A complaint survey is one with a minimum of 10 patient data points).

What does it mean if the doses at my facility are above the Australian DRLs?

By definition 25% of facilities will have doses that are above the Australian DRLs. It is important to remember that DRLs are not strict dose limits, they represent a dose level which is achievable by 75% of facilities.

If you submit a survey and your FRL is above the Australian DRL and you ***do not*** have clinical justification for exceeding the DRL, you should review your protocol and optimisation may be required.

More information on the DRLs can be found on the ARPANSA website

www.arpansa.gov.au/services/ndrl/

2014 Data Submissions

In 2014 there was a total of 716 compliant surveys submitted, which is not quite as many as the 2013 total of 794 (fig 1).

The majority of surveys, 662, were completed for the Adult age group with 30 and 24 surveys submitted for the Child and Baby/Infant age groups respectively (fig 2).

The greatest number of surveys were submitted for the Head protocol followed by the Abdo Pelvis protocol (fig. 3).

Over 50% of surveys were submitted by facilities in Victoria (fig. 4).

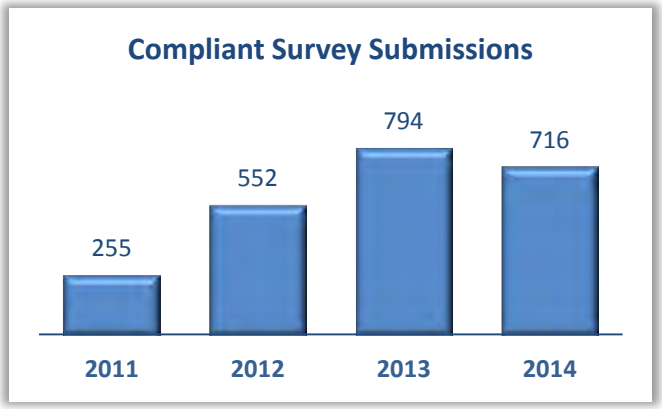


Figure 1

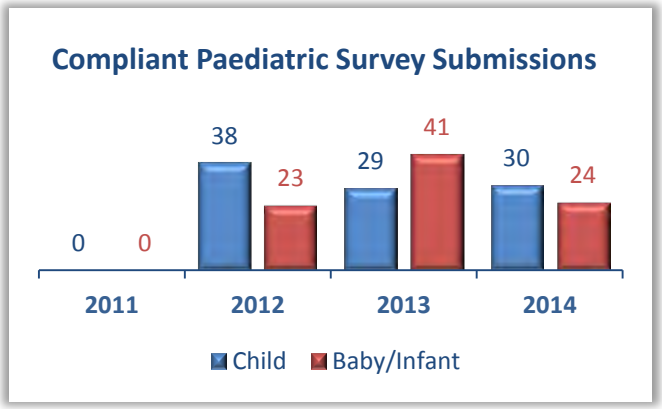


Figure 2

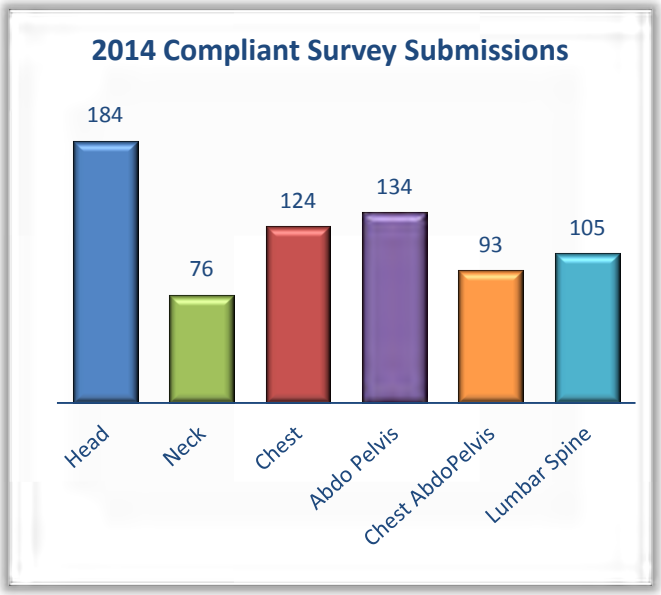


Figure 3

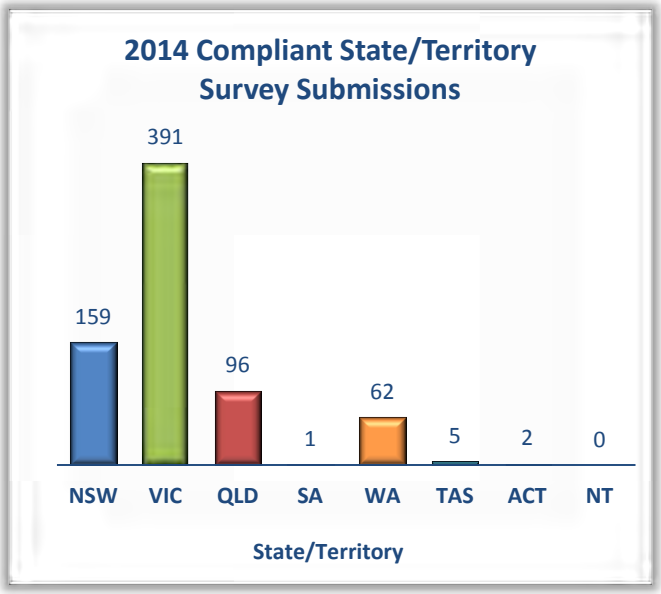


Figure 4

2015 MDCT Data Collection

The NDRLS is an ongoing service with 2015 marking the fifth year of operation.

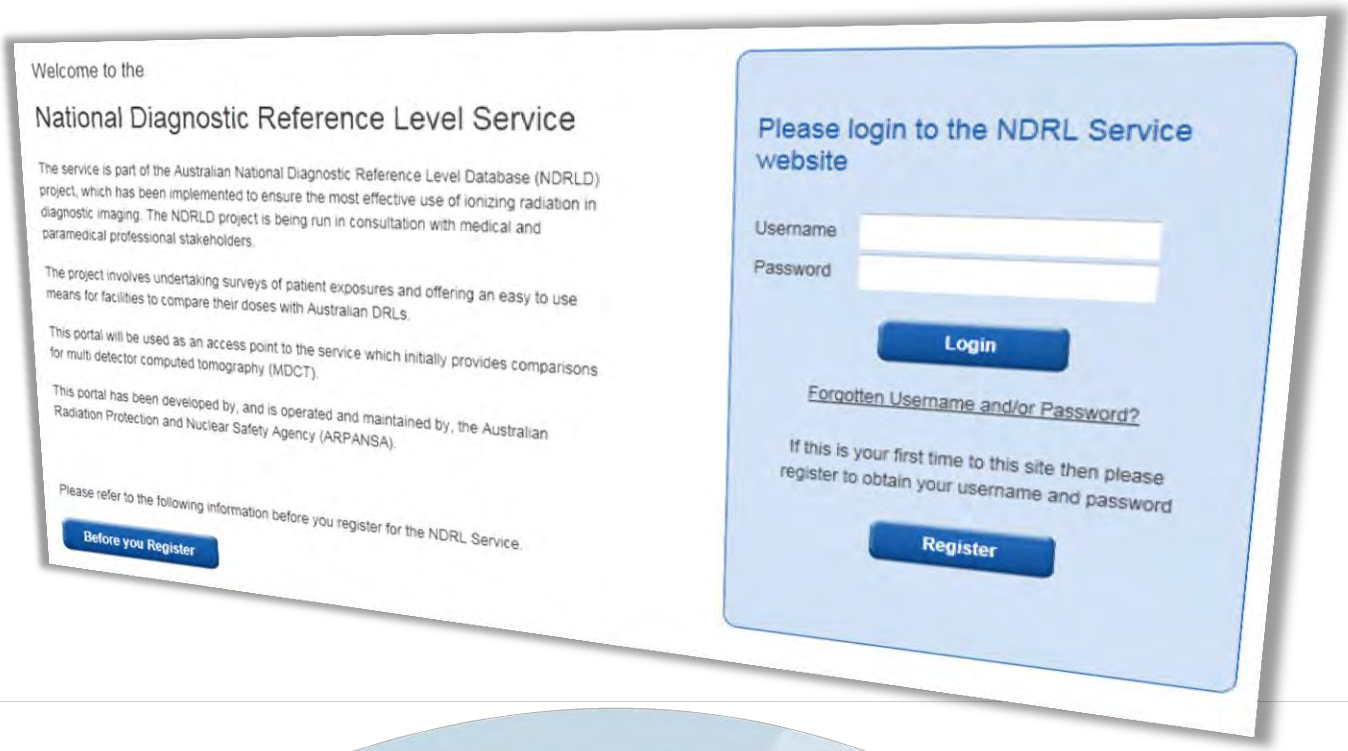
The NDRLS has two equally important functions –

- it provides facilities with a free means of documenting and comparing their MDCT doses against the Australian National DRLs,
- the data submitted can be analysed and used to update the Australian National DRLs in the future

With the exception of the 'close off day' and any other site maintenance, the NDRLS website is available all year round. This means the service is available now for you to compare your 2015 MDCT doses.

Your facility registration remains valid, ***there is no need to re-register.***

Any surveys started now will have until Jan 3rd 2016 to be completed.



Each individual survey involves entering **technical parameter** information and **patient dose metrics**

Technical Parameters

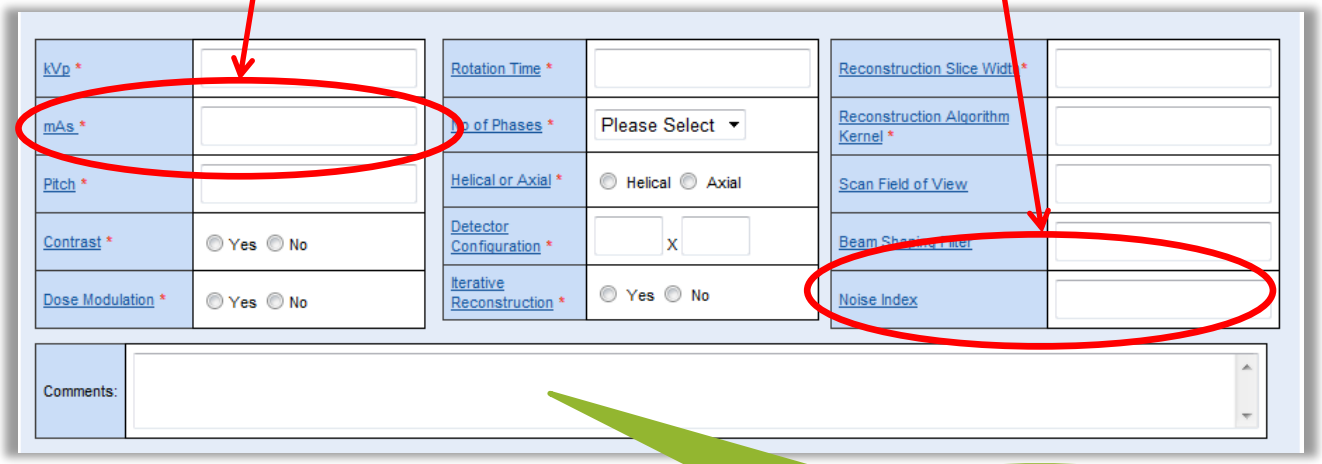
This is information about the protocol in general, while most fields are straight forward some can be tricky. Here are some examples –

mAs

Different manufacturers use different values, some of the common ones are 'starting mAs', 'average mAs' and 'max and min mAs'. All of these values are acceptable. The important thing to remember is that this section of the form is for your benefit, so enter a value that is meaningful to you at your facility. It is also likely that this value will be different for every patient. In this case it is recommended that you enter the average value for your 20 patients. The 'Comments' field can be used to record further details of values provided, for example, mAs is the average starting mAs of the 20 patients below'.

Noise Index

This is the image quality reference parameter and each manufacturer calls it something different. Manufacturers also tend to re-name this when marketing new systems. It can be known as the 'Quality Reference mAs', the 'Reference Image', the 'Standard Deviation'. It may be useful to record some description of what value you have entered in the 'Comments' field.



Use the 'Comments' field to make notes for future reference!

Patient Dose Metrics

Each individual survey requires patient dose metrics for 20 patients in the form of $CTDI_{vol}$ and DLP.

For single phase protocols this is simply the $CTDI_{vol}$ and DLP value displayed for the main scan, the 'topogram' or 'scout view' $CTDI_{vol}$ and DLP should not be included.

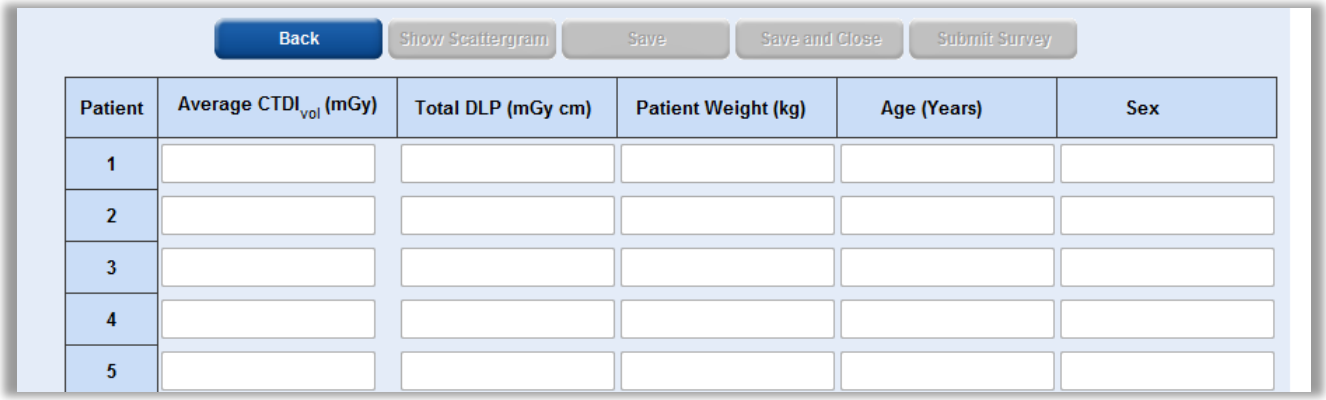
For multiple phase protocols we require that you enter the ***average*** $CTDI_{vol}$ and ***total*** DLP.

If you add your $CTDI_{vol}$ values instead of averaging them your resulting value will be ***too high***.

If you average your DLP values instead of adding them your resulting value will be ***too low***.

$$DLP_{Total} = DLP_{1st\ phase} + DLP_{2nd\ phase} + DLP_{3rd\ phase} + \ldots$$

$$CTDI_{vol_{Average}} = \frac{CTDI_{vol_{1st\ phase}} + CTDI_{vol_{2nd\ phase}} + CTDI_{vol_{3rd\ phase}} + \ldots}{No.\ of\ phases}$$



Patient	Average $CTDI_{vol}$ (mGy)	Total DLP (mGy cm)	Patient Weight (kg)	Age (Years)	Sex
1					
2					
3					
4					
5					

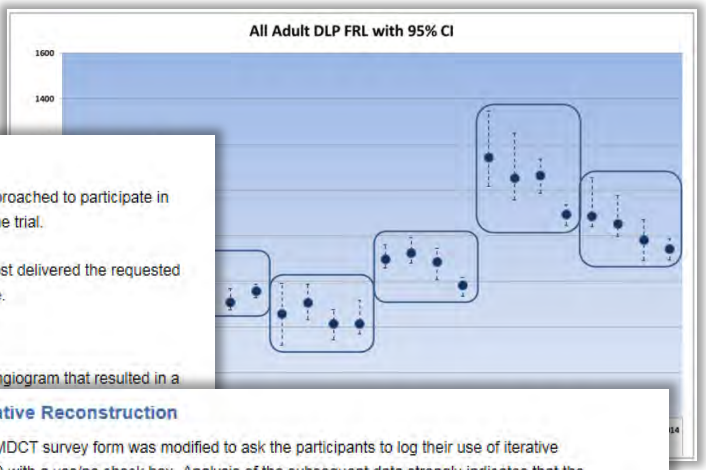
Data submitted to the NDRLS in the past indicates that these rules have not always been followed, the prime example is the $CTDI_{vol}$ ChestAbdoPelvis DRL which is 30 mGy compared to the Chest and AbdoPelvis DRLs which are both 15 mGy. We hope this can be corrected with a future DRL revision.

ARPANSA Website

Last year we introduced a NDRLS statistics page to the ARPANSA website. This page gives a summary of vital statics for the NDRLS since its launch in 2011. This page has recently been reviewed and updated to include 2014 statistics and can be found here

www.arpansa.gov.au/services/ndrl/statistics.cfm

New additions to the page include an analysis of the impact of iterative reconstruction on MDCT doses and results of the draft Image Guided Interventional Survey.



Draft Image Guided Interventional Procedures

In 2013 a number of Image Guided Interventional Procedures (IGIP) facilities were approached to participate in an IGIP survey trial. Some participants were also were self-selected upon hearing of the trial.

Submissions were received from 9 practices incorporating 14 interventional rooms. Most delivered the requested 30 patients undergoing a standard coronary angiogram with an unremarkable outcome.

Patient Inclusion Criteria

It was decided to survey a single cohort of patients who have undergone a coronary angiogram that resulted in a non-remarkable outcome. The participants were given the follo

> "Patients with 'Normal' Coronaries. For purposes of def
> those with no or physiologically insignificant diameter st
> narrowing) by visual inspection in patients studied spec

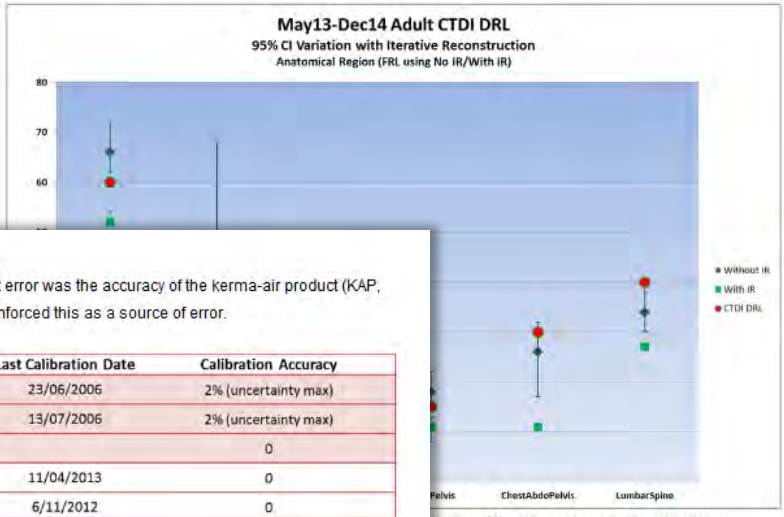
Survey Format

	Sex	Age (yrs)	Weight (kg)	Fl Time (sec)	Fr Rate (fr/sec)
Patient 1	Female	78	74	230	15
Patient 2	Male	74	85	629	15
.....					
Patient 30	Female	85	55	464	15

Figure 1

Impact of Iterative Reconstruction

In April 2013 the MDCT survey form was modified to ask the participants to log their use of iterative reconstruction (IR) with a yes/no check box. Analysis of the subsequent data strongly indicates that the application of IR to all protocols substantially reduces the dose delivered to the patient.



cation of iterative reconstruction algorithms

Kerma Air Product and Calibration Accuracy

It was recognised that a potential source of significant error was the accuracy of the kerma-air product (KAP, Gy.cm^2) meters. Subsequent survey submissions reinforced this as a source of error.

Practice	Make	Last Calibration Date	Calibration Accuracy
A1	KERMAX-plus	23/06/2006	2% (uncertainty max)
A2	KERMAX-plus	13/07/2006	2% (uncertainty max)
B1	PTW Diamentor		0
C1	PTW Diamentor	11/04/2013	0
C2	PTW Diamentor K1-S	6/11/2012	0
D1	Kerma X-Plus	12/12/2013	0
E1	PTW Diamentor	< 12 months	> -20%
F1	IBA (KermaX Plus)	3/09/2013	15.30%
F2	IBA (KermaX Plus)	28/12/2011	14.50%

Other Modality Surveys

Nuclear Medicine and PET Survey

Last year ARPANSA launched the Nuclear Medicine and PET DRL Survey. This survey involves recording the administered activity for all procedures over a four week period. Submissions will be accepted until the end of May 2015 and any interested facilities are encouraged to register.

IGIP Survey (Image Guided Interventional Procedures)

Last year ARPANSA also launched the IGIP survey. This survey involves recording dose information from 30 patients for five common interventional and diagnostic fluoroscopic procedures. Submissions will be accepted until the end of Dec 2015 and interested facilities are encouraged to register.

Online registration forms for both surveys are available from the ARPANSA website at the following links

Nuclear Medicine and PET

www.arpansa.gov.au/services/ndrl/nucmed.cfm

IGIP

www.arpansa.gov.au/services/ndrl/igip.cfm

Contact us:

Medical Imaging Section

Australian Radiation Protection and Nuclear Safety Agency

Free call: 1800 033 972

Email: ndrld@arpansa.gov.au

Australian Adult (15+ yrs) MDCT DRLs		
Protocol	DLP (mGy.cm)	$CTDI_{vol}$ (mGy)
Head	1000	60
Neck	600	30
Chest	450	15
AbdoPelvis	700	15
ChestAbdoPelvis	1200	30
Lumbar Spine	900	40

Australian Child (5-14 yrs) MDCT DRLs		
Protocol	DLP (mGy.cm)	$CTDI_{vol}$ (mGy)
Head	600	35
Chest	110	5
AbdoPelvis	390	10

Australian Baby/Infant (0-4 yrs) MDCT DRLs		
Protocol	DLP (mGy.cm)	$CTDI_{vol}$ (mGy)
Head	470	30
Chest	60	2
AbdoPelvis	170	7