

Initial Guidance
National Diagnostic Reference Levels (NDRLs)

Publishing Year
2018

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Introduction

It is imperative that healthcare organisations work continuously and collaboratively to accomplish the optimisation of patient protection. One of the fundamental aspects of the optimisation of patient protection is the diagnostic reference levels (DRLs). Diagnostic reference levels have been defined in FANR Regulation 24 on Basic Safety Standards for Facilities and Activities involving Ionizing Radiation other than in Nuclear Facilities (version 1) as ‘a level used in medical imaging to indicate whether, in routine conditions, the Dose to the patient or the quantity of Radioactive Material administered in a specified radiological procedure is unusually high or low for that procedure. Diagnostic Reference Levels are established following consultation with health competent authorities and relevant professional bodies and are based upon surveys or published values appropriate to the circumstances in the State’. These diagnostic reference levels are specific and tailored according to patient age, organ or area on the body being examined and the clinical indication so that doses are optimised for the clinical purposes of the examination. Identification and establishment of reference levels serve as a tool to monitor the practice to ensure patient protection. It will allow FANR and the regulators of the health sector in each Emirate in the UAE to address the differences in doses between healthcare facilities for a certain examination in a specific group of patients and promote practice improvements.

The Project

During the UAE/9/011 technical cooperation project between the UAE and the International Atomic Energy Agency (IAEA) for the 2014-2015 cycle, a number of UAE hospitals participated in establishing the UAE’s diagnostic reference levels. The project was led and managed by the Dubai Health Authority in cooperation with UAE healthcare organisations. For diagnostic radiology, patient radiation doses that were collected in this project were for dental examinations, mammography and computerised tomography (CT). The data were obtained from Dubai Health Authority and Abu Dhabi Health Service Company (SEHA) hospitals. For nuclear medicine examinations, data were collected from all private and governmental hospitals with nuclear medicine in the UAE. The dental data were obtained as direct dose measurements whereas CT data were mainly collected from patients’ examinations through the pictures archiving and communication system otherwise known as PACS. Mammography allows for the provision of patients’ doses obtained from digital mammography systems. With the completion of the data collection phase, data were analysed to establish the initial diagnostic reference levels.

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Annex I in this document shows diagnostic reference levels for:

- CT scans on the brain, chest, abdomen and pelvis for adult patients
- Mammography
- Dental examinations: intra-oral and orthopantomograms (OPG) for adults and paediatric patients
- Nuclear medicine

These diagnostic reference levels were presented in April 2015 to the IAEA Expert Mission to the UAE for the technical cooperation project between the UAE and the IAEA for the 2014-2015 cycle. The diagnostic reference levels in Annex I have been accepted to be the UAE national initial diagnostic reference levels. Two assumptions were made based on the IAEA Expert Mission recommendations: that the image quality was acceptable and that all machines were fit for clinical application.

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Progress

On 15 March 2017, the national Radiation Protection Committee endorsed these diagnostic reference levels to be the initial national diagnostic reference levels to be implemented in all private and governmental healthcare facilities. These initial diagnostic reference levels should be considered as baseline information for healthcare providers (both private and governmental) to establish their diagnostic reference levels with the view to contributing towards the establishment of the national diagnostic reference levels. For the future collection of data on diagnostic reference levels, unified forms are to be used. These forms will be enhanced to include further details on the image parameters and the facility's quality assurance programmes for optimisation of patient exposure. Furthermore, additional routine examinations will be included to cover all medical imaging procedures for adults and paediatric patients. All healthcare facilities and organisations are requested to establish their diagnostic reference levels, which will be analysed to establish the national diagnostic reference levels for the routine examinations of the following imaging procedures:

- General diagnostic radiology
- CT scans
- Fluoroscopy
- Dental examinations: intra-oral, OPGs and cone beam computerised tomography (CBCT)
- Mammography
- Nuclear medicine

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References

- https://rpop.iaea.org/RPOP/RPoP/Content/InformationFor/HealthProfessionals/1_Radiology/Optimization/diagnostic-reference-levels.htm
- FANR Regulation 24 on Basic Safety Standards for Facilities and Activities involving Ionizing Radiation other than in Nuclear Facilities, Version 1
- http://www.icrp.org/docs/DRL_for_web.pdf

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Annex I: Initial National Diagnostic Reference Levels for Dental, Diagnostic Radiology and Nuclear Medicine

UAE Initial Radiology Diagnostic Reference Levels (IDRLs) Result – July 2015 (Report Ref. no DRL#1-2015)

UAE Initial National Radiology Diagnostic Reference Levels (NDRLs):

➤ Computerised Tomography (CT)

UAE Initial CT Adult diagnostic Reference Level (DLP, mGy cm) July 2015	
Examination	Average
CT Brain	871
CT Brain + Contrast	1071
CT Chest	443
CT Abdomen & Pelvis	671

Data represent Abu Dhabi and Dubai areas (SEHA and DHA Hospitals)

➤ Mammography

UAE Initial Mammography diagnostic Reference Level (AGD, mGy) July 2015	
Examination	Average
Mammography- craniocaudal (CC) 45 mm breast thickness	1.44

Data represent Abu Dhabi and Dubai areas (SEHA and DHA Hospitals)

➤ Dental*

- Intra Oral (posterior view (molar))

UAE Initial Dental Intra Oral diagnostic Reference Level (ESD, mGy) July 2015	
Examination	Average
Adult Intra Oral	0.753
Paediatric Intra Oral	0.598

Data represent Abu Dhabi and Dubai areas (SEHA and DHA Hospitals)

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• **Panoramic (OPG)**

UAE Initial Dental Panoramic diagnostic Reference Level (ESD, mGy) July 2015	
Examination	Average
Adult OPG	4.48
Paediatric OPG	2.94

Data represent Abu Dhabi and Dubai areas (SEHA and DHA Hospitals)

UAE Initial Nuclear Medicine Diagnostic Reference Levels (IDRLs) Result – August 2015 (Report Ref. no DRL#2-2015)

UAE Adult Nuclear Medicine Initial Diagnostic Reference Levels (NDRLs) Administered Activity, in MBq- August 2015:

UAE Adult Nuclear Medicine Initial Diagnostic Reference Levels (IDRLs) Administered Activity in MBq	
Examination	Average
Bone Scan	826
Myocardial Perfusion 2 day (Rest)	782
Myocardial Perfusion 2 day (Stress)	829
Thyroid	180
Lung Perfusion	184
Parathyroid Scan	666
Hepatobiliary Scan	181
Lymphoscintigraphy	42
Whole Body Scan	181
Renal Scan-Static	135
Renal Scan-Dynamic- MAG3	190
Renal Scan-Dynamic- DTPA	151
Renal Scan-Dynamic- EC	173

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Acknowledgment

This initial guidance was developed as a collaborative effort under the IAEA Technical Cooperation project and different Health Organizations in the UAE. FANR would like to thank the project team for their contribution to the Initial Guidance on National Diagnostic Reference Levels (NDRLs).

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