1. Objectives

Diagnostic Reference Levels (DRLs) are reference dose values for standard diagnostic examinations or interventional procedures against which recorded patient dose values can be compared.

DRLs provide a reference against which clinical equipment operators can compare local dose levels to aid in the identification of higher than expected patient doses and for optimisation purposes.

Local DRLs (LDRL) are established for the range of examinations and procedures within each department performed as part of medical diagnosis or treatment. This includes procedures as part of health screening programs and for asymptomatic individuals.

Employer's Procedure EP-12 defines how radiation doses delivered to patients shall be assessed for comparison with documented DRLs.

This Employer's Procedure aims to ensure that NHS Greater Glasgow and Clyde:

- has documented DRLs in place for an appropriate range of diagnostic procedures and interventional radiology practices performed within the organisation.
- undertakes appropriate reviews whenever Diagnostic Reference Levels are consistently exceeded and ensures that corrective action is taken where appropriate.

2. Responsibilities

The Head of Health Physics (for standard diagnostic examinations and interventional practices within Diagnostics and standard diagnostic examinations out-with Diagnostics) and the Head of Imaging Physics (for Nuclear Medicine) are responsible for ensuring that lists of DRLs for standard examinations are reviewed annually.

Medical Physics Experts (MPE) contribute to the application and use of DRLs, working as part of a multidisciplinary team including MPE, radiographers, radiologists, interventionists and cardiologists as appropriate, in an Image Optimisation Team (IOT). IOTs are responsible for proposing DRLs for ratification at meetings of the relevant Radiation Safety Committees for a range of standard examinations.

The Radiation Safety Committee Chairpersons have responsibility for circulating the lists of DRLs to all relevant departments.

Service Leads (SL) are responsible for selecting DRLs from the approved employer's lists to cover the range of procedures representative of those examinations performed within the local department.

The relevant Service Lead shall also;

- Ensure DRLs are reviewed annually via an IOT, including any requirement to set a different value for any examination because of requirements for the examinations performed on the local patient group.
- Initiate appropriate reviews whenever there is evidence that DRLs have consistently been significantly exceeded, and shall ensure that corrective action is taken where appropriate.
- Ensure that staff accurately enter dose information onto RIS or the patient record as required and for dose surveys

The Local Service Lead shall ensure that a list of appropriate DRLs is displayed and readily available to operators performing relevant diagnostic examinations or interventional practices.

The appropriate IOT groups will review the dose surveys and be responsible for proposing Local DRLs.

The appropriate radiation safety committee will be responsible for ratification of the IOT recommendations and will receive reports on outcomes and Local DRLs.

3. Establishing DRLs

Lists of DRLs for standard X-ray and nuclear medicine examinations performed within the Diagnostics Directorate will be available, as the definitive set, on the Q-pulse Quality Management System.

These will be reviewed by the relevant IOT at regular meetings in addition there will be review by the MPEs annually. Revised lists of DRLs will be issued following the reviews by the relevant IOTs. The revised lists of DRLs will be made available on Q-pulse, after being ratified at meetings of the relevant Radiation Safety Committees.

DRLs for dental examinations will be revised by the MPEs and circulated through the Oral Health Directorate Managements Structure.

Directorates other than Diagnostics will need to establish their own DRLs for particular procedures that they perform. Lists of suitable DRLs based on local and national data, where these are available, will be included in the X-ray lists. If there are no suitable DRLs in the employer's list, the SL should consult with a Medical Physics Expert to set up DRLs that are appropriate for their specialty. These DRLs shall be listed in the relevant procedure for each site.

The procedures shall specify these DRLs in terms of practical quantities, e.g. dose-area product, entrance surface dose, computed tomography dose index$_{volume}$, dose length product, screening time or administered activity.

The standard X-ray and nuclear medicine examinations DRLs adopted will be based on values proposed by National and/or European professional bodies, other available published data where this is considered appropriate, and results of local dose surveys. DRL values for Interventional radiology procedures will be based on local practice whenever possible.

A list of appropriate DRLs will be displayed and readily available to operators performing relevant diagnostic examinations or interventional procedures in each department.

National DRLs for Diagnostic Radiology, Interventional Radiology and CT imaging as part of hybrid imaging in SPECT/CT and PET/CT procedures, are published online by UK Health Security Agency. Imaging patient dose assessments will be compared to locally adopted LDRLs or National DRLs.

4. X-ray DRLs

X-ray DRLs shall be set either as practical dose measurement quantities for typical diagnostic examinations on standard sized adults and children, or as variables which relate to dose, such as Dose Area Product (DAP) values for fluoroscopy. Where possible data recorded on RIS for large numbers of patients will be used to avoid weight restrictions although outlier values will be excluded.

Paediatric DRLs will be set based on weight ranges or age according to national guidance.

If there are not appropriate Health Board DRLs for any examinations performed on a particular X-ray unit, because of the specialist nature of the procedures or the patient cohort, local departmental DRLs should be established. The Service Lead will identify staff to join IOT groups to assess dose-related data and establish appropriate local DRLs.

Advice and assistance in this exercise may be sought from MPEs in Health Physics.

5. Nuclear Medicine DRLs

The Administration of Radioactive Substances Advisory Committee (ARSAC) provides DRLs for typical examinations for average size patients (70 kg). DRLs for nuclear medicine procedures in NHS Greater Glasgow and Clyde shall be based closely on those recommended by ARSAC.

Variations and additions to the DRLs used in a department may be derived to suit particular local practices. These DRLs must be agreed with the Service Lead in consultation with the Lead Nuclear Medicine Clinician and the MPE for the area, and documented in the relevant procedure.

LDRLs may have to be exceeded in exceptional circumstances such as for bariatric patients or a patient who is unable to tolerate standard acquisition times. Approval must be obtained from ARSAC for any adopted DRL which is greater than their recommended value.

6. Actions required when LDRLs are consistently exceeded

LDRLs should not be exceeded when good and normal practice is applied. All operators must be familiar with and trained in the appropriate use of LDRLs.

Actions to be taken by staff when a LDRL is exceeded for a single patient, as well as consistently exceeded as identified from a patient dose audit, are documented in guidance document EP-Guidance-017.