

Patient Radiation Dose Management

As part of any programme to manage patient doses, elements should be in place for both justification and optimisation. Where the justification process ultimately involves a decision regarding whether the potential benefits to the patient outweigh the risks. Optimisation encompasses achieving the image quality required for the clinical task by using the smallest amount of radiation necessary, but no less. The management of patient doses has become a vital part of any image optimisation process.

Patient dose monitoring

Over the years, patient dose surveys have highlighted wide variations in practice per site, per organisation and nationally. Published results have led to a concerted effort to establish baseline dose levels (so called Diagnostic Reference Levels, DRLs), which have proved useful in optimising patient doses. More recently, Patient Dose Management Systems (PDMS) have helped to streamline the dose collection and analysis, in order to establish local, national, and European DRLs.

Patient dose management

The advent of the PDMS and the ability to handle a large and diverse dataset provides an opportunity to move beyond annual benchmarking to a wider-scale optimisation strategy. The ease of data collection and analysis facilitates focused and continuous dose and image quality optimisation; with the ability to identify opportunities for dose optimisation, and analysis of practice by modality, study, series, procedure code or operator. Various business intelligence methods can then be employed to help users visualise the data (by means of dashboards, reports, alerts) and increase awareness of doses from imaging procedures and ultimately to improve staff engagement in the optimisation process.

Dose tracking and cumulative patient dose

The PDMS introduces the potential for tracking doses to individual patients from multiple examinations. This has led the IAEA and others [1] to issue a call to action regarding patients who have a large number of X-ray examinations due to the selected care pathway and treatment regime. They suggest that it should be a requirement that the accumulated dose information is readily available for inclusion in the justification process, particularly when it exceeds 100 mSv. However, it has been argued [2,3] that the decision to order medical imaging exams should be based on clinical grounds, including the information available from prior imaging results, and not on the dose from prior image-related radiation exposures. Questions have also been raised regarding the validity of estimated cumulative effective doses and the surreptitious application of a patient dose limit. Although such an approach is not appropriate, studies of cumulative dose have identified certain clinical conditions where recurrent radiological imaging is more likely to be undertaken, which could lead to relatively high cumulative doses. Efforts should be put into planning and optimisation of the imaging arrangements for such conditions to ensure that procedures for repeated imaging are appropriate.

The decision about whether a radiological imaging procedure should be justified in the UK has always been based on the potential benefit to the patient assessed, linked to their clinical history and the effect on management of their condition. This should include clinical information available from previous imaging, and the procedure should be adapted and optimised for each individual patient, but other than that, the BIR does not consider it appropriate or relevant to consider the dose that the patient has received from previous imaging. Therefore, users should be careful in using patient cumulative dose information and particularly any notifications (alarms) when a specified dose level is exceeded.

[1] IAEA/EFOMP/ESR/DITTA/HERCA/Image Gently Alliance/IOMP/ISR/ISRRT/WHO Joint position statement and call for action for strengthening radiation protection of patients undergoing recurrent radiological imaging procedures. Available here:

https://www.iaea.org/sites/default/files/position_statement_final_endorsed.pdf

[2] AAPM/ACR/HPS Joint Statement on Proper Use of Radiation Dose Metric Tracking for Patients Undergoing Medical Imaging Exams.

Available here: <https://www.aapm.org/org/policies/details.asp?id=1533>

[3] Frush DP and Frija G. Looking critically at the paradigm of radiation exposure from multiple imaging examinations. European Radiology 2022 <https://doi.org/10.1007/s00330-022-08557-1>

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