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Fourth review of the UK national patient dose database

The Editor,

The Health Protection Agency (HPA) has recently published a fourth review (for 2010) of the UK National Patient Dose Database (NPDD) [1], which collates information on typical doses to patients from radiographic and fluoroscopic X-ray imaging procedures (excluding CT, which is monitored separately). Previous such national reviews have been published at 5-year intervals (for 1995, 2000 and 2005) and each has been highlighted in the pages of this journal [2–4].

For more than 20 years, the NPDD has been a unique national resource for monitoring trends and promoting improvements in the optimisation of patient protection. It was set up following a national dose survey during the mid-1980s and the subsequent adoption of a national dosimetry protocol in 1992. One of the key outputs from analyses of the NPDD has been the recommendation by the HPA (and its predecessor organisation, the National Radiological Protection Board) of national reference doses. These are pragmatically set at the 75th percentile value of the distributions of mean doses observed in the NPDD in order to provide an indication on a national scale of unusually high typical doses, against which hospitals and clinics can check their own performance. Such dose data have also provided the basis for national diagnostic reference levels (DRLs) that are similar in purpose and are promulgated by the Department of Health [5] in fulfilment of requirements under the Ionising Radiation (Medical Exposure) Regulations 2000.

As well as storing data on radiation doses to patients undergoing medical and dental X-ray examinations and interventional procedures in both the NHS and the independent sector, the NPDD also includes information on factors that might affect the dose, such as the size of the patient, the type of imaging equipment (digital or film-screen) and the examination technique. The database presently seeks to collate data voluntarily submitted from a large number of hospitals and dental practices spread throughout the UK in order to ensure, as far as possible, results that are representative of national practice. All data are treated confidentially, and the performance of specific hospitals/clinics is not revealed in published reviews of the database.

In the 2010 review [1], we analysed the data collected from 320 hospitals (about a quarter of all the hospitals with diagnostic X-ray facilities in the UK) and about 4000 dental practices (more than one-third of all UK dental practices) during the period from January 2006 to December 2010. These data comprise 165 000 entrance surface doses and 185 000 dose–area products (DAPs) for

single radiographs, and 221 000 DAP measurements and 146 000 fluoroscopy times for complete examinations, representing in total nearly twice as many doses as for the 2005 review [6]. Rounded third quartiles for the distributions of the mean values for these dose quantities per X-ray room form the basis of the updated national reference doses presented for 38 types of diagnostic X-ray examination and 7 types of interventional procedure on adults, 3 types of medical X-ray examination on children, and both intra-oral and panoramic dental radiographs on adults and children. These doses have been derived in relation to standard-sized adults (mean weight 70 kg, apart from coronary angiography and percutaneous transluminal coronary angioplasty patients where a mean weight of 80 kg pertains) and for five standard-sized paediatric patients corresponding to newborn babies, and 1, 5, 10 and 15 year olds. The 2010 national reference doses for adults are on average about 10% lower than those from the 2005 review [6], and are typically less than half the values of the original UK national reference doses that were derived from a survey in the mid-1980s [7]. The national reference doses for paediatric patients are generally less than half the values given for the 2005 review.

For dental X-ray examinations, national reference doses have been expressed in terms of patient entrance dose for intra-oral radiographs, and DAP for panoramic radiographs. The updated values for intra-oral radiographs are lower than those in the 2005 review. National reference doses for panoramic dental radiographs are now given separately for adults and children, rather than as a single value as previously for 2005 [6].

The 2010 review [1] has demonstrated a continuing trend for reductions in the mean and third quartile values of typical patient dose, although the present average percentage reductions are less than those observed previously between reviews. The series of four 5-yearly reviews has witnessed an almost complete change in imaging systems. For the 1995 review [8], all medical X-ray rooms used film-screen imaging, whereas only 3% did so for the 2010 review [1], with the rest using either computed radiography or flat panel detectors. The latter appear now to be fulfilling their potential for dose reduction and typically allowing lower radiation doses than either computed radiography or film-screen systems. Switching from film to computed radiography does not appear to be the best long-term strategy for lowering doses.

The regular monitoring of patient doses that has been encouraged in the UK since the early 1990s, and is now a regulatory requirement, appears to have had a significant impact on patient protection. Over the last 25 years, UK national reference doses have typically fallen by a factor of two, and the distributions of patient doses appear to have narrowed, although substantial variations remain in the typical dose between X-ray hospitals/clinics for the same type of examination, indicating that there is further scope for patient dose reduction.

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National reference doses should continue to be useful in identifying opportunities for improvement and supporting the formal setting by the Department of Health of national DRLs.

The HPA gratefully acknowledges the co-operation of hospital physicists and radiology department staff in supplying patient dose data to the NPDD. Further national reviews of patient dose will be essential in order to monitor trends following continuing advances in radiological practice. However, there is now a timely opportunity to develop new methods for streamlined data collection and analyses to provide more comprehensive reviews that will make best use of information from electronic healthcare information systems in order to meet evolving requirements for the national monitoring of patient doses following imminent further developments in European legislation concerning radiation protection for patients.

Yours etc.,

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