Radiation protection in paediatric radiology has recently come to the forefront of academic debate, as radiologists strive to promote quality and safety in medical imaging. Utilising the 'as low as reasonably achievable' (ALARA) principle, radiologists are reducing the harmful effects of ionising radiation on the developing child, whilst maximising the diagnostic usefulness of the study.

In the UK, national dose reference levels (NDRLs) are determined by a review of the National Patient Dose Database every five years, including 221,000 dose-area product (DAP) measurements from 320 hospitals. In the latest review of 2010, 3% of the values related to children and NDRLs were less than half of the values in the 2005 review and a quarter of the values in the 2000 review. As the importance of maintaining radiation doses within diagnostic reference levels is becoming increasingly recognised, it is expected that further progress will be made in the 2015 review.

This presentation will highlight dose reduction techniques and will present the results of a district general hospital (DGH) study of dose-area product (DAP) values for paediatric fluoroscopy, compared to a tertiary referral centre and UK national guidelines. Effective dose reduction is possible in the DGH environment and is not the preserve of tertiary referral centres, nor does it require the use of specialist equipment.

Ten Steps in Effective Dose Reduction in Paediatric Fluoroscopy:

1. Removal of the antiscatter grid
2. Use of maximum tube table distance (overcouch tube)
3. 0.1 mm of additional copper filtration
4. Different dose curves for ionic contrast and barium examinations
5. Use of low pulse frequency (3/s)
6. Use of 'dose-hold' selection
7. Dominant use of frame-grab images
8. Judicious use of light-beam diaphragm to ensure minimum area of exposure
9. Keep fluoroscopy times to a minimum and avoid magnification
10. Use of gonad protection

A DGH study of DAP values for paediatric fluoroscopy, compared to a tertiary referral centre and national guidelines

1,037 fluoroscopic studies were grouped by age for specific examinations and retrospectively analysed, covering a period of eight years. The median DAP and 75th percentiles were compared with those published from a tertiary centre in 20061 and the guidelines from the Health Protection Agency (HPA, 20122) following the 2010 national survey.

Local DAPs (75th percentile) from Queen Mary’s Hospital for Children (QMH) are substantially lower than the current NDRLs by a factor of between x2 and x53 (mean x13) for upper gastrointestinal studies and micturating cystourethrograms (MCUGs). The median values are between x2 and x100 lower (mean x23). When compared with Great Ormond Street Hospital (GOSH), MCUGs are the most commonly performed local investigation and are x4 lower. Contrast swallows are x10 lower in 0-1 year-olds, enemas x18 lower and follow-throughs x36 lower in the same age group. Overall DAPs are x7 lower than at the tertiary centre.

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2 Doses to patients from radiographic and fluoroscopic x-ray imaging procedures in the UK – 2010 review. HPA, Hillier MC, Shrimpton PC, HPA-CRCE-034. 2012.