evaluators graded images with a grid (n = 80) at tube voltages across the diagnostic energy range and varying detector air kermas. These were scored against corresponding images reconstructed without a grid, as per current clinical protocol.

Outcome: For all patients, diagnostic image quality improved with the use of a grid, without the need to increase tube mAs (and therefore patient dose), irrespective of tube voltage used. Increasing tube mAs by an amount determined by the Bucky factor made little difference to image quality.

Discussion: A virtual clinical trial has been performed with simulated chest CR images. Results indicate the use of a grid improves diagnostic image quality for average adults, without the need to increase tube mAs, even at low tube voltages.

Relevance/impact: Validated with images containing realistic anatomical noise, it is possible to improve image quality by utilising grids for chest radiography with CR systems without increasing patient exposure. Increasing tube mAs by an amount determined by the Bucky factor is not justified.

Patient dose measurement and management

P178 X-ray internal dose audit using diagnostic reference levels

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Routine dose analysis is a key driver in radiation protection, IR(ME)R regulations require an employer to set up diagnostic reference levels. The aim of this dose audit was to establish local diagnostic reference levels (LDRL) and to compare these to the national diagnostic reference levels (NDRL's) and the recommended DRL's from IRS The most common diagnostic procedures dose levels were collected. If possible the data was collected directly from the room console/PC, CRIS was used if the console data was not accessible. 14 examination doses of each of the common diagnostic procedures outlined on the template (REF IRM016) were noted and an average obtained. The examinations with the 2 highest and 2 lowest DAP readings were excluded from the results.

Exposure factors collated were: kV, mAs & DAP readings, each individual piece of equipment had their own individual data sets. Compared to last year's audit we have seen the majority of our doses decrease by significant levels. The large majority of our doses are well below the national levels and the levels set out by IRS.

Standardisation of exposures across the digital rooms was put into progress after last year's audit and there has been more correlation between the results of similar rooms. Understandably there is significantly less doses between our digital and CR equipment, including Portable machines. I found the need to review staff training on technical factors during portable chest examinations as these were the examinations with the highest doses, due to Radiographer technique and positioning.

P179 Epidermolysis Bullosa: A retrospective analysis of radiation exposure and fluoroscopic techniques

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Epidermolysis Bullosa (EB) is an inherited connective tissue disorder with a UK incidence of 1 in 17,000 live births. It is characterised by blistering of the skin and mucous membranes in response to mechanical trauma. Those that present with dysphagia and malnutrition secondary to gastro-intestinal mucosal involvement, tend to have Dystrophic Epidermolysis Bullosa (DEB).

Guys and St Thomas' Hospital is one of two national centres for the diagnosis and clinical care of patients with EB. We performed a retrospective analysis of all diagnostic and interventional fluoroscopic procedures undertaken in DEB patients, within our radiology department, from 2012 to 2014. 22 patients with DEB were identified, who had undergone a total of 93 contrast swallows and 47 balloon dilatations of the oesophagus, with a mean number of 4

swallows and 2 dilatations per patient. The mean age of our patients was 38 years, (with 59% of patients below the age of 35 years). The female to male preponderance was 2:1.

With regards to radiation dose, there was a direct correlation between increasing DAP (Dose Area Product) and the number of fluoroscopic studies undertaken and screened views acquired. Most patients, (84%) had oesophageal strictures; mostly within the cervical oesophagus and oropharynx. 15 of 22 patients (68%) underwent oesophageal dilatation. In 94% of patients with recurrent stricture formation, the position of the stricture did not alter.

As many DEB patients are young and have a stable stricture location, we should endeavour to target our fluoroscopic studies, in order to minimise radiation exposure.

P180 **Pelvic radiography: what effect does patient orientation have on image quality and radiation dose?**

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Purpose: To investigate the effect of patient orientation on the radiation dose and image quality (IQ) for digital (DR) and computed radiography (CR) examinations of the pelvis.

Methods: A randomised hospital-based study was conducted using a DR and CR X-ray room. The standard patient orientation of head towards (HT) the two outer AED chambers was compared with a group of patients with their head away (HA) from the two outer AED chambers. The entrance surface dose (ESD) and effective dose (ED) were compared between groups. Eight anatomical areas were blindly assessed by three experienced observers. IQ data were analysed for inter-observer variability.

Results: For DR pelvis examinations switching patient orientation (from HT to HA) reduced the mean ESD and ED by 31%, respectively. For CR examinations the dose reduction was greater between the two orientations (38%). Examinations of the hips allowed dose reductions of around 50% between orientations. For DR examinations minor reductions in IQ were seen and favoured the HT orientation. For CR examinations there were no statistically significant differences in overall IQ between orientations.

Conclusion: Switching pelvic orientation relative to the automatic exposure device (AED) chamber position can help optimise radiation dose during pelvic radiography. In order to facilitate this AED chamber position should be clearly marked on all imaging equipment and patient orientation should be a consideration when tailoring individual examinations. When using DR minor changes in IQ are a consequence of changing orientation and should be factored into the decision making.

P181 **Lifetime risk of radiation-induced cancer from screening mammography**

Raed M.Ali[12]; Andrew England[2]; Peter Hogg[2]
University Of Kufa, Iraq[1]; University Of Salford[2]

Purpose: To propose a method for evaluating the effective lifetime risk of radiation-induced cancer from screening mammography and to present initial data comparing risks from different national screening programmes.

Material and methods: An ATOM phantom with thermoluminescent dosimeters and a perspex-polyethylene breast phantom were used to measure organ doses during a standard four view screening mammogram. Imaging was undertaken using a HOLOGIC Lorad Selenia digital mammographic unit. The effective radiation dose was calculated and effective risk was modelled for a range of client ages. The lifetime effective risk was then calculated for national screening programmes.

Results: In addition to the examined breast, contralateral breast, thyroid, thymus, brain, lung, and bone marrow received radiation dose during screening mammography. Major differences exist for lifetime risk of radiation-induced cancer between screening programmes. For example, females with average risk of breast cancer in a US screening programme have an estimated lifetime effective cancer risk of 925 cases/1,000,000; by contrast an average risk female in a UK programme would have a lifetime effective risk of 177 cases/1,000,000. Differences are attributable to the number of recommended screens per annum between programmes.

Conclusion: This study proposes a method to evaluate lifetime effective risk of radiation-induced cancer from screening mammography in order to compare different mammography screening programmes. Work will be extended to assess the repeatability of results for a single machine and also across a range of mammography machines.

Radiation protection and quality assurance

P182 CR mammography image uniformity

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The detector uniformity measurement has historically been a part of prescribed mammographic QA programmes[1]. Many mammography units using CR under are beyond the 10% remedial level for this test, as carried out according to national guidance[2]. Direct digital mammographic systems on the other hand, exhibit very good uniformity.

The objectives of the project were to:

- Explore factors affecting CR uniformity
- Identify whether the current uniformity test gives useful information on a CR system
- Compare the remedial findings with any clinical issues reported
- Ascertain whether the current remedial level used in this test is appropriate for CR systems.

Various factors affecting image uniformity were identified, but the main finding was that beam uniformity was very close to the tolerance without adding any non-uniformity from the rest of the system.

Discussions at a national meeting found that if this test resulted in even a few percent non-uniformity for digital systems, the Medical Physics service would recommend flat-fielding calibration. For CR mammography, 8-19% non-uniformity is an expected finding. Therefore the published remedial level is not being used for this test. With no clinical issues reported from any of our CR centres, it is questionable whether 10% is relevant to today's image display systems. The author questions whether the published tolerance needs to be revised to separate tolerances for CR and digital imaging systems.

[1] NHSBSP report 0604 version 3 (2009), IPEM report 89 (2005), European guidelines for quality assurance 4th edition, IPEM report 32 vii (2010) [2] NHSBSP report 0604 version 3 (2009)

P183 Medical student awareness of radiation legislation and exposure - a quality improvement project

Ben Thomson
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Aims: Doctors requesting imaging have a legal obligation to comply with The Ionising Radiation (Medical Exposure) Regulations (IRMER). This is endorsed by guidelines from the Royal College of Radiologists (RCR) and the GMC. However, studies show postgraduate knowledge of radiation protection is poor and few receive undergraduate training. We aim to assess knowledge of radiation legislation and exposure amongst medical students and to suggest how education could be improved.

Methods: An anonymised questionnaire, developed from RCR AuditLive, was completed by third year students. Formalised departmental teaching was then undertaken. Students were educated on IRMER regulations and current RCR advice on image requesting. They were then asked to complete a post study questionnaire.

Results: 31 students completed the pre intervention questionnaire (response rate 100%). Only 10% had prior teaching on radiation exposure and 77% were not aware of national legislation about radiation. The mean score for a) dose estimation and b) risk of malignancy from exposure to common radiological procedures was 11% and 23% respectively. A post intervention questionnaire (response rate 97%) showed that student's mean score rose to 62% ($p<0.001$) for dose estimation and 87% ($p<0.001$) for risk of malignancy. 100% found the teaching a useful experience.