

Conclusions Individuals and organisations seeking to introduce dose management systems may need to be aware of such barriers when considering their introduction, and weigh them against the substantial potential benefits offered by these systems.

p166 **Compliance with RCR standards for sign offs in radiological reports**

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The Royal College of Radiologist states that those radiologists who formally reports images must sign off with the following as a minimum: 1. Full name 2. Professional status 3. General Medical Council Number.

We looked at 100 reports from various consultants in a single trust and recorded which of the above were included in the sign off. The results we obtained showed the following: 1. Full name 95% 2. Professional status 95% 3. General Medical Council Number. 15% The results were positive with respect to name and status, we were surprised to that 5% were not signed off at all and only 15% had their GMC number on their reports. The results were fed back to the department and we are working on trying to make the sign off include all the aspects automatically when the radiologist signs there name.

We implemented an auto-signature for the radiologist when they dictate which gives an automatic signature including their name, professional status and GMC number. Following this we re-audited this with the following results. 1. Full name 97% 2. Professional status 97% 3. General Medical Council Number. 93% The results showed a large improvement in the compliance. We also found that the main reason why it wasn't 100% was due to amendments which were made without dictate. In

Conclusion the use of an auto signature improves the overall compliance with the RCR standards and we hope to implement this trust wide.

1. Berlin L. *Communicating radiology results. Lancet 2006; 367: 373-375* 2. Garvey CJ, Connolly S. *Radiology reporting- where does the radiologist's duty end? Lancet 2006 367: 443-445*

RADIATION PROTECTION AND QUALITY ASSURANCE

p167 **Assessment of doctors' knowledge on radiation risks and exposure during in emergency department**

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Background: With the growing use of diagnostic imaging modalities in emergency medicine practice, comes the concern about their risks. This study aims to assess the knowledge of radiation exposure doses and risks among doctors working in emergency department.

Methods: A validated questionnaire was distributed to 120 emergency doctors and doctors from other specialties rotating in emergency departments of 8 hospitals. Participants were asked to answer questions regarding possible risks associated with radiation exposure and to estimate the radiation doses that patients were exposed to during various radiological procedures. Chi-squared test, an Independent t-test and One-Way ANOVA with LSD as Post-Hoc analysis were used for analytical purposes.

Results: A total of 90 doctors completed the questionnaire. 52 of them were residents, 26 were specialists, and 11 were consultants. 22% of them had formal training on radiation protection. None of the doctors estimated all the doses correctly. The overall correct answer rate for residents was 17.1%, compared to 22.7% for specialists and 40% for consultants ($p = .003$). Those who had formal training did not have a statistically significant higher rate of correct answers ($p = .411$), and no specialty had a statistically significant higher rate of correct answers when compared to other specialties ($p = .857$).

Conclusion: This study delineates that doctors working in emergency department had poor knowledge about radiation doses received by their patients and the risks associated with the exposure to radiation in the different imaging procedures. This issue warrants attention considering the increasing use of the radiological

p168 **MRI incidents: A review and proposed categorisation**

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Background: Safety is paramount in MRI, with review of incidents and monitoring for trends a key aspect of providing assurance and reducing risk.

Purpose: An internal review of incidents over an 18month period was conducted, which included both static and mobile magnets nationwide, looking at safety and drug related events. During this period only 1973 MR related incident reports were submitted via Sentinel accounting for 46% of all incidents documented. Of these 0.024% were MR safety related, and to be able to better assess any significant trends these were sub-categorised under 15 headings which were thought to summarise the key causes of safety events. Of the drug related incidents occurring in MRI; 60% were reactions which represented a 1% adverse drug rate, 20% extravasations, with the remainder relating to other issues such as cardiac drugs, medicines management and dynamic scan timing.

Summary: From the subcategories used for looking at MRI Safety, the biggest issue seen is around contraindicated referrals, particularly from GP's, and mainly pacemakers probably due to confusion over conditional devices that not all sites currently scan. The next significant categories of 'unable to confirm safety' and 'unexpected implant/foreign body', suggest issues associated with screening processes and interaction with patients. The key message from this is around the importance of engaging and effective screening in order to be able to obtain a reliable and sufficient medical history to be able to assure patient safety.

p169 **The effect of Exposure Index (EI) on the subjective analysis of image quality**

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Background: Exposure Index (EI) is a logarithmic index that provides a quantitative marker of the exposure received by an image receptor during projectional radiography. [1] This study investigates if the presence of EI data biases radiographers' subjective perception of image quality.

Method: 25 staff and student radiographers were invited to rate the image quality of 15 chest radiographs of an anthropomorphic model using Likert scales. Within the 15 images used, six images were duplicated, with the EI values hidden on one. There was ethical approval to deceive participants regarding the true aim of the study. Image quality scores for the duplicated images were compared in the presence and absence of EI data using the Wilcoxon Signed-Rank Test.

Results: A statistically significant difference in image quality scores for images with and without EI was only observed for one image ($p=0.001$). Crucially however, this image was considered most "borderline" in terms of diagnostic quality. 52% of participants would have repeated the image when EI data was hidden, versus 84% when it was shown.

Conclusion: Although only a pre-clinical pilot study, results suggest the presence of a quantitative EI number may bias how radiographers perceive image quality for borderline diagnostic images. This has implications for practice if it potentially leads to unnecessarily repeated images. Given the paucity of guidance on the clinical use of EI, further research in the clinical setting is required to observe how radiographers use EI in practice.

1. Butler, M.L., Rainford, L., Last, J. and Brennan P.C. (2010) Are exposure index values consistent in clinical practice? A multi-manufacturer investigation, *Radiation Protection Dosimetry*. March, 139 (1-3), pp. 371-374.

p170 **Eye lens exclusion in CT head scans at a district general hospital - Completing the audit loop**

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Background: Computerised tomography (CT) scans of the head are becoming increasingly common in hospitals following the update in NICE Guidelines (2004). A strong relationship between repeated CT head scans and cataract formation has been well documented. The standard for lens exclusion in CT head scans is 100% unless specifically looking for orbital abnormalities.

Method: A retrospective analysis of 50 consecutive CT head scans from a district general hospital was conducted in October 2016. Orbits were studied to visualise lens inclusion. Exclusion criteria applied to scans which had been requested for assessment of orbital disease. Audit guidance was obtained from AuditLive regarding the number of patients to include.

Results: Cycle one audited in July 2016 revealed 96% of head CT scans had lens inclusion. Results were presented departmentally and recommendations made. Re-audit in November 2016 revealed 98% of head CT scans had lens inclusion. No improvement in lens exclusion was noted.

Conclusion: Lens exclusion from CT scans will reduce the radiation exposure to the eye. Consequently, the likelihood of lens damage and cataract formation will be reduced. Limitations in patient positioning and the local CT scanner (difficulty angling the gantry) were contributing factors. The audit results have warranted further education and reminders to local staff until a new CT scanner has been purchased. Engaging in the audit process has highlighted the importance of monitoring standards and implementing further strategies to capture deficits.

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p171 **Are X-ray exposures being managed effectively in the clinical environment?**

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Background In the United Kingdom (UK) radiographers are required to keep radiation doses 'as low as reasonably practicable' (ALARP) whilst ensuring optimum image quality for radiological reporting. This legislative practice stems from the hypothetical linear non-threshold dose response model, which maintains there is 'no safe radiation dose', thus informing radiation safety today. The importance of reducing ionising radiation is published in numerous studies demonstrating dose optimising opportunities in chest and skeletal radiography whereby 33-80% dose reduction is reportedly achieved (depending on clinical query). This paper challenges whether X-ray exposures are being managed effectively in contemporary practices and how this is likely attributed to dose creep and integrity of the profession.

Methodology Research from a PhD study explores the use of X-ray exposures and exposure indexes and challenges whether improper techniques are being critically reflected upon by staff. Data stemming from both qualitative and quantitative paradigms is presented for this argument. Radiographers were observed and interviewed, supported by X-ray experiments supporting and/or refuting claims made by diagnostic radiographers.

Results Results demonstrate that radiographers may not be wholly practicing the ALARP principle. This is support with radiographers being unfamiliar with exposure indexes. Whilst exposure indexes have limitations they can be used as clinical aids enabling radiographers to reflect clinically, which may not be apparent.

Conclusion The use of X-ray exposures remains an essential part of the imaging process, yet it may not be managed effectively by both radiographers and managers in contemporary practices. It is proposed that unless challenged, it may continue.

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p172 **Challenging light beam diaphragm design: A method of dose optimisation to radiosensitive organs?**

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Background This article offers dose reduction to radiosensitive organs within general radiography. In contemporary practices the light beam diaphragm (LBD) is generally accepted to limit ionising radiation using horizontal and longitudinal lead shutters, yet this article offers further dose limitation to radiosensitive organs by placing lead-rubber inferior to the LBD device.

Method Using an anthropomorphic phantom and arm construction quantitative data was collected in a controlled X-ray environment. A lateral projection of the elbow was selected due to the close proximity of radiosensitive organs. Dose readings (μGy) were recorded before and after the placement of lead-rubber inferior to the LBD. A paired two sample t-test was undertaken challenging how likely dose reduction was attributable to chance ($p < 0.05$). Correlation and regression analysis significantly ($p < 0.001$) supported pre and post dose readings, maintaining reliability and validity.

Results Descriptive and inferential statistics demonstrate dose reduction to radiosensitive organs upon placement of the lead-rubber inferior to the LBD. The paired two sample t-test demonstrated statistically significant dose reduction ($t = 2.04$, $df = 7$, $p = 0.04$) thus significant for radiographic practice.

Conclusion The study concludes by offering an alternate method of dose limitation to radiosensitive organs within the general radiographic environment. It strongly suggests that that this method can offer dose limitation to more than one radiosensitive organ within a single X-ray exposure, conforming to the 'as low as reasonably practicable' (ALARP) principle.

DOSE OPTIMISATION AND MEASUREMENT**p173 Evidence of dose optimisation with a single UK radiology department**

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Purpose: Optimisation is a fundamental requirement of radiographic practice. The degree in which this is routinely undertaken is likely to vary and is difficult to quantify. The aim of this study was to assess dose optimisation within common radiographic projections using novel DICOM header data extraction software.

Methods: Within a large state hospital DICOM information was extracted from three digital radiography rooms over a two month period. Radiographic examinations assessed included chest, abdomen, shoulder and knee. Data extraction was by bespoke software and included demographics and all available procedure/dose related parameters. Study data were then compared with default protocols to identify evidence of optimisation. Patients under the age of 16 were excluded and all projections were subject to visual scrutiny.

Results: Data from a total of 1250 examinations were collected. With paediatric patients removed data analysis was undertaken on 1245 (99.6%) examinations (724 women; mean (SD) age 57 (18) years). Examinations were equally split between the four anatomical areas. In terms of kVp, for chest radiography, parameters were adjusted from the default in six (2.4%) cases. For abdominal radiography parameters were adjusted in a greater number of cases (29/247; 11.7%). For shoulder and knee radiography kVp settings were adjusted in 3.2% of cases. For mAs (non-AEC examinations) 6 out of 581 (1.0%) projections (knee/Shoulder) had adjustments from the baseline protocol.

Conclusion: Based on this initial assessment of DICOM header data exposure factors appear to be infrequently adjusted and this raises questions regarding levels of dose optimisation within clinical practice.

p174 Exploring how altering exposure factors effects the entrance skin dose for paediatric extremity imaging using direct radiography

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Background: With the wider use of Direct Radiography (DR) systems it has become apparent that there are differences within protocols used in Radiology departments(2). Literature suggests an increase in image quality when a lower range of kV is used(3,4,5,6) contradictory to previous literature regarding paediatric dose, high kV technique, and older technologies(1). The aim of this study is to explore the relationship between kV and entrance skin dose when imaging paediatric extremities on two styles of DR X-ray equipment.

Method: Using two different styles of DR equipment (portable detector and under table detector), experiments of similar set up will be carried out using a phantom to monitor entrance skin dose over a range of exposure parameters, using a dosimeter at the level of the skin surface for a typical paediatric extremity. Image quality will be monitored using a TOR18 test tool and radiologist analysis to ensure transferability to practice. The results will be analysed using a linear statistical model to answer three core hypotheses.

Results: The desired outcome of the study is to identify where the trade-off between image quality and entrance skin dose lies in DR imaging, and whether these results can be replicated between manufacturers and styles of equipment.

Conclusion: This study will provide guidance for Radiographers, department managers, and protocol developers in making evidence-based decisions on their DR imaging practice. The experimental design is easily replicable for use in other departments with several manufacturers allowing for optimisation of paediatric entrance skin dose on a national level.

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