Discussion: All 12 patients with residual disease/recurrence were demonstrated by I123 SPECT CT compared with 5 by ultrasound and 11 by thyroglobulin measurement, indicating the value of this technique even in patients with a normal thyroglobulin. Low risk patients could be safely followed up by neck ultrasound.

Patient dose measurement and management

P-173 **The uncertainty of dose-area product measurements and the impact on patient dose monitoring**

Edwina Peck; Oliver Morrish
Addenbrooke's Hospital

Introduction: There is a requirement to record and audit patient doses from radiological examinations. This can be done retrospectively or prospectively and relies on an accurate dose indication provided by the x-ray equipment. This study looks to investigate dose-area product (DAP) meters to verify their accuracy, consider the proper application of correction factors and understand the nature of the measurement uncertainty.

Method: DAP meters on clinical equipment were intercompared with a range of portable DAP meters that have calibrations traceable to national standards. Some of the DAP values quoted by the clinical systems were from transmission DAP meter measurements, others were calculated. The intercomparison covered a range of exposure conditions, including different kVs, doserates and filtration. Correction factors were derived for each exposure condition and a single factor was calculated for each system.

Results/discussion: The majority of DAP meters were accurate to within 20% across the range of exposure conditions with a tendency for the correction factor to decrease with increasing energy. When considering the effect on patient dose audits, application of a single correction factor to a range of kVs, compared with applying kV specific factors, in the majority of cases makes a difference of less than 10%. However for some systems the uncertainty introduced by this approach can be more than 20%.

In light of the introduction of patient dose monitoring systems acquiring large volumes of data, the application of correction factors is likely to become impractical, however the uncertainty generated by taking this approach should be understood.

P-174 **Patient dose management: Should we move to lean body mass?**

Hishar Hassan; Mohd Hafizi Mahmud; Fathinul Fikri Ahmad Saad; Salasiah Mustafa; Abdul Jalil Nordin
Centre for Diagnostic Nuclear Imaging, Universiti Putra Malaysia

Introduction: Patient dose management in PET is less complex than in CT, as one has control on the administration of Fluorodeoxyglucose (FDG). Study aims to demonstrate that a shift to administration of FDG per lean body mass (LBM) would statistically lower the internal exposure (Eint) attain from FDG-PET as compared to per body weight (BW).

Methodology: Patients (n = 50, age 53.8 ± 14.1 years) administered with FDG activity, 285.64 to 399.23 MBq for PET/CT whole body examination were evaluated retrospectively. Patient's weight and height were recorded for calculation of LBM; (i) men = (0.3281 x kg) + (0.33929 x cm) – 29.5336; (ii) women = (0.29569 x kg) + (0.41813 x cm) – 43.2933. The administered dose per BW of patients were calculated and used to predict the administered dose per LBM on patients. Effective dose of Eint were estimated from Eint = Γ. A where Γ is a dose coefficient (18F = 19 µSv/MBq) and A is the administered activity. Means computed were compared using Independent-samples T-test to observe if the group means are significantly difference ($p < 0.05$).

Results and discussion: Patient's mean Eint from FDG-PET had statistically lower when FDG per LBM were administered, 4.7 ± 0.61 mSv against 6.31 ± 0.65 mSv when FDG per BW were administered. The group means were statistically significant difference ($t(98) = 12.7$, $p = 0.000$).

Conclusion: A shift to administration of FDG per LBM could statistically lower the Eint from FDG-PET, which typically contribute to 5.7 - 7.0 mSv.

P-175 **Mean glandular dose and image quality in BreastScreen Aotearoa, New Zealand in 2012**

Jeremy Nicoll
BreastScreen Aotearoa, National Screening Unit, New Zealand

BreastScreen Aotearoa is the publically funded programme offering biennial, two view mammography to women in New Zealand, aged from 45 to 69 years. In 2012 mammography might be film:screen or digital equipment, depending on the configuration of the local provider. Mammographic Quality Assurance follows the protocols of the Royal Australian and New Zealand College of Radiologists, which are in turn based on those established by the American College of Radiology. Each unit is tested 6 monthly by a Medical Physicist. For screen:film units image quality is assessed by counting the features visible in a radiograph of an RMI156 phantom; and radiation dose assessed by the mean glandular dose (MGD) to the same. For digital mammography the same phantom is used but additional image quality assessment is made by measuring signal to noise and signal difference to noise ratios for 2, 4, and 6 cm blocks of Perspex.

Analysis of 150 medical physics surveys conducted in 2012-3, gives a mean MGD for digital units of 1.05 mGy and for screen:film of 1.08 mGy. Surveys in 2006-8, when there were few digital machines in the programme, gave a mean MGD of 1.05 mGy. The data is further analysed to show the maintenance of image quality and the digital data broken down by machine type.

P-176 **Closing the loop - medical physics feedback in mammography**

Claire Mercer

University Hospital South Manchester NHS Foundation Trust

Aims/objective: A fundamental part of the National Health Service Breast Screening Programme (NHSBSP) is Quality Assurance (QA). Medical physics have been an indispensable part of the QA system since the implementation of the breast screening programme. Commissioning, routine testing and visits following equipment maintenance, if required, are an integral part of this service. Following any visit a report is produced and it is the QA Radiographer and managers responsibility to ensure that any recommendations that are made on these reports are actioned and that feedback is returned to medical physics.

Aim: Development of a robust structured feedback system from a mammography service to the medical physics service.

Content: Development of simple and effective system that supported effective feedback and action on a simple colour RAG rated system. Review of developed system to further incorporate equipment fault report information. Enables clear individual log for each mammography, ultrasound, specimen cabinet and pacs monitor in the department.

Relevance/impact: To roll out system into NHSBSP to enable effective and systematic monitoring of units.

Outcomes: Developed tool - highlights effective system and monthly reporting mechanism to medical physics. Each system has a unique tab and historical information about each system will be enabled.

Discussion: Being responsible for managing a screening service goes hand in hand with inherent systematic QA processes; one of which is ensuring that the equipment that is in the service is effectively monitored to high standards to ensure effective image quality.

P-177 **Automated dose management: Maximising dose reduction and optimisation with compliance to ALARA**

Melissa McMurran
NHS Ayrshire & Arran

Purpose: A fundamental requirement of Ionising Radiation (Medical Exposure) Regulations 2000 (IR(ME)R) is to ensure patients' medical exposures are as low as reasonably possible. The objective is to describe how the implementation of an automated dose management solution can enable simplified analysis of dosimetry and device utilisation across multiple hospitals for efficient compliance to quality and legislative requirements.

Content:

- Integration and implementation of the system.
- Objectives (Comparison of CT dosimetry between protocols and devices cross facility/establish dose alerts/annual dose reports for review).
- Features (interactive dosimetry, productivity & utilisation, dashboards, alerts & dose reference levels).
- Findings - Automated CT dose reports/key statistics.
- Task - Interesting find!
- Utilisation - Comparison of devices cross facility, waiting times.
- Future - IR data integration.

Relevance & impact: Automated dose monitoring efficiently provides continuity of information across our hospitals, raising dose awareness as well as supporting compliance with regulatory requirements.

Outcomes:

- Identify and investigate high CT dose reports.
- Review current CT protocols to take steps towards standardising CT protocols cross-facility.
- Service improvements: monitoring utilisation of devices.
- Report to Clinical Governance meeting - staff awareness.
- Change of practice.
- Compliance with IRMER - DRL's/evidence based practice.

Discussion: Implications/responsibilities/action - reports/evidence based practice.

P-178 **Characterization of flat fiber for patient dose measurements**

Noramaliza M.Noor; Hairul Azhar; Nizam Tamchek; Taiman Kadni; Hishar Hassan; Husaini Salleh; D.A Bradley
Centre for Diagnostic Nuclear Imaging, Universiti Putra Malaysia; Department of Physics, University of Surrey

The aim of this present study is to investigate the alternative use of a new fabricated flat optical fiber with (6% mol Ge-doped concentrations) as a potential medical dosimeter in diagnostic examinations. The flat fibers were screened to establish dosimetric characteristics of such TL media, including reproducibility, linearity, fading and energy dependence. The fibers were calibrated against a parallel plate ionization chamber. Use was made of a 70 kVp energy, with 100 cm focus to surface distance (FSD), 10×10 cm2 field size and delivered at a rate of 1.2 mAs, at the surface of a Perspex solid water phantom, using a kilovoltage x-ray machine located at Medical Physics Group, Malaysia Nuclear Agency.

The new fabricated flat fibres offer linearity between TL yield and dose, with a reproducibility of better than 5%, following repeated measurements (n = 3) for doses from 0.02 Gy up to 3 Gy. The fibres also offer angular and dose rate independent, while an energy-dependent response was found over the energy range 40 to 150 kVp. The maximum signal loss, 5%, was obtained for fibres following 1 months of storage at room temperature. A new fabricated flat fibre represents a viable system for use in diagnostic examinations.

P-179 **Computed tomography requesting practise: Are intravenous contrast guidelines being followed and renal function being documented?**

Christian Burd
Chelsea and Westminster Hospital NHS Foundation Trust

The use of intravenous (IV) contrast agents in computed tomography (CT) imaging has increased dramatically. With the obvious advantages come many potential negatives such as contrast nephropathy. The Royal College of Radiologists has provided clear guidance on identifying those at risk of and avoiding contrast toxicity.

A retrospective audit of CT requesting practise, looking specifically at renal function documentation and assessment on request forms, was carried out. Over 1 week 170 patients underwent a CT scan fulfilling our criteria. 12.9% of these had an impaired eGFR which was not documented in 97.3%. 54.6% of those with an impaired eGFR had IV contrast administered. Notably, 18.8% of the patients did not have an eGFR result within the guidelines timeframe.

Posters were then placed throughout clinical areas to raise staff awareness of guidelines. In a re-audit, of 121 patients, 16.5% had an impaired eGFR, which was not documented in 35%. 45% of patients with an impaired eGFR had IV contrast administered. Further, 7.4% of the patients did not have an eGFR result within the guidelines timeframe.

This data demonstrates that renal function is not being recorded in line with guidelines, and many patients are receiving contrast without documentation that renal function has been considered. After a simple campaign to raise awareness the proportion of requests not documenting impaired renal function fell by 37.8%. Further, the number of patients with impaired renal function receiving IV contrast fell by 9.4%. Future improvements could be made by implementing an eGFR section on CT request forms.

Radiation protection and quality assurance

P-180 **A review of QC testing practices across the North West**

Conor Clancy; Andy Shaw
The Christie NHS Foundation Trust

CMPE provides an online platform (using Google Apps) to 31 hospitals across the North West which stores, analyses and collates in-house QC data. This study analyses this data in order to compare QC-testing practices across the region to the recommended standards provided by IPEM Report 91.

With regard to testing practices, it was found that the tests which most commonly exceed a tolerance are AEC sensitivity for radiography (77%), dose rate reproducibility for fluoroscopy (58%), dose per image reproducibility for fluorography (74%) and DDI monitoring for CR readers and DR detectors (76% and 53% respectively). Trends in the data strongly suggest that QC testing practices, as opposed to equipment malfunction, are the main reason why test results exceed tolerance.

The standards also recommend that when a tolerance is exceeded corrective action should be initiated but, the data suggests that this is occurring in only 8% of radiography cases, 5% of fluoroscopy/fluorography cases, 3% of DR detector cases and not at all for CR reader tests.

An analysis of testing frequency showed that 77% of radiography, 53% of fluoroscopy, 46% of fluorography, 61% of CR reader and 57% of DR detector tests were not performed within the minimum 90 day testing period.

This study shows that in-house QC testing is not meeting the recommended standards with regard to test performance, corrective action or testing frequency. Raising these concerns with hospitals may help to isolate and remove weaknesses in testing practices and bring testing to a recognised standard across the region.