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ABSTRACT BOOK

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The Institute of Physics & Engineering in Medicine

B1 What do we need to understand - what are the additional considerations we need to have when providing radiotherapy for LGBT+ individuals?

B1.1 Evaluating the perceptions of the transgender and non-binary communities on pelvic radiotherapy information booklets

Hannah Burton; Pete Bridge; Pauline Pilkington
University of Liverpool

Background: Acute and late toxicity arising from pelvic radiotherapy can cause a significant impact on psychosocial functioning and quality of life (Esparza, 2018). Having written information regarding these symptoms in the form of booklets is helpful to patients in making informed decisions about their management and as a reference for support throughout radiotherapy treatment. The UK transgender and non-binary communities are growing steadily (GIRES 2011), yet their needs differ from those of the general population and it is unclear if the information booklets produced for patients undergoing pelvic radiotherapy provide relevant support to this demographic.
Method: An online survey was distributed via social media to evaluate the perceptions of these communities of four commonly distributed pelvic radiotherapy information booklets. Likert questions addressed overall appropriateness and relevance of the booklets while open questions sought qualitative responses regarding these answers.
Results: In total, 18 full responses were provided. Respondents found the information to be relevant but that language and assumptions made regarding their social and sexual dynamics were incorrect and, in some cases, distressing. Some respondents pointed out that the language used may be confusing for non-binary people who identify as neither men nor women, and for those individuals who may have undergone part of a medical transition, who are not represented. Some stated plainly that the wording or guidance included would make them feel uncomfortable.
Conclusions: Further research is required to establish what is needed to provide an inclusive and empowering booklet for transgender and non-binary individuals undergoing pelvic radiotherapy.

1. Esparza AO, Tomás MÁ, Pina-Roche F. Experiences of women and men living with urinary incontinence: A phenomenological study. Appl Nurs Res 2018;40:68-75
2. Gender Identity Research and Education Society. The Number of Gender Variant People in the UK - Update 2011

B7 GI and GU short paper presentations

B7.1 Renal oncocytoma: Can we diagnose them on pre-op CT?

John Spillane; Paul McCoubrie
North Bristol Trust

Purpose: To retrospectively review the pre-operative imaging of a case series of pathologically confirmed renal oncocytomas to determine if the radiological findings are predictive for accurate diagnosis.
Methods and materials: Patients were identified from a local pathology database that also had pre-operative imaging available. From 2006-2017, a total of 164 scans from 117 patients were reviewed. The scans were assessed for characteristic imaging features based on a critical review of literature.
Results: There were 77 male and 40 female patients, with a mean age of 68 years old (with a range of 36 to 82). 3 patients had bilateral masses. 2 patients had concurrent renal cell carcinomas. 23 patients had recorded symptoms including pain and haematuria. Mass sizes ranged from 15 to 150mm in diameter. 98 (82%) were exophytic. All the masses showed contrast enhancement. 87 (73%) had heterogeneous enhancement. Only 11 (9%) of lesions had a stellate scar. 4 (3%) had a cystic component. 30 patients had follow-up imaging, of which 14 (47%) showed significant interval growth. None of the patients had lymphadenopathy, renal vein invasion, or metastases.
Conclusion: Oncocytomas can have variable CT appearance and often mimic a renal cell carcinoma but some authors say they can be predicted accurately. In our case series, few had the 'typical findings'. Only a minority were small masses in young patients. Few had a typical homogeneous appearance with a central stellate scar. Therefore, oncocytomas cannot be accurately diagnosed on pre-op CT, and histological diagnosis is still required.

B7.2 It is time to think inside the (collimation) box; A quality improvement project to reduce over-scanning in CT KUB

Matthew Spurr; Alireza Vosough
Southmead Hospital

Background: The Royal College of Radiology (RCR) recommends CTKUB as the first line investigation for renal colic. Radiology departments need to optimise CTKUB scans to reduce unnecessary scan length. The RCR recommends that excess scan length above the upper pole of the highest kidney should not exceed 10% of the total scan length. Currently there is no literature assessing if this is being achieved.
Aim: The aim of this quality improvement project is to determine what proportion of CTKUBs performed at a district general hospital (DGH) are meeting this standard and to explore improvement options as necessary.

Method: A retrospective study was performed of 100 consecutive patients who attended a DGH Emergency Department with renal colic from 1-30 October 2018 and subsequently had a CTKUB. The number of slices above the upper pole of the highest kidney, relative to total scan length was recorded. Radiographers at the DGH believed that over-scanning could be reduced by viewing CTKUB image acquisition in real time and manually stopping the scan when the top of the highest kidney was seen. This was implemented and the departments CTKUBs were re-audited using 50 consecutive patients from 15-28 November.
Results: Scan length above the highest kidney exceeded the standard on 81 of 100 CTKUBs (81%). Over-scanning was reduced to 7 of 50 patients (3.5%) after implementation of the intervention.
Conclusion: The DGH in this study was over-scanning 81% of patients having a CTKUB. Radiographers manually stopping the CTKUB reduced the number of patients over-scanned to 3.5%.

Turney, B.W., Reynard, J.M., Noble, J.G. and Keoghane, S.R. (2012) Trends in urological stone disease, British Journal of Urology International, 109(7): 1082-7

B7.3 MR Enterography: A comparison between Moviprep and Mannitol and Locust bean gum

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Manchester University NHS Foundation Trust

Background: MR enterography is a widely utilised imaging method for the assessment of small bowel. The success of the study predicates upon adequate distension of small bowel. There is at present no general consensus on best oral distension agent for MR enterography. This study seeks to compare bowel distension and patient satisfaction between two oral preparation agents - Moviprep and Mannitol with locust bean gum (Mannitol-LBG).
Method: Prospective recruitment of 60 patients undergoing MR enterography. Of these patients, 30 had Moviprep and 30 had Mannitol-LBG bowel preparation. Patients were given an optional questionnaire on acceptability of the preparation. Bowel distension was measured across three small bowel points (jejunum, mid ileum and distal ileum) on all study scans. Overall assessment of bowel distension (adequate vs inadequate) was also performed. Statistical analysis performed on SPSS.
Results: There was a significant difference (p=0.005) in mean bowel diameter with Mannitol-LBG (17.8mm) compared with Moviprep (15.5mm). In particular, significantly (p=0.001) better jejunal distension was observed with Mannitol-LBG (20.1mm vs Moviprep 15.8mm). Patient satisfaction with drinking the preparation was higher with Mannitol-LBG (76%) than with Moviprep (68%) but this was not statistically significant (p=0.85). Patient compliance was better with Mannitol-LBG, with 60% or patients finishing the preparation, in comparison to Moviprep (53%, p=0.79). A higher percentage of studies with Mannitol-LBG (87%) were deemed as adequate, in comparison with studies with Moviprep (73%), but this was not statistically significant (p=0.33).
Conclusion: In comparison with Moviprep, Mannitol - LBG preparation yields higher average bowel distension, and is associated with higher patient satisfaction and compliance.

B7.4 The efficacy of CT, MRI and FDG-PET/CT for target volume delineation in radiotherapy treatment planning of colorectal Cancer: a systematic review

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[1]University of Hertfordshire, UK/University College Hospital, Nigeria; [2]University of Hertfordshire, UK;
[3]University College Hospital, Nigeria

Background: The roles of preoperative chemoradiotherapy and advanced conformal radiotherapy techniques in rectal cancer treatment are well recognised. However, the benefits of these strategies may be lost or detrimental without accurate tumour volume delineation using appropriate imaging techniques. This systematic review investigated the efficacy of CT, MR and FDG-PET/CT imaging and the effects of their use on the interobserver variation in target volume delineation in radiotherapy planning of rectal cancers.
Methods: PubMed, EMBASE, Cochrane library, CINAHL, Web of Science and Scopus databases and other sources were systematically queried using keywords and relevant synonyms. Eligible full-text studies were assessed for methodological quality using the QUADAS-2 tool and data were extracted.
Results: Of 1448 originally identified studies, eight studies (n=261), all cross-sectional studies met the inclusion criteria. Findings show that MRI significantly delineate larger tumour volumes than FDG-PET/CT while DW-MRI identified smaller GTVs compared to T2W-MRI. CT-GTVs were found to be larger compared to FDG-PET/CT. FDG-PET/CT further identified new lesions and tumour volumes extending outside the routinely used clinical standard CT tumour volumes in about 15-17% and 29-83% of patients respectively. Between observers, delineated volumes were similar and consistent between MRI sequences whereas, interobserver agreement was significantly improved with FDG-PET/CT than CT.
Conclusion: FDG-PET/CT and DW-MRI appears to delineate smaller rectal tumour volumes and shown improved interobserver variability. With FDG-PET/CT, approximately one in six patients had a change in treatment plan. Multimodality imaging shows ample potential for future rectal cancer radiotherapy planning.

1. Gwynne, S., Mukherjee, S., Webster, R., Spezi, E., Staffurth, J., Coles, B. & Adams, R. (2012). Imaging for target volume delineation in rectal cancer radiotherapy - a systematic review. Clin Oncol, 24(1), 52-63
2. Joye, I., Macq, G., Vaes, E., Roels, S., Lambrecht, M., Pelgrims, A., Haustermans, K. (2016). Do refined consensus guidelines improve the uniformity of clinical target volume delineation for rectal cancer? Results of a national review project. Radiotherapy & Oncology, 120(2), 202-206
3. Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. BMJ, 339:b2700

4. MacManus, M., Nestle, U., Rosenzweig, K. E., Carrio, I., Messa, C., Belohlavek, O., Jeremic, B. (2009). Use of PET and PET/CT for radiation therapy planning: IAEA expert report 2006-2007.Radiotherapy & Oncology, 91(1), 85-94
5. Rahbari, N. N., Elbers, H., Askoxylakis, V., Motschall, E., Bork, U., Büchler, M. W., Koch, M. (2013). Neoadjuvant radiotherapy for rectal cancer: meta-analysis of randomized controlled trials. Ann Surgl Oncol, 20(13), 4169-4182

B7.5 An evaluation of a newly introduced 68 Gallium PSMA PET-CT service

Vicki Major; Paula Merry; Bal Sanghera; Christopher Shepherd; Wai-Lup Wong
Paul Strickland Scanner Centre

Background: According to the Evidence-based indications for the use of PET-CT in UK (2016), when ^{68}Gallium prostate specific membrane antigen (PSMA) is used for the assessment of prostate malignancy it has superior diagnostic accuracy compared to ^{18}F-Choline. Ten months ago, in response to demand from local oncologists we decided to offer ^{68}Gallium PSMA as an additional service to our ^{18}F-Choline scans. ^{68}Gallium has a half-life of 68 minutes and is produced in generator the nearest being 21 miles from our Centre. Several factors were considered when setting up the new service, regulatory compliance, training of ARSAC licence holder, production, supply and transport of tracer, radiographer/technologist competence, quality assurance, radiation dose, audit, scanning protocols and calibrator testing. The ^{68}Gallium PSMA service was setup for a Saturday to facilitate the quickest journey times from production to scanning centre. When all phantom work, training and QA was completed and regulatory consents were in place the service could commence. An audit was undertaken to evaluate the new service, with the following outcomes being measured:

- Dose administered to patient
- Number of cancellations due to tracer not being available
- Referral criteria
- Clinical findings

Purpose: To inform of the complexity of setting up a new non 18F-FDG service in PET/CT.
Summary: A discussion of how a new service can be setup along with the factors to be considered. The results of an audit to evaluate the new service will also be discussed.

The, R. C. O. R., Royal, C. O. P. O. L., Royal, C. O. P., Royal College of Physicians of Edinburgh, & Administration Of Radioactive Substances Advisory Committee. (2016). Evidence-based indications for the use of PET-CT in the United Kingdom 2016. Clinical radiology, 71(7), e171

B7.6 Post and pre-biopsy MPMRI for prostate cancer - audit and re-audit of a pathway

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[1]Southport and Ormskirk Hospital NHS Trust; [2]University Hospital Plymouth NHS Trust, Plymouth

Background: Multi-parametric magnetic resonance imaging (mpMRI)for investigation of prostate cancer is rapid developing with the focus moving from post-random biopsy to pre-random biopsy MR to target the initial biopsy. MpMRI has is shown to improve diagnostic accuracy and avoid unnecessary surgery. We have changed from using MPMRI for assessing targetable prostate lesions in the post random biopsy setting to the pre-biopsy mpMRI for new patients using PIRADS-V2. We present data from a closed-loop audit comparing pre and post-biopsy mpMRI outcomes with pathology samples.
Method: We collected data from 135 MpMRI's (61 tissue samples) patients on an 'active surveillance' management pathway, post-random-biopsy in 2017 over a 6-month period. We then implemented a change with patients performing mpMRI prior to sampling. We then re-audited with 138 (78 tissue samples) pre-biopsy mpMRI's performed in 2018.
Results: Accuracy of the pathway for PIRADS v2 5 lesions for detecting any prostate cancer gleason 3+3 or greater increased from 76.9% post-biopsy (2017) to 95% (2018) for pre-biopsy mpMR, however detection of clinically significant cancer (defined as greater than gleason 3+4 or greater than 4+3) results to 75% and 50% respectively. PIRADS 3 lesions demonstrated a reduction in any cancer score from 16% to 5.8%.
Discussion: The amount of mpMRIs performed in our centre has increased following the move to pre-biopsy. Cancer detection rates for high-probability lesions are high and fewer PIRADS-V2 3-scoring lesions are biopsy-positive. No comparable data for PIRADS 1/2 was available due to the limited number of tissue samples.

C7 Physics: Dose justification and optimisation short paper presentations

C7.1 Diagnostic imaging IRMER improvement notice to CQC outstanding

Emma Spouse
Royal Cornwall Hospitals NHS Trust

The diagnostic imaging department had a serious incident involving a paediatric imaging examination in 2015 and was subsequently issued with an ionising radiation (medical exposure) regulations (IRMER) improvement notice. This notice related specifically to staff training records, the paediatric imaging competency assessment of Radiographers and the optimisation of ionising radiation exposures following the introduction of new digital radiography (DR) equipment. The service implemented a quality-based project approach in order to address the improvement actions required and to commence working towards Imaging Service Accreditation Standards (ISAS) certification. In September 2018 the county wide imaging service was assessed

by the ISAS team and underwent the first independent diagnostic imaging CQC inspection. ISAS accreditation was achieved and the Diagnostic Imaging service has recently been rated as outstanding by the CQC.

C7.2 A retrospective review of justification of computed tomography examinations in Northern Ireland

Yvonne Sullivan
Public Health England

Background: Justification is one of the key principles of radiation protection. The most appropriate use of CT relies on many factors which must be considered each and every time a scan is justified. The Regulation and Quality Improvement Authority (RQIA), commissioned this study to assess the justification rate of CT examinations in a single 24 hour period across NHS Trusts in Northern Ireland.
Method: The study retrospectively reviewed the clinical information within 450 referrals for diagnostic CT scans against published referral guidelines to assess justification. Each referral was independently assessed by two consultant radiologists and where opinions differed, arbitration was carried out. The reviewers were also asked to indicate if an alternative modality would have been more appropriate in any referrals that they deemed unjustified. Results were analysed for variations in justification rate by patient gender, patient age, geographical location and anatomical region scanned.
Results: This study found that 94% of the CT referrals reviewed were justified. The number of justified scans varied with regard to the anatomical region being scanned, with the abdomen and pelvis being the only region that demonstrated any statistical significance in the number of unjustified examinations. The highest suggested alternative modality was MRI at 33% of the unjustified referrals.
Conclusion: The study compared favourably to a similar study carried out in Sweden from 2009 where the justification rate was 80%. This review shows that conventional systems utilising up-to-date referral criteria and robust justification processes can ensure that inappropriate examinations are rare.

C7.3 Dose optimisation in facial bone OM projection with variation in AEC chamber selection and centring point: A phantom study utilising DR

Gail Berbal; Anthony Manning-Stanley; Colette Bennion
University of Liverpool

Background: The recommended automatic exposure control (AEC) chamber selection for digital radiography (DR) examinations of the facial bones is not supported by confirmatory literature. The aim of this study was to provide evidence to support radiographic practice.
Method: Using DR equipment, a phantom was positioned to achieve an occipitomental (OM) radiographic projection. 7 AEC chamber combinations were utilised, with an SID of 100cm, and a 1cm grid of 9 incremental centring points (3x3) in lateral and craniocaudally planes, resulting in 63 images. Recording milliamps per second (mAs), peak-kilovoltage (kV_p) and dose-area product (DAP) facilitated effective dose (ED) calculations via PCXMC (mSv). Images were blindly evaluated by two experienced radiographers against four image quality criteria (3-point scale).
Results: ED for the recommended central AEC chamber setting was significantly higher than for the other 6 settings ($p<0.001$); however, this was the only setting for which all images were evaluated as 'fully acceptable'. Whilst the left-central and right-central AEC chamber combinations were able to produce 'probably acceptable' images at a lower dose than the central chamber, this only occurred at specific centring points. All other AEC chamber combinations and associated centring points produced 'unacceptable' images, with similar image quality scores, and no statistically significant difference between calculated EDs.
Conclusion: The current recommended central AEC chamber is the optimal radiographic technique, producing consistently acceptable images, whilst allowing for a certain degree of centring variability. It is recommended future textbooks should reference this study in order to evidence best practice in the OM projection.

C7.4 Slice reduction in CTKUB for renal colic

Jonathan Adlam
Barts Health NHS Trust

Purpose: As the gold standard for suspected urolithiasis[1], CTKUB is an increasingly important source of radiation. One dose reduction strategy without direct guidelines at our institution was active reduction of the number of slices imaged from above the upper pole of the higher kidney.
Methods and materials: 50 sequential CTKUB examinations were reviewed for excess slices which the RCR suggests should never exceed 10% of total slices[2]. Three audit cycles were carried out with two interventions employed. Firstly, a new guideline specified that all scans should begin just above the upper kidney if visible on the CT scout views. Otherwise, the scan should begin at the upper border of T12. Following this, radiographers who continued to have excess slices were contacted individually to ensure the new guideline had reached all CT radiographers.
Results: Each intervention reduced the proportion of CTKUB examinations with more than 10% excess slices from 46% to 20%, and then 10%. The average excess slices were reduced from 10.62% to 6.68% ($p<.0001$) and then to 4.51% ($p<.05$). Practice

changed to represent the new guideline with 58% of examinations starting at T12 compared to 16% initially. DLP was not significantly different between cycles, which is attributed to variation in body size and therefore insufficient power with the numbers audited.

Conclusion: Implementation of a new local guideline to actively restrict the upper limit of CTKUB examinations resulted in changes to local CT practice with associated reduction in excess slices.

1. Tsiotras, A. (2018) British Association of Urological Surgeons standards for management of acute ureteric colic. J. Clin. Urology 11(1) 58-61
2. Twemlow, M., Munjal, I. (2018) Audit to optimise CT KUB imaging in investigation of renal colic. [Online] Available from: https://www.rcr.ac.uk/audit/audit-optimise-ct-kub-imaging-investigation-renal-colic [Accessed 1st December 2018]

C7.5 Dual energy CT for assessing myeloma in MRI-incompatible patients: Preliminary phantom study and clinical implementation

Ana Pascoal [1]; Ian Honey [1]; Dan Hodson [1]; Samuel J Whitney [1]; Matthew Streetly [1]; Ulrike Haberland [2]; Christian Kelly-Morland [1]; Vicky Goh [1]

[1]Guy's and St Thomas' NHS Foundation Trust, London, UK; [2]Siemens Healthcare, CT Research Collaborations, Frimley, UK

Purpose: Whole body MRI is the first line test for suspected myeloma. However, this may not be tolerated in a subset of patients. We aimed to develop a DECT protocol as an alternative for disease assessment for myeloma.

Methods and materials: An anthropomorphic torso phantom (Kyoto) was scanned (Somatom Force, Siemens) with a non-contrast DECT protocol (90kV/150kV) at a range of dose levels (ref mAs, x0.25, x0.5 and x2), and compared with a single energy non-contrast chest-abdomen-pelvis (SECAP) protocol (110kV). Noise and CNR were measured within the phantom (liver, bone and soft-tissue background). Image quality (IQ) of DECT image data sets (90kV, Sn150kV and weighted-average) and SECAP was assessed (5-point Likert scale). CTDIvol and DLP were compared for the DECT and SECAP protocols and effective dose (mSv) was calculated using DLP and a conversion factor (k=0.021 mSv.mGy-1cm-1). Clinical scans were scored qualitatively by an experienced radiologist.

Results: The DECT protocol at default dose provided weighted-average images with noise (15.0-16.2 and CNR (4.2-23.7) comparable or improved to those for the SECAP protocol (noise 17.2-21.4; CNR 3.9-21.7). The IQ assessment of 'bone' and 'bone/soft tissue' contrast showed a preference for the DECT images over those with the SECAP protocol. The dose for the DECT protocol at the default reference mAs (DLP 456 mGy.cm; ED 9.1mSv) was 25% higher than that for the SEAP protocol (366 mGy.cm; ED 7.3 mSv). All clinical scans were of excellent diagnostic quality. Conclusions DECT provided comparable or superior IQ at an acceptable dose increase for clinical evaluation.

1. Myeloma: diagnosis and management, NICE guideline [NG35], February 2016
2. Petritsch B, Kosmala A, Weng AM, Krauss B, Heidemeier A, Wagner R, Heintel TM, Gassenmaier, Tobias, Bley TA (2017) Vertebral Compression Fractures: Third-Generation Dual-Energy CT for Detection of 'bone' Marrow Edema at Visual and Quantitative Analyses. Radiology 284 (1)
3. Kosmala A, Weng AM, Heidemeier A, Krauss B, Knop S, Bley TA, Petrish B (2017) Multiple Myeloma and Dual Energy CT: Diagnostic accuracy of virtual non calcium technique for detection of bone marrow infiltration of the spine and pelvis. Radiology 286 (1)
4. Shrimpton PC, Jansen JT, Harrison JD, Updated estimates of typical effective doses for common CT examinations in the UK following the 2011 national review. British Journal of Radiology 2016; 89 (1057)
5. Phantom model PBU-50 user manual, Kyoto Kagaku, Japan

C7.6 Ionising radiation in research - the lead clinical radiation expert

Andrea Williamson Shemilt

Nottingham University Hospitals NHS Trust

The Health Research Authority (HRA) carries out regulatory review on healthcare research[1]. It requires that the entire burden of radiation exposure to a participant in research be articulated appropriately in the IRAS application form[2], including consideration to exposures that would be additional to routine care through participation in research. This is to inform the review of the application for HRA and REC approval prior to the commencement of the research, a legislative requirement[3]. Under their definition, a research exposure is one required by the trial protocol, which may or may not be additional to routine care.

The IRAS form requires input from a Lead Medical Physics Expert, who makes a statement on the trial radiation procedures, their estimated dose and radiation risk. This is reviewed by a Lead Clinical Radiation Expert, who judges which exposures might be additional to standard care at any site in the research, and whether the trial radiation exposures are justified in the context. There is a reported lack of training available for those fulfilling Lead CRE roles in research, as this is considered to be described in the literature[2, 4] and largely similar to the IRMER justification process required at a local level for every radiation exposure[3]. This talk describes the legislative and policy requirements for the Lead CRE, as well as the context and content for the Lead CRE review. Feedback from surveyed Lead CREs will be discussed, including approaches to streamline the Lead MPE/Lead CRE review process.

1. https://www.hra.nhs.uk/about-us/
2. https://www.myresearchproject.org.uk/
3. http://www.legislation.gov.uk/uksi/2017/1322/pdfs/uksi_20171322_en.pdf
4. https://www.hra.nhs.uk/planning-and-improving-research/policies-standards-legislation/ionising-radiation/

E3 Paediatrics and chest short paper presentations

E3.1 Audit on paediatric appendicectomies - the role of ultrasound and paediatric appendicitis score (PAS) in the diagnosis of appendicitis

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Barnet Hospital, Royal Free London NHS Foundation Trust

Background: Clinical diagnosis of appendicitis in the paediatric population can be challenging. Ultrasound imaging (USS) is used as a first-line evaluation tool due to its favourable radiation safety profile compared to CT (Doria et al., 2006). We aimed to evaluate the role of Paediatric Appendicitis Score (PAS), a validated clinical scoring tool (Samuel, 2002, Goldman et al., 2008), and USS in diagnosing appendicitis in paediatric patients.

Method: We conducted retrospective analysis of patients aged <18 who underwent appendicectomy between April and September 2018. Patients were clinically stratified into PAS low (1-3), intermediate (4-7) and high risk (7-10) for appendicitis. Diagnostic performances of USS and PAS score in detecting appendicitis were evaluated with ROC analyses using histopathology as gold-standard.

Results: 53 patients underwent appendicectomy of which 60% had pre-operative USS (n=32). Negative appendicectomy rates for PAS high, intermediate and low risk were: 3%, 39% and 66% respectively. 52% of PAS high-risk patients had pre-operative USS compared to 67% of intermediate and 83% of low risk patients. Sensitivity and specificity of USS was 50%. AUC for USS and PAS were 0.50 and 0.81, respectively (p=0.011). Mean time from admission to operation in patients with pre-operative USS was 24 hours compared to 14 hours in those without USS (p<0.001).

Conclusion: PAS was a better predictor of appendicitis compared to USS findings. USS is highly operator dependent and has a role in diagnosing appendicitis in the low/intermediate risk patients. In high-risk patients, the benefits of USS must be balanced against the potential delays it can cause to treatment.

1. DORIA, A. S., MOINEDDIN, R., KELLENBERGER, C. J., EPELMAN, M., BEYENE, J., SCHUH, S., BABYN, P. S. & DICK, P. T. 2006. US or CT for Diagnosis of Appendicitis in Children and Adults? A Meta-Analysis. Radiology, 241, 83-94
2. GOLDMAN, R. D., CARTER, S., STEPHENS, D., ANTOON, R., MOUNSTEPHEN, W. & LANGER, J. C. 2008. Prospective validation of the pediatric appendicitis score. J Pediatr, 153, 278-82
3. SAMUEL, M. 2002. Pediatric appendicitis score. J Pediatr Surg, 37, 877-81

E3.2 Generalised systemic lymphangiomatosis - an imaging case study

Ghassan Almeer [1]; Jeanette Kraft [2]; David C Crabbe [3]; Kate Kingston [4]
[1]York Teaching Hospital NHS Foundation Trust; [2]Paediatric Radiology, Leeds Teaching Hospitals NHS Trust; [3]Paediatric Surgery, Leeds Teaching Hospitals NHS Trust; [4]York Teaching Hospital NHS Trust

Backround: A 7yo boy presented to our DGH A&E in November 2018, limping with a painful left leg and no traumatic history. X-ray demonstrated a pathological fracture through a 28mm ill-defined lucency in the distal fibula shaft, with similar lesions in the proximal fibular and tibial diaphyses. No relevant history was provided and prior imaging constituted 3 CXRs from 2015 demonstrating an ante-nataly diagnosed, presumed lung sequestration and a later right pleural effusion. RIS sytem letters revealed a diagnosis of generalised systemic lymphangiomatosis under tertiary centre care.

Purpose: This rare systemic condition is infrequently encountered outside tertiary centres and we present an interesting imaging case study to illustrate features of this disease for educational purposes.

Summary: We will utilise studies from ante and neonatal periods and early childhood including plain film, US and cross sectional imaging to depict the clinical journey of this child and illustrate the systemic involvement. This condition is a generalised lymphatic anomaly which may involve the cutaneous and superficial soft tissues, thoracic and abdominal viscera and bones. Our patient has experienced recurrent chylous pleural effusions and a pathological fracture through an osseous lesion and is known to have visceral involvement. We will use this case in conjunction with relevant literature to discuss clinical presentation, imaging features and dilemmas in diagnosis, clinical and therapeutic management of these patients; including the biochemical, hormonal and immunological imbalances associated with the drainage of recurrent chylous effusions and the effect of drugs used to try and treat the condition.

1. Yang,D.H (2009) Generalised Lymphangiomatosis: Radiographic Findings in Three Pediatric Patients. Korean J Radiol. 7 (4), 287-291
2, Raman, S.P (2009) Imaging of Thoracic Lymphatic Diseases. American Journal of Roentgenology. 193 (6),1504-1513
3. Steiner, G. M. & Farman, J. & Lawson, J.P. (1969) Lymphangiomatosis of Bone. Radiology. 93 (5)

E3.3 Wilms' tumour: An overview and a multi-modality diagnosis pictorial review

Antoinette Silcott
Glasgow Caledonian University

Background: Wilms' Tumour (Nephroblastoma), is the most common Paediatric renal cancer[5]. It's origin though unknown has been considered embryonic as it manifests from the development of immature kidney cells and generic with alterations of genes that aid in genitourinary development[4,11]. Wilms tumour's peak incidence is 1-3 years with 5% and 1% having a birth defect and a family history respectively, it is more common in blacks than whites and Asians and equal in both gender[3,8]. Symptoms may include: palpable abdominal mass, haematuria, abdominal pain which all warrants referral within 48 hours to oncology specialists[9]. Ultrasound is usually the initial assessment modality, followed by Computed Tomography of chest and abdomen to

stage the tumour, to assess IVC, renal veins and metastatic spread[2,6]. Magnetic resonance imaging, been more superior at imaging Wilms' tumour is often also used to staging and diagnosis[7]. Although having a lower sensitivity chest X-ray may be used optionally to assess chest metastases[8]. Wilms' Tumour has five stages which determine, the protocol/guidelines used to develop treatment plans which may include surgery, chemotherapy and radiotherapy[1].

Purpose: To Increase the awareness of Wilms' tumour while highlighting the collaborative role of Imaging in its diagnosis. Advantages and disadvantages of the modality used to image WT will be presented which can assist Practitioners in making informed decisions.

Content: The aetiology, risk factors and symptoms of WT will be presented, however, focus will be on the diagnosis using a multi-modality picture review. A clinical pathway for Wilms' Tumour cases will be outlined.

1. How are Wilms Tumor diagnosed. American Cancer Society http:// www.cancer.org
2. BALDISSEROTTO, M., 2014. Wilms' tumor: is computed tomography specific to detect lymph nodes metastasis?. Radiologia Brasilia. [47 (1)]
3. CANCER RESEARCH UK. 2017. Children's Cancer. Cancer Research UK
4. COOPES M.J & PRITCHARD-JONES. K., 2000. Principles of Wilms' tumor biology. Urology Clinic North America
5. JOHN, R. et al., 2018. Clinical outcomes of children with Wilms tumor treated on a SIOP WT 2001 protocol in a tertiary care hospital in south India. Journal of Pediatric Urology
6. KO, E.Y., RITCHEY, M.L., 2009. Current management of Wilms' Tumor in children. Journal of Pediatric Urology. [online]. 5 (1), pp 56-65
7. Lowe, L H; Isuani, B H; Heller, R M; Stein, S M; Johnson, J E; Navarro, O M; Hernanz-Schulman, M., 2000. Pediatric renal masses: Wilms tumor and beyond. Radiographics: a review publication of the Radiological Society of North America, Inc. 20 (6), pp .1585–1603
8. MULLEN, E.A., WELDON. C., KREIDBERG. J.A., 2004. Pediatric Renal Tumors. IN: AVNER, E.D., HARMON, W.,NIAUDET, P., NIAUDET, P., Pediatric Nephrology.ed Lippincott Williams & Wilkins, pp 1431-1444
9. NICE guidelines. 2015. Wilms tumour
10. VALLACE K.L., DOME, J.S., 2013. Renal Tumors in Children .In: FINKEL , K.W & HOWARD,S.C., Renal Disease in Cancer Patients. [online]Academic Press, pp 129-130
11. WEBER, Georg F., 2007. Molecular Mechanisms of Cancer. [Online]. Dordrecht: Springer Netherlands

E3.4 Does the compressed lung in cases of antenatal diaphragmatic hernia behave different to that in cystic pulmonary malformations?

Alice Saunders [1]; Andrew Fry [2]; Elspeth Whitby [3]
[1],[2]Sheffield Teaching Hospitals; [3]University of Sheffield

Background: In fetal lung conditions such as congenital diaphragmatic hernia (CDH) and cystic pulmonary airway malformation (CPAM), normal lung tissue is compressed. The reduced fetal lung volume and altered lung maturation lead to neonatal morbidity and mortality. Changes in lung signal intensity (SI) on magnetic resonance imaging (MRI) may reflect altered lung development.

Aim: To evaluate patterns in lung SI and volume in CDH and CPAM cases on T2-weighted images fetal MRI.

Methods: A retrospective study of 26 CPAM, 51 CDH and 21 control patients. The average lung SI was calculated using a region of interest tool for contralateral, ipsilateral and cystic lungs. SI ratio of the contralateral:ipsilateral lung was calculated. Regression analysis and analysis of covariance were performed. Lung volumes were also measured. Results SI ratio significantly increased over gestation in CDH, but no change was seen in the controls or CPAM. No significant differences were found between contralateral lungs in controls, CPAM and CDH. Despite compression, the ipsilateral lung in CPAM followed the same pattern as controls. In CDH, ipsilateral SI significantly decreased with gestation, suggesting lung hypoplasia. Inter- and intra-observer agreement was excellent. The results were not dependent on the volume of the lungs.

Conclusion: Fetal lung compression affects lung development differently, depending on the pathology. Lung compression results in a hypoplastic ipsilateral lung in CDH, however in CPAM the ipsilateral lung develops normally. Contralateral lungs develop normally in both CDH and CPAM. Fetal MRI signal intensity may help predict postnatal outcome.

E3.5 Optimisation of SABR lung CBCT verification

Louise Turtle; Andrew Willett; Colin Lee; Christopher Fitzpatrick; Robert Biggar
Clatterbridge Cancer Centre

Background: At our clinic SABR lung patients receive pre-treatment 4D CBCT and post-treatment 3D CBCT using Varian TrueBeam 'thorax' mode (125kV, 15mA, full trajectory, 46cm FoV). To improve on-set efficiency and optimise imaging dose 'spotlight' CBCT exposures (200 trajectory, 25cm FOV) were investigated. Spotlight was tested on post-treatment imaging to determine if clinically suitable for verification.

Method: Two thorax spotlight modes (A, B) were optimised using a CIRS lung phantom. Exposure parameters were reduced to 100kV and 10mA or 15mA for modes A and B, respectively. 5 patients were selected for clinical testing. 'Thorax' mode was replaced by 'spotlight' A or B, on subsequent fractions. Images were scored offline by 4 RTTs and 1 physicist blinded to which exposures had been used. A 5 point scoring system was utilised, where a score ≤3 was deemed clinically suitable.

Results: Spotlight A and B achieved an average scoring of 2.4 and 2.5 respectively, deeming both suitable for clinical use. With minimal scoring difference, the lower dose Spotlight A was preferred. CBCT delivery time was reduced from 60 to 33 seconds. $CTDI_W$ was optimised from 3.94 to 0.78 mGy, with an associated lifetime cancer risk of 1:8,000 reduced to 1:42,000.

Conclusion: The use of spotlight mode for verification of lung SABR has been demonstrated. Imaging dose has been optimised as low as reasonably practicable whilst fulfilling the clinical requirement for verification. Delivery time has been reduced, improving patient experience and clinic throughput. The new mode will be introduced as the clinical standard.

E3.6 Lungs of stone - a review of pulmonary calcification and other causes of high attenuation lesions in the lungs

Varsha Halai; Lucia Chen; Andreea Leandru; Adam Wallis
Portsmouth Hospitals NHS Trust

Background: Pulmonary calcification is commonly encountered, often being visible even on plain radiographs. CT enables more accurate localisation and characterisation of calcification which has a wide differential diagnosis. The radiologist has to know when calcification is due to a benign cause and when it can signify more important malignant or metabolic disease.
Purpose: This presentation will allow the radiologist to recognise the various causes of calcific and high attenuation lesions in the lungs, differentiate benign from more important malignant and metabolic conditions and potential pitfalls in diagnosis to facilitate accurate ongoing management.
Summary: Using cases from our thoracic centre, various benign causes of calcification including hamartoma, sarcoidosis, amyloidosis and infective granulomatosis, and malignant causes of calcification including calcified metastases, carcinoid and sarcoma metastases will be presented, with pathologic correlation. We will also illustrate metabolic conditions including metastatic calcinosis, and various non calcific causes of high attenuation including vertebroplasty cement emboli, aspiration of contrast, pneumoconiosis, drug toxicity and talcosis. Solitary and multifocal processes will be included. Key features distinguishing the benign from more important malignant and metabolic conditions will be highlighted as well as potential pitfalls and how to avoid them.

E5 History short paper presentations

E5.1 The Marie Curie Hospital, Hampstead, 1929-1967

Francis Duck
University of Bath

The Marie Curie Hospital was a pioneering specialist cancer hospital for women, staffed by women. After WWI, a 400-case investigation of radium treatment of uterine cancer was carried out, co-ordinating the treatments at three London hospitals together the New Sussex Hospital in Brighton. One outcome was the creation of the Marie Curie Hospital at 2 Fitzjohn's Avenue, Hampstead in 1929, allowing all skills and radium sources to be brought together in one place.
The hospital had access to one gramme of radium, worth about £12,000, lent by several public bodies and private individuals. Leading doctors included Helen Chambers, Louise Martindale and Lady Barrett. The hospital emphasised team-work, involving surgeons, physicians, pathologists and, notably, physicists. 300mg of the radium was in a form suitable for the treatment of breast and rectal cancer.
In 1932, high-voltage radiotherapy was installed, extending radiation treatment to include fibroids and menorrhagia. Diagnostic X-rays were added in 1936. Radiation protection and dosimetry remained largely under the lead of Professor Sidney Russ from the Middlesex Hospital, who oversaw the recovery of the radium when the hospital was destroyed by enemy action in 1944. After the war, new premises were established nearby, the hospital eventually moving to become part of Mount Vernon Hospital in 1967. By then over 11,000 cases had been treated, including 3008 for cancer of the cervix and 2,259 for breast cancer. The Marie Curie Hospital is an important landmark in the development of gynaecological cancer treatment in Britain.

E5.2 Some common eponymous signs in gastrointestinal radiology - who were the eponymists?

Arpan K Banerjee
University Hospitals Birmingham NHS Foundation Trust

Background: Eponyms often much maligned still today remain an essential descriptor and part of medical practice worldwide and are often the source of interesting historical vignettes and a homage to the discoveries of the pioneers. In a previous presentation I covered the eponymous signs and eponymists in chest radiology. Continuing on this theme in this presentation I aim to discuss the lives and common eponymous signs and terms and famous eponymists as applicable to gastrointestinal radiology.
Method/results: In this talk some of the eponymous signs in Gastrointestinal Radiology will be described along with brief biographical sketches of the eponymists and and reference to the original descriptions. Some examples include the American radiologist Leo Rigler and his double wall sign on the plain abdominal film, Schatzki and his ring, Barrett and his oesophagus, Boerhaave and his syndrome, Carman and his meniscus sign. Modern and historical examples of the signs will be presented and the original descriptions reviewed along with a brief biographical vignette of the eponymists.
Conclusion: Eponyms are here to stay and a knowledge of the common ones along with the history of the discoveries and reference to the original writings will continue to be a helpful and interesting way of learning about medicine's vast herit.

E5.3 Tuberculosis and radiotherapy: A historical perspective

Adrian Thomas
Canterbury Christ Church University

Tuberculosis has been a major source of morbidity both historically and in the present day. Whilst modern treatments rely on pharmacological interventions, in the past radiation treatments were utilised. Whilst these are largely forgotten, in their day were both popular and efficacious. This paper reviews their use and significance, and places contemporary treatments in a historical context. In 1904 a symposium took place at the 5th Annual Meeting of the American Röntgen Ray Society on the use of the Röntgen rays in the treatment of tuberculosis (TB) at various sites[1]. Comparisons were made between the radiological and surgical treatments and all areas of the body were covered.

Robert Koch had recently discovered the pathogen that causes TB in 1882, and in the year following the meeting the BCG vaccine was developed. In the early 20th century knowledge of TB increased with the development of new treatments. Of particular interest at those involving various radiations including heliotherapy, the Finsen light, and X-rays. That TB responds to radiation is interesting. The impact of an infection on the body are complex, and depends on factors such as poverty, nutrition, mental and spiritual state and immunity. The response of the body is central, and radiation will modify the immunologic and cellular response to a foreign noxious influence.

This will be discussed and mechanisms proposed. Modern clinical practice relies on pharmaceutical interventions, however the traditional therapies should be remembered, and may once again become useful.

1. Transactions of the American Röntgen Ray Society, Fifth Annual Meeting, St Louis, Mo., September 9-13, 1904. (1905) Philadelphia: A H Sickler Company

E5.4 Godfrey Hounsfield - The centenary of his birth

Elizabeth Beckmann
Lanmark

Godfrey Newbold Hounsfield was born on the 28th August 1919 in Sutton on Trent near Newark. He is well known as the inventor of the CT scanner - an invention which transformed medicine in the 2nd half of the 20th Century. Who was he and what sort of person was he? This paper will explore this question looking at his roots, his interests, his academic successes and failures and the influences which lead him to create the CT scanner.

1. Godfrey N. Hounsfield – Biographical. nobelprize.org
2. Sir Godfrey Hounsfield. Obituary in Daily Telegraph (17 August 2004)
3. Beckmann, Elizabeth C. (2005). "Godfrey Newbold Hounsfield". Physics Today. 58 (3): 84.
4. Beckmann, E. C. (2006). "CT scanning the early days". British Journal of Radiology. 79 (937): 5-8
5. Gunderman, Richard (2006). Essential Radiology. Thieme. p. 10. ISBN 1588900827
6. Kalender, W. (2004). "Worthiness of Sir Godfrey N. Hounsfield". Zeitschrift für Medizinische Physik. 14 (4): 274–275.
7. Oransky, Ivan (2004). "Sir Godfrey N Hounsfield". The Lancet. 364 (9439): 1032
8. Peeters, F.; Verbeeten Jr, B.; Venema, H. W. (1979). "Nobel Prize for medicine and physiology 1979 for A.M. Cormack and G.N. Hounsfield". Nederlands tijdschrift voor geneeskunde. 123 (51): 2192–2193.
9. Raju, T. N. (1999). "The Nobel Chronicles". The Lancet. 354 (9190): 1653–1656.
10. Richmond, C. (2004). "Sir Godfrey Hounsfield". BMJ. 329 (7467): 687–687. Young, Ian (Jan 2009). "Hounsfield, Sir Godfrey Newbold (1919-2004)". Oxford Dictionary of National Biography
11. Waltham, Richard; Stephen Bates; Liz Beckmann; Adrian Thomas (2012). Godfrey Hounsfield: Intuitive Genius of CT. London: The British Institute of Radiology. p. 261. ISBN 978-0-905749-75-4.
12. Wells, P. N. T. (2005). "Sir Godfrey Newbold Hounsfield KT CBE. 28 August 1919 - 12 August 2004: Elected F.R.S. 1975". Biographical Memoirs of Fellows of the Royal Society. 51: 221–235

F6 Radiotherapy: Treatment, planning and verification short paper presentations

F6.1 UK Stereotactic Ablative Body Radiotherapy (SABR) consortium survey 2018: Developments in UK provision and practice over the past 6 years

Gail Distefano [1]; Satya Garikipati [2]; Matthew Hatton [2]; Helen Grimes [3]
[1]Royal Surrey County Hospital; [2]Weston Park Hospital, Sheffield, UK; [3]University College London Hospitals

Background: A survey was designed updating data from the 2012 UK SABR Consortium survey[1]. It aimed to aid standardisation and, by highlighting issues within the NHS, improve access to SABR services and trials across the UK.

Method: An online questionnaire was sent to 65 UK radiotherapy institutions covering current service provision and techniques collecting data on immobilisation, motion management, scanning protocols, target/OAR delineation, planning, image-guidance, QA and future plans.

Results: 50 centres responded, key developments since 2012:

a) Provision - number of centres having an active SABR program increased (15 to 38); 30 centres deliver SABR to non-lung sites, 27 centres offering the range of sites required for treating oligometastatic disease. A lack of NHS contracts is a barrier, with geographical inequity noted.

b) Practice - the development of Linac delivered SABR to non-lung sites; increasing use of abdominal compression (15 vs 2 centres); 90% use VMAT delivery; increase in planning time (table 1) reflecting increased complexity of cases; introduction of flattening-filter free beams and 4DCBCT; a wide range of approaches exists in accounting for tumour motion, target ITV delineation and treatment image verification; > 90% still perform patient specific QA.

Conclusion: This survey documents increasing SABR provision in the UK, but the program needs to continue to expand to ensure that patients with early stage lung cancer and oligometastatic disease have access. Implementation of novel technology is noted, however, guidance to address variability in target delineation, image guidance and possible reduction in patient specific QA is warranted.

1. Distefano G, Baker A, Scott AJ, Webster GJ; (2014) UK SABR Consortium Quality Assurance Group. Survey of stereotactic ablative body radiotherapy in the UK by the QA group on behalf of the UK SABR Consortium. Br J Radiol. 87:1037

F6.2 Treatment planning study of single vs multi isocentre stereotactic radiosurgery for treatment of brain metastases

Yogesh Jagannath Hatage [1]; Colin Jennings [2]
[1]Royal Preston Hospital; [2]Rosemere Cancer Centre

Background: It is time consuming to plan and treat multi-lesion Stereotactic Radiosurgery (SRS) plans with multiple treatment isocentre's. The planning and delivery time can be significantly reduced if the treatment is planned using single Isocentre and verified through the use of a Hexapod 6 degrees of freedom couch. The aim of this work is to compare both treatment methods dosimetrically and assess the efficiency of the treatment delivery.

Methods: This study included 6 patients, each with 2 to 4 SRS lesions. Static beam plans were generated using Pinnacle planning system. For multiple isocentre, each isocentre was placed at the centre of Planning Target Volume (PTV) and for single isocentre it was placed at centre of combined PTVs. Paddick conformity index (PCI), gradient index (GI), tumour coverage, normal brain receiving 12Gy (V12), delivery time and number of Cone Beam Computed Tomography (CBCT) required were evaluated.

Results: Dosimetric improvement was achieved for single isocentre treatments with percentage variation for PCI of 0.1%+4.7%, GI 3.8%+9.6%, tumour coverage of -0.5%+0.9% and V12 of 6%+13.6%. A simulation of the treatments showed a treatment time reduction of up to 44.6%+8.4% for the single isocentre technique, considering only one CBCT/lesion.

Conclusions: The main advantages for single isocentre are time saving and reduction in CBCT imaging exposure without compromising plan quality. As approximately 50% of patients require a post move scan, a single isocentre technique has a significant patient benefit.

1. Justin Roper (2015) Single-Isocenter Multiple-Target SRS: Risk of Compromised Coverage. Int J Radiat Oncol Biol Phys. 2015 November 1; 93(3): 540–546. doi:10.1016/j.ijrobp.2015.07.2262.
2. SAMEER K. NATH (2010) SINGLE-ISOCENTER FRAMELESS INTENSITY-MODULATED STEREOTACTIC RADIOSURGERY FOR SIMULTANEOUS TREATMENT OF MULTIPLE BRAIN METASTASES: CLINICAL EXPERIENCE. Int. J. Radiation Oncology Biol. Phys., Vol. 78, No. 1, pp. 91–97, 2010

F6.3 HDR brachytherapy skin applicator fabrication for clinical cases: Hand-formed vs digitally designed and 3D printed

Shauna Nic A Bhaird; Rhydian Caines; Lee Chris
Clatterbridge Cancer Centre

Background: Previous studies have demonstrated feasibility of 3D-printed brachytherapy skin applicators[1-3], but none have systematically compared this process to traditional hand-formed methods. This study compared five clinical hand-formed applicators, used previously for treatment, to digitally designed 3D-printed applicators retrospectively created for the same cases.

Methods: The hand-formed applicators compromised a thermoplastic shell, wax stand-off and catheters for source transfer, constructed to meet skin-catheter and catheter-catheter distance specifications. A process was developed to design applicators digitally in a TPS contouring module (Eclipse v13.6, Varian Medical Systems, CA). Applicators were printed using the Axiom20 3D-printer (Airwolf3D,CA). Applicators were CT-scanned and >3,800 geometric measurements made in the TPS. Skin-catheter and catheter-catheter distances were inspected and the proportion of measurements within 1 mm tolerance determined. Treatment planning and delivery was performed for all applicators according to local protocol. TLDs were used to verify dosimetry.

Results:

Skin-catheter distances: The proportion of geometrical measurements within 1mm of specification was 0.56 [95%CI: 0.53-0.59] for hand-formed applicators and 0.69 [95% CI: 0.67--0.72] for 3D-printed ($p<0.01$, Fig.1)

Catheter-catheter distances: The proportion of geometrical measurements within 1mm of specification was 0.58 [95%CI: 0.55-0.61] for hand-formed applicators and 0.82 [95% CI: 0.80--0.85] for the 3D-printed ($p<0.01$, Fig.2)

Dosimetry: TLD measurements for all applicators agreed within ±5% of expected doses.

Conclusion: The 3D-printed applicators were more geometrically accurate compared to hand-formed. All applicators gave satisfactory dosimetric performance. 3D-printing is faster and less labour intensive. The applicators are durable, lightweight, low cost, visually appealing and re-printable.

1. Ricotti, R. et al. (2016). 3D-printed applicators for high dose rate brachytherapy: Dosimetric assessment at different infill percentage. Physica Medica, 32(12), pp. 1698-1706
2. Jones, E.L. et al. (2017). Introduction of novel 3D-printed superficial applicators for high-dose-rate skin brachytherapy. Brachytherapy, 16(2), pp. 409-414
3. Zhao, Y. et al. (2017). Clinical applications of 3-dimensional printing in radiation therapy. In Medical Dosimetry, 42(2), pp. 150-155

F6.4 Complexity metrics to predict DQA performance for challenging RayStation VMAT plans

Alex Taylor; Anna Trezza; Jonathan Sutton; Jonathan Littler; Elizabeth Harron
Nottingham University Hospitals Trust

Background: Delivery quality assurance (DQA) is a routine part of treatment plan checking to assess a plan's deliverability, but is time consuming and labour intensive. Departments often perform DQA for all Volumetric Modulated Arc Therapy (VMAT) plans even though only certain complex plans are undeliverable. Metrics have been previously developed to measure plan complexity; these are average leaf travel (LT), modulation complexity score (MCS) and LTMCS which is a combination of both LT and MCS. This work assesses whether complexity metrics can predict which VMAT plans will pass DQA.
Method: 24 VMAT beam arcs were used for analysis, based on 12 complex dual-arc plans (6 bilateral head and neck (H+N), 6 prostate and nodes planned in RayStation V6). The complexity metrics LT, MCS and LTMCS were determined for each arc using an in-house python script, and a gamma analysis pass rate was determined from DQA measurements using a Delta4 phantom.
Results: Early results demonstrate that the MCS is the most useful metric for predicting DQA pass rates for these VMAT plans. An MCS score > 0.21 gave 90 % sensitivity and 100 % specificity for identifying H+N plans which would pass a stringent 95 % gamma pass rate in DQA (local 2%/2 mm criteria). The results exhibited site-specific dependencies on the minimum MCS score, with a difference noticeable between prostate and H+N groups.
Conclusions: Applying complexity metrics to assess challenging VMAT plans in RayStation showed good accuracy in predicting which plans would likely pass DQA, potentially reducing practical measurement time.

1. Masi, L., Doro, R., Favuzza, V., Cipressi, S. and Livi, L., 2013. Impact of plan parameters on the dosimetric accuracy of volumetric modulated arc therapy. Medical physics, 40(7), p.071718

F6.5 Implementation of PerFRACTION™ to reduce phantom based patient specific quality assurance (PSQA)

Yun Miao; Vasu Ganesan; Dom Withers; Ghirmay Kidane; Liz Crees; Ahmed Ifthaker
Barking, Havering and Redbridge University Hospitals NHS Trust

Background: ArcCHECK®(Sun Nuclear, Melbourne) phantom has been used to verify the treatment delivery accuracy for individually-generated VMAT and IMRT patient treatment plans in our clinic. Recently, our clinic has implemented the PerFRACTION™(Sun Nuclear, Melbourne) software module as a PSQA tool to replace phantom-based PSQA which is time-consuming for physics staff. A local benchmark pass rate has been determined for the PerFRACTION™ software to ensure the accuracy of delivery for VMAT and IMRT plans.
Method: Thirty-one 6MV VMAT and IMRT plans, including H&N, brain, prostate, breast and lung, were retrospectively analysed. The plans were generated in Eclipse (v15.6) using AAA algorithm and delivered using a Varian Edge linear accelerator equipped with HDMLC and aSi 1200 portal imager. The gamma results obtained from PerFRACTION™ were compared with the ArcCHECK® results. A Bland-Altman test was performed to analyse the agreement between the two methods, and a local tolerance was determined for PerFRACTION™.
Results: All plans passed a tolerance of 97% when the gamma criteria of 2%/2mm was applied in PerFRACTION™. The Bland-Altman test between PerFRACTION™ and ArcCHECK® showed a bias of -0.5 with 2%/2mm criteria.
Conclusion: The PerFRACTION™ method for pre-treatment of PSQA is efficient and capable of producing results similar to the results obtained using ArcCHECK®. A tolerance of γ(2%/2mm)≥97% and is defined for the PSQA passing rate. Work is in progress to implement the PerFRACTION™ software for 10MV plans.

1. Bresciania, S et al (2018) Comparison of two different EPID-based solutions performing pretreatment quality assurance: 2D portal dosimetry versus 3D forward projection method. Physica Medica. **52** 65-71

F6.6 Using EPID results to compare the accuracy of set up between traditional tattoo set up and Surface Guided Radiotherapy (SGRT) set up - a move to markerless radiotherapy

Ben Allen; Mark Ramtohul
Queen Elizabeth Hospital

Background: Tattoos are not always ideal as they aren't where we want to treat and skin is mobile (Stanley et al 2017). A comparison of the accuracy between a tattoo set up and an SGRT set up using AlignRT for breast patients was conducted.
Method: The EPID results of the following patient set ups were assessed to compare accuracy of each set up: 96 breast patients with tattoos and in Free Breath (FB). 95 SGRT DIBH patients. 26 SGRT FB breast patients. Corrective shifts are applied to any treatment with ≥0.5cm deviation from planned position.
Results: Corrective shifts were needed in: 28% of patients with tattoo set up, 4.2% of patients with SGRT DIBH set up. 7.7% of patients with SGRT FB set up. Comparing the first fraction shifts for each cohort suggests there is higher accuracy of setups in all directions when comparing the standard deviations of DIBH (Sup-Inf: 1.8mm, Left-Right: 1.7mm, Ant-Post: 1.8mm) to free breath (Sup-Inf: 3.1mm, Left-Right: 3.4mm, Ant-Post: 2.4mm). Testing the distributions using the Kolmogorov-Smirnov test confirms ($P<0.001$) that this is true for the Ant-Post direction and magnitude of the shift. Initial data for the SGRT FB patients suggest that the accuracy is better than the use of tattoos (Sup-Inf: 2.4mm, Left-Right: 2.6mm, Ant-Post: 1.6mm).
Conclusion: The results suggest SGRT produces a more accurate set up over a tattoo set up and will be adopted as the new standard for breast radiotherapy set up.

Stanley, D. McConnell, K. Kirby, N. Gutierrez, A. Papanikolaou, N. Rasmussen, K (2017). Comparison of initial patient setup accuracy between surface imaging and three point localization: A retrospective analysis. Journal of Applied Clinical Medical Physics. 18 (6). Pg58-61. Available from: doi.org/10.1002/acm2.12183

H7 Head and neck short paper presentations

H7.1 Imaging on time, when 'time is brain': A case study and image series outlining rapid and safe mechanical thrombectomy in hyperacute stroke

Ganeshan Ramsamy; Kurdow Nader; Don Sims
University Hospitals Birmingham NHS Trust

Background: The goal of hyperacute ischaemic stroke management is rapid arterial recanalisation as safely as possible. Mechanical thrombectomy has revolutionised stroke management across the UK. It has been shown to be a highly successful and cost-effective procedure for large artery occlusive stroke[1]. For neuro-radiologists and stroke physicians to achieve prompt revascularisation during thrombectomy, immediate imaging is recommended, either via CT angiography or MR imaging/angiography[2].

Aims:

- To illustrate and explain key radiological findings for an acute stroke patient who underwent thrombectomy and made a full neurological recovery.
- To increase knowledge and awareness about the benefits possible with early intervention and appropriate imaging from the time of onset of stroke.
- To outline the considerable impact interventional neuro-radiology services can have on patient outcomes and the overall cost of stroke management.

Content: This paper will present the case of a 51-year-old male with sudden onset right-sided hemiparesis, facial droop and dysarthria. An intraluminal thrombus in M2 segment of the left middle cerebral artery was noted on CT. The timing from onset of symptoms to arterial puncture was less than 90 minutes - considerably quicker than median times reported in recent positive trials[3]. A detailed, chronological image series of plain CT, CT angiography and thrombectomy will be presented and salient features explained in order to understand the excellent outcome achieved. The benefits of imaging and thrombectomy services available in this case will be discussed. Recommendations and future radiological considerations will be made for physicians and radiologists involved in managing acute stroke.

1. Evans MRB, White P, Cowley P, et al. (2017) Revolution in acute ischaemic stroke care: a practical guide to mechanical thrombectomy Pract Neurol. 17:252-265
2. White PM , Bhalla A , Dinsmore J , et al. (2015) Standards for providing safe acute ischaemic stroke thrombectomy services. Clin Radiol. The Royal College of Radiologists. 72, e1-175 - e9
3. Saver JL , Goyal M , van der Lugt A , et al. (2016) Time to treatment with endovascular thrombectomy and outcomes from ischemic stroke: a meta- analysis. JAMA. 316, 1279-88

H7.2 Trigeminal neuralgia: The patient experience of magnetic resonance imaging (MRI) of the brain

Sophie Gallagher; Julie de Witt
University of Derby

Background: Novel study to explore the experience of group of patients with Trigeminal Neuralgia (TN) and their experience of having an MRI brain scan. This gives a new perspective when considering patient centred services, not only to patients with this rare condition, but perhaps when scanning anyone with a pain condition, or indeed for MRI brain scanning in general.
Method: Qualitative method utilised an online survey (Limesurvey) with free text responses and some limited demographic data. Ethical approval was obtained. Survey was advertised on closed social media group and on National charity website (Trigeminal Neuralgia Association UK). 96 responses were received, with 50 free text responses to the open questions. These were analysed using thematic analysis (2 researchers, 2 Assistants involved for quality checking).
Results: Five themes emerged, with a number of sub-themes within each. These are that there are some good stories, there are some not so good experiences, that care and communication makes a difference that TN pain is more than just a headache and finally involving patients in their scan is important. In describing the experience of having an MRI brain scan it was striking that narratives key impact in terms of experience seemed to be the perceived care and 'kindness' of the staff.
Conclusions: It is important to work with a patient and their pain triggers. This is beneficial as this is likely to result in a timely scan with minimal blur artefacts if the patient's pain is minimised. And that care and compassion matters.

H7.3 Assessing dynamic change in salivary gland function using MRI during chemoradiation for head and neck cancer (HNC)

David Noble [1]; Fulvio Zaccagna [2]; Amy Bates [3]; Tilak Das [4]; Vicky Lupson [5]; Karen Welsh [5]; Gill Barnet [6]; Rashmi Jadon [6]; Richard Benson [6]; Neil Burnet [7]; Raj Jena [1]; Ferdia Gallagher [2]
[1]Cambridge University, Department of Oncology; [2]Cambridge University, Department of Radiology; [3]Cambridge Clinical Trials Unit, Cambridge University Hospitals NHS Foundation Trust; [4]Department of Radiology, Addenbrooke's Hospital, Cambridge University Hospitals NHS Foundation Trust.; [5]Wolfson Brain Imaging Centre, Cambridge Biomedical Campus.; [6]Oncology Centre, Addenbrooke's Hospital, Cambridge University Hospitals NHS Foundation Trust.; [7]University of Manchester, Manchester Academic Health Science Centre and The Christie NHS Foundation Trust

Introduction: Parotid gland (PG) and submandibular gland (SMG) volumes decrease following radiotherapy for HNC, whilst apparent diffusion coefficient (ADC) on diffusion weighted imaging (DWI) increases. This study evaluated the relationship between toxicity and MRI changes during treatment to determine the role of imaging in guiding adaptive radiotherapy.

Methods: Seven patients (6 men, 1 woman, 55.1±1.2 years) recruited to the CRUK VoxTox-MinotOAR study were assessed. All received 65Gy/30 fractions (IG-IMRT) with weekly cisplatin for oro/hypopharyngeal SCC. Images (3T Siemens Skyra-fit) were acquired immediately prior to fractions 1, 6, 16 and 26. Volume changes were defined on T2; ADC on DWI (b-values: 0,700). Acute and late CTCAEv4.03 xerostomia and salivary duct inflammation (SDI) were recorded.

Results: Mean baseline volumes and ADC values were 27.1±2.2cm^3 (PG), 9.1±0.5cm^3 (SMG) and 1.72±0.05x10^{-3}mm^2/s (PG), 1.81±0.05x10^{-3}mm^2/s (SMG) respectively. Proportional volume reductions at fractions 6, 16 and 26 were: PG 9.3±1.9%, 23.0±3.0%, 26.2±2.8% and SMG 11.2±1.7%, 25.5±2.5%, 30.9±2.1% respectively (Figure 1A-B). Proportional ADC increases were: PG 5.5±5.1%, 13.8±4.9%, 23.1±4.5% and SMG 0.6±4.9%, 7.2±4.7%, 17.5±4.2% (Figure 1C-D). Falling SMG ADC at fraction 6 was correlated with worse acute SDI (R^2=0.60, p=0.002, Figure 2). Patients with Grade 2+ SDI at 6 months had a fall in ADC compared to those with Grades 0-1 (-4.0% vs. +5.9%, p=0.03).

Figure 1: Change in salivary gland volume and ADC during treatment.

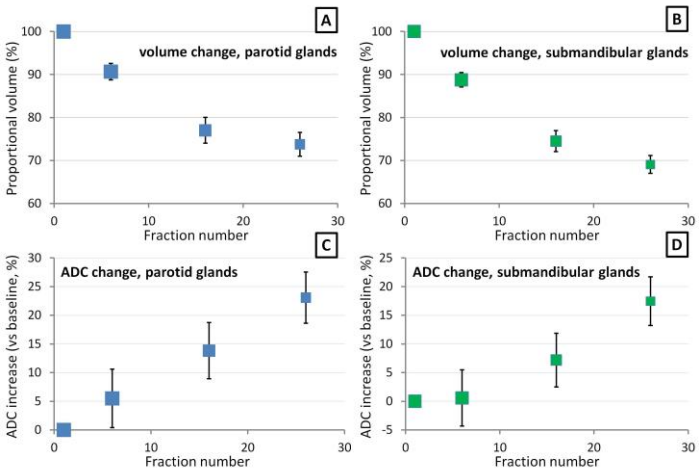
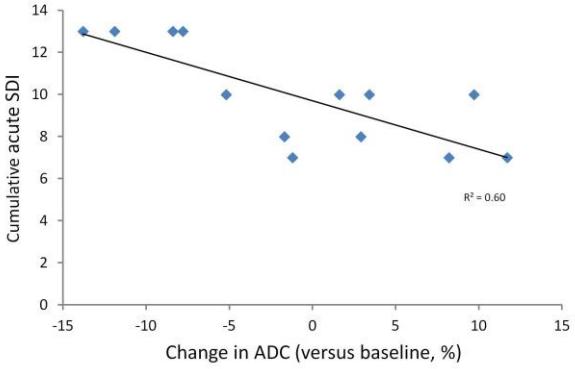


Figure 2: Cumulative acute toxicity (salivary duct inflammation) versus proportional change in ADC by fraction 6



Conclusions: Salivary glands decrease in volume early in treatment, whilst increases in ADC changes occur later. Falling SMG ADC on DWI by fraction 6 predicts more severe acute and late SDI and could be used as an imaging biomarker to guide adaptive radiotherapy.

H7.4 Head and neck cancer using MRI in radiotherapy planning: A pictorial review

John Paul Sahibbil
GenesisCare UK

Background: MRI has become an integral part in head and neck radiotherapy planning workflow. The decision to this recent development is based on superior soft tissue-contrast compared to CT scan. MRI has a number of advantages over CT scan as it has shown to improve the delineation accuracy in intracranial lesions, and perineural spreads, nasopharyngeal lesions, pterygopalatine fossa infiltrations, tumours in the liver, and better visualisation of cancerous regions within the prostate gland. Over the past years, MRI has been used to outline the tumour volume and organs at risks and has provided support to various processes involved in radiotherapy treatment planning and delivery.

Purpose of the poster: To present routine imaging protocols used in head and neck radiotherapy planning. It illustrates the imaging set-up using a flat tabletop overlay, the use of a thermoplastic mask with the phased-array coil. This review identifies technical challenges in image resolution and scans time. This presentation would be helpful to imaging professionals involved in radiotherapy planning. The aim of the review is to educate the reader on various MRI appearances and ways to improve patient throughput.

Summary: Important parameters related to anatomical information are outlined including imaging set-up and imaging pitfall like geometric distortion. Over the past months, it has improved and implemented MR-based planning successfully into clinical practice with in-house educational training being implemented for all radiographers and physicists connected to MRI. In line with this, we can suggest an optimal imaging protocol based on the most used MR sequences.

1. Bahig, H., Boudam, K., Landry, D., Filion, E., Ballivy, O., Roberge, D., Côté, J.C. and Nguyen-Tan, P.F., MRI in Head and Neck Radiotherapy Planning
2. Balter, J., Yue, C. and Wang, H., 2013. Optimizing MRI for radiation oncology: initial investigations. MAGNETOM Flash, 45
3.Schmidt, M.A. and Payne, G.S., 2015. Radiotherapy planning using MRI. Physics in Medicine & Biology, 60(22), p.R323

H7.5 No radiologist required - a sustainable approach to implementing a one stop neck lump clinic

Nicola Davidson
Worcestershire Acute NHS Trust

Improving outcomes for patients diagnosed with cancer is high on the NHS agenda. When NICE recommended that ultrasound guided biopsies be used in the assessment of patients presenting with a neck lump in 2016, demand soon exceeded the capacity. With a national shortage of Radiologists and the increasing demand for their time to be spent reporting and performing more complex procedures, it was decided to extend the role of a sonographer to support this service.
After a period of training and consolidation, dedicated sonographer led sessions for Fine Needle Aspiration (FNA) were introduced. Whilst radiology was able to improve its own 2 week wait performance, the Trust was still not meeting 62 day targets of referral to treatment in patients diagnosed with head and neck cancers.
The process of referral to initial diagnosis often required the patient to make multiple attendances. Inadequate FNA samples could add weeks to an already slow process and a more streamlined approach was required. To improve the pathway the multidisciplinary team decided to trial a 'one stop neck lump clinic'. Our service was established to be led by a sonographer and biomedical scientist. This combined approach has almost eliminated inadequate samples thus improving patient experience and reducing the time between referral to diagnosis.
By sharing our experiences, patient feedback, and by presenting the outcomes of the clinic, we hope to encourage others that this is a sustainable model which has seen an improved service for patients and positive role development for staff.

1.Ganguly, A, Giles, TE et al. (2010).The benefits of an on-site cytology with ultrasound guided fine needle aspiration in a one-stop neck lump clinic. Ann R Coll Surg Engl. 92(8):660-884
2. NICE. (2016) Cancer of the Upper aerodigestive tract: assessment and management in people over the age of 16. NICE guideline (NG36)

H7.6 PET-CT surveillance post (chemo)-radiotherapy (CRT) in advanced head and neck squamous cell cancer - beyond the PET-Neck protocol

Claire Paterson [1]; Suyun Zhou [1]; Robert Rulach [1]; Fraser Hendry [2]; Allan James [1]; David Stobo [2]; Mary Frances Dempsey [2]; Derek Grose [1]; Stefano Schipani [1]; Carolynn Lamb [1]; Mohammed Rizwanullah [1]; Christina Wilson [1]
[1]Beatson West of Scotland Cancer Centre; [2]West of Scotland PET CT Centre

Background: The PET-NECK study demonstrated PET-CT scan 12 weeks post-radiotherapy for HNSCC was non-inferior to planned neck dissection (ND). High negative predictive value means patients who are disease-free are reliably identified and spared ND. Poor positive predictive value means optimal management for equivocal responders (EQR) remains unclear. The aim of this analysis was to evaluate outcomes using PET-CT surveillance with particular focus on those achieving an EQR nodal response.
Methods: All patients with node positive HNSCC treated with CRT between January 2013 and September 2016 were identified. PET-CT responses were classified as complete (CR), incomplete (ICR) or EQR. Patient demographics and outcomes were obtained from electronic records.
Results: 187 patients were identified. 82.3% had oropharyngeal cancer, 80.5% of those were HPV-positive. 80.7% had N2 disease. Median follow-up was 30 months. Median time from end of radiotherapy to PET-CT scan was 90 days. 59.4% had CR, 23.0% EQR and 17.6% ICR nodal response. Only 10 NDs (23.2%) were carried out for the EQR group with 50% pathological involvement. 2-year recurrence rate was 12.8%, 11.8% and 37.5% for CR, EQR and ICR groups respectively. 2-year survival was 91.9%, 87.5% and 50.0% respectively. No statistically significant differences in recurrence and survival rates were found between CR and EQR at 1-year and 2-years.
Conclusion: This study showed that patients with equivocal response on 12 week PET-CT have similar clinical outcomes compared to the complete response group, despite the omission of ND. This confirms the safety of an active surveillance strategy rather than immediate ND.

I7 Humanise and personalise short paper presentations

I7.1 The construction of care in CT

Rachael Forton [1]; Maryann Hardy [2]; Anita Sargeant [2]
[1]Norfolk & Norwich University Hospital NHSFT; [2]University of Bradford

Background: Patient centred care and the 'patient voice' are core components of UK healthcare policy and practice guidance. This study explored how care is perceived and experienced within the high technology environment of CT.
Methods: A Grounded Theory (GT) methodology using semi structured interviews was used to obtain primary data from CT radiographers and patients. Recruitment and data collection were performed at a 1200 bed teaching hospital over a 6-month period.
Results: The patient radiographer relationship and the radiographer's role in providing care within CT are complex and multifaceted. Both patients and radiographer's perceive CT imaging to be an integral part of the overall patient care and treatment pathway. As such, the act of being imaged is perceived as a care process and while image acquisition is recognised as a task orientated and technical process, the human element of providing care is cognitive, dynamic and responsive to individual need. Importantly, patient confidence in the care received was influenced by the radiographer's ability to build a trusting relationship and display technical competence and this in turn facilitated active compliance resulting in a technically accurate

examination. Despite previous literature suggesting that the technical environment created a barrier to patient care, patients within this study confirmed that radiographers provide care commensurate to the nursing ideals represented by the 6C's (Care; Compassion; Competence; Communication; Courage; Commitment).
Conclusion: A new model of care encompassing both technical components and patient-centeredness has been constructed based on care perceptions within high technology imaging environments.

I7.2 Exploring the humanistic work of clinical imaging: Emotional labour and gifts of caring

Tracy O'Regan [1]; Leslie Robinson [2]; Ann Newton-Hughes [2]; Ruth Strudwick [3]
[1]The Society and College of Radiographers; [2]University of Salford; [3]University of Suffolk

Background: Discussion of emotional labour is becoming part of healthcare service discourse[1]. Patient and carer distress, suffering, anxiety and anger are all common sources of emotional labour for healthcare professionals[2]. People using imaging services are often in a vulnerable state[3]. However, recognition of how the design of imaging services contributes to vulnerability of patients and the labour of staff is lacking. Paradoxically, there is also a lack of recognition of the satisfaction that can be derived from the silent care provided in clinical imaging[3].
Method: A methodology of visual ethnography included radiographer, assistant practitioner and student collage production. Collage encouraged the use of metaphor to communicate knowledge and experience[4] while facilitating processes of emotion[5]. Axial coding was used to develop overarching themes that made sense of findings.
Results: Sections of collage images and conversational quotes will illustrate the results. The emphasis for this presentation will be emotional labour in relation to and representing the humanistic work of imaging. The concepts of emotional labour, exhaustion and gifts of caring[6; 7] will be introduced.
Conclusion: Much emotional labour literature focuses on burnout and stressors among healthcare professionals. The relational work of emotional labour has traditionally been undervalued[1]. Autonomous use of emotions, when individuals offer emotional gifts and derive satisfaction from caring, represent a humanistic element of imaging work that can benefit the experiences of patients and staff.

1. ELLIOTT, C. (2017) Emotional labour: learning from the past, understanding the present. British Journal of Nursing, 26, 1070-1077
2. RILEY, R. & WEISS, M. (2016) A qualitative thematic review: emotional labour in healthcare settings. Journal of Advanced Nursing, 72, 6-17
3. MUNN, Z. & JORDAN, Z. (2011) The patient experience of high technology medical imaging: A systematic review of the qualitative evidence. Radiography, 17, 323-331
4. PINK, S. (2004) Applied visual anthropology social intervention, visual methodologies and anthropology theory. Visual Anthropology Review, 20, 3-16
5. DIGGS, L., LUBAS, M. & DE LEO, G. (2015) Use of technology and software applications for therapeutic collage making. International Journal of Art Therapy, 20, 2-13
6. HOCHSCHILD, A. (1979) Emotion work, feeling rules, and social structure. The American Journal of Sociology 85, 551-575. 191 7. HOCHSCHILD, A. (1983) The Managed Heart: Commercialization of Human Feeling, London: University of California Press Ltd

I7.3 Examining the relationship between emotional intelligence and leadership attributes of Australian Chief Radiographers

Sarah Lewis [1]; Dania Abu Awwad [1]; Stuart MacKay [2]; John Robinson [1]
[1]The University of Sydney; [2]The University of Liverpool

Introduction: Emotional intelligence (EI) is a person's ability to control their emotions and be empathetic, and influences how a person interacts with others. EI has been linked to strong job performance parameters such as leadership and is an important attribute for health leaders including chief/superintendent radiographers[1]. This study explores the relationship between EI scores and leadership attributes of chief radiographers in Australia.
Methods: A cross-sectional survey design was used. A convenience sample of potential participants (n=70) were contacted and given unique codes to access the National Health Service Leadership Self-Assessment Tool (LSAT)[2] and the Trait EI Questionnaire Short-Form (TEIQue-SF). The TEIQue-SF yields a global EI score and four factor scores for Sociability, Emotionality, Well-Being, and Self-Control[3]. A total of 18 chief radiographers from a variety of Australian medical imaging departments participated in both questionnaires. Spearman's rank-order correlation and Kruskal-Wallis H-test were used for analysis.
Results: Chief radiographers from larger hospitals (>500 beds, n=6) had lower Sociability EI scores than those in hospitals with <200 and 200-500 beds (p=0.057, n=12). Chief radiographers with less than 10 years' experience in their role (n=6) had higher scores for the LSAT 'Developing Capability' dimensions than those with 10-20 years and >20 years of experience (p=0.043, n=10). Increasing years of experience was associated with a reduction across the LSAT and EI factors, particularly 'Sharing the Vision' (rho=--0.507, p=0.032) and 'Developing Capability' (rho=--0.583, p=0.011).
Conclusions: The study demonstrates negative relationships between years of experience, increased department size, EI and leadership of chief radiographers in Australia. The findings could be used as a starting point to plan strategies to support senior leaders of the profession to aid leadership, workforce retention and job performance across the working lifespan of radiographers.

1. Mackay SJ, Pearson J, Hogg P, Fawcett T, Mercer C. Does high EI make for good leaders? Synergy 2010; May, 22–4
2. NHS Leadership Academy. Healthcare leadership model the nine dimensions of leadership behaviour [Internet]. Leeds: NHS Leadership Academy, 2013 [cited 2018 Jul 1]
3. Petrides KV. Technical Manual for the Trait Emotional Intelligence Questionnaires (TEIQue). London Psychometric Laboratory, London, 2009

I7.4 Think calm, stay calm and keep calm: A cognitive behavioural approach to anxiety related reaction in MRI

John Paul Sahibbil
GenesisCare UK

Background: MRI examinations are often associated with anxiety related reaction in many patients. This causes discomfort during the scan causing movements, panic attacks, or non-completion and termination of the scan. Published studies and the development of treatment were previously largely behavioural, and the focus has turned to the role of cognition. The last decade has seen a dramatic increase in the use of cognitive behavioural techniques for an effective form of psychological therapy for emotional disorder.

Method: Healthcare staff were trained using a face-to-face workshop. The degree of understanding and techniques for management of anxiety were assessed using simulation exercises, questionnaires and integrated cognitive stages - think calm, stay calm and keep calm.

Results: Reports shows a significant decrease in patients' refusal and scan termination due to anxiety after the training session. The correlation of reports was assessed for three months that are likely to reflect the technique using the cognitive-behavioural approach.

Conclusion: Our initial report identified a deficit in knowledge and awareness of healthcare staff in managing anxiety related reaction in MRI with significant improvement following a face-to-face workshop. Clearly, in the case of MRI scans, anxiety management should be incorporated in a structured program, rather than using basic strategies, which could increase the patients' level of anxiety and raise their vulnerability to extreme reactions. Although cognitive behavioural techniques show focus in improving anxiety, it is worth remembering that this tactic will not be useful in every situation and should ensure that this is applied appropriately in clinical practice.

1. Fletcher, J. 2014. Anxiety Panicking About Panic. A powerful, self help guide for people suffering from anxiety or panic disorder. London; Createspace Independent Publishing
2. Hudson, D. 2017. 8Cs education. [leaflet] (Experiences of Care Week – Supporting MRI Scanxiety) High Wycombe; InHealth Ltd (unpublished)
3. Munn, Z., Moola, S., Lisy, K., Riitano, D. and Murphy, F., 2015. Claustrophobia in magnetic resonance imaging: A systematic review and meta-analysis : Radiography.[e-]. 21 (2) pp.e59-e63
4. Silove, D. and Manicavasagar, V., 2009. Overcoming Panic and Agoraphobia. A self-help guide using cognitive behavioural techniques. 2nd ed. London:Robinson
5.Thorpe, S., Salkovskis, P.M. and Dittner, A., 2008. Claustrophobia in MRI: the role of cognitions: Magnetic Resonance Imaging.[e-]. 26 (8) pp.1081-1088
6. Thu, H., Stutzman, S.E., Supnet, C. and Olson, D.M., 2015. Factors Associated With Increased Anxiety in the MRI Waiting Room : Journal of Radiology Nursing.[e-]. 34 (3) pp.170-174

I7.5 Clinical and lay attitudes towards sharing images with patients: A quantitative analysis

William Cox [1]; Penelope Cavenagh [2]; Fernando Bello [3]
[1]University of Portsmouth; [2]University of Suffolk; [3]Imperial College London

Introduction: Advancing technologies offer novel opportunities to share diagnostic radiological images with patients[1,2]. This sharing may occur within the clinical environment under the supervision of a clinician, or may involve remote, unsupervised access[2]. However, the benefits and risks of such practices have not been widely explored[3].

Methods: A questionnaire was developed to measure respondent attitudes towards benefits and risks of image sharing utilising Likert scale type responses and a free text option. The questionnaire was distributed to clinical imaging experts and lay persons. Data were analysed using inferential statistics.

Results:

121 clinical and 282 lay responses were received:

- 94% (n=266) of lay participants surveyed wanted to see their imaging
- 79% (n=95) of clinicians thought sharing images with patient was a 'good idea'

Statistically significant findings included:

- Patients mean ranked higher on the scale asking whether sharing images with people was a good idea than clinicians did
- Patients ranked impact on the following factors as higher than clinicians did:
  - Knowledge and understanding
  - Communication
  - Engagement
- Patients ranked lower than clinicians regarding impact on the following:
  - Potential for negative emotional impact
  - Likelihood to confuse
  - Data security
  - Likelihood to affect their expectations.

Conclusion: Respondents confirmed that sharing images with patients may provide benefits, but there are risks inherent to this process. There is a need, therefore, for further work seeking clarification of how identified benefits and risks can be effectively managed.

1. Imperial College Healthcare NHS Trust. How it works.
2. Sectra. Share and collaborate.

3. Cox, WAS, Cavenagh, P. & Bello, F. (2017) The diagnostic radiological image - identifying the benefits from the literature - Poster Presentation. UKRC/O Congress, 12 - 14 June 2017. Manchester Central Convention Complex. IRAS Project ID 187752 NHS REC Ref 17/LO/0864

J6 Late breaking short paper presentations

J6.1 Pelvic radiography; the erect position and its impact on clinical measures

Kevin Flintham [1]; Beverly Snaith [2]; Andrew England [3]; Kholoud Alzyoud [3]; Peter Hogg [3]
[1]The Mid Yorkshire Hospitals NHS Trust; [2]The Mid Yorkshire Hospitals NHS Trust, University of Bradford; [3]University of Salford

Background: There is increasing evidence demonstrating the importance of spinopelvic alignment on image appearances when undertaking pelvic radiography (Fuchs-Winkelman et al, 2008, Jackson et al, 2016). Previous research from the SEPRAIDD project (ISRCTN) has demonstrated that patient's body morphologies change with anteroposterior thickness increasing with patients imaged in the erect position. This study has considered the implications for clinical measures used within pelvis radiography and assessed for any significant changes between supine and erect positions.

Method: Ethical approval was gained for patients referred for pelvic radiographs to undergo measurements of body habitus in both erect and supine positions and to have radiographs obtained in both positions. Clinical measurements were performed on all radiographs, including sacrococcygeal-symphysis distance, Sharp's angle, Tonnis angle, Wiberg's centre-edge angle, acetabular quotient, femoral head extrusion index, Kellgren-Lawrence grading and the presence or absence of crossover sign, posterior wall sign, ischial spine prominence and cam and pincer deformities.

Results: 60 participants were recruited. Variations in abdominal thickness were observed between erect and supine positions with a change in anterior pelvic tilt demonstrated, assessed by sacrococcygeal-symphysis distance measurements. However, there was no correlation between the patient's BMI or the measured sacrococcygeal-symphysis distance and the other clinical measures.

Conclusion: Radiographic technique for the pelvis can be adapted to be performed in the erect position. This may result in a change in pelvic tilt but the assessed clinical measures remain unaffected from this change in technique, giving confidence for the continued use of these measurements if radiographic acquisition techniques change.

Fuchs-Winkelmann, S., Peterlein, C. D., Tibesku, C. O., & Weinstein, S. L. (2008). Comparison of pelvic radiographs in weightbearing and supine positions. Clinical Orthopaedics and Related Research, 466(4), 809–812.
ISRCTN registry. Supine and erect pelvis radiographs: a pilot study.
Jackson, T. J., Estess, A. A., & Adamson, G. J. (2016). Supine and Standing AP Pelvis Radiographs in the Evaluation of Pincer Femoroacetabular Impingement. Clinical Orthopaedics and Related Research, 474(7), 1692–1696. https://doi.org/10.1007/s11999-016-4766-7

J6.2 Experiences of delivering an MR-only prostate radiotherapy pathway: The view from the treatment floor

Rachel Brooks; Hazel McCallum; Jonathan Wyatt; Karen Pilling; John Frew; Rachel Pearson
Newcastle upon Tyne Hospitals

Background: MR-only planning has dosimetric[1] and clinical benefits including smaller GTVs, potentially reducing side effects, greater geometrical accuracy and one less patient visit. At our centre we have delivered an MR-only radiotherapy pathway for 6 patients using MRI for target delineation and generation of synthetic CT to enable dose calculation. As the first department in the UK to use online soft tissue matching to an MRI reference image set, radiographer training and clinical implementation is presented.

Method: A group of 5 senior radiographers with extensive prostate soft tissue matching experience implemented the treatment technique. The staff had MRI outlining training with a Consultant Clinical Oncologist (CCO) to improve their recognition of prostate structures on an MRI scan and then did practice and benchmarking cases.

Results: Clinical implementation on the treatment units was straight-forward. The improved quality of the reference data and the definitive structure sets based on one reference data set contributed to efficient clinical decision making and timely treatment delivery. This enabled MR-only patients to be treated in the same allocated appointment time as standard prostate patients meaning intra-fraction motion and treatment machine capacity are comparable.

Conclusion: Moving from CT-planning to MR-only pathway was a substantial change in practice and training and support from CCOs was critical in ensuring patient safety when the change was first implemented. However, the high image quality of MR enabled radiographers to quickly develop expertise in MR-CBCT matching. In fact, the improved reference data set highlighted the opportunity to improve CBCT image quality.

1. Wyatt, J.J., Dowling, J.A., Kelly, C.G., McKenna, J., Johnstone, E., Speight, R., Henry, A., Greer, P.B. and McCallum, H.M., 2017. Investigating the generalisation of an atlas-based synthetic-CT algorithm to another centre and MR scanner for prostate MR-only radiotherapy. Physics in Medicine & Biology, 62(24), p.N548

J6.3 MR-guided isotoxic dose escalation of muscle-invasive bladder cancer using diffusion-weighted MRI

Jane Rogers [1]; Victoria Sherwood [1]; Sarah Wayte [1]; Jon Duffy [2]; Spyros Manolopoulos [2]
[1]University Hospitals Coventry and Warwickshire NHS Trust; [2]University of Warwick

Background: Outcomes for muscle-invasive bladder cancer (MIBC) have changed little over recent decades, with long term survival remaining around 50 % (CRUK, 2018). Standard treatment involves resection of the tumour followed by uniform radiotherapy to the whole bladder, as residual tumour is not readily visible on computed tomography (CT). This work

investigated the use of diffusion-weighted MRI (DW-MRI) to enable dose-escalation, aiming to quantify local control improvements via MRI-based changes in technique.
Method: Geometrical distortion in DW-MRI was investigated via a bladder-mimicking phantom, to quantify effects on fiducial markers between DW-MRI, T2-weighted MRI, and CT. Open source software was tested for correction of magnetic susceptibility-related distortion in DW-MRI.
Patient CTs were used to mimic registration of DW-MRI to CT via 18 simulated bladder tumours, with planning target volume margins incorporating findings from the phantom investigations. Dose-escalated plans were compared against standard plans, using established organ at risk dose-constraints. Poisson-based TCP models were fitted to MIBC trials data and used to predict TCP.
Results: Fiducial locations on distortion-corrected DW-MRI agreed with CT within a maximum of 1.8 mm (mean 1.3 mm). Maximum dose-escalations to simulated tumours of 70 - 78 Gy were possible corresponding to TCP increases of 9.0 - 19.2 % and were highly dependent on tumour location.
Conclusion: The use of DW-MRI for planning and pre-treatment imaging of MIBC patients could isotoxically increase local control of MIBC. A personalised approach in which prescription is dependent on tumour location is indicated.
1. CRUK, 2018. Bladder cancer survival statistics. [Online] Available at: www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/bladder-cancer/survival#heading-Two

J6.4 Incidentally detected renal cancers - characteristics and route to diagnosis

Tom Welsh; Amoolya Mannava; Alison Bradley; Giles Maskell
Royal Cornwall Hospitals NHS Trust

Background: Renal cancer is increasingly diagnosed as an incidental finding on imaging performed for another purpose.
Method: Imaging and histology records of 308 consecutive patients with a confirmed diagnosis of renal cancer were reviewed.
Results: 114 patients (37%) were symptomatic (pain, mass, haematuria or systemic symptoms) at the time of diagnosis and 194 patients (63 %) had tumours diagnosed incidentally. Of the incidentally detected tumours, 80 (41%) were identified on US, 75 (39%) on CT, 35 (18%) on MRI and 4 (2%) on other modalities. Although the majority were identified on abdominal ultrasound or thoraco-abdominal CT, a significant number of tumours were identified on other tests including spinal, hepatobiliary and cardiac MRI as well as hybrid radionuclide examinations. Incidentally detected cancers were found in younger patients (median age 65 versus 69), and were smaller in size (median 5.5cm versus 7.2cm). There were no significant differences in cell type between symptomatic and incidentally detected cancers. Considering only the cancers of clear cell type, which comprised 80% of all tumours, the incidentally detected lesions were of a lower Fuhrman grade than those found in the symptomatic cohort.
Conclusion: Incidentally detected renal tumours differ in certain characteristics from those identified as a result of symptoms. Reporters of many different types of imaging studies should be alert to the possibility of making an incidental diagnosis of renal cancer.

J6.5 Exploring the potential relationships between microvascular haemodynamics and density in bone: A feasibility study utilising near infrared spectroscopy

Robert Meertens; Karen Knapp; Francesco Casanova; Susan Ball; William David Strain
University of Exeter

Background: Near infrared spectroscopy (NIRS) has shown promise at providing real time measurements of haemodynamics markers in bone tissue *in vivo*. This is an exciting prospect given existing difficulties in measuring haemodynamics in bone tissue, and the potential pathogenic role of microvascular dysfunction on bone health[1]. To date there has been no attempt to associate NIRS derived haemodynamic changes with the primary clinically accepted method of assessing bone health: bone mineral densitometry (BMD) using dual-energy X-ray absorptiometry (DXA).
Method: 36 participants underwent NIRS testing of the proximal tibia using an arterial occlusion protocol of the thigh to observe oxygen extraction rates under ischaemic conditions, and subsequent recovery post occlusion release. Participants also underwent DXA testing for BMD of the total body and at the site of NIRS measurement.
Results: There were statistically significant correlations between oxygen extraction rates during arterial occlusion with NIRS and BMD at the proximal tibia (r=0.45, p=0.01), average leg BMD (r=0.44, p=0.01), and total body BMD (r=0.43, p=0.01). There were statistically significant correlations between NIRS markers of hyperaemic recovery post arterial occlusion and BMD at the proximal tibia (r=0.44, p=0.01), average leg BMD (r=0.53, p=0.001), and total body BMD (r=0.52, p=0.002).
Conclusion: Results suggest weak to moderate positive associations between BMD and haemodynamic changes during ischaemia and recovery at the proximal tibia. Whilst these associations should be interpreted tentatively, this is the first study demonstrating the potential for NIRS to complement DXA in research around the potential pathophysiological role of microvascular dysfunction within bone tissue.
1. Meertens R, Casanova F, Knapp KM, Thorn C, Strain WD. Use of near infrared systems for investigations of haemodynamics in human in vivo bone tissue: A systematic review. Journal of Orthopaedic Research. 2018 Oct;36(10):2595-603

J6.6 Recognising and sharing the benefits of participation in diagnostic imaging research

Martine Harris [1]; Judith Holliday [1]; Beverly Snaith [2]
[1]The Mid Yorkshire Hospitals NHS Trust; [2]The Mid Yorkshire Hospitals NHS Trust & University of Bradford

Background: Health research is undertaken in NHS organisations across the UK with outcomes informing evidence-based practice and advances in patient care. There is a strong drive to grow patient-focussed research activity within diagnostic imaging, particularly research which combines emerging technologies and innovative practice to improve quality and patient experience. Although evidence shows that research activity can influence care processes and impact hosting organisations, such outcomes are often not acknowledged. This work presents the application of an actionable research impact tool[1] to assess the wider benefits of undertaking research within diagnostic imaging.
Method: The VICTOR tool (making Visible the ImpaCT Of Research) was used to evaluate six research impact domains for two radiology initiated research studies exploring point-of-care creatinine testing. This included service and workforce, health benefits, research capacity, economic impacts, knowledge, networks and influence. The focus was to capture stakeholder perceptions of where research impact mattered most to the organisation.
Results: A range of impacts were highlighted across all domains. Additional to recognisable advantages of research participation such as knowledge generation, the tool captured broader gains of research engagement. Although not exhaustive, this comprised patient safety benefits, increased knowledge of participants, enhanced change management, strengthened multi-disciplinary team relationships and collaboration with external partners.
Conclusion: Utilising the VICTOR tool, this case study has demonstrated the difference that research made in developing the clinical and research skills of staff, implementing sustainable workforce and service changes and partnership working with patients. Findings will inform future research delivery to maximise impacts to those involved.

1. The National Institute for Health Research Collaboration for Leadership in Applied Health Research and Care Yorkshire and Humber (2019) VICTOR: Visible impact of research

L6 Best practice short paper presentations

L6.1 Parathyroid isotope imaging: Best practice?

Peter Strouhal; Shahad Yahya; Peter Turner
Royal Wolverhampton NHS Trust

Background: Parathyroid imaging is challenging with isotopes as the glands are imaged only indirectly and there is no agreement on what is the overall best method: SPECT (or SPECT.CT), washout imaging, or dual-isotope subtraction imaging? Or a combination? Most institutions (from previous publications and surveys) use a compromised protocol due to time constraints what with no generic BNMS guidelines for the same. And what if the isotope study is discordant with concurrent ultrasound scan? Which modality to then rely on as correct? Should all these patients have 4D-CT post contrast study? And when to operate, based on which imaging?
Purpose: We summarise our experience over last 8 years in a tertiary/quaternary referral centre where combined medical/surgical clinics are run, with difficult cases further reviewed at MDT; we showcase how isotope imaging should include all of dual isotope thyroid-parathyroid imaging, washout and SPECT.CT imaging; we include tips and tricks to optimise these protocols from patient perspective and how to carefully correlate with ultrasound in an algorithm, so <3% need to go to CT (scanners that are usually already running to capacity in most hospitals) without compromising the surgical outcome. All cases included have pathology correlation or long-term follow-up.
Summary: We propose (wil display) the 'optimum' parathyroid imaging algorithm, including patient prep and optimising scans to increase signal to noise and reduce artefacts; correlated to outcomes, we also propose (and will show) a patient pathway based on the imaging.

1. Shafiei B et al. Preoperative ^{99}mTc-sestamibi scintigraphy in patients with primary hyperparathyroidism and concomitant nodular goiter: comparison of SPECT-CT, SPECT, and planar imaging. Nucl Med Commun. 2012 Oct;33(10):1070-6
2. Warren Frunzac R, Richards M. Computed Tomography and Magnetic Resonance Imaging of the Thyroid and Parathyroid Glands. Front Horm Res. 2016;45:16-23. doi: 10.1159/000442274. Epub 2016 Mar 15
3. Usmani S et al. Ectopic Intrathymic Parathyroid adenoma demonstrated on Tc-99m Sestamibi SPECT-CT. Gulf J Oncolog. 2016 May;1(21):61-3.
4. Vu TH at al. Solitary Parathyroid Adenoma Localization in Technetium Tc99m Sestamibi SPECT CT and Multiphase Multidetector 4D CT. AJNR Am J Neuroradiol. 2018 Dec 6. doi: 10.3174/ajnr.A5901.

L6.2 Investigating occult malignancy in patients with unprovoked venous thromboembolism at a large teaching hospital: Changing practice

Pia Charters [1]; Tarryn Carlsson [1]; Fiona McCurdie [2]
[1]North Bristol Trust, Severn Deanery; [2]London North West Healthcare Trust

Background: 'Idiopathic' venous thromboembolism (VTE) can be the first manifestation of occult malignancy[1]. The incidence of occult malignancy in unprovoked VTE patients studied in two recent, high-quality, randomised controlled trials was only 4% (previously considered >10%)[2,3,4]. Routine screening with CT abdomen/pelvis did not provide a clinically statistical significant benefit[2]. We wish to establish the occult malignancy detection rate in our Trust and determine whether we are appropriately investigating patients in line with current NICE guidance[5].

Method & results: A retrospective, observational, single-centre study analysed all pulmonary angiograms, ventilation/perfusion scans and lower limb dopplers between 23/06/2014-31/08/2014. 37% of 108 VTE's were unprovoked. 56% had subsequent CT abdomen/pelvis that demonstrated a malignancy rate of 2.6%. There was wide variability in other malignancy investigations performed e.g. none had mammography and <50% had serum calcium or chest X-ray. Patients as young as 28 were exposed to radiation without the first-line investigations having been performed first.
We produced recommendations based on NICE guidance[5] for investigating patients with 'unprovoked' VTE that was distributed to all Trust consultants and GP practices. Findings and recommendations were presented locally.
A second study was performed with identical inclusion criteria from 03/08/2017—28/01/2018. Of the 49 unprovoked VTE's, 4% had subsequent abdominal imaging. The majority had standard investigations in line with the new guidance.
Conclusion: Our 2.6% rate of occult malignancy in unprovoked VTE is comparable to the literature. Following distribution of new Trust VTE recommendations the frequency of screening CT abdomen/pelvis reduced from 56% to 4% with projected financial and resource savings.

1. Lee A, Levine M. Venous thromboembolism and cancer: risks and outcomes. Circulation 2003;107:I 17-21
2. Carrier M, Lazo-Langner A, Shivakumar S. et al. Screening for occult cancer in unprovoked venous thromboembolism. N Engl J Med. 2015; 373: 697–704
3. Van Doormal F et al. (2011), Is extensive screening for cancer in idiopathic venous thromboembolism warranted? Journal of Thrombosis and Haemostasis, 9: 79-84. doi:10.1111/j.1538-7836.2010.04101
4. Mayor Susan. CT for occult cancer is unnecessary in people with unexpected venous thromboembolism, study finds BMJ 2015; 350 :h3386
5. National Institute for Health and Care Excellence (2018) Suspected cancer recognition and referral (NICE Guideline NG12). http://pathways.nice.org.uk/pathways/suspected-cancer-recognition-and-referral. NICE Pathway last updated: 21 August 2018. [Accessed 16 Dec 2018]

L6.3 Time to Lego - re-thinking the radiology job plan

Melissa Melissa Werndle; Andrew Macallister; Nicholas Ridley; Sian Davies
Great Western NHS Hospital Trust

Background: Radiology workload continues to grow with little growth in radiology numbers. Radiologists along with Pathologists are relatively unique in that unlike many clinicians' work can be generated for them outside of the job planning process. They are often rota'd to perform two or more tasks at once. Current job plans reflect each session in a day by day hourly chart (we use CRMS). The complexity, overlap and workload within these sessions is not truly reflected. We wished to create an alternative approach to the job plan that would be more accurate.
Method: We reviewed some actual job plans in our department. Instead of viewing these in the standard format we created a single vertical job plan, where each task was given a precise sessional value. Overlapping tasks such as reporting double CT list, duty radiologist, meeting would get a true value and not be lost in the standard job planning chart. Once the values are stacked like lego bricks vertically in a single tower with the height in agreed sessions marked it becomes clear how the workload exceeds the allocated sessions.
Results: Work load in radiology is underestimated using the current sessional planning standard. This can be as much as a PA per week.
Conclusion: A vertical job plan will accurately reflect when work load exceeds the allocated sessions. A quart cannot be poured into a pint pot.

L6.4 How readable are radiology reports?

Riddhika Chakravartty; Georgiana Zamfir; Kunal Khanna
Frimley Health Foundation Trust

Background: The objective of this study was to assess the readability of radiological reports in common imaging modalities and the reading grade required to understand them. We aimed to identify the ease with which a patient may read and understand their own report should it be provided to them, through increasing access to medical records.
Method: This retrospective study assessed 50 reports from each radiology modality (Radiographs, Ultrasound, CT, MRI, Flouroscopy and Nuclear Medicine) between 01 and 30 January 2018 randomly selected using a random number list. Foreign film imaging and autotext reports were excluded. An online calculator was used to assess semantic (word length) and syntactic (sentence length) content and readability scores including Flesch Reading Ease (higher scores were easier to read) and Flesch Kincaid Grade level (score equivalent to the US grade level of education that the reader would require to be able to understand that text). Studies suggest a Flesch Reading Ease of 60 and Flesch Kincaid Grade level of 8 for the general public to understand a document.
Results: On average a radiology report had 2 syllables in each word and 11 words in each sentence, giving an average Flesch Reading Ease of 30.8 (range -4.2 to 55.2). The average Flesch Kincaid Grade Level showed 12.1 years of formal education were required to understand radiology reports (range 10.3 to 13.1). There was no significant difference in scores over different imaging modalities.
Conclusion: Readability scores suggest that in their present form radiology reports are not readily understandable.

L6.5 Performance of Nigeria-trained radiographers in X-ray interpretation

Christopher Ohagwu; Christopher Ilounoh; Joseph Eze
Nnamdi Azikiwe University, Awka

Background: There is currently a dearth of radiologists in many countries including Nigeria leading to many X-ray examinations not to being reported before getting to the referring clinician. Radiographers are the best placed allied health professionals to provide expert opinions on radiographs in the absence of the radiologist but there continue to be a debate on the suitability of Nigeria-trained radiographers for X-ray interpretation.

Aim: To assess the performance of Nigeria-trained radiographers in the interpretation of X-ray films from a selected range of X-ray investigations. Material and Methods: Ten Nigerian radiographers blinded to one another interpreted films from 1189 X-ray examinations. The interpretations of each radiographer were compared with the contents of a radiologist's reports which were regarded as the gold standard. The sensitivity, specificity and accuracy of the radiographers' interpretations were then determined.

Results: An overall sensitivity of 89.8 per cent, specificity of 93.5 per cent and an accuracy of 92.3 per cent were recorded for the performance of the Nigeria-trained radiographers in X-ray film interpretation. Results suggest that additional training in X-ray interpretation lead to significantly better performance in X-ray interpretation ($p < 0.05$).

Conclusion: The performance of the selected Nigeria-trained radiographers in X-ray film interpretation is very high and may be improved upon by an additional training in X-ray film interpretation. Therefore, Nigeria-trained radiographers with X-ray film interpretation skills may report the selected range of x-ray investigations in the absence of a radiologist or as an addition to the radiology workforce.

1. Brealey S, Scally A, Hahn S, Thomas N, Godfrey C, Coomarasamy A (2005). Accuracy of radiographer plain radiograph reporting in clinical practice: A meta-analysis. Clin Radiol; 60: 232–241
2. Buskov L, Abild A, Christensen A, Holm O, Hansen C, Christensen H (2013). Radiographers and trainee radiologists reporting accident radiographs: A comparative plain film-reading performance study. Clinical Radiology; 68: (1): 55-58
3. Cook, A.P., Oliver, T., Ramsay, L (2004). Radiographer reporting: discussion and Australian workplace trial. Radiographer; 51: 61–66
4. Department of Medical Radiography and Radiological Sciences, Faculty of Health Science and Technology, College of Medicine, University of Nigeria Enugu Campus, Nigeria (2017). Curriculum for the Bachelor of Science in Medical Radiography
5. Egan I, Baird M (2003). Optimizing the diagnostic imaging process through clinical history documentation. The Radiographer; 50 (1): 11-18
6. Ekpo EU, Egbe NO, Akpan BE (2015). Radiographer's performance in chest X-ray interpretation: the Nigerian experience. Br J Radiol; 88 (1051): 20150023
7. Froehle CM, White DL (2014). Interruption and forgetting in knowledge-intensive service environments. Production Oper. Management; 23 (4):704–722
8. Hardy M, Hutton J and Snaith B (2013). Is a radiographer led immediate reporting service for emergency department referrals a cost effective initiative? Radiography; 19 (1): 23-27
9. Lee EH, Jun JK, Jung SE, Kim YM, Choi N (2014). The efficacy of mammography boot camp to improve the performance of radiologists. Korean J Radiol; 15: 578–85
10. McDonald RJ, Schwartz KM, Eckel LJ, Diehn FE, Hunt CH, Bartholmai BJ, Erickson BJ, Kallmes DF (2015). The effects of changes in utilization and technological advancements of cross-sectional imaging on radiologist workload. Acad Radiol; 22: 1191-1198
11. Piper K, Cox S, Paterson A, Thomas A, Thomas N, Jeyagopal N, Woznitza N (2014). Chest reporting by radiographers: Findings of an accredited postgraduate programme. Radiography; 20: 94–9
12. Piper K, Paterson A, Ryan C (1999). The Implementation of a Radiographic Reporting Service for Trauma Examinations of the Skeletal System in 4 NHS Trusts. NHS Executive South Thames, UK, 1999
13. Smith T (2002). Radiographer's role extension gathers pace. Diagnostic Imaging Europe; 18-21
14. Snaith B, Milner RC, Harris MA (2016). Beyond image interpretation: Capturing the impact of radiographer advanced practice through activity diaries. Radiography; 22 (4): 233-238
15. The College of Radiographers (2006). Medical Image Interpretation and Clinical Reporting by Non-Radiologists: The Role of the Radiographer. London: The College of Radiographers
16. The College of Radiographers (1997). Reporting by Radiographers: a Vision Paper. London: The College of Radiographers
17. The Radiographers Registration Board of Nigeria (2004). Code of professional conduct and ethics for radiographers. Pp. 1-9 18. The Society of Radiographers (2013). Preliminary clinical evaluation and clinical reporting by radiographers: policy and practice guidance. The College of Radiographers, London
19. Woznitza N (2014). Radiographer reporting. J Med Radiat Sci; 61: 66–68

L6.6 Barriers to research utilisation amongst diagnostic radiographers in the UK

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NHS Tayside

Introduction: Lack of research uptake and utilisation amongst radiographers compared to other allied health professions prompted the publications of four consecutive research strategies by the Society and College of Radiographers in attempts to bridge the gap.

Aim: The aim of this study was to find out perceived barriers to research utilisation amongst diagnostic radiographers in the UK.

Method: The BARRIERS scale questionnaire was used to solicit for the perception of 1020 radiographers working in the NHS.

Results: Response rate was 72.8%. The majority of radiographers were Band 6 (n=296, 47.0%) holders. Only 8(1.3%) of the radiographers held a doctorate. The greatest perceived barriers to research utilisation were departments not making time for research-related activities (n=437,69.4%), how to develop research questions (n=355, 56.3%), find relevant literature (n=320, 50.8%), workload (n=317, 50.3%) and interpret statistics (n=311, 49.4%). There was a positive attitude to research utilisation however, 198 (31.4%) held the view that research was not in their scope of practice. A further 127 (20.2%) felt radiologists and physicists should review research in their practice. Statistically significant differences existed for age range, highest educational

qualification, number of years qualified and area of practice in relation to attitude to research. It was found that the highest educational qualification was associated with a higher probability of research knowledge (p=0.040).
Conclusion: The study concludes that dissemination mechanisms to facilitate research utilisation are lacking within radiology departments. It is recommended that managers and lead radiographers create a platform that will enable practitioners to communicate research evidence in their practice.

1. Funk, S. G., Champagne, M. T., Wiese, R. A., & Tornquist, E. M. (1991a). Barriers to using research findings in practice: The clinician's perspective. Applied Nursing Research, 4(2), 90-95. doi.org/10.1016/S0897-1897(05)80062-X
2. Funk, S. G., Champagne, M. T., Wiese, R. A., & Tornquist, E. M. (1991b). Barriers: The barriers to research utilisation scale. Applied Research Nursing, 4(1), 39-45 doi.org/10.1016/S0897-1897(05)80052-7
3. HCPC. (2013). Standards of proficiency: Radiographers. London: Health and Care Professions Council
4. NICE. (2007). How to change practice: Understand, identify and overcome barriers to change. Retrieved from http://www.nice.org.uk/Media/Default/About/what-we-do/Into-practice/Support-for-service-improvement-and-audit/How-to-change-practice-barriers-to-change.pdf
5. Rogers, E. M. (2003). Diffusion of innovations (Fifth ed.). London: Simon and Schuster 6. SCoR. (2015). Research strategy 2016-2021. London: The College of Radiographers

N5 Education short paper presentations

N5.1 Group coaching to support therapeutic radiography students during clinical placement

Joanne Harris; Nicola Arnold; Aga Kehinde; Lisa-Jane Conway
Royal Surrey County Hospital NHS Foundation Trust

Introduction: With a history of high attrition rates attributed to feeling a low sense of belonging whilst on clinical placement[1], there is a need for clinical educators to provide support which allows students to feel empowered and seek their own solutions[2]. Coaching provides students with a safe, confidential space to discuss aspects of work, and has been successfully implemented within pharmacy to support their trainees. Thus, decided to trial this approach with therapeutic radiography students.
Method: A four week inter-professional group coaching programme for radiotherapy and pharmacy trainees focusing on Confidence and Self-belief, Resilience, Time Management and Interview Skills was run.
Results: Confidence and Self-belief saw a 75% decrease in feelings of low confidence and a 50% increase in those who now felt very confident. Similarly, Resilience saw a 100% decrease in those who expressed poor confidence initially.
Conclusion: Students embraced coaching and 9/13 participants would recommend this programme to others. Coaching addressed key barriers to learning such as confidence and resilience. Students enjoyed partaking in group discussion in a safe environment, collaboration across departments, and gaining perspectives of other professions. Moving forward we will monitor these students over the duration of their placement to assess for a tangible impact as feedback from the post questionnaire suggested it was too soon to fully appreciate the true impact of the sessions. Overall the results would support adopting coaching to support our trainees during their clinical placement.

1. Coyler, H. (2013) Improving retention of the radiotherapy workforce - the role of practice placements in student attrition from pre-registration programmes in England. Society of Radiographers
2. Trad, M. (2009). Mentoring Radiation Therapy Students: A Review and Survey. Radiation Therapist, [online] 18(2), pp101-108

N5.2 Exploring and understanding research pedagogy in radiography, in a UK university

Louise McKnight
Birmingham City University

Background: As a radiography educator studying for a Professional Doctorate in Education, research pedagogy and the importance of research for our profession form the focus of my study. The aims include addressing issues raised by The College and Society of Radiographers 'Research Strategy 2016-2021' (2015) around embedding research in the curriculum. This research explored how current practice in one educational setting endeavours to realise the aims of this research strategy from the perspective of educators and radiography students.
Methods: By developing an innovative use of imagery in both data collection and presentation of results, my method is symbolic of the practices of the radiography profession as it maintains the importance of images, their interpretation, and use in my research. Participants were invited to take part in individual interviews which included participant image making. Information gathered was reported as a pictorial and written narrative, in an echo of our professional work of image making and reporting. A thematic analysis was conducted, looking for patterns through all the data.
Results: The data has been viewed through a Bourdieusian lens, using concepts of habitus (Bourdieu 1977) and professional field (Wacquant 1989). The results suggest that radiography students and educators do see the importance of research to individuals and the profession but identify many constraints to teaching and learning.
Conclusion: The findings will be used to inform future research pedagogy and curriculum development in radiography, helping us to embed research in the curriculum in a way that educators and students recognise.

1. Bourdieu, P. (1977) Outline of a Theory of Practice, Cambridge university press. Society and College of Radiographers (2015) Society and College of Radiographers Strategy [2015-2017]
2. Wacquant, L.J. (1989) 'Towards a reflexive sociology: A workshop with Pierre Bourdieu', Sociological theory, 26-63

N5.3 **Adopt and adapt: Undergraduate diagnostic radiography student responses to technology enhanced collaborative assessment using online wiki and verbal MS PowerPoint presentations**

Iain MacDonald
University of Cumbria

The views of diagnostic radiography students using two methods of computer supported collaborative learning (CSCL) are considered in this study. Second year students, in groups, used the the 'familiar' Microsoft (MS) PowerPoint presentation and the 'novel' wiki, a web communication and collaboration tool to explore the diagnosis of common diseases. Using an action research methodology, informed by grounded theory, outcome measures using the two group assessments are explored, particularly socio-emotional responses.

The influence of learning approach on identified themes is emphasised. This study was prompted by increasing opportunities for group formative assessment afforded by the virtual learning environments provided by universities. There has been relatively little previous work on the response of students with varying learning approaches towards using CSCL. Eight 'surface' and eight 'deep' learners were identified from online questionnaire responses and a number of key themes were clarified and explored. Findings demonstrated that all students had previous experience of MS PowerPoint; however, the wiki was new to students. Learning approach influenced students' experience of these CSCL assessments, with surface learners more likely to be passive and welcoming learning from others. Deep learners more clearly identified the benefits of online working, for example, working remotely from others in the group, and were concerned about effort from others in group work. Anxiety about verbal presentations was widespread, affecting the learning of surface learners particularly; wikis caused less anxiety, and were valuable to some students. This research increases understanding of the complex responses of students adapting to computer supported group learning.

1. Entwistle, N.J. (2009). Teaching for understanding at university: deep approaches and distinctive ways of thinking. Basingstoke: Palgrave Macmillan
2. Stephens, M., Robinson, L. and McGrath, D. (2013). Extending inter-professional learning through the use of a multi-disciplinary Wiki. Nurse Education in Practice, 13(6), pp. 492-498
3. Zitzelberger, H., Campbell, K.A., Service, D. and Sanchez, O. (2015). Using Wikis to Stimulate Collaborative Learning in Two Online Health Sciences Courses. Journal of Nursing Education, 54(6) , pp. 352-355

N5.4 **Compassionate patient care in diagnostic medical imaging**

Jill Bleiker; Karen Knapp; Sarah Morgan-Trimmer; Susan Hopkins
University of Exeter College of Medicine and Health

Background: Compassion is a poorly understood concept in medical imaging research, but an increase in its focus was recommended in the Francis Report (2013). Qualitative data were collected from student radiographers, service users and radiographers to conceptualise compassion and understand its meaning and manifestation in diagnostic imaging (DI) with a view to producing recommendations for radiography education and research.

Methods: The project was conducted from within a constructivist paradigm with appropriate ethical approval. Thirty-four semi-structured interviews were conducted with a purposive sample of DI ex-patients. Five focus groups with approximately six student radiographers recently returned from placement and one group of post-graduate radiographers were facilitated, and data were harvested from an online journal club discussion between radiographers of the author's published literature review. Data were transcribed and analysed thematically.

Results: The data reveal individual variations in needs, expectations, feelings and attitudes during DI, with preliminary results suggesting themes of humanity, kindness and understanding as key components of a compassionate radiographer-patient interaction. Asking targeted clinical questions during the introductory stage of the interaction establishes rapport between radiographer and patient and offering information about patients' X-ray images during the closing stages may limit or reduce uncertainty and anxiety. These findings have implications for scope of practice around training and competence in image interpretation.

Conclusion: Foregrounding the humanities in the radiography curriculum, in particular philosophy and ethics might personalise an otherwise technically focused radiographer-patient interaction. Understanding the nature of compassionate care could inform future interventions to re-structure patient examinations in DI.

1. Braun, V. and Clarke, V. (2006) Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2) pp. 77-101
2. Francis, R. (2013) Report of the Mid Staffordshire NHS Foundation Trust Public Inquiry: Executive summary. London: HMSO
3. Lincoln, Y.S. and Guba, E.G. (2013) The Constructivist Credo London: Routledge

N5.5 **A pilot study investigating the effectiveness of a collaborative workshop between medical students and diagnostic radiography students on justifying radiology request forms to comply with IRMER legislation**

Joanne Holmes
The Dudley Group NHS Foundation Trust

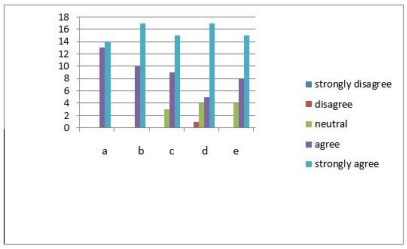
Background: Medical Students should be familiar with how to request and justify X-rays in preparation for working as a doctor. Existing literature is limited but has recognised a dearth of teaching in this area and examples of poor communication between medical teams and imaging departments is cited as a result of inadequate imaging requests.

Method: After briefly introducing the Ionising Radiation (Medical Exposure) Regulations (IRMER) the students were given clinical scenarios where diagnostic imaging of the patient was necessary. Working in small multi-disciplinary groups the medical students decided upon appropriate imaging for the patient and wrote a request form for the radiography students to justify. The interactive session was designed to encourage effective communication across the two professions and was facilitated by a qualified Diagnostic Radiographer and Clinical Teaching Fellow who answered questions and clarified best practice. Finally, students critiqued sample request forms and decided whether they were justified under IRMER.

Results: Feedback questionnaires indicated that the workshop was well received, with students from both professions citing the benefits of discussing appropriate imaging for patients and practically writing requests.

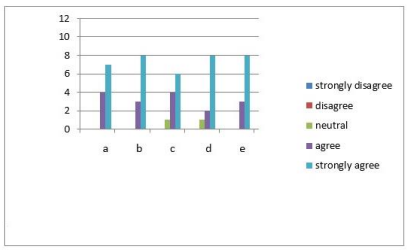
Conclusion: This pilot study although small scale, endorses inter-professional education to enable students to understand their future roles when communicating about and arranging for patients to undergo diagnostic imaging. Discussion of how similar workshops may be incorporated into academic programmes for both professions is recommended in the future with research into the effects of this training may have on communication and justification of radiology procedures in the clinical environment.

Medical student feedback



a) The workshop content was relevant to my course
b) The workshop content was relevant to my future practice
c) The workshop has increased my knowledge of what happens in an Imaging Department
d) The workshop has increased my understanding of the risks of ionising radiation within a hospital environment
e) I feel more confident about explaining imaging tests to patients

Radiography student feedback



a) The workshop content was relevant to my course
b) The workshop content was relevant to my future practice
c) The workshop has increased my knowledge of what happens in an Imaging Department
d) The workshop has increased my understanding of the risks of ionising radiation within a hospital environment
e) I feel more confident about explaining imaging tests to patients

Borgen L, Stranden E & Espeland A (2010) Clinicians` justification of imaging: do radiation issues play a role? Insights Imaging July 1 **(3)** 193-200
Kelly BS, Rainford LA, Gray J & McEntee MF (2012) Collaboration between radiological technologists (radiographers) and junior doctors during image interpretation improves the accuracy of diagnostic decisions Radiography**18** 90-95
Kruse J, Lehto N, Riklund K, Tegner Y & Engström Å (2016) Scrutinized with inadequate control and support: Interns` experiences communicating with and writing referrals to hospital radiology departments — A qualitative study Radiography **22** 313-318
Nyhsen CM, Patel P & O`Connell JE (2016) Bullying and harassment — Are junior doctors always the victims? Radiography **22** e264- e268
Strudwick RM & Day J (2014) Interprofessional working in diagnostic radiography Radiography **20** 235-240

N5.6 Personalised e-learning for MSc medical ultrasound students

Lyndsey Callion [1]; Dorothy Keane [2]; Shelly Smart [3]
[1]e-Learning for Healthcare; [2]Society of Radiographers; [3]University of Cumbria

Purpose: The use of e-Learning is widespread in healthcare education[1], however it can be controversial and have mixed results[2,3]. Lecturers at the University of Cumbria have personalised e-learning programmes from e-Learning for Healthcare and the Society of Radiographers and used these as a basis for their course material. Lecturers have incorporated the e-learning within their teaching. Students who will start the course in January 2019 will have an opportunity to feedback on their experience.

Background: MSc Medical Imaging (Ultrasound) is a new fulltime programme at the University of Cumbria. This is intensive an accelerated pathway to a career in sonography, designed to address the UK-wide shortage. The University are working in partnership with Health Education England, e-Learning for Healthcare (HEE e-LfH) to provide a personalised learning pathway to help students acquire the academic knowledge to work in the field. e-Lfh is a vast resource containing over 200 programmes, including several specialist imaging projects - Image Interpretation, Radiology, eProton, Radiotherp-e and e-IRMER. Within the radiography programme, Image Interpretation, there are over 400 sessions, a fantastic free resource, but where to start? Lecturers at the University of Cumbria have curated relevant content into a learning path, allowing material to be structured in a format that mirrors their university programme.

Summary: A joint project between the University of Cumbria, Society or Radiographers and e-learning for Healthcare. Demonstrating the value of collective working to make the most of existing educational resources by personalising the approach.

1. George, P.P., Papachristou, N., and Belisario, J.M., et al, 2014. Online eLearning for undergraduates in health professions: A systematic review of the impact on knowledge, skills, attitudes and satisfaction. J Glob Health, 4(1):010406
2. Lahti, M., Hätönen, H., Välimäki, M., 2014. Impact of e-learning on nurses' and student nurses knowledge, skills, and satisfaction: A systematic review and meta-analysis. Int J Nurs Stud, 51(1), pp.136-149
3. Rasmussen, K., Belisario. J.M., and Wark. P.A., et al, 2014. Offline eLearning for undergraduates in health professions: A systematic review of the impact on knowledge, skills, attitudes and satisfaction. J Glob Health, 2014;4(1):010405

MSK POSTER PRESENTATIONS

P001 USGI in the foot and ankle - are we all playing by the same rules?

Georgia Scott; Kathryn Duke; Irena Stefanova; Matthew Solan
The Royal Surrey County Hospital

Selective injections are a useful investigation in the diagnosis and treatment of tendon and joint pathology. This is especially true in the Foot and Ankle, with a high incidence of tendinopathies and 28 different bones. Most injections can be conveniently performed as an Outpatient under US guidance, with USGI referrals being generated from Orthopaedic Surgeons, Extended Scope Physios or General Practice. There is the potential for complications after injection of steroids, most notably the risk of tendon rupture in cases of tendinopathy. Referrer attitudes to this risk varies, some recommend use of a protective surgical boot. Uncertainty about the safety of undertaking an injection for a patient without a boot can lead to delay and a further appointment once one is organised.

We developed a comprehensive USGI Guidance document to ensure that injections are only undertaken for appropriate indications; that the optimum steroid volume and preparation is used; a protective boot is available; and that the referrer and sonographer give the same instructions for duration of boot use. Referring clinicians may deviate from the "rules" if they specify clear alternative instructions on the referral. All secondary care referring clinicians have agreed these "Default Settings" for USGI and aftercare. Since our multidisciplinary team adopted these agreed guidelines, there have been no instances where patients have had to reattend for injection after a preliminary USS. Clearly defined guidance agreed within the multidisciplinary team has strengthened our teamwork, reduced unnecessary appointments and afforded consistency in the care of our patients.

P002 Knees - a rheumatological perspective

Nicholas Ridley; Hyeladzira Thahal; Elizabeth Price
Great Western Hospital

Background: We hold weekly radiology-rheumatology clinical meetings. There are a large number of cases collected. We reviewed a series of knee related imaging and have constructed an educational poster as a result.

Purpose: The purpose of the poster is to provide an educational resource for radiologists, rheumatologists and radiographers.

Summary: The poster is divided into the following knee appearances:

1. Rheumatological conditions such as rheumatoid, psoriasis, pseudogout, Paget's disease and DISH.
2. Conditions that the rheumatologist should be aware of such as malignancy, infection and stress fracture.
3. Rare conditions such as scurvey and rickets.

P004 Intra and inter-operator variability in the manual segmentation of lumbar spine MR images using ImageJ©

Eleanor Sexty; Katy Crocker; Laura Jones; Polly Cutmore; Liliana Rodrigues
University of Exeter Medical School

Background: The shape modelling of lumbar spine has been demonstrated as a powerful tool to quantify variations in spine morphology and also pointed out as a potential new predictor of several musculoskeletal conditions. As the segmentation of the lumbar spine is the first step of the shape model and is very often done manually, is important to measure inter and intra-operator variability.

Methods: 4 operators, each operator evaluated 30 images twice. Statistical Package for the Social Sciences (SPSS) software was used to calculate the Intraclass Correlation Coefficient (ICC) for intra and inter-operator variability.

Results: All of our ICC values are above 0.92 belonging to an excellent standard. The ICC for intra-operator precision ranged 0.990, 0.993, 0.993 and 0.988. The inter-operator ICC ranged 0.989 ($p<0.001$).

Conclusion: High precision was demonstrated for both inter and intra-operator assessment. Our results have shown that Y value ICC scores are considerably more consistent across all four operators than the X values. A potential theory to explain this could be that the anterior and posterior vertebral margins are harder to interpret due to distinguishing between surrounding soft tissue and bone, varying slice selection may also be a factor. All of our ICC values were clinically significant and to an excellent standard. Therefore, our results display that for our operators there was minimal variability which leads us to conclude that the operator has limited influence on the segmentation of the lumbar spine.

1. Ali H.A. Ali, Amy-beth Cowan, Jennifer S. Gregory, Richard M. Aspden & Judith R. Meakin (2012) The accuracy of active shape modelling and end-plate measurements for characterising the shape of the lumbar spine in the sagittal plane, Computer Methods in Biomechanics and Biomedical Engineering, 15:2, 167-172, DOI:10.1080/10255842.2010.518962
2. Meakin J, Gregory J, Smith F, Gilbert F, Aspden R. Characterizing the Shape of the Lumbar Spine Using an Active Shape Model. Spine. 2008;33(7):807-813
3. Meakin, J., Gregory, J., Aspden, R., Smith, F. and Gilbert, F. (2009). The intrinsic shape of the human lumbar spine in the supine, standing and sitting postures: characterization using an active shape model. Journal of Anatomy, 215(2), pp.206-211
4. Portney, L. G., & Watkins, M. P. (2009). Foundations of clinical research: applications to practice. (3rd ed.). Upper Saddle River, NJ: Prentice-Hall
5. Fleis, J. (1986). Design and Analysis of Clinical Experiments. New York: John Wiley & Sons

P005 **A systematic review to assess the impact of total knee replacement/arthroplasty/revision on bone mineral density**

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Background: The impact of total knee replacements, revisions, and arthroplasties on post-operative bone mineral density (BMD) is of great importance and currently no systematic review has been conducted to establish a consensus on when and where the greatest bone density changes are following surgery.
Method: A collection of databases were searched using pre-determined key terms; results were imported into Endnote, duplicates removed, and title and abstract screening was conducted by two independent reviewers. Full text screening was performed with data extraction and quality assessment undertaken on the final included papers. The outcomes included investigating BMD changes compared to baseline/contralateral knee at intervals of 3, 6, 12, 18, 24, 48, and 60 months post-surgery.
Results: After de-duplication, 957 papers were identified by searches. Title and abstract screening yielded 57 papers for full text screening, from which 32 papers were included in the review (five of these papers investigated bisphosphonates impact on BMD post-surgery). The highest reported bone loss in the tibia was at 24 months post-surgery of -41.3% on the medial tibial side, with the highest loss in the femur being at 24 months on the anterior aspect of the femur -40%.
Conclusion: The combined data demonstrated BMD loss post-operatively, with some of the highest losses reported at 24 months post-surgery. Furthermore, those treated with bisphosphonates showed an increase in BMD at 6 and 12 months, suggesting that post-operative bisphosphonates may mitigate peri- and post-operative bone loss.

P006 **Pilot study to investigate the impact and value of hot/immediate reporting of appendicular musculoskeletal emergency department plain images at the weekend**

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University Hospitals North Midlands

Background: Hot/immediate reporting is not a new concept but is seen as the 'Gold Standard' to ensure optimal care for Emergency Department patients. NICE 'Resource Impact Report' (2016), describes this service as 'providing a definitive written report of emergency department X-rays of suspected fractures before the person is discharged from the emergency department'. Immediate formal interpretation/reporting of plain images taken at the time of ED attendance is described as, reducing; missed fractures, discharge delays, recalls, incorrect treatment and potential litigation. Although been seen as the gold standard for many years, immediate reporting is not performed by all acute centres in the UK. Literature describes the key restricting factor to be lack of financial resource to staff immediate reporting. Immediate reporting has been in place 9am-5pm Monday to Friday for some time. Pilot gives opportunity to investigate the impact to patients if this service provided 9-5, 7 days a week.
Aims and objectives: To explore further if the expansion of the hot-reporting service could offer benefit to the ED service and positive impact to patients. Compare 'pre Hot' and 'Hot' reporting of MSK appendicular ED exams, by quantifying missed fractures, discharge delays, recalls, incorrect treatment and potential litigation. Qualitative feedback from ED and imaging staff as to value of service.
Method: 6 weeks 'Pre Hot' March/April 2017, 9am - 5pm, Saturday/Sunday: 6 weeks 'Hot' March/April 2018, 9am-5pm, Saturday/Sunday.
Outcomes: Pilot demonstrated a significant improvement in accuracy of patient outcome at the time of patient attendance in ED

1. Hardy, M et al. (2013) 'The impact of immediate reporting on interpretative discrepancies and patient referral pathways within the emergency department: a randomised controlled trial'. British Journal of Radiology. Vol 86 (no.1021); p. 20120112
2. Hardy, M et al. (2013) 'Is a radiographer led immediate reporting service for emergency referrals a cost effective initiative?' Radiography. Vol 19 (no.1); p. 23-27
3. NICE (2016) 'Putting NICE guidance into practice. Resource and impact report, trauma guidelines' (NG37-41) Figure 3.3

P007 **Commonly missed fractures in the emergency department: A pictorial review**

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Background: Radiological diagnostic errors in the emergency department commonly include missed diagnosis of subtle or radiographically occult fractures on plain radiographs. This may occur either due to misinterpretation or low sensitivity of plain radiographs in diagnosing these fractures. Fractures of hand phalanges and metatarsals are most commonly missed in an emergency setting, followed by those of distal radius, tibia, and foot phalanges. Cross sectional imaging (MRI or CT) is more sensitive and should be used in appropriate cases to establish diagnosis.
Purpose: Missed traumatic fractures are a common occurrence in emergency department. Knowledge of common pitfalls and use of appropriate alternate imaging aids in identifying radiographically occult fractures, reducing subsequent complications and morbidity.

Summary: A pictorial review outlining a variety of commonly missed fractures in the emergency department, along with tips and radiological signs to help identify occult fractures.

1. Mounts, J. et al. (2011) Most Frequently Missed Fractures in the Emergency Department, Clinical Pediatrics, 50(3), pp. 183–186
2. Smalley, C. et al. 2011. Most Frequently Missed Fractures in the Emergency Department, Clin Pediatr 2011;50:183. Journal of Emergency Medicine 41, 110
3. Crock, C, Deakin, A., Hansen, K., Schultz, T. J., and Hansen, K. (2015), Case Letter. Emerg Med Australas, 27: 177-178

P008 What every radiologist needs to know about pathological fractures

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Background: A pathological fracture is any fracture through an area of abnormal bone architecture. It can be either a benign lesion (e.g. haemangioma) or malignant lesion (primary bone tumour or metastatic deposit) or due to a diffuse process. Bone metastases are an exceedingly common spread of cancer and pathological fractures are seen in up to 29% of cases[1] causing a significant burden on services. Bone metastases are commonly seen in myeloma and in cancers arising from the prostate, breast, lung, and kidneys. The literature on the incidence of pathological fractures is scarce; although it has been cited that the age-adjusted incidence for pathological fractures is 87 per 100,000 population[2].

Purpose: Evaluating bone lesions and pathological fractures is a difficult task and there is little guidance available on this topic. We aim to make a comprehensive guide in assessing the common pathological fractures due to localised bone pathology.

Summary: This poster identifies the usual sites for pathological fractures. We describe different underlying bone lesions which are at risk of pathological fracture and their appearances across various imaging modalities. Plain film, CT and MRI appearances will be discussed. We aim to describe the subtle differences in morphology that can be appreciated to help the radiologist determine the underlying aetiology. We highlight the difference between pathological and stress fractures, and visit a criteria for determining risk of fracture.

1. Buggay D, Jaffe K: Metastatic bone tumours of the pelvis and lower extremity. Journal of Surgical Orthopaedic Advances [01 Jan 2003 12(4): 192-199]
2. Amin S, Achenbach SJ, Atkinson EJ, Khosla S, Melton LJ 3rd: Trend in fracture incidence: a population-based study over 20 years. Journal of Bone and Mineral Research [Mar 2014, 29 (3): 581 -589]

P009 Incidental vertebral fractures: are we under-reporting them?

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County Durham & Darlington NHS Foundation Trust

Background: The early diagnosis of osteoporosis may facilitate effective intervention with bisphosphonates, calcium, and vitamin D, which can reduce the risk of future fragility fractures (NICE, 2018). Incidental diagnoses of vertebral fractures on CT may be the first sign of osteoporosis, yet we suspected these fractures may be under-reported. We aimed to investigate for under-reporting of vertebral fractures within our trust.

Method: We retrospectively considered 500 consecutive CT scans across three hospitals for inclusion. Exclusions were on the basis of 1) insufficient field of view; or 2) high pre-scan probability of vertebral fracture (known malignancy or trauma, previously reported vertebral fractures, or clinical suspicion). Junior doctors in the radiology department double-reported all included scans utilising a semiquantitative method (Genant et al., 1993), and a consultant musculoskeletal radiologist subsequently reviewed all suspected vertebral fractures. Finally, we compared the original scan reports to our assessment of vertebral fracture status.

Results: We included 199 scans, with a mean patient age of 65 years and 113 (57%) male patients. Fifteen (8%) scans contained new or previously unreported vertebral fractures, which were not reported in eight (53%) of the original scan reports. All eight reports commented upon the skeleton, but six (75%) dismissed the skeletal changes as purely degenerative. Ten out of 13 (77%) unreported fractures were located between T7 and T12.

Conclusion: Vertebral fractures were under-reported incidental findings in our trust. We encourage all radiologists to report incidental vertebral fractures.

1. Genant, H., Wu, C., van Kuijk, C. and Nevitt, M. (1993) Vertebral fracture assessment using a semiquantitative technique. *Journal of Bone and Mineral Research,* 8(9), pp.1137-1148.
2. National Institute for Health and Care Excellence, (2018) *Osteoporosis overview*

P010 Audit of reporting of incidental (prevalent) vertebral fracture in chest abdomen and pelvis (CTCAP) reports

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[1]Derriford Hospital, University Hospitals Plymouth NHS Trust; [2]Royal Osteoporosis Society

Background: Up to 70% of vertebral fractures (VFX) remain undiagnosed[1] despite an association with excess mortality[2,3], hip fracture and further VFX[4,5]. Diagnostic imaging departments have a role in fracture prevention by reporting incidental findings of prevalent VFX in reports of scans including the thoraco-lumbar spine, and alerting referrers to their significance. This study investigated reporting of incidental finding of VFX on cross-sectional imaging including the thoraco-lumbar spine in routine clinical practice at a large tertiary centre.

Method: Data was pooled from two separate audits investigating prevalence of VFX in cross-sectional imaging and patients with hip fracture with previous imaging in 5 years prior to fracture (from Q1 2015 of the National Hip Fracture Database).

81 CTCAP images (47 consecutive non-selected CTCAP & 34 hip fracture patients) were blind reviewed with sagittal reconstruction by a specialist reporting radiographer for VFX using the semi-quantitative method[6]. Verified radiology reports were scrutinised for corroboration of audit findings, and for reference to recommendation for further assessment or an alert of a significant incidental finding.

Results: VFX identified at audit: 34

Conclusion: Only 58% off patients had their vertebral fractures noted in the report of their CT scan, and none of the reports made any recommendation for further assessment for osteoporosis. This represents 17 important missed opportunities in this audit to treat underlying osteoporosis and prevent further fracture. Long-term outcomes for patients can be improved my more effective reporting of VFX, at a low cost in terms of time and financial investment. Implementing clinical guidance on the identification of VFX[7]could improve outcomes for patients.

1. NICE (TA161) Alendronate, etidronate, risedronate, raloxifene, strontium ranelate and teriparatide for the secondary prevention of osteoporotic fragility fractures in postmenopausal women. NICE 2008. Last updated August 2017
2. Kado DM, et al. (1999). Vertebral fractures and mortality in older women: a prospective study. Study of Osteoporotic Fractures Research Group. Arch Intern Med. 159(11): 1215-1220
3. Jalava T, et al. (2003). Association between vertebral fracture and increased mortality in osteoporotic patients. J Bone Miner Res. 18(7): 1254-1260
4. Black DM, et al (1999). Prevalent vertebral deformities predict hip fractures and new vertebral deformities but not wrist fractures. Study of Osteoporotic Fractures Research Group J Bone Mineral Res. 14:821-28
5. Melton LJ 3rd, et al. (1999) BL. Vertebral fractures predict subsequent fractures. Osteoporosis Int. 10:214-221
6. Ferrar L, Jiang G, Adams J, Eastell R, (2005) Identification of vertebral fractures: and update. Osteoporosis International. 16:717-28
7. Royal Osteoporosis Society, (2017) Clinical Guidance for the Effective Identification of Vertebral Fractures

P011 Case studies: Unreported incidental finding of vertebral fracture (VFX) on CT represents missed opportunity to prevent future hip fracture

Jill Griffin
[1]Derriford Hospital

An audit of sagittal reformatted images of the spine was conducted in August 2017. We present two case studies where VFX were not identified or reported, resulting in a missed opportunity to treat and possibly prevent subsequent hip fractures.


Fig 1. Antero-posterior projection radiograph of the right hip


Fig 2. Single image of sagittal reformat of CT volume (VFX at T8 and T11).


Fig 3. Single image of sagittal reformat of CT volume (VFX at T3)

Case Study 1: 09/2014: Mrs A (70yo), referred for CTCAP to investigate rectal bleeding/malignancy. Report comment: 'bones are intact'.
02/2016: Patient sustained a right-impacted sub-capital neck-of-femur fracture (fig.1).
Referred for DXA.
Audit 2017 - Sagittal-reformatted 09/2014 images of the spine demonstrated VFX at T8 & T11 (fig.2)
Case Study 2: 02/2013: Mrs B (84), referred for CT thorax (CTT) following treatment for TB and onset of chest pain. Report comment: 'No aggressive bony lesion'. No recommendation for further assessment for osteoporosis.
05/2015: Follow-up CTT performed. No report comment on bones.
04/2016: Patient sustained a fractured neck of femur, treated by total hip replacement. Did not leave care and died in June 2016. Audit 2017 - VFX identified at T3 from 02/2013 CTT (fig 3)

Discussion: Both cases demonstrate very poor outcomes of a missed incidental finding of vertebral fracture on CT, even though the original referrals were for unrelated indications. If the fractures had been reported at the first opportunity, subsequent assessment and treatment for osteoporosis may have avoided subsequent hip fracture. New clinical guidance on the identification of vertebral fracture1 could be implemented to improve outcomes for this sort of patient.

1. Royal Osteoporosis Society, (2017) Clinical Guidance for the effective identification of vertebral fractures

P014 "Don't be afraid to use the f word!" improving identification of vertebral fractures and onward referral for bone health assessment (DXA) using a standardised reporting code in radiology

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The Mid Yorks NHS Trust

Introduction: Vertebral fractures are a predicator of further fracture with an increased relative risk of 5.4 for vertebral fracture[1]. Historically incidental vertebral fractures on plain film have been under reported (70% remaining undiagnosed). Ambiguous reporting language that does not include the word fracture in the report, has led to inappropriate treatment in many

of these patients[1].Over 55% of older women with hip fracture have evidence of a prior vertebral fracture hence the importance of identifying these fractures.
Purpose: The National Institute for Health and Care Excellence (NICE) TA161 recommends assessment of bone density for patients with vertebral fractures. The reporting team at this trust have developed a generic reporting code to identify the presence of fractures and highlight findings to the referring clinician. The aim is to identify patients with vertebral fractures and recommendations for DXA imaging in bone health assessment. This will identify those that require treatment in order to prevent future fractures. This poster will present audit data demonstrating the impact of using a generic reporting code for those with osteoporotic vertebral fractures and onward referral for DXA to assess bone mass.
Summary: To show effectiveness of generic reporting code in identifying vertebral fractures on plain film and recommending onward referral for DXA imaging to prevent future vertebral fractures.
1. National Osteoporosis Society (2017) Clinical Guidance for the effective identification of vertebral fractures NOS Bath

P015 Not every lump is a lipoma: unusual masses

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Great Western Hospitals NHS Trust

Background: Ultrasound requests principally from GP's for soft tissue lumps are invariably lipomas. However, from time to time unusual masses will present. We reviewed our archive of cases and present a pictorial review of these.
Purpose: This is to highlight alternate pathology to lipomas encountered in ultrasound by sonographers and radiologists.
Summary: Masses that raise concern of course include sarcomas, lymphomas and cancer metastatic nodes. Benign unusual masses include multiple haemangiomas, muscle hernias, ganglia, fat necrosis, calcification and panniculitis. The value of correlation with plain films and the need for MRI as appropriate are highlighted.

P016 T1 hyperintense vertebral lesions: beware of the nasty one - melanoma

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Background: On T1 weighted MRI sequence, vertebral metastases usually present as abnormal low signal intensity lesions on a background of mildly hyperintense bone marrow. T1 hyperintense vertebral lesions are generally considered benign. Malignant melanoma is an aggressive neoplasm that can involve virtually every organ system. Increased T1 signal intensity in melanoma has been well documented and is attributed to the T1 shortening effect of either melanin or blood products from intratumoral haemorrhage. T1 hyperintense melanoma metastases are more common in the central nervous system. The majority of vertebral metastases in melanoma are of low signal on T1.
Purpose: This poster aims to highlight that T1 hyperintense vertebral lesions are not always benign. Malignant melanoma can result in T1 hyperintense vertebral metastases. This is very rare and is dependent on the melanin content of the lesions. On T1 weighted sequences, hyperintense metastases can be easily masked by the background T1 high signal bone marrow. Hence it is advisable to perform additional sequences like STIR or post gadolinium T1 weighted sequence with fat saturation to bring these lesions to light.
Summary: Although T1 hyperintense vertebral lesions are usually benign, there are exceptions. Malignant melanoma vertebral metastases can appear hyperintense on T1 weighted image. As the background hyperintense bone marrow can mask these lesions on T1, additional postcontrast T1 fat saturation sequences or STIR images are advised, in the search for metastatic melanoma.
1. McMenamin, D.S. Stuckey, S.L. Potgieter G.J. (2007) T1 hyperintense vertebral column melanoma metastases. AJNR Am J Neuroradiol 28: 1817- 1818
2. Christopher, J. Hanrahan and Lubdha, M.S. (2011) MRI of spinal bone marrow: Part 2, T1 weighted imaging-based differential diagnosis. AJR, December 2011, Volume 197, Number 6

P017 An analysis of organ dose in the CT scan projection radiograph when used to assess scoliosis

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Background: Scoliosis is defined as a deformity of the spine with lateral curvature in the coronal plane. It requires regular X-ray imaging to monitor the progress of the disorder, therefore scoliotic patients are frequently exposed to radiation. It is important to lower the risk from these exposures for young patients. The aim of this work is to compare organ dose (OD) values resulting from Scan Projection Radiograph (SPR) mode in CT against projection radiography and EOS® imaging system when assessing scoliosis.
Methods: A dosimetry phantom was used to represent a 10-year old child. Thermoluminescent dosimetry detectors were used for measuring OD. The phantom was imaged with CT in SPR mode using 27 imaging parameters; projection radiography and EOS machines using local scoliosis imaging procedures. Imaging was performed in anteroposterior, posteroanterior and lateral projections.
Results: 17 protocols delivered significantly lower radiation dose than projection radiography ($p < 0.05$). OD values from the CT SPR imaging protocols and projection radiography were statistically significantly higher than the results from EOS. No

statistically significant differences in OD were observed between 10 imaging protocols and those from projection radiography and EOS imaging protocols (p >0.05).
Conclusion: EOS has the lowest dose. Where this technology is not available, we suggest there is a potential for OD reduction in scoliosis imaging using CT SPR compared to projection radiography. Further work is required to investigate image quality in relation to the measurement of Cobb angle with CT SPR.

P018 **Colles' fractures: Intra- and inter-operator precision of alignment measurements from projection radiographs pre- and post-manipulation under anaesthesia**

Lina Beresineviciute [1]; Naomi Goldsworthy [1]; Agata Ilczyszyn [1]; Chloe Ringrose [1]; Constantino Reyes-Aldasoro [2]; Andrew Appelboam [3]; Karen Knapp [1]
[1]University of Exeter; [2]City University; [3]Royal Devon and Exeter NHS Foundation Trust

Background: Colles' fractures are a common injury often resulting from a fall onto an outstretched hand. These fractures are frequently associated with wrist deformity, which can result in problems using the wrist if not corrected. Most adult patients undergo manipulation under anaesthesia within the emergency department if fracture reduction is required. Measurements made on projection radiographs of the wrist can assist in the assessment of deformity and aid clinical decision making.
Methods: 96 wrist radiographs including 30 normal, 30 pre-MUA and 36 post-MUA cases had duplicate measurements on separate days of volar tilt (VT), radial height (RH) and ulnar variance (UV) measured by four trained operators. Intra- and Inter-operator precision errors were calculated using intraclass correlations (SPSS V25, IBM).
Results: Intraclass correlations for intra-operator precision ranged from 0.951 to 0.999, 0.842 to 0.979 and 0.980 to 0.996 (p<0.001) for VT, RH and UV respectively. The inter-operator intraclass correlations ranged from 0.867 to 0.986 for VT, 0.942 to 0.922 for RH and 0.957 to 0.987 for RH. There was variation in precision errors between the normal, pre-MUA and post-MUA cases, with post-MUA measurements demonstrating greater error than pre-MUA.
Conclusion: Good precision is demonstrated for all measurements demonstrating that there is no significant difference between different operators making them. While the measurements are more difficult to make with the cast in-situ, this does not impact significantly on the precision errors.

P019 **The reproducibility of near infrared spectroscopy markers of microvascular haemodynamics at the proximal tibia and gastrocnemius**

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University of Exeter Institute of Health Research

Background: Near infrared spectroscopy (NIRS) allows real time measurement of microvascular haemodynamics in vivo by measuring changes in oxygenated and deoxygenated haemoglobin concentrations. This offers potential microvascular research applications in different disease states for both bone and muscle tissue. However, previous literature has called for evaluation of the reproducibility of NIRS measurements, particularly for bone tissue[1].
Method: Inter operator reproducibility was assessed by measuring the resting total oxygenation index (TOI) at the proximal tibia and lateral head of the gastrocnemius on 12 participants using 5 blinded operators. To assess intra operator reproducibility, and the response of NIRS during ischaemic events, 38 participants were tested at the same anatomical sites for haemodynamic markers during and immediately after occlusion of the blood supply at the thigh for four minutes. Testing was repeated on different days to account for natural biological variation.
Results: Inter operator reproducibility at the gastrocnemius and proximal tibia produced a within participant coefficient of variation (CV) of 2.7% (95%CI 0.0-5.5) and 3.8% (95%CI 0.4-7.1) respectively. The rate of oxygenation decrease during arterial occlusion (signifying oxygen extraction rate) produced a CV of 12.14% (95%CI 0.0-23.35) and 11.6% (95%CI 0.0-25.5) respectively. The rate of oxygenated haemoglobin recovery post occlusion release produced a CV of 12.02% (95%CI 0.33-23.71) and 13.5% (95%CI 0.0-27.9) respectively.
Conclusion: Results confirm that in the context of existing microvascular testing tools, near infrared spectroscopy has suitable reproducibility to warrant its use in future research on bone and muscle tissue haemodynamics at the proximal tibia and gastrocnemius.

1. Meertens R, Casanova F, Knapp KM, Thorn C, Strain WD. Use of near infrared systems for investigations of haemodynamics in human in vivo bone tissue: A systematic review. Journal of Orthopaedic Research. 2018 Oct;36(10):2595-603

P020 **Sonographers' management of work-related musculoskeletal disorders (WRMSD): An ideological dilemma?**

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University of Cumbria

Background: Contradictions within common sense and the governing ideologies of cultures and institutions are typically analysed as points of practical paralysis. Although rarely acknowledged in the imaging sciences, the work of Billig et al. (1988) highlights how dilemmas within ideology can also have enabling impacts on everyday thought; they can assist individuals in reasoning constructively about themselves and their social environments. The research reported in this paper explores the

manners in which practicing sonographers with work-related musculoskeletal disorders (WRMSD) manage their own professional lives. It draws particular attention to how the ideological dilemmas evident, while sometimes constrictive, can also reinforce the participants' positive self-identification.
Method: Extended semi-structured interviews with N=9 experienced sonographers working in the UK were conducted and provisionally analysed using Interpretative Phenomenological Analysis (Miller, Booth and Spacey, 2017). Core thematic areas that emphasised ideological contradictions were then further examined to highlight how participants specifically made sense of them.
Results: The key ideological tensions evident in the findings pertained to those between individuality and collectivity, and freedom and necessity. Evidence indicated that the participants often freely chose to work while injured, despite being aware of the prospective personal costs. In doing so, they underscored their own agency as professionals, and also their own commitment to a broader altruistic model that reinforced their identities as good healthcare professionals.
Conclusions: Ideological dilemmas provide a useful analytic framework for understanding some of the everyday aspects of working with injury in ultrasound. Further exploration of the conceptual facility thereof is recommended.
Billig, M., Condor, S., Edwards, D., Gane, M., Middleton, D. and Radley, A. (1988) Ideological dilemmas: a social psychology of everyday thinking. London: Sage.
Miller, P.K., Booth, L. and Spacey, A. (2017) 'Dementia and clinical interaction in frontline radiography: Mapping the practical experiences of junior clinicians in the UK', Dementia. doi: 10.1177/1471301217700742

P021 Accuracy of ultrasound guided caudal epidural needle placement

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Background: Caudal epidural injections are commonly used for surgical anaesthesia in children and for a variety of chronic pain conditions in adults. Successful delivery of medication requires a needle to be passed through the sacral hiatus and into the epidural space. Fluoroscopically guided caudal epidural injection is the current gold standard technique. Fluoroscopy, however, exposes patients to radiation and requires an intervention suite. An alternative is ultrasound guided injection, which avoids these drawbacks and has been shown to have 100% accuracy of needle placement into the sacral canal[1]. A literature review revealed that only one study involving 70 patients has examined the feasibility of ultrasound guidance, which possibly explains the lack of ultrasound adoption by many hospitals[1]. The aim of this study was to clarify whether this procedure can be performed safely under ultrasound guidance rather than fluoroscopy.
Method: This was a prospective study involving 50 consecutive patients who attended a district general hospital from May 2017 to November 2018 for a caudal epidural injection. Needle placement was performed under ultrasound by a musculoskeletal radiology consultant and then instantly confirmed with fluoroscopy.
Results: Accurate needle placement was achieved in 49 of 50 cases (98%) under ultrasound guidance. Conclusion This study increases the number of cases in the current literature by over 70% and confirms that accurate caudal epidural needle placement can be achieved under ultrasound guidance. This procedure is now done under ultrasound guidance in the hospital where the study was performed in.
1. Chen C.P., Tang S.F., Hsu T.C., Tsai W.C., Liu H.P., Chen M.J., Date E. and Lew H.L. (2004) Ultrasound guidance in caudal epidural needle placement. Anesthesiology; 101: 181 - 4

P022 Differences in calcaneal quantitative ultrasound measurements between adolescents participating in professional athlete training

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[1]University of Exeter; [2]Southampton Football Club; [3]Central School of Ballet; [4]South Dartmoor Community College

Background: There is increasing interest in measuring bone density in athlete populations to assess risk of stress fracture and following injury. Current reference data may not appropriately assess vulnerabilities in groups undertaking different elite sports due to the increased bone mass related to athletic participation[1]. The aim of this study was to compare the quantitative ultrasound (QUS) measurements of bone between professional and amateur academy footballers and professional ballet dancers.
Methods: 15 male amateur academy (16.9y±0.4), 25 male professional academy football players (18.3y±1.2) and 19 male ballet dancers (18.1y±1.0) were recruited. All had bilateral calcaneal QUS measurements. Means, standard deviations and a one way ANOVA were used to analyse the data (SPSS V25, IBM).
Results: Mean stiffness index was 117.6 ±18.7 for the amateur football players, 132.0 ± 13.1 for the professional academy players and 108.2 ±20.2 for the ballet dancers; these groups significantly differed from each other ($p<0.001$). The amateur footballers were significantly younger than the professional players and ballet dancers.
Conclusion: There are significant differences between groups participating in amateur and professional training in football. Ballet dancers have further reduced mean QUS measurements. While the amateur football players were on average 1.3y younger than the professional players and dancers, this was not sufficient to account for the differences measured. Professional academy players develop higher bone mass and current reference data may not be adequate to pick up those with bone

vulnerabilities in relation to training-load. Further research is needed to understand the lower QUS measurements in ballet dancers.

1. Vlachopoulos D, Barker AR, Williams CA, et al. The Impact of Sport Participation on Bone Mass and Geometry in Male Adolescents. Med Sci Sports Exerc 2017; 49(2): 317-26.

HEAD & NECK/NEURO

P023 4D Dynamic CT imaging of the eustachian tube - technique and future applications

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Already established in imaging of dynamic tracheal collapse, 320-slice multi-detector CT offers the unique opportunity to view the post nasal space airway and Eustachian tube ostium during swallowing using up to a 16 cm field of view and up to seven rotations in the same position. A 2,240 image dataset is acquired during coached swallowing at low dose and then merged into 2- and 3D movies. We aim to show, by volume rendered movies, the changes that occur in the orifice and the length of the Eustachian tube in a variety of benign pathologies of the post nasal space and tubes. We believe that nasal endoscopy and other conventional ways of tube demonstration have been unable to demonstrate the dynamic changes observed. The mean DLP was a modest 115.2 mGy.cm. The technique with dose minimisation and outcomes are discussed with reference to 12 cases studied over a 30 month period.

P024 Imaging features of Gorlin-Goltz Syndrome

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Background: Gorlin-Goltz syndrome (GGS) is a rare multisystemic disease with an autosomal dominant trait. Diagnostic radiology for assessment includes orthopantomogram, skull and chest radiographs and computed tomography scans. A 20-year-old male was diagnosed with GGS following a nine-year history of multiple jaw cysts and known hydrocephalus at birth. Initial presentation was at his dentist, which revealed two hard swellings on the buccal surface of the alveolar bone in the left mandible. An orthopantomogram revealed large radiolucent cystic lesions affecting the developing adult dentition. Further investigations revealed cysts in the maxilla whilst skull and chest radiographs showed falx cerebri calcification and multiple bifid ribs respectively. There was no known family history of the disorder. Following diagnosis, the patient underwent cyst enucleation. Histology confirmed odontogenic keratocysts. DNA testing revealed a significant patched (PTCH) gene defect indicative of a GGS diagnosis.
Purpose: To highlight the importance of a multidisciplinary approach to providing accurate diagnosis and better patient care. To highlight the importance of different radiologic imaging in GGS diagnosis, and to present the key radiological findings; this is important since early detection facilitates timely treatment.
Summary: This case demonstrates the diagnostic imaging-driven evaluation of a patient presenting with GGS and a past history of hydrocephalus, and that was subsequently treated via cyst enucleation. It focuses on how different members of the multidisciplinary team are needed in managing the dento-alveolar aspect, as well as of the importance of dermatological, orthopaedic and clinical geneticist involvement.

P025 A guide to the petrous apex for the general radiologist

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The petrous apex is routinely included on cross-sectional imaging of the skull. The paired triangular-shaped structures are directed toward the medial skull base. The petrous apex houses a number of vascular and neurological channels and has an intimate relation to the internal carotid artery, cavernous sinus and Meckel's cave. A variety of developmental, infectious, inflammatory, neoplastic and vascular pathologies may affect this region. The purpose of our review is to illustrate the anatomy of the petrous apex and clinically-important pathologies and normal variants which make the petrous apex an important review area to the general radiologist.

P026 Review of imaging in advanced head and neck cancer; compliance with NICE quality standard for use of PET-CT

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Background: Upper aerodigestive tract cancers commonly present late due to lack of symptoms in low-stage disease. Advanced imaging modalities, particularly positron emission tomography with CT (PET-CT), play a central role in accurate staging of advanced disease, contributing significantly to management planning and prognostication. This review was undertaken to evaluate use of the range of advanced imaging, both to measure local compliance with NICE quality standards, and to identify patterns of presentation, particularly in cases with advanced disease. Through retrospective review of 115 patients discussed in a specialist Head & Neck Multidisciplinary team meeting over a three month period in 2018, cases were identified that met the

criteria for PET-CT. This was to validate stage at diagnosis, and to review use of advanced imaging modalities, including, CT, MRI and PET-CT in this patient group.

Purpose:

- Provide a methodology for review of a NICE Quality Standard in Radiology
- Summarise the patterns of presentation in cases with high stage Head and Neck cancer
- Discuss imaging strategies in head and neck cancer, including case selection for PET-CT

Summary: The poster will describe our methodology for undertaking this review, including tabulated results for the range of imaging utilised. Alongside selected images, the patterns of presentation of advanced disease will be described. In addition to reporting our performance against the NICE Quality Standard, UKIO participants will be able to take away a handout to assist them to undertake a similar audit in their own centres.

P027 **Acute stroke referrals from Accident and Emergency (A&E): Are we scanning within the hour?**

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St Helen's and Knowsley

In the UK, stroke is a leading cause of death and disability[3]. Under the NICE guidelines[4] and The National Stroke Strategy[2] patients with acute stroke symptoms should be imaged in 'the next slot, or within one hour, whichever is sooner'. Treatment within the golden hour results in better outcomes and reduced mortality and morbidity rates[1]. The aim of this audit is to investigate radiology's role in the diagnosis of acute stroke.

A retrospective audit was undertaken on the CT head pathway for acute stroke patients attending A&E in September 2018. Our trust uses "urgency code 2" to highlight these patients. The audit explored if the trust was complying with the NICE guidelines, by examining the speed of the pathway from when the order was placed, to a formal report. 52 scans were performed under the urgency 2 code, 45 of these patients presented with acute stroke symptoms.

Below shows the mean value of data collected. Order being placed to patient attending: 11 Minutes From attending to post processing the scan: 12 Minutes Time taken to report from examination: 35 Minutes TOTAL: From order placed to report: 58 Minutes To conclude the trust is complying with the NICE guidelines. Further months are currently being audited to ensure the sample is more representative. The variance between in and out of hours reporting is an area for improvement. However, this audit did not consider scans incorrectly requested under the wrong codes, this will also be explored.

1. Advani, R., Naess, H. and Kurz, M. (2017). The golden hour of acute ischemic stroke. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine, 25(1), pp1-5.
2. Department of Health (2007). National Stroke Strategy: Department of Health – Publications
3. Gov.uk (2018). New figures show larger proportion of strokes in the middle aged
4. NICE (2008). Stroke and transient ischaemic attack in over 16s: diagnosis and initial management: Guidance and guidelines - NICE

P028 **The use of 4dct in highlighting the location of parathyroid adenoma and comparison with ultrasound/nuclear scintigraphy - our experience**

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Background: 4DCT is a relatively new modality of imaging being used to locate parathyroid adenomas. It is often used subsequent to Ultrasound and/or Nuclear Medicine (SestaMIBI) scans as a potential third modality of imaging to help provide further confirmation of the location of a suspected parathyroid adenoma[1]. This is particularly useful as increasingly surgeons are resorting to minimally-invasive surgery to resect these adenomas and 4DCT helps them carry out this surgery with increased confidence[2]. Sensitivity of Ultrasound and MIBI varies in the current literature but is generally between 75-80%[3]. Hence, this audit was carried out in our Trust to see if the use of 4DCT subsequent to Ultrasound and MIBI, increases sensitivity any further.

Methods: A retrospective audit was carried out that looked at all the cases of histologically-confirmed parathyroid adenoma in our Trust over the last five years, which had used 4DCT to pre-operatively help confirm the site. Using CRIS, we then established how many of these cases had also made use of Ultrasound and Nuclear scintigraphy beforehand. The percentage of true positives was then calculated to give us the sensitivity of the three methods combined.

Results: The combined use of Ultrasound, MIBI and 4DCT led to a sensitivity of 89% which is an increase of almost 10% compared to using only Ultrasound and MIBI.

Conclusion: A combination of Ultrasound, MIBI and 4DCT demonstrates almost 90% sensitivity in the detection of parathyroid adenoma and so we recommend that a combined approach be adopted by radiologists.

1. Christakis I. et al. (2017) The diagnostic accuracy of neck ultrasound, 4D-Computed tomographyand sestamibi imaging in parathyroid carcinoma. *Eur J Radiol.* ***95****, 82-88*
2. Wang T.S et al. (2011) Would scan, but which scan? A cost-utility analysis to optimize preoperative imaging for primary hyperparathyroidism. *Surgery* ***150****(6),1286-94*
3. Tublin M.E. et al. (2009) Localization of parathyroid adenomas by sonography and technetium tc 99m sestamibi single-photon emission computed tomography before minimally invasive parathyroidectomy: are both studies really needed? *J Ultrasound Med.* ***28****(2):183-90*

P029 **Repeatable accurate targeting of the lacrimal region for CBCT scanning**

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Cavendish Imaging Ltd

Introduction: CBCT is an effective modality at minimising radiation and maximising anatomical detail of the lacrimal region. However accurate targeting of the region of interest (ROI) is vital for the radiographer to perform the correct scan. This work aims to produce an effective scanning protocol, including all essential anatomy in the smallest field-of-view.
Method: Twenty maxillofacial scans (10 males and 10 females, 20-40 years old) were randomly selected. The ROI was defined as the area covering both lacrimal ducts, sacs and caniculi. Various FOVs were applied over this ROI. This was completed by two operators to evaluate inter-operator variability.
Results: The largest FOV tested was 17cm-diameter x5cm-height but, on all scans, both ducts fitted within a FOV of 6cm-diameter x5cm-height. A 4cm-diameter x5cm-high volume was too small. To target the 6cm-diameter x5cm-height ROI accurately over the whole of the lacrimal anatomy, the smallest scout size used was 8cm by 8cm. The AP scout was centred on the patient's MSP. The vertical limits of the 5cm-high volume were the nasal bone and the base of the nasal spine. Laterally, the 6cm-diameter FOV was centred onto the inner-canthus. Both operators enclosed the ROI in these scans. The DAP of 1280mGy.cm2 used for the largest scan was reduced to 685mGy.cm2 with the 6x5cm FOV. The voxel size was 125 microns.
Conclusion: Using 8cmx8cm scouts, followed by a 6cm-diameter x5cm-height volume precisely positioned achieves a repeatable CBCT scan of the lacrimal region. This anatomically-specific protocol is a valuable aid to the radiographer.

P030 **A pictorial review of hypoglossal nerve palsy and its causes**

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Hypoglossal nerve palsy is a relatively rare entity which has a characteristic radiological appearance, with unilateral intrinsic and extrinsic tongue muscle atrophy on the ipsilateral side of the causative lesion. Unilateral tongue atrophy should prompt the radiologist to search for pathology along the anatomical path of the ipsilateral hypoglossal nerve from the medulla oblongata to the oral cavity. It is therefore essential that the radiologist is familiar with the anatomy of the hypoglossal nerve in order to scrutinise its entire course for the causative lesion. MRI is the preferred modality for imaging a patient with hypoglossal nerve palsy as it allows both excellent visualisation of the unilateral tongue atrophy and identification and characterisation of the causative lesion. We review the segmental anatomy of the hypoglossal nerve, and present a pictorial review of our case series of hypoglossal nerve palsy, classified according to anatomical site.

Thompson EO & Smoker WR Hypoglossal nerve palsy: a segmental approach.(1994) Radiographics 14(5)

P031 **The implementation and benefits of multidisciplinary cone beam CT reviews for head and neck radiotherapy**

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East Suffolk and North Essex NHS Foundation Trust

Background: At Colchester the position of head and neck patients is verified using online kV-kV bony match and check of neck flexion. Recently the department implemented weekly cone beam CT (CBCT) imaging to provide information about internal anatomy and external contour changes. The CBCT is acquired after the online match has been completed.
Method: The CBCTs are reviewed offline by radiographers and physicists with a view to identify problems such as change in contour due to weight loss, change to tumour in response to treatment or swelling caused by oedema or chemotherapy. This identifies those that need clinician review due to anatomical changes or further dosimetric calculation to assess the impact of shape change. All patients are reviewed by a clinician half way through treatment.
Results: We provide examples of issues identified by this process that resulted in a modification to the patient's treatment which may not have been spotted using kV imaging alone. These include significant tumour growth identified at the first fraction resulting in treatment suspension pending a new treatment plan and a reduction in tumour size as treatment progressed which resulted in a replan. We also show how dosimetric calculations using the CBCT dataset can be used to determine whether a change in patient contour due to weight loss is significant enough to merit further action.
Conclusion: The implementation of CBCT has facilitated the identification of internal anatomical changes that cannot be identified using kV imaging and has provided data for dosimetric assessment of shape change.

P032 **Our experience of head and neck VMAT commissioning**

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Background: The current technique implemented in the department for H&N patients is IMRT. This was due to the limited VMAT capacity. IMRT plans include 5-9 fields resulting up to 18 subfields.
Since the capacity issue was resolved it was decided to move to VMAT which provides shorter time on the machines, comparable PTV coverage, better OARs sparing and less MUs[1,2].

Method: 24 IMRT H&N patients, with varying laterality, were chosen to be re-planned. The scans were acquired by the GE LightSpeed and plans were produced with Varian's Eclipse v.13.7 using the AAA algorithm. The VMAT plans were qualitatively and quantitatively evaluated against the IMRT plans based on the Conformity Index (CI), MUs, PTV coverage and OARs sparing. The dosimetric accuracy of the VMAT delivery was validated with PTW's 1500 2D ion chamber array, with γ-analysis criteria of 3%/3mm and 2%/2mm.
Results: The plans selected for valuation had adequate PTV coverage and OAR sparing. The mean CI was found to be 0.519 for VMAT against 0.520 for IMRT. The MUs for VMAT were ~36.50% lower for bilateral and ~15.47% higher for unilateral patients. The pass rates for 3%/3mm were (97.5±2.9)% and for 2%/2mm (90.6±6.7)%.
Conclusion: VMAT plans were found to provide similar or on some cases better results on PTV coverage and OARs sparing, especially brainstem and spinal cord. VMAT QA results were within 95% pass rate for 3%/3mm local gamma assessment (departmental criteria). The technique was commissioned as it was found clinically appropriate for implementation.

1. Ezzell, G.A., Galvin, J.M., Low, D., Palta, J.R., Rosen, I., Sharpe, M.B., Xia, P., Xiao, Y., Xing, L. and Yu, C.X., 2003. Guidance document on delivery, treatment planning, and clinical implementation of IMRT: report of the IMRT Subcommittee of the AAPM Radiation Therapy Committee. Medical physics, **30**(8), pp.2089-2115
2. Stieler, F., Wolff, D., Schmid, H., Welzel, G., Wenz, F. and Lohr, F., 2011. A comparison of several modulated radiotherapy techniques for head and neck cancer and dosimetric validation of VMAT. Radiotherapy and Oncology, **101**(3), pp.388-393

P033 Knowledge-based planning for head and neck radiotherapy treatment planning

Joanne White [1]; Matthew Jones [2]; Richard Powis [1]; Andrew Bird [1]; Gareth Baugh [2]; Gareth Webster [1]
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Background: The presence of multiple critical organs at risk (OAR) proximal to treatment targets in head and neck (H&N) cancer, often results in complex radiotherapy treatment plans trading-off radiation dose to the tumour and nearby OARs. Plan quality and consistency can vary between and within radiotherapy centres, negatively impacting tumour control and OARs. Knowledge-based planning (KBP) is a proposed solution to increase plan consistency. We aimed to develop a local KBP tool for H&N radiotherapy treatment planning, investigating its impact on plan quality.
Method: Historical data from two radiotherapy centre RayStation databases were analysed using in-house IronPython scripts. Primary analysis focused on modelling achievable parotid gland dose plotting overlap between parotids and target against mean parotid dose[1,2]. This process was repeated for spinal cord and brainstem using minimum OAR-target separation and maximum OAR dose. Experienced planners participated in a blinded review of several plans with varying levels of agreement between current and modelled dose.
Results: KBP models identified several potential outlying plans based on OAR sparing; these same plans were identified in the blinded planner review as having sub-optimal OAR sparing. Results for spinal cord suggested that a more complex model is required to predict achievable cord doses. Statistical comparison yielded similarity between plans from the two centres.
Conclusion: KBP was successfully employed to identify H&N plans with sub-optimal OAR doses which could benefit from replanning. These findings prompted a review of local planning practices. KBP can be useful for cross-institutional plan evaluation.

1. Moore, K.L., Brame, R.S., Low, D.A., and Mutic, S. (2011). *Experience-based quality control of clinical intensity-modulated radiotherapy planning*. Int. J. Rad. Onc. Bio. Phys. **81**(2), 545-551
2. Powis, R., Bird, A., Brennan, M., Hinks, S., Newman, H., Reed, K., Sage, J., and Webster, G. (2017). *Clinical implementation of a knowledge based planning tool for prostate VMAT*. Rad. Onc. **12**, 81

P034 An evaluation of the information on Human Papilloma Virus (HPV) given to patients diagnosed with HPV positive head and neck cancers

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Background: Incidence rates of Human Papilloma Virus (HPV) positive head and neck cancer (HNC) are increasing. There is a paucity of evidence on available patient information and education of health professionals to provide information following such a diagnosis, which is widely stigmatised as a sexually transmitted disease. Patient information was explored in a survey of health professionals involved in the care of patients with HNC.
Method: An online questionnaire was distributed to health professionals through the British Association of Head and Neck Oncologists website. The questionnaire explored the theme of patient information for HPV associated HNC and the knowledge and confidence of health professionals in providing patients with information.
Results: Twenty-four health professionals from six professions and five UK cancer alliances completed the questionnaire. On a scale of one to ten, mean confidence in providing HPV related information was 5.8. Forty-eight percent of participants did not know whether patients were routinely provided with information regarding HPV following a positive diagnosis; twenty-seven percent indicated that specific information was available within their trust, however fifty percent were unaware of the content of the information leaflets available. Fifty-nine percent of respondents stated that it was not documented when patients received information on their HPV diagnosis.

Conclusion: Inconsistencies exist in patient information on HPV available across the participating Cancer Alliances. A need was identified for the education of health professionals involved in the care of patients with HPV positive cancer. More effective record keeping of the information given is also required.

P035 **Characterisation of multiple sclerosis on the brain magnetic resonance images using texture analysis**

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Multiple Sclerosis (MS) is the most common chronic autoimmune demyelinating inflammatory disease of the central nervous system, which can be diagnosed by magnetic resonance imaging (MRI) by evidence of multiple patches Wight of scar tissue in different parts of the central nervous system on T1 weighted images, T2 weighted image, and FLAIR. Texture analysis evaluates interpixel relationships that generate characteristic organizational patterns in an image, many of which are beyond the ability of visual perception.

The aim of this study was to characterize MS plaques in MR images using Texture analysis which facilitate pattern recognition that might not visible to the human eye. This study is an analytical study, which conducted at Modern medical Centre and Omdurman military hospital in a period from December 2015 to March 2018. The sample of this study consisted of 200 MR brain (T1, T2, and FLAIR) images selected conveniently from a patient with MS. Computer-based software Interactive Data Language (IDL) and stepwise linear discriminant analysis were used to generate a classification score and to select the most discriminant features that can be used in the classification of normal and abnormal brain tissues.

The results reveal that the MS areas were very different from the CSF, bones, white matter and gray matter. However, plaques can be identified and classified using textural analysis with high sensitivity of 90.9% for first order statistics and 96.9% using higher order statistics. In conclusion, the textural feature can be used with some confidences to pinpoint the areas of MS in brain images. Generation of image processing unit is recommended to decrease the misdetection rate.

1. Fazekas, F., Barkof, F., Filippi, M., Grossman, R.I., Li, D.K.B., McDonald, W.I., McFarland, H.F., Patty, D.W., Simon, J.H., Wolinsky, J.S., Miller, D.H.: The contribution of magnetic resonance imaging to the diagnosis of multiple sclerosis. Neur. 53, 44-456 (1999)
2. Barnett MH, Prineas JW (2004) Relapsing and remitting multiple sclerosis: pathology of the newly forming lesion. Ann Neurol 55: 458–468
3. Gay F (2007) Bacterial toxins and Multiple Sclerosis. J Neurol Sci 262: 105–112
4. Allen IV, McKeown SR. A histological, histochemical and biochemical study of the macroscopically normal white matter in multiple sclerosis. J Neurol Sci 1979;41:81-91
5. Griffin CM, Dehmeshki J, Chard DT, et al. T1 histograms of normalappearing brain tissue are abnormal in early relapsing-remitting multiple sclerosis. MultScler 2002; 8:211–216
6. Davies GR, Tozer DJ, Cercignani M, et al. Estimation of the macromolecular proton fraction and bound pool T in multiple sclera sis. MultScler 2004; 10:607–613.2
7. Bonzano L, Roccatagliata L, Mancardi GL, Sormani MP. Gadolinium-enhancing or active T2 magnetic resonance imaging lesions in multiple sclerosis clinical trials? MultScler. 2009; 15: 1043–1047. doi: 10.1177/1352458509106610 PMID: 19570818
8. Haralick RM, Dinstein I and Shanmugan K. Textural features for image classification. IEEE Trans Syst Man Cybern. 1973; SMC-3: 610–621
9. ang X. Texture information in run-length matrices. IEEE Trans Image Process. 1998; 7: 1602–9. doi: 10.1109/83.725367 PMID: 18276225
10. G. Castellano, L. Bonilha, L. M. Li, and F. Cendes, Texture analysis of medical images, Clinical Radiology, vol. 59, no. 12, pp. 1061–1069, 2004
11. M. M. Galloway, Texture analysis using gray level run lengths, Computer Graphics and Image Processing, vol. 4, no. 2, pp. 172–179, 1975
12. Chu A., Sehgal C.M., Greenleaf J. F., Use of gray value distribution of run length for texture analysis. Pattern RecognitionLetters, vol. 11, n° 6, p. 415-419, 1990
13. Galloway M. M., Texture analysis using grey levelrun lengths, Computer Graphics Image Processing,vol. 4, p. 172-179, July, 1975
14. Haralick R.M., Shanmugam K., Dinstein I., Textural features for image classification, IEEE Transactionson Systems, Man and Cybernetics, vol. 3, p. 610-621, 1973
15. Xu D., Kurani A., Furst J., Raicu D., RunLength Encoding For Volumetric Texture, International Conference on Visualization, Imaging and Image Processing (VIIP), p. 452-458, 2004

P036 **Audit of adequacy of clinical information provided on electronic requests for MRI brain for Hypoxic Ischemic Encephalopathy**

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Background: Hypoxic Ischemic Encephalopathy (HIE) is one of the most common causes of cerebral palsy, with an incidence of 2 to 9 per 1000 live births[1]. MRI (magnetic resonance imaging) is the gold standard imaging technique for suspected HIE[2]. Accurate assessment of the imaging depends on its correlation with clinical history. Our QIP aimed to identify if adequate clinical information was being provided on the requests to diagnose HIE.

Method: A retrospective analysis of MRI requests from CRIS software was done to evaluate if requests made for MRI head for HIE entailed the following details: Gestational age at birth, date, duration and severity of hypoxic event and if therapeutic cooling was given. A total of 40 requests were studied, requested over three years (04/2015 to 04/2018).

Results: Analysis revealed that only half of the requests provided the gestational age at birth, date and duration of the hypotensive episode. Only one-sixth of the requests contained the severity of the hypoxic insult however, most of the requests specified whether or not therapeutic cooling was given.

Conclusion: Poor compliance was noted in providing details needed to facilitate accurate interpretation of images. Commonly identified reasons included lack of awareness among referring clinicians about the need to include above mentioned

information and limited character space on the electronic request. Presentation of the audit findings at the neonatal MDT meeting and discussion with the clinicians enforced the need to include clinical details. Educational posters were displayed in the neonatal wards to facilitate change and improve practice.

1 .Â Dodd KL, Hull J: Falling incidence of hypoxic-ischaemic encephalopathy in term infants.Â Br J Obstet Gynaecol1992; 99: 386â€"391
2. Barkovich AJ. The encephalopathic neonate: choosing the proper imaging technique.Â AJNR Am J Neuroradiol1997; 18: 1816â€"1820

P037 A rare case of an intracranial germinoma with granulomatous reaction mimicking a neuroinflammatory lesion

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Tumours of the pineal gland are extremely rare, comprising less that 1% of all intracranial tumours[1]. Of these lesions the most common are pineal germinomas, which account for 50% of cases and are typically seen in males in the 1st and 2nd decades of life cases[2].

Intracranial germinomas are typically midline lesions which are more likely to be found within the pineal region than any other intracranial locations. While the gonadal and extra-gonadal variants classically demonstrate granulomatous inflammation, this is rarely seen with intracranial germinomas and when present can mimic neuro-inflammatory lesions such as sarcoidosis. Thus pineal germinomas associated with granulomatous reactions can pose a significant diagnostic and clinical challenge.

We present the case of a young gentleman who presented with right upper limb ataxia, parasthesia and squint. An MRI head demonstrated a contrast-enhancing lesion in the left midbrain associated with granulomatous reaction. A surgical biopsy was initially avoided due to the eloquence of this area. Interval imaging revealed some reduction in the size of the mass following steroids. However, there was subsequent clinical and radiological progression and a stereotactic biopsy was performed. Histological analysis of the lesion confirmed it to be a germ cell tumour with an intense granulomatous reaction. This case highlights the importance of suspecting germinomas with all intracranial midline lesions associated with granulomatous reaction. When there is diagnostic uncertainty and atypical imaging features, histological analysis should be undertaken where possible. This presentation will outline the typical and atypical radiological appearances of intracranial germinomas.

1. Al-Hussaini, M., Sultan, I., Abuirmileh, N., Jaradat, I., Qaddoumi, I. (2009) Pineal gland tumors: experience from the SEER database. J Neurooncol. **94**(3), 351-358
2. Seilanian Toosi, F., Aminzadeh, B., Faraji Rad, M., Nekooei, S., Nahidi, M., Keykhosravi, E. (2018) Pineal and Suprasellar Germinoma Cooccurence with Vertebra Plana: A Case Report. Brain Tumor Res Treat. **6**(2):73-77

P038 Vessel wall MRI to identify vulnerable atherosclerotic plaque as a cause of acute ischaemia

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Background: A 61-year-old man presents with alexia, dysphasia and ataxia. CT showed hypoattenuation consistent with acute infarction in the posterior circulation territory. MRI showed diffusion restriction. CTA showed only a non-stenotic, ulcerated plaque of the right V4 vertebral artery (VA)(Figure 1). Doppler, echocardiogram, and 24hr ECG were normal.

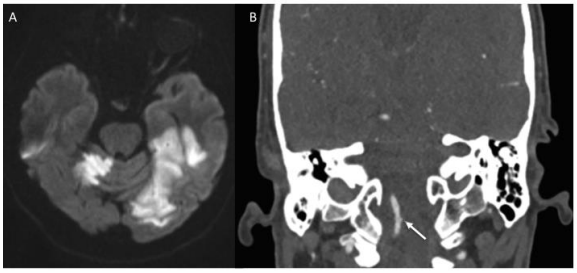

Figure 1. Neuroimaging (Diffusion Weighted MRI, CTA) following acute neurological symptoms DWI demonstrating acute ischaemic lesions in the right cerebellum, left parahippocampal and fusiform gyri and left occipital lobe (A). CTA demonstrating subtle irregularity of the right V4 VA (B). Vessel wall MRI demonstrated prominent eccentric enhancement of the V4 segment, correlating with the CTA abnormality, and consistent with atherosclerotic plaque (Figure 2). No abnormal intracranial enhancement was seen elsewhere.

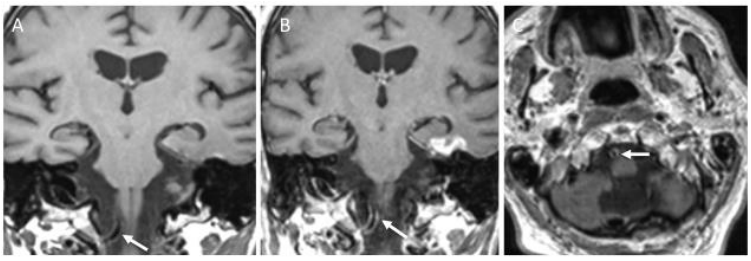

Figure 2. Vessel wall MRI imaging Blood suppressed vessel wall MRI coronal T1 weighted pre contrast (A), coronal T1 weighted (B) and axial T1 weighted (C) post contrast demonstrating eccentric enhancement of the medial wall of the right V4 segment VA. Vessel wall MRI can help identify active disease processes affecting the vessel wall including non-stenotic, atherosclerotic plaque and vasculitis (1,2). Purpose and summary: This case will highlight the importance of MRI black blood imaging techniques to identify a cause of acute ischaemia that is not evident on traditional imaging sequences. Understanding the pathophysiology and being able to apply this to patients will aid diagnosis and help tailor management. Overall the patient will benefit from accurate diagnosis and prevention of further acute ischaemic events.

1. Bhogal P, Navaei E, Makalanda L, Brouwer P, Sjostrand C, Mandell D and Lilja A. Intracranial vessel wall MRI. Clinical Radiology 2015; 71. http://dx.doi.org/10.1016/j.crad.2015.11.012 2. Yuan J, Usman A, Das T, Patterson A, Gillard J, Graves M. Imaging Carotid Atherosclerosis Plaque Ulceration: Comparison of Advanced Imaging Modalities and Recent Developments. 2016; 15. http://dx.doi.org/10.3174/ajnr.A5026

P039 Hippocampal help - the seahorse made simple

Sian Ebden; Stuart Baines; Shawn Halpin; Rhian Rhys
Royal Glamorgan Hospital

Its resemblance to a seahorse has earned the medial temporal lobe its name of the hippocampus (hippos - horse; kampos - sea monster). We review its complex anatomy and present a wide spectrum of hippocampal pathologies and describe how they can be recognised on CT and MRI along with their potential clinical presentations.

P040 What not to MISS on a CT head scan

Stuart Baines; Sian Ebden; Rhian Rhys; Carys Jenkins; Shawn Halpin
Cwm Taf University Health Board

Most of us report CT Heads on a daily basis. Extracranial pathology is often retrospectively visible. Remembering to check outside 'the box' may identify important incidental pathology before it becomes clinically apparent. We describe a simple method of review using the acronym MISSS. We will reveal the method in the presentation.

P041 Stuck in the middle

Stuart Baines; Sian Ebden; Shawn Haplin; Rhian Rhys
Cwm Taf University Health Board

Often underutilised, the sagittal multi-planar reformat (MPR) offers an optimal view of vital structures including the brainstem, hypothalamus and paramedian forebrain. We present several cases where the diagnosis of degenerative brain conditions is most easily appreciated on CT and MRI by studying the sagittal plane.

Silsby, M et al (2017) The midbrain-to-pons ratio distinguishes progressive supranuclear palsy from non-fluent primary aphasias. European Journal of Neurology. 24, 7: 956-065

P042 Imaging features in an adult with maple syrup urine disease

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Background: Maple syrup urine disease (MSUD) is an autosomal recessive metabolic disorder that results in a pathological elevation of leucine, isoleucine, and valine amino acids that can lead to cerebral oedema. A 17-year-old female presented with reduced and painful vision, headaches lasting three days (exacerbated on bending forwards) and proptosis for over a year. On initial examination, the patient had mild to moderate papilloedema. A previous history of neonatal MSUD and Henoch-Schönlein purpura were noted. Brain MRI revealed widespread signal abnormalities through the cerebral and cerebellar hemispheres with significant associated generalised hemispheric swelling. Swelling involved the subcortical U fibres through the deep white mater of all lobes, as well as through the thalami and subthalamic nuclei. There was also crowding around the foramen magnum. To prevent neurological damage, the patient was commenced on IV 3mL/kg 3 % saline with acetazolamide. Food intake was carefully monitored and MSUD anamix junior, leucine exchanges, isoleucine and valine supplements were provided.
Purpose: To discuss the imaging features of MSUD in a 17-year-old female. To highlight the importance of close monitoring and diagnostic imaging in the management of MSUD. To review the literature on the potential negative and life-threatening downstream clinical manifestations of undertreated MSUD.
Summary: This case presents an adult patient diagnosed with neonatal MSUD who, despite receiving appropriate therapeutic treatment, manifested with widespread hemispheric swelling, intramyelinic and vasogenic interstitial oedema. Clinical management and radiological findings will be discussed.

P043 Changing the standard in the imaging of glioblastoma

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Glasgow Caledonian University

Background: Gliomas are tumours originating from glial or within the central nervous system. They are divide into four grades and the glioblastoma multiforme (GBM), or grade IV, is the most aggressive and common, with high morbidity and mortality[4]. An early diagnosis is, usually, difficult since there is no screening test for brain tumours and majority of the symptoms are related to the advanced phased of the tumours (e.g. seizures, memory loss, personality changes, losses in movement or sensations, cognitive impairments, language dysfunctions)[5]. Neuro-radiological imaging, in particular MRI, provide morphological information at high resolution and the advanced techniques have improved the results in the grading of the GBM, by adding biological and functional information[5-1]. Although, these techniques are not a substitute for a biopsy. The main improvement in the use of diagnostic imaging has been done for the treatment planning. Due to GBM complexity, the standard treatment (surgery follow by radiotherapy combined with chemotherapy) has been essentially unchanged for many years,

despite the great attention given to this tumour[4]. However, the use of imaging techniques, such as MRI functional and DTI, have improved the treatment response by providing information used to plan a more precise radiotherapy treatment and/or a more complete resection[1].
Purpose: An update of basic knowledge of GBM is necessary since recent developments in the use of diagnostic techniques have improved diagnosis and treatment.
Content: This poster will focus on presenting the multiple roles of MRI techniques in the diagnosis, treatment planning and response assessment for GBM.

1. Arribas Alpuente, L., Menéndez López, A. & Yayá Tur, R. Clin Transl Oncol (2011) 13: 240. https://doi.org/10.1007/s12094-011-0648-3
2. DUFFAU H.; 2010. Pre-surgery Brain mapping in neuro-oncology: what is the future?. Future Neurology 2010 5:3, 433-448
3. HOLLAND, E. C., 2000. Glioblastoma multiforme: The terminator. Proceedings of the National Academy of Sciences of the United States of America. 97(12), pp.6242-6244. Available from: 10.1073/pnas.97.12.6242
4. NANDU, H., WEN, P.Y. & HUANG, R.Y., 2018. Imaging in neuro-oncology. Therapeutic Advances in Neurological Disorders. 11
5. SARKAR, A.&CHIOCCA, E.A. 21 - Glioblastoma and malignant astrocytoma. In: Brain Tumors Elsevier Ltd, pp. 384-407

P044 Is Meckel's cave routinely evaluated by northern deanery radiology trainees?

Amar Chotai
Royal Victoria Infirmary

Background: Meckel's cave is a paired CSF-filled pouch in the posteromedial aspect of the middle cranial fossa. This study was undertaken after a subtle right Meckel's cave abnormality was missed on an MRI Brain by a trainee and consultant, with a history of prostate cancer and right facial numbness provided. This was discovered after a CT Brain examination, performed 3 months later, demonstrated a large, enhancing right cavernous sinus mass.
Aims: 1) Whether or not trainees are routinely evaluating Meckel's cave when reporting an MRI Brain examination; 2) whether or not trainees have knowledge about the rare possibility of intracranial metastases from prostate cancer; and 3) whether or not trainees have knowledge regarding the anatomy and function of the trigeminal nerve.
Materials and methods: Trainees (ST2 - ST5) were shown the axial T2 sequence of the brain in 4 stages (two minutes/stage): no history available (Stage 1); history of prostate cancer provided (Stage 2); and further history of right-sided facial numbness provided (Stage 3). If the correct diagnosis was not made, the trainee was asked to correctly identify Meckel's cave (Stage 4).
Results: 37 trainees participated in the study, with 10 correctly identifying the abnormality: none at Stage 1, one at Stage 2 and nine at Stage 3. Of the 27 trainees unable to identify the abnormality, nine subsequently identified Meckel's cave correctly (Stage 4). Conclusion: In conclusion, this study highlights that trainees are not routinely evaluating Meckel's cave and that the vast majority were unsure about.

BREAST

P045 The National Breast Imaging Academy: Progress update

Caroline Parkin; Mary Wilson; Megan Bydder; Soujanya Gadde; Lyndsay Kinnear; Paula Stavrinos
NBIA

The national breast imaging workforce is in crisis. Demands on the service continue to grow at a time when insufficient staffing levels are compounded by staff originally trained at the inception of the National Breast Screening Programme retiring en mass. Units are consequently struggling, merging and closing. In response to the problem, the National Breast Imaging Academy (NBIA) team developed a business case detailing a national plan to future proof the workforce. It covered strategies including (1) apprenticeships, (2) proposals for all tiers of radiographic staff (3) the development of a credential for Breast Clinicians and the recruitment of a national cohort of trainees to increase Breast Clinician numbers nationally, (4) the introduction of a national network of breast radiology fellowships, (5) the development of an "On Line Academy" providing technology enriched learning resources and (6) a new purpose built building in Manchester to act at the support centre and host site for multiple aspects of the proposed national plan. In February 2018 Health Educational England agreed to partially fund revenue aspects of the bid. The NBIA has since been collaborating with stakeholders to maintain momentum and make progress where possible. In this poster we describe our progress to date including how training pathways and resources have been developed, details of 2019 recruitment drives and a progress update in relation to capital funding. This initiative illustrates what can be achieved when a workforce in crisis comes together to find a way forward through collaboration and innovation.

P046 Invasive lobular carcinoma in a supernumerary breast: A case report

Harriet Conley; Sarah Doyle; Stephanie Jenkins
Plymouth Hospitals NHS Trust

Background: Breast cancer is the commonest cancer in the UK. Whilst the incidence of supernumerary breast tissue is reported as 0.2-6% of the population[1], a diagnosis of primary breast cancer in a supernumerary breast is rare, particularly in a site remote from the axilla. Breast cancer prognosis is strongly linked to early detection and treatment, and imaging has a crucial role in the appropriate pre-treatment work-up of this rare but important clinical entity. This is illustrated by our case of a 75-

year-old female with an invasive lobular cancer originating in an inframammary supernumerary breast, with ipsilateral axillary nodal involvement.
Purpose: Learning outcomes include imaging considerations based on the unusual anatomical site, as well as the histological subtype of the tumour. Staging of breast cancer includes assessment of the relevant locoregional nodes, which is affected by the anatomical site, and influenced our staging plan with a CT of the chest/abdomen/pelvis performed. Lobular carcinoma has an increased prevalence of multifocality and multicentricity. In view of this and the unusual presentation breast MRI was also used, in addition to standard breast imaging modalities. A multimodality approach to evaluate supernumerary tumours with involvement of the MDT is recommended.
Summary: An overview of the clinical presentation, radiological imaging (images from assessment and staging included), surgical and oncological management is presented. Relevant learning points are detailed in each section, with an emphasis on the role of imaging and the breast MDT.
1. Rouitot, T., Marchal, C., Verhaeghe, J.L., Depardieu, C., Netter, W., Weber, B., Carolus, J.M. (1998) Breast carcinoma located in ectopic breast tissue: a case report and review of the literature. *Oncol Rep*. **5**, 413-417.

P047 **Use your brain (window); breast cancer on CT**
Nicholas Ridley; Karen Litton; Michelle Taylor
Great Western Hospital
Background: CT is used commonly to stage Breast Cancer. Breast cancers are not infrequently seen incidentally on CT scans. They may represent the cause for metastatic disease or represent an opportunity for early diagnosis. Breast cancers often enhance but this is lost in the breast density on standard CT windows. We noticed that putting the scans onto brain windows (HU w80 l 40) made the cancers stand out and even helped with multifocality.
Purpose: This poster will highlight the value of using brain windows as a simple aid to increase the conspicuity of breast cancer. This is of value both on the staging scans and serendipitous pickup of cancers.
Summary: We illustrate with multiple examples the value of CT brain windows to see the extent of disease correlated with mammographic and MR findings.
1. Liesbeth J et al (2011) Is contrast enhancement required to visualize a known breast tumor in a pre-operative CT scan? Radiotherapy and Oncology. Vol 100, issue 2, 271-275

P048 **Breast MRI - it is not just all breast**
Tamara Suaris; Linda Metaxa; Philip Dilks; Shefali Dani
St Bartholomew's Hospital NHS Trust
Bckground: Currently, annual breast MRI screening is offered to a selected group of high risk women in accordance with NHS Breast Screening Programme (NHSBSP) protocols. Standard post contrast breast MRI sequences are performed in dedicated breast coils, as per technical standards of NHSBSP.
Purpose: We are a high volume breast MRI screening centre. We would like to highlight incidental non breast pathologies that we have come across whilst reporting breast MRI, some of which were clinically relevant to the patient. These include lung nodules, AV malformation/other chest wall lesions, thoracic aortic aneurysms, bone metastases, liver lesions and pleural effusions.
Summary: We would like to present an educational pictorial review of incidental non breast pathologies identified during the reporting of surveillance breast MRI in high risk screening patients along with the clinical significance of these lesions, helping the breast radiologist to have a more holistic approach when reporting a breast MRI.
Lets go out of the Breast: Prevalence of Extramammary Findings and their characterisation on Breast MRI : European Journal Of Radiology

P049 **Capacity, confidence, care ~ using artificial intelligence and machine learning to support breast screening**
Simon Harris [1]; Hugh Harvey [2]; Sam Hawkins [3]; Jacqueline Moxon [4]; Joanathan James [5]; Becky Roberts [6]
[1]; [2]Kheiron Medical; [3]ASI Data Science; [4]EMRAD; [5]Nottingham Breast Institute; [6]United Lincs Breast Screening Service
The national breast screening programme currently invites women aged 50-70 to attend for a mammogram every 3 years. These images are interpreted by two healthcare professionals - so called "double-reading". This is the best way of picking up cancers whilst keeping the number of women who are called back for further assessment to a minimum. Readers are usually specialist breast radiologists (imaging doctors) or radiographers with advanced training. However, there is a national shortage of specialist breast radiologists, and the Royal College of Radiologists predicts that this will increase over the next 5 years.
Within our test bed, we will initially be working with two of our seven Trusts which make up our consortium. One has a strong reputation for high cancer detection and low recall rates, but this is very costly in terms of staff resources. The other is also a high performing service but suffers with long-term workforce recruitment issues. The Trust are taking the pragmatic and forward-thinking approach of up-skilling a number of their reporting radiographers to bridge the skills gap left by the absence of Breast Radiologists in the region.

If AI plus a single human reader could deliver the same results, this would have significant implications for the future of the screening workforce, both our testbed Trusts and throughout the UK. In the future, AI may be able to replace both readers, leaving specialists to utilise their skills in other areas.

P050 **The ratio of length versus width of ultrasound masses in young women with breast disease. A possible guide to the decision to biopsy.**

Chris Loughran
East Cheshire NHS Trust

Aim: Breast masses in young women are common and current guidance is that these should be biopsied when aged over 25. However, the majority prove to be benign, commonly fibroadenomas (FA) It was our impression that longer and thinner masses were almost certainly benign whereas with more rounded masses the diagnosis was less certain. We conducted a retrospective study recording the length and width of breast masses to determine whether the ratio could provide additional diagnostic guidance around the need for biopsy.
Methods: Patients aged 35 years or younger who had undergone ultrasound guided breast core biopsy over a four year period were reviewed. Dimensions and the ratio of length versus width of biopsied masses were recorded. These were correlated with the histology.
Results: 101 patients 35 years or younger were reviewed. Twelve patients had breast malignancy. Of these, 10 (83%) had a ratio of 1.5. or less. With fibroadenomas only 7 of 58 (15%) patients had a ratio of 1.5. or less. Of 12 patients where the ratio was 2.6 or greater, 1 patient - with recurrent tumour proved to have a malignant diagnosis.
Conclusion: A decision to undertake a Core biopsy may be influenced by the abnormality dimensions. The more rounded a mass the more malignancy is likely. The more oval a lesion the abnormality is more likely to be benign.

P051 **The use of quality improvement methodology to implement digital breast tomosynthesis within a breast imaging department**

Ruth Fry
Great Western Hospitals NHS Foundation Trust

Background: Digital breast tomosynthesis (DBT) is an emerging breast imaging technology that was approved for use within the NHS Breast Screening Programme in 2014 (NHSBSP, 2014). Scheduled equipment replacement within a breast imaging department enabled DBT to be introduced in addition to Full Field Digital Mammography; the current standard used within the NHS Breast Screening Programme (Department of Health, 2017). However, within healthcare settings it has been shown that many quality improvement (QI) initiatives fail to be implemented or prove unsustainable following initial implementation (Issen et al., 2018). To overcome the challenges associated with implementing the DBT QI initiative, a programme theory was developed and shared with stakeholders, resulting in increased staff engagement and successful delivery of the change (Reed et al., 2014).
Purpose: Using the implementation of digital breast tomosynthesis as a case study, this poster will present the quality improvement techniques employed to aid future innovators. It will introduce novice innovators to a quality improvement methodology employing programme theory, driver diagrams, RASCI matrix, pathways to outcomes models, long term success tool, stakeholder mapping, health economic assessment and measurement for success. Many health care professionals attempt to deliver improvements in clinical practice; an understanding of improvement science should enable greater success.
Content: This poster will include many of the programme theory models developed during the project to implement DBT. A discussion of how these techniques worked in practice within the breast imaging department QI initiative will be included with signposts to QI resources available for health care professionals.

1. Department of Health (2017) NHS public health functions agreement 2017-18, Service specification no.24 Breast Screening Programme.
2. Issen, L., Woodcock, T., McNicholas, C., Lennox, L. and Reed, J.E. (2018) Criteria for evaluating programme theory diagrams in quality improvement initiatives: a structured method for appraisal, International Journal for Quality in Health Care, **30**(April), 508-513
3. NHSBSP (2014) Practical evaluation of Hologic Selenia Dimensions digital breast tomosynthesis system, (July)
4. Reed, J.E., McNicholas, C., Woodcock, T., Issen, L. and Bell, D. (2014) Designing quality improvement initiatives: The action effect method, a structured approach to identifying and articulating programme theory, BMJ Quality and Safety, **23**(12), 1040-1048

P052 **Is there gender inequality in breast imaging?**

Philippa Lee [1]; Amani Chowdhury [2]; Karen Chan [1]; Aia Mehdi [1]; Seema Rodwell-Shah [1]
[1]Hillingdon Hospital; [2]Imperial College London

Background: Breast cancer is the one of the leading causes of cancer-related deaths in women in the UK. Contrastingly, male breast cancer (MBC) represents <1% of all breast malignancies[1]. Timely diagnosis of MBC is key as patients often present with more advanced disease[2]. However, the rarity of MBC and often the delay in patient presentation can inevitably delay the diagnosis. It is therefore unsurprising that studies show mortality rates of male breast cancer to exceed testicular cancer[3]. The most common presentation of male breast lumps (MBL) is gynaecomastia. However, there is no standardised gender-specific recommendation for the assessment of MBL. There is wide variation in practice across the UK and even within our

department. We aim to map an assessment and diagnostic pathway and audit our current practice for men presenting with MBL.
Methods: Retrospective analysis of first attendance of 200 men in breast clinic in a district general hospital was performed. The clinical indication and inclusion of a "P-score", imaging performed and imaging results were recorded. For patients who underwent biopsy, histology was reviewed.
Results: Preliminary results show that over 3/4 of cases presented with gynaecomastia. The majority underwent US only, 14% had both US and mammography. Of these, a "P score" ≥3 was seen in only 20%; it is unclear why the rest received both.
Conclusions: There is wide variation in practice within our department and as a result of this audit, we will produce a standardisation of imaging protocols in assessment of MBL.
1. Yalaza, M., Inan, A., Bozer, M.(2016) Male breast Cancer.J Breast Health.**12**(1):1-8
2. Giordano, S.H., Cohen, D.S., Buzdar, A.U., Perkins, G., Hortobagyi, G.N. (2004) Breast carcinoma in men: a population-based study. Cancer. 101(1):51-7
3. Atlanta (GA): US Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute. (2012) US Cancer Statistics Working Group United States cancer statistics: 1999~2008 incidence and mortality web-based report.

P053 Evaluating the upgrade of large fibroadenomas on final histology

Nyla Khan; Linda Metaxa; Serena Ledwidge; Tamara Suaris; Shefali Dani
Breast Department, Barts Health NHS Trust

Background: Fibroadenomas are common benign lesions of the breast assumed to be due to aberrations of normal breast development/hyperplastic processes rather than true neoplasms. There is limited guidance on the management of large fibroadenomas[1-4].
Method: All biopsy proven fibroadenomas (B2) that underwent surgical excision at our centre over a 4 year period (2015-2018) were collected retrospectively from the surgical diary. Patient demographics, lesion size, imaging characteristics as per the Royal College of Radiologists Breast Group (RCRBG) 5 point scoring system[5] and excision histology was recorded. B3 histology lesions and size <3cm were excluded from further analysis.
Results: 148 patients had surgery for B2 lesions over this time period. 6 patients had multiple lesions and 23 patients had surgery for lesions <2cm; hence a total of 131 B2 fibroadenomas met our inclusion criteria. The size range was 3-6cm and all patients had RCRBG 2/3 imaging characteristics. Mean age of patients was 29 years. One patient was found to have phyllodes on final histology, but she presented with a progressively increasing breast lump. None of the other lesions were upgraded to phyllodes/malignancy following surgical excision.
Conclusion: Currently, all B2 fibroadenomas >3 cm are offered surgical excision at our centre. Our study shows that surgery can be avoided in all patients with clinically stable RCRBG 2/3 graded, biopsy proven B2 fibroadenomas, irrespective of size, thereby reducing the risk of general anaesthesia as well as burden on surgical resources. Additionally, it would avoid unbecoming cosmesis in a young cohort of patients.
1. Diaz NM, Palmer JO, McDivitt RW. Carcinoma arising within fibroadenomas of the breast. A clinicopathologic study of 105 patients. Am J Clin Pathol. 1991;95:614-622
2. Greenberg R, Skornick Y, Kaplan O. Management of breast fibroadenomas. J Gen Intern Med. 1998;13:640-645
3. Neville G, Neill CO', Murphy R, et al. Is excision biopsy of fibroadenomas based solely on size criteria warranted? Breast J. 2018;24:981–985
4. Wu YT, Chen ST, Chen CJ, et al. Lai HW Breast cancer arising within fibroadenoma: collective analysis of case reports in the literature and hints on treatment policy. World J Surg Oncol. 2014;10:335
5. Maxwell AJ, Ridley NT, Rubin G, Wallis MG, Gilbert FJ, Michell MJ. The Royal College of Radiologists Breast Group breast imaging classification. Clin Rad 2009;64:624–7

P054 The use of Oncotype DX score in management of early breast cancer

Jasdeep Bhogal; Hannah Tween; Abel Zachariah; Laura Pettit
Shrewsbury and Telford Hospital NHS Trust

Background: Oncotype Dx is a 21 gene assay used to guide decisions on adjuvant chemotherapy in patients with ER positive, HER 2 and node negative breast cancer. This is a recent and practice changing introduction with the aim of sparing patients unnecessary and toxic chemotherapy. The score initially divided patients into 3 risk groups in terms of chemotherapy benefit; low, intermediate and high. The aim of this study was to review practice since the introduction of Oncotype DX testing at a single U.K. cancer centre.
Method: Patients eligible for Oncotype Dx testing between October 2015 and April 2017 were reviewed using clinical portal. Patient demographics and tumour characteristics were recorded on an excel spread sheet. Patients were separated into risk groups depending on their scores and management decisions were reviewed.
Results: Eighty-two patients were included. Eighteen (22%) patients were in the high risk group; all received chemotherapy. Thirty-two (39%) patients were in the low risk group, two offered chemotherapy due to young age. Thirty-two (39%) patients were in the intermediate risk group, eighteen (50%) received chemotherapy. Factors influencing the decision for chemotherapy included patient performance status, co-morbidities, menopausal status, size and grade of tumour, and patient choice.

Conclusion: Oncotype DX is one of the first tests to examine cancer genes in guiding benefit of adjuvant chemotherapy. The intermediate risk group requires careful discussion between patient and their oncologist. Confidence levels with the Oncotype test are now high. A significant number of patients have been spared chemotherapy.

P055 **Audit of heart doses in left sided breast radiotherapy**

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North Wales Cancer Treatment Centre

There is a known link between breast radiotherapy and increased risk of heart disease. Cardiac-sparing radiotherapy is considered to be the standard of care for patients with left-sided breast cancer. Our left breast treatments are planned using Fast Forward constraints. This assesses the volume of cardiac tissue receiving two stated doses. <30 % of heart volume should receive 2.0 Gy (V2) and <5 % should receive 10.0 Gy (V10). Following the publication of RCR consensus guidelines a change in assessing heart dose was required. 90% of patients are expected to receive a mean heart dose <2Gy.
The guidelines require the implementation of a breath hold technique. To assess the impact of introducing a breath hold technique on heart doses, a retrospective audit of 213 free breathing patients with left breast cancer was performed. The V2, V10 and mean heart dose were collated along with any beam modification required to ensure compliance. 94.9% of our patients meet the V2 constraints and 91.6% meet the V10 constraints.
The average mean heart dose is 2Gy. While we are meeting current constraints, there is some compromise in shielding chestwall/breast tissue. If our breath hold technique produces reduction in dose that matches published works we will exceed the recommendations while eliminating the need for this compromise. We intend to implement a deep inspiration breath hold technique within 6 months and conduct new dose comparison audits of DIBH patients, left sided partial patients and right sided patients receiving treatment to internal mammary nodes.

1. Bartlett F.R. et al (2013) Breast Radiotherapy and Heart Disease - Where Are We Now? Clinical Oncology 25: 687-689
2. Bin-Bin, Cong, et al. (2017) Internal mammary lymph nodes radiotherapy of breast cancer in the era of individualized medicine. Oncotarget 8 (46): 81583-81590
3. Darby, S.C. et al. (2005) The risk of cardiovascular disease after radiotherapy. Lancet Oncology 6: 557-565
4. Poortmans, P.M. et al. (2015) Internal Mammary and Medial Supraclavicular Irradiation in Breast Cancer. NEJM 373:4 317-327 5. Royal College of Radiologists November (2016) Postoperative radiotherapy for breast cancer: UK consensus statements.
6. Whelan, T.J. et al. (2015) Regional Nodal Irradiation in Early-Stage Breast Cancer. New England Journal of Medicine 373:4 307-316

P056 **Halcyon two-field breast technique using volumetric imaging**

Anissa Seegobin
Queen's Hospital Radiotherapy Department

Backgound: Conventionally, the two-field breast technique is achieved by checking the tangential field placement and borders on the patient with the light field and imaging the medial tangents in the beam's eye view only. Queen's Radiotherapy Department installed the UK's first Varian Halcyon radiotherapy unit in October 2017. The Halcyon does not have a field light to check the tangential field placement and borders on the patient.
A pre-treatment CBCT is mandatory and this is used to match three-dimensionally. It allows visualisation of the BEV for both the medial and lateral tangents. It gives more matching information than a single BEV medial tangential image and therefore gives a more accurate match over the entire PTV. This new technique was implemented for non-DIBH patients. It has improved patient and radiographer experience by significantly reducing the treatment time for breast patients. There is much less need for multiple setups as there is no focus on matching borders. Instead, the 3-D CBCT data set is used to match to a volume. Treatment is delivered using IMRT. A future consideration will be clip matching and simultaneous integrated boost.
Purpose: This poster is intended to share Queens Radiotherapy Department experience with using a 3-D data set to match to a volume for breast radiotherapy. This technique is applicable for any treatment machine that is CBCT-imaging capable.
Summary: The content will include the headings: Background, method, results, conclusion. It will outline the technique and imaging processes. Photos and screenshots will be included. No references used, description based on department practice.

P057 **Implementation of Deep Inspiratory Breath Hold (DIBH) for radiotherapy to left sided breast cancer patients using Surface Guided Radiotherapy (SGRT)**

Ben Allen
Queen Elizabeth Hospital Birmingham

Background: It is acknowledged that left sided breast cancer patients should be offered a breath hold technique in order to benefit from cardiac sparing during their radiotherapy treatment[1].
Aims: To implement a Deep Inspiratory Breath Hold (DIBH) technique for left sided breast cancer radiotherapy and to roll this out to all left sided patients who could comply.
Method: We reviewed several breath hold techniques to see which technique we preferred. We also went to see these techniques being planned and delivered at various hospitals so we had a full understanding of the differences between them.

We decided that Surface Guided Radiotherapy (SGRT) seemed the most patient and staff friendly and also provided the most accurate method of delivery so we began the process of acquiring AlignRT (2).
SGRT DIBH was implemented in June 2018 in a phased roll out to ensure we could cope with the change in technique as well as the extra time required to treat this patient group. We selected different priorities of left sided breast cancer patients in order to control the roll out but also prioritise the patients who would benefit the most initially.
Results: 2 Linacs are now equipped with AlignRT and within 6 months we were able to offer DIBH to all left sided breast cancer patients who could comply with the breath hold.
Discussion: Now we are offering DIBH we are constantly reviewing the service and trying to improve our coaching in order to maximise patient compliance.

1. Bartlett, FR. Colgan, RM. Carr, K. Donovan, EM. McNair, HA. Locke, I. Evans, PM. Haviland, JS. Yarnold, JR. Kirby, AM. The UK HeartSpare Study: randomised evaluation of voluntary deep-inspiratory breath-hold in women undergoing breast radiotherapy. Radiotherapy and Oncology. 2013 Aug;108(2):242-7 2. Zagar, TM. Kaidar-Person, O. Tang, X. Jones, EE. Matney, J. Das, SK. Green, RL. Sheikh, A. Khandani, AH. McCartney, WH. Oldan, JD. Wong, TZ. Marks, LB. Utility of Deep Inspiration Breath Hold for Left-Sided Breast Radiation Therapy in Preventing Early Cardiac Perfusion Defects: A Prospective Study. International Journal of Radiation Oncology Biology and Physics. 2017 Apr 1;97(5):903-909

P058 Using EPID results to compare the accuracy of set up between standard radiotherapy patient set up and Surface Guided Radiotherapy (SGRT) patient set up

Ben Allen
Queen Elizabeth Hospital Birmingham

Background: Tattoos are often not ideal as they aren't always where we want to treat and the skin is a mobile organ[1]. We are comparing the accuracy of set up between our traditional set up and an SGRT set up using AlignRT for breast patients[2].
Method: The Electronic Portal Imaging Device (EPID) results for 96 standard breast patients and 95 SGRT patients were compared to see how many patients needed corrective shifts applying to their set up. Corrective shifts are applied to any treatment where the EPID show ≥0.5cm deviation from planned position. A stereoscopic MV pair are acquired for verification.
Results: Corrective shifts were applied to 27/96 patients with the standard set up, (28%). 15 patients needed a repeat image when an EPID result was out of tolerance. The amount of repeat images ranged from 1 to 6 during their treatment. Corrective shifts were applied to 4/95 patients with SGRT set up, (4.2%). 10 patients needed a repeat image when an EPID result was out of tolerance but the maximum number of repeat images needed for any patient was 1 during their treatment.
Conclusion: The results suggest SGRT produces a more accurate set up. This needs exploring further as the patients set up with SGRT in this cohort are all DIBH patients. We will extend this SGRT study to include patients who are in free breath and I expect these results to enable us to move to markerless radiotherapy for breast patients in early 2019.

1. Dennis N. Stanley, Kristen A. McConnell, Neil Kirby, Alonso N. Gutierrez, Nikos Papanikolaou, Karl Rasmussen. (2017) Comparison of initial patient setup accuracy between surface imaging and three point localization: A retrospective analysis. Radiation Oncology Physics. DOI: 10.1002/acm2.12183
2. J. Rigley, P. Robertson. To Evaluate the Accuracy of Delivering Breast Radiotherapy without Tattoos. EP2338

P059 An evaluation of factors to pre-determine the use of VMAT planning for breast and IMC patients

James Barber; Elinor Sawyer; Roshni Chauhan; Rubina Begum; Alexandra Henderson; Benson Leung
Guy's and St Thomas' NHS Foundation Trust

Background: All patients referred for radiotherapy for breast and IMCs go through the standard breast pathway. However, a third require a re-plan to achieve dose constraints, taking up additional planners time and meaning the radiographers and doctors time at VSim had been wasted. An audit was carried out to identify factors that can be reviewed prior to VSim which would give a strong enough indication to determine if some patients can go straight to VMAT.
Method: The audit was a retrospective data analysis of all patients referred for IMC radiotherapy in the last year. 41 patients were identified. Patients referred directly into the VMAT pathway before scanning, patients for bilateral treatment and patients for IMC radiotherapy adjuvant to breast radiotherapy were excluded. This left 31 patients.
Results: The audit results showed a strong correlation between ipsilateral lung volume and the need for VMAT planning. Patients with an ipsilateral lung volume of 1200cm3 or less required a VMAT plan with one exception (10 out of 11 patients). This indicates that patients with an ipsilateral lung volume of 1200cm3 or less should go directly for VMAT planning.
Conclusion: It is recommended that when VSim import the scan, the OARs (Ipsilateral lung and heart) are volumed as per departmental protocol and the ipsilateral lung volume measured. If this is found to be 1200cm3 or less, they would then discontinue the VSim pathway and refer directly for VMAT planning. This will be re-audited in 6 months to evaluate efficacy.

P060 Improving cancer screening participation in Nigeria using The JP Kotter Change Management Model

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Background: Cancer screening is critical for disease detection at its early stage, when the odds are better for cure. In Nigeria, participation in screening programmes, is poor. This study aims to assess the existing situation regarding breast and cervical cancer screening in Nigeria and determine how the J.P. Kotter Change Management model, which is an 8-step model theory can be incorporated into the system to effect improved participation in breast and cervical cancer screening.

Methods: This was a cross-sectional study of fifty health workers randomly selected from healthcare facilities in Lagos State, Nigeria. The theoretical framework was built on J.P. Kotter's change management model. Questionnaires were used for data collection and statistical analysis done using Statistical Package for Social Sciences (SPSS) version 20.
Results:70% of the respondents considered the health-seeking behaviour of patients to be poor. Majority of respondents also considered financial (42%) and geographical (38%) accessibility to be major screening challenges. Most steps in the screening method were majorly rated as bad. In the assessment of elements of Kotter's model within the screening system, urgency, alliances, structure and celebrating successful short-term plans received the poorest ratings.
Conclusion: Several factors which posed a challenge to screening participation were highlighted. The weaknesses in the screening system as they relate to the J.P. Kotter model were also identified. Recommendations were made regarding how these elements could be improved upon and used to improve screening participation.

1. Baron R.C., Melillo S., Rimer B.K., Coates R. J., Kerner J., Habarta N., Chattopadhyay S., Sabatino S.A., Elder R. and Leeks K.J. (2010). Intervention to Increase Recommendation and Delivery of Screening for Breast, Cervical, and Colorectal Cancers by Healthcare Providers. A Systematic Review of Provider Reminders. American Journal of Preventive Medicine 38(1). 110-117
2. Berraho M., Obtel M., Bendahhou K., Zidouh A., Errihani H., Benider A. and Nejjari C. (2012). Socio-demographic factors and delay in diagnosis of cervical cancer in Morocco. The Pan African Medical Journal (online). 12(1)
3. Cancer Research UK, (2009). Why is early diagnosis important (online)
4. Chigbu C.O. and Aniebue U. (2011). Why southeastern Nigerian women who are aware of cervical cancer screening do not go for cervical cancer screening. International Journal of Gynecological Cancer. 21(7). 1282-1286
5. Chukwuali L.I., Onuigbo W.I.B. and Mgbor N.C. (2003). Cervical cancer screening in Enugu, Nigeria. Tropical Journal of Obstetrics and Gynecology. 20(2). 109-112
6. Dim C.C., Uwagba I.U., Ezeqwui H.U. and Dim N.R. (2009). The need to incorporate routine cervical cancer counselling and screening in the management of women at the outpatient clinics in Nigeria. Journal of Obstetrics and Gynaecology. 29(8). 754-756
7. Ezem B.U. (2007) Awareness and uptake of cervical cancer screening in Owerri, South-Eastern Nigeria. Annals of African Medicine. 6(3). 94-98

P061 A quality improvement project to improve efficiency in the one stop breast clinic

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Background: Thousands of woman are referred to the One Stop breast clinic each year. The clinic involves examination, followed by mammogram or ultrasound and a follow-up consultation. A large proportion of patients with an unremarkable examination and no abnormalities detected by the radiologist will have to return to clinic in order to be discharged by the breast clinician. There is no consensus on whether such patients can be discharged directly by the radiologist.
Purpose: The repeat consultation time spent with this cohort of healthy patients could be used for new or anxious patients or more concerning cases. Furthermore, it is inconvenient for patients to wait around for this appointment or to return to the clinic on another day, if they are satisfied with the normal results. We conducted a quality improvement project to standardise the follow-up plan for one stop patients and increase the number of patients who could be potentially discharged by radiology. We audited one stop clinic consultations at our Trust over one month. On 23% of forms it was stated by the clinician that the patient could be discharged from radiology if appropriate. We then introduced a new form which required clinicians to tick-box whether the patient could potentially be discharged by radiology. This resulted in 55% of patients that could be potentially discharged by the radiologist over one month, of which 90% were actually discharged.
Content: The poster will offer an idea for optimising efficiency in the one stop clinic with proposed time and monetary savings.

P062 Ultrasound tips and tricks for the rookie breast radiology trainee

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Manchester Foundation Trust

Breast ultrasound is the workhorse of breast imaging within the breast clinic. Ultrasound may be the sole modality employed for breast imaging in younger women. When used along with mammograms whether in the screening or symptomatic set-up, it complements mammography. It allows for ultrasound guided biopsy of lesions identified on ultrasound which is one of its strongest USPs. The drawbacks of ultrasound include user-dependency and inconsistent replicability between users. Learning to perform diagnostic breast ultrasound involves learning basics of ultrasound and pattern recognition in breast disease and appearance of normal breast tissue in various stages of development.
Learning interventional breast ultrasound involves good hand eye coordination, depth perception and good biopsy technique while paying utmost attention to patient safety keeping in mind procedural complications. Breast ultrasound skills are not limited to knowledge and procedural skills but transcend these to include communication with the ultrasound helper and a patient who can observe the play of every expression that flits across the radiologist's face. The radiologist also needs to keep in mind risks to themselves both in the short term and ergonomic risks in the long term. This puts breast ultrasound in a unique position in terms of training.
There is no substitute for learning from experience, however the trainee can learn from the experience of a trainer or senior colleague. This session brings such practical skills alive by touching on both basics such as appropriate use of depth and tissue harmonics as well as changing patient position in order to target

1. David C. M. Taylor & Hossam Hamdy (2013) Adult learning theories: Implications for learning and teaching in medical education: AMEE Guide No. 83, Medical Teacher, 35:11, e1561-e1572
2. Breast Ultrasound- how, why and when- Edited by Anne-Marie Dixon

CARDIAC / CHEST & LUNG

P063 Feasibility of cardiac sparing in isotoxic dose escalated radiotherapy for NSCLC

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Background: Heart constraints used in NSCLC radiotherapy planning have not changed greatly in the past two decades, despite evidence that there may be an association between heart irradiation and decreased survival. We have therefore carried out a planning study to determine the extent to which heart doses can be reduced without diminishing plan quality. Specifically, we investigated the feasibility of reducing mean heart doses (MHD), and the volume of left atrial wall (LAW) receiving doses in excess of 63Gy (V_{LAW63}).

Method: 20 NSCLC patients were re-planned following IDEAL-CRT protocol[1] using VMAT. We identified new target levels for MHD and V_{LAW63} (Table 1). Patients were then re-planned, more highly prioritising heart and LAW dose constraints, and determining the extent to which heart and LAW irradiation could be reduced while still meeting the IDEAL-CRT target dose coverage levels and dose constraints.

Results: After IDEAL-CRT planning, 8 patients met the ambitious level for V_{LAW63}; however after prioritising constraints on LA Wall irradiation the ambitious level could be achieved for 19/20 patients. Similarly, after IDEAL-CRT planning the ambitious level for MHD was met for only 3 patients, and 5 failed to meet the basic level; but after prioritising reductions in MHD, the ambitious level was achieved in 8 patients and none failed to meet the basic level.

Conclusion: By setting more demanding heart dose constraints, MHD and LAW doses can be substantially reduced while continuing to meet the target coverage and normal tissue constraints of the IDEAL-CRT protocol, potentially improving survival.

Table 1a

	V_{LAW63} Constraint				
	Constraint Level	Ambitious	Moderate	Basic	Failed
		0%	≤2.2%	≤20%	>20%
	Prescribed Dose (Gy) Median [range]				
IDEAL Baseline	68.8 [63, 73]	n=8	n=8	n=4	n=0
Tighter V_{LAW63} planning	68.8 [63, 73}	n=19	n=1	n=0	n=0

Table 1b

	Mean Heart Dose Constraint				
	Constraint Level	**Ambitious**	**Moderate**	**Basic**	**Failed**
		≤5Gy	≤11Gy	≤20Gy	>20Gy
	Prescribed Dose (Gy) Median [range]				
IDEAL Baseline	68.8 [63, 73]	n=3	n=9	n=3	n=5
Tighter MHD planning	68.8 [63, 73}	n=8	n=8	n=4	n=0

1.Landau D, Hughes L, Baker A, Bates A, et al. IDEAL-CRT: A Phase 1/2 Trial of Isotoxic Dose-Escalated Radiation Therapy and Concurrent Chemotherapy in Patients with Stage II/III Non-Small Cell Lung Cancer. Int J Rad Oncol Biol Phys. 2016;95(5):1367-1377

P064 Rare, medium or well done? Practising skin care in interventional radiology

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Background: The capabilities of Interventional Radiology (IR) to treat is continuously expanding, naturally increasing the technical complexities of procedures undertaken and is one of the reasons why IR is an area of radiology which is considered to be at risk of resulting in a skin radiation dose exceeding 5Gy Air Kerma (AK). This recommended trigger point carries advice for further action post procedure due to possible deterministic injury. In reality there is widespread variability within local hospital policies. The trust at the focus of this poster did not have a standardised pathway for high dose procedures within its IR departments. Cardiology based interventional procedures however have a high radiation dose pathway set at 5Gy AK and 500Gycm2 DAP for total amount of radiation delivered to the patient.

Purpose: The aim of the poster is to outline the importance of measuring practice against the standard, illustrate which IR procedures result in the highest radiation dose levels and the importance of recognising cumulative dose and its position within

procedural planning, the relationship of peak skin AK (radiation dose received to a single area of skin) in comparison to accumulative AK is portrayed through dosewatch data.

Summary: The poster includes the methodology, results and conclusions of the audit on high dose interventional and cardiology procedures with a copy of the high dose pathway that is being introduced. The pathway has been designed to support future IR procedures, detailing specific processes and resources to be utilised within radiation dose management.

1. Balter, S. et al, 2010. Fluoroscopically guided interventional procedures: A review of radiation effects on patients' skin and hair. Radiology, [online], 254(2), pp. 326-341
2. National Council on Radiation Protection and Measurements (2014). Outline of administrative policies for quality assurance and peer review of tissue reactions associated with fluoroscopically-guided interventions. NCRP statement No.11. [online] Bethesda: NCRP, pp.1-8
3. Jaschke, W. et al, 2017. Radiation-induced skin injuries to patients: what the interventional radiologist needs to know. Cardiovascular Interventional Radiology, [online], 40, pp.1131-1140
4. Stecker, M.S. et al, 2009. Guidelines for Patient Radiation Dose Management. Journal of Vascular Interventional Radiology, [online], 20 pp. 263-273
5. Vano, E. et al, 2013. Patient radiation dose management in the follow-up of potential skin injuries in Neuroradiology. American Journal Neuroradiology, [online], 34 pp. 277-282

P065 Imaging in the diagnosis of a unicuspid aortic valve and Gerbode defect

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Background: Unicuspid aortic valve (UAV) is a rare congenital malformation with an incidence of 0.02% in the adult population[1]. A 21-year-old male medical student discovered an incidental cardiac murmur on self-examination. He was investigated with echocardiogram that demonstrated mild aortic regurgitation thought secondary to a congenital bicuspid aortic valve. This was monitored over the course of 14 years. At 35, on routine follow up the echocardiogram showed an anomaly. He had a cardiac MRI which demonstrated a unicommissural unicuspid aortic valve and concentric left ventricular hypertrophy. As he had severe aortic stenosis with moderate aortic regurgitation it was decided to offer open-heart surgery. The native aortic valve was replaced with a 25mm non-stented bioprosthetic valve. On 3 month follow up, an acquired Gerbode defect was demonstrated on echocardiogram. This is a rare left ventricle to right atrial shunt and represents <1% of all heart defects[2].

Purpose: To highlight the importance of radiological imaging in the diagnosis of this rare condition and of its rare complications. To demonstrate the importance of vigilant surveillance in patients with suspected UAV. To review the literature on the potential adverse effects of delayed UAV treatment, and of the possible post-surgical complications.

Summary: UAV is a rare congenital malformation, mainly confused with bicuspid aortic valve and that presents with aortic valve insufficiency. This case demonstrates radiological diagnosis in an asymptomatic adult with no previous known congenital heart defect, and who remained haemodynamically stable for several years prior to surgical intervention.

1. Novaro GM, Mishra M, Griffin BP. (2003) Incidence and echocardiographic features of congenital unicuspid aortic valve in an adult population. J Heart Valve Dis. 12(6), 674-8
2. Dores H, Abecasis J, Ribeiras R, Neves JP, Mendes M. (2012) Uncommon acquired Gerbode defect following extensive bicuspid aortic valve endocarditis. Cardiovasc Ultrasound. 10(1), 7

P066 The impact of motion management techniques on clinical outcomes in early stage non-small cell lung cancer patients undergoing stereotactic ablative radiotherapy: A critical review of the literature

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Background: Stereotactic ablative radiotherapy (SABR) has taken a vital role in the management of early stage non-small cell lung cancer (NSCLC) in the UK (Yahya et al., 2018). Considering SABR's distinguishing features, motion management techniques (MMTs) are crucial (Goldsmith and Gaya, 2012). Despite the increasing prevalence of MMTs reported in literature (Cole et al., 2014), there is paucity reporting clinical outcomes of patients based on differing MMTs. This work aimed to assess the outcomes of studies involving SABR for NSCLC based on MMT utilised, namely tracking, gating, motion encompassing methods such as internal target volume (ITV), or combination of techniques which includes using ITV and another form of MMT.

Methods: A literature search was undertaken relating to outcomes in SABR for early stage NSCLC, specifically local control (LC), overall survival (OS) and toxicities. The search period included January 2009 to March 2018. Search parameters were filtered using the terms trials, outcome and English. The resulting articles were selected after assessing for relevance, leaving 29 papers.

Results: Data extraction demonstrated comparisons of clinical outcomes for the MMTs, a sample of which can be seen in table 1. Furthermore, variations among the included studies were noted, seen in table 2.

Table 1: An example of MMT comparison based on local control and overall survival			
MMT	No. of studies with existing data	Range	Median
Local control - 24 months			
Tracking	13	74-98%	84%
Combination	3	84-86%	85%
ITV	3	92-98%	96.4%
Overall survival - 24 months			
Tracking	9	60-82%	75%
Combination	5	52-78%	65%
ITV	4	55-75%	64.5%

Table 2: Differences found in studies	
Dose	34Gy/1# to 60Gy/8#
Patients	21-500 participants
Follow-up	12-60 months with all studies including up to 24 months of LC and OS

Conclusion: The evidence highlighted several preliminary recommendations. In this sample of three MMTs at one follow-up in time, median LC was highest in ITV and equivalent for the other studies but a larger variation for tracking compared to the combination studies. This suggests MMTs may be a contributing factor for clinical outcomes.

1. Cole, A., Hanna, G., Jain, S. and O'Sullivan, J. (2014) Motion management for radical radiotherapy in non-small cell lung cancer. *Clinical oncology*, **26**(2), 67-80
2. Goldsmith, C. and Gaya, A. (2012) Stereotactic ablative body radiotherapy (SABR) for primary and secondary lung tumours. *Cancer imaging: the official publication of the International Cancer Imaging Society*, **12**(2), 351-360
3. Yahya, S., Ghafoor, Q., Stevenson, R., Watkins, S. and Allos, B. (2018) Evolution of stereotactic ablative radiotherapy in lung cancer and Birmingham's (UK) experience. *Medicines*, **5**(3), 77

P067 A comparison of soft tissue and bone to verify treatment position for lung cancer patients receiving radical radiotherapy

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Introduction: As the complexity of radiotherapy treatments increase, more on treatment imaging is being routinely in clinical practice. Studies vary in which anatomical landmark to match to in lung cancer treatment to ensure treatment accuracy. Prior to transitioning from bone matching using two-dimensional kilovoltage (kV) imaging to 3D soft tissue matching using Cone Beam CTs(CBCTs), we retrospectively assessed the optimum landmark for image-matching purposes.

Method: Five radiographers conducted automatic and manual matches to bone, carina and tumour in 88 CBCTs of 20 patients. For each of the 2600 matches, couch shifts were recorded in the anterior/posterior, left/right and superior/inferior directions. Tumour coverage was graded using target volume margins. The level of agreement between automatic and manual matches and the percentage of set-up errors out of tolerance (5mm) were calculated. CBCT feasibility was assessed by examining inter observer reliability, reporting difficult matches and comparing timings of CBCTs with kV images.

Results: There was a significant improvement in target coverage when matching to tumour, instead of bone or carina ($P<0.001$). However, Bland-Altman analysis demonstrated tumour matching had the lowest automatic and manual agreement. Tumour matching detected the highest proportion of set-up errors (26.1%), then carina (19.05%) and bone (18.41%). All methods demonstrated good or excellent inter-observer reliability (intraclass correlation 0.871-0.957). Problematic matches occurred in 20% and timings were comparable with kV imaging.

Conclusion: This study supports CBCT imaging and soft tissue matching to tumour as routine clinical practice in radical lung radiotherapy, with visual inspection of the tumour to ensure target coverage.

1. Chan, E., Moseley, D., Malam, S., Loudon, J., Sae, S., Mohamoud, G., Smith, K. and Holborn, C., 2017. An Automatic Registration Tool for Daily Online CBCT for Lung Cancer. *Journal of medical imaging and radiation sciences*, 48(1), p.S3
2. Ozyigit, G., Selek, U. and Topkan, E. eds., 2016. *Principles and Practice of Radiotherapy Techniques in Thoracic Malignancies*. Springer
3.Van den Bosch, M., Öllers, M., Reymen, B. and van Elmpt, W., 2017. Automatic selection of lung cancer patients for adaptive radiotherapy using cone-beam CT imaging. *Physics and Imaging in Radiation Oncology, 1*, pp.21-27

P068 Lung cancer - stage of disease at diagnosis

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Background: The stage of cancer at diagnosis is an important prognostic factor. International population-based studies suggest that differences in stage at presentation may explain some of the survival variation for several cancers[1].

We looked at all new lung cancer diagnoses over a five-month period at a UK teaching hospital to determine the stage of disease at diagnosis and whether first presentation as an inpatient or outpatient influences the stage of disease at time of diagnosis.
Methods: A retrospective study from May to September 2018. A list of patients was generated from the MDT co-ordinator for all new diagnoses of lung cancer within this timeframe.
Our exclusion criteria:

- Not a new primary diagnosis of lung cancer
- Patients from outside-of-area.

Results: 74 patients were identified. 34 patients were excluded and 40 patients were analysed. There were 80% outpatients in the cohort. 62.5% patients had T3-4 disease, 67.5% had nodal disease and 42.5% had metastatic disease at diagnosis. Compared with the outpatient group, all of the inpatient group presented with T3-4 disease, 100% and 53.1% respectively. Inpatients were also more likely to have metastatic disease, 62.5% and 37.5% respectively.
Conclusion: The majority of lung cancers were diagnosed at a late stage. Patients diagnosed as an inpatient are far more likely to have higher stage disease. Further research and improvement of the diagnostic pathway to allow for the detection of lung cancers at an earlier stage is on-going with studies into the effectiveness of lung cancer screening[2].

1. Walters, S; Maringe, C; Coleman, MP; Peake, MD; Butler, J; Young, N; Bergström, S; Hanna, L; Jakobsen, E; Kölbeck, K; Sundstrøm, S; Engholm, G; Gavin, A; Gjerstorff, ML; Hatcher, J; Johannesen, TB; Linklater, KM; McGahan, CE; Steward, J; Tracey, E; Turner, D; Richards, MA; Rachet, B; ICBP Module 1 Working Group; (2013) Lung cancer survival and stage at diagnosis in Australia, Canada, Denmark, Norway, Sweden and the UK: a population-based study, 2004-2007. Thorax, 68 (6). pp. 551-64
2. Crosbie PA, Balata H, Evison M, et al. (2018) Implementing lung cancer screening: baseline results from a community-based `Lung Health Check` pilot in deprived areas of Manchester. Thorax, 2017-211377

P069 An example of Boerhaave's syndrome

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Background: Oesophageal rupture is a rupture of the oesophageal wall. Iatrogenic causes account for approximately 56% of oesophageal perforations, usually due to medical instrumentation such as an endoscopy or para-oesophageal surgery (Marx et al 2010). In contrast, the term Boerhaave syndrome is reserved for the 10% of oesophageal perforations which occur due to vomiting (eMedicine 2018). This condition is frequently self-limiting but may have serious sequelae if undiagnosed. Signs on conventional radiography of the chest include pneumomediastinum and pneumopericardium. These appearances should trigger further imaging to identify the location of the rupture and any complications.
Purpose: To illustrate the typical appearances on conventional chest radiography, relate these to other imaging modalities and inform management options and differential diagnoses.
Summary: 33 year old patient presented to the Emergency Department with chest pain following prolonged vomiting. Conventional chest image on initial presentation showed pnuemopericardium and surgical emphysema. Patient was recalled for CT scan of the chest which confirmed free gas in the mediastinum, pericardium and soft tissues, but failed to identify an oesophageal rupture. Contrast swallow examination was also normal. The patient was discharged after antibiotic treatment and observation with Out Patient follow-up for endoscopy. Appropriate annotated images will be displayed. Brief discussion of differential diagnoses and treatment.

1. Boerhaave syndrome at eMedicine.medscape.com (2018)
2. Marx, John A.; Hockberger, Robert S.; Walls, Ron M.; Adams, James, eds. (2010). Rosen's emergency medicine: concepts and clinical practice. 1 (7th ed.). St. Louis: Mosby/Elsevier

P070 Imaging in Idiopathic Pulmonary Fibrosis (IPF) - review of the revised international guidelines and management implications

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Background: IPF is the most common form of interstitial lung disease (ILD) encountered in routine clinical practice. Accurate diagnosis requires an MDT approach and is critical to facilitate correct management in this era of anti-fibrotic therapies to slow the course of IPF. The histologic pattern of IPF is Usual Interstitial Pneumonia (UIP). The radiologist has an important role and in 2018, new guidance from the Fleishner society and an international group including the European Respiratory Society (ERS) expanded the HRCT classification of UIP from the prior 3 categories to 4 categories.
Purpose: To describe the imaging appearances of IPF in the context of the recently revised international guidelines. This educational exhibit will enable radiologists to accurately apply the new guidelines in interpretation of HRCT and understand the implications in diagnosis and management. The important role of the multidisciplinary team (MDT) will be discussed.
Summary: With cases from our referral centre for ILD we will illustrate the 4 categories in the new HRCT classification of UIP. Cases of typical UIP, probable UIP, indeterminate for UIP and atypical for UIP where alternative diagnoses should be considered will be presented. Key imaging features of all categories will be presented. The importance of the MDT will be discussed allowing clinical, laboratory and radiologic correlation, increasing diagnostic confidence. We will also illustrate cases where ultimately biopsy was necessary for diagnosis.

P071 **Imaging in lung cancer staging- a review of Tumour Node Metastasis (TNM) 8 and treatment implications**

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Portsmouth Hospitals NHS Trust

Background: Lung cancer is the most common cancer worldwide and the leading cause of cancer death in the UK. The TNM staging 8th edition has been created based on statistical analysis of over 100,000 patients and has re-classified lung cancer stages based on prognostic data. Staging plays a crucial role in describing the extent of a lung cancer and this together with patient specific factors aids the multi-disciplinary team (MDT) in formulating a management plan suited to the patient. Important changes which have been made include a greater influence of tumour size on staging, the influences of tumour extent and local invasion and recognition of distinctions between solitary or multiple sites of extrathoracic metastatic disease. It is important for radiologists and to be aware of these changes.

Purpose: To describe the changes made to TNM classification of lung cancer in accordance with the recently changed international guidelines. This exhibit will enable radiologists to understand the broadened staging categories and implications on treatment. We will discuss the impact this has had on lung cancer management at our thoracic centre.

Summary: Cases from our thoracic centre will be reviewed, key features distinguishing between different staging subtypes will be highlighted as well as potential pitfalls. We will describe memory aids with the aim of helping trainees in recalling some of the different staging subtypes and these will be correlated with images.

P072 **Seeing through the fog - a review of adenocarcinoma spectrum lesions in the lung and their staging according to TNM 8**

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Background: Lung cancer remains a leading cause of cancer death in the UK and adenocarcinomas remain the most common histologic subtype. In 2011, replacing the old term bronchoalveolar carcinoma (BAC) a new classification of adenocarcinoma introduced new terminology and diagnostic criteria. In the 2018 lung NTM 8 the spectrum of lung adenocarcinoma lesions was introduced into formal TNM staging for the first time.

Purpose: This educational poster will use cases from our thoracic centre with radiologic-pathologic correlation to illustrate the spectrum of adenocarcinoma lesions in the lung, from pure ground glass nodules to part solid and ultimately sold lesions. Use of the new TNM 8 staging system will be demonstrated to enable radiologists to correctly stage these lesions.

Summary: This poster will clearly outline the progression of adenocarcinoma spectrum lesions from premalignant atypical adenomatous hyperplasia through to the early malignant lesion minimally invasive adenocarcinoma and on to invasive disease. We will outline how to apply the new TNM 8 staging system and how this informs the lung cancer multidisciplinary team in management and follow up of these lesions. Important features that the radiologist must be aware of in the follow up of these lesions including increasing solid component will be highlighted.

P073 **The use of imaging as a predictor of malignant solitary fibrous tumours of the pleura**

Priya Agarwal; Grazvydas Gaikstas
Northern Care Alliance

We present an 85 year old woman, non-smoker and no previous exposure to asbestos, complaining of back pain. Computed tomography (CT) scan showed an incidental finding of soft tissue mass measuring 5.3 × 6.4 cm, posteromedially at the right lung base. There was evidence of post-contrast enhancement and tumour necrosis with erosion into T10 vertebra and fracture of 10th rib. Magnetic resonance imaging (MRI) confirmed this, revealing a homogeneous mass on T1- weighted imaging and heterogeneity on T2-weighted images. The mass extended into the neural foramina and spinal canal.

The patient subsequently underwent an 18F-FDG PET/CT scan showing a soft tissue mass with high FDG uptake (SUV max 13.3). No significant hilar or mediastinal lymphadenopathy or other increased metabolic activity noted. Histopathology showed cores of fibrotic tissues infiltrated by sheets of spindled tumours cells with moderate pleomorphism and up to 3-4 mitotic figures seen per 10 high per fields. Foci of haemorrhage and necrosis were evident. On immunostaining, the tumour cells were positive for vimentin CD34 and BCL 2, confirming malignant solitary fibrous tumour. SFTP is a rare mesenchymal tumour, accounting for 5% of pleural tumours of which 12-33% are malignant.

Histological differentiation between benign and malignant tumours is difficult due to its heterogeneity and large size. Therefore, diagnosis is confirmed histologically, post-surgical resection. Literature review suggests the use of single imaging modality is limited. Multimodal imaging including CT, MRI and PET/CT is required for a radiological diagnosis of malignant SFTP.

1. de Perrot, M and Fischer, S. et al. Solitary fibrous tumors of the pleura. The Annals of thoracic surgery (2002) 74(1): 285-293
2. England, M. and Hochholzer, L. et al. Localized benign and malignant fibrous tumours of the pleura. A clinicopathologic review of 223 cases. The American Journal of Surgical Pathology (1989) 13(8): 640-658
3. Gupta, A and Souza, C.A.. Solitary fibrous tumour of pleura: CT differentiation of benign and malignant types. Clinical radiology (2017) 72(9): e9-796. e.17
4. Hélage, A and Revel, M.P . Solitary fibrous tumour of the pleura: Can computed tomography features help predict malignancy? A series of 56 patients with histopathological correlate. Thoracic imaging (2016) 97(3): 347-353
5. Inaoka, T. Takahashi, K. Miyokawa, N. Ohsaki, Y. Aburano, T. Solitary fibrous tumour of the pleura: apparent diffusion coefficient (ADC) value and ADC map to predict malignant transformation. Journal of magnetic resonance imaging (2007) 26(1): 155-158

6. Rosado-de-Christenson, M.L and Abbott, G.F et al From the archives of AFIP localised fibrous tumours of the pleura RSNA (2003) 23(3)
7. Song, S.W. and Jing, J.I. Malignant solitary fibrous tumour of the pleura: computed tomography- pathological correlation and comparison with computed tomography of benign solitary fibrous tumour of the pleura. Japanese Journal of Radiology (2010) 28(8): 602-608
8. Tazeler, Z. Tan, G. Aslan, A. Tan, S. The utility of 18 F-FDG PET/CT in solitary fibrous tumors of the pleura. Revista espanola de medicina nuclear e imagen molecular (2016) 35(3) 165-170
9. You, X. and Sun. X. CT diagnosis and differentiation of benign and malignant varieties of solitary fibrous tumour of the pleura. Medicine (2017) 96(6): e9058

P074 Systematic approach to reviewing chest X-rays for nasogastric tube placement

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Nasogastric tube feeding is common practice and thousands of nasogastric tubes are inserted daily without incident. Feeding into the lung through a misplaced nasogastric tube is a "Never Event". The National Patient Safety Agency (NPSA) suggests X-ray image interpretation could be a major factor. A systematic and logical review pattern used consistently can reduce the likelihood of "Never Events". A nasogastric tube identified to be in a lung should be removed immediately to ensure the best outcome for the patient. The poster will include a systematic approach review of chest radiographs for the purpose of evaluating nasogastric tube placement, along with high quality images to demonstrate appropriately placed tubes and misplaced tubes.

P075 The role of FFR in coronary artery CT

Paula Cunningham-lally; Nick Watson; Simon Duckett; Hefin Jones
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Current guidelines recommend non-invasive imaging as the first line test in stable coronary artery disease. This has led to the increasing role of cardiac CT. Limitations of this test are the ability to determine between ischaemic and non-ischaemic lesions. However recent advances in FFR (fractional flow reserve from Heartflow) allow an individual 3d model of patients coronary arteries derived from CT coronary angiography and highlight any lesion specific ischemia. There are high levels of diagnostic accuracy and is supported by NICE Guidance.

The role of FFR in assessment of functional significance enables accurate selection of the patients who will benefit from revascularisation and invasive coronary artery intervention. The poster aims to highlight the use of FFR via case reviews of cardiac lesions diagnosed on CTCA and subsequent patient management.

1. Heartflow. (2018). Enabling better coronary artery disease decisions for patients around the world
2. Pim A. L. Tonino, MD, William F. F, MD, Bernard De Bruyne, MD,. (2010). Angiographic Versus Functional Severity of Coronary Artery Stenosis in the FAME Study. Journal of the American College of Cardiology. Vol. 55 (25), 2816-2821
3.Tesche, C., De Cecco, C., Albrecht, M., Duguay, T., Bayer, R., Litwin, S., Steinberg, D. and Schoepf, U. (2019). Coronary CT Angiography-derived Fractional Flow Reserve, Radiology

P076 Delivering radiotherapy in DIBH to a lymphoma patient in a thermoplastic BDS - a case report

James Barber; George Mikhaeel; Jessica Brady; Benson Leung; Rubina Begum
Guy's and St Thomas' NHS Foundation Trust

Background: A 35 year old male was referred for radiotherapy to a Classical Hodgkins Lymphoma including cervical level III, IV and V, the SCF and the anterior mediastinum. The treatment area extended to the inferior extent of the mediastinum. Standard protocol was to treat in a full 5-point thermoplastic BDS. Dose constraints for the heart and lungs couldn't be met using the butterfly technique in free breath. Therefore, a technique for delivering DIBH in a mask was required.

Method: Current practice was to treat all DIBH mediastinal lymphomas with arms raised, but this approach would not give adequate immobilisation of the cervical area. As local practice is to use AlignRT (SGRT) to verify DIBH this precluded the use of a full head and shoulder BDS as this would obscure too much of the patient contour. To allow optimal immobilisation while still allowing SGRT to verify DIBH, a head only BDS in conjunction with shoulder depressors was used. This minimised the risk of pitch in the head and variance in the position of the shoulders when entering and exiting DIBH, while still allowing AlignRT to detect sufficient patient contour to verify breath-hold.

Results: Re-planning the patient using the butterfly technique in DIBH allowed dose constraints to be met. Mean heart dose dropped from 21.359Gy to 10.568Gy and Lung-PTV mean dose dropped from 14.556Gy to 8.939Gy.

Conclusion: Following successful treatment this technique has been used successfully in 5 further cases, allowing radiotherapy to be safely delivered to long volumes.

P077 An audit to investigate the possible advantages of treating lymphoma stomach patients in DIBH or EEBH to reduce heart dose

James Barber; George Mikhaeel; Jessica Brady; Benson Leung
Guy's and St Thomas' NHS Foundation Trust

Background: Standard protocol for treating lymphoma stomach patients is to treat in free breath. For GI primary lesions, treatment in end exhalation phase, either gated or breath-hold, or using abdominal compression, are widely thought to be beneficial. However, for the younger cohort of patients seen in lymphoma treatments, cardiac dose is of greater concern.

Method: A baseline data collection was carried out retrospectively looking at abdominal 4DCT scans. This evaluated the distance between the superior extent of the stomach and the inferior extent of the heart in the inhalation and exhalation phases to give an indication as to whether DIBH or EEBH would beneficial in minimising heart dose.
Results: Of the 20 patients evaluated, 85% showed a greater distance from stomach to heart in inhalation and 5% an equal distance. While a consideration in interpreting this data is that the patients analysed had not consistently followed any fasting protocol, this correlation is still strong enough to favour use of DIBH to reduce cardiac dose in these patients, especially factoring in that this distance is likely to increase further in deep inspiration hold from a natural inhalation.
Conclusion: This has provided the evidence to go forwards piloting treating this cohort in DIBH. A second retrospective data collection was carried out to show mean heart doses in lymphoma patients treated in free breath. This will be prospectively compared to patients planned in DIBH to definitively show if cardiac dose is reduced.

GI UPPER AND LOWER / HEP

P078 Pictorial review: Imaging features of extra-abdominal desmoid tumours at presentation and following treatment

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Background: Extra-abdominal desmoid tumours (DT) are monoclonal proliferations of fibroblasts that are locally aggressive with unpredictable clinical behaviour. These tumours are difficult to treat medically and surgically. Although definitive diagnosis remains histopathological, DTs have characteristic imaging features that aid diagnosis and response assessment.
Purpose: To present multi-modality imaging features of extra abdominal DTs and post-treatment changes. The learning outcomes will include 1) Familiarity with the radiological appearances of extra abdominal DTs 2) Appreciation of imaging features following treatment.
Summary: This educational pictorial review will present a variety of extra abdominal DT images from various modalities in a tertiary centre. We will outline the main imaging features that aid diagnosis and assessment of treatment response.

1. Alman BA, Pajerski ME, Diaz-Cano S, Corboy K, Wolfe HJ. Aggressive fibromatosis (desmoid tumor) is a monoclonal disorder. Diagn Mol Pathol 1997; 6: 98–101
2. Castellazzi G, Vanel D, Le Cesne A et al. Can the MRI signal of aggressive fibromatosis be used to predict its behaviour? Eur J Radiol 2009; 69: 222-229
3. Firouzeh, Wei-Lien st al., MRI may be used as a prognostic indicator in patients with extra-abdominal desmoid tumours. Br J Radiol. February 2016; 89 (1058)
4. Gronchi A, Colombo C, Le Péchoux C, Dei Tos AP, Le Cesne A, Marrari A, et al. . Sporadic desmoid-type fibromatosis: a stepwise approach to a non-metastasising neoplasm-a position paper from the Italian and the French Sarcoma Group. Ann Oncol 2014; 25: 578–83
5. Lee JC , Thomas JM, Phillips S et al. Aggressive fibromatosis: MRI features with pathologic correlation. AJR Am J Roentgenol 2006; 186: 247–25
6. McCarville MB, Hoffer FA, Adelman CS, Khoury JD, Li C, Skapek SX. MRI and biologic behavior of desmoid tumors in children. AJR Am J Roentgenol 2007; 189: 633–40
7. Salas S, Dufresne A, Bui B, Blay JY, Terrier P, Ranchere-Vince D, et al. Prognostic factors influencing progression-free survival determined from a series of sporadic desmoid tumors: a wait-and-see policy according to tumor presentation. J Clin Oncol 2011; 29: 3553–8
8. Salem UI, Amini B. Imaging patterns of local failure in desmoid fibromatosis: how to scan and what to look for. In. Society of Skeletal Radiology, 2014 Annual Meeting; 10/11/2014; San Diego, CA2014

P079 Clinical audit of rectal cancer patient referrals for Papillon contact brachytherapy

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Background: Papillon contact X-ray brachytherapy (CXB) is an alternative to surgery for rectal cancer(NICE, 2015). Although it has seen a resurgence in the UK in recent years (Myint, 2017) there are currently no national guidelines guiding referrals for treatment. This study audited patients who were referred for and treated with CXB over a 6 year period against guidelines derived from a critical review of the evidence.
Methods: Patient demographics, tumour characteristics, and outcome data were gathered for 31 patients referred for CXB. A critical review of the evidence identified consensus referral criteria and outcome data against which to audit patients.
Results: Referral criteria were derived from six published studies of patients unfit for surgery or stoma-averse. All referred patients had a visible tumour or scar with a tumour size under 3cm sited less than 12cm from the anal verge. Nodal status varied (N0-2) but there was no metastatic disease present. The audited cohort demonstrated equivalence of median age, performance status, and tumour stage. Initial clinical complete response, local recurrence, and occurrence of distant metastases were also comparable. The overall survival rate of 83.9% exceeded the published results.
Conclusion: Similarity of cohort demographics enabled comparison of outcome data which confirmed the validity of referral and treatment protocols. Although the limited evidence base and retrospective nature of the audit limits the strength of the findings, this work should guide future referrals until evidence from ongoing studies becomes available and contribute to development of robust national2015)

1. Myint, A.S. (2017) Do patients have a choice? Oncology News.12(1), 4-6 2. National Institute for Health and Care Excellence. (2015) Low energy contact X-ray brachytherapy (the Papillon technique) for early stage rectal cancer. NICE Interventional procedures guidance (IPG532); NICE: London

P080 **Simultaneous integrated boost for positive pelvic sidewall lymph nodes in rectal cancer patients**

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[1]The Clatterbridge Cancer Centre; [2]Sheffield Hallam University

Purpose: Long course pre-operative chemo-radiotherapy is the standard treatment for people diagnosed with locally advanced rectal cancer. Between 10 and 20% of these patients may present with positive pelvic sidewall lymph nodes which often fall beyond the standard surgical plane. By boosting the dose to the positive nodes, a greater reduction in the size of the lymph node may be achieved. This is a single patient case study presenting the use of a simultaneous integrated boost (SIB) to a patient staged as T2 N0 M1, with positive pelvic sidewall lymph nodes.
Method: Patients diagnosed with rectal tumours are offered computed tomography (CT) staging scans of the chest, abdomen and pelvis in addition to magnetic resonance imaging (MRI) to determine resection margins and lymph node staging. Volumetric modulated arc therapy (VMAT) treatment is planned using Varian Eclipse Treatment Planning System, V13.6 (Varian Medical Systems, Palo Alto, California) using 2 full arcs at 6MV. Optimisation structures are created for all organs at risk to control the dose distribution without compromising coverage to the PTVs.
Results: By utilising VMAT, external beam radiotherapy is delivered using two arcs at 6MV whilst simultaneously delivering a boosted dose to the enlarged positive pelvic sidewall lymph nodes. Doses to surrounding organs at risk are controlled during optimisation to minimise toxicity.
Conclusions: The patient presented tolerated the treatment with negligible toxicity and proceeded to successful surgery with an R0 resection margin to the primary tumour, at resection, the tumour was re-staged as T1 N0.

P081 **Increasing Radiologist's reporting time by extending skills mix to Interventional Radiology**

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Introduction: Ultrasound (US) guided paracentesis for ascites is a safe and commonly performed procedure by Radiologists. Patients' waiting times for paracentesis varies depending on availability of Radiologists and beds within the hospital. Inpatients and Outpatients were experiencing delays, leading to increased symptoms and discomfort. Subsequently many of these outpatients were admitted to the hospital, however with the implementation of a radiology day case unit (RDCU), the burden on the service was partly alleviated. This led to the training of advanced practitioner radiographers (APR) to perform ultrasound-guided paracentesis, with a view to improving the service[1,2].
Methods: An audit of 170 APR performed paracentesis was performed between January 2017 and December 2018. Effectiveness of the service was measured using the key indicators of: the wait from referral to drain insertion time, documented procedural complications, whether radiologist assistance was required and the average time taken to perform paracentesis.
Results: Effectiveness of the service was measured by the average referral to drain insertion time which was on average 7.9 days for RDCU outpatient and 2.2 days for an inpatient. No complications and no requirement of Radiologist assistance were recorded for any APR performed paracentesis. On average the time of APR performed paracentesis was 32 minutes; this equates to 90 hours Consultant Radiologist time saved.
Conclusion: APR led paracentesis service is a safe and effective in providing patients with improved care. This service has also led to considerable time being saved for Consultant Radiologists to deliver other imaging service where advanced practitioner roles are limited[3].

1. Hill, S., Smalley, J. R., & Laasch, H. U. (2013). Developing a Nurse-Led, Day-Care, Abdominal Paracentesis Service. Cancer Nursing Practice, 12(5)
2. Aplin, N. (2017). Advanced nurse practitioner-led abdominal therapeutic paracentesis. Emergency Nurse (2014+), 24(10), 34. 3. NHS. (2017). Cancer Workforce Plan: Phase 1: Delivering the cancer strategy to 2021. London. NHS

P082 **The role of multi-modality fusion imaging with CT/Fluoroscopy for TIPSS Procedures using Philips Vessel Navigator Software**

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Background: The current standard practice is to perform TIPSS (transjugular intrahepatic portosystemic shunt insertion) procedures using live Fluoroscopy only with Hepatic Venography. By using this technique there is no visualisation of the portal vein, so navigation during procedure can prove extremely difficult and time consuming for the Interventional Radiologist; the blind portal vein puncture remains the most challenging step during transjugular intrahepatic portosystemic shunt (TIPSS) creation[1]. The procedure can also lead to excessive radiation dose to both patient and Interventional staff involved. Dedicated fusion software was employed to improve practice for performing TIPPS procedures.
Purpose: The poster aims to demonstrate the clinical use of Philips Vessel Navigator Software, which combines pre-op CT data with Fluoroscopy to perform fusion-imaging .This provides a continuous 3D Roadmap of the hepatic and portal veins and significantly improves the accuracy of navigation of needle/guide-wire path and stent deployment for TIPPS procedure.
Summary: The poster will show how the use of fusion imaging in TIPPS procedures has led to improvement in overall image

quality, radiation dose reduction to both patient and staff, reduction in the amount of contrast and shortened procedural times which has led to an overall improvement in standards for practice and safety for performing TIPPS procedures

1. Xuefeng Luo, Xiaoze Wang,(2018).Transjugular intrahepatic portosystemic shunt creation: three-dimensional roadmap versus CO2 wedged hepatic venography. European Radiology. Volume 28, Issue 8, (1), pp 3215–3220

P083 SPLENOSIS - A pictorial review

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Background: Splenosis is a benign condition caused by heterotopic autotransplantation of ectopic splenic tissue following splenic trauma or elective splenectomy. It has a slight male preponderance and although it is normally asymptomatic or an incidental finding, the splenic tissue can be surgically removed in symptomatic patients. Accurately diagnosing splenosis is vital in the context of possible lymphoma, polysplenia, accessory spleens, metastatic disease, endometriosis, exophytic renal or liver tumours. The gold standard for diagnosis is a Tc99m-tagged heat-damaged RBC scan with autologous erythrocytes being capable of specifically proving splenic tissue.

Purpose: The purpose of this pictorial review is to aid diagnosis by achieving the following learning outcomes:

1. To review the aetiology, epidemiology and presentation of splenosis.
2. To appreciate the characteristic appearances of splenosis on ultrasound, CT and Scintigraphy.
3. To discriminate between splenosis and its common differential diagnosis.

Summary: For this pictorial review, we have selected cases of splenosis diagnosed in our tertiary centre using a range of modalities. We have reviewed the patient histories and the methods used for achieving an accurate diagnosis, highlighting the different radiological features for each case.

1. Fremont R. D. and Rice T. W. (2007): Splenosis: A Review. South Med J. Jun;100(6):589-93
2. Fortin F et al. Splenosis.
3. Yammine J. N. et al. (2003) Radionuclide imaging in thoracic splenosis and a review of the literature. Clin Nucl Med. Feb;28(2):121-3

P084 The potential role of high-resolution MRI in guiding treatment of early rectal cancer: What a radiologist needs to know

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Screening for early rectal tumours (ERC) has significantly increased the detection rate of non-invasive T1 colorectal cancers. The current gold standard of endoscopic ultrasound (EUS) is failing to adequately stage these cancers and, in turn, has led to a considerable number of patients being subjected to unnecessary radical treatment[1]. Encouraging results from recent preliminary studies suggest high-resolution MRI is able to successfully delineate the degree of invasion in mucosal and muscular layers within the rectum and significantly improve the accuracy of ERC staging; specifically reducing the under/over-staging produced by other diagnostic techniques[1,2]. This potentially would improve identification of tumours amenable to organ preserving treatment such as endoscopic or transanal microsurgery (TEMS).

The principal aim of the poster is to educate the reader on the potential of high-resolution MRI in ERC staging with a view to shielding patients from unnecessary radical treatments. Initially, the current practice and associated concerns of ERC staging will be outlined. This will be followed by MRI's prospective role in addressing these concerns and its additional benefits, such as evaluation of nodal status. Specific detail will be included on how to improve the MRI technique to increase visualisation, for example, by the use of buscopan, 3T scanners and rectal distension and further discussion will address how radiologists can improve their ability to identify early tumours. The poster layout will be a pictoral review based on evidence-based research[1,2] encompassing the above points.

1. Svetlana Balyasnikova, James Read, Andrew Wotherspoon et al (2017) *Diagnostic accuracy of high-resolution MRI as a method to predict potentially safe endoscopic and surgical planes in patients with early rectal cancer. BMJ Open Gastro 2017;4:e000151. doi:10.1136/bmjgast-2017- 000151*
2. Regina G. H. Beets-Tan, Doenja M. J. Lambregts, Monique Maas et al (2017) *Magnetic resonance imaging for clinical management of rectal cancer: Updated recommendations from the 2016 EuropeanSociety of Gastrointestinal and Abdominal Radiology (ESGAR) consensus meeting. Eur Radiol (2018) 28:1465-1475*

P085 Correlation between diagnostic query on request form and findings on CT scan in the acute abdomen at a DGH

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Background: The workload of clinical radiology continues to increase each year with 5,146,475 computed tomography scans performed in England in 2017/2018 - a 6.9% increase from the previous year[3]. Studies have found a large proportion of CT scans carried out for acute abdominal pain are not clinically indicated or performed prior to sufficient clinical work up[1], as well as an overuse of CT for minor head injuries[2].

Method: A retrospective review was undertaken of one hundred acute abdominal/pelvic CT scans from December 2017 to January 2018, using RCR iRefer guidelines as our standard. Primary outcome was positive yield rates between indication on request and radiology report. Scans were deemed positive if there was a radiologically significant lesion related to the indication

for the scan. Other outcomes included analysis of content of the request, variation in clinical indications, report outcome/diagnosis and clinical outcome.

Results: The positive yield rate of CT scans was 40%, meaning that 60% of radiological reports did not correlate with the indication on the request. Request for query obstruction or collection carried the highest negative rates at 10% and 9% respectively. Overall there were 27 different clinical diagnoses queried in the requests, with 3% categorised as 'vague' due to no identifiable clinical question.

Conclusion: The low positive yield rates between indication and report outcome is concerning, as is the content and diagnostic variation of requests. Education regarding appropriate requesting of CT scans could be warranted to attempt to reduce the number of unnecessary scans requested.

1. de Burlet, K. J. et al. (2018) 'Appropriateness of CT scans for patients with non-traumatic acute abdominal pain', The British Journal of Radiology. The British Institute of Radiology, 91(1088), p. 20180158. doi: 10.1259/bjr.20180158
2. Cellina, M. et al. (2018) 'Overuse of computed tomography for minor head injury in young patients: an analysis of promoting factors', La radiologia medica, 123(7), pp. 507–514. doi: 10.1007/s11547-018-0871-x. 3. NHS England (2018) Diagnostic Imaging Dataset Annual Statistical Release 2017/18

P086 Drug pushers- A case report and review of the literature

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Background: Radiology has a key role in the identification of ingested/inserted packages of elicit substances (e.g. cocaine) in drug packers/pushers, as well as a role in the detection of potential complications. It is therefore vitally important for radiologists to be aware of the spectrum of appearances of illicit drug packages on various imaging modalities including abdominal radiographs and CT, which are the most common methods used for the identification of concealed drug packets and their potential complications.

Purpose: We aim to review the key differences between drug packers and pushers, the different packaging methods used and the implications for radiologists reviewing their imaging. We will review the imaging techniques used and the key radiological features to look out for in the identification of cocaine packets in drug packers/pushers. The varying radiological appearances of cocaine packets when different packaging methods are used will also be highlighted. Finally we will provide some key learning points to bear in mind when reviewing your next case of drug packing/pushing to prevent misdiagnosis!

Summary: Through the use of images from an interesting "drug pusher" case we will provide an overview of drug packing/pushing, the role of radiology in the diagnosis and management of these patients and provide a pictorial review of the differing radiological appearances of cocaine packets dependant on packing method used.

1. Aks, S. and Bryant, S. (2017). Acute ingestion of illicit drugs (body stuffing)
2. Pinto, A., Reginelli, A., Pinto, F., Sica, G., Scaglione, M., Berger, F., Romano, L. and Brunese, L. (2014). Radiological and practical aspects of body packing. The British Journal of Radiology, 87(1036), p.20130500

P087 Management and surveillance of pancreatic IPMNs: An update

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Background: Intraductal papillary mucinous neoplasms (IPMNs) are mucin-producing pancreatic papillary tumours which arise from the epithelium of the main pancreatic duct or the duct side branches. They are therefore classified into three types: side branch IPMN, main duct IPMN or combined IPMN which shares imaging features of both. They account for approximately 20-50% of all pancreatic cystic lesions, and are associated with a number of hereditary conditions. They do have a malignant potential, however the management and surveillance strategy for IPMNs, in particular branch-duct type, has remained controversial. Therefore, many patients with IPMNs will have extensive imaging follow-up over a number of years and repeated MDT discussion.

Purpose: 1. Understand the malignant potential of pancreatic IPMNs. 2. Adopt an evidence-based surveillance and management strategy for IPMNs based on the 2018 European guidelines. 3. List the relative and absolute indications for surgery in radiologically suspected IPMN. 4. Review appearances of the range of IPMN features on CT, MRI and EUS (endoscopic ultrasound).

Summary: This poster reviews the 2018 European evidence-based guidelines on pancreatic cystic neoplasms, with specific reference to IPMNs. It contains an algorithm for a management and surveillance strategy that can be adopted to appropriately and safely utilise imaging and MDT time. It also provides specific case examples of the range of IPMN features seen on EUS, CT and MRI.

1. European Study Group on Cystic Tumours of the Pancreas, 2018. European evidence-based guidelines on pancreatic cystic neoplasms. Gut, pp.gutjnl-2018

P088 Are they really bleeding? Common CT artefacts post endoscopy

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CT is common place post endoscopy to identify ongoing haemorrhage which may require embolisation or repeat endoscopy in both upper and lower GI bleeds. Advancements in endoscopic technology have brought novel ways of stemming GI bleeds.

Many of these new technologies lead to artefacts on subsequent CT imaging which, unless the reporting Radiologist is aware of the endoscopic procedure, can be misinterpreted as active haemorrhage. Here we present a pictorial review of cases where artefact from endoscopic procedures has led overcalls of active contrast extravasation and the lessons learned from these cases.

P089 **Non-specific upper GI mural thickening on CT - is it just from peristalsis?**

Neel Jain; Raunak Poonawala; Ruhaid Khurram; Rajan Patel; Zohaib Tariq; Jonathan King; Kalpesh Besherdas
Barnet Hospital, Royal Free London

Background: Non-specific upper GI mural thickening on CT is a common abnormal finding, raising the suspicion of upper GI malignancy. The correlation between this finding and an endoscopic diagnosis of malignancy is not clearly known.
Method: A retrospective single centre study of patients referred for gastroscopy with the indication of 'abnormal imaging' (n=147) over a 3-year period (2016 to 2018) was performed. Patients with a CT reported finding of 'mural thickening' were included for analysis (n=59).
Results: Site of CT reported mural thickening: oesophageal 20, GOJ 9, gastric 23, pyloric 4, duodenal 5 and jejunal 1. Median time from CT to endoscopy: 21 days (IQR 12 - 54). Median age: 77 (IQR 62 - 83). Initial indication for CT included: weight loss 16, abdominal pain 14, possible malignancy 6 and dysphagia 3.
11 patients had a normal gastroscopy, 24 showed oesophagitis or gastritis, 20 had a hiatus hernia and 5 had benign polyps.
5 had a histological diagnosis of gastric adenocarcinoma, 4 of Barrett's oesophagus and 1 of squamous dysplasia.
Those with adenocarcinoma could not be accurately differentiated by indication for imaging (abdominal pain 2, weight loss 1 and non-GI or systemic related symptoms 2).
Conclusion: Upper GI mural thickening on CT correlated with malignancy, dysplasia or metaplasia in 10/59 (17%) patients in this study. Patients with malignancy could not be accurately differentiated by indication for imaging. Owing to this high concordance, we recommend gastroscopy is performed in every case when mural thickening is detected incidentally.

P090 **Do I really need to go to the toilet eight times tonight? Quality of CT colonographies in patients with or without laxative bowel preparation**

Kyungmin Kim; Sarah Touyz; Priya Agarwal; Grazvydas Gaikstas; Milan Sapundzieski
Pennine Acute Hospitals NHS Trust

Introduction:

- The CT colonography (CTC) is used to detect colonic tumours
- Prior to the CTC, patients are instructed to consume oral contrast (e.g. Gastrografin), and in some centres, also laxative bowel preparation (LBP) (e.g. Citrafleet)
- However, LBPs commonly cause patient discomfort, dehydration and electrolyte abnormalities
- We investigated whether LBPs affected the quality of CTCs.

Methods:

- We retrospectively identified all patients aged >75 who had a CTC in the Pennine Acute Trust between September and December 2017, and recorded whether they had Citrafleet
- The quality of faecal tagging was determined by calculating the average CT attenuation of tagged faecal matter across the ascending, descending and distal colons
- The extent of bulky faecal residues was classified into none, slight, moderate or severe.

Results:

- 25 patients received both Citrafleet/Gastrografin, whereas 57 patients only received Gastrografin during the study period
- The quality of faecal tagging was significantly better ($P = 1.06x10^{-4}$) in patients who received Gastrografin only (694.0 HU; 95% CI 612.8-775.3 HU *vs* 409.8 HU; 95% CI 308.9-510.6 HU)
- The number of patients with moderate or severe bulky faecal residues was 3 in the Citrafleet/Gastrografin group and 12 in the Gastrografin-only group ($P = 0.5356$).

Conclusion:

- Taking LBPs prior to CTCs does not significantly improve the quality of the CTC, but is associated with a significant side effect profile
- We recommend that all UK centres should protocol their CTCs such that patients only receive Gastrografin prior to their CTCs.

GU & URO

P091 **The effect of rectal size and shape on bladder deformation in urinary bladder radiotherapy**

Nicky Hutton [1]; Jenny Callender [2]; Daniel Hutton [3]; Lauren Williams [4]; Suzanne Wong [1]; Helen Wong [1]; Isabel Syndikus [1]
[1]Clatterbridge Cancer Centre NHS FT; [2]The University of Liverpool; [3]Clatterbridge PropCare Services Ltd; [4]Clatterbridge Cancer Centre

Objective: To identify any significance in the relationship between rectal consistency and bladder deformation with a view to reconsidering appropriate treatment margins. The bladder is subject to variation in shape and size and can be influenced by adjacent organs, notably the rectum. An earlier study showed improve consistency in rectal diameter and content between planning and treatment with the use of a micro-enema.
Methods: Control group consisted of patients asked to empty their bladder immediately before planning and treatment. An intervention group consisted of patients asked to use a micro-enema 20 mins prior to planning and each treatment. Treatment CBCT images were analysed on-line using an automatic match algorithm to provide a rigid bone registration and a 3mm Action level and a CTV coverage check. Retrospective analysis was carried out on 97 CBCT scans, control group (n = 41) and intervention group (n= 56). Volume and positional organ variations were determined from the rigid bone registration of CT and CBCT. Centre of mass shifts (CoM) for bladder and rectum were determined in the X,Y and Z axis and the magnitude of CoM shift and Dice similarity coefficient calculated.
Results/conclusion: The introduction of a micro-enema shows significant worsening of bladder and rectum stability. The significant result for correlation between rectum changes in the Y and Z directions and bladder CoM shift in the same direction suggest that the use of micro-enema may destabilise the rectum. Bladder radiotherapy may benefit from daily imaging with appropriate justification and optimisation of imaging.

P092 Seminal vesicle volume variability in patients receiving radiotherapy to the prostate

Rhianna Bairstow [1]; Pete Bridge [1]; Michelle Cain [2]; Phil Reynolds [2]
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Introduction: Prostate positional variability has been widely explored with seminal vesicle (SV) variability only coming into the forefront in recent years. The effects of bladder and rectum volumes on prostate and SV motion have led to PTV margin changes and preparation protocols. There is far less evidence on SV variability than prostate, and the studies that exist (Deurloo 2005, Stenmark 2012) have looked at SV position only and not volume variability.
Aim: The aim of this study was to investigate whether interfraction volume variability of the seminal vesicles can exist in patients receiving radiotherapy to the prostate.
Method: SV variability was investigated by comparing 4 on-treatment Cone Beam Computer Tomography (CBCT) scans to a planning Computer Tomography (CT) image for two patients receiving prostate radiotherapy. Volumes (cm3) were compared, and Dice Similarity Coefficients (DSC) calculated to identify positional variations between CBCT and planning CT.
Results: SV volume variability was seen in both patients with the largest change in volume being 78.38%. DSC also showed positional variation in both patients which was much greater in one patient than the other.
Conclusion: This study found that there is potential for daily SV volume variability in patients receiving prostate radiotherapy. Future large scale studies using Magnetic Resonance Imaging are warranted to identify the extent of this motion and potential clinical impact. Evidence-informed PTV margins and possible SV volume control protocols may need to be adopted depending on the findings of further studies.

1. Deurloo, K, Steenbakkers, R, Zijp, L, de Bois, J, Nowak, P, Rasch, C, van Herk, M. (2005) Quantification of shape variation of prostate and seminal vesicles during external beam radiotherapy. Int J Radiat Oncol Biol Phys. 61(1). 228-238
2. Stenmark, M, Vineberg, K, Ten Haken, R, Hamstra, D, Feng, M. (2012) Dosimetric implications of residual seminal vesicle motion in fiducial-guided intensity-modulated radiotherapy for prostate cancer. Med Dosim. 37(3), 240-244

P093 Development of a bowel toxicity sheet for patients undergoing pelvic radiotherapy

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Background: With the introduction of FFF radiotherapy for prostate patients, acute side effects were being seen earlier in treatment. Frequent staff changes between machines made it increasingly difficult to keep track of how the patients were progressing, what advice had been given and what was appropriate to advise based on the patient's normal status. Although there was a basic toxicity record sheet in place for pelvis patients a more thorough way of documenting reactions needed to be developed and the advice given made consistent. It was hoped this would lead to a more proactive and personalised approach to patient care.
Purpose: Demonstrating how better documentation leads to a greater understanding of side effects, earlier intervention and improved outcomes for the individual patient. Communication and safety improved in the department. A range of CPD outcomes can be covered in the development process.
Summary: The need for its development What discussions were had and with who. What grading systems could be utilised. What information was required. What layout would be most efficient and effective. Pictures of sheet. Discussion of the multiple advantages and benefits of the sheet. Disadvantages and difficulties encountered.
Conclusion: Improved patient care and communication achieved with better documentation and consistent advice. Is there a need to give the patients more control over their treatment and side effects? Help them feel more involved and valued and humanises the experience. CPD outcomes covered.

1. RTOG/EORTC Late Radiation Morbidity Scoring Schema . 2018. RTOG/EORTC Late Radiation Morbidity Scoring Schema

2. Natsuo Tomita, N. (2018). International prostate symptom score (IPSS) change and changing factor in intensity-modulated radiotherapy combined with androgen deprivation therapy for prostate cancer

P094 **Virtual imaging for patient information on radiotherapy planning and delivery for prostate cancer: Data collection and analysis**

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Background: To assess whether provision of information on RT planning and delivery with a Virtual Environment Radiotherapy Training (VERT) system improves not only patient's satisfaction[1], but also compliance to preparations for prostate radical RT.
Method: In this randomised study, patients were allocated to group 1 (information on RT planning and delivery using VERT was given prior to starting RT) or group 2 (after the last RT day). 92 patients completed a prescription of 74Gy-37 fractions delivered with VMAT (Volumetric Arc Therapy). Their planning CT (pCT) images and RT plan were uploaded onto the VERT system, allowing patients and relatives to visualise and further understand their treatment nature as well as the set-up importance. Bladder volumes and product of separations AP-RL in both bladder and rectum were analysed blindly in 'Eclipse' from the pCT, and then on days 1,2,3, and weekly from the CBCT scans.
Results: No significant differences were seen in the number of CBCT scans between group 1 (39.0 per patient) and 2 (38.5 per patient), and either in the reduction of bladder volumes and APxRL-products in bladder and rectum. The percentages of the bladder volume for group 1 and 2 patients when compared to the pCT values were (81.8+7.3)% and (80.2+11.4)% respectively at week 4, and (84.7+10.3)% and (76.5+10.3)% respectively on the last treatment week.
Conclusion: Providing information on RT planning and delivery using 3D-imaging systems helped patients to better understand the treatment, hence, improving patients' experience[1]. However, no substantial differences were found regarding patients' compliance to RT.

1. Sulé-Suso J., *et al* . Pilot study on virtual imaging for patient information on radiotherapy planning and delivery. Radiography 21: 273-277; 2015

P095 **Too anal to talk about gay sex? Developing UK guidance on how long men should abstain from receiving anal sex before, during, and after investigations and treatments for prostate cancer**

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Introduction: Gay and bisexual men's sexual practices are different to that of heterosexual men. This group of patients therefore require targeted information and support in order to be appropriately prepared for the sexual side effects of prostate cancer treatments (Blank, 2005; Fish & Williams, 2018; Macmillan Cancer Support, 2015).
Aim: To develop UK guidance on how long men should abstain from receiving anal sex before, during, and after investigations and treatments for prostate cancer.
Method: A modified Delphi technique utilising two question rounds was employed in order to generate consensus opinion from a panel of 15 clinical oncologists and 11 urological surgeons.
Results: The overwhelming consensus from panel members was yes men should abstain from receiving anal sex before, during, and after investigations and treatments for prostate cancer. The consensus for how long should men abstain was: 1 week before a PSA test; 2 weeks after a transrectal ultrasound guided biopsy; 1 week after a transperineal biopsy; 6 weeks after a radical prostatectomy; yes during external beam radiotherapy and for 2 months after; and 2 months after high-dose rate brachytherapy. Panel members failed to reach consensus on how long men should abstain after the insertion of fiducial markers and permanent seed brachytherapy.
Conclusion: Men should abstain from receiving anal sex before, during, and after investigations and treatment for prostate cancer in order to avoid receiving a false positive PSA test; manage their side effects appropriately; minimise radiation exposure to sexual partners; and to minimise the risk of developing post-intervention complications.

1. Blank, T. O., 2005, Gay men and prostate cancer: invisible diversity: Journal of Clinical Oncology, v. 23, p. 2593-2596
2. Fish, J., and I. Williamson, 2018, Exploring lesbian, gay and bisexual patients' accounts of their experiences of cancer care in the UK: European Journal of Cancer Care, v. 27, p. 1-1
3. Macmillan Cancer Support, 2015, No One Overlooked: Experiences of LGBT People Affected by Cancer

P096 **A retrospective review of bladder volumes during prostate radiotherapy - "to pee or not to pee" that is the question**

Ruth Smith

Nottingham University Hosptital

Background: There is much debate surrounding the ideal bladder status for patients having prostate radiotherapy. A bladder-filling protocol is challenging to manage in terms of appointment scheduling, patient compliance and comfort. The purpose of

the audit is to establish if a fluctuating bladder volume has an effect on GU/GI toxicities reported and to simulate the dosimetric effect if the bladder volume is much smaller than the reference.
Method: A sample of 10 patients (planned for 60Gy/20 fractions according to CHHIP constraints), all following the same protocol of drinking 500ml of water over 20 minutes before treatment, had their daily cone beam CT exported to the planning system. Bladder volumes were outlined, collated and the results analysed. Acute toxicities at 3-6 months were reviewed. The dosimetric effect on the planned bladder dose constraints was simulated for the smaller bladder volumes.
Results: 198 scans were analysed and variations in bladder reference volumes were seen despite all patients following the same protocol. 118 treatments were delivered with a bladder volume outside a 70-130% range of the reference volume. Reported toxicities were no less favorable for smaller bladder volumes. Preliminary dosimetric comparison demonstrated the bladder V60Gy decreased and the V40Gy increased.
Conclusion: The current bladder-filling protocol is shown to be ineffective at replicating the reference volume for treatment and the analysis shows that an empty bladder approach should be considered.

P097 Development of bowel preparation sheet for patient undergoing prostate radiotherapy

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Betsi Cadwaladr Health Board

Background: Poor patient compliance with bowel and bladder preparation for prostate radiotherapy is a common problem. It seems to stem from a patient's lack of knowledge about why it is important. A lot of staff time is wasted by having to repeat preparation instructions, information and checks before treatment disrupting already busy schedules. In addition, with a higher dose per fraction, the organs at risk and the reproducibility of their position is even more critical. An information sheet was designed to give patients more information and improve compliance.
Purpose: Demonstrating how a detailed yet easy to understand information sheet can greatly improve patient compliance and hence improve side effects (monitored with bowel toxicity sheets developed simultaneously). Patients feel more involved and in control over their own treatment, humanising the entire experience.
Summary: Why the need for its development? How, what discussions were had and with who? What information was required? What language should be used as not to be to clinical? Would diagrams be of benefit? Picture of sheet. Discussion of the multiple advantages and benefits of the sheet. Disadvantages and difficulties encountered.
Conclusion: Improved patient care and communication achieved with better documentation and consistent advice. Prioritise clinical care by involving and educating the patient effectively, making them part of the team, humanising the experience, streamlining the preparation process and ultimately improving the treatment pathway for the patient CPD outcomes covered.

P098 Minimising radiation dose in computed tomography of kidneys, ureters and bladder (CT-KUB)

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Background: CT-KUB is the favoured imaging to confirm the diagnosis of urinary tract calculi, in accordance with the Royal College of Radiologists and British Association of Urological Surgeons guidelines. CT-KUB should commence cranially to include both kidneys in their entirety but be well collimated thereafter to minimise dose. The dose can be reduced by minimising the scan field with many authors quoting the upper border of T10 as a landmark to commence the examination. However, many commence above this and thus expose the patient to unnecessary radiation.
Methods: A retrospective study involving two cycles with 200 CT-KUB's in each. 1st: 14/03/18 - 14/04/18 2nd: 06/11/18 - 06/12/18. Data collected: A) vertebral level at which kidneys fully included B) vertebral level at which scan commenced The findings of the 1st cycle were presented at a departmental QI meeting leading to change of the CT-KUB protocol to specifically state (Plain Scan upper T10 to symphysis pubis) instead of (Plain scan top of kidneys to symphysis pubis). Radiographers were encouraged to follow this. See attached imaging:

Red line: Current practice
Yellow Line: suggested change

Results:

Data collected	1st Cycle	2nd Cycle
A) vertebral level at which kidneys fully included	199 patients had their kidneys between T10-12 1 patient had the upper level of their kidneys at upper border of L1	197 patients had their kidneys between T10-12 3 patients had the upper level of their kidneys at upper border of L1
B) vertebral level at which scan commenced	115 scans commenced between T10-T12 85 commenced above T10	145 scans commenced between T10-T12 55 commenced above T10

Discussion: Our study shows that after raising radiation awareness the protocol for CT-KUB has changed and this led to reasonable improvement in the range of scans that commenced at the standard level (T10).

1. British Association of Urological Surgeons (BAUS) guidelines for acute management of first presentation of renal/ureteric lithiasis, December 2008, reviewed and updated February 2012
2. iRefer. Making best use of a Department of Clinical Radiology, Guidelines for Doctors, 7th Edition 2012, The Royal College of Radiologists, London
3. Webb WR, Brant WE, Major NM. Elsevier - Health Sciences Division. November 2005. Page 276 Fundamentals of Body CT. Third edition.

P099 In emergency department patients requiring resuscitation room care, is renal resistive index measurement a feasible early indicator of acute kidney injury

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Background: Doppler renal resistive index (RRI) has emerged in the last decade as a useful prognostic indicator for transient and persistent acute kidney injury (AKI)[1] and a potential early marker for sub-clinical AKI and post procedural AKI risk[2,3]. This study aimed to determine the feasibility of RRI measurement in an Emergency Department (ED) resuscitation room setting using a point-of-care ultrasound system.

Method: Prospective single centre study. RRI measurement was attempted in non-consecutive patients by a single expert sonographer and evaluated against context specific feasibility criteria and target outcomes.

Results: 20 patients (11 male, 9 female) Age of patients 33 years to 91 years (mean 62.3 years). Adequate visualisation of both kidneys achieved in 60% of patients (n=12). Limiting technical factors were shortness of breath (SOB) (n=6), high BMI (n=2). In 30% of patients (n=6) no usable spectral trace was achieved. SOB noted as a technical difficulty in 60% of patients (n=12) In 9 patients (45%) SOB was the primary reason for failure to acquire a usable Doppler trace. All criteria for RRI measurements were met in only 3 patients (15%).

Conclusion: Measurement of RRI was not feasible in patients requiring resuscitation room care using a current point of care ultrasound system. If RRI is to play a useful role in this high priority patient group, the problem of image blur due to patient breathing movement must be resolved. A theoretical model for adaptation of the standard RRI measurement algorithm is presented that may mitigate motion blur in these patients.

1. Darmon, M., Schortgen, F., Vargas, F., Liazydi, A., Schlemmer, B., Brun-Buisson, C., et al. (2011). Diagnostic accuracy of Doppler renal resistive index for reversibility of acute kidney injury in critically ill patients. Intensive Care Medicine, 37(1), 68-76
2. Marty, P., Ferre, F., Labaste, F., Jacques, L., Luzi, A., Conil, J. M., et al. (2016). The Doppler renal resistive index for early detection of acute kidney injury after hip fracture. Anaesth Crit Care Pain Med, 35(6), 377-382
3.Wybraniec, M. T., Chudek, J., Bozentowicz-Wikarek, M., & Mizia-Stec, K. (2017). Prediction of contrast-induced acute kidney injury by early post-procedural analysis of urinary biomarkers and intra-renal Doppler flow indices in patients undergoing coronary angiography. Journal of Interventional Cardiology, 30(5), 465-472

P100 Granulomatous prostatitis, a mimic of prostate cancer on MRI

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Background: Multiparametric prostate MRI incorporating anatomical and functional imaging is a contemporary imaging technique used in prostate cancer diagnosis and management. However, a range of benign conditions may mimic prostate cancer on MRI. Granulomatous prostatitis (GP) is a rare inflammatory condition that can imitate cancer clinically (abnormal digital rectal examination and/or elevated PSA) and present with high suspicion PIRADS (Prostate Imaging Reporting and Data System) scores with overlapping MRI features of clinically significant prostate cancer. Therefore, histological analysis is required for conclusive diagnosis.

Pupose: To briefly discuss GP and to illustrate a series of histologically proven cases that present with features mimicking clinically significant prostate cancer on MRI.

Summary:

- A brief outline of GP and its subtypes
- Describe and illustrate a series of histologically confirmed GP cases designated a multiparametric prostate MRI PIRADS score of 5, highly suspicious for clinically significant prostate cancer at presentation
- Review and present a summary of clinical and imaging features from literature review that may aid in the diagnosis of GP.

1. Kitzing, Y., Prando, A., Varol, C., Karczmar, G., Maclean, F. and Oto, A. (2016). Benign Conditions That Mimic Prostate Carcinoma: MR Imaging Features with Histopathologic Correlation. Radiographics. **36**(1):162-75
2. Bhowmik N.M., Yu J., Fulcher A.S., Turner M.A. (2016) Benign causes of diffusion restriction foci in the peripheral zone of the prostate: diagnosis and differential diagnosis. Abdom Radiol. **41**(5):910-8.
3. Lee S.M, Joshi J., Wolfe K., Acher P., Liyanage S.H. (2016) Radiol Case Rep. **16**;11(2):78-82
4.Rais-Bahrami S., Nix J.W., Turkbey B., Pietryga J.A., Sanyal R., Thomas JV5, Gordetsky J.B. (2017). Clinical and multiparametric MRI signatures of granulomatous prostatitis. Abdom Radiol. **42**(7):1956-1962

P101 **Granulomatous prostatitis: A pictorial review of multi-parametric MRI features of a perfect mimic of aggressive prostate cancer**

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Background: Granulomatous prostatitis is a benign inflammatory condition which can be a perfect mimic of aggressive prostate cancer clinically and radiologically. On multi-parametric MRI (mpMRI), it is a specificity-limiting factor, being a regular cause of a false positive scan. It can lead to a prostate biopsy with associated risks and poses a diagnostic challenge for the reporting radiologist.

Purpose: MpMRI prostate can guide biopsy and avoid biopsy in up to 30% of men referred with raised prostate specific antigen (PSA)[1]. An awareness of granulomatous prostatitis as a mimic of prostate cancer on mpMRI will help the radiologist arrive at an accurate diagnosis. The aim of this pictorial review is to identify these confounding MRI features.

Summary: This pictorial review illustrates the spectrum of granulomatous prostatitis MRI features, including gland-confined and locally advancing-looking lesions. The increased incidence of granulomatous prostatitis in patients who have Bacillus Calmette-Guérin (BCG) treatment for bladder cancer is described. Finally, a case of caseating granulomatous prostatitis confirming prostate tuberculosis is demonstrated. In addition to description and illustration of granulomatous prostatitis, we include average MRI signal intensities and the contrast enhancement pattern for granulomatous prostatitis, normal prostate and cancers, taken from a review of 150 patients who underwent mpMRI prostate examinations.

1. Kapoor, J., Lamb, A. D., & Murphy, D. G. (2017). Re: Diagnostic Accuracy of Multi-parametric MRI and TRUS Biopsy in Prostate Cancer (PROMIS): A Paired Validating Confirmatory Study.Ã‚Â European Urology,72(1), 151. doi:10.1016/j.eururo.2017.02.014

P102 **Learning from malignancies missed on CT urogram**

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Pennine Acute Hospitals NHS Trust

Background: Unexplained painless visible haematuria is a red flag symptom which needs urgent investigation, as up to 40% of patients will go on to develop a urological malignancy. CT urography is the initial diagnostic tool to investigate the cause for bleeding, and can be followed later with cystoscopy. CT Urography is a powerful tool for diagnosing malignancies within the urinary tract, of which bladder cancer is the commonest one. There are occasions, however, where malignancies outside the urological system are identified on CT urogram.

Purpose: This poster shall present a pictorial review of several cases identified from a busy district general hospital of malignancies identified on CT urography. It will highlight anatomical regions where causes for haematuria outside the urinary system were seen as well as other clinically relevant incidental findings. One learning example of particular importance will be that in female patients, perceived haematuria can be caused by cervical malignancies instead of urological causes.

Summary: CT urography is a good initial diagnostic test for visible haematuria. We will present several pictorial learning cases where we found significant other pathology. One important learning point from our series will be that cervical malignancies can masquerade as urological in origin with haematuria.

P103 **The spectrum of abnormal adrenal FDG uptake on PET: A pictorial review of pearls and pitfalls**

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Background: Adrenal uptake is often noted on positron emission tomography (PET) using 18F-fluorodeoxyglucose (FDG). This may be incidental, but may represent significant benign or malignant findings. There are also recognised indications for FDG-PET assessment of suspected malignant adrenal lesions. Imaging assessment of the adrenal glands is often complex and requires a multimodality approach with conventional anatomical imaging, (including contrast-enhanced computed tomography with wash-out technique, and magnetic resonance imaging, particularly in-and-out phase imaging); functional imaging (including MIBG scintigraphy and Ga-68 DOTATATE PET/CT); and correlation with biochemistry. A multidisciplinary approach to the work-up of this finding is required.

Purpose: Increased adrenal uptake on FDG-PET often presents a diagnostic challenge as it can occur with both benign and malignant pathology. We aim to demonstrate a range of potential causes of increased adrenal uptake on FDG-PET, patterns of uptake and explain the approach to the subsequent work-up of this finding.

Summary: We will present cases from our institution demonstrating a range of adrenal pathology; these were initially identified incidentally on FDG-PET imaging performed for other indications. We will discuss the clinical significance of these lesions, and summarise the assessment of this finding using imaging and biochemistry.

1. Dong, A. et al. (2014) '18F-FDG PET/CT of adrenal lesions', American Journal of Roentgenology, 203(2), pp. 245–252
2. Chong, S. et al. (2006) 'Integrated PET-CT for the Characterization of Adrenal Gland Lesions in Cancer Patients: Diagnostic Efficacy and Interpretation Pitfalls', RadioGraphics, 26(6), pp. 1811–1824
3. Economopoulou, P. et al. (2013) 'Adrenal incidentalomas in cancer patients are not always "innocent": a case report and review of the literature.', Case reports in medicine, 2013, p. 461409

OBS & GYNAE

P104 'Fertility patient' well no surprise there! Audit of request forms for hysterosalpingography (HSG)

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Imperial College Healthcare NHS Trust

Background: Provision of adequate clinical details by a referrer for an imaging investigation is an IR(ME)R requirement. The RCR provide an audit template for assessing adequacy of completion of forms. In women referred for hysterosalpingography a pre-procedure questionnaire, which records confirmation of patient demographics, information about current and past medical and reproductive history, written informed consent and procedural details, is completed by the radiologist undertaking the study. A perception arose that while patient demographics and name of referrer were always compliant insufficient clinical information was provided which had implications for patient rapport, conduct and interpretation of the procedure. An initial audit confirmed this suspicion: 15% of forms were deemed inadequate and a further 10% borderline. Following a variety of interventions, the compliance remains at 100% for demographics and has risen to 81% for clinical information.
Purpose: To outline and discuss the implications of inadequate provision of clinical information with particular reference to hysterosalpingography. To review the effectiveness of the interventions undertaken with 'offending' referrers. To present the results of the completed audit cycle with suggestions for future action to further improve compliance. Reasons for failure to achieve 100% compliance will be suggested.
Summary: The results of the initial audit and subsequent re-audit will be presented together with illustrative examples of compliant, borderline and inadequate requests. The interventions undertaken ranging from direct contact with individuals concerned to escalation to referring directorate clinical leads will be discussed. Implications for inadequately completed requests will be illustrated.

The Ionising Radiation (Medical Exposure) Regulations 2017 IR(ME)R http://www.legislation.gov.uk/uksi/2017/1322/regulation/10/made Royal College of Radiologists. Adequate completion of Radiology Request forms https://www.rcr.ac.uk/audit/adequate-completion-radiology-request-forms Royal College of Radiologists. iRefer: RCR referral Guidelines 8th Edition London: RCR, 2017 https://www.irefer.org.uk/guidelines/about-guidelines/communication-radiology-service

P105 Does a previous miscarriage cause anxiety for patients during the dating scan of a subsequent pregnancy?

Vicki Pickering; Sophie Laverie
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A spontaneous miscarriage (SM) is the most common miscarriage in early pregnancy and is one of the leading causes of anxiety and depression for women during future pregnancy dating scans[1]. SM are often misunderstood due to the lack of knowledge surrounding the reasons for miscarriage and patient emotions in the psychological sequel are due to this lack of knowledge[2]. The purpose of this poster is to evaluate whether a previous miscarriage causes anxiety for patients during the dating scan of a subsequent pregnancy. "Scopus" database, along with "PubMed" and "Medline" was used to extensively search for relevant literature. A "CASP" tool was used to evaluate the papers. Anxiety in patients having suffered a previous miscarriage is evident at the 12 week dating scan however this is also coupled with other emotions such as excitement and fear[3].
The strength of these emotions is individual to every woman. It is difficult for sonographers to interpret these emotions. Ineffective communication between the ultra-sonographer and patient may cause more patient anxiety. However, the anxiety felt before the scan, following a previous spontaneous miscarriage is often uncontrolled by the sonographer. As women react differently and anxiety being an immeasurable scale, it is evident why sonographers may misread these emotions during the dating scan and do not know how to alleviate anxiety. However, the stigma surrounding SM is lessening and steps to promote ways to alleviate anxiety before, during and after the scan are being taken (4) Key words: Previous miscarriage, anxiety, dating scan, future pregnancy.

1. Jeve, B. Yadava, Davies, William (2014) Evidence-Based management of recurring miscarriages, Journal of Human Reproductive Sciences 7 (159-169
2. George, C, Lalitha A.R, Antony, A, Kumar, A.V, Jacob, K.S (2016) Antenatal depression in coastal South India: Prevalence and Risk Factors in the community. Int J Soc Psychiatry 62(2): 141-7
3. Moulder C (2016) Miscarriage: Women's Experiences and Needs, Psychology Press, pp 104
4. de Jong M. R (2013) Essentials of Sonography and Patient Care - E-Book, Elsevier Health Sciences, Chapter 5: Medical Techniques and Patient Care, pp 87

P106 Computed tomography imaging: Beware the ovarian twist

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Background: Ovarian torsion is a gynaecological emergency associated with partial or complete ovarian & fallopian tube rotation around its supplying vascular pedicle causing arterial, venous, and lymphatic compromise.1
Ultrasonography is the most reliable imaging modality for accurate diagnosis. The identification of ovarian enlargement combined with absence of blood flow increases its diagnostic sensitivity and specificity to 100% and 97%, respectively.2
Additional ultrasonic features indicative of torsion include findings of a solid, cystic, or complex mass, with or without free fluid, or cystic haemorrhage.3

If the adnexa appear normal on ultrasonography, Computed Tomography (CT) can be useful in excluding other acute presentations including ovarian torsion.4

Purpose: Patients presenting with severe abdominal pain may inadvertently have a CT scan performed as an initial imaging investigation to exclude suspected renal colic, acute appendicitis, ruptured ovarian cyst, or tubo-ovarian abscess.

CT imaging of ovarian torsion may demonstrate a complex adnexal mass, with or without surrounding fat stranding, oedema, and free fluid. These features are non-specific and patients are often misdiagnosed with an ovarian tumour as a result.

We're aiming to highlight the importance of this diagnosis despite its rarity and encourage colleagues to be more mindful of this condition as a potential diagnosis.

Summary: The poster will be organised into three main sections:

1. Ovarian Torsion - Introduction, Epidemiology, Clinical Presentation, Pathophysiology, and Radiographic Findings
2. Clinical Cases illustrating relevant radiographic findings of patients misdiagnosed with an ovarian tumour based on initial CT imaging
3. Conclusion

1) Hosny TA. (2017) Oophoropexy for ovarian torsion: a new easier technique. Journal of Gynecologic Surgery. 14 (1):7.
2) Beloosesky R, Deutsch M, Filmer S, Nizar K, Weiner Z, Weizman B. (2009) Doppler studies of the ovarian venous blood flow in the diagnosis of adnexal torsion. Journal of clinical ultrasound. 37 (8): 436-9.
3) Fleischer AC, Joo HJ, Kwon HC, Lee EJ, Suh JH. (1998) Diagnosis of ovarian torsion with color doppler sonography: depiction of twisted vascular pedicle. Journal of Ultrasound in Medicine. 17 (2):83-9.
4) Dixon A, Glick Y. (2018) Ovarian Torsion. [online] Radiopaedia. Available at: https://radiopaedia.org/articles/ovarian-torsion/revisions [accessed 17 December 2018]

P107 Classic pathological appearances in female pelvic imaging

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Background: Across the range of gynecological imaging modalities there are a number of 'Aunt Minnies' in which certain appearances are thought to equate to a particular diagnosis. These imaging patterns are often 'once seen and never forgotten'. It is helpful for practitioners of all levels to be able to recognise these appearances, which can assist in determining an accurate diagnosis, but it is also important to be aware of some of the pitfalls.

Learning outcomes: To be able to recognise a range of typical radiological signs in female pelvic imaging.

Summary: We present a pictorial review of common and important radiological signs in pelvic imaging, including how they correlate to specific disease processes. We include hints and tips on how to clinch the diagnosis and illustrate some of the pitfalls. From the 'ring of fire' sign of the corpus luteum and the 'ground glass' sign of the endometrioma to the 'lines and dots' associated with dermoid cysts, we cover a broad range of gynecological pathology. Appreciating these distinct appearances will hopefully help radiologists and sonographers in deciding on a diagnosis more quickly and with more confidence, potentially avoiding further unnecessary tests.

P108 A guide to the recto-vaginal septum - a mysterious but important space in the female pelvis

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Background: The recto-vaginal septum (RVS) consists of a fascial membrane which separates the posterior wall of the vagina from the anterior wall of the rectum. It extends from the perineal body to the inferior-most aspect of the Pouch of Douglas and usually contains fat. Given its deep pelvic location outwith the peritoneal cavity, the RVS is difficult to assess on physical examination and it is not directly visualised at laparoscopy, therefore any pathological involvement can be clinically occult. This space can however be readily and non-invasively evaluated with MRI.

Purpose: We aim to promote awareness of the RVS and highlight the importance of specifically evaluating this anatomical space for pathological involvement in patients with endometriosis, rectal or vaginal tumours and rectocoeles. This is of particular relevance to radiologists who report rectal and/or gynaecological imaging, who can assist in making the clinical diagnosis and provide useful information which will guide overall patient management.

Summary: We describe the anatomy of the RVS on MRI and demonstrate how it represents a potential site of involvement in deep pelvic endometriosis, an anatomical boundary between the vagina and rectum that may be breeched by locally invasive rectal and vaginal tumours, and how it functions as a support structure which resists bulging of the rectum into the vagina (failure of which results in a rectocoele). We use illustrative cases to describe the relevant imaging features of RVS involvement and how this can influence clinical diagnosis, cancer staging and treatment strategies.

1. Coutinho A Jr, Bittencourt LK, Pires CE, Junqueira F, Lima CM, Coutinho E, Domingues MA, Domingues RC, Marchiori E. MR imaging in deep pelvic endometriosis: a pictorial essay. Radiographics. 2011 Mar-Apr;31(2):549-67. doi: 10.1148/rg.312105144
2. Dariane C1,2, Moszkowicz D1,2, Peschaud F3,4. Concepts of the rectovaginal septum: implications for function and surgery. Int Urogynecol J. 2016 Jun;27(6):839-48. doi: 10.1007/s00192-015-2878-3. Epub 2015 Dec 21

P109 **Incidental ovarian cysts: What the general radiologist needs to know**

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Background: Ovarian cysts are a common incidental finding on clinical imaging performed for non-gynaecological indications. Although smaller cysts may be asymptomatic, their potential morbidity increases with cyst size and can result in rupture, haemorrhage or torsion. They must be carefully assessed to ensure that there are no features which are concerning for a cystic ovarian tumour. All general radiologists should therefore be familiar with surveillance and management strategies for ovarian cysts to ensure appropriate follow-up.
Method: This retrospective review of all CT Thorax, abdomen and pelvis (CT TAP) examinations includes all examinations over a year period in which the final report contained the phrase "ovarian cyst," and their subsequent imaging pathway.
Results: 46 CT TAPs were reviewed. 33 patients (76 %) were postmenopausal. 27 (58%) were not characterised as simple or complex. 11 (24%) of ovarian cysts had only subjective measurements of "small" or "large." Only 10 of 35 postmenopausal >1 cm had a follow-up ultrasound. 2 premenopausal patients had an ovarian cyst >5cm and both had follow-up imaging; MRI and ultrasound respectively. All complex cysts had follow-up ultrasound.
Conclusion: There was no consistent approach to follow-up in ovarian cysts, and the postmenopausal cohort in particular was not followed-up appropriately. Here we review the implementation of clinical support tools and the Royal College of Gynaecologists (RCOG) algorithm for imaging. This is essential for reducing the morbidity associated with ovarian cysts and for expediting surgical management in patients in whom the risk of malignant ovarian cystic neoplasm is high.

1. Ross, E.K. (2013) Incidental ovarian cyst: when to reassure, when to reassess, when to refer 80(8):503-514 2. The management of ovarian cysts in postmenopausal Women (2016) Green-top Guideline No. 34

P110 **Cups, coils and caesarian sections - a pictorial view of common gynaecological devices and other pelvic interventions**

Saad Qureshi; Sarah Sharp; Rebecca Wiles
Royal Liverpool and Broadgreen Hospital Trust

Background: In recent decades the use of temporary and permanent gynaecological internal devices has become more diverse and commonplace. With increased use, there has also been a rise in the incidental imaging of both the devices and their complications. These devices may not be instantly recognisable to the general radiologist; this can lead to misinterpretation. Familiarity allows for accurate recognition, and the easy identification of their associated complications.
Purpose: The aim of the poster is to demonstrate the radiological appearances of common gynaecological interventions, contraception and hygiene products in the female pelvis. Examples will include intrauterine devices, tampons, menstrual cups, pessaries and post surgical appearances. We envisage this will increase diagnostic accuracy and reduce the confusion radiologists may encounter when faced with such images.
Summary: This poster will provide an overview of common gynaecological and contraceptive devices and their appearances on a variety of radiological images.

P111 **Interrupted vena cava: Ultrasound identifiers for prenatal diagnosis**

Rebecca Evans; Gillian Coleman; JP Mayes; Heather Venables
University of Derby

Background: Interrupted vena cava is a rare (1:5000) congenital anomaly associated with azygos or hemiazygos continuation of the vena cava. The condition is largely an isolated variant with good prognosis, however, has been noted to have association with left isomerism and cardiac abnormalities with less favourable outcome.
Identification Techniques for Prenatal Diagnosis: There are a number of ultrasound identifiers which can aid in the identification of interrupted vena cava - many of which can be visualised in the standard cardiac FASP planes however may become more prominent within the third trimester. Images are included to illustrate these views, with explanation on how to achieve the technique.
Summary: Awareness of the potential ultrasound appearances of interrupted vena cava and how to assess for this may assist with diagnosis during routine scan assessment. Careful assessment of the aorta and IVC during second trimester scanning within the standard FASP planes will allow for detection of Isolated interrupted vena cava however a secondary assessment within the third trimester may be of added value.

1. Bronshtein, M. et al (2010). Prenatal diagnosis and outcome of isolated interrupted inferior vena cava. American journal of obstetrics and gynaecology. 202(4), 1-4
2. Giang, D. et al. (2014). Prenatal diagnosis of isolated interrupted vena cava with azygos continuation to superior vena cava. Annals of paediatric cardiology, 7(1), 49-51

P112 **It takes two to tango: Azoospermia is a valid indication for Hysterosalpingography!**

Anne Hemingway; Jennifer Wakefield; Siham Sudderuddin; Elika Kashef; Katherine vanRee; Susan Hesni; Nishat Bharwani
Imperial College Healthcare NHS Trust

Background: Subfertility is defined as failure to conceive after one year of regular, unprotected sexual intercourse, 84% of couples conceive naturally within 1 year, 92% within 2 years. Male subfertility affects 1 in 20 men. The Centres for Disease Control and Prevention (CDC) annually publishes the diagnoses in couples who undergo ART (assisted reproductive therapy). Isolated male factors occur in 18-19% of couples. Multiple factors affecting both male and female partners occur in 18% of couples.
Purpose: To illustrate the spectrum of abnormalities found when imaging the female partner in cases of known male factor subfertility. A retrospective review of local experience revealed abnormalities in 39.5% of women undergoing hysterosalpingography (HSG) when a male factor was known to be contributory. Of this group 86% exhibited uterine abnormalities including polyps, fibroids, Asherman's syndrome, congenital anomalies and adenomyosis and 13 % tubal abnormalities including tubal occlusion, salpingitis isthmica nodosa (SIN) and hydrosalpinx.
Summary: The presentation will discuss the causes of female and male factor subfertility. The importance of imaging the female partner when there is known male factor subfertility will be illustrated with representative HSG images showing the range of uterine and tubal pathology detected. The implications of the abnormalities detected for fertility and management will be discussed. The need to image women who are undergoing donor insemination within same sex partnerships will also be discussed. A brief overview of relevant literature will be given.

Anawalt BD, Page ST 2017 Causes of male infertility, Centers for Disease Control and Prevention (2018). Assisted Reproductive Technology (ART) National ART surveillance
https://www.cdc.gov/art/nass/index.html Simpson WL, Beitia LG, Mester J (2006)Hysterosalpingography: A reemerging study Radiographics 26(2):419-431
https://pubs.rsna.org/doi/10.1148/rg.262055109 Vickramarajah S, StewartV, VanRee K, Hemingway AP, Crofton ME, Bharwani N (2017) Subfertility:What the Radiologist Needs to Know Radiographics 1587-1602

P113 Evaluating the impact of rectal gas on target volume position in gynaecological patients undergoing external beam radiotherapy

James Iddenden; Lousie Turtle; Robert Biggar; Victoria Chapman
Clatterbridge Cancer Centre

Purpose: To evaluate the impact of no rectal preparation protocol on target volume position in gynaecological patients.
Method: A retrospective cohort (n=25) of gynaecological patients undergoing radical EBRT were identified by SQL query against the Aria Database. Results included patients requiring re-plan or an offline review by dosimetrists. The CT planning scan and CBCT (#1-3) were analysed for each patient, measuring the maximum rectal anterior/posterior (A/P) dimension and volume of gas present. The online matches were reviewed to assess any changes in CTV position compared to the planning scan.
Results: The CBCT match data demonstrated an association between the initial A/P rectum size at planning and the shift in CTV on treatment [Figure 1]. A measurement of ≥4cm A/P and a volume of gas over 40cc were classified as a large rectum [Figure 2]. These cases were more likely to cause variation in the target position. This variation measured over 1-3# ranged from +2.6cm ant to -3.5cm post, with a median absolute move of 0.8cm. Online matches from the 3rd fraction suggested 50% of patients had CTV movement exceeding 1cm, which is clinically significant compared with the PTV margins of 1-1.5cm. In ~10% of patients sampled CTV was not covered by PTV.
Conclusion: Larger rectums have more gas at scanning. This gas has been seen to shift and not be present on CBCT images. Further CBCT images during treatment should now be analysed to assess the potential benefit of using a rectal protocol early in the patient pathway.

Figure 1

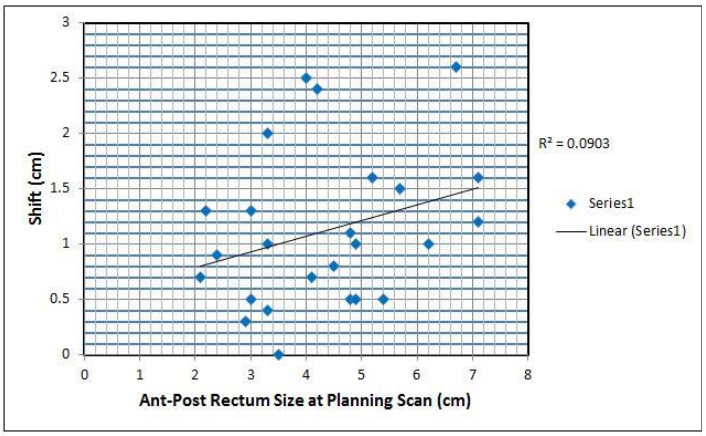
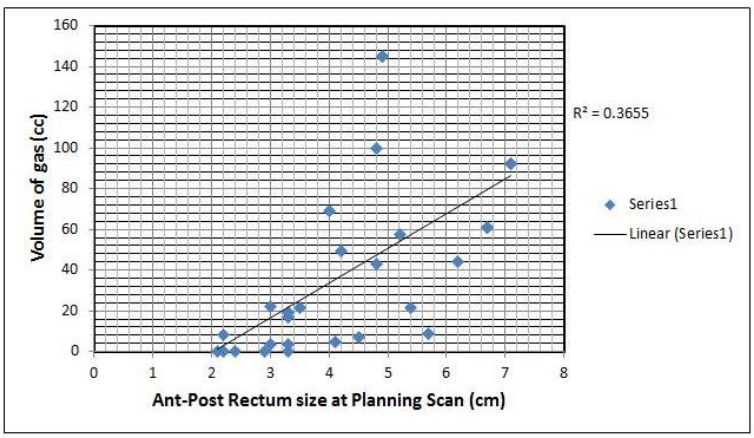


Figure 2



P114 **Assessing the effect of bowel and bladder size on treatment accuracy in post-operative endometrium patients**

Carly Williams
Guy's & St Thomas'

Introduction: An initial audit of current practice identified that using a 2D verification bone-match was not adequate for post-operative endometrium patients. This study evaluated 10 patients where daily 3D-CBCT was employed to measure the effect variations in bowel and bladder size had on the PTV.

Method: 10 post-operative endometrium patients were verified with daily 3D-CBCTusing an bone-match, bladder assessment within 50% of planning volume and the rectum size within 1cm of planning scan. An independent offline review assessing soft tissue and PTV coverage was carried out. Bladder volume/positioning and rectum size was assessed using a bone-match and soft tissue match.

Results: Strong correlation was evident between large bladder and/or rectal size variations and inadequate PTV coverage. PTV tumour coverage was improved where bladder volume was within 50% and A/P rectum size within 1cm of that planned. PTV lymph node coverage was affected by adjustments to compensate for pelvic tilt and variations in bladder or rectum size.

Conclusion and discussion: During online 3D-CBCT the automatic bone match was regularly adjusted to achieve PTV coverage due to variations in rectum and bladder size causing soft tissue displacement. Corrections based on a bone match resulting in good PTV coverage occured when bladder and rectum size were consistent. The FOV for CBCTs must include the whole volume to ensure PTV visualisation and adequate coverage. Staff training in soft tissue matching for Gynaecological patients is highly recommended, plus daily documentation of bladder and rectum status to ensure accurate PTV coverage.

1. National Radiotherapy Implementation Group Report. Image Guided Radiotherapy (IGRT) Guidance for implementation and use. Gynaecological. 2012

P115 **Early efficacy, toxicity and dosimetric analysis of volumetric modulated arc therapy (VMAT) and image guided adaptive brachytherapy (IGBT) in locally advanced cervical cancer following EMBRACE II protocol**

Ian S. Boon; Samantha Hodgson; Kate Cardale; Juliette Anderson; Sarah Swift; Joshua Mason; Peter Bownes; Rachel Cooper
Leeds Cancer Centre, St James's Institute of Oncology, Leeds Teaching Hospitals NHS Trust, United Kingdom

Background: In 2017 we implemented VMAT and image guided brachytherapy following the EMBRACE II protocol in preparation for entering patients into this multicentre research study. We report our initial outcome, early toxicity and dosimetric analysis.

Method: Between June 2017 and October 2018, 63 consecutive patients with locally advanced cervix cancer treated with radical intent. Of these 53 received external beam radiotherapy (EBRT) followed by IGBT using the EMBRACE II protocol. EBRT with VMAT delivered dose of 45Gy in 25 fractions to the Elective PTV, if nodal involvement a simultaneous integrated boost up to 55-60Gy in 25 fractions to the nodal PTV. This is followed by 3 fractions of IGBT delivering a combined EBRT plus brachytherapy EQD2 HRCTV D90>85Gy (α/β 10), while adhering to organ at risk (OAR) constraints. Response was assessed by pelvic MR and PET-CT at 3 months.

Results: Baseline characteristics are described in Table 1. Median follow up of 9.0 (range 2.6-17.5) months. 3 months post-treatment restaging showed complete response in 76% of patients, partial response 19%, and progressive disease 5%. Local recurrence rate is 4% and distant recurrence rate is 8%. 2 patients died from disease. The majority of patients reported minimal toxicity, Grade 2 CTCAE toxicity in majority of patients are fatigue (28%), bowel(19%), bladder(13%) and vagina(4%). 2 patients were admitted due to toxicity. Full dosimetric analysis will be presented.

Conclusion: Implementation of VMAT and IGBT using the EMBRACE II protocol for locally advanced cervix cancer in routine clinical practice is feasible, safe, tolerable and dosimetric parameters achievable.

1. Choong, E.S. et al., 2016. Hybrid (CT/MRI based) vs. MRI only based image-guided brachytherapy in cervical cancer: Dosimetry comparisons and clinical outcome. Brachytherapy, 15(1), pp.40-48 2) Pötter, R. et al., 2018. The EMBRACE II study: The outcome and prospect of two decades of evolution within the GEC-ESTRO GYN working group and the EMBRACE studies. Clinical and Translational Radiation Oncology, 9, pp.48-60

P116 **Assessing the delivered dose to the CTV during external beam cervical cancer radiotherapy using cone-beam CT data**

Victoria Moore; Sophie Otter; Chris South; Donna Rickard; Jordan Bravery
Royal Surrey County Hospital

Background: Interfractional variations in bladder and rectal volume can change the position of the Clinical Target Volume (CTV) in cervical cancer. This study aims to assess whether current Planning Target Volume (PTV) margins ensure the prescribed dose is delivered to the CTV, and the effect on dose to surrounding organs at risk (OARs).

Method: Cone-beam CT (CBCT) image sets taken at each fraction of treatment were rigidly registered to the original treatment planning CT for five patients. Each patient had a prescription of 50.4Gy to the PTV over 28 fractions. The cervix/uterus CTV, rectum and bladder were contoured on each CBCT by a clinical oncologist and Dose-Volume Histograms (DVH) assessed for each fraction and compared to planning aims.

Results: The median delivered CTV D99 (dose to 99%) was 96.0% of the prescribed dose (range 65.6%-97.4%) compared to a planned PTV D99 of 95.7% (95.1%-95.8%). Median delivered bladder D1cc was 50.9Gy (49.2Gy-51.7Gy) compared to a planned value of 50.1Gy (50Gy-51.2Gy). For rectum, median delivered D1cc was 51Gy (49.2Gy-52.3Gy) compared to a planned value of 50.3Gy (49.7Gy-50.4Gy).

Conclusion: These results imply that current PTV margins are adequate to ensure the CTV receives an adequate dose and that planned OAR doses are representative of delivered doses despite interfractional variations.

PAEDIATRICS

P117 Assessing the impact of the latest RCR guidelines on skeletal survey follow up imaging

Allison Thirsk; Jessica Bryant
Nottingham University Hospitals NHS Trust

Background: Diagnostic imaging plays an integral role in suspected Non Accidental Injury (NAI) investigations in Paediatrics. RCR guidelines underpin practice, with the most recent 2017 guidelines recommending more extensive follow up imaging than previously advised. This aims to standardise practice nationally, and improve diagnostic outcome. Increased awareness of the importance of effective safeguarding, and previous missed high-profile cases highlight the need for thorough NAI investigations. However, current literature indicates differing opinions regarding optimal follow up imaging with the increased radiosensitivity of Paediatrics a consideration.
Aim/method: This retrospective audit of skeletal surveys performed at NUH from August 2017, aims to assess the impact of the new RCR follow up imaging guidance (implemented at NUH in February 2018) with regards to attendance, radiation dose, time spent in department and diagnostic yield.
Discussion: To date, the audit suggests:

- More extensive follow up imaging has had no influence on patient attendance at follow up, with 100% of patients attending
- The additional views increase time spent in department, and dose to the patient (as expected)

Results from the audit so far suggest no additional injuries have been identified that would not have been detected on a chest X-ray as previously performed at follow up. As the guidance has been implemented for under 1 year, we intend to continue our data collection in order to increase the sample size. As a single site audit, we would welcome opportunities to extend the audit to other Trusts so as to compare results.

The Royal College of Radiologists (2017). The radiological investigation of suspected physical abuse in children. 1st ed. [ebook] London: The Royal College of Radiologists. Available at: https://www.rcr.ac.uk/system/files/publication/field_publication_files/bfcr174_suspected_physical_abuse.pdf [Accessed 10 Sep. 2018]

P118 Paediatric supine chest X-Ray radiation doses: CR vs DR

Megan Bunford; Angela Staley
Nottingham University Hospitals NHS Trust

Aim: Investigate if there is a percentage difference in radiation dose between CR and DR exposures used on paediatric supine chests.
Method: An audit of CRIS dose data was conducted to establish the difference in resultant dose given to children in the age group 0-18 months for supine chest X-rays on a CR system and DR systems. The doses were compared to calculate a percentage difference in each age group, and then an overall percentage difference for the 0-18 month age group was generated.
Results: The audit shows on average a 67.35% reduction in radiation dose when using DR systems compared to CR.
Discussion: DR systems provide a better dose efficiency than CR systems leading to a greater potential for dose reduction whilst maintaining a diagnostic quality image. Trusts across the UK have been investing their budgets into DR systems. At NUH, paediatric radiographers have been working very hard to optimise the exposures that are used on DR systems to adhere to ALARP, especially with the greater radiosensitivity of children compared to adults. Through these measures there has been a dramatic reduction in dose for supine chest X-rays in children, supporting the trust's investment in DR and further investment for mobile X-ray equipment for paediatrics.

P119 Change of practice-fluoroscopy of the paediatric abdomen

Angela Staley; Vanessa Waspe
Nottingham University Hospital

Aim: The ALARA principle should always be adhered to. Patients often require multiple abdominal X-rays for certain clinical findings which result in a substantial radiation dose. The dose was dramatically reduced using fluoroscopy instead of X-ray.
Method: Radiation doses to patients, with multiple attendances, were assessed. e.g. naso-jejunal tube position. We compared the dose received from an abdominal X-ray and a fluoroscopic image on the same patient; and audited this change of practice. Patients attending for feeding tube position or ingested foreign body had a low dose fluoroscopy image during normal working hours. Images were evaluated by the Consultant Radiologists to ensure the clinical question was answered. The dose of the fluoroscopic image was compared to the previous abdominal X-ray.
Results: Dose for the fluoroscopy image was on average 1% of the dose of an abdominal X-ray. This confirmed that we should change our practice permanently to adhere to ALARA.

Conclusion: Patients within normal working hours have a fluoroscopy image in preference to an abdominal X-ray. Paediatric technique protocol updated. Authorisation guidelines written to allow radiographers to authorise the examination according to IR(ME)R. This change highlighted we would normally follow the ten day LMP rule for female patients undergoing fluoroscopy of the abdomen. After discussion with Medical Physics, they evaluated the doses and decided we can follow the 28 day rule for all paediatric fluoroscopy. This has proved considerably advantageous when booking other fluoroscopy procedures that require substantial planning with other professionals.

P120 Imaging for ingested FB in children

Haram Zia; Amanda Martin
Royal Bolton Hospital

Imaging for ingested foreign body in children is generally undertaken using projectional radiography although national standards and protocols vary within trusts.

Purpose: A suggestion that we use fluoroscopy was made but there is a sparsity of literature relating to this topic. A local study was undertaken using fluoroscopy for some examinations and the image quality was assessed along with the associated dose. This demonstrated that large dose reductions could be achieved in some cases without compromising the ability to identify the foreign body. However, concerns were raised by clinicians about the ability of fluoroscopy imaging in being diagnostic enough to identify certain foreign bodies. Protocols were changed and guidelines produced for radiographers to enable the use of fluoroscopy in some cases.

Summary: This poster shows snapshot of a local audit under taken. It provides evidence of dose reduction and diagnostic value was not comprised using fluoroscopy imaging for some foreign bodies ingested by children in comparison to conventional imaging. The findings resulted in a change of local practice and protocol.

P121 Paediatric functional MRI: The experience of a tertiary paediatric centre

Athar Barakat [1]; Shivaram Avula [2]
[1]Aintree University Hospital and The Walton Centre; [2]Alder Hey Children's NHS Foundation Trust

Background: Functional MRI is an advanced MRI technique that provides BOLD activation of brain parenchyma based on specific tasks. It can be challenging in children due multiple factors including motion, ability to understand and perform tasks. We are presenting a service evaluation audit of Paediatric Functional MRI (fMRI) at a tertiary paediatric centre in the North West of England, Alder Hey Hospital (AHH), and showing case examples of where fMRI was useful in-patient management.

Method:

- Functional MRI studies performed from 16/11/2009 until 24/8/2017 at AHH were analysed
- Data was acquired from radiology reports on the Radiology Information System (RIS)
- Data was collected about: patient demographics, indications, paradigms used and success of each paradigm
- For patients in whom fMRI was partially or unsuccessful, further information was sought in clinical letters to explain reasons for lack of success.

Results:

- The number of fMRI studies performed between 16/11/2009 and 24/8/2017 was 42
- Male: Female ratio: 1:1
- Age range: 8-18, mean: 14, median: 15, mode: 15
- Indication: 93% epilepsy and others (mainly tumour imaging)
- Paradigms: motor, language, visual
- Overall success rate 73%, partial success 18%
- Reasons for partial or no success include: restrictions to tailoring paradigms for younger children and those with learning difficulties, young age, underlying learning difficulties and/or motor deficits, and patient cooperation
- We aim to re-audit with paediatric-specific paradigms.

Conclusion: Our audit shows the applications and clinical utility of functional MRI, and challenges faced in the paediatric population.

1. De Tiege X, Connelly A, Liegeois F, et al. Influence of motor functional magnetic resonance imaging on the surgical management of children and adolescents with symptomatic focal epilepsy. Neurosurgery. 2009;64(5):856-64; discussion 864
2. Gaillard WD, Grandin CB, Xu B. Developmental aspects of pediatric fMRI: Considerations for image acquisition, analysis, and interpretation. Neuroimage. 2001;13(2):239-249
3. Kesavadas C, Thomas B, Sujesh S, et al. Real-time functional MR imaging (fMRI) for presurgical evaluation of paediatric epilepsy. Pediatr Radiol. 2007;37(10):964-974
4. Smits M, Visch-Brink E, Schraa-Tam CK, Koudstaal PJ, van der Lugt A. Functional MR imaging of language processing: An overview of easy-to-implement paradigms for patient care and clinical research. Radiographics. 2006;26 Suppl 1:S145-58

P122 **How does focused education impact radiography students' ability to evaluate paediatric elbows?**

Fiona Smith; James Harcus; Pauline Reeves
Sheffield Hallam University

Background: Upon qualification, diagnostic radiographers should have sufficient knowledge to preliminarily evaluate images[4] but, literature links limited confidence to restricted participation in commenting systems[5,3]. The challenge of interpreting paediatric radiographs is well documented with the elbow described as particularly difficult[1] due to developmental differences[2]. Focused training may positively affect abnormality detection and commenting abilities[4] and subsequently increase confidence. Therefore, this study examines how focused training impacts image evaluation abilities of third year radiography students, particularly focusing on paediatric elbows.

Method: This study utilised a pre- and post-test methodology. An image bank of twenty paediatric elbow radiographs (50% abnormality incidence) exhibiting a range of developmental stages and abnormalities was constructed to evaluate image evaluation performance. Participants were asked to select whether or not images were normal and then describe any abnormalities. An educational intervention focusing on paediatric elbow image evaluation was delivered and then participants repeated the image bank test.

Results: Results suggest significant improvement in students' accuracy following educational intervention (p= 0.002), driven by 15.3% mean increase in specificity. This is supported by data relating to decision-making confidence which demonstrates an increase in 'Definitely normal' and 'Definitely abnormal' responses. Whilst commenting scores also showed improvement, a paired t-test found this insignificant.

Conclusion: Focused education positively impacted students' ability and confidence to evaluate the paediatric elbow, particularly in identifying normal appearances. However, to effectively implement widespread preliminary clinical evaluation, there is more work needed to enhance student commenting accuracy as they approach qualification.

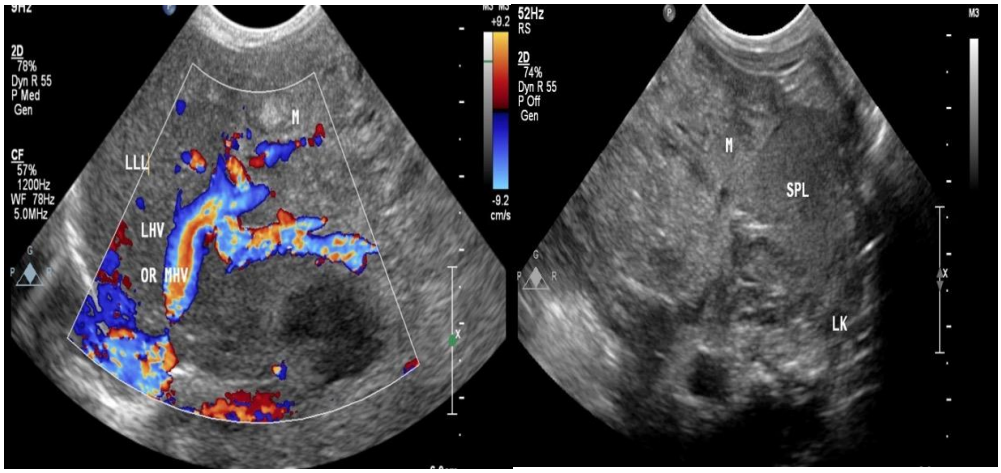
1. Boutis, K., Cano, S., Pecaric, M., et al. (2016). Interpretation difficulty of normal versus abnormal radiographs using a pediatric example. *Canadian medical education journal* [online]. **7**(1), e68-e77
2. DeFroda, S., Hansen, H., Gil, J., et al. (2017). Radiographic evaluation of common pediatric elbow injuries, *Orthopedic reviews* [online]. **9**(1), 7030
3. Neep, M., Steffens, T., Owen, R., et al. (2014). A survey of radiographers' confidence and self-perceived accuracy in frontline image interpretation and their continuing educational preferences. *Journal of Medical Radiation Sciences*[online]. **61**(2), 69-77
4. Stevens, B., & Thompson, J., (2018). The impact of focused training on abnormality detection and provision of accurate preliminary clinical evaluation in newly qualified radiographers. *Radiography*. **24**(1), 47-51
5. Stevens, B., & White, N., (2018). Newly qualified radiographers' perceptions of their abnormality detection abilities and the associated training they received at undergraduate level. *Radiography.* **24**(3), 219-223

P123 **Approach to neonatal liver lesions: A case report**

Gasim Ahmed; Manish Gupta
Royal Preston Hospital, Lancashire Acute Hospitals Foundation Trust

Background: Evaluation of abdominal masses in neonates is challenging. Here, we report a case of a neonate who presented with abdominal distension.

Case report: A three days old female with a normal prenatal history was referred to the radiology department with a left-sided abdominal mass and a significantly elevated alpha-fetoprotein (AFP) level. US and MR confirmed the diagnosis of infantile hepatic haemangioma. AFP level dropped spontaneously to baseline within three weeks; excluding sinister conditions such as hepatoblastoma.



Discussion: In the neonatal population, abdominal lesions are predominantly benign. The majority of lesions arise from genitourinary and gastrointestinal tract (>70%) while a small minority (5-6%) are hepatic in origin[1]. Both Benign lesions eg. infantile hepatic haemangioma (IHH) and mesenchymal hamartoma and malignant lesions eg. hepatoblastoma and metastasis from a neuroblastoma are commonly seen in this age group. Imaging, (in addition to clinical features and serum AFP level), helps in diagnosis, management and follow-up especially in malignant hepatoblastoma. Ultrasonography is often the first imaging modality as it provides valuable information regarding lesion localisation, characterisation (cystic, solid, or mixed consistency), vascularity including evidence of vascular invasion, and guides biopsy if

needed. IHH is generally observed ultrasonographically (rapid proliferative growth in early life which is followed by regression and involution). [2,3]. In severe cases embolisation can be considered.

Conclusion: Although evaluation of abdominal masses in neonates is challenging, ultrasonography provides valuable information regarding lesion characterisation. The commonest benign hepatic lesion in this population is IHH where as hepatoblastoma is the commonest malignant lesion.

1. Drolet BA, Esterly NB, Frieden IJ. Hemangiomas in Children. New England Journal of Medicine. 1999;341(3):173-181
2. Bivings L. Spontaneous regression of angiomas in children: twenty-two years' observation covering 236 cases. J Pediatr. 1954;45(6):643-647
3. Chang LC, Haggstrom AN, Drolet BA, Baselga E, Chamlin SL, Garzon MC, Horii KA, Lucky AW, Mancini AJ, Metry DW, Nopper AJ, Frieden IJ; Hemangioma Investigator Group. Growth characteristics of infantile hemangiomas: implications for management. Pediatrics. 2008;122(2):360-367

P124 Non-accidental Injury: A paediatric radiologist's perspective

Sophie McGlade; Katie Giles
Torbay and South Devon NHS Foundation Trust

Background: A recent survey within the Southwest Peninsula training scheme examined radiology trainee perceptions of paediatric radiology as a subspecialty career option. This revealed that, following concern over potentially being the only paediatric radiologist within a District General Hospital, the second most common factor putting trainees off considering this subspecialty is the emotive subject matter. Free text comments expanded on this further with several references to concerns over the work involved for suspected physical abuse in children and the legal or court-based work. This is an area of paediatric radiology to which many general trainees are not sufficiently exposed, yet was revealed as an important consideration in career choices.

Purpose: This educational poster aims to better inform the reader on the work of a paediatric radiologist within a District General Hospital (DGH), in particular with respect to NAI.

Content: This poster will include quantitative data on the volume and type NAI work encountered within a DGH, together with qualititative data from consultant experiences, the training and support provided, information about the legal and court process for these cases, and an overview of why this work is important. It is hoped that through better understanding of the work involved and support available, many of the fears and concerns over this aspect of working with an emotive subject matter may be addressed.

1. Unwin-Golding, S. (2018) *Encouraging radiology trainees to choose Paediatrics as a sub-specialty. Southwest Paediatric Radiology Group Meeting, Barnstaple, 25/09/2018*

P125 Paediatric IGRT hitting the target

Sarah Stead
Clatterbridge Cancer Centre

Over-utilisation of modern radiotherapy treatment verification systems and procedures could inflict a large amount of excessive radiation exposure to our paediatric patients who already risk the chances of a secondary malignancy. An accurate knowledge of CBCT dosimetry
dose. Educating the entire radiotherapy team, empowering them with efficient and effective tools to reduce imaging exposure will minimise exposure to our patients and promote and improve quality of care. A comprehensive analysis of imaging dose and the dose patterns could provide further insight into the efficacy and the benefit to risk ratio of the imaging procedures and enable the cumulative dose from the imaging modalities to be measured for each patient.

Case report 1 year old rhabdomyosarcoma upper lip with metastatic neck nodes, anaesthetised, nasogastric tube and laryngeal mask. Daily CBCT was required as it was IMRT and daily repositioning was difficult due to the position of the Nasogastric tube and laryngeal mask. The CBCT mode editor was utilised and, Varian settings where modified. The dose was reduced in steps to avoid low HU values in the middle of the reconstructed images to avoid an impact on image quality, such as homogeneity, contrast and noise in the reconstructed CBCT image. The geometry of a cone beam scan enabled a large scan length or field of view (FOV) to be viewed in one rotation.

P126 Implementation of low kV imaging technique in digital paediatric imaging of the extremities

Emma Edwards; Rebecca Scott
University Hospitals of North Midlands NHS Trust

Background: Digital radiographs produced using a 60Kv technique are of inferior image quality when compared to lower kilovoltage (kV) techniques (Knight 2014). Paediatric Tertiary Centres have improved and optimised image quality and adapted the 40kV technique as best practice. Optimised imaging quality is paramount for accurate diagnosis of subtle fractures, early callus formation and periosteal reaction in suspected physical abuse.

Purpose: Our goal is to promote standardised best practice paediatric imaging techniques. We provide a strategic algorithm based approach and pathway to implementing the low KV technique, which can be used in Imaging Departments not within tertiary Paediatric Trusts. This pathway can create a local standard operating protocol, which reinforces the importance of image quality and lower dose techniques.

Summary: Timeline and stages of implementation for the new imaging technique are presented. Stakeholder's involvement in this process, specifically the medical-physics department, are described. Preliminary imaging was undertaken using chicken legs, and the methodology for ascertaining the lowest achievable kV are shown. Scoring charts which use a fully validated system for assessment of image quality are given. Both radiologist and reporters' review of the images are included, where the preliminary results show 40kV/7.13mAs to be the highest scoring exposure factor. Further results will be presented. All audit results will be presented for review and discussion at interested centres in order to promote inclusive peer review on a national level to work towards standardisation of practice.

1. Knight, S.P. (2014). A paediatric X-ray exposure chart. Journal Of Medical Radiation Sciences. 61 (3): 191-201

DOSE / RAD PROT / IMAGING TECHNOLOGIES

P127 The use of a mechanical apparatus to improve the accuracy of dose delivery to patients undergoing superficial radiotherapy treatments

Peter Devlin; Graham Read; Mark Blinkhorn; Tracy Perry; Terry Laing; Natalie Thorp
Royal Preston Hospital

This cancer centre treats around 360 patients annually on a superficial X ray treatment machine. The majority of patients are referred for skin cancers such as basal cell carcinomas (BCCs), but we also treat Dupuytrens, keloid scars and severe cases of eczema. Patients being treated for BCCs will usually be prescribed a total of 10 fractions treated as one fraction daily over a two week period, whilst palliative patients generally receive the same prescription but twice daily over 5 days. Since the superficial unit delivers treatments using very short source-to-skin distances, any small variations in set up, such as stand-off distance or applicator position will mean that the treatment area will not receive the expected prescribed dose.
An in-house mechanical apparatus has been constructed to allow a precise and fixed set up for treatments that are prone to stand-off, such as areas on and around the nose, and around the inner and outer canthus. The apparatus, which has been used clinically for about a year, ensures that patient set up is accurate, reproducible and fast, leading to precise dose delivery, improved comfort for the patient and an improved patient workflow.
The poster will give a written and pictorial description of the apparatus. Images will demonstrate the apparatus in clinical use. Statistical data will be presented; indicating the improved change in set up in terms of both time and dose accuracy.

P128 Evaluation of a new third party independent brachytherapy dose check platform

Alice Brain; Louise Gately; Robert Biggar; Chris Lee
Clatterbridge Cancer Centre

Aim: To evaluate SunCHECK Patient's DoseCHECK for a range of HDR brachytherapy plans.
Method: The DoseCHECK platform was used to perform secondary (independent) dose calculations on cervical, prostate and skin HDR brachytherapy treatment plans. Oncentra Brachy v4.5 and Oncentra Prostate TPS were used for planning with a Flexitron HDR afterloader. DICOM data (plan, image, structures and dose) was exported from the TPS to SunCHECK's Patient platform. Secondary dose calculations were performed using the platform's TG43 calculation. The resultant doses were compared to the primary TPS dose for analysis.
Results: DoseCHECK effectively calculated secondary dose calculations for cervical and skin brachytherapy plans with a mean dose agreement of 98.8% [96.49%-100%] using 1%/1mm gamma analysis. DoseCHECK could not support prostate plans' DICOM format, so no analysis was possible.
Discussion: SunCHECK Patient DoseCHECK is a viable option for performing secondary dose calculations of cervical and skin plans produced using Oncentra Brachy v4.5. Resultant analyses include point dose comparison, gamma analysis and visual (calculated) distribution over the planning CT. The analyses provide a comprehensive secondary calculation of the treatment plan, giving assurance of the primary treatment plan calculation. DoseCHECK could not be used to calculate secondary dose calculations for prostate plans produced using Oncentra Prostate due to the platform's inability to handle ultrasound data. These issues have been fed back to Sun Nuclear who are investigating compatibility in future updates.

P129 Simple method for measuring CBCT deterministic dose safety limits in radiotherapy

Neda Shiravand; Frances Lavender; Niall MacDougall
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Background: When introducing cone beam computed tomography (CBCT) online imaging in radiotherapy it is important that the associated imaging dose to the patient is considered. Although CTDI and CBDI measurements are useful for comparing different CBCT modes, they provide no information about the CBCT dose distribution within the patient. The purpose of this work was to develop a streamlined methodology for measuring doses to organs at risk (OARs) for clinical CBCT modes, using equipment readily available in most RT departments.

Method: Thermoluminescent dosimeters (TLDs) were calibrated for kV energies using an orthovoltage unit; TLDs with deviation of <2% of the mean dose value were selected for the measurements. The TLDs were then used to measure the dose to representative OAR points in an anthropomorphic phantom for three clinical CBCT modes.
Results: The dose to OARs per scan ranged from 0.55-1.25cGy (head and neck mode), 0.20-0.27cGy (breast mode) and 0.74-1.04cGy (thorax mode). Results were also reported in terms of the number of CBCT scans that would deliver 1Gy to each OAR.
Conclusion: This simple methodology allows rapid evaluation of the impact of any changes to CBCT exposure parameters and highlights the differences in OAR dose for clinical CBCT modes. Reporting CBCT doses in scans per Gray allows clinicians to make informed decisions regarding the imaging schedule and justification of concomitant doses.

P130 Late toxicity of prostate SABR with variation in planned dose to organs at risk

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Background: Prostate stereotactic ablative radiotherapy (SABR) is an advanced technique delivering large doses. Steep dose gradients may amplify the effect geometric uncertainties have on dose to normal tissue.
Methods: 41 patients completed treatment in local safety, feasibility and efficacy study. Prostate SABR linear accelerator based technique 35Gy/ 5, 10X FFF. Matching to fiducial markers on pre treatment CBCT. Retrospective delineation of bladder and rectum on 205 pre-treatment CBCT image sets. CBCT registered to planning CT at treatment position. Daily CBCT rectum and bladder contours overlaid on planning CT for dosimetric analysis. The dose received by organs at each fraction measured on DVH using ratio of structure at the planning constraint. Total dose received by each organ evaluated to ensure planning constraints met despite organ motion. Gastrointestinal and genitourinary RTOG scoring recorded at baseline, 6, 12, 18 and 24 months.
Results: In 9 patients 35% of the rectum received > 18Gy. In 19 patients 10 % of the rectum received >28Gy. In 19 patients 5 % of the rectum received >32Gy and in 17 patients 1 % of the rectum received >35Gy. In 18 patients 1 % of the Bladder received >35Gy (table 1.). Gastrointestinal and genitourinary toxicity up to 24 months can be seen in figure 1.

Figure 1.

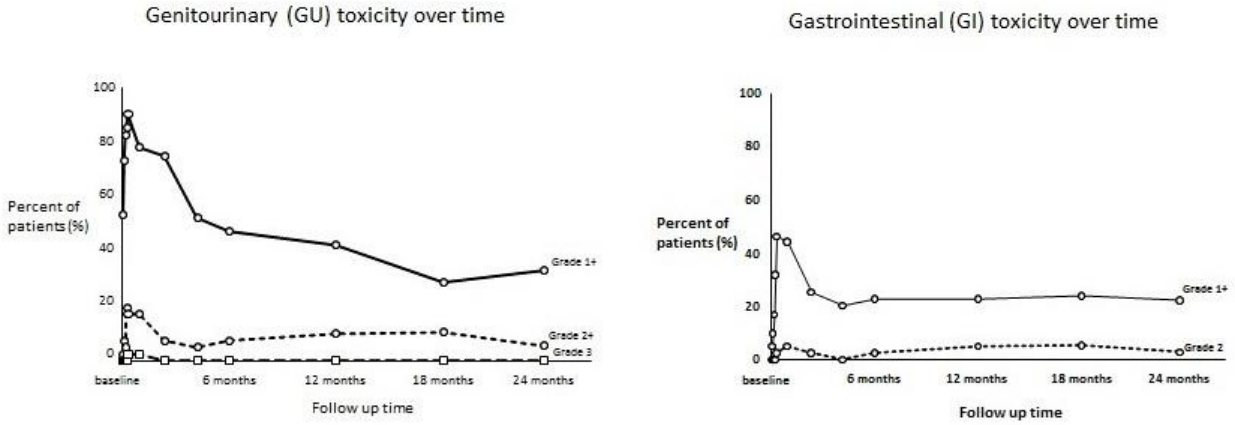

Table 1.

	Planning			Treatment			
Dose to ratio of structure	Patients failing constraint	%	95% CI	Patients failing constraint	%	95% CI	
Rectum							
D35%<18Gy	2	4.9	(0.6-15.5)	9	22.0	(10.6-37.6)	p=0.016
D10%<28Gy	7	17.1	(7.1-32.1)	19	46.3	(30.7-62.6)	p=0.004
D5%<32Gy	4	9.8	(2.7-23.1)	19	46.3	(30.7-62.6)	p=0.0001
D1%<35Gy	2	4.9	(0.6-15.5)	17	41.5	(26.3-57.9)	p=0.0001
Bladder							
D1%<35Gy	4	9.8	(2.7-23.1)	18	43.9	(28.5-60.3)	p=0.0001

p – value from Wilcoxon signed rank test of equivalence of planned and delivered do

Conclusion: Due to organ variations, rectal and bladder constraints are not met on treatment for some patients. Despite this, late toxicity is acceptable and comparable to that reported by the CHHIP trial[1].

1. Dearnaley D, Syndikus I, Mossop H, et al. Conventional versus hypofractionated high-dose intensity-modulated radiotherapy for prostate cancer: 5-year outcomes of the randomised, non-inferiority, phase 3 CHHiP trial. The Lancet Oncology. 2016 8;17(8):1047-60

P131 **Evaluating SmartAdapt™ deformable registration as a tool in the adaptive radiotherapy decision process for H&N weight loss patients**

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Background: Deformable image registration (DIR) can be used to propagate contours between CT and CBCT images to allow new dose distributions to be calculated when changes are seen on CBCTs (see Moteabbed et al., [2015] and Rigaud, et a.l [2015]). We propose that DIR can be utilised to determine whether an adaptive replan is necessary in H&N patients.
Method: Analysis was performed retrospectively on data from H&N patients who received at least one adaptive assessment during treatment. SmartAdapt™ was used to propagate contours from patients' original CT images to the CBCTs on which dosimetry assessments were originally done. These CBCT contours were then copied back to the original CT dataset (adjusting the surface contour for weight-loss) before calculating the original plan on this altered dataset and comparing the resultant dose back to the original plan.
Results: In all cases the same decisions about whether or not to replan were arrived at with the SmartAdapt contours as was decided clinically. Having the physical structure and DVH data available made it easier to review the CTV coverage, e.g. one clinical adaptive assessment missed an area where the prophylactic CTV lost coverage that became obvious when it was contoured by SmartAdapt.
Conclusion: Using contours to perform the dosimetry assessment has qualified the original clinical decisions and would be beneficial to implement into the adaptive assessment process. The next steps for consideration when using SmartAdapt for adaptive assessments are the effect of variation in patient setup and the quality of CBCT images.

1. Moteabbed, M., Sharp, G. C., Wang, Y., Trofimov, A., Efstathiou, J. A. and Lu, H.-M. (2015) Validation of a deformable image registration technique for cone beam CT-based dose verification. *Medical Physics*. **42**(1), pp 196-205. DOI: 10.1118/1.4903292
2. Rigaud, B., Simon, A., Castelli, J., Gobeli, M., Ospina Arango, J.-D., Cazoulat, G., Henry, O., Haigron, P. and De Crevoisier, R. (2015) Evaluation of Deformable Image Registration Methods for Dose Monitoring in Head and Neck Radiotherapy. *BioMed Research International*. 2015: 726268. DOI: 10.1155/2015/726268

P132 **The effectiveness of thyroid shields in protecting the orthopaedic surgeons from long-term effects of low-dose ionisation radiation**

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Background: The focus of this study was on the necessity of shielding the thyroid gland from radiation. There is currently little knowledge on this topic. The thyroid is a very sensitive organ and is not routinely shielded by lead rubber protectors. Moreover, there is no legislation regarding the mandatory use of thyroid shields. The aim of this poster is to assess whether orthopaedic surgeons should wear thyroid shields during x-ray guided operations.
Method: This literature review was conducted by using SCOPUS and MEDLINE databases. Additionally, University of Liverpool Discover search engine was used. Appropriate search terms and inclusion and exclusion were used in order to establish an up to date review of current literature. To assess the validity and reliability of the chosen literature, a critical appraisal tool was used.
Purpose: Papillary thyroid carcinoma (PTC) is the commonest type of thyroid cancer, which is predominantly caused by radiation exposure. Recent reports have shown that the rate of PTC occurrence has been rising in the past decade. It has been reported that a very small number of surgeons (11%) wear thyroid shields when carrying operations using X-rays. 1. Assess current practice/knowledge in relation to thyroid cancer and the use of thyroid personal protective equipment by orthopaedic surgeons. 2. To assess current use of thyroid PPE in the orthopaedic theatre. 3. To demonstrate the need for orthopaedic surgeons to wear PPE for thyroid to ensure dose reduction and minimisation of thyroid cancer.

1. Andreo, P., Burns, D.T., Nahum, A.E., Seuntjens, J. and Attix, F.H., 2017. Fundamentals of ionizing radiation dosimetry. John Wiley & Sons
2. Brun, A., Mor, R.A., Bourrelly, M., Dalivoust, G., Gazazian, G., Boufercha, R., Lehucher-Michel, M.P. and Sari-Minodier, I., 2018. Radiation protection for surgeons and anesthetists: practices and knowledge before and after training. Journal of Radiological Protection, 38(1), p.175
3. Cope, M.R. and Shaw, D.L., 2002. The use and availability of thyroid shields in orthopaedic theatres: a telephone questionnaire of English hospitals. Annals of the Royal College of Surgeons of England, 84(3), p.193
4. Devalia, K.L., Peter, V.K. and Braithwaite, I.J., 2012, February. EXPOSURE OF THE THYROID TO RADIATION DURING ROUTINE ORTHOPAEDIC PROCEDURES. In Orthopaedic Proceedings (Vol. 94, No. SUPP_II, pp. 28-28). The British Editorial Society of Bone & Joint Surgery
5. Hak, D.J., 2017. Radiation exposure during intramedullary nailing. Injury, 48, pp.S26-S29
6. Lester, J.D., Hsu, S. and Ahmad, C.S., 2012. Occupational hazards facing orthopedic surgeons. American journal of orthopedics, 41(3), pp.132-139
7. Nugent, M., Carmody, O. and Dudeney, S., 2015. Radiation safety knowledge and practices among Irish orthopaedic trainees. Irish Journal of Medical Science (1971-), 184(2), pp.369-373.
8. Wagner, M., Duwenkamp, C., Ludwig, W., Dresing, K. and Bott, O.J., 2010. An approach to simulate and visualize intraoperative scattered radiation exposure to improve radiation protection training. Studies in health technology and informatics, 160(Pt 1), pp.625-628.
9. Zabel, E.W., Alexander, B.H., Mongin, S.J., Doody, M.M., Sigurdson, A.J., Linet, M.S., Freedman, D.M., Hauptmann, M., Mabuchi, K. and Ron, E., 2006. Thyroid cancer and employment as a radiologic technologist. International journal of cancer, 119(8), pp.1940-1945
10. Zielinski, J., Garner, M., Band, P., Krewski, D., Shilnikova, N., Jiang, H., Ashmore, P., Sont, W., Fair, M., Letourneau, E. and Semenciw, R., 2009. Health outcomes of low-dose ionizing radiation exposure among medical workers: a cohort study of the Canadian national dose registry of radiation workers. International journal of occupational medicine and environmental health, 22(2), pp.149-156

P133 **Awareness among junior doctors of radiation doses incurred in commonly requested investigations involving diagnostic ionising radiation**

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Background radiation refers to exposure to ionising radiation in day-to-day life, excluding occupational exposures. In the UK, Public Health England has calculated that on average people are exposed to about 2.7 mSv of radiation each year. 16% is due to medical investigations and treatments involving ionising radiation. Biomolecular radiation damage occurs when tissues are exposed to ionising radiation. Ionisation leads to the production of free radicals. A chain reaction effect can result in significant alterations to organic material. If this occurs amidst molecules that are decisive to cellular metabolism, the fundamental function of the cell is at risk. Free radicals can affect nucleic acid molecules leading to cell mutation or cell death.
There has been an approximate three-fold rise in the number of examinations performed in the UK in recent years. Mainly due to the increase in CT examinations. The annual collective dose to the UK population from diagnostic medical procedures is increasing. Using radiological investigations is an accepted part of medical practice when justified in terms of clear clinical benefits to the patient, which should outweigh the radiation risks.
This poster demonstrates the results of a closed loop audit set out to determine whether foundation doctors had an awareness of the radiation doses for commonly requested imaging and their corresponding lifetime additional risk of fatal cancer. It also raises awareness of radiation doses and the potential hazards of radiation. The results revealed a lack of awareness of the estimated doses and and risks incurred with ionising radiation.

iRefer – Making the Best use of Clinical Radiology, Eighth Edition 23 May 2017
Ionising Radiation Exposure of the UK Population: 2010 Review
Foundation Programme curriculum 2016: https://horus.hee.nhs.uk/home/forms-start-new Royal College of Radiologist's

P134 **Dose optimisation: An audit to review local diagnostic reference levels (LDRLs)in a district general hospital**

Theresa Noon
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Rationale: Diagnostic reference levels (DRLs) have been recommended by the International Commission on Radiological Protection (ICRP). Radiographers have a professional and legal responsibility to apply a mindful approach whilst maintaining a dose which is As Low as Reasonably Practicable (ALARP). LDRLs must be reviewed annually to improve practice.
Standard: Diagnostic reference level s (DRLs) should be available for all common examinations and they are a requirement under (IR(ME)R 2017)
Method: DAP readings were audited over a 6-month period, from November 2017 to April 2018 for all plain film examinations only. n=29172 examinations. Retrospective data from the CRIS system was used. All appendicular and axial examinations undertaken with the department during the time period and following the local protocol projections. All DR rooms within the department had undergone their QA/QC which had been recorded as per departmental protocol. The DAP reading recorded for standard projections. The data was compared to the recently set LDRLs and tabulated.
Results: Variation In results between CR & DR with overall difference in DAP readings from -8% to +24%. Some examination areas have been breached and we need to be mindful of why this is happening and how to optimise these examinations.
Conclusion: There is some variation, factors include: Increased work demands, Subjectivity of 'Gold standard' images, Lack of attention to detail. Radiographers should check every exposure against LDRL charts and report any breaches. Improvements in DR equipment do not allow for poor practice. Every department should follow.

1. GOV.UK. (2018). National Diagnostic Reference Levels (NDRLs)
2. GOV.UK. (2018). Radiographic, fluoroscopic and dental X-rays: patient dose audits
3. Iaea.org. (2018). International Atomic Energy Agency | Atoms for Peace and Development;
4. Legislation.gov.uk. (2018). The Ionising Radiation (Medical Exposure) Regulations 2017
5. Legislation.gov.uk. (2018). The Ionising Radiations Regulations 2017

P135 **Optimisation of region of interest in CT pulmonary angiography**

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Background: IR(ME)R 2017 advises regular review of CT protocols and that exposure to ionising radiation should be as low as reasonably practicable[1]. A previous study has shown that excess scan length, and thus mean organ dose, in CT pulmonary angiography (CTPA) can be reduced by addition of a lateral topogram[2]. Current practice in our trust is to perform an anteroposterior (AP) topogram only. We assessed adequacy of region of interest in CTPA scans at our trust.
Method: All CTPA scans performed over a 2 week period in November 2018 were retrospectively identified. Images were reviewed to assess whether entire lung parenchyma had been imaged and measure excess scan length. We excluded pregnant patients and CTPA scans performed for indications other than pulmonary embolus.
Results: 62 scans were reviewed. No scans had a lateral topogram performed. 71% of scans included the entire lung parenchyma (29% were inadequate). Mean excess scan length was 31.9mm (SD 18.5mm) compared to 19.5mm in the previous study. This equated to 11% of the scan length being unnecessary overscan.

Conclusion: 11% excess scan length beyond the region of interest represents excess radiation dose. Mean overscan was much higher than in the previous study where lateral and AP topograms were performed. High variability in excess scan length highlights the difficulty in selecting region of interest. Addition of a lateral topogram can optimise region of interest and thus minimise radiation dose. The CT manufacturer has advised a method to perform both AP and lateral topograms for CTPA scans.

1. Ionising Radiation (Medical Exposure) Regulations 2017
2. JCL Rodrigues, Negus IS, Manghat NE, Hamilton MCK. (2013) A completed audit cycle of the lateral scan projection radiograph in CT pulmonary angiography (CTPA): the impact on scan length and radiation dose. Clin Rad **68** 574-579

P136 Evaluation of a novel imaging method to reduce patient dose while assessing "lost" intrauterine coil devices (IUCD)

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Background: In patients with a possible mal-located IUCD, ultrasound is used first for assessment of IUCD position. If the IUCD is not located with ultrasound, usual practice is to obtain an abdominal radiograph (AXR). We have replaced AXR with a CT topogram: If the IUCD is seen on the topogram, an additional thin-section axial image through the IUCD is taken, to define whether the coil is within the uterus or is extra-uterine. We present a service evaluation of this technique.

Method: For all CT examinations performed in 2018 for this purpose, kV, mAs and DLP were recorded. Effective dose was calculated using a conversion factor of 0.02mSV/mGycm (Shrimpton et al 2016). We compared this with our departmental female mean effective dose for AXR (0.25 mSv).

Results: After the switchover there was a learning curve while radiographers adapted. 13 patients were examined with correct technique. In 9/13 patients the IUCD was not seen on the CT topogram and so the examination was complete without the additional axial imaging; estimated mean effective dose was 0.11mSV. In 4/13 with a visible coil on the CT topogram, additional axial imaging was performed, allowing accurate location of the IUCD; estimated mean effective dose was 0.17mSv. Mean effective dose for all 13 patients was 0.13mSV.

Conclusion: Based on the estimated effective dose calculated with a conversion factor, this novel method for locating IUCD reduces radiation dose in this cohort of patients by up to 48% while providing better anatomical information.

1. Shrimpton PC, Jansen JT and Harrison JD (2016) Updated estimates of typical effective doses for common CT examinations in the UK following the 2011 national review. Br J Radiol. 2016; 89(1057): 20150346. doi: 10.1259/bjr.20150346. Epub 2015 Nov 6

P137 To mag or not to mag... that is the question? An audit to show dose optimisation in Barium swallows

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The barium swallow examination is one that has been around for many years and is well known in the world of radiology. This can mean that we may become stuck in our ways of how to perform the examination. Going back to when we used to print images onto film. We have always magnified on Barium Swallow procedures. Even through, CR and then to DR. This has been tradition and practice hasn't changed since. During Dose Optimisation, we worked closely with our Applications support from the equipment manufacturer, we discussed improvements. As a reporting radiographer, we would always magnify the image on PACS when reporting. So through discussion, we wondered whether magnification is still needed if we can magnify/zoom in the image. This audit aims to show that we can change!

I decided to have a look and see if I could reduce the radiation dose for this examination. Using 148 patients (before and after change of practice) in total I looked at the doses given and found that we can reduce the dose significantly but still maintain the exacting standards set out in our Standard Operating Procedure. I will compare this with the National Dose Reference Levels. This poster aims to show you the dose reduction percentage and how I did it. Hopefully it will prompt you to look at ways to optimise your dose.

1. GOV.UK. (2018). National Diagnostic Reference Levels (NDRLs): 15 November 2018 onwards
2. White, F., Westmorland, A., Roe, G., Wolstenhulme, S. and Sheridan, M. (2018). Barium Swallow Examination: Radiographer and radiologist compliance to National Diagnostic Reference Levels. International journal of diagnostic imaging and radiation therapy

P138 Audit of the standard of horizontal beam lateral hip x-rays - re-audit

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Background: The image quality of horizontal beam lateral hips has been variable with varying radiographic techniques, a re-audit from 2012 due to staff turnaround.

Aim: To improve the quality of the images produced and provide guidance on the possible techniques to be used.

Method: Data collected from November 2017 to March 2018. 130 images were collected however 8 could not be retrieved. Patient size, exposure factors, dose, and use of grid were all recorded. Images were assessed by an Advanced Practitioner and a lead general radiographer and put into 3 categories: good, adequate and poor.

Overall results:

- Good, 29.5% in 2012 and 31.4% in 2018
- Adequate, 41.8% in 2012 and 50.1% in 2018

- Poor, 28.7% in 2012 and 17.1% in 2018

Conclusion:

- Exposure factors were higher for good images however gave lower doses
- Poor quality images generally under-penetrated making poor visualisation of the head of the femur
- Good images showed good collimation, centring, used a grid, had both high kVp and mAs with no AEC
- Poor images used high kVp, low mAs causing them to be under-exposed. The AEC was used but were poorly centred and used lack of collimation.
- Poor patient positioning with the 'good' leg overlying the area of interest as the leg support was not used. Plus the patient was not always positioned at 45 degrees from the detector, the patient should be positioned at 45 degrees not just the trolley.

The results were presented to the staff with the aim to re-audit in 2019.

1. Carver. E and Carver. B (2006) *Medical Imaging: Techniques, reflection and evaluation. Second Edition. Churchill Livingstone Elsevier, London*
2. Charnley. C et al (2016) *An option for optimising the radiographic technique for horizontal beam lateral (HBL) hip radiography when using digital X-ray equipment* Radiography **22** (2), e137-e142
3. Clohisy. J et al (2008) *A systematic approach to the Plain Radiographic Evaluation of the Young Adult Hip* The Journal of bone and joint surgery **90** (4), 47-66
4. Martin. C (2007) *Optimisation in general radiography* Biomedical Imaging and Intervention Journal **3** (2), e18
5. Statkiewicz Sherer. M (2018) *Radiation Protection in Medical Radiography 8th Edition Elsevier, London*

P139 An audit of clinical evaluations for auto-reported plain film X-ray examinations

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Background: IR(ME)R 2017[1] requires that a documented clinical evaluation is made of the outcome of all radiology examinations. This usually takes the form of a Radiology report but employers may delegate the responsibility to appropriately trained non-radiology staff (e.g. the referrer) via a process commonly known as auto-reporting[2]. Where examinations are auto-reported employers are required to provide assurance that a documented clinical evaluation is made on every occasion. An audit of clinical evaluations of auto-reported plain film examinations was therefore undertaken at a large acute NHS trust.

Method: A random sample of 20 plain film examinations was identified for each of the nine referral sources auto-reported at the Trust. The care records (case notes and electronic clinical letters) of the relevant patients were searched for a recorded clinical evaluation. Since IR(ME)R compliance is a legal requirement the audit standard was set at 100%.

Results: The case notes for 3 patients could not be retrieved, and for 2 examinations a formal report had subsequently been provided by radiology. Of the remaining 175 examinations, 123 (70.3%) had a recorded clinical evaluation. Compliance by individual referral sources ranged from 52 - 84%.

Conclusion: The audit standard was not met; where plain film examinations are auto-reported a clinical evaluation is not consistently recorded in the patient's care record. Substantial improvement is necessary to achieve IR(ME)R 2017 compliance, requiring significant engagement from the relevant referring clinicians. Further work is also required to confirm the accuracy of those clinical evaluations that are recorded.

1. Department of Health (2017) The Ionising Radiation (Medical Exposure) Regulations. London: The Stationary Office
2. Care Quality Comission (2018) Radiology Review. A national review of radiology reporting within the NHS in England.Newcastle-upon-Tyne: Care Quality Commission

P140 Experiences of critical examination and acceptance checks of the kV on-board imaging system of a Varian ProBeam proton therapy gantry

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The Christie NHS Foundation Trust

The Christie is home to the first high energy NHS proton beam therapy (PBT) centre in the UK, which is now in routine clinical use. Each clinical PBT gantry houses on-board kV X-ray imaging devices capable of planar and cone beam CT (CBCT) imaging. These are used to assess anatomical changes and assist in the accurate positioning of patients immediately prior to delivering the proton therapy. These, along with the other positioning aids, ensure that the treatment is delivered in-line with the treatment plan to the correct anatomy. As part of the acceptance and commissioning process we assisted Radiotherapy Physics with the critical exam and acceptance testing of kV X-ray imaging device to ensure it was performing as expected. We intend to summarise our experiences of critical examination and acceptance testing of this unit, including images taken during the measurements, including a description of the difficulties encountered in performing the measurements on this unique equipment and the difficulties encountered in assessing the results from some very novel technology.

P142 Identifying osteoporosis on pelvic radiographs using textural analysis

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UHCW NHS Trust

Background: Osteoporosis is very common in older age but vastly under-diagnosed[1]. Fragility fractures can have a devastating impact on individuals and place a huge financial burden on health systems. Textural Analysis can detect changes on radiographs

which are imperceptible to the eye. In England over 10 million radiographs are undertaken annually on patients over the age of 60. These radiographs contain enormous amounts of textural data, some of which could potentially be leveraged to identify individuals at risk of osteoporosis. This study investigated whether textural analysis of routine clinical radiographs can be used to identify patients with unsuspected osteoporosis.

Method: Pelvic radiographs and Dual X-Ray Absorptiometry (DXA) results were obtained for 150 patients who had undergone both examinations within a 6 month period. Textural Analysis software was used to calculate 300 textural parameters for Regions of Interest (RoI) corresponding to the femoral head, neck and shaft on each radiograph. Nine Machine Learning algorithms were then employed to generate models for predicting a patient's DXA classification using only the textural measurements. The accuracy of each model was evaluated using tenfold cross-validation.

Results: The greatest improvement over baseline accuracy (simply predicting the most common outcome) was obtained using textural measurements made at the femoral neck to predict Femoral Neck DXA classification (10.8 percentage points).

Conclusion: The textural analysis approach used shows potential but further research is required into the effect of radiographic exposure conditions and patient positioning on textural measurements to allow prediction accuracy to be optimised.

1. Marsh, D., Currie, C., Brown, P., Cooper, A., Elliott, J., Griffiths, R., Hertz, K., Johansen, A., McLellan, A. R., Mitchell, P., Parker, M., Sahota, O., Severn, A., Sutcliffe, A. and Wakeman, R. (2007) The care of patients with fragility fracture. London: British Orthopaedic Association

P143 Evaluating deep learning artificial intelligence use in radiotherapy target volume definition: A systematic review

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Background: Artificial intelligence (AI) uses computer algorithms to learn from database of information to perform specific tasks autonomously. Deep learning is the latest branch of AI. Radiotherapy target volume delineation is where oncologist outline tumour and organ at risks (OAR) volumes to deliver radiotherapy. We performed a systematic review on the application of deep learning method to the radiotherapy target volume definition.

Method: Search was performed using the MEDLINE, EMBASE and CINAHL databases in accordance to PRISMA guidelines up to October 2018.English language papers were included. Search terms "artificial intelligence", "machine learning"," deep learning", "radiotherapy" and "radiotherapy target delineation" were used.

Results: 658 papers were identified of which 89 full papers were assessed for eligibility. 18 publications were included in this analysis. AI was used in delineation of tumour volume (11), OAR (6) and both in 1 study respectively. Radiotherapy modality used were CT (61%), MRI (22%) and PET/CT (17%). Top tumour sites studied were head and neck (33%), lung (28%) and colorectal (17%). Median number of patients contours used for validation was 22 (range 5-800). Outcome was poorly reported and not standardised. AI are capable of producing good contours but not yet able to be used clinically with 17% of studies reporting saving clinician time.

Conclusion: Deep learning AI technology is still at its infancy and not yet capable of producing clinically acceptable radiotherapy contours. The major hurdle to AI method is it requires a large dataset to train its model. AI improvements with time will potentially have a role in future radiotherapy workflow.

1) LeCun Y, Bengio Y, Hinton G. Deep learning. Nature. 2015 May 28;521(7553):436-44. doi: 10.1038/nature14539. Review. PubMed PMID: 26017442
2) The Royal College of Radiologists, (2018). RCR position statement on artificial intelligence

P144 Assessment of Velocity and Mirada auto-segmentation tools

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Background: We assessed 2 software packages (Mirada Embrace:CT and Varian Velocity) for auto-segmentation and adaptive re-contouring .

Methods: Auto-segmentation tools were assessed using 15 CT scans previously contoured by an experienced clinician (5 pelvis, 5 thorax, 5 head and neck (H&N)). For each patient, a consultant oncologist carried out a blinded evaluation of organ-at-risk (OAR) contours generated by Mirada, Velocity and the original clinician. They scored quality of contours (1-5), and estimated potential time saving. Adaptive re-contouring was similarly assessed using data from 7 patients who had previously been contoured on one CT then re-contoured on a subsequent scan (3 H&N, 2 thorax, 2 pelvis). Adaptive dose re-calculation was assessed for 8 patients (3 H&N, 3 pelvis, 2 chest). Delivered dose was calculated for the CBCT geometry using Mirada and Velocity, and compared to dose calculated on a CT rescan.

Results: For auto-segmentation of H&N OARs, clinician contours scored an average 4.4, Mirada 3.4 and Velocity 2.2. The assessing clinician reported that all auto-contoured structure sets required editing, but provided an estimated time saving of approximately 20 minutes per patient. For pelvis and thorax patients, automatically generated contours required extensive editing and did not provide a significant time saving. For adaptive re-contouring, H&N clinician contours scored average 3.3, Mirada 4.0 and Velocity 3.0. Dose re-calculation using CBCT was similar for both packages (within 1-2% of CT rescan calculation). This gave a quick method to assess the impact of anatomical changes.

Conclusions: Both packages are potentially useful for some patient groups.

P145 **The effect of time of flight and attenuation correction on image quality of PET in patients with different BMI**

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Background: The image quality in Positron Emission Tomography (PET) improves with adding Time-to-flight (TOF) combined with attenuation correction (AC). The aim of this work was to investigate the effect of TOF and AC on PET images for patients with different BMI.
Method: 80 studies (40 from F18-FDG and 40 from F18-NaF) with different BMI were retrospectively processed. The image quality was compared between TOF and NTOF (no time of flight) and AC and NAC (no attenuation correction) using SNR and SUV. SUVmax was used to test the contrast and 4 regions over the liver for SNR. Two nuclear medicine physicians have evaluated the impact of TOF and NTOF on the contrast of lesions for F18-FDG and F18-NAF.
Results: SNR was significantly increased using TOF AC compared to NTOF AC with mean 17.2 ± 2 and 9.7 ± 3.5 respectively for all BMI. The SNR for TOF AC data (17.2 ± 7.16) was improved compared to NAC (5.6 ± 2.2). A significant improvement of SUVmax was noticed in TOF AC versus NTOF AC with mean 11.3 ± 6.8 and 10.6 ± 6.7 respectively. All Patients have shown significant increase in the contrast and SNR using TOF and AC regardless of their BMI. Both observers were supporting images with TOF AC compared to NTOF AC (kappa=0.82) as the contrast of lesion was improved with p value 0.002.
Conclusion: TOF combined with AC offers a better contrast, SNR and more accurate SUV. This will help in improving the quality of images and detectability.

1. Sibylle I. Ziegler. Positron Emission Tomography: Principles, Technology, and Recent Developments. Nuklearmedizinische Klinik, Klinikum rechts der Isar der Technischen Universität. München, Ismaninger Str. 22 D-81675 München, Germany. Nuclear Physics A 752 (2005) 679c–687c
2. Simon R Cherry, James A Sorenson, Michael E Phellps. Physics in Nuclear Medicine. 4th ed
3. E.E. Kim et al. (eds.), Clinical PET and PET/CT: Principles and Applications, DOI 10.1007/978-1-4419-0802-5_1, © Springer Science+Business Media New York 2013
4. van Eijk CWE. Inorganic scintillators in medical imaging. Phys Med Biol. 2002;47: R85–106
5. Surti S, Karp JS, Muehllehner G, Raby PS. Investigation of lanthanum scintillators for 3-D PET. IEEE Trans Nucl Sci. 2003;50(3):348–54
6. Tomitani T. Image-reconstruction and noise evaluation in photon time-of- flight assisted positron emission tomography. IEEE Trans Nucl Sci. 1981;28(9): 4582–9
7. Matej S, Surti S, Jayanthi S, Daube-Witherspoon ME, Lewitt RM, Karp JS. Efficient 3-D TOF PET reconstruction using view-grouped histoimages: DIRECT-direct image reconstruction for TOF. IEEE Trans Med Imag. 2009;28(5):739–51
8. Karp JS, Surti S, Daube-Witherspoon ME, Muehllehner G. Benefit of time-of- flight in PET: experimental and clinical results. J Nucl Med. 2008;49(3):462–70
9. Frederick D, Frederic H, Alan B, Royal T. Abass A, and S. Skeletal PET with 18F-Fluoride: Applying New Technology to an Old Tracer. Division of Nuclear Medicine, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania; and University of Pennsylvania Medical School, Philadelphia, Pennsylvania. J Nucl Med 2008; 49:68–78
10. Paul D, Yoshimi A, Richard L, MD. Pitfalls in Oncologic Diagnosis with FDG PET Imaging: Physiologic and Benign Variants. Department of Nuclear Medicine, Veterans Affairs Medical Center, Ann Arbor, Mich (P.D.S.)
11. Suleman S, Joshau S, Georges El f, Margaret E, Nathalie A, elc. Impact of TOF PET on whole-body oncologic studies: a human observer lesion detection and localization study. J Nucl Med. 2011 May; 52(5): 712–719
12. [unknown]. Attenuation Correction. the University of Virginia 2013
13. Dan J, Michael E, Maurizio C, Bjoern W. Cristina L, David W. The Impact of Time-of-Flight of PET Tumor Detection. Department of Medicine, University of Tennessee, Graduate School of Medicine. J Nucl Med April 17, 2009
14. Rogasch J, Steffen I, Hofheinz F, Grober O, Furth C, Mohnike, Hass P, Walke M, Apostolova L and Amthauer H. The association Of Tumor-To-Background Ratios And SUVmax Deviations Related To Point Spread Function and Time-Of-Flight F18-FDG-PET/CT Reconstruction In Colorectal Liver Metastases. Rogasch et al. EJNMMI Research, 31(5). 2015
15. Quak E, Roux P, Hofman M, Robin P, Bourhis D, Callahan J, Binns D, Desmonts C, Salaum P, Hicks R and Aide N. Harmonizing FDG PET Quantification While Maintaining Optimal Lesion Detection: Prospective Multicentre Validation in 517 Oncology Patients. Eur J Nucl Med Mol Imaging, 42. 2015
16. El Fakhri G, Surti S, Trott C, Scheuermann J and Karp J. Improvement in Lesion Detection with Whole-Body Oncologic TOF – PET. J Nucl Med, 52(3). 2011
17. Oldan J, Turkington T, Choudhury K and Chin B. Quantitative Differences in [18F] NaF PET/CT: TOF Versus Non-TOF Measurements. Am J Nucl Med Mol Imaging, 5(5). 2015
18. Win A and Aparici C. Normal SUV Values Measured from NaF18- PET/CT Bone Scan Studies. J Nucl Med, 9(9). 2014
19. Conti M. Focus On Time-Of-Flight PET: The Benefits of Improved Time Resolution. Eur J Nucl Med Mol Imaging, 38 (11). 2011

P146 **The effect of reconstruction times on PET radiomic features**

Emad Alsyed [1]; Christopher Marshall [2]; Rhodri Smith [2]; Stephen Paisey [2]; Emiliano Spezi [1]
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Background: Radiomics involves extracting quantitative features from medical images which cannot be determined by the naked eye. Several studies claim that radiomic features could play an essential role in predicting the treatment outcomes. Purposes: The objective of this study is to evaluate the variation of PET image radiomic features with time of imaging post injection.
Methods: Eight mice with large 4T1 tumours in their lower flank were scanned after injection with 10.0 ± 2.0 MBq of 18F-FDG. Each mouse was scanned for 20 minutes between 50 and 70 minutes post injection and images were rebinned into 4 x 5 minute PET scans. Tumors in the first time point image were segmented and copied to all other points. 289 radiomic features were extracted and the coefficient of variation (COV) was calculated for each parameter. COV was categorized into four groups.
Results: Fifty eight (20%) features exhibited COV ≤ 5% and thirty three (11%) exhibited a combination between COV ≤5% and COV ≤ 10% for all mice. Eighty (27%) features showed COV > 10%.

Conclusions: This study demonstrated that the majority of features vary on images acquired at different timepoints. Further studies are needed to investigate the impact of imaging time on PET/CT image radiomic parameters. Radiomic parameters that are very sensitive to imaging times should be standardized before they can be used in patient management.

Cook, G. J. R., Siddique, M., Taylor, B. P., Yip, C., Chicklore, S., & Goh, V. (2014). Radiomics in PET: principles and applications, 269–276
Shiri, I., Rahmim, A., Ghaffarian, P., Geramifar, P., Abdollahi, H., & Bitarafan-Rajabi, A. (2017). The impact of image reconstruction settings on 18F-FDG PET radiomic features: multi-scanner phantom and patient studies. European Radiology, 27(11), 4498–4509
Tong, S., Alessio, A. M., & Paul E Kinahan. (2010). Image reconstruction for PET/CT scanners: past achievements and future challenges. Imaging in Medicine, 2(5), 529–545
Yip, S. S. F., & Aerts, H. J. W. L. (2016). Applications and limitations of radiomics. Physics in Medicine and Biology, 61(13), R150–R166

P147 The effect of edge-enhancement on the precision of maximum abdominal aortic diameter measurements using three different ultrasound measurement techniques

Amy O'Brien; Gemma Young-Santos; Katie Philpott; Ashley Davies; Sue McAnulla
University of Exeter

Background: Three measurement techniques are documented as being implemented for assessment of aortic diameter using ultrasound; inner-to-inner (ITI), outer-to-outer (OTO) and leading-edge to leading-edge (LELE). It is also suggested in the literature that edge-enhancement algorithms may improve measurement precision. This project tested this hypothesis.
Method: Observers (n=5 including a consultant sonographer) assessed the maximum anterior-posterior abdominal aortic diameter by completing repeated measurements using ImageJ software using the ITI, OTO, and LELE methods from one transverse abdominal aortic image obtained from a Siemens X700 ultrasound machine and a Kyoto Kagaku 'ABDFAN' ultrasound phantom. Intra- and inter-observer precision was assessed by comparing the coefficients of variation (CV%) for each technique.
Results: The use of edge-enhancement did not improve the precision of measurements for ITI or OTO measurements. The CV%s for non-edge enhanced measurements ranged from 1.5 to 3.3 for ITI, 1.3 to 2.0 for OTO and 1.4 to 2.3 for LELE. For edge enhanced measurements CV ranges of 1.5 to 2.9, 1.2 to 2.0 and 1.6 to 3.0 were noted for ITI, OTO and LELE respectively.
Conclusion: Good inter-operator precision is demonstrated for all measurements in this study. The edge enhancement algorithm used in this study was not shown to have any significant effect on measurement precision.

P148 Identifying metallic foreign bodies prior to MRI scan

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MRI scanning has dramatically increased in popularity over the last decades. One of the largest risks of exposing a patient to the high magnetic field of the MRI scanner is that of disturbing any metallic foreign object (MFO) lodged in the body. Depending on the location and material of a MFO, any forces or torque applied to it from the magnetic field could potentially cause injury. For this reason it is commonplace for MRI centres to have screening questionnaires to identify patients at higher risk for metallic foreign objects, and if necessary to carry out screening X-rays to confirm their absence prior to the MRI scan[1].
Because x-rays do not differentiate between types of metal, patients with a non-specific MFO visible in their x-ray may be contraindicated for MRI[2,3]. Some of this contraindication could be unnecessary, because non-ferromagnetic materials (such as lead or aluminum) are not subject to the magnetic field in the screening room, only the heating effects undergone by any conductive material in a magnetic field.
This poster will describe some different methods currently used to identify MFOs prior to MRI scan, discuss types of MFO that might be encountered and whether they are ferromagnetic.

1. British Association of MR Radiographers, MR Safety Document 2016
2. Safety in magnetic resonance imaging, Society of Radiographers
3. Review article - X Radiation dose implications in screening patients with ferromagnetic IOFBs prior to MRI: a literary review OPTIMAX 2014 – radiation dose and image quality optimisation in medical imaging

P149 Adequacy of contrast enhancement in CT pulmonary angiograms - an audit

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Blackpool Victoria Hospital

Background: Suboptimal enhancement of CTPAs leads to non-diagnostic studies and therefore poses unnecessary exposure to contrast and radiation. A minimum enhancement of 210 Hounsfield Units (HU) is reqired to identify chronic thrombus. *(Wittram et al. 2005)*
Target: As per RCR AuditLive proforma, no more than 11% of scans should have inadequate contrast as approximately 10.8% may be suboptimal based on all causes. *(Jones & Wittram 2005)*
Aims: To establish the percentage of inadequate CTPAs at a UK based trust.
Method: Retrospective sampling of 100 consecutive CTPAs was undertaken. The HU at the pulmonary trunk were measured with a standardized method. HU<210 was defined as inadequate. Patient age, sex and radiology report findings were also noted.

Results: The mean patient age was 67.57. 16 out of 100 scans were suboptimal. 5 studies were reported as non-diagnostic, all of which fulfilled the criteria for an inadequate CTPA. 16 Pulmonary embolisms (PE) were reported, 3 of which (18.75%) were from inadequate scans.
Conclusions: The percentage of adequate CTPAs does not meet RCR targets. No direct correlation between age, sex and non-diagnostic studies was observed. Larger PEs may still be reported despite suboptimal contrast enhancement.
Suggestion: Disseminate the result to radiographers to raise awareness of adequate contrast enhancement. Ensure radiographers realise the importance of a large cannula in the antecubital fossa with appropriate arm positioning and proper breathing instructions. This will be re-audited with larger sample size to further establish the age correlation and check improvement.

1. Jones SE, Wittram C. The indeterminate CT pulmonary angiogram: imaging characteristics and patient clinical outcome. Radiology 2005; 237: 329-337
2. Wittram C, Maher MM, Halpern E, Shepard JO. Hounsfield unit values of acute and chronic pulmonary emboli. Radiology 2005: 235; 1050-1054

P150 Introducing an O-arm for complex spinal cases

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Royal Liverpool and Broadgreen University Hospitals

As a busy recognised spinal centre in the heart of a major city dealing with complex spinal cases ranging from scoliosis correction to oncology cases, the spinal team and radiology recognised the need for better, more accurate ways to image the spine during surgery. The Medtronic O-arm was introduced a year ago and we have currently performed over 20 cases. As radiographers providing an intra-operative service we have had to implement strict protocols and systems that meet surgeon demand and expectations whilst maintaining our own obligations under IRR 17 & IR(ME)R 17 to ourselves, other staff and patients. The poster aims to outline a brief overview of the O-arm & its functions.

The positives we have experienced in the year from the perspective of the surgeon and radiographer including:

- Advantages of the kit such as real time navigation of individual screw paths
- Impact on radiographer time in theatre
- Increased communication
- Impact on budget and wastage
- Role expansion for staff.

The disadvantages we faced including:

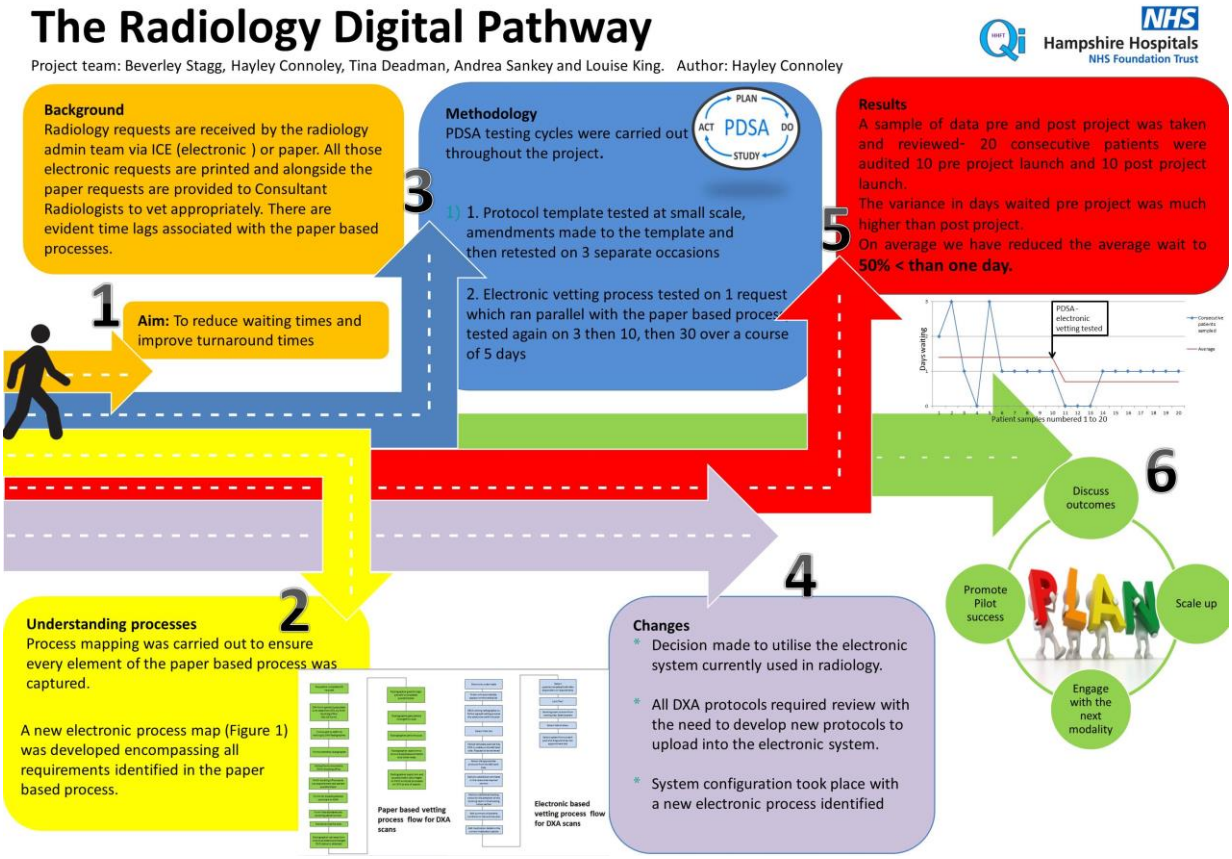
- Increased dose to patient and potentially staff
- Limitations to practice with input from RPS/medical physics
- Staff training issues and limitations to service.

Future learning possibilities including:

- Audit opportunities in terms of dose
- Advantages & disadvantages on long term patient outcomes & management.

P151 **The radiology digital pathway**

Hayley Connoley; Beverley Stagg
Hampshire Hospitals NHS Trust



The Radiology Digital Pathways (RDP) project will deliver paper light processes within the radiology department. This has provided great benefits to patients by reducing the time at all stages in the process between request, vetting, booking and scanning. We hope that this will take days off the diagnostic pathway, and particular benefit will be seen in those pathways under significant time pressure, such as 2 week wait cancer diagnosis. This will also benefit staff at all levels working in the radiology department, as time will no longer be spent chasing paper forms between various locations.
Several members of staff will be able to access the same information simultaneously, editing will be visible to all who need access, vetting processes will be faster and scanning protocols will be standardised across the trust. Digitalisation of these processes will also reduce the risk of error due to duplication of paper forms. The team working on the RDP project have had to work with many clinical and non-clinical staff groups within and outside radiology. Engagement levels have been high and this reflects positively the collaborative way in which the project has been run so far.

P152 **The role of PSMA for patients with advanced prostate cancer**

Joseph Drabble
GenesisCare

Prostate cancer is the second most common cause of cancer related deaths in men in the UK. Accurate staging of prostate cancer plays an important role in patients treatment management. Current practice for staging prostate cancer is to use bone scans (BS's) to detect bone metastases and morphological CT/MRI imaging to predict malignant lymph nodes. BS's effectiveness is limited due to insensitivity of early metastatic lesions and morphological imaging is limited in that 80% of malignant lymph nodes are smaller than the 1cm short axis that is used as a predictor of malignancy. PSMA PET/CT imaging can be beneficial to staging patients with advanced prostate cancer as it shows a significantly high expression in the majority of prostate cancer cells. This can help earlier detection of bone metastases and also detection of metastatic lymph nodes therefore enabling faster treatment and more accurate treatment interventions improving patients prognosis. PSMA is also being trialed therapeutically using 177Lu-PSMA-617 for compassionate treatment of patients with castrate-resistant prostate cancer. Results have shown a significant reduction in 50% PSA decline and improvements to overall survival times. Currently published results are limited to mainly retrospective data but PSMA therapy prospective trials are currently in progress.

P153 **End to end electronic Multi-disciplinary team meeting workflow using order comms**

Sara Abdulrahman; Dimitri Amiras; Katherine Van Ree
Imperial College Healthcare NHS Trust

Background: MDT discussions have traditionally been difficult to arrange and track in a patient history. The requesting of the case to be discussed in an MDT is via various methods which were not always integrated with the existing database and EPR systems. After GDPR all this information needs to be transferred and stored in a compliant manner which is difficult when multiple systems are being utilised. We describe a new workflow which has allowed clinicians to check MDT reviews in the same place in the EPR/PACS under the patient record. By utilising the existing HL7 interface between Cerner EPR and the radiology system. The various MDTs were built as exams that could be ordered via the existing order Communication. MDT discussions orders placed in Cerner were used to drive the PACS system using the existing desktop integration. Users could place notes in the form of unauthorised reports on the system and then authorise formal reports once the discussion was concluded. The report was then sent back to Cerner.
Purpose: To describe the HL7 based workflow for MDT discussions to be requested and recorded in the patient history in the EPR, RIS and PACS and to demonstrate the benefit of utilising the existing workflows.
Summary: It is possible to use existing radiology and electronic patient record systems and interfaces to create a GDPR compliant complete MDT workflow with existing information systems without specialist software or interfaces. Future developments include scheduling MDT discussions using existing radiology scheduling procedures.

P154 **Graves' disease and radiotherapy: The work of Florence Stoney**

Adrian Thomas
Canterbury Christ Church University

Radiologists and surgeons have always looked for treatments that avoid major surgery, which has a considerable morbidity and mortality. Following the discovery of X-rays its therapeutic potential was quickly appreciated, and treatments were given for a wide variety of conditions with considerable success. This presentation describes a technique that was used in the early 20th century, and places modern clinical practice within a historical context.
Florence Stoney started treating Grave's disease in 1908, and by 1912 had seen 48 patients. She described her experience at the annual meeting of the British Medical Association held in Liverpool[1,2]. This became a well-established treatment for this condition although as not without complications, and, whilst external radiation is no longer used today, radiation treatment continues with the use of radioiodine, which was introduced following the Second World War. Florence stated "It is to me rather terrible to see these patients subject to operation, where the risks are considerable, and shock in their nervous systems very severe and sometimes fatal."
Her patients were often very sick, and the oral anti-thyroid drugs used today were not yet developed; for example propylthiouracil only came into medical use in the 1940s, and methimazole was only introduced in 1954. Of her 41 completed treatments Florence had 14 complete cures and 22 had great improvement and returned to ordinary life. Her results, and importance of her work will be demonstrated.

1. Stoney FA. (1912) On the Results of Treating Exophthalmic Goitre with X-rays. Brit Med J. ii: 476-480 2. Stoney, FA. (1913) On the Results of Treating Exophthalmic Goitre with X-rays. Archives of The Roentgen Ray. 17 (8) 317-322

EDUCATION AND WORKFORCE

P155 **Radiation therapy education and certification in Ghana**

Emmanuel Worlali Fiabedzi
University of Ghana

In response to the need of adequately trained Radiation therapists in the health delivery system of Ghana, a Bachelor of Science in Therapy Radiography Programme was established by the University of Ghana School of Allied Health Science in 2014.It is the only institution training Radiation therapists. Over the years, the Radiation therapy programme in Ghana has grown from initially admitting local students to admitting foreign students from other Africa countries.
The program runs bi-annually with a maximum student intake of eight. The entire duration of the Programme is four years followed by a one year compulsory clinical internship at the National Centre for Radiotherapy and nuclear Medicine. There is also Vocational clinical training which is supervised during inter-semester breaks. Students take general courses together with their colleagues in the General Radiography Program during their first and second year after wish they branch into more specialised courses in their third and final year. An external examiner mostly from abroad examines the students in their final clinical practicum exams before students graduate.
In order to practice in Ghana, students then undertake their one year compulsory clinical training at the National centre for Radiotherapy followed by a registration exam with the Allied Health Profession Council. Successful candidates are issued with their licences and are posted to any of the three Radiotherapy Facilities in Ghana for job placement. In future, changes will be required to increase student intact, run it yearly, ensure that certification remains of high standard and recognition continues.

1. Donkor Andrew, Yakanu Frederick, Anarfi Kwabena, Adesi Kyei Kofi, Della Atuwo-Ampoh Vivian, Fiagbedzi Emmanuel, Lawson Pearl and Hanson Justice, "Radiation therapists' historical and central role in cancer care in Ghana: Professional inquiry",(2017) INTERNATIONAL SOCIETY OF RADIOGRAPHERS & RADIOLOGICAL TECHNOLOGISTS AUGUST NEWSLETTER,Volume 26,p 33-36

P156 Championing undergraduate oncology: Roles and responsibilities of consultants and registrars

Ian S. Boon; Eldho Joseph; Patricia Packham; David Bottomley; Rebecca Goody; Mohan Hingorani; Nathalie Casanova; Emma Dugdale; Kate Cardale; Emma Thomas; Di Gilson; Mehmet Sen; Robin Prestwich; Rachel Cooper; Shirin Namini; Michelle Kwok-Williams

Leeds Cancer Centre, St James's Institute of Oncology, Leeds Teaching Hospitals NHS Trust

Background: Cancer incidence in the UK continues to increase contributing to demands on oncology service[1]. Recruitment to consultant and registrar in oncology continues to be challenging[2]. Early exposure of medical students to oncology is essential for medical education and future recruitment to oncology[3].

Methods: Respective consultants and registrars are given leadership roles to design and lead year 1 medical student oncology placement at a cancer centre. This is an iterative process taking into account feedback from previous batches of medical students. Students are assessed with direct observation of procedural skills (DOPS) and weekly debriefing sessions. Feedback is collected for quality improvement.

Results: We had two cohorts of 4 medical students in 2018. End of placement feedback is collected and analysed.

Learning environment: We received excellent feedback (100%) in the domains of induction, facilities and delivery of teaching.

Motivation and passion: Students were impressed with the passion of doctors exposing them to oncology with enthusiasm.

Feedback culture: Introduction of direct observed assessments and debrief sessions allow feedback to be given on student performance in a safe environment.

Learning experience: We were graded highly for opportunity for learning and clinical experience (97%). 100% of our students would recommend our placement to their colleagues.

Conclusion: Undergraduate oncology benefits from clear leadership roles in medical education from consultants and registrars. Student feedback should be regularly reviewed to make improvements to medical placements. Considerations for pastoral and logistical support for students are essential. Observed assessments and debriefing sessions can be useful medical educational tools.

1. Cancer Research UK, (2018). Cancer Statistics for the UK
2. The Royal College of Radiologists, (2017). Clinical oncology UK workforce census report
3. General Medical Council, (2015). Promoting excellence: standards for medical education and training

P157 How do we maximise medical student teaching opportunities in clinical oncology?

Samantha Cox [1]; Emma Christopher [1]; Sarah Davies [2]; Sarah Gwynne [1]; Kath Rowley [1]

[1]South West Wales Cancer Centre; [2]ABMUHB

Background: The prevalence of cancer is such that nearly every doctor will regularly encounter patients that either have a current or previous cancer diagnosis; however exposure to Clinical Oncology during medical training remains limited (RCR, 2016). It is therefore vital that undergraduate training opportunities are maximised to ensure future doctors are adequately skilled and to improve speciality recruitment.

Purpose: To demonstrate how the RCR non-surgical oncology curriculum (RCR, 2014) can be introduced to undergraduate oncology placements; to provide examples of how medical student oncology placements can be structured.

Summary: Third year medical students each spend a week within our cancer centre; the majority of the placement was previously spent on the ward clerking patients admitted acutely with complications of their cancer and/or treatment. Modifications were made in line with the RCR curriculum during the 2017-2018 academic year. We developed a timetable to include sessions in outpatient clinics and MDTs. A suggested reading list of textbooks and websites was circulated. To ensure adequate exposure to the major oncological emergencies regardless of the admissions to the ward, a 1-hour tutorial was written using 4 real patient cases and delivered on a weekly basis by the oncology registrars; learning objectives, question/answer handouts and feedback forms were created. The attachment has received excellent feedback from students and continues for the 2018-19 academic year. The project has improved the oncology training medical students, providing teaching on the minimum competences required of newly qualified F1 doctors to safely care for oncology patients.

1. Royal College of Radiologists (2016). Why clinical oncology? Factors influencing trainees' choice of career
2. Royal College of Radiologists (2014). Medical undergraduate non-surgical oncology curriculum

P158 Reducing training burden through a comprehensive integrated radiotherapy simulation placement

Pete Bridge; Sarah-Jane Ketterer; Flora Al-Samarraie; Bev Ball; Jenny Callender; Kerrie-Anne Calder; Jo Edgerley; Cath Gordon; Mike Kirby; Marie Pagett; Pauline Pilkington; Bridget Porritt; Mark Warren

University of Liverpool

Background: Workload pressure on clinical departments can challenge implementation of radiotherapy student placements and restrict learning opportunities. Although evidence supports use of simulation for health profession training, much of this (Bridge 2007, Jiminez 2018) is based on students' self-assessment of enjoyment and perceived learning of technical skills only. This study

aimed to determine the feasibility of reducing training burden with the use of a novel comprehensive integrated simulation placement.
Method: A cohort of 29 first-year undergraduate radiotherapy students were randomly assigned to either simulation placement, based in an academic facility, or conventional fortnight clinical placement. Formative assessment of all students was performed based on the existing clinical outcomes and assessment criteria grids and scores were compared between the two groups.
Results: Use of a wide range of equipment, actors, service users and structured activities created a realistic simulated placement. Mean overall scores for each cohort were within 3% of each other. The simulation cohort had statistically significant ($p = 0.028$) higher "communication" scores than the traditional group. The integrated and prospectively designed learning experience of the simulation placement combined with the ability to gain both technical and interpersonal skills through mistakes helped improved learning compared to clinical placement.
Conclusions: Results from this study confirm that intensive simulation can enable students to acquire clinical skills away from busy departments. Better-prepared students will integrate with clinical staff more readily and improve the patient experience. Use of simulation placements may allow for reduction of overall clinical placement time, reducing departmental training burden.
1. Bridge P, Appleyard R, Ward J, Phillips R, Beavis A. (2007) The development and evaluation of a virtual radiotherapy treatment machine using an immersive visualisation environment. Comp. Educ.49, 481-494
2. Jimenez Y, Thwaites D, Juneja P, Lewis S. (2018) Interprofessional education: evaluation of a radiation therapy and medical physics student simulation workshop. J. Med. Radiat. Sci. 65:106-113

P159 The mistreatment of staff who raise valid concerns in the NHS must stop

Hugh Wilkins

The NHS has a serious problem in its response, or lack of response, to staff who raise concerns in the public interest. In many if not all NHS scandals which have come to light, including the former Mid-Staffordshire foundation trust, Bristol paediatric heart surgery, Baby 'P', Savile, Paterson, Gosport etc, some staff did speak up but were ignored/vilified/disciplined, whilst others kept silent for fear of: futility of raising a concern because nothing would be done about it; and/or repercussions for themselves and their careers. The 2015 Freedom To Speak Up Review report[1] refers to shocking accounts of the way some people have been treated.
Senior leaders in the DHSC and NHS know that this problem is widespread in many parts of the NHS; it exists within the imaging and oncology community. There is recognition that there is need for culture change such that speaking-up becomes normal practice, though the current approach to promoting such change is controversial. At present it is apparent from many cases that NHS staff cannot be sure that it is safe to speak up when things are not right. Legislation which supposedly protects 'whistleblowers' - i.e. staff who raise concerns in the public interest - is weak, and typically provides only paltry financial compensation to the few who succeed against legal and financial odds in winning cases at employment tribunals.
This is a complex and often misunderstood area, in which education is sorely needed. This talk will outline salient issues, and suggest appropriate ways forward.
1. Francis, R.F. (2015) Freedom to Speak Up: An independent review into creating an open and honest reporting culture in the NHS. Executive Summary para 3, page 8. http://freedomtospeakup.org.uk/

P160 Co-production: Working together to create a shared sense of compassion

Amy Taylor; Denyse Hodgson
Sheffield Teahing Hospitals NHS Trust

Background: Historically, academic researchers carried out studies with little or no involvement of those who commissioned, provided or used health services (Heaton et al 2006). Consequently, findings were often deemed to not be relevant to or representative of those groups (Cooksey, 2006. Tooke, 2007). Co-production is founded on the notion that users are not simply participants, instead are regarded as active agents' not merely passive subjects (Ostrom, 1996).
Purpose: The presentation provides an overview of the co-production strategies employed within the authors PhD; Exploring compassion and compassionate behaviours in cancer care. Bringing together the researcher, Therapeutic Radiographers, student Therapeutic Radiographers and patients diagnosed with cancer and care-givers to share and explore their experiences of compassionate practice. Co-production permitted synthetisation and integration of the data enabling the collective experiences of the different participant groups to shape the themes generated. Mixed participants groups, ensured the voices of each group were reflected in the findings.
Summary: By detailing the co-production methods employed, delegates will gain an understanding of the purpose of co-production and ways in which it can be embedded into healthcare research and service development. The presentation will address the benefits of co-production and identify the self-reported advantages conveyed by the co-production participants they gained from their involvement. Including improvements both student and registered Therapeutic Radiographers felt they would make to improve their own compassionate practice. Using co-production in research can produce findings which hold significance and meaning within clinical environments by engaging those who both use and deliver the service, enabling
1. Cooksey D. (2006) A review of UK health research funding: London: Her Majesty Treasury
2. Heaton J, Day J, Britten N. (2006) Collaborative research and the co-production of knowledge for practice: an illustrative case study. Implementation Science, 11(20)

3. Ostrom E. (1996) Crossing the great divide: coproduction, synergy, and development. World Development, 24(6):1073–87
4. Tooke J. (2007) Report of the high-level group on clinical effectiveness, London: Department of Health; 2007

P161 **Personnel flux and workplace anxiety: Personal and interpersonal consequences of understaffing in UK ultrasound departments**

Paul Miller; Lorelei Waring; Gareth Bolton; Charles Sloane
University of Cumbria

Introduction: By 2013, the UK government's Migration Advisory Committee had determined sonography to be a formal shortage specialty, and understaffing remains a key concern for research in the domain[2,4]. This presentation, emergent of a qualitative study funded by Health Education North West, explores unit managers' perspectives on the present state of UK ultrasound. The focus herein falls upon the personal and interpersonal consequences of this circumstance for individuals working in specific understaffed departments.

Methods: A thematic analysis informed by a Straussian model of Grounded Theory was utilised;[3] N=20 extended accounts provided by ultrasound department leads in public (n=18) and private (n=2) units were collected and analysed accordingly.

Results: Two global themes are addressed herein. The first describes how both inter-departmental movement of senior sonographers and early retirement, within a nationally understaffed picture, impacts negatively upon local knowledge economies and lessens training opportunities. The second highlights how such staffing instabilities can undermine the day-to-day self-efficacy of managerial staff and practicing sonographers alike, with both orders of individual reported to be persistently dealing with the stress of actual and potential departures. This is further reported to undermine team morale, and render planning for the future extremely problematic.

Conclusions: It is personnel flux, rather than simple short-staffing, that is reported to cause the greatest social-psychological problems for both managers and sonographers[1]. The issues raised herein require further examination from the perspective of sonographers themselves, in order to corroborate the views of the managers interviewed.

1. Hudson CK, Shen W. Understaffing: An under-researched phenomenon. Organ Psych Rev 2015;5:244-263
2. Migration Advisory Committee. Skilled shortage sensible: Full review of the recommended shortage occupation lists for the UK and scotland, a sunset clause and the creative occupations. London: Migration Advisory Committee; 2013
3. Sloane C, Miller PK. Informing radiography curriculum development: The views of UK radiology service managers concerning the 'fitness for purpose' of recent diagnostic radiography graduates. Radiography 2017;23(s1):S16-S22
4. Waring L, Miller PK, Sloane C, Bolton GC. Charting the practical dimensions of understaffing from a managerial perspective: The everyday shape of the UK's sonographer shortage. Ultrasound 2018;26(4):206-213

P162 **Pulmonary nodule reporting radiographers - 2 years in practice**

Paul Holland [1]; Hazel Spence [1]; Alison Clubley [2]
[1]Nottingham University Hospitals; [2]Nottingham University Hosptials

Locally there was a lack of thoracic radiologists and with appropriate training radiographers have been able to report CT Chest follow up scans for pulmonary nodules. The role allows radiographers to do comparison measurements from baseline and previous CT imaging to establish whether these nodules are longstanding and then recommend follow up, discharge, referral to Nodule MDT or escalate to Lung MDT. By referring to the British Thoracic Society (BTS) guidelines[1] the radiographers endeavour to produce accurate timely reports with comparison volumetry measurements. This service consolidates the existing pathway for nodule follow up with more consistent and detailed reports to enable effective patient management. This role has been undertaken with in house training by thoracic radiologists, attendance at MDTs and collaboration with respiratory physicians.

Further training in plain film chest reporting Is also been undertaken by the nodule reporters to locally expedite diagnosis of lung cancer. Additionally the role currently involves NIHR research on new predictive nodule software. There is also a current partnership with other centres to improve radiographer involvement in the optimal lung cancer pathway[2]. This service was developed in May 2017. Continual audit and report feedback has been very positive and the thoracic radiologists and respiratory physicians have seen the service improve since its inception.

1. Callister M, Baldwin D, Akram A et al. (2015) British Thoracic Society guidelines for the investigation and management of pulmonary nodules. BMJ Thorax
2. Lung Clinical Expert Group (2017) National optimal lung cancer pathway

P163 **Student radiographers: Current career aspirations**

David Palmer; Claudia Foster
Sheffield Hallam University

Background: Health Education England (2017) introduced an initiative, the "cancer workforce plan". This plan included the commitment to increase levels of the current workforce with an additional 2227 Full-time Equivalent Diagnostic Radiographers by 2021. The Society of Radiographers (2014) estimate there is currently 26,000 diagnostic radiographers to be registered with the HCPC, this initiative will increase the workforce by 8.5%. There will be an increase of demand on services and exploring career aspirations of student Diagnostic Radiographers will give an insight into the future workforce of radiography. This will

give an indication as to the potential impact of current students on this initiative and where the gaps in the workforce will be.
Method: Students at one university will be asked to participate, with informed consent, in an online survey using a combination of open ended and closed questions. This survey compromises of 14 questions, which explore the intentions of students' post-qualification. Question themes centred on student demographics, pre-course aspirations, modality interests and employment type and location. Results will be analysed using descriptive statistics and thematic analysis.
Results: The results of this study have not been collected at this point. Results will be collected in the near future.
Conclusion: Although no conclusion can be made until results have been analysed, it is anticipated that many participants will seek further education into modalities or into advanced practice. It is important to recognise the limitations of this study, such as the small sample size compared to the amount of students studying radiography.

1. Health Education England (2017). Cancer Workforce Plan: Phase 1: Delivering the cancer strategy to 2021, London, UK
2. The Society of Radiographers (2014). Diagnostic Radiography UK Workforce Report 2014, London, UK

P164 **Abbreviations used in imaging requests and reports and their potential pitfalls**

Lucy Knox [1]; Nikita Balaji [1]; Michelle Williams [1]; Simon McGuirk [2]; Fiona Hawke [2]
[1]NHS Lothian; [2]NHS Borders

Background: As the primary means of communication between radiology and other departments, request forms and radiology reports need to convey the necessary facts quickly and clearly. However, abbreviations have the potential to cause confusion, delay diagnosis and compromise patient safety. This audit aims to assess the frequency and types of abbreviations used in radiology requests and reports in a district general hospital.
Method: The imaging request and report for all chest X-rays (CXR) performed over a two-week period were reviewed. The text was reviewed and all abbreviations were identified and categorised.
Results: 763 CXR were reviewed. In total 167 different abbreviations were used in the requests and 23 different abbreviations were used in the reports. Abbreviations ranged from frequently used abbreviations (eg. COPD, chronic obstructive pulmonary disease) to unknown ones e.g. SPI. The most common abbreviation was SOB (short of breath), which occurred in 13% of requests. At least 1 abbreviation was used in 60% of CXR requests and 59% of CXR reports. The most frequent abbreviation in CXR reports was the type of radiograph (AP or PA), and when these were excluded only 9% of the reports contained abbreviations. Abbreviations were more frequently used in requests from within the hospital (617 requests, 69%) compared to requests from general practitioners (146 requests, 18%).
Conclusion: Abbreviations are used frequently, and are more common in imaging requests compared to radiology reports. The large spread in abbreviations shows how varied imaging requests are, and how many different abbreviations radiographers and radiologists must decode.

P165 **Assessment of the perceptions and expectations of radiographers in UAE to accept new responsibilities through role extension**

Mohamed Abuzaid [1]; Wiam Elshami [1]; Marilyn Baird [2]; Jonathan McConnell [3]
[1]University of Sharjah, College of Health Sciences, Medical Diagnostic Imaging; [2]Monash University, Department of Medical Imaging and Radiation Sciences, Melbourne, Australia; [3]Queen Elizabeth University Hospital, Glasgow and Monash University

Introduction: Success of radiographer role development in the UK and Australia has stimulated discussion about similar developments in the United Arab Emirates (UAE). Image interpretation may enhance professional status, improve job satisfaction and boost professional confidence for radiographers in the UAE. This article investigates radiographer perceptions, expectations and interest in future role extension for UAE radiographers.
Materials and methods: An online survey was used to obtain information about current status, opinions and perceptions of radiographers role extension. Demographics, qualifications, experiences, duties and prospective area of role expansion was also extracted. An emphasis on the potential for image interpretation was studied. Expectations, responsibilities and future educational requirements for role extension were explored.
Results: A 72% (185/257) survey response rate was achieved. Demographic analysis identifying educational background and staffing construct was performed. Respondents indicated areas they would like to receive education in, and existing educational approaches provided for current work areas. With respect to image interpretation, response rates varied according to the term defining image interpretation. Confidence in recognition of plain radiography features across a range of presentations was established. Participants indicated variation in CPD planning and levels of support. A large proportion of respondents (165/185) indicated they wished to role extend.
Conclusions: The UAE is not traditionally linked with promoting radiographer role change. By revealing UAE radiographers' perceptions about role extension this investigation identifies factors influencing role change to inform leaders about the potential for radiographer development in the UAE, notably through image interpretation responsibilities.

1. Thom SE. Does advanced practice in radiography benefit the healthcare system? A literature review. Radiography. 2018;24(1):84–9
2. McConnell J, Devaney C, Gordon M, Goodwin M, Strahan R, Baird M. The impact of a pilot education programme on Queensland radiographer abnormality description of adult appendicular musculo-skeletal trauma. Radiography
3. Hardy M, Snaith B. Role extension and role advancement - Is there a difference? A discussion paper. Radiography. 2006;12(4):327–31

4. Gqweta, Ntokozo. Role extension: The Needs, Perceptions and Experiences of South African Radiographers in Primary Health Care. South African Radiogr [Internet]. 2012;50(1):22–6

P166 **Addressing diversity on clinical placement: Improving the experience for radiography students**

Hilary Baggs; Charlotte Burnside
Birmingham City University

Background: With NHS courses now being fee paying with no access to a bursary the external pressures on students have increased and the modern radiography student population has become increasingly diverse. Anecdotal evidence suggests that the traditional clinical placement working day no longer fits with these students' lives. This study will allow the academic team to gather a deeper understanding of the student population and investigate the student experience in clinical placement, allowing us to personalise students' experiences.
Method: Questionnaires will be distributed to level 5 radiography students, with follow up interviews to elicit further information. This year group has been chosen as they already have a year's experience of placement but are not facing the pressures of their final year of study. Qualitative data will be analysed to show any trends in diversity. Open text answers will be analysed by looking for trends in student demographics and placement experiences. Interviews will be analysed using thematic analysis.
Results: It is expected that the results will show a hugely diverse cohort, and that the placement experience needs to be tailored to address this diversity.
Conclusion: We already know that a certain amount of diversity exists within the cohort, and some practice partners can accommodate students on an individual basis, however, this is not the case for every placement provider. With evidence from this research, we can open up discussions with all placements about how we can work together to address these issues, in order to enable to expand the workforce.

P167 **Governance - a framework for learning and career development for radiographers**

Malcolm McNinch
InHealth Ltd

With so much focus on Advanced Practitioner roles are there other avenues, unidentified or unexplored which are open to radiographers? Governance may by an overlooked and unidentified route which is not yet seen as a viable option to career progression. However, it can be satisfying, interesting and rewarding to those who decide to move into this sphere. Governance is not about policing services or systems nor is it about enforcing, change, rooting out bad practice or identifying areas where things may go disastrously wrong.
Whilst there may be certain aspects of these, there are key areas of knowledge and skills which must underpin any ability to work in this field:

- Service Improvement: How to bring about change, staff involvement, LEAN techniques, process mapping
- Clinical Knowledge: Anyone working in governance must have a strong and broad clinical background which should include general and specialist areas
- Tutoring and Training: The ability to impart knowledge, and desire to want to provide a high-quality service
- Human Factors: Understanding that people are fallible and make mistakes which cannot always be understood
- Incident Investigation: Incident/complaints review, Root Cause Analysis, recognition of Serious Incidents Policy
- Procedure Review: The skills to be able to write policies, review, maintain and update according to current legislation and guidelines
- Learning and Sharing: How to disseminate lessons learned from an incident to promote good practice and to stop it happening again Governance should empower, encourage, energise, inspire, improve, and give aspiration to best practice both in the clinical and managerial arenas.

P168 **Trailblazers: Stakeholder motivations for developing degree apprenticeships for the radiography profession**

Trudy Sevens; Julie Nightingale
Sheffield Hallam University

Background: Degree apprenticeships offer a new alternative route to health professional registration which aligns to an approved standard developed by employer-led stakeholder groups known as trailblazers. In 2017 three national radiography related (diagnostic radiography, therapeutic radiography and sonography) trailblazer groups were established and standards approved in 2018. This research aimed to identify challenges and opportunities related to the introduction of the degree apprenticeship training routes by exploring key stakeholder motivations for engagement in the trailblazer groups.
Methods: A multiple case study qualitative design captured stakeholder (chairpersons, employers, academics and professional body representatives) perceptions via semi structured interviews. Thematic analysis enabled emerging themes to be compared and contrasted within and between trailblazer groups. A radiography degree apprenticeship implementation model was subsequently created to guide future curriculum development.

Results: Emergent 'motivational' themes relate to the notion of increased control over their future workforce (desire for more local recruitment of students; better retention of staff; professional pride; professional recognition). The 'barriers' currently identified differ across trailblazer groups but appear to relate to workforce challenges (regulation; career structures; professional protectionism; financial sustainability).
Conclusion: Degree apprenticeships are a new concept for allied health professions and the experience of each development stage should be captured, built upon and learnt from. There is no previous research in this area, and our timely recommendations will support evidence-based apprenticeship curriculum developments and facilitate a seamless integration of apprentices into the existing radiography workforce.

P169 **Towards a discursive psychology of expertise in radiography education: Lecturers' use of "authenticity through autobiography" in classroom sessions**

Paul Miller; Lisa Booth
University of Cumbria

Background: Often drawing upon K. Anders Ericsson's approach[2] the contemporary corpus of research into radiography expertise tends to reflect a set of broadly social-cognitive concerns, whereby the knowledge and experience acquired by a professional are the focus[1]. The Discursive Psychological (DP) approach, however, provides an alternative model; herein, how expertise is performed becomes key[5] - DP describes how actors endeavour to make their own expertise persuasively and dynamically relevant in ways tailored to the intended audience.
Methods: Using the standard methods of DP[3], N=10 classroom sessions were analysed to highlight the nuanced interpersonal ways in which experienced radiography lecturers performed their own expertise.
Results: Findings indicate the routine use of a socio-linguistic device termed "authenticity through autobiography" in the discursive sciences[4]. The lecturers, in a variety of (usually) subtle ways, recurrently drew attention to:
(a) The quantity and/or quality of their professional service in radiography;
(b) the quantity and/or quality of their teaching experience; and
(c) the quantity and/or quality of their research outputs and activities. All were raised only in moments whereby the specific topics of discussion - or the actions of the students - could in some way be inferred to contextually challenge the lecturers' own status as experts. Moreover, the particular autobiographical details raised always directly addressed the specific nature and implications of any challenge.
Conclusions: The work presented draws attention to the importance of interpersonal performance in communicating information in radiography, such that it might be recognised by students as expert knowledge.

1. Donovan T, Litchfield D. Looking for cancer: Expertise related differences in searching and decision making. Applied Cognitive Psychology 2013; 27:43
2. Ericsson KA. An expert-performance perspective of research on medical expertise: The study of clinical performance. Med.Educ. 2007;41:1124-1130
3. Miller PK, Richardson BH. Depression, rational identity and the educational imperative: Concordance-finding in tricky diagnostic moments. Palgrave Communications 2017;3:17033
4. Widdicombe S, Wooffitt R. The language of youth subcultures: Social identity in action. Hemel Hempstead: Harvester Wheatsheaf; 1995
5. Wiggins S. Discursive psychology: Theory, method and applications, 1st ed. London: Sage; 2017

P170 **Waving not drowning: How preceptorship will equip degree qualified sonographers to excel in the workforce**

Nicola Davidson
Birmingham City University

Background: Preceptorship has been used in a wide range of health professions to provide support to newly qualified staff as they transition from student to registered practitioner. The preceptorship period should provide guidance and ensure that that each individual can develop to their full potential in a structured, supported way. Whilst a preceptorship period is advocated in many professions it is the responsibility of individual NHS trusts to determine how they will provide this support.
Purpose: With the introduction of a BSc Medical Ultrasound course a formal preceptorship period is being designed to enable this new transition. This has always been considered fundamental to the course by allowing the student to transition to practitioner and beyond, clinically and academically. To do this the preceptorship programme needs to be robust and meet the needs of the preceptee and their employer whilst ensuring that the preceptorship framework criteria are met. This poster shows how we are addressing these needs as we want to share our experiences with other educators and clinical sonographers.
Summary: As the first HEI to include sonographer preceptorship to those with an undergraduate qualification, we would like to present our journey of developing this programme.

P171 **Personal experiences of students on a new medical ultrasound education programme**

Louise McKnight; Penny Reed; Denise Paddock; Nicola Davidson; Anushka Sumra; Helen Brown; Helen White
Birmingham City University

Background: There is a recognised shortage in the UK medical ultrasound workforce which we are addressing with a direct entry BSc Medical Ultrasound qualification. Using an innovative approach to this workforce problem has given students on this new

course opportunities and challenges both academic and clinical, which we want to assess from their perspectives and use to inform future improvements.
Method: A qualitative methodology was used to gain an insight into students' personal experiences. Third-year students were invited to take part in interviews which used a semi-structured format. Data was analysed using thematic analysis, both theory-driven and data-driven, to allow exploration of our pre-conceived ideas and of evolving themes.
Results: Full results will be available later in the year.
Conclusion: Although this was a small group of participants, we felt it was important to explore students' experiences and while this work may not be generalisable, we expect to share our experiences with other providers who may benefit from our assessments of a new provision.

P172 Preliminary clinical evaluation (pce) by radiographers: How accurate are we?

Leah Fenning; Rebecca Melling
St Helen's and Knowsley NHS Trust

Background: Radiographers' contribution to image interpretation should not be undermined and work by Berman et al. 1985 was some of the first to recognise preliminary II by radiographers[1]. In a study that assessed how accurately staff can recognize and describe trauma, radiographer's scores were statistically higher than nurse practitioners[2]. By providing a written comment, radiographers are replacing the ambiguous 'red dot' previously used to highlight abnormal radiographs.
Aim: The aim of this audit was to establish how accurate radiographers are at detecting abnormalities with a view to implementing a written PCE system.
Method: This data has been taken over one month however the completed audit will address 12 months. All patients who attended A&E for plain film imaging examinations were considered (excluding chest and abdomen). Only requests for query fracture or dislocation were included. Quantitative data was collected based on whether the radiographer applied a 'red dot' and/or wrote a brief description of the abnormality. The radiographers' judgements were then compared to the official report and statistical measures of performance were calculated.
Results: The radiographers' achieved an overall sensitivity of 91%, a specificity of 97% and an accuracy of 95%.
Conclusion: Maximising the contribution of all members of the diagnostic team is central to improving capacity, efficiency and the patient experience. It also supports the national values outlined by Health Education England in supporting the development of Advanced Clinical Practice[3]. Results of such audits may identify areas for development which could be addressed through tailored continuous professional development.

1. Berman, L., De Lacey, G., Twomey, E., Twomey, B., Welch, T. and Eban, R. (1985). Reducing errors in the accident department: A simple method using radiographers. British Medical Journal, 290(6466), pp.421-422
2. Coleman, L. and Piper, K. (2009). Radiographic interpretation of the appendicular skeleton: A comparison between casualty officers, nurse practitioners and radiographers. Radiography, 15(3), pp.196-202
3. Health Education England (2017). Multi-professional framework for advanced clinical practice in England. London: Health Education England

P173 Multidisciplinary performance in preliminary clinical evaluation of appendicular radiographs

Paul Lockwood; Lisa Pittock
Canterbury Christ Church University

Background: The study aimed to evaluate the performance of a cohort of healthcare professionals (nurses, paramedics, a radiographer, an assistant practitioner, and a physiotherapist) in image interpretation of appendicular radiographic examinations following a preliminary clinical evaluation (PCE) course.
Methods: Thirteen participants completed an image based Objective Structured Examination (OSE). The case bank comprised of 25 retrospective appendicular radiographic examinations. Prevalence of abnormal examinations approximated 52%, and included traumatic conditions, normal variants and incidental findings. The individual test scores were analysed against the OSE reference standard with alternative free-response receiver operating characteristic (AFROC) calculation of Area under the Curve (AUC), sensitivity, specificity, and Cohen's Kappa for multi-reader agreement. Professional subgroup results were compared with Analysis of Variance (ANOVA).
Results: The individual study results demonstrated a range of test scores from 100% to 78.2%. The individual sensitivity scores ranged from 100% (95%CI 81.2-100) to 80.8% (95% CI 58.2-94.4), specificity values were 100% (95%CI 78.4-100) to 72.7% (95%CI 48.6-72.7). The AUC was 1.000 AUC; (95% CI 0.863-1.000) to 0.779 (0.569-0.918). The ANOVA analysis between each subgroup (professional) performance displayed test score F 6.42; F Critical 3.83; p=0.01; AUC score F 4.44; F Critical 3.83; p=0.03).
Conclusions: In an academic environment the radiographer and nurses scored higher than published literature. The paramedics, assistance practitioner and physiotherapist results demonstrated in this study could not be compared to published papers due to an absence of research on these professions ability in radiographic image interpretation.

1. Society and College of Radiographers. (2013) Preliminary Clinical Evaluation and Clinical Reporting by Radiographers: Policy and Practice Guidance. London: Society and College of Radiographers
2. The Health and Care Professions Council. (2013)Standards of Proficiency: Radiographers. London: HCPC

3. Stevens BJ, Thompson JD. (2018) The impact of focused training on abnormality detection and provision of accurate preliminary clinical evaluation in newly qualified radiographers. Radiography.24(1):47-51
4. Piper KJ, Paterson A. (2009) Initial image interpretation of appendicular skeletal radiographs: a comparison between nurses and radiographers. Radiography 15, 40-48
5. L. Coleman, K. Piper. (2009) Radiographic interpretation of the appendicular skeleton: a comparison between casualty officers, nurse practitioners and radiographers. Radiography, 15, 196-202
6. Hardy M, Barret C. (2004) Interpretation of trauma radiographs by radiographers and nurse practitioners in the UK: a comparative study. The British Journal of Radiology, 77, 657-661
7. Health Education England. (2017) Multi-professional framework for England. Health Education England, Leeds
8. The College of Paramedics and Health Education England. (2017) Digital Career Framework 2017. The College of Paramedics, Bridgwater
9. The Royal College of Emergency Medicine. (2017) Emergency Care Advanced Clinical Practitioner Curriculum and Assessment Adult Only/Adult and Paediatric / Paediatric. Version 2.0. The Royal College of Emergency Medicine, London
10. Nursing and Midwifery Council. (2009) Record keeping: Guidance for nurses and midwives. London: Nursing and Midwifery Council
11. Making a Difference (1999). Strengthening the Nursing and Midwifery and Health Visiting Contribution to Health and health care. D.O.H London
12. Chartered Society of Physiotherapy. (2016) Advanced practice in physiotherapy: Understanding the contribution of advanced practice in physiotherapy to transforming lives, maximising independence and empowering populations. Chartered Society of Physiotherapy, London
13. IMAGE Information Systems Ltd. (2008) K-PACS (Version 1.6.0). Germany
14. Berman L, de Lacey G, Twomey E, Twomey B, Welch T, Eban R. (1985) Reducing errors in the accident department: a simple method using radiographers. Br Med J (Clin Res Ed). 9;290(6466):421-2
15. Snaith B, Hardy M. (2014) Emergency department image interpretation accuracy: The influence of immediate reporting by radiology. International emergency nursing. 1;22(2):63-8
16. Freij RM, Duffy T, Hackett D, Cunningham D, Fothergill J. (1996) Radiographic interpretation by nurse practitioners in a minor injuries unit. Emergency Medicine Journal. 1;13(1):41-43
17. Brealey S, Scally A, Hahn S, Thomas N, Godfrey C, Crane S. (2006) Accuracy of radiographers red dot or triage of accident and emergency radiographs in clinical practice: a systematic review. Clinical radiology.61(7):604-15
18. Swaby-Larsen D. (2009) X-ray interpretation by emergency nurse practitioners: Dorthe Swaby-Larsen and colleagues discuss an audit of the ability of emergency nurses to interpret X-rays accurately. Emergency Nurse.17(6):24-9
19. Ball ST, Walton K, Hawes S. (2007) Do emergency department physiotherapy Practitioner's, emergency nurse practitioners and doctors investigate, treat and refer patients with closed musculoskeletal injuries differently?. Emergency Medicine Journal. 24(3):185-8
20. Kersten P, McPherson K, Lattimer V, George S, Breton A, Ellis B. (2007) Physiotherapy extended scope of practice–who is doing what and why? Physiotherapy. 93(4):235-42
21. College of paramedics. (2017) Paramedic post-graduate curriculum guidance 2017. College of paramedics. The College of Paramedics, Bridgwater

P174 Review of the effectiveness of a spinal surgical multi disciplinary team meeting

Martin Mitchell; Sanjay Sinha; Marion Mueller; Imran Rafiq
Medway NHS Foundation Trust

This poster presents the findings of a review of spinal multidisciplinary team meetings held from 2010 to date with specific pathway data taken between January 2017 and December 2018. This innovative initiative of medway maritime hospital incorporates spine surgeons/radiology/pain team/community musculoskeletal services at regular bi weekly meetings. The results of an audit of patients discussed shows the significant contribution of team working in the community with regular meetings boosting the cohesiveness and team spirit of regional spinal services. About one third of the patients discussed in the 2 years were discharged after mdt discussion reducing the pressure from spine services.

P175 Use of simulation techniques in MRI training

Darren Hudson; Jenny Corden-Jolly
InHealth

Background: Simulation is a teaching technique aimed at recreating real life scenarios within which trainees can practice and develop clinical skills away from the clinical setting in a safe, non-threatening environment. It was felt this could be a useful approach to introduce into the training programme in an attempt to help expedite trainee skills to help meet operational demands. It was hoped that through different simulation approaches that were as close to the real clinical setting as practicable, trainees would build confidence and develop competence sooner.
Purpose: The approach outlined demonstrates how simulation techniques have been introduced into an innovative training programme to support learners develop confidence in new clinical skills. This was achieved using actors in simulated screening scenarios, access to a mobile scanning unit in which to begin to interact with gantry controls and coils for positioning, and purchase of an online scanner interface to aid hand-eye co-ordination and begin understanding slice placement and parameter selection. Overall, feedback has shown that following training days using the techniques, trainees felt more confident and prepared to be able to actively participate back in the clinical environment. Whilst there were some barriers to all techniques, they were generally well received by trainees and thought to support their understanding and application in practice.
Summary: An overview of simulation approaches used will be given to demonstrate their application within a modality specific training programme. Feedback from trainees and facilitators will also be presented to show its acceptability and impact within training.

SHARING BEST PRACTICE

P176 An AlwaysEvent® in MRI

Darren Hudson; Carrie Monteith; Dale Gardiner; Danielle Blake
InHealth

Background: AlwaysEvents® were developed in the United States, and the methodology has been adopted by NHS England (NHSE). In contrast to a Never Event commonly referred to in incident management terms, the concept of an AlwaysEvent® is based around something that should always happen in relation to patient experience. At the heart of this approach are patients and the concepts of co-design and co-production to ensure their involvement throughout. As part of our endeavour to continually improve the experience of having an MRI scan for our patients, the organisation signed up to developing an AlwaysEvent® and piloted this at a hospital based site.
Purpose: To demonstrate an example of an AlwaysEvent® within medical imaging. The pilot has seen engagement with over 100 patients so far helping to better understand what matters, their emotional journey throughout, and what could be improved. The feedback has shown that a clear area for improvement was around the 'Warm Welcome'.
Summary: The ongoing AlwaysEvent® shows the potential for improvement based on what is important to patients locally. There are challenges with obtaining patient engagement within this environment, but this was achieved through differing approaches. A vision statement for the event, and the aims to support this, were created in the voice of the patient. Potential change ideas to achieve the improvement were generated and voted for by patients. The top five ideas were then developed and implemented with patients, and assessment for positive impact made against the intended aims.

P177 Close or Open MRI? - a focused management appointment journey for inpatients including the scanxious and corpulent from your ward to us

Apollo Exconde
InHealth Ltd - Croydon University Hospital

Background: Presently, examinations are requested online and the usual information are displayed with little to no data are given regarding mobility, metallic implants and mental capacity etc. Due to the increase of demand this may lead to subjects such as unpredictable/unexpected encounters. Thus, to address and identify potential problem that may arise and be a cause of further clinical and radiological investigation, cancellation or delay before giving an anticipated appointment, a scheme was created to ensure that both inpatients and MRI staffs are prepared physically and emotionally.
Method: A systematic approach of cross-examination for inpatients using a devised MRI pre-scan-questionnaire slip through telephone follow-up has been the norm to create a tailored, patient-centred approach from ward transition, choice of transport equipment, close or open MRI options from our three scanners, whereby then further categorised from either claustrophobic or their habitus grade and imaging protocol selection which depends on the clinical condition of the inpatient.
Conclusion: The content will be set a out of display of charts and plans annotated to explain the stream. Only a of meagre of 2.69% cancellation was recorded between November 2016 to October 2017 and an increase of 3.72% for the following year. A success rate of 96.82% was projected for the last two years, with questions and approach being re-evaluated to cope up with the demands of every patient and has been ultimately proven over time for a smooth patient cycle journey.

1. Solet, DJ et al (2005) Lost in translation: challenges-to-physician communication during patient hand-offs. Academic Medicine 80 1094-1099 2. The Joint Commission Center for Transforming Healthcare

P178 Spodylodiscitis - development of guidelines for equivocal MRI

Martin Mitchell; Mohammed Abdeen; Marion Mueller
Medway NHS Foundation Trust

Diagnosis of spondylodiscitis can be difficult: history and clinical symptoms are vague and non-specific, inflammatory markers may be normal and microbiology cultures negative. tissue biopsies may be problematic to obtain. mri remains the mainstay of diagnosis, however differentiation of acute infection and chronic modic Type 1 changes can be challenging. in this study we evaluated mri with potential discitis and compared these with the clinical notes. As a result clear mri indicators for infection were identified and we subsequently developed a management pathway for patients with equivocal imaging for sponylodiscitis.

Dunbar, J.A.T. Sandoe, J.A.T, Rao, A.S, Crimmins, D.W, Baig, W, Rankine, J.J (2010) The MRI appearances of early vertebral osteomyelitisand discitis. Clinical Radiology. **65** , 974-981
Pegrum, J. Altaf, F. (2014). Spondylodiscitis: The Usefulness of Inflammatory Markers and Biopsy. The Spine Journal. **14**, Issue 11, Supplement, Page S145

P179 MRI safety: Everyone's responsibility

James Shaw; Glenda Shaw; Jasen Whyte
Royal Cornwall Hospital Treliske

Following two incidents related to MRI safety, the Clinical Imaging MRI team at Royal Cornwall Hospital, decided to put an action plan together to improve MRI safety awareness throughout the hospital. Improved education was needed for all of our hospital

staff in order to reduce the risks to both patients and staff. This poster describes the changes that were made, how they were implemented, the resulting success of our service improvements and the shared learning that resulted.

P180 **The effect of a patient information leaflet on MRI scan outcome for patients suffering from claustrophobia or anxiety**

Elizabeth Ashburner
Fairfield General Hospital

Background: Anxiety or claustrophobia may be exacerbated by MRI scans leading to failed and cancelled scans, or poor quality images due to patient movement.
Aim: To look at information given to patients undergoing MRI scans and whether improving patient knowledge of what to expect during an MRI scan helps reduce feelings of claustrophobia and anxiety.
Method: Audit 1 (September 2017) included 475 patients who did not received any information prior to their appointment. Audit 2 (August 2018) included 495 patients who received a patient information leaflet with their appointment letter. Radiographers completed a questionnaire for patients who expressed anxiety or claustrophobia.
Results: 38/475 (8% Audit 1) and 36/495 (7.2% Audit 2) of patients expressed feelings of claustrophobia or anxiety and were included in the audit. Numbers of concerns expressed by patients generally reduced between audit 1 and 2:
Completed scans increased from 29/38 (76.3% Audit 1) to 33/36 (91.7% Audit 2). DNAs and cancellations decreased from 2/38 (5.2% Audit 1) to 0/36 (0% Audit 2). Patients who previously failed an MRI but had successful scans this time increased from 3/38 (7.89% Audit 1) to 33/36 (27.8% Audit 2). Completed scans without movement artefacts or the need to use blade/fast scans increased from 19/36 (50% Audit 1) to 28/38 (77.8% Audit 2).
Conclusion: Better informing patients prior to their scan using an information leaflet enables us to help and reassure people suffering from claustrophobia or anxiety, resulting in a positive outcome with a significant improvement in completion rate and scan quality.

P181 **Raising the profile of public health and prevention in radiography**

Laura Charlesworth
Sheffield Hallam University

Background: In November 2018, the Secretary of State for Health and Social Care released a new vision for public health[1], indicating that an increased focus on prevention will follow in 2019 with the publication of the NHS Long Term Plan and a Prevention Green Paper. With a national focus on prevention, we have the opportunity to further showcase the value and contribution of the Allied Health Professions (AHPs) to the public health and prevention agenda. Public Health England and associated arms length bodies continue to provide support to AHPs[2] and an abundance of supporting materials will be launched in 2019, including a new UK AHP Public Health strategic framework, a prevention focused service toolkit and a series of AHP public health leadership events. The Radiography profession is well placed to lead positive change in public health and prevention and can provide innovative solutions.
Purpose: This poster aims to:
1. Provide up to date policy context for AHPs related to public health and prevention
2. Apply the context to Radiography professions
3. Empower Radiography professionals to embed public health and prevention in their practice and influence for change
4. Present 3 rapid case study examples of Radiography innovation in public health and prevention (2 with research funding)
5. Provide examples for wider Radiography engagement in public health and prevention.
Summary: Explanation of the above aims will form the content for the poster (including case study examples).

1. Department of Health and Social Care. (2018) Prevention is better than cure: our vision to help you live well for longer
2. NHS England. (2017) AHPs into action: using Allied Health Professions to transform health, care and wellbeing. 2016/17 - 2020/21. London

P182 **A modesty garment for patients receiving radiotherapy treatment to the pelvis**

Candice Martin
Nova Healthcare & The Leeds Gamma Knife Centre

In recent years there have been positive steps to improve the dignity of patients receiving radiotherapy to the breast. Studies looking at the impact of the implementation of breast gowns to reduce exposure during radiotherapy treatment have all reported positive outcomes and many centres in the UK now use these gowns[1,2]. McLean and Hodgson[2] discussed the use of gowns for different treatment sites as being beneficial for the wellbeing of all radiotherapy patients as a recommendation of their study analysing patient perception around treatment gowns. Around 13,000 patients receive radiotherapy to the pelvis every year and there has been very little research or development regarding improvement of dignity for this patient group. The poster aims to look at the requirements and implementation of a garment to improve dignity for patients receiving radiotherapy to the pelvis.

1. Harris, Rachel et al. (1997) The use of a breast gown during radiotherapy by women with carcinoma of the breast. Radiography , Volume 3 , Issue 4 , 287 - 291
2. Hodgson, D. and McLean, M (2006) Cancer patients' perceptions of using a "breast gown': a qualitative study. Journal of Radiotherapy Practice, Vol 5, 97-107

P183 **Assessing the benefit of a patient history questionnaire in patients attending for whole body bone scan in nuclear medicine**

Lindsay Watkinson; Ruth Puddy; Karen Harrison; Lisa Matthews; Alison Speakman; Alison Brobyn
Warrington and Halton Hospitals NHS Foundation Trust

Background: Over the last few years it has come to our attention that when a patient is followed through from request to report by the same practitioner, there is a wealth of information available from the patient at the point of care. We wanted to harness this for all staff members, so that any clinically significant information was passed along the chain for those involved with diagnosis.

Purpose: A clinical history questionnaire was developed utilising existing patient history research, along with experience of useful information gathered. After cyclical trials, this was made established practice from March 2018. Both NM practitioners and reporters felt it was useful to have extra information than that provided by the referrer. There appears to be a 3-fold benefit to undertaking this questionnaire, with very little impact on the service, as the form takes approximately 2 minutes to complete for each patient, and can be done alongside the preliminary explanation of the examination:

1. Increased confidence in reporting pathologies on whole body bone scans
2. Reduced X-ray requirements for anatomical comparison, resulting in dose reduction
3. Better patient experience, because many scenarios no longer need patient clarification at the time of imaging, the history questionnaire already provides the answers in a pro-active way by asking at the start of the examination.

Summary: Improved patient and staff outcomes of whole body bone scans by embedding a practice of recording information that is freely given by the patients, with scope to extend to other scan types.

P184 **Preparing student radiographers for imaging patients with dementia: An exploratory study of the "what?" and the "how?" in higher education strategy**

Devon Benton [1]; Paul Miller [2]; Lisa Booth [2]
[1]Blackpool Victoria Hospital; [2]University of Cumbria

It has been well established across the spectrum of allied healthcare literature that newly qualified practitioners, fresh from university education, often feel unprepared for their early experiences of managing patients with dementia[1,2]. Moreover, this situation can have unfortunate knock-on effects regarding practitioner confidence. As Miller, Booth and Spacey observe[3], however, such literature rarely goes beyond proposing that 'more education' is the solution. Rarely unpacked is what content this education should contain at undergraduate level, and how it should be integrated into extant curricula in order to best benefit graduates in their future clinical work.

This exploratory study reports findings emergent of N=6 detailed interviews with final year Diagnostic Radiography students, at the time placed in a variety of hospitals in the North West of England. Employing an analytic model based in the Straussian model of Grounded Theory[4], four global issues were revealed:

- Education around the differentiated forms of dementia should be provided before any student encounters a pertinent patient on placement
- Direct education about best practice in communicating with patients with dementia is essential at the earliest possible stage
- Bringing in dementia carers and other affected parties can help contextualise potential problems in a non-abstract way
- The experiences of undergraduates on other healthcare programmes (particularly nursing) can help inform a student's-eye understanding of dementia in radiography.

It is contended that these findings can open up important pedagogical discussions around an issue that has hitherto remained largely unarticulated in contemporary radiography curricula.

1. Baillie, L., Cox, J. and Merritt, J. (2012) 'Caring for older people with dementia in hospital Part one: challenges', Nursing Older People, 24(8), pp. 33-37
2. Baillie, L., Merritt, J. and Cox, J. (2012) 'Caring for older people with dementia in hospital. Part two: strategies', Nursing Older People, 24(9), pp. 22-26
3. Miller, P.K., Booth, L. and Spacey, A. (2017) 'Dementia and clinical interaction in frontline radiography: Mapping the practical experiences of junior clinicians in the UK', Dementia, in press
4. Sloane, C. and Miller, P.K. (2017) 'Informing radiography curriculum development: The views of UK radiology service managers concerning the 'fitness for purpose' of recent diagnostic radiography graduates', Radiography, 23(S1), pp. S16-S22

P185 **Fear of cancer recurrence: The role of the therapy radiographer in addressing and alleviating patient concerns**

Josie Cameron [1]; Yuan Yang [1]; Gerald Humphris [2]
[1]Nanfang Hospital, Guangzhou, Guangdong, China; [2]School of Medicine, St Andrews University

Background: Patients with breast cancer may experience distress in the form of fears of cancer recurrence (FCR) during their treatment[1]. Moderate to severe FCR is reported in 30 to 70% of patients[2]. These levels of FCR can have negative consequences including depression, insomnia, reduced quality of life and increased health service demands[3]. There are few studies in the literature which focus on how patient concerns are managed during treatment therefore this study provides valuable insight to this area.

Methods: Breast cancer patients (n = 94) attending for radiotherapy treatment had their first two review clinic appointments with their therapy radiographer (TR) audio-recorded. In addition, FCR was assessed (FCR7) at baseline, weekly and at 6-8 weeks following their final radiotherapy visit.
Results: Patients' who were younger, separated, had undergone chemotherapy, Herceptin and had 4-field radiotherapy plus a boost reported higher recurrence fears at baseline. Most women experienced a decline in fear during and after RT. Listening to FCR concerns at the review clinic appointments may be crucial to reducing the process of FCR development post treatment.
Future Developments A phase 2 study is in progress utilising a co-design process with therapy radiographers, previous patients and an external stakeholder group to develop a communication skills training package to assist therapy radiographers undertaking review consultations address FCR concerns. The acceptability and feasibility of the training package will be evaluated and if found to be effective will be available to healthcare staff involved in cancer treatment via Breast Cancer Now who supported both studies.

1. Dunn LB, Langford DJ, Paul SM, Berman MB, Shumay DM, Kober K, et al (2015) Trajectories of fear of recurrence in women with breast cancer. Support Care Cancer. 23:2033-43
2. Simard S, Thewes B, Humphris G, Dixon M, Hayden C, Mireskandari S, et al (2013) Fear of cancer recurrence in adult cancer survivors: a systematic review of quantitative studies. J Cancer Survivors 7:300-22
3. Lebel S, Tomei C, Feldstain A, Beattie S, McCallum M (2013) Does fear of cancer recurrence predict cancer survivors' health care use? Support Care Cancer.21:901-6

P186 Values based practice in radiography

Ann Newton-Hughes [1]; *Ruth Strudwick* [2]
[1]University of Salford; [2]University of Suffolk

Background: This work presents the findings of a CoRIPS funded study. Radiography practice is changing with an increased demand for services, a need to reduce waiting times, and technological developments. While these influence our service the patient remains at the centre of our practice. This study investigated the values of patients in their radiographic examinations and radiotherapy treatments. The study also identified any similarities or mismatches in the understanding of radiographers and radiology managers in relation to their values and that of patients.
Method: Focus groups were conducted with patients who had experience of imaging and radiotherapy treatment. Patients were given an explanation of the concept and their values were sought. A similar process was employed with diagnostic radiographers. Radiology managers were asked for their values via telephone interview or email. The audio recorded data were transcribed and thematic analysis was used.
Results: Results revealed that patients expressed similar values irrespective of their pathway (diagnosis or treatment) however a stark difference in experience between diagnostic and therapy encounters was noted. Radiographers' values were somewhat different from those of patients with an emphasis on speed and efficiency not expressed by patients. Similarly, managers expressed different values to that of patients.
Conclusion: While the concept of Values Based Practice and recruitment is widely acknowledged little is known of what radiology patients value in their imaging or treatment. This small study has gone some way to address this deficit and identified ways of providing values based care in the current clinical environment.

P187 Paws for thought..?

Jennifer Thompson
Nottingham University Hospitals

In the UK there are 700,000 adults and children approximately who are autistic[1]. The National Autistic Society has a helpful set of guidance for healthcare professionals. Each autistic person will have certain difficulties but it affects each person individually. The Society of Radiographers (SCoR) has general advice for diagnostic radiographers regarding how to meet the needs of autistic patients[2]. As a therapy radiographer this has been helpful in meeting the needs of a patient with Asperger's syndrome. It would be helpful to have advice for therapy radiographers as in most cases we may treat them for more than one day. Within this poster it will discuss a case study of a breast cancer patient with Asperger's Syndrome and her experience of radiotherapy in our department. As a Radiotherapy Advanced Practitioner this was a challenging case due to lack of awareness and knowledge.
The purpose of the poster is to teach other professionals on how to meet the needs of autistic patients on radiotherapy treatment. The poster will include background on autism, brief outline of the patient's diagnosis. What obstacles we faced in meeting the patients' needs: on treatment reviews, communication and how we dealt with them. It will include photographs to help illustrate this. Whilst on her treatment I built a rapport with her with the help of a squashy. The poster will outline what I have learnt and do differently in the future and how this has changed my practice including introducing squashy's to anxious patients.

1. National Autistic Society. (n.d.) Autism guidance for health professionals
2. Barker, P. (2019) Adults with Autism Spectrum Disorder (ASD): A guide for radiography staff. Society of Radiographers

P188 **A critical review exploring religion, culture and other barriers to breast and cervical cancer screening uptake in BME women in the UK**

Janet Olowookere; Kerrie-Anne Calder
The University of Liverpool

Aim: To determine the barriers which cause disparities in cancer screening uptake amongst women of BME groups.
Methods: A search strategy was developed and key databases were searched to identify primary research studies (published in the last 15 years) that investigated the uptake of breast and cervical cancer screening in Black and minority ethnic '(BME) group women living in the UK.
Results: The barriers to screening uptake in BME women were found to be religion, culture, lack of knowledge, fear and embarrassment. Quantitative research displayed that screening attendance is lower in areas densely populated by BME groups and is associated with increased mortality in some instances. The barriers identified impacted differently on BME women depending on their culture and religion. Future steps to improve participation include providing pre- and post screening counselling, providing education or training for health care practitioners in cultural and religious beliefs and customs as well as utilising religious and social settings to promote screening.
Conclusion and discussion: The majority of the studies were conducted on a very small scale which limits the generalisability. Some studies were conducted with BME and white British women which made barriers affecting BME women alone more distinguishable and highlights barriers which is common across all women. Religion, culture, lack of knowledge, fear and embarrassment are factors which impact on a BME woman's' likelihood to attend screening. These barriers impact differently depending on the individual. Improvements suggested include utilising religious leaders and the media to increase BME women's participation in breast and and cervical cancer screening.

1. Bambidele O, Ali N, Papadopoulos C, Randhawa G. (2017). Exploring factors contributing to low uptake of the NHS Breast Cancer Screening Programme among Black African women in the UK. Diversity and Equality in Health and Care. Aug 1
2. Eilbert K, Carroll K, Peach J, Khatoon S, Basnett I, McCulloch N. (2009) Approaches to improving breast screening uptake: evidence and experience from Tower Hamlets. British Journal of Cancer. V101(S2):S64MS67
3. Marlow LA, Waller J, Wardle J. (2015) Barriers to cervical cancer screening among ethnic minority women: a qualitative study. J Fam Plann Reprod Health Care
4. Thomas VN, Saleem T, Abraham R. (2005). Barriers to effective uptake of cancer screening among Black and minority ethnic groups. International journal of palliative nursing

P189 **CT adaptation techniques used at Queen's Hospital for patients who are unable to positioning themselves when scanning upper extremities**

Wan Lam Foo
BHR Univ. Hospitals NHS Trust

At Queen's Hospital, sometimes we have patients who are unable to positioning themselves properly when having CT scan for upper extremities. This poster demonstrates how we apply CT adaptation techniques to patients who are unable to positioning themselves. The upper extremities include hand, wrist, radius and ulna, elbow and humerus. We very often have obese patients who are unable to positioning themselves properly on the scan table or patients who are unable to raise their arms above their heads when scanning upper extremities. Therefore, instead of having laid down on the table we would have patients sitting on the other side of the scanner.
This method not only has resolved the problems mentioned above, it has in addition also improved the image quality. The most important is patients have less stress and more comfy during the CT scan.

1. Mamourian, A.C. (2013) CT Imaging: practical physics, artifacts, and pitfalls. Oxford Univ. Press.

P190 **Appropriateness of requests for CT aorta to rule out acute aortic syndrome (AAS)**

Priya Agarwal; Suraj Amonkar
Northern Care Alliance

Background: Acute aortic syndrome (AAS) encompasses multiple emergency aortic pathology including aortic dissection, having a pre-hospital mortality of 20% and in-hospital mortality of 30%. Therefore, clinicians are expected to have high index of suspicion in ruling out AAS. Ionising Radiation Medical Exposure Regulations state all imaging modalities must be justified. We have seen increased CT scan requests but suspect few show confirmed cases of AAS, although no statistics substantiate this. We aimed to assess justification of CT scans and prevalence of AAS.
Method: We retrospectively studied 247 patients who underwent CT aorta scans within emergency departments across our hospital trust in 2017. Using CRIS, we accessed request cards and reports to calculate pre-test likelihood of AAS using European Society of Cardiology (2014)/British Society of Cardiovascular CT (2016) guidelines.
Results: 26 (10.5%) patients had confirmed AAS. Request cards were insufficiently completed with documentation of symptoms, examination findings, and comorbidities in 93.9%, 64.0% and 44.9% patients respectively. Retrospectively calculating, 22 (8.9%) patients were high risk AAS and would have justified a CT scan, of which 3 were confirmed AAS. The remaining 23 patients with AAS were deemed low and intermediate risk, yet had significant pathology.
Conclusion: Although 91.9% patients were deemed low and intermediate risk of AAS, strict adherence to guidelines (hence no scan) would have missed 23 cases of AAS. Justification of scan relies on good clinical information provided by referrers more

than actual scoring. We urge emergency departments to assess risk of AAS and supply requests with adequate clinical information.

1. Erbel, R. and Aboyans, V. et al. 2014 ESC guidelines on the diagnosis and treatment of aortic diseases. European Heart Journal (2014), 35: 2873-2926
2. Vardhanabhuti, V. and Nicol, E. Recommendations for accurate CT diagnosis of suspected acute aortic syndrome (AAS)- on behalf of British Society of Cardiovascular Imaging (BCSI)/ British Society of Cardiovascular CT (BSCCT). British Journal of Radiology (2016) 86 (1061): 20150705
3. The ionising radiation (medical exposure) regulations (2017)

P191 A review of HSC205 CT referrals in a single tertiary centre

Yee Mei Koay; Sathi Sukumar
Manchester University Foundation Trust

Background: Health Service Circular 205 (HSC205) is the urgent suspected cancer pathway, whereby referrals are given priority to meet management timescale for oncology patients. Cases that meet criteria include cases of new suspicion of cancer and first staging of cancer patients. It is important that requests made under the pathway are appropriate, to meet scanning targets. Our initial audit found 9.5% of all HSC205 referrals in a month to be unjustified. We re-audited to complete the audit cycle.
Method: We retrospectively identified all patients who had a CT scan requested under the HSC205 pathway on the CRIS system in a one month period. Patient details were obtained from PACS and Sunrise ICE system, and entered onto a database. The clinical request information was then reviewed and vetted.
Results: A total of 359 CT requests were made under the HSC205 pathway in one month. The average time from request to scan performed was 8 days. 9.5% of CT requests were incorrectly requested under HSC205. The referring specialties were divided into chest, gastrointestinal, genitourinary, breast, head and neck and others. Incorrect requests include pre-operative and pre-treatment interval scans and follow-up scans.
Conclusion: Our re-audit cycle demonstrated similar percentage of inappropriate CT requests to the previous cycle, although there has been an overall increase in CT requests. Some HSC205 requests may have been correctly requested, but were deemed unjustified due to insufficient written clinical information. Increased awareness of the HSC205 criteria will minimise inappropriate referrals and meet scanning targets.

P192 Is the standardisation of CT protocols best? An overview of the potential effect of standardisation of CT protocols across the UK

Laura Shell
UHB (HGS)

The main purpose of the study is to investigate how standardising CT (Computerised Tomography) protocols will impact current methods that are used in the UK and if this is best practice. Many hospitals use different protocols to scan patients regardless of pathology and/or anatomy. However, there are various factors to be looked at to determine whether this is viable, the main one being whether this will reduce the risk to the patient by reducing the incidences of recalls due to missing pathology as well as reducing radiation dose. Also, the benefit to hospitals by improving efficiency and reducing the risk of litigation. This could lead to better patient-centred care and, with radiology resources being limited, may improve efficiency and throughput of patients. The conclusions of the 16th COMARE report issued in 2014 alluded to trying to accomplish this however there may not have been as much progression as hoped.

1. Arthurs O.J, van Rijn R.R and Sebire N.J. Current Status of paediatric post-mortem imaging: an ESPR questionnaire-based survey. 2014
2. Beets-Tan R.G.H, Lambregts D.M.J, Maas M, et al. Magnetic Resonance Imaging for clinical management of rectal cancer patients: recommendations from the 2012 European Society of Gastrointestinal and Abdominal Radiology (ESGAR) consensus meeting. 2013
3. Boland A, Cherry M.A and Dickson R. Doing a Systemic Review: A Student's Guide. 2017
4. Brookes-Fazakerley S.D, Shyam Kumar A.J and Oakley J. Survey of the initial management and imaging protocols for occult scaphoid fractures in UK hospitals. 2009
5. Fiebach J.B, Schellinger P.D, Geletneky K, et al. MRI in acute subarachnoid haemorrhage; findings with a standardised stroke protocol. 2004
6. Gauss, Tobias, Balandraud, Paul, Frandon, Julien, et al. Strategic proposal for a national trauma system in France. 2018
7. Haldorsen I.S, Husby J.A, Werner H.M.J, et al. Standard 1.5T MRI of endometrial carcinomas: modest agreement between radiologists. 2012
8. Harm A.W.M Tiddens, Wieying Kuo, Marcel van Straten, Pierluigi Ciet. Paediatric lung imaging: the times they are a-changin'. 2018
9. Malik A.K, Shetty A A, Targett C, Compson J.P. Scaphoid views: a need for standardisation. 2004
10. Neri E, Brady A.P, Gibaud B, Visser J.J, Nahum Goldberg S and Pyatigorskaya N. ESR paper on structured reporting in radiology. 2018
11. Sampson, M. A., Colquhoun, K. B. M. and Hennessy, N. L. M. Computed tomography whole body imaging in multi-trauma: 7 years' experience 2006
12. Watson S.G, Calder A.D, Offiah A.C and Negus S. A review of imaging protocols for suspected skeletal dysplasia and a proposal for standardisation

P193 CT colonography - the other side: A patient perspective of bowel preparation and low residue diet

Michael Smith
University Hospital of North Midlands

CT colonography (CTC) bowel preparation with low residue diet, faecal tagging and laxative varies considerably between different hospitals throughout the UK. Having had a personal experience of this examination and the bowel preparation regime adopted by our hospital, this has allowed me to view our regime and patient instructions from a different perspective. This has led to a number of changes in the way we not only prepare our patients but the instructions we give them, both before, during and after the examination. Our previous regime involved a combination of low residue diet 2 days prior to the examination date

followed by a split dose of 100mls of Gastrografin faecal tagging 1 day prior to the examination. The information provided to the patient details the low residue diet and instructs the patient on when and how to administer Gastrografin.
I found the information to be extremely confusing to follow prior to the exam and my experience following CTC was not as I had previously described for many of our patients. In addition, I was not aware of the importance of following the low residue diet regime strictly. The poster will describe my experiences, the previous regime and detail the changes made, including addition of low residue diet menus on the hospital internet site.

1. Connor, A., Tolan, D., Hughes, S., Carr, N. and Tomson, C., 2012. Consensus guidelines for the safe prescription and administration of oral bowel-cleansing agents. Gut, 61(11), pp.1525-1532
2. Ghanouni, A., Smith, S.G., Halligan, S., Taylor, S.A., Plumb, A., Boone, D. and von Wagner, C., 2013. An interview study analysing patients' experiences and perceptions of non-laxative or full-laxative preparation with faecal tagging prior to CT colonography. Clinical radiology, 68(5), pp.472-478
3. Wu, K.L., Rayner, C.K., Chuah, S.K., Chiu, K.W., Lu, C.C. and Chiu, Y.C., 2011. Impact of low-residue diet on bowel preparation for colonoscopy. Diseases of the colon & rectum, 54(1), pp.107-112

SERVICE DELIVERY AND OPTIMISATION

P194 Improvement of Raystation volumetric modulated arc therapy (VMAT) delivery quality assurance (DQA) results through plan complexity reduction and beam model fine-tuning

Elizabeth Harron; Angela McKenna; Alexander Taylor; Jonathan Sutton; Anna Trezza; Jonathan Littler
Nottingham University Hospitals NHS Trust

Background: Accurate modelling of the radiotherapy beam by the treatment planning system is essential for reliable delivery of VMAT. We recently purchased Raystation, which requires the department to produce their own beam model. Open field agreement was good but VMAT DQA results were initially poor and results varied between linacs by up to 6%. We will present our process for improving the DQA results.
Method: Test plans were created for 6 challenging cases each of bilateral head & neck and prostate & nodes. DQA was performed with the Delta4 and an ion chamber. A script was written to measure the modulation complexity score (MCS)[1] of the test plans. Plans were re-optimised with a limit applied to the monitor units, which resulted in reduced complexity, but a clinically acceptable dose distribution. The new plans' DQA showed the Delta4 results were better than the ion chamber. The beam model parameters of transmission, tongue and groove width and leaf tip were then adjusted iteratively to get good agreement with both DQA methods.
Results: By reducing the plan complexity and adjusting the model, Delta4 pass rates increased by a mean of 6% (local gamma 2%/2mm) and the absolute dose agreement improved so that all linacs now deliver dose within 2% of the expected value.
Conclusion: Calculating MCS helped us to identify particularly complex beams. We have improved DQA results for beam modelling through improving plan simplicity and iteratively adjusting beam parameters so that we can be confident that plans will pass DQA.

1. Masi, Doro et al (2013) Impact of plan parameters on the dosimetric accuracy of volumetric modulated arc therapy Med. Phys. 40 (7)

P195 Keeping our patients safe 24/7 - does shift-work in Radiology have an impact on safety? A literature review

Jason Elliott
Cardiff University

Background: UK Radiology departments are under pressure to reduce waiting times whilst providing 24-hour cover for emergency imaging of patients. Departments often utilise a mixed pattern of days and nights, with prevalence of extended days and fast rotating shifts. This increases the risk of Shift Work Disorder (SWD), which has been shown to have an impact on performance; therefore raising the prevalence of error - a key concern when working in radiology for patient outcome.
Method: A review of the available literature was planned and executed to investigate the risk of error in out-of-hours work, and the subsequent impact on imaging departments. Narrative synthesis was used to describe the heterogeneous findings of the studies appraised.
Results: No radiography-based research was identified, so the search field was expanded to all shift-based healthcare professionals; and the potential impact would be discussed. Four of the five studies selected after critical appraisal suggested a positive correlation of error with increased mental and physical fatigue as a result of shift work or rapid shift rotation. It can be suggested as a result that radiology departments may be at a greater risk of IR(ME)R incidents due to staff fatigue.
Conclusion: Considerations need to be made when optimising shift work for healthcare professionals as to avoid Shift Work Disorder and consequential error; particularly in the context of ionising radiation. Research into environmental and lifestyle support should be pursued to study its effect as prevention or management. Further direct study on radiographers is recommended.

P196 Increasing the radiotherapy research profile of individual cancer centres - rising to the CRUK challenge

Samantha Cox; Russell Banner; Jayne Caparros; Douglas Etheridge; Stuart Foyle; Les Hammond; Emily Harris; Elizabeth Hawkes; Richard Hugtenburg; Jemma Hughes; Ryan Lewis; Maureen Noonan; Gillian Palmer; Ceri Powell; Adam Selby; Roger Taylor; James Williams; Sarah Gwynne

South West Wales Cancer Centre

Background: CRUK has highlighted that individual cancer centres need to participate in research and clinical trials to develop a world-class radiotherapy (RT) service and improve patient care (The Tavistock Institute, 2014). In 2017, our cancer centre established a RT Research Strategy Board tasked with increasing both clinical and academic RT-related research and innovation over the next 5 years.
Purpose: To demonstrate that it is possible to encourage an environment for clinical and academic research and innovation in smaller cancer centres; to provide information on how others can introduce a similar programme in their department.
Summary: The strategy was launched at the first RT-research showcase day in 2017 with over 20 speakers presenting recent projects. A multidisciplinary RT Research Working Group of clinicians, physicists and staff from RT, management and R&D departments was established to create an environment to encourage and support both novel research and participation in clinical trials. In the last 12 months we have implemented an annual RT showcase day; appointed the first RT clinical fellow with funding secured for a further two 1-year posts; provided structured clinical supervision for physics MSc students; introduced monthly educational meetings with local/regional speakers; created a live database detailing projects which have been published or presented at conference. Priorities for the future include promoting collaborations with industry partners and our affiliated university. Recruitment to academic posts, dedicated research time in clinical job plans, and treatment machine capacity for research are planned.

The Tavistock Institute. (2014). Recommendations for achieving a world-class radiotherapy service in the UK.

P197 Increasing recruitment to research studies by strategic support, engagement and diversification of the research portfolio to support service department delivery

Maria Maguire; Sheena Khanduri
The Clatterbridge Cancer Centre NHS Foundation Trust

Background: The Trust has long been recognised for its strength in depth in the delivery of complex systemic anti-cancer therapeutic clinical trials. However, this resulted in reduced numbers of participants recruited to research, pressures within research facing staff in service departments and decreased accessibility to research across the Trust for our patients. We identified huge opportunity as we developed a new research strategy to not only make every patients' experience count, but to enable and empower staff to undertake their own research and to diversify the portfolio so that we could support real world qualitative studies, translational research and studies led by our skilled staff in all departments.
Implementation: To enable our aims we:
1. Horizon scanned and strategically selected new studies that reflected patients' quality of life needs, real world studies following on from trials of novel agents, studies using staff expertise such as MRI Imaging studies for example, MROC
2. Implemented system change, working with partner Trusts to streamline process and supplying our expertise in return
3. Provided PA time for all staff from clinicians to AHPs to free up time for research
4. Invested in new posts that focused on recruitment to non-interventional studies
5. Invested in infrastructure so that service departments could manage and support research studies
6. Invested in training of clinical fellows.

Outcome:

- Re-energised staff focused on research
- Highest ever recruitment to both NIHR portfolio and non-portfolio studies
- Increased partnership working across Trusts
- Increased patient benefit, care and wellbeing.

P198 Validation of the electron Monte Carlo (eMC) algorithm in Eclipse 13.6

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Background: The eMC 13.6.23 algorithm in Eclipse was commissioned and evaluated to replace the manual calculation of MU for electron treatments on a TrueBeam linac.

Method: Beam models at various energies were built using the Varian representative data for TrueBeam linacs. A block of water was simulated in Eclipse and used to compare to measurements taken in a water tank. 20 patients, previously treated with manually calculated MU, were re-planned using eMC and the calculated monitor units compared. End-to-end tests were performed to test situations with significant curvature, e.g. the wax dome shown in figure 1, or inhomogeneity. In-vivo skin surface measurements are performed at first fraction of treatment using TLDs according to local standard protocol. A retrospective audit of these measurements was performed.

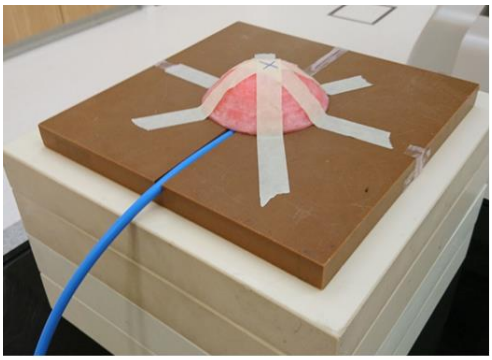


Figure 1 - Wax dome setup with Roos chamber for end-to-end test of curvature.

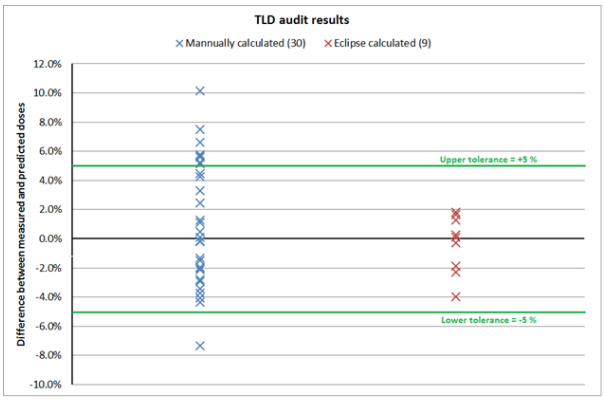


Figure 1 - TLD audit results showing the difference between measured and predicted doses.

Results:
Commissioning results compared to measurements in a water tank were satisfactory. The average difference between eMC and the manually calculated MU for the previously treated patients was 6.2% with a maximum deviation of 14.7%, hence the need for the end-to-end tests. Eclipse calculated doses matched Roos measurements underneath the wax dome to ≤±2.0% and TLD measurements to ≤±0.7%. The results of the TLD audit are shown in figure 2. All measurements so far are within the local tolerance level of ±5%.

Conclusion: All tests performed to validate the eMC beam model had satisfactory results, including in non-standard conditions. Some patient's eMC calculated MUs are significantly different to previous manual calculations. Patients planned using eMC in Eclipse have shown good agreement with skin dose TLD measurements.

P199 **Utilising a multi-disciplinary work force to optimise efficiency in delivering a palliative radiotherapy service: The Northampton experience**

Kashif Jarral [1]; Anu Gore [1]; Michael Graveling [2]
[1]University Hospitals Leicester; [2]Northampton General Hospital

Introduction: Palliative radiotherapy is an intervention for symptom control in patients with advanced cancer, when indicated the rapid delivery of treatment is warranted. The 2017 RCR workforce census has highlighted challenges in maintaining sufficient numbers of clinical oncologists who lead radiotherapy services. Those currently working have multiple commitments, making availability for palliative radiotherapy planning difficult. In response, skills mix initiatives have been developed to support delivery of this treatment modality. Therapeutic radiographers are experienced in delivering radiotherapy and their specific training in palliative planning can increase work force capacity to deliver timely treatment.
Methods: We collected data from the Radiotherapy Department at Northampton General Hospital for all palliative radiotherapy prescribed by radiographers over a 6-month period, from July to December 2016. Radiographers were trained as part of a departmental initiative to independently plan and prescribe palliative radiotherapy without direct Clinical Oncologist supervision.
Results: 92 patients were treated with palliative radiotherapy planned by radiographers during the 6 months period. Treatment sites included bone metastases (54), whole brain radiotherapy (22) and malignant spinal cord compression (16). The median time taken from planning CT scan to first treatment was 1 day, with a range of 0 to 7 days.
Conclusions: The average time from planning CT to treatment was one day, with many patients treated the same day. This suggests access to palliative treatment for cancer patients can be improved with skills mix initiatives to support rapid delivery of radiotherapy and improve overall patient experience and quality of life.

2017 Clinical Oncology Workforce Census Report, BFCO(18)1, June 2018, www.rcr.ac.uk

P200 **Comparison of inter-and intra-observer variability in image registration using cone-beam CT and MRI for cervix radiotherapy**

Rosie Hales; John Rodgers; Lisa McDaid; Louise McHugh; Jacqui Parker; Lee Whiteside; Robert Chuter; Anthea Cree; Cynthia Eccles
The Christie NHS Foundation Trust

Background: Despite known advantages of soft tissue visualisation in MRI over CT, image registration accuracy in MR-guided radiotherapy workflows remains a source of uncertainty. Accurate soft tissue registration is fundamental in adopting an

adaptive radiotherapy workflow on the Elekta Unity MR-linac. This work quantifies inter- and intra-observer agreements in an MR-to-CT registration workflow compared to CBCT-to-CT.
Methods: Soft tissue image registration was undertaken by five therapeutic radiographers for cervical cancer patients undergoing radiotherapy on an ethics-approved imaging study. CBCTs and on-treatment MRI sequences were registered to the planning CT in Monaco (v5.19.05 Research, Elekta, Stockholm, Sweden) for optimal target soft tissue matching. Resulting translations, matching confidence and perceived image quality were recorded for inter-observer comparisons. To assess intra-observer variation, repeat registration was undertaken on three patients by each observer.
Results: Three CBCTs, T2w and mDIXONw sequences were matched to planning CT for ten cervical cancer patients. Mean displacements for all observers and difference from the mean for each registration were calculated. Intra-observer variation was calculated from two observations on three datasets. There was negligible inter-observer variation for all modalities used. Intra-observer variability was greater than inter-observer in longitudinal and vertical planes. Image quality and confidence were higher for MR than CBCT. Whilst all observers considered MR images superior in quality and matched with higher confidence, inter-observer variation was consistent regardless of modality.
Conclusion: Inter-observer variability for MR-to-CT is similar to CBCT-to-CT workflow. As familiarisation and experience with MRI increases, accuracy and agreement between therapeutic radiographers registration is expected to increase.

P201 **Independent MU check for halcyon using RadCalc**

Ahmed Ifthaker; Vasu Ganesan; Dom Withers; Ghirmay Kidane; Liz Crees
Barking, Havering and Redbridge University Hospitals NHS

Background: The aim of the study was to commission Radclac as independent MU check for Halcyon treatment plans. Independent MU check software has been in use for several years in radiotherapy to verify the MUs from a treatment planning system. Since October 2017, our department has installed two Halcyon linacs, used only for IMRT and VMAT. Initially, patient specific QA was performed for all patients as no independent commercial MU check software was available. A version of RadCalc released in early 2018 had Halcyon compatibility, and our department commissioned and validated its use as an independent MU check system for Halcyon treatments.
Method: Halcyon (Varian Inc., Palo Alto, CA, USA) is a new linac platform that has only 6MV FFF and double-stack MLC, with no jaws. The MLC leaves project 1cm thick at iso-centre, with, the distal leaves off-set by 0.5cm to the proximal leaves, thereby producing a 0.5cm aperture resolution. Halcyon is only capable of delivering sequenced fields i.e. IMRT, VMAT, merged field-in-field, surface compensator or flattened-sequence plans. Treatment plans were generated using Eclipse V15.6 (Varian Inc., Palo Alto, CA, USA). Radcalc V6.3 (Lifeline software, USA) was commissioned for MU determination of IMRT and VMAT treatment fields.
Results: The preliminary results give a good agreement between MUs calculated in RadCalc and those calculated in Eclipse. Mean differences were in the range 0.2-2.5% depending on the site and delivery technique.
Conclusion: RadCalc can be used to perform independent MU check on plans produced for Halcyon treatment plans.

1. Halcyon Physics User's Manual V2.0 2. RadCalc Users Manual V6.3

P202 **Penile rehabilitation for prostate cancer patients undergoing radiotherapy and androgen deprivation therapy**

Wes Doherty [1]; Pete Bridge [2]
[1]The Christie NHS Foundation Trust; [2]University of Liverpool

Background: Treatment-induced erectile dysfunction (ED) is a common side-effect of radiotherapy and androgen deprivation therapy (ADT) that impacts on patient quality of life. (Howlett, 2010) Penile rehabilitation interventions including both pharmacological and physical therapies aim to reduce the impact of ED. Despite NICE (2014) guidelines recommending access to ED services, penile rehabilitation is not widely discussed or implemented. This systematic review aimed to appraise the evidence base for penile rehabilitation and identify evidence-based recommendations for practice.
Methods: A systematic review of the evidence base was undertaken using the PRISMA guidelines. The SCOPUS and Medline databases were searched for papers relevant to penile rehabilitation interventions for prostate radiotherapy patients. Study quality was graded using the Oxford Levels of Evidence and the Scottish Intercollegiate Guidelines Network.
Results: Nineteen papers related to penile rehabilitation in prostate radiotherapy patients. Despite the range of available physical and pharmaceutical interventions, relevant research focussed solely on the use of phosphodiesterase type 5 (PDE5) inhibitors. Findings confirmed the value of early PDE5 inhibitor intervention with a need for ongoing prophylactic use during ADT. The evidence mostly comprised quantitative data of low quality. A qualitative approach to this issue would help inform development of personalised penile rehabilitation programmes appropriate for individual patient needs.
Conclusion: Future research into the impact of the full range of penile rehabilitation interventions will ensure patients have access to those therapies that are most appropriate for them. A paradigm shift towards qualitative research in this field may be of more value than reductive quantitative studies.

1. Howlett K, Koetters T, Edrington J, West C, Paul S, Lee K, et al., editors. Changes in sexual function on mood and quality of life in patients undergoing radiation therapy for prostate cancer. Oncology nursing forum; 2010
2. NICE. Prostate cancer: diagnosis and management 2014

P203 **MR only radiotherapy for prostate cancer: First UK clinical implementation**

Jonathan J Wyatt; Rachel A Pearson; John A Frew; Serena C West; Michele Wilkinson; Karen Pilling; Rachel Brooks; Christopher Walker; Hazel M McCallum
Newcastle upon Tyne Hospitals NHS Foundation Trust

Background: MR only radiotherapy provides the superior soft-tissue contrast of MR for delineation without the MR-CT registration uncertainty, as well as improved patient experience and departmental efficiency. However, MR only radiotherapy requires a synthetic CT (sCT) for dose calculations. sCT algorithms are now commercially available. This study aimed to pilot clinical implementation of MR only radiotherapy for prostate cancer.
Method: Five patients will receive a planning MR scan with a radiotherapy couch top and immobilisation. The patients will be set-up using in-house developed skin markers and lasers. Two MR sequences will be acquired: a small Field Of View (FOV) image for target delineation and a large FOV image for healthy organ delineation, sCT generation and on-treatment verification. A CT scan will also be acquired for quality assurance. The sCT will be generated using MriPlanner (Spectronic Medical, Sweden). The treatment volumes will be copied to the sCT and a VMAT plan created. The plan will be recalculated on the CT and dose differences determined. For on-treatment verification the CBCT will be matched to the large FOV MR. Offline this match will be compared to a CBCT-CT match.
Results: The first patient has been treated; their large FOV MR image with skin markers and the online CBCT-MR match is shown. The sCT with dose distribution and dose difference map is recorded. The target dose differences were 0.5%. The mean couch shift difference to CT was 0.8 mm.
Conclusion: MR only planning has been successfully clinically implemented for one patient.

P204 **ACU radiology champions**

Hayley Connoley; Tanuj Lad
Hampshire Hospitals NHS Trust

A great example of collaborative working between HHFT radiology and ACU at Hampshire Hospitals NHS Trust where significant improvements were recorded in ACU patient access and turnaround times into radiology. Better coordination, staff awareness

ACU Radiology Champions

Hampshire Hospitals NHS Foundation Trust

Optimising access and turnaround times for ACU patients and improving morale and communication for all ACU and BNHH radiology staff

Hayley Connoley, Radiology Performance Manager, Zoe Crawley, CT superintendent, Violet Chabooka Sonographer, Lyanne Court MR radiographer, Charles Hungwe SHO Acute medicine, Kayleigh Balchin SHO AAU, James Austin SHO Acute medicine, Dr Tanuj Lad, Consultant Acute Medicine and Critical care.
Author: Hayley Connoley, Tanuj Lad

Problem:

- Lack of understanding of service provision, requirements, and challenges between ACU and BNHH radiology
- Delays to patient pathways due to disjointed requesting, appointing and image acquisition

Aim:

- To improve communication between ACU and Radiology
- To improve requesting and booking process
- To reduce waiting times into CT, US, MR for all ACU patients
- To improve turnaround times from point of request to image acquisition for all ACU requests into CT, US and MR
- To improve staff morale
- To build a culture of Trust and innovation
- For staff to understand and benefit from collaborative working

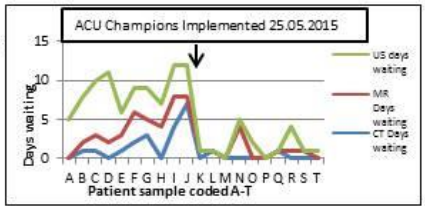
Methodology:

- Presentation to the radiology department on ACU services, care and benefits to patient pathways
- ACU Radiology champions identified to promote & link Radiology with ACU
- A communication strategy developed
- Twitter utilised to promote #ACUradiology strategy

- Access routes into imaging and methods to achieve agreed
- Experienced radiographer (ACU champions) facilitated discussions with Consultant Radiologists and wider teams

Data:

- A sample of data pre and post project launch was taken and reviewed- 20 consecutive patients were audited. 10 pre project launch and 10 post project launch in each modality.



- The variance in days waited pre project was much higher than post project.
- Improvements noted within days of project from patient feedback via Twitter.

ACU Survey question	Yes	No	Total
Faster access to imaging	9	0	9
Better coordination of imaging with ACU clinic times	9	0	9
Quicker clinical decision making	9	0	9

Radiology Survey question	Yes	No	Total
Aware of ACU champions	20	0	20
More authority to fast track patients to imaging	16	4	20
Fewer phone calls chasing patients to imaging	14	6	20

- Radiology noted a significant decrease in the number of phone calls received
- 100% of ACU staff noted improvement into access, better coordination of imaging with ACU clinical times and quicker decision making
- Minimal wasted CT slots
- These changes supported Spring/Summer action in '18/19'

Next steps:

- Increase the number of ACU radiology champions
- Meet regularly to transfer information
- Share success stories
- Continue to collaborate to improve patient pathways

of different departments services, challenges and processes alongside minimal wasted CT slots were all noted in the conclusion phase of this project.

P205 **We can break your fall: An AHP collaboration**

Sarah Mould; Jonathan McConnell
NHS Greater Glasgow & Clyde

Introduction: In early summer 2018, a Pilot Study introducing an innovative radiographer to occupational therapist (OT) referral pathway took place. The study encompassed four teaching hospitals in a large UK city, and GP patients (>65yrs) with a falls history were the focus. The imaging departments operate a "drop in" service for GP patients attending X-ray. Radiographers introduced a simple questionnaire into X-ray examinations, and with consent passed details to the OT team for further assessment. Current practice involves GP referral to the occupational therapy falls prevention team

Aim: The aim of this study is to streamline patient pathway by enabling access to available services sooner.

Method: A three month period (May-July), screening questionnaire and referral process was agreed with OT falls prevention team colleagues. Radiographers working in participating departments incorporated the questionnaire in to X-ray examinations, and completed forms were submitted. The OT team used triage calls to consenting participants to assess individual support requirements. Following the Pilot, retrospective statistical analysis was performed.

Results & discussion: During the Pilot, 16 patients were referred to the OT falls team. Of these, 5 accepted input - including physiotherapy, pharmacy review and community alarm referral. None of the patients referred by radiographers had duplicate GP to OT referrals during the Pilot. Statistical analysis showed that only 9% of potentially suitable candidates were referred to OT by radiographers.

Conclusion: Introduction of a direct inter-professional referral route to streamline services and improve holistic patient care has also resulted in strengthened communication and collaborative links.

1. Scottish Government. The Prevention and Management of Falls in the Community. A Framework For Action For Scotland 2014/16. Crown Copyright. Edinburgh 2014
2. Scottish Government. Allied Health Professions co-creating Wellbeing with the People of Scotland. The Active and Independent Living Programme in Scotland. Scottish Government, Edinburgh, June 2016

P206 **Managing the tide: Controlling access to imaging referrals from nursing, midwifery and allied healthcare profession staff**

Paul Simpson
City Hospitals Sunderland NHS Foundation Trust

Background: The Ionising Radiation (Medical Exposure) Regulations (IR(ME)R) 2017 state that a referrer is "a registered healthcare professional who is entitled in accordance with the employer's procedures to refer individuals for exposure...", but leave the processes for governing exactly which registered healthcare practitioners are entitled to refer to individual employers to decide.

Traditionally this Trust, a large Acute Foundation Trust in North East England, used "Radiology Group Directions" to allow medics (doctors) to delegate the responsibility of referring patients for examination requiring the use of ionising radiation to nursing, midwifery and allied healthcare professionals. However, due to the rising number of access requests and huge variation in access scope, this system had become un-sustainable.

Purpose: This poster will outline the changes made to our access process, which has moved from paper-based to paperless, and has introduced more structured pathways designed to standardise referral criteria. It will also outline how an electronic system can make referral audit easier.

Summary: The poster will display the rationale for the changes, alongside a process flowchart and example pathways and access request forms. There will also be a section on audit of referrer access.

The Ionising Radiation (Medical Exposure) Regulations 2017 (SI 2017/1322)

P207 **Large peri renal haematoma post ESWL, the role of the advanced practitioner in patient care**

Amanda Swift; Sally Hodgkins
Mid Yorks NHS Trust

Background: Currently there are over 300 patients who undertake Extracorporeal Shockwave Lithotripsy (ESWL) to renal stones each year within the trust. The associated complications include infection, steinestrasse, medication reactions and potentially serious peri renal haematoma. The reported haematoma rate is less than 1% however, when a patient becomes acutely unwell following treatment it is important that they are managed quickly and appropriately to avoid any renal impairment and limit the chance of any possible life threatening blood loss.

Purpose: This poster will discuss the haematoma incidence rate and show both US and CT findings of a patient who immediately presented with severe flank pain post ESWL. It will detail the criteria followed prior to ESWL treatment, the taking of patient consent and discuss the impact of the advanced practitioner role on patient management and follow up. The poster will show UKIO participants the ultrasound and CT appearances of a renal haematoma. US is a fast and most easily accessible method of

imaging the kidneys in an acute setting and large haematomas are easily identified on US therefore it should be considered as a cause of pain post ESWL by sonographers.
Summary: Introduction - background of haematoma's as a complication post ESWL and potential on going implications. Describe the patient and display images Look at possible treatments of an actively bleeding haematoma. Conclude/recommendations advice for clinical practice.

P208 **The perils of consent in radiological interventional procedures**

Mohammed Nabi; Rowena Johnson; Rajat Chowdhury
Oxford University Hospitals NHS Trust

Informed consent is an essential step in our interventional work. There is however little known about the real practice in image guided interventional procedures, and there are no clear guidelines on how to standardise and continuously improve the process in this setting. Although informed decision-making for clinical treatment is a fundamental part of modern medical practice, it has different purposes in different contexts and is inconsistently practised, often falling short of the theoretical model.
In this review, we emphasise points from the RCR standards for patient consent, as well as the 12 key pieces of information that patients should be given as detailed by GMC. We discuss important issues such as the delegation of consent, the legal implications of written versus verbal consent, and the appropriate elements of robust written consent. In addition we discuss the impact of the National Safety Standards for Invasive Procedures that was released by NHS England in September 2015 and how the law on informed consent has changed following landmark Supreme Court judgments. Finally, we highlight the NICE guidelines in consenting patients for procedures where the benefits and risks are uncertain, such as in autologous blood injection for tendinopathy.

1. General Medical Council. Consent: patients and doctors making decisions together (June 2008)
2. Montgomery v Lanarkshire Health Board (2015) SC 11 (2015) 1 AC 1430
3. NHS England patient Safety Domain. National Safety Standards for Invasive Procedures (September 2015)
4. NICE: Consent - procedures for which the benefits and risks are uncertain (2003)
5. Royal College of Radiologists. Standards for patient consent particular to radiology (2nd edition 2012)

P209 **Phone calls giving you a headache? Reducing unnecessary interruptions on-call**

Sara Ffrench-Constant; Luke Dixon; Dermot Mallon; Chris Watura; Amrish Mehta; Brynmor Jones
Imperial College NHS Trust

Background: Despite a shortage of radiologists, the radiological workload is ever-increasing and compounded by an increasing frequency of interruptions, the majority of which are phone calls. It is therefore essential that efforts are made to optimise radiologist productivity and their working environment. While radiologists must be readily accessible, unnecessary interruptions must be minimised for maximal clinical effectiveness.
Aims: Identify common and potentially avoidable sources of telephone call interruptions to the on-call radiologist.
Method: The number and reason for telephone calls to the on-call radiology registrar were prospectively collected during two 3 week periods, 1 month before and 3 months after the implementation of a novel protocol for the automated vetting of non-contrast CT head scans.
Results and intervention: 54% of telephone calls related to vetting of a radiological examination, of which approximately half (48%) were for vetting of non-contrast CT heads. Following this, based on current guidelines an automated vetting protocol for adult CT heads was formulated and introduced. Post protocol implementation, there was an 80% reduction in phone calls regarding CT heads and a 21% overall reduction in the total number of calls. The number of CT heads performed remained unchanged.
Discussion: In an attempt to reduce pressure on radiologists, we demonstrate the successful implementation of a novel protocol for automated vetting of unenhanced CT heads. By doing so, we have achieved a marked and sustained reduction in the number of telephone interruptions. This has improved both radiology workflow and in turn, patient flow through the emergency department.

P210 **Tele-oncology: Presenting a remote radiotherapy treatment planning solution**

Susannah Jansen van Rensburg; Delos Wilbur; David Wastall
GenesisCare, UK

Background: The role of remote reporting in radiology is well-established[1]. There is very little literature discussing the use of remote radiotherapy treatment planning on a large scale; its implementation can help increase access for referring oncologists and reduce delays in the patient's radiotherapy planning pathway. We present a successful approach to the use of remote radiotherapy planning.
Purpose: Outline of the technical requirements for successful implementation of the remote radiotherapy planning solution, with reference to software and systems used. The work will help readers to understand the training requirements for both staff and referring oncologists. Describe the advantages to be gained in terms of planning days, as this practice facilitates a 5 working

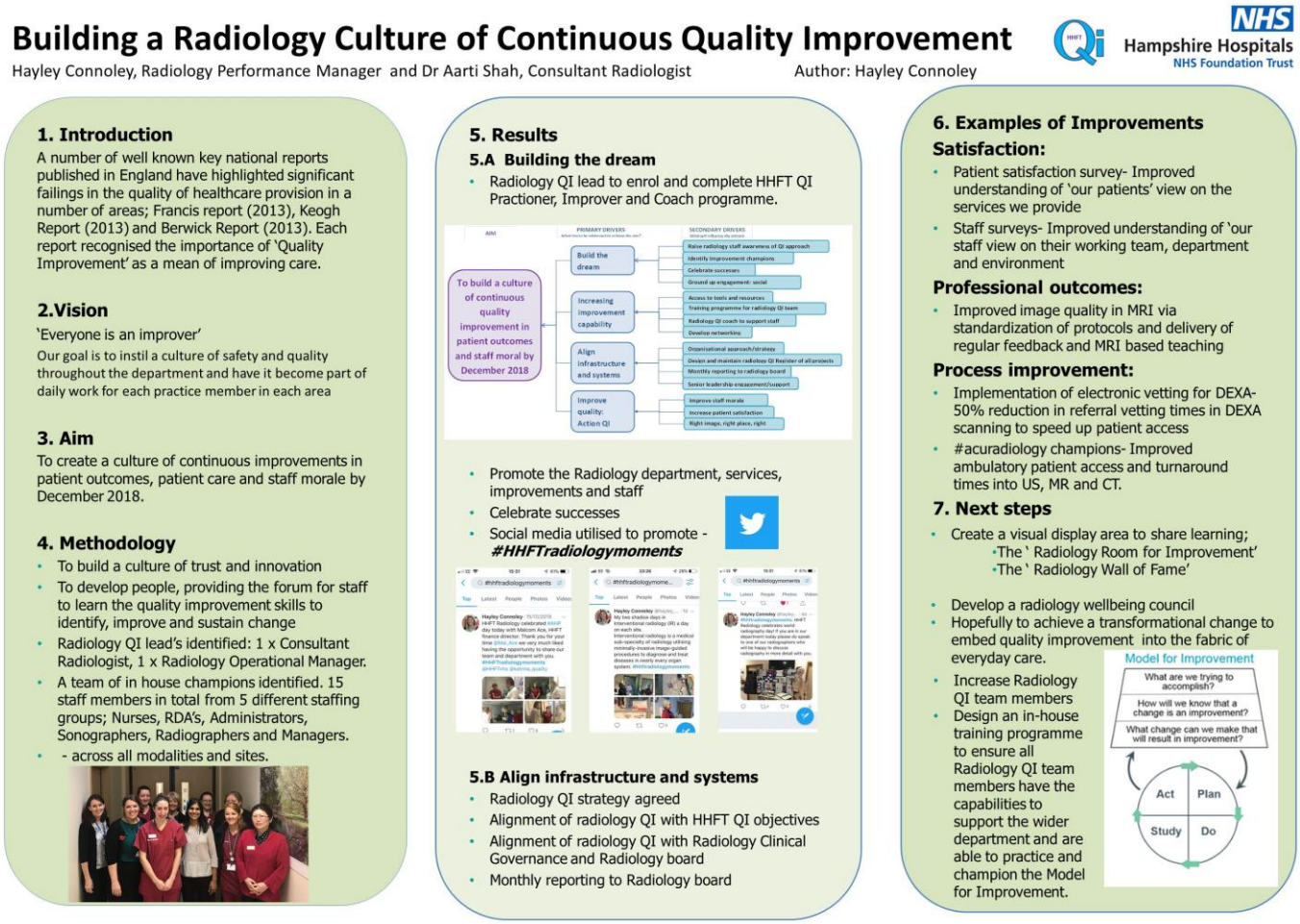
day turnaround from CT to treatment for radical radiotherapy cases. Consideration will be given to the ethico-legal requirements with respect to patient confidentiality and data protection.

Summary: An initial overview of the institution will include the number of referring oncologists and linear accelerators, to give context to the scale of the solution. There will be an outline of the remote planning pathway (including flow diagram) with the software used. Feedback will be included from referring oncologists regarding the solution. There will be a discussion of the strengths and limitations of the solution, as well as recommendations for implementation.

1. Thrall, J. H. (2004). Teleradiology. Part I. History and clinical applications. Radiology 243: 613-617

P211 Building a radiology culture of continuous quality improvement

Hayley Connoley; Aarti Shah
Hampshire Hospitals NHS Trust



Francis report (2013), Keogh Report (2013) and Berwick Report (2013)

P212 Potential efficiency savings in daily QA of a linear accelerator

Matthew Bolt [1]; Andrew Nisbet [1]; Catharine Clark [2]; Tao Chen [3]; Gail Distefano [4]
[1]Royal Surrey County Hospital; [2]National Physical Laboratory; [3]University of Surrey; [4]Royal Surrey County Hospital/University of Surrey

Background: Current practice is to measure beam output for each beam energy during daily QA, which is time consuming. If changes in beam output are energy independent there is potential scope to reduce the daily QA, therefore increasing clinical linac availability.

Methods: Four years of output measurements from 8 Varian linacs across two clinics were collated, including 6MV, 10MV, 15MV, 6FFF, 10FFF photons and 6MeV, 9MeV, 12MeV, 16MeV and 20MeV electrons. Daily PTW-Linacheck and weekly ionisation-chamber measurements in solid water were analysed. Linear least-squares regression was performed between the 6MV and all other beams for each linac. Corrections were applied to account for beam calibrations during this period (to offset the drift in beam output).

Results: Correlation was observed for all beams with respect to 6MV. The greatest correlation was for 10MV and least for 15MV with Spearman's correlation coefficients of 0.97 and 0.89 respectively. R-squared values ranged from 0.62 (6MeV) to 0.97 (10MV). In Figure 1, a plot of 10MV and 12MeV against 6MV is shown for one linac with different calibration periods highlighted showing the correlation.

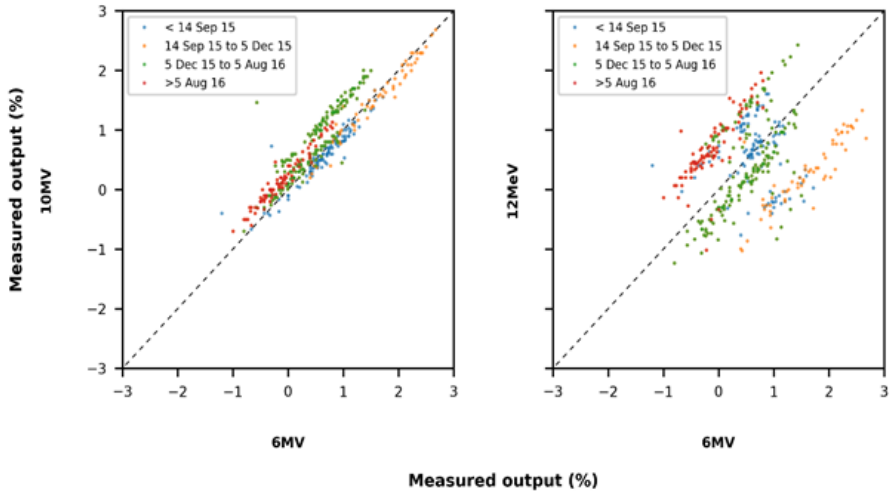


Figure 1: Plots of 10MV (left) and 12MeV (right) against 6MV results measured on the same day for one linac. The measurements have been separated into time periods determined by the point at which a calibration or equipment adjustment occurred.
A banded structure appears which indicates the beam output of different energies on the same linac are correlated. It has been observed that the MV beams have greater correlation than the MeV beams.

Conclusions:
Strong correlation is observed between measured outputs for all beams on an individual linac. There is potential to reduce the time needed for daily QA if a reduced number of beams are measured. For a multi-modality linac this may currently take 45 minutes using an ionisation chamber, which could be reduced to 15 minutes if a single energy was measured, resulting in 2.5 additional clinical hours per week per linac.

P213

Who do reporting radiographers consider their peers?

Kirsty Wood
University of Derby

Background: Over the last 30 years there has been an increase in radiographers expanding into image reporting roles, traditionally undertaken by radiologists. Often both radiographers and radiologists report the same scope to the same standard (Brealey et.al 2005; Stevenson et.al 2012; Hardy et.al 2013). This research aimed to investigate who reporting radiographer considered their peers, particularly in relation to peer review.
Method: In order to gain a national perspective an online survey was distributed via a professional network and social media. Sixty-five responses were received, estimated approximately 10% of the radiographer reporting workforce. The survey asked "As a reporting radiographer do you have peers?" 100% of responses stated 'yes', followed by a free text entry of who they considered their peers. Information including geographic location (region), scope, time reporting radiographer practice established (team and individual), mentor and supervision arrangements and peer review/audit arrangements was also collected in an aim to contextualise answers.
Results: Radiology colleagues (registrars, radiologist, consultant radiologist) was identified as a peer in 26.5% of responses. 27% specified advanced practitioner rather than reporting radiographer, 45% stated reporting radiographers as their peers. Free-text answers reflected that a peer was not defined by scope of practice or experience, but by who undertakes the same task.
Conclusion: When reporting medical images, a peer is one who undertakes the same task regardless of job role or title, experience or scope of practice. Radiographers identify strongly with their own profession, and acknowledge similarities to the radiology profession- relating to scope.

Brealey, S. King, D. Hahn,S. Crowe,M. Williams, P. Rutter, P. Crane, S. (2005) Radiographers and radiologists reporting plain radiograph requests from accident and emergency and general practice. Clinical Radiology, 60 (6). 710-717pp
Stevenson, P. Hannah, A. Jones, H. Edwards, R. Harrington, K. Baker, S. Fitzgerald, N. Belfield, J. (2012) An evidence based protocol for peer review of radiographer musculoskeletal plain film reporting. Radiography. 18 172-178pp
Hardy, M. Hutton, J. Snaith, B. (2013) Is a radiographer led immediate reporting service for emergency department referrals a cost effective initiative? Radiography 19(1) 23-27pp

P214 **What effect does decreasing the time to report radiographs have on reporting accuracy?**

Jeanette Carter
UHNM

Background: The increasing number of radiographs undertaken along with the introduction of hot reporting appendicular Emergency Department radiographs has inevitably brought about increased pressure on the Advanced Practitioners (AP) raising the concern about the effect on reporting errors. Previous similar studies focused on radiologists, despite it being documented that APs report most of the radiographs within the NHS. Plus: they did not investigate the effect on satisfaction of search (SOS) and voice recognition (VR).

Method: One group of 60 appendicular radiographs were reported by APs within 4hours and the second within 2 hours. The true and false positives and negatives, sensitivity, specificity, accuracy, positive and negative predictive value were calculated before the P-value to identify statistical significance. The number of SOS and VR errors were calculated alongside the P-value. Results being split into the observation of the acute and chronic pathologies.

Analysis: Initially there was no statistical significance, further investigation highlighted that one participant was faster when allocated more time. With this consideration negative results were statistically more accurate when more time was taken, with both acute and chronic pathologies. It was observed that not all APs discuss the chronic pathologies. No statistical difference was seen when looking at SOS and VR errors. Notably the wrong patient's radiograph was reported when working fast, a 'never event'.

Limitations: It was noted that no participants took longer than 3hours when given 4hours, something to be considered in future studies.

Conclusion: Reporting accuracy was improved when more time was allocated to report.

1. Edwards. A. J et al (2003) The effect of reporting speed on plain film reporting errors Clinical Radiology **5** (8) 971-979
2. Hardy. M, Spencer. N and Snaith. B (2008) Radiographer Emergency Department hot reporting: An assessment of service quality and feasibility. Radiography **14** 301-305
3. Snaith. B and Hardy. M (2014) Emergency Department image interpretation accuracy: The influence of immediate reporting by radiology International Emergency Nursing **22** 63-68
4. Sokolovskaya. E et al (2015) The effect of faster reporting speed for imaging studies on the number of misses and interpretation errors: A pilot study Journal of the American College of Radiology **12** 683-688

SHARING BEST PRACTICE

P215 **Development of radiographer led on-treatment review clinics, following a competency based framework**

Louise Hughes
Clatterbridge cancer centre Aintree

Purpose: To share our experience of developing and delivering Radiographer led On Treatment Review clinics for patients receiving radiotherapy across 2 clinical sites, following a medical model for review, and the projection of how this will work across a 3rd site. The poster follows a timeline of how the service was set up, initially at a satellite centre, the results of a pilot project for implementation of the service at the main hospital site, and follows the development of the service, with expansion of the treatment sites reviewed, and the development of the staff involved.

P216 **Feasibility study of one-stop emergency palliative treatments on Halcyon linac**

Dom Withers; Yun Miao; Ahmed Ifthaker; Vasu Ganesan; Ghirmay Kidane; Liz Crees
Queen's Hospital, Romford

Background: The Halcyon linac has mandatory imaging as part of patient workflow. It produces high-quality kV-CBCT images up to 24.5cm long and 49.1cm wide. Emergency palliative patients (e.g. cord compressions) are usually scanned on a CT scanner, wait for a plan to be completed, and are then treated on a linac, requiring moving a patient onto two separate couches. A workflow is considered where localisation and treatment are both done on the Halcyon, thereby reducing patient re-location.

Method:

- The process was developed using a thorax phantom
- A plan with a field is prepared in advance on a separate phantom
- A kV-CBCT scan of the phantom is obtained on the Halcyon
- In Eclipse, the kV-CBCT has a body contour applied where the density is forced to water
- The prepared plan has the kV-CBCT assigned to it, and the field altered for appropriate treatment
- An MLC-based irregular surface compensator is created to flatten the Halcyon 6MV FFF beam
- The plan is exported to RadCalc for MU check
- After review and approval, the plan is used for treatment.

Results: Using a phantom, all the steps from the start of the localisation scan to the end of treatment beam delivery can be completed within 15 minutes.

Conclusion: Allowing for other steps, such as patient alignment and approval by a clinician, it is anticipated that a 30-minute Halcyon appointment should be sufficient, minimising inconvenience for cord compression patients. Further work will include developing the workflow, and calibrating the kV-CBCT scans for heterogeneity corrections.

P217 **Emergency physicians request far too many trauma scans - or do they? Implementing a trauma scan request pro-forma in a regional trauma unit**

Kyungmin Kim; Priya Agarwal; Sarah Touyz; Suraj Amonkar
Northern Care Alliance

Background:

- At the Royal Oldham Hospital, a regional Trauma Unit, a new trauma scan request pro-forma was introduced in November 2017, which allows emergency physicians to request a whole-body CT scan without the need for the request to be vetted by the on-call radiologist.
- However, trauma scans expose patients to high radiation doses and create immense reporting volumes for radiologists.
- We wanted to assess whether the implementation of the new trauma scan request pro-forma has increased the total number of trauma scan requests and reduced the request-to-scan time.

Method:

- We analysed the number of whole-body CT scan requests in October 2017, December 2017 and December 2018.
- Furthermore, we also assessed how many of those scans actually had positive trauma related findings.

Results:

- In October 2017, 31 whole-body scans were requested. In December 2017 and 2018, 21 and 19 whole-body scans were requested respectively.
- The median request-to-scan time was 40 minutes, 82 minutes and 20 minutes in October 2017, December 2017 and December 2018 respectively.
- In October 2017, only 32.4% of all whole-body scans had positive trauma-related findings, whereas in December 2017 and 2018, 55% of all whole-body scans had positive trauma-related findings.

Conclusion:

- In this snapshot analysis, there was no evidence of increase in the number of trauma scan requests since the implementation of the physician-led trauma scan request pro-forma.
- The implementation of the trauma scan request pro-forma appears to have increased the probability of detection for trauma-related findings.

P218 **An audit into the clinical appropriateness and diagnostic yield of AXR requests in the emergency department**

Rashed Al-Khudairi; Usman Goga; Tara Sood
Royal Free Hospital

Background: The abdominal X-ray (AXR) is an investigation with low diagnostic yield, yet remains commonly requested in the emergency department. In addition to the limited clinical value, financial and patient safety factors need to be considered with their continued use. We aim to assess the clinical appropriateness of AXR requests in the emergency department and the overall contribution to patient diagnoses.

Methods: We conducted a prospective study of 100 random AXR requests in a single month, pre and post intervention, and collected data on demographics and clinical details to assess the appropriateness and diagnostic yield of these requests. Intervention comprised of written communication and posters to inform requesters of our findings, prior to repeating data collection. A request was considered appropriate if it met the Royal College of Radiologists (RCR) list of indications for AXR requests.

Results: In the pre-intervention cohort only 50% of requests were appropriate with 22% of requests demonstrating any significant findings. Post-intervention only 48% were appropriate, however 37% of all requests demonstrated significant findings. When requests were meeting RCR guidelines this becomes 40%, and when inappropriate the diagnostic yield is 27%. Within 72hrs of the initial AXR further abdominal imaging was performed in 25% of all patients.

Conclusion: Adherence to RCR guidelines is associated with a higher proportion of significant findings. Further interventions are required to increase the number of appropriate clinical requests. The contribution of abdominal X-rays in making a diagnosis is unclear where one quarter of all patients proceeded to further abdominal imaging.

1. iRefer Guidelines RCR Version 8.0.1 (2017)

P219 **Blinded by the binder - a need to change existing trauma protocol**

Lucy Taggart; Jules Silverton
NHS Greater Glasgow and Clyde

Background: Clinical review of patient trauma pathway through the imaging department and ensuring only the necessary imaging performed for diagnosis. Collaboration with Accident and Emergency, Orthopaedic teams with the common aim to improve treatment and results for haemodynamically stable patient involved in major trauma.

Aims: This poster aims to:

- Review and redesign trauma imaging pathway
- Examine the need of a pre and post binder removal pelvic X-ray on the haemodynamically stable patient going straight to CT Purpose.

As the largest hospital in Europe there is an increasing number of major trauma referrals. Patients are perceived to be receiving an unnecessary amount of plain film imaging despite receiving "Trauma CT". This raises the question, are we being over cautious in our pre and post pelvic binder removal X-rays when the patient is be transferred straight to CT? Are we potentially over irradiating the haemodynamically stable patient? Is there potential to create a more efficient patient pathway allowing them quicker access to CT, without being over imaged in Plain film?

Summary: Review and redesign of existing trauma protocol for plain film and wider recognition of going straight to CT may negate need for plain film prior to scan. Points to examine - Pre and post pelvic binder X-rays, is there a need for a pelvic Plain film x-ray in the haemodynamically stable patient prior to going to CT without any delay - How can we streamline a imaging pathway in the trauma patient?

P220 **Investigation of weight loss in older adults**

Fatima Alves Pereira; Simon Smith
Ipswich Hospital

15 to 20% of patients older than 65 are affected by unintentional weight loss. This nonspecific symptom is associated with increased morbidity and mortality. Many patients are over investigated due to clinician/patient fear of underlying malignancy. However, unintentional weight loss in the elderly is multifactorial and in approximately 25% of patients who are investigated no cause is found for the weight loss[1]. NICE guidelines on the investigation of suspected cancer for primary care state that unintentional weight loss carries a positive predictive value (PPV) of 7%. For this reason, guidance has been provided on the investigation of this symptom[2]. In the current climate of limited resources, we audited the NICE guidance mentioned above, as well as a review published by McMinn and colleagues (2011).

The aim of this audit was to ensure resources were being used in a sequential fashion, as opposed to resorting immediately to cross-sectional studies. Our results, showed that our institution did not meet the standards for basic investigations before referring on to more expensive tests. For example, compliance with having the patient weight/weight loss/duration of symptom measured and documented accurately in clinic was 82%, 74% and 66%, respectively. Despite patients having normal initial investigations (serum analysis/ CXR/ ultrasound or endoscopy), they went on to have further cross sectional imaging, which did not reveal any malignancy. We conclude that the NICE guidelines on this common constitutional symptom are ambiguous, may result in over investigation, inappropriate use of expensive and limited resources.

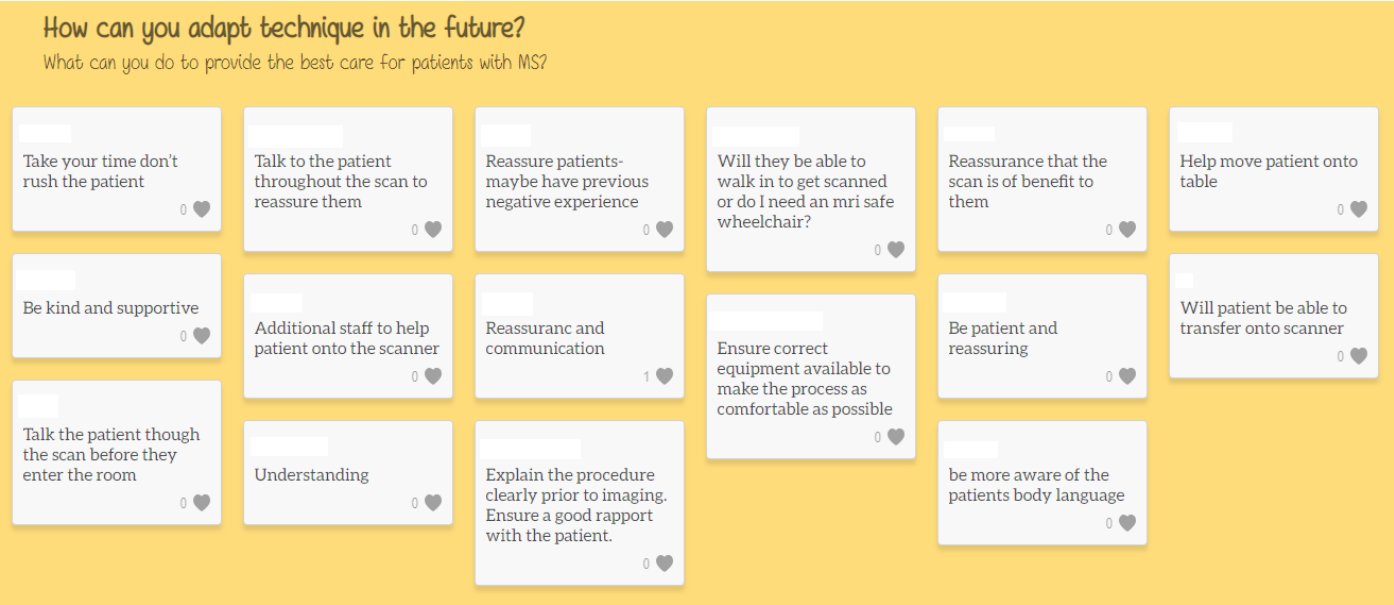
1. McMinn J, Steel C, Bowman A. (2011) Investigation and management of unintentional weight loss in older adults. BMJ. Mar 29;342:d1732–d1732
2. National Institute for Health and Care Excellence (2015) Suspected cancer - recognition and referral pathway (update)

P221 **Nearpod in diagnostic radiography and education: Student engagement and feedback**

Chloe Shand; Clare Rainey
Ulster University

This poster will be a visual display of the way Nearpod has been used so far on the undergraduate Diagnostic Radiography and Imaging course at Ulster University. Multiple licenses for this 'app for active learning' have been held by the teaching team since 2016 and so far it has been positively received by students of all year groups. Samples of quiz results, poll results and student drawings as well as student feedback will be displayed under the headings 'knowing, doing, being', providing a clear demonstration of how Nearpod has been effectively used at various teaching levels[1].

Quizzes and app-based active learning have both been demonstrated to improve student engagement[2,3]. It is hoped that this poster will lead to further development of ideas and discussion within the realms of student engagement and how we can encourage this and develop it further within the topic of Radiography. Image 1 displays year-three cohort responses when asked how students could adapt their technique after they watched a video about a patient who lives with dementia.



1. Centre for Learning Excellence. 2016. Credit Level Descriptors for Higher Education. Luton: University of Bedfordshire
2. Gallagos, C. and Nakashima, H. 2018. Mobile Devices: A Distraction, or a Useful Tool to Engage Nursing Students? Journal for Nursing Education, 57(3), 170-173
3. McClean, S. and Crowe, W. 2017. Making room for interactivity: using the cloud-based audience response system Nearpod to enhance engagement in lectures. FEMS Microbiology Letters, 364

P222 The value of pre-application clinical department visits in radiotherapy

Jenny Callender; Pete Bridge; Cath Gordon; Jo Edgerley
The University of Liverpool

Background: The mandatory clinical radiotherapy department visit undertaken by potential University applicants aims to provide understanding of the profession and therefore reduce attrition. Increasing pressure on clinical departments makes visits a logistical challenge. This additional requirement may also present an unnecessary barrier to applicants. With no evidence relating to visits, this study aimed to explore the perceptions of both students and clinical educators concerning potential benefits and challenges.
Method: A focus group interview method was utilised to gather in-depth qualitative data concerning the clinical department visit experiences from first year undergraduate students and clinical educators.
Results: Three main themes emerged from the student focus groups: the perceived purpose of the clinical visit, the visit content and the outcomes and impact arising from the visit. Clinical educator data also followed these themes with the addition a "logistical impact" theme.
Conclusion: The clinical visit has value to applicants in affirming their decision to study radiotherapy. There is variation in expectation and content for these visits and they are logistically challenging. Nationally agreed guidelines for visit structure and content could improve visit efficiency and effectiveness. A national clinical visit form may reduce workload for educators and applicants.

P223 ARENA: An advanced education assessment of tumour volume delineation in radiotherapy

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Background: Delineation of radiotherapy target volume has an essential role in modern treatment planning. However, it is affected by intra/inter-observer variations and it has been identified as a weakness in RT planning. For this reason, accurate target volume delineation (TVD) outlining is necessary to ensure optimal tumour coverage. ARENA is a collaborative project among Cardiff University, Velindre Cancer Centre and Singleton Hospital. The project aims at facilitating higher quality and standardised TVD approach through development of tumour site-specific TVD instructional modules and corresponding outlining module.
Purpose: To present and describe the ARENA software to support TVD education and ongoing continuous professional development for clinical oncology trainees and consultants through site-specific TVD modules and qualitative and quantitative feedbacks.
Summary: The training software components currently developed include: a) an user-friendly interface for selecting and importing radiotherapy data to be assessed; b) a viewer to show images and radiotherapy structures contour in axial, coronal,

and sagittal planes; c) an image analysis package to compute quantitative (conformity metrics) and qualitative evaluation (user outline vs. reference volume, maximum and minimum acceptable volumes, over and under contoured regions and a 'red flag' for volumes inappropriately contoured) of the investigator performance; d) training packages and educational material including detailed radiotherapy planning guidance document and details of common TVD errors of pilot clinical sites (oesophagus and prostate); e) a structured report generator that produces a personalised summary of the quantitative and qualitative feedback to the user.

P224 **Malpractice, negligence, and litigation in advanced radiography practice setting**

Anselm Chukwuani [1]; David Omiyi [2]; Anita Ginigeme [3]; Joseph Ndukwu [1]; Chidinma Nnamani [4]

[1]Tameside and Glossop Integrated Care NHS Foundation Trust, Ashton-under-Lyne, Greater Manchester; [2]Department of Radiography, University of Lagos, Nigeria; [3]Georgetown University, Washington DC, United States; [4]Southend University Hospital NHS Foundation Trust, Southend-on-the-Sea

Background: There is no doubt the advanced practice radiographer shoulders more responsibilities and bears accountability for the decisions and actions he takes in the clinical environment. For instance, a reporting radiographer will bear the responsibility for patient's diagnosis and even the outcome of actions taken by others who relied on his report for their patient management decisions. Therefore, advanced practitioners are charged with new duties, exposing them to higher risks of malpractice and negligence claims, liabilities, and other medico-legal issues. Consequently, it has become essential for advanced practitioners to fully understand elements of medical malpractice; reasons why patients may sue and steps to prevent litigations in advanced practice. This paper aimed to examine these issues and the applicable laws of tort associated with medical litigation.
Method: Two major online databases, namely MEDLINE and PubMed, were searched for articles and papers related to the medico-legal issues in radiological settings with a particular reference to advanced practice and radiography. The retrieved papers were reviewed. A number of published textbooks on medical litigation and negligence were also consulted and reviewed.
Results: The reviews revealed a dire dearth of information on medico-legal issues, and showed many radiographers have a poor background knowledge of these issues with regard to the prevailing practices of today's clinical setting.
Conclusion: The knowledge of what could amount to negligence and malpractice, and possibly lead to litigation will help advanced practitioners to take steps to avoid conducts/actions that might lead to malpractice or litigation without resorting to "defensive" clinical practice.

1. Arogundade RA and Omiyi DO. (2010). Malpractice and medicolegal issues in radiology practice: knowledge base for trainees and trainers. Nigerian Postgraduate Medical Journal. 17(3), 227-32
2. Berlin, L (2013). Medicolegal - Malpractice and Ethical Issues in Radiology. American Journal of Roentgenology, 201(W517), 312-8
3. Cannavale, A et al. (2013) Malpractice in Radiology: What Should You Worry About? Radiology Research and Practice. 2013 (2), 10
4. Chukwuneke FN. (2015). Medical incidents in developing countries: A few case studies from Nigeria, Nigerian Journal of Clinical Practice, (18)7, 20-24
5. Cook J. (2007). Law of Tort. 8th Edition. New York: Longman
6. Eze, C.U. et al. (2006). Legal issues facing radiographers in Nigeria. British Journal of Health Care Management, 18(4), 206
7. Halpin, S. (2009) Medico-legal claims against English radiologists: 1995–2006. British Journal of Radiology, 82(984) pp. 982–988
8. Jena, A. B et al (2012). Outcomes of medical malpractice litigation against US physicians. Archives of Internal Medicine, (172)11, 892–894
9. Luiz C et al. (2012) Medico-legal analysis of lawsuits in medical imaging. Radiologia Brasileira, 45(2)
10. Oakley, JN 2005, 'Practical medico legal issues in digital radiography' Paper presented at UK Radiological Congress 2005, Manchester, United Kingdom, 6/06/05 - 8/06/05
11. Pandit M. S. and Pandit S. (2009). Medical negligence: Coverage of the profession, duties, ethics, case law, and enlightened defense - A legal perspective. Indian Journal of Urology, 25(3). 372–378
12. Parelli R. (2008). Medicolegal Issues for Diagnostic Imaging Professionals, 4th Edition. Boca Raton: CRC Press
13. Pinto, A et al. (2012). Learning from errors in radiology: a comprehensive review. Seminars in Ultrasound, CT and MRI, 33(4) 379–382, 2012
14. The Royal College of Radiologists, Standards for the NPSA and RCR Safety Checklist for Radiological Interventions, The Royal College of Radiologists, London, UK, 2010
15. Singh, S et al (2014). Medico-legal issues in radiology: Indian context. Journal of Medical Society. 16. Sokol, D. K. (2012). Law, ethics, and the duty of care. British Medical Journal, 345(7878), 29

P225 **Survival kit for managing difficult situation in a healthcare setting: Appropriateness of role-plays and simulation exercises**

John Paul Sahibbil

GenesisCare UK

Background: There are still limited studies and discussion that addressed the mechanism of clinical coping for managing difficult situations. Patient satisfaction has become a paramount concern in health care professions, and this is often discussed. However, satisfaction among difficult patients and situations is underreported. With little training and discussions exploring effective ways to manage challenging patients, fatigue, stress and negative emotions often develop among health care providers in the UK.
Purpose: This presentation provides a clear and consistent overview of the importance of patient-centred behaviour. The review also outlines different communication techniques for conflict management and the use of powerful phrases. Additionally, it provides the health care staff with an opportunity to share ideas and recognize their personal traits that influence their ability to

relate with others. The aim of this review is to share knowledge acquired from literature review, disseminating best practices and lesson learnt using the best available evidence.

Summary: Raising awareness for challenging situations in a health care setting is essential to enable providers to reflect on and practice difficult situations or conversation. Self-reflection, preparatory and relational skills, emphatic presence, team approach and patient-centred strategy demonstrate an important kit structure that establishes overall benefits and confidence to healthcare staff. Importantly, healthcare staff favoured this method of support. It is believed that this toolkit improves effective emotional management and a tempting solution for supporting various factors associated with managing difficult situations.

1. Anderson, P. F., Wescom, E., & Carlos, R. C. (2016). Difficult Doctors, Difficult Patients: Building Empathy. Journal of the American College of Radiology, 13(12), 1590–1598
2. Benjamin, S.F. (2008). Perfect Phrases for Dealing with Difficult People. New Your; McGraw-Hill
3. Lokko, H. N., & Stern, T. A. (2015). Confrontations with Difficult Patients: The Good, the Bad, and the Ugly. Psychosomatics, 56(5), 556–560
4. Luff, D., Martin, E. B., Mills, K., Mazzola, N. M., Bell, S. K., & Meyer, E. C. (2016). Clinicians' strategies for managing their emotions during difficult healthcare conversations. Patient Education and Counseling, 99(9), 1461-1466

P226 Exploring peer mentoring in the diagnostic imaging curriculum: What is the experience of the peer mentor and how does this develop graduate skills?

Julie de Witt
University of Derby

Background: Peer mentoring is established in the diagnostic imaging curriculum, final year students are allocated to a 1st year student and together they work on an educational (clinical) intervention. This scheme appears to confer benefits to both parties; the 1st year student gains support and guidance from someone with current experience of being a student, while the final year student gains experience of acting as a mentor. However, these impressions are not evidence based; this study sets out to understand the experience of being a peer mentor, in particular looking at this in respect to development of graduate level 'softer' skills.

Method: Using a questionnaire, based on the University's graduate attributes, evaluating at how students rate themselves against these (using a likert scale) before embarking as a peer mentor and post experience of being a peer mentor. Data analysis, using SPSS, paired T test. Qualitative element aims to understand the lived experience from the perspective of the peer mentor, where the questions focus asked of a focus group will concentrate on benefits in terms of 'graduateness' (an appreciative approach).

Results: This research is on-going at present but this paper will report on initial findings around establishing of the peer mentoring relationship, how those relationships are established, some of the barriers and enablers. It will also explore themes emerging from questionnaire data about whether peer mentoring impacts on development on graduate 'soft' skills

Conclusions: Working hypothesis: engaging in peer mentoring develops some graduate level skills but with some caveats for practice.

P227 An inter-professional approach to learning within a Radiology department. Best of both worlds?

Richard Tucker; Cheika Kennedy
Nottingham University Hospitals

This poster is a qualitative approach following a PDSA cycle of inter-professional approach to Learning within a Radiology department. Historically the training of Radiology registrars at a Trust within the East Midlands has been Consultant Radiologist led. In recent years with the introduction of advanced practice of Radiographers and Nursing staff taking on more medical type roles, the teaching of the registrars in their training has become more of a multi professional approach. This poster looks at how an inter- professional approach to registrar training can enhance the current learning cycle, and yet provide additional learning for the non medical advanced practitioner from the interaction with a medical registrar.

This poster follows a PSDA cycle of learning, supported through inter-professional literature search to suggest that an inter-professional approach to learning allows for appreciation of current roles, opportunities for teamwork and provides a tier approach to radiology registrar learning. This means that the basics of the registrar learning is delegated to an advanced practice non medic to teach, deliver the initial training and then for the registrar to receive Consultant Radiologist teaching further down the line to conclude the learning.

1. Boyko, J., Carter, N. and Bryant-Lukosius, D. (2016). Assessing the Spread and Uptake of a Framework for Introducing and Evaluating Advanced Practice Nursing Roles. Worldviews on Evidence-Based Nursing, 13(4), pp.277-284
2.Herrmann, G., Woermann, U. and Schlegel, C. (2014). Interprofessional education in anatomy: Learning together in medical and nursing training. Anatomical Sciences Education, 8(4), pp.324-330
3.Hoff, R., Frenkel, J., Imhof, S. and ten Cate, O. (2018). Flexibility in Postgraduate Medical Training in the Netherlands. Academic Medicine, 93(3S), pp.S32-S36
4. Kuper, A., Veinot, P., Leavitt, J., Levitt, S., Li, A., Goguen, J., Schreiber, M., Richardson, L. and Whitehead, C. (2016). Epistemology, culture, justice and power: non-bioscientific knowledge for medical training. Medical Education, 51(2), pp.158-173

P228 **No more - In at the deep end! A structured approach to returning to training for radiology trainees**

Jennifer Wakefield [1]; Kate Hawtin [2]; Louise Dickinson [2]; Jane Young [3]
[1]Imperial College Healthcare Trust; [2]University College Hospital; [3]Health Education England (London)

Background: Around ten percent of trainees are out of programme at any one time for a variety of reasons. This may include time out to pursue other training opportunities, research, a career break, and most frequently parental leave. There was no structured planning process for trainees prior to their return, and anecdotally many found themselves feeling 'out of their depth' at the beginning of their return to training being expected to 'pick up where they left off', with limited re induction. This is not good practice for either the trainee or for patient safety. The London School of Radiology, with support from HEE London, has developed a formal process for taking out of programme leave, with pre- leave planning and preparation for return taking into account the individual learning needs. A period of supervision and support of returners work is explicit, mutually agreed and reviewed. This was piloted in October 2018 and March 2019. This is linked to a 2 day practical course including case reviews and simulation.
Purpose: To present a framework for supporting trainees back into training demonstrating the process/content of the paperwork and practical course and how that can be adapted to local circumstances.
Summary: We present the rationale, process, course content and preliminary feedback.

P229 **Does simulation help ultrasound students to humanise personal interactions on placement?**

Louise McKnight; Penny Reed; Denise Paddock; Nicola Davidson; Anushka Sumra; Helen Brown; Helen White
Birmingham City University

Background: There is a recognised shortage in the UK medical ultrasound workforce which we are addressing with a direct entry BSc Medical Ultrasound qualification. A range of simulation activities help prepare students for clinical placement. We recognise that while simulation equipment may help students gain transferable skills, we wanted to assess how much they felt simulation had helped them develop their interpersonal and communication skills.
Method: Students were asked to assess how well they felt simulation prepared them for practice in both technical and interpersonal skills using an email elicitation method. Data gathered will be analysed using a thematic analysis.
Results: Full results will be available later in the year.
Conclusion: We expect to share our experiences with other providers who may benefit from our assessments of simulation activities. Feedback from our students will help us to tailor our provision with students needs and expectations.

P230 **A two-year evaluation of a direct-entry postgraduate ultrasound programme: the perspectives of clinical leads**

Gareth Bolton; Lorelei Waring; Amanda Marland; Charles Sloane; Paul Miller
University of Cumbria

Background: The UK's public ultrasound departments have been understaffed for some years[3,6]. This short-staffing is noted have a range of detrimental outcomes for patients, departmental managers and working sonographers alike[1-3]. While ultrasound courses have traditionally recruited from a pool of general radiography graduates, a current shortage of the latter is compounding the overall problem[6]. Consequently, new direct-entry programmes have been advocated[5]. This poster reports findings from an evaluation of one of the UK's first postgraduate direct-entry ultrasound programmes, exploring the perspectives of the clinical leads of the departments within which participating students were placed.
Methods: A thematic analysis informed by a Straussian model of Grounded Theory was employed[4]; semi-structured interviews with N=6 participating clinical leads were conducted at the end of the first and the second year of the programme.
Results: Five global themes emerged: (a) The anticipated extra work required to clinically mentor students with no front-line healthcare experience; (b) The 'soft skills' (chiefly communication) of students with no prior clinical background; (c) Student management of clinical objectives; (d) Rapid student adaptation to context; (e) Financial benefits of the direct-entry postgraduate model.
Conclusions: The anxieties of participants regarding (a) were rapidly quashed, while those around (b) were reported to have taken a little longer to fully address. While the equation between clinical objectives and academic work was an occasional ongoing concern, the rapidity with which the students adapted was reported to have given the participants great confidence in the selection process and the programmatic model itself.

1. Bolton GC, Cox DL. Survey of UK sonographers on the prevention of work related muscular-skeletal disorder (WRMSD). J Clin Ultrasound 2015;43:145-152
2. Migration Advisory Committee. Skilled shortage sensible: Full review of the recommended shortage occupation lists for the UK and Scotland, a sunset clause and the creative occupations. London: Migration Advisory Committee; 2013
3. Miller PK, Waring L, Bolton GC, Sloane C. Personnel flux and workplace anxiety: Personal and interpersonal consequences of understaffing in UK ultrasound departments. Radiography 2018
4. Sloane C, Miller PK. Informing radiography curriculum development: The views of UK radiology service managers concerning the 'fitness for purpose' of recent diagnostic radiography graduates. Radiography 2017;23:S16-S22
5. Society and College of Radiographers. Direct entry undergraduate ultrasound programmes (with competency to practise): A briefing from the society and college of radiographers. London: SCoR; 2013
6. Waring L, Miller PK, Sloane C, Bolton GC. Charting the practical dimensions of understaffing from a managerial perspective: The everyday shape of the UK's sonographer shortage. Ultrasound 2018;26:206-213

P231 **A two-year evaluation of a direct-entry postgraduate ultrasound programme: Mapping the student experience**

Lorelei Waring; Gareth Bolton; Shelley Smart; Charles Sloane; Paul Miller
University of Cumbria

Background: A progressive shortage of qualified clinicians within the UK's public ultrasound departments has been documented for some time[2], as have the organisational, physical and psychological consequences for departmental managers and working sonographers themselves[1,3,6]. Extant strategies to enhance recruitment from traditional graduate cohorts (typically diagnostic radiography) have, to date, barely kept pace with wastage. Consequently, new direct-entry programmes have been necessitated[5]. This presentation reports findings from an evaluation of one of the UK's first postgraduate direct entry programmes, with a particular focus on student experience within the first cohort.
Methods: A thematic analysis informed by a Straussian model of Grounded Theory was employed[4]; semi-structured interviews with N=5 participating students with a variety of graduate backgrounds were conducted at the end of the first and the second year of the programme.
Results: Five Global themes emerged: (a) The perceived and real benefits of prior undergraduate anatomical/biological education; (b) The perceived and real benefits of prior clinical experience in any field; (c) The demands of a placement-oriented programme and the importance of a clinical coordinator; (d) Balancing academic achievement with clinical objectives, and; (e) Concerns regarding lack of HCPC registration.
Conclusions: It was clear that many of the academic and practical worries articulated by participating students at the end of their first year had evaporated by the end of the second. Equally, adaptations were rapidly made to the demands of placement work where it was a new experience. Managing clinical objectives and lack of HCPC registration, however, remained concerns to the end.

1. Bolton GC, Cox DL. Survey of UK sonographers on the prevention of work related muscular-skeletal disorder (WRMSD). J Clin Ultrasound 2015;43:145-152
2. Migration Advisory Committee. Skilled shortage sensible: Full review of the recommended shortage occupation lists for the UK and Scotland, a sunset clause and the creative occupations. London: Migration Advisory Committee; 2013
3. Miller PK, Waring L, Bolton GC, Sloane C. Personnel flux and workplace anxiety: Personal and interpersonal consequences of understaffing in UK ultrasound departments. Radiography 2018
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5. Society and College of Radiographers. Direct entry undergraduate ultrasound programmes (with competency to practise): A briefing from the society and college of radiographers. London: SCoR; 2013
6. Waring L, Miller PK, Sloane C, Bolton GC. Charting the practical dimensions of understaffing from a managerial perspective: The everyday shape of the UK's sonographer shortage. Ultrasound 2018;26:206-213

P232 **Expanding the use of simulation and normal volunteers in ultrasound education**

Gillian Coleman; Heather Venables; Rebecca Evans; JP Mayes
University of Derby

The use of simulation and normal volunteers has been well utilised in ultrasound education. Simulation is well established in education and is well recognised as aiding in early ultrasound scanning skill development. The scanning of normal volunteers has been restricted to non-pregnant volunteers in accordance with BMUS guidelines on the use of volunteers for teaching purposes. There has been an increased focus on training more practitioners to undertake third trimester obstetric ultrasound scans due to increased demands on obstetric departments. This has led to the development of guidelines and governance procedures for the use of normal pregnant volunteers in consultation with the BMUS safety group.
Pregnant patient volunteers recruited from the local Obstetric ultrasound department have been utilised during the Obstetric module academic teaching on the University campus to enhance and embed practical learning within the academic practice. Student feedback has been extremely positive on the first uses of normal pregnant volunteers on the university campus and this has led to further development of the curriculum to reflect this for future cohorts.

P233 **The appropriateness and accuracy of information provided on ultrasound (US) requests in the deep venous thrombosis (DVT) service for suitable vetting and justification**

Andrew Swali; Catrin Barwick; David Chandler
Betsi Cadwaladr University Health Board

Accuracy of clinical details is essential to streamline vetting and justification of scans which allows the patient to be accurately allocated to the 'Likely' or 'Unlikely' DVT pathway. Inadequate information causes inappropriate and unnecessary scans to be performed in an already overly-burdened NHS DVT US service. The aim of this audit was to assess the accuracy and appropriateness of information provided by clinicians on DVT US requests to guide suitable vetting and justification by sonographers and/or radiologists.
Using an audit live template from the RCR, 50 ultrasound requests were retrospectively reviewed. In conclusion it was found that insufficient information was provided on request forms. This led to ambiguous justification of requests. An increased number of scans in an already burdened ultrasound service.

Recommendations for improvement included electronic requesting, a "Suspected DVT" pathway and referral form with specific questions tailored for the requester including Wells Score, treatment and D-Dimer, posters in clinical areas highlighting the NICE guidelines to requestors, education to practitioners for appropriate justification of requests and a re-audit in 12 months. Implementing recommendations will reduce the number of inappropriate requests, and allow for correct justification.

1. Müller-Bühl, U., Leutgeb, R., Engeser, P., Achankeng, E.N., Szecsenyi, J. and Laux, G., 2012. Varicose veins are a risk factor for deep venous thrombosis in general practice patients. Vasa, 41(5), pp.360-365
2. Sweetland, S., Parkin, L., Balkwill, A., Green, J., Reeves, G. and Beral, V., 2013. Smoking, Surgery, and Venous Thromboembolism Risk in Women: UK Cohort Study. Circulation, pp.CIRCULATIONAHA-113
3. Goodacre, S., Sampson, F., Thomas, S., van Beek, E. and Sutton, A., 2005. Systematic review and meta-analysis of the diagnostic accuracy of ultrasonography for deep vein thrombosis. BMC medical imaging, 5(1), p.6
4. Wells, P.S., Anderson, D.R., Rodger, M., Forgie, M., Kearon, C., Dreyer, J., Kovacs, G., Mitchell, M., Lewandowski, B. and Kovacs, M.J., 2003. Evaluation of D-dimer in the diagnosis of suspected deep-vein thrombosis. New England Journal of Medicine, 349(13), pp.1227-1235
5. Baglin, T.P., Keeling, D.M., Watson, H.G. and British Committee for Standards in Haematology, 2006. Guidelines on oral anticoagulation (warfarin): - 2005 update. British journal of haematology, 132(3), pp.277-285
6. Howard, L.S. and Hughes, R.J., 2013. NICE guideline: management of venous thromboembolic diseases and role of thrombophilia testing. Thorax, 68(4), pp.391-393

P234 I don't understand - setting communication standards in ultrasound

Lynne Williams
InHealth Group

Background: Effective communication is essential in all aspects of healthcare. Ensuring that patients understand the process of their appointment, and what will occur, has a positive impact on the efficiency of the appointment; the quality of the scan; the experience of the patient and is critical to informed consent.

Purpose: This project was instigated because of an analysis of all ultrasound related complaints over a 12-month period. It was discovered that 58% of complaints were communication related. A project was begun to improve the communication skills of all clinical staff involved in the ultrasound service. This was accomplished with a series of practical workshops and reflective practice.

Content: This poster looks at the different ways that we communicate with our patients, to raise awareness and perception of communication and how to improve those skills. Also, to analyse our personal reactions and responses to patients and to reflect on how patients perceive us. The poster looks to assess how stresses occur during appointments and how complaints may occur. Finally, to consider how good communication contributes to the overall quality of the ultrasound service.

1. Booth Lisa A Manning David J (2006) Observations of radiographer communication: An exploratory study using Transactional Analysis. Volume 12, Issue 4, Pages 276 282
2. Brinkert, R (2010) Journal of Nursing Management 18, 145 A literature review of conflict communication causes, costs, benefits and interventions in nursing education"
3. Teresa L.Thompson, Jeffrey D.Robinson, and Dale E. Brashers (1994) "Interpersonal Communication and Health Care" Journal of nursing management - Wiley Online Library

P235 Interpretation and reporting of the initial chest x-ray (cxr) done in a&e on admission: clinician vs radiology

Yasmeen Zaki; Mihaela Ene; Davis Thomas
Northampton General Hospital

Background: Chest X-rays are pivotal for diagnosing chest diseases. Correct interpretation by the medical team and their reference back to the formal Radiology reports are very important in safely providing the correct diagnosis. Objectives are to outline if there are major discrepancies between the interpretation of CXR done in A&E between the medical doctors and the formal Radiology report. Re-audit and compare the turnaround times for CXR reports and the documentation of these reports in the patient notes.

Method: This is a closed-loop prospective audit. Data collection was from the electronic reports of the CXR and the junior doctor and consultant interpretations on the admission proforma; analysis was done using SPSS 16. Standards by the Royal College of Radiologists were used to audit and re-audit against.

Results: A total of 103 samples were included. 51% of reports were issued within the same week compared to 33% from the previous audit. No significant discrepancies were noted between the medical team and the Radiology report. 9.8% of clinicians documented the Radiology report in the patient notes compared to 5.8% previously.

Conclusion: The turnaround time for reporting of CXRs continues to improve and is now within one week due to efforts to improve by increasing staff numbers in Radiology and outsourcing. No significant discrepancies were noted between the medical team and the formal Radiology report. Most of the clinicians did not document the Radiology report in the patient notes. This could lead to missing discrepancies and potentially affecting patient safety.

1. Cayetano KT. (2012) AN eight-year-old radiographic abnormality. Chest. Oct 1;142(4_MeetingAbstracts):576A–576A
2. Johnson ER, Matthay MA. (2010) Acute Lung Injury: Epidemiology, Pathogenesis, and Treatment. J Aerosol Med Pulm Drug Deliv. Aug;23(4):243–52
3. Medical Benefits Reviews Task Group, Diagnostic Imaging Review Team. Review of Funding For Diagnostic Imaging Services: Final Report. Department of Health and Ageing; 201
4. Porcel JM, Light RW. (2006) Diagnostic approach to pleural effusion in adults. Am Fam Doctor. Apr 1;73(7):1211–20
5. Solomon CG, Wunderink RG, Waterer GW. (2014) Community-Acquired Pneumonia. N Engl J Med. Feb 6;370(6):543–51

6. The Royal College of Radiologists (2006) Standards for the reporting and interpretation of imaging investigations. RCR, London 7. The Royal College of Radiologists (2010), Standards for a results acknowledgement system. RCR, London 8. Ware LB, Matthay MA. (2005) Acute Pulmonary Edema. N Engl J Med. Dec 29;353(26):2788–96

P236 A pictorial visualisation of optimal imaging technique during radiographic investigation of Non Accidental Injury (NAI) skeletal surveys

Kate McIntyre; Fiona Sutherland; Jess Hasson; Lauren Grady
NHS Greater Glasgow and Clyde

Background: The Royal Hospital for Children, Glasgow is a specialist paediatric imaging centre and performs a high percentage of the Child Protection Non Accidental Injury (NAI) imaging cases for Scotland. Rising numbers of NAI imaging examinations makes it more vital than ever that radiographers ensure optimal radiographic technique throughout these cases. The implementation of the new Royal College of Radiologists (RCR) guidelines at our hospital has seen the introduction of several new views and it was felt that this would be the optimal time to produce an informative NAI imaging poster[1].
Purpose: We aim to provide a pictorial visualisation of positioning techniques for radiographic investigation of NAI. Included will be a number of step by step photographs demonstrating high quality positioning technique for radiographic NAI examinations. The photographs will depict anatomy immobilised in optimal radiographic imaging positions and will include all views currently recommended by the RCR. Each anatomical image will be accompanied by a corresponding radiographic image. The poster will also include a "Top Tips Section" to include topics such as immobilisation and distraction methods.
Summary: Through the use of photographs and radiographs this poster will provide an easy to understand pictorial demonstration of high quality positioning techniques.

1. The Royal College of Radiologists (2017) The radiological investigation of suspected physical abuse in children

P237 Assessing set-up accuracy and reproducibility in rectal cancer patients - is routine CBCT verification imaging required?

Katie Perkins; Ruth McLauchlan; Riz Ahmad; Dolan Basak; Katy Gillard; Kitrick Perry; Pippa Riddle; Susan Cleator
Imperial College Healthcare NHS Trust

The routine clinical use of Cone Beam CT (CBCT) for on-treatment image verification is increasing. Our Department has demonstrated clear benefit for the 3D volumetric information obtained from CBCT, where the soft tissue structure clinical target volumes can be seen, as opposed to planar imaging, where the bony anatomy must be used as a surrogate for their position, in a number of pelvic cancer sites. As in other pelvic cancers, the position of the Clinical Target Volume (CTV) for rectal malignancies can be affected by rectal and bladder filling which cannot be observed with kV planar imaging.

Table 1

	AP	SI	LR
Population Σ [cm]	0.14	0.12	0.12
Population σ [cm]	0.20	0.22	0.27
Van Herk Margin [cm]	0.49	0.45	0.49

An evaluation of the use of CBCT imaging was performed for 15 rectal cancer patients. Patients received CBCT imaging on fractions 1-3 and weekly thereafter. An auto-bone match was performed followed by a manual check ensuring the CTV was within the Planning Target Volume (PTV). The data collected in this study, from 94 CBCT images, was used to determine our systematic and random set-up errors[1], assess our CTV-PTV margins (Table 1), and the need for CBCT imaging to become routine practice for these patients.
Our systematic and random errors compare well with published data[2,3], and the resulting margins using the van Herk recipe[4] were within the Departmental protocol of 1.0cm. Two patients had bowel preparation issues identified on their CBCT images but the CTV was covered by the PTV following a bony match in all cases. Therefore the routine use of CBCT for this site is under discussion.

1. (2008) On Target: Ensuring Geometric Accuracy In Radiotherapy. A joint report published by the Society and College of Radiographers, the Institute of Physics and Engineering in Medicine and The Royal College of Radiologists
2. Kleijnen, J.-P. J. E., et al. (2018) Does setup on rectal wall improve rectal cancer boost radiotherapy? Radiation Oncology, 13 (1), 61
3. Chong, I., et al. (2011) Quantification of Organ Motion During Chemoradiotherapy of Rectal Cancer Using Cone-Beam Computed Tomography.International Journal of Radiation Oncology Biol. Phys., 81 (4), e431-e438
4. van Herk, M. et al. (2000) The probability of correct target dosage: dose-population histograms for deriving treatment margins in radiotherapy.Int. J. Radiation Oncology Biol. Phys., 47(4), 1121-1135

e001 **How can we make a consultant post more appealing to radiology trainees?**
Siane Davies [1]; Christopher Cook [2], [1]University Hospitals Bristol NHS Foundation Trust; [2]Weston General Hospital

e002 **A survey exploring personalised medicine among radiography academics within the United Kingdom**
Jerome Atutornu [1]; Christopher Hayre [2], [1]University of Suffolk; [2]Institute of Applied Technology, Abu Dhabi

e003 **Peer-to-peer buddy support for student radiographers**
Sophie Willis; Jane Harvey-Lloyd, University of Suffolk

e004 **Patient focused informed consent in an imaging department**
Paula Merry; Kirti Thakor, Paul Strickland Scanner Centre

e005 **Email helpline for non-urgent radiological advice - experience in North Wales**
Johnson Chen; Conor Corr; Praveen Govind, Betsi Cadwaladr University Health Board

e006 **Reporting the reported - an analysis of the incidents for a hospital-based MRI unit**
Apollo Exconde; Bernard Walter, InHealth Ltd - Croydon University Hospital

e007 **Initiation of inter-departmental management of malignant ascites in a tertiary centre - a quality improvement project**
Siona Growcott [1]; Hannah Lyons [2]; Helena Barton [1]; John Hughes [1]; Huw Roach [1]; Lorna Hawley [2], [1]Bristol Royal Infirmary; [2]Bristol Haematology and Oncology Centre

e008 **Improving imaging workflow in a clinical trials setting**
Stephen Gallagher, The Christie NHS Foundation Trust

e009 **Dual energy imaging - technical approaches, protocol optimisation and clinical applications**
Wei Liang Hong; Chidambaram Viswana Anad, Singapore General Hospital

e010 **The role of 4D CT in diagnosing and guiding treatment of hyperparathyroidism**
Oliver Czarnecki; Alastair Oakes; Sanjin Idriz, Royal Surrey County Hospital

e011 **High density contrast mimics causing interpretation error: A pictorial review**
Charlotte Jones; David Shatti; Garrett McGann, Cheltenham General Hospital

e012 **Clinical audit on the appropriateness and accuracy of information provided on ultrasound requests in the deep venous thrombosis service for suitable vetting and justification**
Haisum Qayyum; Preeti Arora; Navin Khanna, Pennine Acute Hospital Trust

e013 **CT scan of the mandible: Dose optimisation in practice**
Suzannah Patel [1]; Andrew Shah [2]; Cherith Desmeules [1]; Paula Merry [1]; Subhadip Ghosh-Ray [1], [1]Paul Strickland Scanner Centre; [2]East and North Hertfordshire NHS Trust

e014 **Dose comparison of three Computed Tomography (CT) scanners**
Suzannah Patel; Rachael Bowie; Vicki Major; Andrew Gogbasian; Andrew Shah, Paul Strickland Scanner Centre

e015 **Are we adequately completing pregnancy questioning prior to radiographs that expose the developing foetus?**
Yasser Al-Obudi [1]; Nicholas Reading [2]; Markus Abdulrehman [2]; Hasanein Al-Hasani [3], [1]West Hertfordshire Hospitals NHS Trust; [2]Barts Health NHS Trust; [3]King's College Hospital

e016 **Rebooting Lu-177 DOTATE therapy for NETs: Balancing dosimetry vs additional imaging**
Jacqueline Roberts, Leeds Teaching Hospitals

e017 **A re-audit of trends in MSK shoulder ultrasound referral**
Yashoda Gurung Koney; Frederick Barber; Geeta Kapoor; Richard Goodwin, Norfolk and Norwich University Hospital

e018 **Shoulder hydrodilatation, an effective treatment option for adhesive capsulitis: outcomes over a 2 year period from a district general hospital**
Snehansh Chaudhary; David Gendy; Ynyr Morus Edwards; Gary Rosbotham-Williams, Warrington and Halton Hospitals NHS Trust

e019 **What's outside the box? Clinically relevant findings outside the spine on spinal MRI**
Bankolu Alo [1]; Kemi Alo [2]; Hyeladzira Thahal [3], [1]St George's University of London; [2]Royal Orthopaedic Hospital Birmingham; [3]Great Western Hospitals NHS Foundation Trust

e020 **Using abbreviated MR protocol in suspected cases of cauda equina; a simple solution to reduce scanning time**
Afshin Nasoodi, EMA Diagnostics Dublin

e021 **Causes of chronic foot pain: A radiological review**
Fatima Ahmed; Khizer Rana, Sandwell & West Birmingham Hospitals NHS Trust

e022 **A review of NICE guidelines for radiological imaging in head and neck trauma**
Fatima Ahmed [1]; Inderbir Jassel [2]; Khizer Rana [1]; Rehaan Nensey [1], [1]Sandwell & West Birmingham Hospitals NHS Trust; [2]Medacs Healthcare

e023 **Deep Face Mine: Exploring the pterygopalatine fossa and its pathological significance**
Lucy Hilder, University Hospitals Bristol

e024 **Kimura disease from Asia to Europe and beyond: A challenge for radiologists**

Stavroula Theodorou [1]; Daphne Theodorou [2]; Yousuke Kakitsubata [3]; Sachiko Kakitsubata [4]; Yuko Miyata [3]; Daian Takehiro [3], [1]University Hospital of Ioannina, Greece; [2]General Hospital of Ioannina, Greece; [3]Miyazaki Konan Hospital, Japan; [4]Miyazaki Shiminnomori Hospital, Japan

e025 **Improving patients' experiences of radiotherapy using co-design**
Russell Fitchett; Lucy Fitchett; Alex Martin, Norfolk & Norwich University Hospital Foundation Trust

e026 **Rosai-Dorfman disease (sinus histiocytosis): Nodal and extranodal manifestations of disease with long-term follow up**
Stavroula Theodorou [1]; Daphne Theodorou [2]; Savvas Tsigas [2]; Thomas Tzimas [2], [1]University Hospital of Ioannina, Greece; [2]General Hospital of Ioannina, Greece

e027 **An evaluation of the role of imaging in the diagnosis of boxing related chronic traumatic encephalopathy**
Joseph Connor [1]; Zainab Hussain [2]; Dean Harris [2], [1]Knowlsey and St Helen's Hospital Trust; [2]Department of Diagnostic Radiography

e028 **Appropriateness of the addition of CT c-spine imaging in the context of trauma CT head examinations**
Leon Sergot; Toby Hall, Royal United Hospital Bath

e029 **Listeria encephalitis: Dreaded manifestations of serious CNS infection**
Stavroula Theodorou [1]; Daphne Theodorou [2]; Soultana Papadopoulou [1]; Vasilios Gogos [1]; Anna Gotsi [2]; Avraam Ploumis [2], [1]University Hospital of Ioannina, Greece; [2]General Hospital of Ioannina, Greece

e030 **MR imaging evaluation of cranial nerve III (oculomotor) palsy from brain to the eye**
Stavroula Theodorou [1]; Daphne Theodorou [2]; Soultana Papadopoulou [2]; Vasiliki Tzeliou [2]; Anna Gotsi [2]; Avraam Ploumis [1], [1]University Hospital of Ioannina, Greece; [2]General Hospital of Ioannina, Greece

e031 **Pareidolia in intepreting imaging: Recognising the need to recognise**
Surina Taneja [1]; Vignesh Gopalan [1]; Sundip D, Udani [2], [1]University College London; [2]National Hospital for Neurology and Neurosurgery

e032 **Implementation of BrainLab ExacTrac imaging with Stereotactic Radiosurgery (SRS) for patients with cancer of the brain and brain metastasis**
Clare Knee; Deborah Thornberry; Bansi Mulji-Shah; Diana Grishchuk; Mark Chan; Robert Richardson; Jonathan Nelson; Matt Williams; Alison Falconer; Waqar Saleem; Mark Elsworthy; Katie Perkins, Imperial College Healthcare NHS Trust

e033 **Paediatric CT brain imaging in non head injury**
Alexander Johnson; Shalini Nandish; Soraya Hachemi; Camilla James, Calderdale and Huddersfield NHS Foundation Trust

e034 **Breast planning without couch angles**
Anthi Alexandrou; Natasa Solomou; Ghafour Hallaji Zahmatkesh; Sarah Betts, Norfolk & Norwich University Hospitals NHS Foundation Trust

e035 **NHS breast screening programme - can we safely reduce our clinical recall rate?**
Jennifer Birtchnell; Gillian Hutchison, Manchester University Foundation Trust

e036 **National optimal lung cancer pathway audit - early experience at a major acute care centre**
Jacob Whitworth; Toby Hall, Royal United Hospitals Bath

e037 **Radiographer-led target volume definition for SABR lung patients**
Alex Martin; Russell Fitchett, Norfolk & Norwich University Hospital Foundation Trust

e038 **RapidArc with avoidance sectors for the treatment of lung and oesophagus cancers**
Nilesh S Tambe [1]; Craig Moore [1]; Isabel M Pirce [2]; Raharshi Roy [1]; Sanjay Dixit [1]; Andrzej Wieczorek [1]; Nabil El-Mahdawi [1]; Sunil Upadhyay [1]; Andrew W Beavis [1], [1]Hull and East Yorkshire Hospitals NHS Trust; [2]Faculty of Health Sciences, University of Hull

e040 **CT-Guided percutaneous Lung Biopsy: Lessons from a completed audit cycle**
Nardia Poole [1]; Guven Kaya [1]; Hatef Mansoubi [2], [1]Brighton and Sussex NHS University Trust; [2]Western Sussex Hospitals NHS Trust, St Richard's Hospital

e041 **When push comes to shove - identifying pathology on plain radiographs based on the movement of structures**
Susan Hesni [1]; Ali Vahedi [2], [1]Imperial Radiology; [2]Liverpool Deanery

e042 **Systemic sclerosis (scleroderma): Cardiac MR imaging manifestations**
Stavroula Theodorou [1]; Daphne Theodorou [2]; Dimitrios Rizos [2]; Thomas Tzimas [2], [1]University Hospital of Ioannina, Greece; [2]General Hospital of Ioannina, Greece

e043 **Impact of advanced practice CT colonography role development on service provision**
Louisa Edwards, ABMU Health Board

e044 **Advanced practice CT colonography radiographer reporting audit**
Louisa Edwards, ABMU Health Board

e045 **Improving the patient experience by modifying CT colon pre-procedure information within an Advanced Practice Radiography role**

Louisa Edwards, ABMU Health Board

e046 **The diagnostic yield and rate of alternate diagnosis when using CTKUB to assess acute renal colic**
Emily Smith; Amna Ahsan; Rehaan Nensey, Sandwell and West Birmingham NHS Trust

e047 **Evaluating positive CT-KUB findings with referrer speciality: Is there a link?**
Sarus Jain [1]; Emily White [2], [1]Royal Blackburn Hospital; [2]East Lancashire Hospitals NHS Trust

e048 **Prostate MRI reporting: Do we include the necessary information required by PI-RADS 2?**
Victoria Jackson; Suraj Amonkar; Shyam Sunder; Michael Adeleye, Pennine Acute Hospitals Trust

e049 **The radiological spectrum of renal and extra-renal complications in patients on long-term haemodialysis**
Manaswini Choudhary; Manish Gupta; Chooi Oh, Royal Preston Hospital

e050 **Barriers to discussing erectile dysfunction in men having hormone-radiotherapy for prostate cancer**
Philip Reynolds, Clatterbridge Cancer Centre

e051 **Renal stones disease**
Nora Alohaly, Glasgow Caledonian University

e052 **Radiology investigation in malignancy induced hyponatremia**
Morteza Afrasiabi; Neda Noroozian; Nick Watson, University Hospitals of North Midlands

e053 **A case for reducing palliative bladder radiotherapy margins**
Rachel Brooks; Rachel A Pearson; Karen Pilling; Bethany Ormston; Ian Pedley; John Frew; Rhona McMenemin, Newcastle upon Tyne Hospitals

e054 **Visualisation of the fetal bowel on antenatal and post mortem magnetic resonance imaging scans**
Georgia Hyde [1]; Andrew Fry [2]; Elspeth Whitby [1], [1]University of Sheffield; [2]Sheffield Teaching Hospitals NHS Foundation Trust

e055 **HELLP!! Radiology HELLP!! A case report of hepatic rupture due to HELLP syndrome**
Thevarajah Viyasar; Manish Gupta, Royal Preston Hospital

e056 **Blurred lines: A pictorial review of vascular access catheter placement**
Isabel Cornell; Aisling Fagan; Sara Ffrench-Constant; Samir Mahboobani; Neeral Patel; Edward Barden, Imperial College Healthcare NHS Trust

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