

THE UK RADIOLOGICAL CONGRESS



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The British Institute of Radiology,
The College of Radiographers and
The Institute of Physics & Engineering in Medicine

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Georgina Devenish, Royal Glamorgan Hospital



Clinical: Musculoskeletal

P001 Audit on open access MRI for General Practitioners

Krishanantham Ambalawananer; [Misha Kathirgamanathan](#)

Ipswich Hospital NHS Trust

Open access to MRI Knees was started at Ipswich Hospital in 2009. It was implemented to aid the management of patients with knee problems in primary care and reduce secondary care referrals. Since 2009 we have noted a significant increase in GP requests for MR Knee, with 586 referrals in 2013. Current hospital guidelines advise that MRI Knees should be instigated in patients under 50 years with chronic knee pain and patients greater than 50 with normal plain X-rays. This audit is designed to see how many requests adhere to clinical guidance and allows the department to become a more efficient and cost-effective. We collected data over January to April 2013, looking at 36 patients in total. Our results highlighted that 14/36 (39%) of referrals did not follow the referral criteria. The majority of MRI requests were for patients over 50 (55%). Although 60 % of them had a previous X-ray that showed degenerative changes, they still went on to have an MRI, which merely confirmed the diagnosis of osteoarthritis. 5/20 (25%) of patients over the age of 50 did not have a previous plain film.

Conclusion: MRI is invaluable in the diagnosis of meniscal and ligamentous tears. However it is more beneficial in those under the age of 50 and patients aged above 50 with a Normal X-ray.

P002 Radiation dose comparison of CBCT and CT extremity scans

[Veronique Sauret-Jackson¹](#); [Amanda Smith¹](#); [Maria Cavadas¹](#); [Shahed Khan²](#)

Cavendish Imaging Ltd¹; Radiation Consultancy Services Ltd²

Objectives: The purpose of this study was to compare the radiation dose delivered to the patient for two modalities in Computed Tomography during scanning of extremities: conventional CT [CT] and Cone Beam CT [CBCT].

Methods: The Dose Length Product [DLP] readings from the NewTom 5G CBCT scanner and the GE VCT conventional CT scanner were recorded for the following extremity examinations: elbow; wrist, knee, ankle and foot. The average DLP/Scan Length was calculated for each area of interest and recorded as the score for comparison.

Results: The initial analysis of the scores for each area of interest revealed that the CBCT scores were 76-92% lower than of the scores from the conventional CT scans.

Conclusion: When comparing doses between CBCT and conventional CT scanners using the DLP/Scan Length as the score, the findings of this study suggest that the radiation dose to the patient undergoing an extremity CT scan is significantly higher than that delivered to the patient undergoing CBCT. The CBCT extremity scan score range was 1-2 mGy in comparison to the CT extremity scan score range of 8-20 mGy.

There are many variables to be taken into account when directly comparing CBCT with CT. The CBCT scan should be indicated when the requirement is largely for bone anatomy; for example mal-union and will not show as much soft tissue detail as the conventional CT. Further studies to assess image quality are recommended.

P003 Common arthropathies: A pictorial review of their typical radiographic characteristics and how to differentiate between them

[Saman Zaman¹](#); [Catriona Reid¹](#); [Prateek Malhotra²](#); [Maxine Hogarth¹](#); [Maria Johnson¹](#); [Ajay Sahu¹](#)

Ealing Hospital, London Northwest Healthcare NHS Trust¹; Charles University Faculty of Medicine, Czech Republic²

Introduction: X-rays are first line investigations in evaluation for arthritis and are usually acquired as a baseline test while first presentation in the clinic. It is absolutely vital to correctly assess the inflammatory arthritis from a degenerative process because the treatment is completely different. However it may not be easy as there are overlapping characteristics, subtle findings, and unclear terminology. Therefore, this presentation aims to educate the general radiologist in hopes of improving patient management.



Aims and objectives: The objective of this review is to present a simplified approach to radiographic evaluation of arthritis. This exhibit will provide a practical review and radiographic pictorial of rheumatoid arthritis, gout, pseudogout, psoriatic arthritis, reactive arthritis and some other common seronegative conditions, which are often confused radiographically.

Presentations and imaging findings: We will include pictorial review of typical radiographic characteristics. Findings will be demonstrated and identified by the use of radiographs. We will use an algorithm and flow chart to help in stream lining the diagnosis. Inflammatory arthritis is characterized by bone erosions, osteopenia, soft-tissue swelling, and uniform joint space narrowing. Failure to stratify the underlying mechanisms into degenerative or inflammatory categories can lead to wrong, expensive and improper medical treatment.

Conclusion: Differentiating these arthropathies may not be straightforward task however even for musculoskeletal radiologists it sometimes needs multi-disciplinary meetings with rheumatologists to reach to a consensus. We endeavour to teach the basic steps to formulate a optimum diagnosis by providing the key learning points in interpretation of these common arthropathies.

P004 Ultrasound-guided dry needling and high volume stripping for achilles tendinopathy: Results in our patients group and review of literature

[Catriona Reid¹](#); [Saman Zaman¹](#); [Elliot Rees¹](#); [Prateek Malhotra²](#); [Maria Johnson¹](#); [Ajay Sahu¹](#)

Ealing Hospital, London Northwest Healthcare NHS Trust¹; Charles University Faculty of Medicine, Czech Republic²

Introduction: Chronic Achilles tendinopathy is a common overuse injury. There are several modalities of treatment including autologous blood injection, corticosteroids, high volume stripping and dry needling. There is significant morbidity associated with surgical treatment hence less invasive treatments are favoured these days. Dry needling is a procedure of repeatedly passing a fine needle through the abnormal tendon substance under local anaesthesia. It is done to stimulate an inflammatory response followed by formation of reparative tissue, which strengthens the tendon.

Aims and objectives: We looked into our practice of dry needling and percutaneous high volume stripping of the Achilles tendon as a novel treatment for this condition. Thirty-two patients with sonographically-confirmed Achilles tendinopathy were analysed after their treatment. All were symptomatic for >4 months and have failed alternative conservative treatments. Ultrasound-guided dry needling of neovascular areas and percutaneous high volume stripping was performed by two dedicated musculoskeletal radiologists. Sonographic assessment of the tendon's thickness and neovascularity was undertaken. Pain scores were obtained before and after the procedure for 4 weeks.

Results: 27 out of 32 tendons have been successfully treated and rest are still having their long term follow up. Our combined therapeutic intervention led to a significant improvement in pain scores and most of the patients >85% are satisfied with their outcome.

Conclusion: Dry needling and percutaneous high volume stripping under ultrasound guidance shows promise as an alternative treatment. Patients prefer this treatment as surgery has a longer recovery process and is more invasive with higher risks attached.

P005 Development and validation of a psychometric scale for the visual assessment of AP pelvis image quality

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Purpose: Create and validate a psychometric scale for assessing AP pelvis digital image quality.

Methods: The scale was created following a standard format (Bandura's theory for self-efficacy). An initial pool of items was generated (n=29) and presented to a focus group (radiologists, radiographers and physicists, n=7) for review and modification. Initially the scale was validated using a series of seven AP pelvis phantom images each of known SNR, representing different image qualities. Then the scale was further validated using cadaver images (n=7)



of known and different image qualities. Validation involved 335 participants scoring the cadaver and phantom images using the scale.

Results: Using the scale, participant aggregated mean scores increased with increasing SNR (Phantom - 62.8 to 111.9, $r^2=0.93$; cadaver - 63 to 97, $r^2=95$). Cronbach's alpha revealed scale items were consistent in measuring image quality for phantom and cadaver ($\alpha= 0.8$ to 0.9 ; acceptable $\alpha \geq 0.6$). Factor analysis was conducted to examine how many factors could be extracted. Redundant items were removed because they had low correlation (i.e. acceptable $r=0.2-0.4$) or introduced excessive amounts of error (i.e. $SD \geq 1.5$). A final scale of 24 items was produced. These items had a good inter-item correlation, ≥ 0.2 , and high factor loadings, ≥ 0.3 .

Conclusion: This study represents the first development and validation of a visual image quality scale based on Bandura's theory. The excellent correlation between scale scores and SNR values together with excellent item factor loadings suggests the scale will have value in clinical and research applications.

P006 Does a lower kVp improve visualisation of the trabecular pattern in an anterior-posterior hip projection?

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University of Salford

Rationale: A reduction in bone density is one of the reasons for the increase in incidence of hip fractures within the elderly. Recent studies have shown that for paediatric appendicular projections lowering the tube potential can improve visualisation of fine detail and trabecular pattern. The aim of this study was to assess if such an intervention can improve the visualisation of the trabecular pattern of the proximal femur.

Method: Anterior-posterior hip images were taken using an anthropomorphic pelvic phantom across a range of kVs (40-100). Three regions of trabecular interest were identified and these were scored by five observers against a reference image to evaluate any perceptual changes in trabecular pattern appearance. Regions of interest were also generated for each of the three areas in order to calculate signal-to-noise ratios.

Results: Perceptual changes were noted across a range of kVps. The image at 40kVp was classed as having the highest perceptual image quality for trabecular pattern across all three regions of interest.

Conclusion: Lower kVp may be an option for increasing the visualisation of trabecular patterns during hip radiography.

P007 Can the Genant semi-quantitative scale for vertebral fracture assessment be applied to cervical spine radiographs using CSPINE-CAD?

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Aims/objectives: To determine the accuracy and applicability of the Genant semi-quantitative scale in vertebral fracture classification in the cervical spine.

Content: 47 cervical spine radiographs were collected from patients aged 18 to 50 years. The radiographs were analysed from C3 to C7 using three different methods: CSPINE-CAD software Version 1.0 (two readers); ImageJ DICOM viewer measurements (one reader) and qualitative visual assessment (one reader) by a reporting radiographer. All readers were blinded to the results of the others during the study. Vertebral compression fractures were classified as mild, moderate and severe with classifications of biconcavity, wedge or crush using the Genant semi-quantitative scale. Data were analysed for percentage agreement in STATA V13.1.

Relevance/impact: The Genant semi-quantitative scale may be a useful measure for computer aided detection (CAD), but whilst the methodology is well-researched in thoracic and lumbar spine fractures, its use and accuracy has not been fully investigated in the c-spine.



Outcomes: Agreement between the two operators using CSPINE-CAD (version 1.0) ranged from 33 to 78%. Excluding the mild fracture category improved the agreement to 65 to 89%. All quantitative methods over-classified vertebrae as fractured when compared to visual assessment by the reporting radiographer.

Discussion: The Genant semi-quantitative scale results in an over-classification of c-spine vertebrae as having compression fractures. Agreement between readers using CSPINE-CAD and DICOM measurements were moderate to good. Adapted thresholds are required for quantitative assessment of the c-spine for CAD software development to improve the accuracy of compression fracture detection.

P008 Student radiographer perceptions of using CSPINE CAD software to assist cervical spine image interpretation and diagnosis

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Aim/objective: The aim of this study was to determine the perceptions of student radiographers of cervical spine (CSPINE) computer aided detection (CAD) software for the interpretation of cervical spine lateral radiographs.

Content: Second year medical imaging students were recruited (n=20) and shown 20 images both with and without CSPINE-CAD applied and asked them to rate their confidence on a scale of 1 - 10. Data were gathered using a survey following the image viewing.

Relevance/impact: The cervical spine is a highly flexible part of the spine which is particularly vulnerable to trauma with the potential for long term and life changing disabilities and degenerative change. Up to 20% of cervical spine injuries have a delayed or incorrect diagnosis. Misinterpretation of images is thought to account for 44% of missed cervical injuries.

Outcomes: Students felt more assured when using CPSINE-CAD software to interpret cervical spine X-rays with a 17.5% increase in their confidence level. All participants considered the software to be potentially useful and also felt similar software could be used for other anatomical areas, particularly thoracic and lumbar spines.

Discussion: The qualitative feedback demonstrated an overall positive response to the development of CSPINE-CAD and participants considered the software to be potentially useful; however, potential disadvantages were outlined such as distracting from the satisfaction of search. Further work is required to explore the impact on diagnostic accuracy from using the software.

P009 Are we united in where we stand - the administration of contrast in postoperative spine

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King's College Hospital

Imaging the post-operative Lumbar spine is challenging on most occasions, not only on the basis of different surgical approaches and techniques but also due to the varied appearances post surgery. Apart from interpreting the imaging, acquiring the appropriate images with the ideal MRI sequences remains a challenge. One of the commonly used sequences in imaging the post-operative spine involves acquiring images with Gadolinium. However, there seems to be quite a varied opinion about the use of Gadolinium particularly regarding the timing of these scans, i.e. duration post surgery.

We conducted a survey to obtain the opinion from various radiologists (neuroradiologists, musculoskeletal and other radiologists who report MRI spine) to highlight the differences that exist between and within them regarding the appropriate protocol for imaging the post-operative spine. Emphasis in particular has been given to the period post surgery when radiologists think Gadolinium enhanced images would be useful. A comprehensive review of literature of imaging the post-operative spine is also presented.



P010 A pictorial review of the appearances on magnetic resonance imaging of cervical spine injuries sustained in trauma

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Oxford University Hospitals NHS Trust

Aim/objectives: Magnetic Resonance Imaging (MRI) is an increasingly common modality used in the assessment of cervical spine trauma. It adds important information about soft tissue injuries associated with bony injuries demonstrated on computed tomography (CT). The aim of this pictorial review is to provide an educational tool for the interpretation of MRI of the cervical spine by highlighting common pathologies, and to suggest a systematic approach to the interpretation of the imaging.

Content: We provide a pictorial review of common injuries seen on MRI cervical spine following trauma. For example, this will include anterior and posterior longitudinal ligamentous injury, disc disruption, epidural haematoma, cord contusion, interspinous ligament and ligamentum flavum injury.

Relevance/impact: This will be of use to radiologists, clinicians and any other member of the multi-disciplinary team involved in the assessment of the trauma patient. Recognition of soft tissue as well as bony cervical spine injuries is necessary in order to make decisions about the subsequent treatment.

Outcomes/discussion: Knowledge of the soft tissue injuries that can be sustained in cervical spine trauma and assessed by MRI is important for anyone involved in the patient's care. A systematic approach to MRI of the cervical spine will facilitate ease of recognition of injuries, and help ensure accuracy of reporting.

P011 MRI importance in early detection of musculoskeletal trauma: Occult injuries may be missed on standard trauma CT

[Catriona Reid](#); [Catriona Reid](#), [Saman Zaman](#), [Elliot Rees](#), [Prateek Malhotra](#), [Ajay Sahu](#), [Maria Johnson](#)

Ealing Hospital, London Northwest Healthcare NHS Trust

Aims/objectives: Pan CT is the first line investigation for assessing polytrauma patients including osseous and spinal injuries in United Kingdom. However, CT has its limitations to demonstrate some injury patterns, particularly soft-tissue injuries and bone oedema. In simpler trauma such as fall in elderly MRI, radiographically occult and undisplaced fractures may not be evident even on a CT scan. In this exhibit, we demonstrate greater sensitivity of MRI in context of trauma.

Content: We will explain the use and indications of MRI in acute trauma settings, recognize bone marrow edema and soft-tissue injuries and correlate these findings with other imaging modalities. The key issue is the ability of MRI to successfully detect not only the normal anatomy but also anatomic disruption caused by injury. Successful MR imaging of radiographically occult bone and soft-tissue injuries involving the spine, hip, knee, ankle, wrist (scaphoid), and elbow will be described.

Relevance/impact: Early diagnosis of these injuries can have significant impact on management especially occult fracture neck of femur, scaphoid or distal radial fractures, talar neck or knee injuries. Traumatic knee derangements may include fractures, osteochondral lesions, bone bruise, cruciate and collateral ligament lesions, and meniscal tears. Traumatic spinal injuries may include intramedullary or epidural hematomas, contusions, vertebral fractures, ligamentous disruption and herniated discs.

Outcomes: Early diagnosis by MRI has proved to be a cost-effective and reliable alternative.

Conclusion: MRI involves no radiation and provides increased diagnostic information in musculoskeletal trauma cases, when compared to standard CT.

P012 Traumatic destabilising elbow injuries: What not to miss - what a radiologist should comment upon!

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Ealing Hospital, London Northwest Healthcare NHS Trust

Introduction: Early identification of injuries that can lead to elbow instability is critical to guide appropriate management of destabilizing elbow trauma. Functional stabilization of the elbow is provided by three primary and



four secondary structural components eg ulnohumeral articulation, the anterior bundle of the MCL, and the LUCL (lateral ulnar collateral ligament). Disruption of the LUCL has been associated with posterolateral rotational injury (PLRI). The injury mechanism most commonly involves valgus and pronation stresses.

Aims and objectives: Our aim is to improve an understanding of the stabilizing osseous and ligamentous anatomy as well as pattern recognition that predispose to instability. Our goal is to recognize possible ligament injury or secondary signs of instability on X-rays and arranging prompt cross sectional imaging. We will emphasize the fracture or dislocation patterns of elbow injury that may result in instability and their associated mechanisms.

Presentation and imaging findings: We will demonstrate simple dislocation, PLRI, posteromedial rotatory instability, the “terrible triad,” Essex-Lopresti fracture-dislocation and the posterior Monteggia lesion etc discussing the features that impact treatment. We will illustrate the injuries through X-ray correlation with CT and MR imaging including MR arthrography.

Conclusion: We expect that radiologist will be better able to recognize and communicate the salient features of destabilizing elbow injuries to allow appropriate treatment planning. The evaluation of traumatic elbow injuries requires not only the radiographic detection of bone abnormalities but also the inference of potential associated secondary occult bone and soft-tissue injuries that could predispose for chronic joint instability.

P013 Funny fingers

[Nicholas Ridley](#); [Russell Young](#); [Lyn Williamson](#); [James Richie](#); [Shoma Banerjee](#)

Great Western Hospital

Aims/objectives: There are a number of unusual findings in the digits that are seen from time to time in the radiology and rheumatology departments.

Content: The cases include the following: terminal phalangeal sclerosis in rheumatoid arthritis, osteopoikyllosis, bone island, osteoid osteoma, infection, sarcoid, dactylitis, BPOP, thyroid acropachy, thalassemia and congenital/normal variants.

Relevance/impact: Some of these anomalies may cause diagnostic confusion. We have created a teaching folder for reference to these and more common findings.

Outcomes: We will present a pictorial review.

Discussion: It is important for rheumatologists and radiologists to be aware of unusual pathological conditions and normal variants. An e-learning resource is helpful for this.

P014 A retrospective audit of GP plain film lumbar spine referrals

[Lyndon Foster](#)

Warrington and Halton Hospitals NHS Foundation Trust

A retrospective audit of 100 patients referred for lumbar spine radiography was undertaken. This was to determine whether GP's are referring patients for these radiographs in accordance with I-refer and to establish whether the current departmental protocols are in line with I-refer's recommendations. Clinical information was used to determine whether it was justified in accordance with I-refer. A radiologist aided in the decision making regarding which imaging path any unjustified patients should have undergone. The sample was also split into over and under 50 years. For patients under 50 years of age 68% of referrals were unjustified whereas 32% were justified. For patients over 50 years of age 62% were unjustified in comparison to 38% being justified.

Possible explanations for this set of results included local guidelines indicating radiography for non-specific lower back that has been ongoing for 6 weeks or more, as well as some GP resources advocating lumbar spine radiography for query OA. Patient pressure and the low availability of MRI are other considerations.

Departmental protocols for lumbar spine X-rays were reviewed and updated, to be on par with the I-refer guidance and to reduce the number of lumbar spine radiographs performed on patients under 55 for non-specific lower back pain. All GP lumbar spine referrals are vetted for their appropriateness by an experienced radiographer and



generalised staff training in vetting is to be rolled out soon. Local GP surgeries have also been informed of the changes to the referral criteria and are expected to adhere.

P016 MR lumbar spine and knee: Are our GPs referring appropriately?

[Jassie Tan](#); [Satya Pal Singh](#); [Aabha Sinha](#); [Alex Wolinski](#)

The Dudley Group NHS Trust

Aim: To assess appropriateness of GP-referred MRI lumbar spines and knees against published guidelines (iRefer) with a view towards resource optimization.

Relevance: Recent reports suggest "doctors were ideally placed to identify savings and minimise waste in the NHS" and "£200m could potentially be saved by reducing unnecessary scans".

Methods: Retrospective study (July–October 2013). 100 GP referrals each for MRI LS spine and knees included. Data compared against iRefer.

Outcomes: MR was used as the appropriate modality in 98% for lumbar spines. 61% had good correlation between imaging findings and clinical information provided. Large discrepancy was noted in referral patterns. Physiotherapist led centres had better requesting practice.

Only 64.2% MRI knees were appropriate investigations. In 31.6% the clinical details correlated with MRI findings. Of the 16 patients >65, 50% had prior X-ray confirmation of OA, therefore didn't need MRI to aid management. 13/16 (81%) had evidence of moderate or severe OA on MRI; hence MRI yielded no additional value.

Discussion: Whilst the MRI service was appropriately used for lumbar spine imaging, this expensive resource was overused for imaging knees in elderly population with increased reliance on MRI over X-rays. Although in younger patients (>65), most MRI knee referrals were appropriate, in older patients (>65) most scans were potentially avoidable. With the current financial constraints and the need to minimise resource wastage, clearer referral pathways for the elderly in current iRefer guidelines should be introduced. The role of cheaper X-rays as primary imaging modality for OA knees should be reiterated to the commissioners.

P017 Identification and numbering of lumbar vertebrae using various anatomical landmarks on MRI of lumbosacral spine

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*University Hospital, Birmingham*¹; *New Cross Hospital, Wolverhampton*²

Aims: Usefulness of anatomical landmarks in numbering of lumbosacral vertebrae in MR reporting and comparison of outcome results with the published literature.

Content: Prospective study looking at consecutive 100 unreported MRI of lumbosacral spine. These were reviewed by a radiology consultant and a radiology registrar. Five different anatomical landmarks were looked on each MRI scan; aortic bifurcation, origin of right and left renal arteries, conus medullaris, origin of iliolumbar ligament and confluence of inferior venacava.

Relevance: There is prevalence of lumbosacral transitional vertebrae in general population ranging anywhere from 4% to 30%. So it is more important to have an accurate numbering of the vertebral levels to avoid wrong level surgeries causing continued suffering to the patients and litigations to the hospitals.

Outcomes: Our study showed that aortic bifurcation at L4 level (80%) versus literature (83%). The origin of the iliolumbar ligament at L5 level (90%), versus literature (83%). Origin of right renal artery at L1 (54%) versus literature (L1/2 disc level 52%). No study were found in the literature looking at left renal artery origin, our study showed L1 level in 57%. There was variation in the level of conus medullaris and IVC confluence, in comparison with the published literature.

Discussion: The two most reliable landmarks in numbering the lumbar vertebrae in everyday practise in cases of lumbarisation or sacralisation or thoracic vertebral variability are aortic bifurcation and the origin of iliolumbar ligaments.

**P018 Recognising acute calcific tendonitis involving the gluteus maximus and adductor magnus insertion**[Samantha Bee Lian Low¹](#); [Andoni Toms¹²](#)*Norfolk and Norwich University Hospital¹; University of East Anglia²*

Pictorial presentations of four cases of calcific tendonitis with osseous involvement occurring in the hip, in particular the gluteus maximus and adductor magnus.

Calcific tendonitis is a benign, self-limiting pathological process defined by calcium hydroxyapatite crystal deposition in tendons with an unknown aetiology. It occurs in up to 3% of adults, with a peak age of incidence between 30 and 50 years and a female predilection. Calcific tendonitis most commonly affects the shoulder, and in decreasing order of frequency, the hip, elbow, wrist and knee. The disease has three phases: phase 1 (pre-calcification); phase 2 (calcification) and phase 3 (post-calcification). Clinically, patients may be asymptomatic or present with pain, being most symptomatic in phase 2. Other non-specific symptoms include erythema, swelling, painful range of motion, and fever.

Calcific tendonitis is diagnosed when radiographs classically show amorphous calcifications in the soft tissues of the shoulder. However, with adjacent bone involvement on advanced imaging, this disease can be easily misdiagnosed as neoplasm or infection, leading to unnecessary intervention.

We present four cases of calcific tendonitis occurring in the hip, initially investigated for malignancy and infection based on conventional radiography.

Further imaging was necessary to diagnose calcific tendonitis. Where magnetic resonance imaging was equivocal, computed tomography helped to define the soft-tissue calcification and cortical erosion. Our findings reiterate that calcific tendonitis can be safely diagnosed when intratendinous calcification is observed in the region of the linea aspera with cortical erosion or periosteal reaction but no discrete soft tissue mass.

P019 An audit of radiological diagnostic accuracy of rotator cuff tears[Sarah Sharp](#); [Gian Abbott](#)*Countess of Chester NHS Foundation Trust*

The aim was to determine the diagnostic accuracy of departmental US, MR and MRA for rotator cuff tears, by comparing radiological findings with subsequent arthroscopy. The radiological accuracy was compared with the standard set in the 2013 Cochrane systematic review. All 142 departmental scans of the shoulder for 6 weeks from 1st January 2014 were included in the retrospective audit, of these 30 resulted in subsequent arthroscopy.

In 63% the radiological and surgical findings agreed. MR showed a diagnostic accuracy of 82%, MRA 80%. Sensitivity for both modalities was 100%, and specificity 79% for MR and 100% for MRA. The US diagnostic accuracy was 43%, with a sensitivity and specificity of 57% and 71% respectively.

In comparison with the Cochrane meta-analysis the MRA and MRI showed superior sensitivity and specificity; however the accuracy for US was significantly worse, with a difference of 34% for sensitivity and 14% for specificity. Causes for this could include a small sample size and operator inexperience. There was an inbuilt audit bias due to the orthopaedic department often performing their own US, whose results were not included as this would have prevented an accurate audit of our own performance. However there is likely a difference in clinical presentation between the two patient groups, which could have impacted the results.

In order to improve performance, the findings were presented at the local clinical governance meeting, a shoulder US reporting proforma was created, and retraining was provided to US practitioners. A re-audit will evaluate the affect of these measures.

P020 Peritalar fractures: A pictorial review of these subtle foot fractures we don't want to miss[Ajay Sahu](#); [Danielle Parslow¹](#); [Roaya Zuhair¹](#); [Michelle Webb¹](#); [Prateek Malhotra²](#); [Maria Johnson¹](#)*Ealing Hospital, London Northwest Healthcare NHS Trust¹; Charles University Faculty of Medicine, Czech Republic²*



Aims/objectives: Peritalar fracture and dislocation is a potentially devastating injury in which the complications range from chronic pain to subtalar arthritis to talar avascular necrosis. Because of the complex anatomy of the foot, rarity of fractures of the foot, and subtle radiographic findings, and low incidence limit familiarity, foot injuries are commonly overlooked and mis/undiagnosed. Peritalar dislocation represents 1.5% of all traumatic dislocations and 15% of talar injuries.

Content: This pictorial review will present an organized, detailed review of the normal anatomy of the peritalar region with conventional radiography and CT imaging. A review of the associated mechanisms of injury along with treatment will be discussed. These peritalar fractures will be presented: peritalar injuries (talus, calcaneal, navicular, and cuboid fractures as well as subtalar, calcaneocuboid, and talonavicular joint dislocations), transverse tarsal (Chopart) joint injury, talar dome injury, lateral and posterior talar process fractures, and occult calcaneal fracture variants.

Relevance/impact: Because of the effect on hindfoot kinematics, missed or delayed diagnosis of peritalar injuries often results in impairment. If the diagnosis is delayed, salvage arthrodesis may be necessary to restore function to the extremity.

Outcomes: Prompt and accurate diagnosis of peritalar injuries may improve long-term outcomes.

Discussion: Recognizing peritalar fractures provides the radiologist the opportunity in making accurate diagnosis and management. Knowledge of these fractures and injury patterns prevents future misses. Targeted signs and findings that support the presence of these fractures will be described. The importance and necessity of CT for prompt diagnosis will be emphasized.

P021 Audit of emergency department ankle X-ray requests: Can we improve compliance with Ottawa rules and how useful are they?

[Christopher Watura](#); [Simon Odum](#)

Southmead Hospital, North Bristol NHS Trust

Aims: To assess Emergency Department (ED) requests for ankle radiographs against Ottawa rules which are the basis of Royal College of Radiologists guidelines. Then re-evaluate following intervention to investigate any change in compliance and subsequent number of positive investigations.

Content: Complete audit cycle retrospectively reviewing data from a single NHS Trust hospital that is a regional trauma centre where ankle radiographs are requested in ED by Doctors, Extended Scope Practitioners and Triage Nurses. Target compliance 100%. Educational intervention involved dissemination of an Ottawa rules algorithm amongst ED practitioners and departmental meeting discussion.

Relevance: Ankle trauma is a common presentation to ED. Although radiographs are requested in most cases, less than 15% being positive for fracture prompted development of the 1992 Ottawa rules.

Outcomes: Cycle 1: 68%(68/100) request forms met standards. 10%(7/68) that met standards and 46%(15/32) that did not (totalling 22) were reported as positive. Cycle 2: 82%(82/100) request forms met standards. 15%(12/82) that met standards and 50%(9/18) that did not (totalling 21) were reported as positive.

Discussion: We highlighted a need to increase ED practitioners' compliance with Ottawa rules. Our intervention was somewhat successful in achieving this. However, the proportion of positive investigations remained similar overall and in both cycles was higher in requests that did not meet standards. More research is needed to evaluate the value of Ottawa rules.

P022 Metal artefact reduction sequences in MR imaging of orthopaedic implants

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Norfolk and Norwich University Hospital



Objective: To discuss the cause of metal artefacts around orthopaedic implants in magnetic resonance (MR) imaging and review conventional methods of metal artefact reduction as well as the dedicated multispectral metal artefact reduction sequences available.

Content: Metallic orthopaedic implants can result in severe degradation of MRI images because ferromagnetic susceptibility causes signal loss, signal pile up, failed fat suppression and geometric distortion. Several methods can be employed to try and reduce these susceptibility artefacts. Fast spin echo techniques can be adjusted by modifying echo times, matrix, receiver bandwidth, slice thickness and echo train to minimize frequency encoding misregistration. Short tau inversion recovery and Dixon techniques are more resistant to susceptibility artefact than spectral fat suppression. Dedicated metal artefact reduction sequences are also available in which frequency encoding misregistration is controlled using a variety of techniques including specific resonant frequency acquisition, view-angle tilting and phase encoding.

Relevance: Imaging around metal implants has been essential to understanding the severity and prognosis of adverse reaction to metal debris in metal on metal hip replacements. Conventional radiography is often normal or demonstrates minimal change and is unable to demonstrate the often extensive soft tissue pathology such as necrosis, soft tissue masses, fluid collections, muscle atrophy, tendon avulsions and osteonecrosis. Due to poor correlation of MRI findings and clinical and serological measures of disease MR imaging is the principal tool for the diagnosis and surveillance.

Outcome: To provide a learning tool and update on conventional and multispectral techniques for optimum MR imaging around orthopaedic implants.

P023 The 'moustache sign': An extremely rare radiological sign of ankylosing spondylitis

[Laura Sweeney](#); [Barry O'Neill](#)

Mater Misericordiae University Hospital

Ankylosing spondylitis (AS) is a chronic inflammatory seronegative arthritis affecting the axial skeleton, particularly the sacroiliac and spinal-facet joints and the paravertebral tissues. The radiographic features of AS are diverse and may be seen by plain radiograph (XR), computed tomography (CT) and magnetic resonance imaging (MRI). The 'moustache sign' is one such radiographic feature of AS found on thoracic MRI that has been reported by Behari et al.¹ The 'moustache sign' represents intervertebral disc desiccation, fibrosis and panligamentous ossification at a focal intervertebral level. This sign seems to be very rare with only two reported cases ever documented.

Materials/methods: We reviewed all (n=2096) thoracic MRIs performed in our institution from January 2000 until September 2012. We also used HIPE to identify all patients admitted to our institution over 10 years with diagnosis of AS (n=136) and reviewed their radiology.

Results: Out of the 2096 thoracic MRIs that we reviewed, we did not find any that demonstrated the 'moustache sign'. We reviewed the radiology records of 136 patients admitted with AS. Only 40 of 136 had thoracic MRIs done: none of which demonstrated the 'moustache sign'.

Discussion: The 'moustache sign' is extremely rare. From our review of 2096 thoracic MRIs, we did not find any evidence of such a sign. Out of 136 patients with AS presenting to our institution over twelve years, most AS patients did not require a thoracic MRI. There are only two documented cases of it to date.

1. Behari S, Tungeria A, Jaiswal AK, Jain VK. The "moustache" sign: localized intervertebral disc fibrosis panligamentous ossification in ankylosing spondylitis with kyphosis. *NeuroIndia*. 2010 Sep-Oct;58(5):764-7.

P024 Fibrodysplasia Ossificans Progressiva - a rare genetic disorder of extra-skeletal bone formation

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University College Suffolk

Introduction: Fibrodysplasia Ossificans Progressiva (FOP), known as Myositis Ossificans Progressiva, Münchmeyer's disease or "Stone Man Syndrome", affects 1 in 2 million people worldwide. In the UK there are 45 known cases. FOP



is a disabling genetic disorder that affects muscles, tendons, ligaments and connective tissues to form/calcify into bone progressively, restricting movement (ifopa, 2009; Kriegbaum and Hillerup, 2013; fopaction, 2014).

Aim: The aim of this poster is to use a case profile approach to inform radiographers about this condition.

Discussion: Frequently, radiographers are the first point of contact with the patients visiting an NHS Trust for the first time. Children who have FOP, typically appear normal at birth. However, it is characterized by the congenital malformation of the great toes, thumbs or both (Kaplan, Chakkalakal and Shore, 2012; Kriegbaum and Hillerup, 2013). During the first decade of life, the children present sporadic episodes of painful soft tissue swellings and bone growth which are commonly mistaken for tumours. Biopsies or surgical attempts to remove the bone, result in more robust bone growth leading to severe disability, pulmonary complications and premature death by the age 50-60 years (Pignolo et al., 2011; Kriegbaum and Hillerup, 2013). There is no known cure for FOP and it is usually misdiagnosed, which could lead to a great deal of pain and suffering for the patients and their families. Increased awareness of this condition would enhance patient care and ensure that a more informed form of treatment can be given in the case of trauma or surgery.

Clinical: Head and neck

P025 Imaging of masses behind the eardrum

[Elfadil Elmahdi](#); [Huw Lewis-Jones](#); [Rebecca Hanlon](#); [Jehan Ghany](#)

University Hospital Aintree

Aims: To discuss the imaging of masses behind the eardrum and give illustrative examples of important differentials.

Content: This is a challenging diagnostic area for the Radiologist. Differentials for masses behind the eardrum include Glomus tumours, Cholesteatomas, invasive head and neck cancers of the middle ear cleft and anatomical variants. Using these examples we will discuss a range of imaging protocols that can be used for investigation of such masses including unenhanced CT scans and contrast enhanced MRI scans. From this, we will then go onto present a protocol for the investigation of middle ear masses.

Relevance: This poster condenses the range of differentials as well as the important aspects of anatomical variants that should be considered by the Clinical Radiologist.

Outcomes: From the discussion and exploration of imaging of masses behind the eardrum we will then go onto to present a protocol for the investigation of such masses.

Discussions: The Clinical Radiologist is often referred patients for investigation who have a mass behind the eardrum. Sometimes this is described as either a reddish blue mass or occasionally a pearly white mass. These masses have a number of differentials ranging from normal variants and benign disease to the more serious malignant pathology. Thus the reporting Clinical Radiologist must have a good understanding of the sorts of pathology that can arise in the area so that the most appropriate imaging modalities can be selected to discern the more serious pathology from the benign.

P026 Assessment of the orthopantomogram and common positioning errors

[Danielle Hogg](#)

Warrington and Halton Hospitals NHS Foundation Trust

The orthopantomogram is currently the most commonly performed extra oral examination. It provides a panoramic overview of the teeth and their supporting structures in a single image, allowing assessment of dental disease, teeth abnormality, trauma and treatment workup.

The development of this technique has resulted in vast improvements in image quality with decreased exposure to radiation and at a low cost. The quality of this examination relies upon the accurate positioning of the patients teeth



and surrounding maxillofacial bone structure. Poor patient positioning can result in a suboptimal image that can subsequently lead to misdiagnosis and the development of an inadequate treatment plan.

Therefore, this poster aims to identify the most common types of positioning errors and to suggest correct techniques. Discussion of how to determine if such positioning errors have occurred will also be included in order to aid radiographic positioning technique.

P027 Image quality and radiation dose in acute CT head: A CT optimisation study of Sinogram Affirmed Iterative Reconstruction (SAFIRE) implementation using phantoms

[Martine Harris¹](#); [John Huckle²](#); [Denis Anthony²](#)

Mid-Yorkshire Hospitals NHS Trust¹; University of Leeds²

Aims/objectives: To determine whether a systematically optimised volumetric CT head protocol with applied SAFIRE has the potential to provide objective and subjective image quality comparable to that of traditional Filtered Back Projection (FBP).

Content: A multi-phased study has been performed that utilises phantoms and simulates the clinical cranial CT head scenario. This study primarily evaluates the influence of decreasing tube current and reconstruction algorithm on traditional objective metrics, the noise power spectrum (NPS) and subjective image quality criteria. Diagnostic confidence and acceptability of optimised cranial image interpretation has been performed in a custom phantom.

Relevance/impact: In principle IR algorithms result in the ability to reduce exposure factors while maintaining or improving image quality. In reality as highlighted by local clinical practice this does not necessarily translate into radiological acceptance for clinical image interpretation. This reflects the complexities that exist exclusively within cranial CT (CCT) with regards to image noise, image texture and reader preferences requiring empirical study.

Outcomes: Compared to the standard reference protocol, increasing strength SAFIRE reconstructions resulted in lower image noise, increased Signal-to-Noise and Contrast-to-Noise Ratios. There was low agreement between observers with regards to subjective low-contrast resolution. ANOVA has been utilised to identify significant differences between imaging protocols for established diagnostic quality criteria.

Discussion: Within the limitations of a phantom study, a methodological approach to SAFIRE implementation with critical image quality investigation has yielded reduced dose, low IR strength diagnostic cranial CT protocols that justify true value verification in a patient cohort.

P028 Sialosis: a modern era condition

[Iara Sequeiros](#); [Susan Armstrong](#)

University Hospitals Bristol NHS Foundation Trust

Objectives: The poster will describe the condition, its aetiology and typical and not so common presenting features. Case examples from our institution will be used to illustrate these.

Relevance and discussion: Sialosis is defined in the literature as chronic bilateral diffuse, non-inflammatory, non-neoplastic swelling of the major salivary glands. Most frequently the parotid glands are involved, but occasionally the submandibular glands and rarely the sublingual glands can be affected. Patients are aged between 30 to 70 years at onset of symptoms; both genders are equally affected.

The enlargement is usually bilateral, symmetrical and painless. However, we report several patients presenting with asymmetric and painful swelling of the parotid glands and sonographic evidence of sialosis.

Causes include diabetes mellitus, endocrine conditions, e.g. pregnancy, alcoholism, liver disease, obesity, chronic malnutrition and eating disorders. Drugs associated with the condition include anti-hypertensives, anti-thyroids and phenothiazines. The pathogenesis is thought to be an autonomic neuropathy.

We suggest that this condition is more prevalent and may have different presentations than previously described. It is the head and neck equivalent of the fatty liver.



P029 So what if its hot? Evaluating incidental PET positive thyroid lesions

[Neena Kalsy¹](#); [Asim Khan²](#); [Alexandra Roberts¹](#)

Royal Liverpool and Broadgreen University Hospital NHS Trust¹; University of Liverpool Medical School²

Aims/objectives: To determine the significance of thyroid lesions showing uptake on PET imaging.

Content: Thyroid nodules are common, however the overall clinical implication of incidental nodules is uncertain, with evidence suggesting a high malignancy risk in PET positive thyroid lesions. Incidental uptake of tracer in the thyroid gland during PET imaging and often leads to further investigation with ultrasound and fine needle aspiration cytology. We have reviewed all cases of PET positive thyroid uptake from January 2013 to August 2014 with data obtained from subsequent ultrasound, FNA cytology and excisional histopathology to review the significance this finding in our centre.

Outcomes/impact: 47 PET positive thyroid lesions were identified, on FDG PET and F18 PET imaging in 46 patients. Uptake was focal, multifocal or diffuse in 29, 6, and 12 scans respectively. Ultrasound was performed in 24/46 (52%) patients overall, with ultrasound rate higher in patients with focal thyroid uptake (62%) compared to multifocal or diffuse change (both 33%). 11 patients had FNA cytology of which 8 were benign (thy2) and 3 were indeterminate (thy 3F). Final histology confirmed 2 follicular adenomas, and no malignant lesions detected. 11 patients with focal uptake did not have US ultrasound performed.

Discussion: 0/47 cases of PET positive thyroid uptake showed malignancy. Provisional data suggests a much lower malignancy rate in incidentally detected PET positive thyroid lesions than published literature. We recognise restrictions to follow up and further work with larger sample size is on-going.

P030 Procurement of a Cone Beam CT Scanner

[Colin Ross](#)

University Hospitals of Leicester

Aims/objectives: A case study description of the different stages involved in gaining approval for the purchase of new piece of X-ray equipment (rather than straight forward like-for-like replacement) – in this case a Cone Beam CT Scanner, in an NHS hospital.

Content: A description of the advantages (to the hospital, patients, and clinicians) of having this sort of scanner e.g. dose reduction, relieving pressure on conventional CT scanners, reducing waiting lists, shorter appointment slots, improving patient flow; a description of the approval process and gateways involved; a timeline; and some reflection on my own learning from having driven forward a business case to procure a Cone Beam CT Scanner.

Relevance/impact: My experiences, and obstacles, are likely to be similar to those of other people trying, or thinking about trying, to gain approval to procure a Cone Beam CT Scanner, or other new technology in an NHS hospital.

P031 An audit to assess compliance with new NICE head injury guidelines

[Sultana Hasso](#); [Sunil Dasan](#)

St George's Hospital

NICE head injury quality standards were newly updated in 2014. Emphasising prompt imaging for those deemed to have life threatening features and introduced a new reporting standard. As part of a busy tertiary London Accident and Emergency, the changes are likely to stretch CT scanner and radiology resources.

The aim is to audit compliance with NICE standards for:

- Time to CT for patients with life threatening features
- CT head reporting times

We conducted a retrospective study over a month of all attendees triaged with “Head injury”. The NICE standard is that 100% of high-risk CT's are performed within 1 hour of risk factor identification, and 100% are reported within 1 hour of CT scan.



196 patients were triaged as “Head injury”, 24% went on to have a CT. 70% of patients with life-threatening signs had a CT within 1 hour of request. With regards to reporting, 79% occurred within 1 hour, those that missed the standard had scans outside of classic working hours.

All patients that missed the 1 hour CT target were within the hours of 9-5 when scanner resources are stretched. Standards for reporting were harder to achieve out of hours, when radiologists are most stretched. None of the requests categorised the urgency of the scan. This highlights the need for all head injury CT’s to be clinically indicated with clear requests that communicate the urgency of the scan; further departmental education and a head injury proforma are being introduced with re-audit to evaluate changes.

Clinical: Neuroradiology

P032 Head injuries in a level 1 trauma centre: Is it safe for radiology trainees to report these scans?

[Alina Denisa Dragan](#); [James Edmund Sarkodieh](#); [Ashok Adams](#)

Barts Health NHS Trust, Royal London Hospital

Background: The demands on Radiology services are increasing, not only in the number of scans and procedures but also through an element of time pressure brought on by new recommendations like the NICE guidelines for head injuries (January 2014).

Aim: Our aim was to determine the incidence and grade of discrepancies in CT scan reporting in head trauma in a busy level I trauma centre.

Methods: We performed a retrospective review of all CT scans done for head injuries over a week, in our hospital. A comparison was made between the provisional report submitted by a trainee (SpR) and the Neuroradiologist’s review the next day. All discrepancies were graded according to the potential and/or actual harm to the patient.

Results: During the week under review, 601 CT scans were reported, 333 of these being emergency scans requested by the A&E department. 66 CT head scans were performed for head injuries. Out of these, we found an overall rate of discrepancies in reporting of 23%, but 15% were negligible (no harm to patient). Two cases had a potentially major discrepancy. In both of these instances, the overlooked findings were on the background of other significant intracranial abnormalities that had been described.

Discussions: The practice of having Radiology trainees reporting CT scans of head injury patients seems to be a safe one even in a busy level I trauma centre. We still advocate prompt consultant review and regular auditing of trainees oncall reporting.

P033 Complex orbit and facial trauma - what you need to know and what you need to look out for

[Tim Skinner](#); [John Adu](#); [Ashok Adams](#); [Amit Roy](#)

Barts Health NHS Trust

Aims: Drawing on our experience of complex facial and orbital trauma cases from a Level 1 trauma centre, the aims of this poster are to:

1. Provide a pictorial review of common facial trauma fracture patterns and their categorisation
2. Provide a pictorial review of common traumatic injuries of the globe of the eye
3. Increase awareness of the potential sequelae of complex of facial fracture

Content:

CT appearances of:

- Zygomatico-maxillary complex fractures
- Naso-orbito ethmoid fractures
- Frontal sinus fractures
- Le Fort I, II and III fractures
- Mandibular Fractures



- Injuries to the lens of the eye
- Globe rupture
- Intra-conal haemorrhage foreign bodies

Relevance: The reporting radiologist must be able to recognise and adequately describe complex facial skeletal trauma, and also be aware of the numerous complications that can be expected to occur.

Discussion: A radiologist must have comprehensive knowledge of facial fracture patterns and their sequelae. Diagnosis, and subsequent surgical management, is vitally important to prevent serious functional impairment, as well as cosmetic deformity. In particular, ocular injuries in association with major trauma may be easily overlooked at a time when life-threatening injuries may take priority. Therefore, vision-threatening injuries may go undetected in the intubated unconscious patient for hours or even days. A significant part of the diagnostic onus may therefore lie with the reporting radiologist on-call. Knowledge of the different types of potential orbital injury and recognition of the associated radiological findings is paramount and might expedite sight-saving as well as life-saving treatment.

P034 The value of MRI brain following negative CT Brain in the acute stroke setting

[Mary-Louise Gargan](#); [Terry Kok](#); [Joyce Kearney](#); [Orla Doody](#); [William Torregiani](#)

Tallaght Hospital, Dublin

Aims/objectives: To determine the value of MRI Brain following negative CT brain in the acute stroke setting.

Content: This was a retrospective study over a 6 month period: 1st January 2014 to 30th June 2014. Patients were selected from the stroke and radiology databases. Inclusion criteria included patients with the clinical findings suggestive of stroke, who had a negative CT, followed by an MRI, within a 24 hour time frame. Review of scans was done by two radiologists in consensus.

Relevance/impact: Our findings demonstrate the importance of MRI Brain in the work up of an acute stroke.

Outcomes: 92 scans were reviewed in total, and of these 75 were included in our study. Scans were excluded when clinical criteria for acute stroke were not fulfilled. There were 40 males and 35 females. Age range 29-86 years with an average age 62 years.

There were 22 positive MRIs in total. 21 were positive for stroke and one MRI was positive for a tumour. There were 53 negative MRIs.

In summary, overall 28% of patients with negative CT's had positive MRI scans for acute stroke and one unexpected tumour.

Discussion: While CT continues to be the gold standard for acute stroke due its rapid access and availability, MRI following negative CT has been shown, from our data, to be of clear value in the diagnosis of acute stroke.

P035 Challenges of diffusion weighted imaging of brain areas with high susceptibility changes

[Yen San Kiew](#); [Xiu Mei Jamie Ho](#); [Tee Meng Tan](#); [Helmut Rumpel](#)

Singapore General Hospital

Background: Diffusion weighted imaging (DWI) of small brain lesions in areas with high susceptibility changes is a clinical challenge with regard to distortion artefacts. Huge susceptibility differences between nearby bony structures, lipids, and surrounding cerebrospinal fluid may arise especially in ultra-high field magnetic resonance imaging systems.

Purpose: The specific aim is to reduce susceptibility artefacts in DWI with in-plane resolution of 1 mm or less by using read-out segmented echo-planar imaging (EPI).

Content: To reduce the distortion artefacts, a good balance of parameters for high resolution DWI-EP is demonstrated when:

- 1) Parallel imaging shortens the EPI-train length at the cost of signal-to-noise ratio (SNR)
 - 2) Read-out segmentation shortens the EPI inter-echo time at the cost of acquisition time, but increases SNR.
-



Taking these interdependencies into account, we use parallel imaging factor of 2 and read-out segmentation of 5 for lesions in the brainstem, but a parallel imaging factor of 3 and read-out segmentation of >5 for orbital lesions.

Discussion: Undesirable distortion effects at the interfaces between tissues of different susceptibility properties in the phase encoding direction causing measurements of the diffusion weighted signal of small brain lesions poses challenges. Reduction of these susceptibility effects can be attained by decreasing the accumulation of the phase errors by using read-out segmented EPI and change in parallel imaging factors. Depending on the location of the brain lesions and careful balancing of the parameters greatly reduces the distortion effects.

P036 Pseudoprogession or true progression? Meta-analysis of post-treatment glioma radiological techniques

[Sarah Abdulla](#); [Stephen Walker](#); [Thankamma Ajithkumar](#)

Norfolk and Norwich University Hospital

Glioblastoma (GBM) is a common brain tumour in adults which, despite multimodality treatment, has a poor median survival. Efficacy of therapy is assessed by clinical examination and magnetic resonance imaging (MRI) features. There is now a recognised subset of treated patients with imaging features that indicate “progressive disease” according to Macdonald’s criteria but subsequently show stabilisation or resolution without a change in treatment. In these cases of “pseudoprogession” it is believed that non-tumoural causes lead to increased contrast enhancement and conventional MRI is inadequate in distinguishing this from true tumour progression.

Incorrect diagnosis is important as failure to identify pseudoprogession could lead to an inappropriate change of effective therapy. The purpose of this meta-analysis is to assess the sensitivity and specificity of radiology techniques included diffusion weighted imaging, MR spectroscopy, perfusion MR, PET imaging and SPECT imaging.

P037 The role of imaging in the diagnosis of Alzheimer's disease and vascular dementia

[Katherine Sharkey](#); [Cath Williams](#)

University of Liverpool

Aims/objectives: The aim is to explore and evaluate how effective current structural and functional imaging is in the diagnosis of Alzheimer’s disease (AD) and vascular dementia (VaD).

Content: This critical literature review examines current publications for AD and VaD.

Outcomes: Cerebral Computed Tomography (CT) is argued to be the preferred initial imaging examination as it rules out other pathology (Benyon et al., 2012).

Several studies report high sensitivity values in dementia diagnosis using Magnetic Resonance Imaging (MRI) techniques with significant improvements in those values when specific markers are used (Duara et al., 2008)(Jacobs et al., 2011).

Bouldek et al. (2011) reported that positron emission tomography (PET) and single positron emission computed tomography (SPECT) have a high sensitivity and specificity (80%-90%) in detecting AD. Functional imaging such as Pittsburgh compound B (PIB) PET, perfusion CT (pCT) and arterial spin labelling (ASL) with MRI are new modalities in this area (Zhang et al., 2012)(Tang et al., 2013)(Bron et al., 2014).

Discussion: Within this scope of research it appears there is currently no definitive answer to which modality is superior in diagnosing AD and VaD, although it appears that structural imaging plays more of a role in the diagnosis of VaD and AD. However, in the future the author believes the accuracy of functional imaging will be recognised and thus preferred. It could be recommended that metabolic and perfusion imaging could be of more use in monitoring the effects of new drugs on dementia patients.

P038 The impact of incidental findings found during imaging on neurologist's workloads

[Jennifer Boyd-Ellison](#)¹; [Tom Booth](#)²

Western General Hospital¹; King's College Hospital²



Objectives: The objectives were (1) to determine the impact of IFs upon neurologists' workloads and healthcare budgets and (2) to examine neurologists' concerns regarding the clinical management of these 'patients'. A qualitative prospective study was performed using constructivist grounded theory.

Relevance: The study showed the impacts of IFs upon the neurologist, 'patient' and the healthcare system. The study also showed the need for further research studies and clinical trials to examine both the natural history of subclinical IFs and the efficacy of intervention. In some scenarios it has been proposed that patients undergo consent for further imaging because of the possibility that an IF is discovered.

Outcomes: Neurologists currently managed the increasing workload of 'patients' referred to them who have IFs found during neuroimaging. However, this increasing workload was thought not to be sustainable in the future. Neurologists experienced 'patient' management dilemmas and noted the financial costs to the healthcare system associated with IFs. Neurologists stated that 'patients' were affected by anxiety and subject to financial implications. The lack of information regarding potential IFs provided to patients by referring clinicians prior to scanning was highlighted.

Discussion: Neuroimaging is invaluable during the assessment of neurological disease but often uncovers incidental findings (IFs). Neurologists experience IF management and treatment difficulties mainly because of the limited evidence-base surrounding the medical significance of IFs and their treatment.

P039 A pictorial review of MRI neuroimaging assessment tools in the diagnosis of dementia

[Haseeb Chaudhary](#); [Mark Caplan](#)

Warrington and Halton Hospitals NHS Foundation Trust

Introduction: The role of neuroimaging in dementia nowadays extends beyond its traditional role of excluding neurosurgical lesions. Radiological findings may support the diagnosis of specific neurodegenerative disorders and sometimes radiological findings are necessary to confirm the diagnosis. It is a challenge for neuroimaging to contribute to the early diagnosis of neurodegenerative diseases such as Alzheimer's disease. Early diagnosis includes recognition of pre-dementia conditions, such as mild cognitive impairment (MCI). In addition, early diagnosis allows early treatment using currently available therapies or new therapies in the future.

Aims and objectives: The aim of this pictorial review is to highlight the important neuroimaging MR features used in the diagnosis of dementia and pre-dementia conditions with illustrative case examples from our institution. This presentation will help radiologists, neurologists and elderly care physicians help diagnose the various dementia types much more effectively and accurately and thereby providing the most appropriate treatment for these patients.

Methods and materials: In this pictorial review we will present the common systematic scales used in the assessment of dementia. With particular focus on the GCA-scale for Global Cortical Atrophy, MTA-scale for Medial Temporal lobe Atrophy, Koedam score for parietal atrophy and Fazekas scale for WM lesions. As well as the importance of understanding strategic infarcts and their common appearances.

Conclusion: A greater understanding of the imaging characteristics of dementia is crucial to making an accurate diagnosis, this pictorial review will facilitate development of a easy systematic approach to MR neuroimaging which can be used by both physicians and radiologists.

P040 Quantitative MRI assessment of the relationship between bone marrow fat-water ratio and apparent diffusion coefficient in a normal population

[Misha Kathirgamanathan](#); [Krishanantham Ambalawaner](#)

Guy's and St Thomas' NHS Trust

Following ethical review board waiver, a retrospective analysis of 113 adult patients who had undergone 1.5T T1 DIXON and DW-MR (at b-values: 0,100,800 s/mm²) of the upper abdomen between 2011-2013 was undertaken. The aim of this study was to assess the normal distribution of fat-water ratio and apparent diffusion coefficient (ADC) of spinal bone marrow and their relationship in the normal population. Establishing the normal distribution of fat-water ratio and apparent diffusion coefficient of bone marrow provides a baseline with which to assess



haematological/metastatic disease in future studies. Patients with haematological disorders/spinal metastases were excluded. ROI analysis centred on the lumbar vertebra was performed on the composed fat-water ratio parametric maps from the T1 DIXON sequence and ADC0-800 parametric maps from DW-MRI. Median (range) of marrow fat-water ratio and ADC were 52.03 (18.19-76.08) and 389.02 (76.43- 755.28) mm²/s respectively. Fat-water ratio differed with age (above and below fifty years, median 57.35 vs 41.79, p=0.001) demonstrating a positive correlation (r=0.583, p <0.001), but did not differ with gender (p=0.881). ADC values differed varied with age (above and below fifty years, median 368.12 vs 414.88, p<0.001). There was also a difference in ADC with gender; females had a higher ADC (median 431.65 vs 362.63, p= 0.001). Fat-water ratio and ADC were inversely related (r=-0.181, p=0.055). This is in keeping with the physiological replacement of hematopoietic marrow with fat marrow with age.

P041 Pictorial review of dural enhancement

Fiona Caswell¹; Georgia Priona²

University Hospital¹, Aberdeen Royal Infirmary²

Aims/objectives: The dura mater is the outermost layer of the meninges, which covers the brain and spinal cord. The dura consists of two layers; an outer endosteal layer and an inner meningeal layer. It forms a sac that envelops the arachnoid mater, surrounds and supports the dural sinuses and carries blood from the brain toward the heart.

Dural enhancement (also called pachymeningeal enhancement) refers to enhancement of the dura following intravenous contrast, most commonly seen on MRI and can be due to a variety of causes.

Relevance/impact: The diagnosis of pachymeningeal enhancement often proves difficult and must be specifically looked for.

Outcomes: We present a selection of clinical cases demonstrating various causes of dural enhancement including spontaneous intracranial hypotension, neurosarcoidosis and intracerebral abscess in order to highlight the salient imaging findings.

Discussion: Improved identification of dural enhancement can only be achieved with prior knowledge of relevant pathology and identification of the salient imaging characteristics.

P042 Early experiences of research MR scanning of unstable neuro ICU patients with subarachnoid haemorrhage

Juliet Semple¹; Payashi Garry¹; Matthew Rowland¹; Rufus Corkill²; Jon Westbrook²; Kyle Pattinson¹

University of Oxford¹; Oxford University Hospitals²

We aim to present our experience of performing novel MRI research techniques on unstable neuro intensive care (NICU) patients with severe aneurysmal subarachnoid haemorrhage (SAH).

Early experiences will be detailed to include:

- Consent when lacking capacity
- Implant safety at 3Tesla (embolisation coils and intracranial pressure (ICP) monitors)
- Practicalities of transfer, ventilation and drug support
- Physiological monitoring challenges
- Collection of research and clinical data
- Evacuation and resuscitation procedures
- Image analysis challenges.

Undertaking research MRI scans in unstable and intubated SAH patients poses significant challenges. SAH patients are at significant risk of complications and currently, there is a lack of MRI data in the acute phase post-rupture. Being able to provide MRI at this time point could provide insight into the pathophysiological processes causing secondary cerebral injury after SAH.

Six intubated and ventilated patients have been recruited and undergone serial research MRI including clinical and novel sequences. Four were reliant on vasopressors during the early scan. Three returned at three months for follow up imaging. Experience of research MR scanning of unstable NICU patients with SAH has shown it is both feasible and



safe. A 25 minute research scan protocol can easily be achieved within a total door-to-door transfer time of 90 minutes. Feedback from NHS clinicians responsible for these patients' care is uniformly positive. Responses from study participants at follow up are also positive. Confidence has been gained scanning this small cohort and 2 future ITU based studies with intubated/ventilated patients are due to start in 2015.

P043 A case of pulsatile tinnitus, visual blurring and diplopia

[Sundip Udani](#)

Southmead Hospital, Bristol

57 year-old ophthalmology nurse presented with a one year history of left sided pulsatile tinnitus. She was admitted with increasing left sided retro-orbital pain, proptosis and diplopia.

On examination she had a left abducens nerve palsy, visual acuity 6/9 in the right eye and 6/18 in the left eye. A bruit was heard over the left eye.

On CT there was prominence of the petrous and cavernous segments of the left internal carotid artery. There was early filling of the left superior ophthalmic vein which was dilated and also the left superficial sylvian vein, pterygoid venous plexus and left inferior petrosal sinus. Appearances were suggestive of a left carotid-cavernous fistula.

Diagnostic angiography by the left internal and external carotid arteries demonstrated a brisk fistula supplied predominantly by the ascending pharyngeal artery in the region of the left hypoglossal canal draining into the varicosity of the inferior end of the inferior petrosal sinus.

A venous catheter was placed at the base of the right inferior petrosal sinus and microcatheter was then navigated via the inferior petrosal sinus, right cavernous sinus, intercavernous connections to the left cavernous sinus, down the left inferior petrosal sinus to the varicosity. A series of coils were then placed within the right varicosity and lower inferior petrosal sinus to the point of occlusion until there was stasis within this vessel. At this point the fistula appeared to be completely occluded.

The clinical and radiological features of the case will be presented, and educational points will be highlighted.

Clinical: Breast

P044 Bright things in the breast on ultrasound - not always benign. A pictorial review of the possible causes

[Nuthan Gupta; Furhan Razzaq](#)

Warrington and Halton Hospitals NHS Foundation Trust

Introduction: According to the BIRADS classification, an echogenic lesion in the breast is defined as a lesion that is more hyperechoic than the fat in the subcutaneous tissue in the breast. Conventionally, all hyperechoic lesions on ultrasound were thought to be benign. However, a recent study by Linda et al showed that hyperechoic lesions are mostly benign but can rarely be malignant (0.5% cases) 1, 2.

Aims: This study looks at both benign and malignant hyperechoic lesions of the breast and aims to reiterate that echogenicity on ultrasound alone is not solely a criterion for distinguishing between benign and malignant lesions. The characterisation of lesions on ultrasound must be made on the basis of the most worrisome finding.

Content: Here, we discuss a range of benign hyperechoic breast lesions such as haematoma, fat necrosis, sebaceous cyst, hamartoma, lipoma, abscess, nodular fasciitis and malignant hyperechoic lesions of the breast such as ductal carcinoma in situ, invasive ductal cancer, invasive lobular cancer, metaplastic cancer, angiosarcoma and papillary intracystic carcinoma of the breast.

Conclusion: Any echogenic lesion on ultrasound needs to be correlated with clinical features, mammographic changes, location of the lesion and demographics. Lesions with suspicious features on ultrasound and mammography need to be biopsied to establish the diagnosis.

References:

Anna Linda et. Al., AJR, May 2011



Yiming Gao et. Al., RSNA Radiographics, Mar-Apr 2013

P045 Not everything 'bright' on breast ultrasound is 'benign'

[Soujanya Gadde](#); [Megan Bydder](#)

University Hospital of South Manchester

Learning objectives:

1. To be aware of the causes of hyperechoic lesions on ultrasound of the breast
2. To describe the diagnostic features of common benign echogenic lesions which require no further intervention
3. To identify the infrequent malignant lesions which can mimic benign lesions, thereby avoiding misdiagnosis.

Content: On ultrasound of the breast, solid hypoechoic lesions often indicate significant or sinister pathology requiring further investigation. In contrast, most solid hyperechoic lesions are benign and include entities such as lipoma, fat necrosis, echogenic cyst and hamartoma. However, echogenic breast lesions can occasionally indicate sinister abnormality and require further intervention. We describe the spectrum of echogenic lesions of the breast, highlighting the features which may help distinguish between benign and malignant causes and change further management.

Summary: This poster reviews the spectrum of echogenic breast lesions with an emphasis on unusual malignant echogenic entities.

P046 Shear-wave elastography as an adjunct to magnetic resonance and ultrasound scanning in the investigation of breast disease

[Judith Hesketh](#); [Anthony Ward](#)

University of Liverpool

Aim/objectives: Mammograms are currently the 'gold standard' in breast imaging, with magnetic resonance imaging (MRI) and ultrasound (US) utilised as adjuncts, however, these modalities have yet to achieve 100% sensitivity and specificity in the detection of, and distinction between, malignant and benign breast pathology. This review evaluates the emerging technique of shear-wave elastography (SWE) as an adjunct in both US and MRI breast imaging.

A literature search of published studies obtained from Cochrane Library, Science Direct and Scopus between 2005 and 2014 was performed.

The content of the presentation is to:

- Help illustrate the technical properties of SWE
- Describe how its application as an adjunct may improve overall specificity
- Present the need for further research to establish the role this emerging technology may have in breast imaging.

Relevance/impact: To increase awareness of the potential of SWE as an adjunct to MRI and US. It is hoped this will generate further interest in researching the potential of this technology.

Outcomes: The reviewed literature demonstrated that SWE can provide quantitative measurements of tissue elasticity, increasing specificity in US and MRI by up to 18% and 15% respectively.

Discussion: Several studies have demonstrated that incorporation of SWE during US and MRI breast imaging has increased specificity between occult and benign lesions. However, compared to large-scale studies undertaken on US elastography, there is a paucity of studies into its application in MRI. Nonetheless, the outcome of this review emphasises the need for future research into the application of SWE.

P047 Do false positive breast screening results inhibit future screening attendances?

[Islam Ali](#)¹; [Sophie Willis](#)²

*Kings College Hospital NHS Foundation Trust*¹; *City University London*²



Background: Breast screening is a valuable method of detecting breast cancer in its early stages and saves approximately 1,400 lives per year. Research outside of the UK suggests that women's longitudinal engagement with screening is negatively affected by a false-positive screening result; reasoning adverse psychological consequences inhibit future engagement. Such reduced engagement is costly at both an individual level and to screening units through lost revenue.

Aim: To investigate whether false-positive breast screening results have a negative effect on women's subsequent screening re-attendance.

Method: Data were gathered from one breast screening unit in London of all women who had been recalled following initial screening for further investigation in 2009/2010 (n=1659). Their attendance at the next screening-recall date in 2012/13 was analysed to explore trends in non-attendance - linked to demographic information. Ethical approval was obtained.

Results: 1,299 (78.3%) women received false-positive results 2009/10. Of these 16.8% (n=279) did not attend 2012/13. Univariate logistic regression was conducted to examine the influence of age, false-positive results and ethnicity in 2009/10 to see if they predict attendance at future screening. Findings were significant and were; baseline, 62.9%; including age variable, 69.3%; including false-positive test result, 81.5%, ethnicity, 62.9%.

Conclusion: False-positive screening results do have a negative effect on women's subsequent engagement with the screening programme, awareness of these trends afford individual units the insight to tailor service to the demography of local service users and improve engagement.

P048 Incidence of internal mammary node (IMN) lymphadenopathy in primary breast cancer

Sarah L Savaridas; [Julie Cox](#)

North Tyneside General Hospital

Aims/objectives: To establish the incidence of IMN adenopathy on CT in primary breast cancer patients within one year of diagnosis.

Content: A retrospective cohort study of all spiral CT thorax performed on breast cancer patients within 12 months of diagnosis from January 2009- December 2012. The number and size of any IMNs were recorded.

Relevance/impact: The importance of IMNs in the staging and treatment of breast cancer is disputed. Lymphoscintigraphic studies demonstrated a significant proportion of breast cancers have primary or partial IMN drainage. Historical studies demonstrated no overall benefit of treating IMNs with surgery or radiotherapy. However with recent advances in treatment; targeted radiotherapy of the IMN chain, is possible.

Outcomes: 830 patients were diagnosed with primary breast cancer within our time frame; 150 patients were included. 42% (62) had IMNs present, the majority were small (<5mm), however, 16% (25) had larger nodes >5mm. We identified sole IMN involvement in 13 (8.7%) patients; 3 (2.0%) were greater than 5mm. Medial cancers did not predispose to IMN adenopathy.

Discussion: We demonstrated that IMNs are present in a substantial number of our primary breast cancer patients. In up to 8.7% of cases this was the sole site of potential disease spread identified on CT. These patients may be undertreated if IMNs are not identified. We suggest that routine imaging of the IMN chain as well as axilla should be considered in the staging of all breast cancer.

P049 Stereotactic clip placement error - a retrospective study

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*Norwich Radiology Academy*¹; *St George's Hospital*²; *The L&D Hospital NHS Foundation Trust*³

To identify the range and causes of stereotactic clip placement error, with the aim of improving accuracy of surgical excision biopsy.

A retrospective study of 59 patients who underwent either vacuum or core biopsy, between November 2012 and May 2014. Pre and post biopsy films were compared and the distance of the target lesion from clip was measured. A



cut-off of 10mm was used to identify outliers, which were reviewed to identify procedural differences between accurate and inaccurate placement.

Increasing use of vacuum biopsy and core biopsies of subtle lesions has increased our requirement for stereotactic marker clip placement. In addition, we intend to implement Radioactive Iodine 125 seed localisation. Understanding and minimising procedural errors in clip misplacement are therefore paramount.

We demonstrated that the largest error occurred in the plane orthogonal to the compression plane (Z axis). 80% of errors were positive, meaning clip placement was inserted too far. No difference in error was demonstrated between vacuum and core biopsies. We have no case evidence of 'clip migration'.

We showed clip position may differ substantially from the biopsy target, exacerbated by the 'accordion effect'. Apart from slippage, no clear cause for inaccuracy was determined from the pre-deployment 'swing pair' films though overshoot in either film and a diffuse target are factors. Post-biopsy mammography should be performed in two orthogonal planes for early demonstration of clip placement inaccuracy. We believe that a method for orthogonal correction of radioactive seed introducer placement is required for this procedure to succeed.

P050 Breast calcification: Does size matter? A retrospective audit to identify the appropriateness of biopsy in small cluster breast microcalcification

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North West School of Radiology Training Scheme¹; Royal Bolton Hospitals Foundation Trust²

Aims/objectives: This audit aims to determine whether those screening mammograms, performed at the Bolton Breast Unit, containing calcification of less than 5mm go on to have benign pathology and could therefore avoid recall to assessment clinic and subsequent biopsy.

Content: The background to the audit will be introduced as well as the methods explained. A thorough review of results and associated discussions will then be presented.

Relevance/impact: Breast calcifications are calcium salt foci that may occur anywhere in breast tissue. They are non-palpable, asymptomatic and can indicate benign or malignant disease. They are increasingly diagnosed within the NHS breast screening programme due to the introduction of digital mammography. Increasing diagnosis has led to an increase in the number of stereotactic biopsies performed. These are a safe way to ensure sufficient tissue is obtained for diagnosis. Increasing biopsies lead to increasing workload and costs for units providing this service as well as increased anxiety for the women.

Outcomes: Of 295 women biopsied, 70 had microcalcification less than 5mm. 37 patients with 4-5mm calcification were benign but 8 women with microcalcification 4-5mm had pathology of B3 or B5. 25 women with calcification 3mm or less showed benign pathological diagnoses.

Discussion: Number of biopsies performed could be reduced by 10% which equates to savings of £3000-6000 per year, additionally preventing anxiety surrounding further intervention. Further retrospective research needed to assess whether trends are similar with larger population. Stereotactic core biopsy could be avoided in screening population with breast microcalcification less than 3mm unless significant history; proving beneficial for the unit and the patient.

P051 Evaluation of Hierarchical Clustering-based Segmentation (HCS) as a perception aid for mammogram readers

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Sheffield Hallam University

Hierarchical Clustering-based Segmentation (HCS) identifies edges of a lesion and heterogeneous regions within. This study evaluated how HCS process's following outputs aid in the visualisation of the details within the abnormalities in mammographic images:

- Boundary outlined dissimilar regions
- Heat map of the dissimilar regions



- Highlighted dissimilar regions.

In an online survey, six mammograms containing a suspected lesion were presented. Participants were asked to examine the suspected lesion and mark its extent, first using only the DICOM images to assist them (condition 1) and again with the HCS process outputs (condition 2).

HCS processing confirms the heterogeneous nature of seemingly homogeneous tissue. HCS process's more appropriate delineation of the heterogeneous regions within abnormalities and the results of this study suggest that this impacts on the diagnostic reading when there is ambiguity in the lesion borders. This might aid better perception of the abnormality, targeting a biopsy to the core of suspected abnormality and the monitoring of tissue during and after treatment to assess the effect of drug and/or radiotherapy.

Differences in the lesion measurements and the inter-subject reliability were compared between the two conditions. When the images were divided into lesions with distinct or diffuse borders, there was a significant change in the absolute differences in the lesion measurements when the lesion borders were indistinct, but not in the images where the lesion borders were clearly defined.

HCS, by clearly defining tissue edges, enables the observer to see what lies within an area of suspicious breast tissue.

P052 Radiographer reporting of magnetic resonance imaging breast examinations: findings of an accredited postgraduate programme

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Canterbury Christ Church University¹; Croydon University Hospital²

Aim: To present the objective structured examination (OSE) results of the initial cohort of radiographers (n=4) who successfully completed the first postgraduate course (accredited by the College of Radiographers) which prepared radiographers to report magnetic resonance imaging (MRI) investigations of the breast.

Method: 25 MRI investigations (prevalence of abnormal cases approximately 50%) were used in the OSE which included the following appearances: malignancy (mass; multi-focal disease; nipple and/or lymph node involvement); benign cysts; implant rupture (intra and extra capsular); and normal breast (with and without implant).

The radiographers indicated if the appearances were normal or abnormal and provided a description and interpretation of any abnormal appearances. Responses (n=100) were compared to the expected answers previously agreed with a consultant radiologist external examiner. Sensitivity (Sn) and specificity (Sp) rates were calculated on the normal/abnormal decision and the total percentage agreement rates were calculated using a pre-determined marking scheme.

Results: The mean % rates (and 95% Confidence Intervals) for sensitivity, specificity and agreement were 94.0% (90.1 – 97.9); 92.5% (88.8 – 96.2) and 86.8% (82.5 – 91.1), respectively. Most common false positive and false negative errors were: lymph node involvement, fibroadenoma, implant rupture.

Conclusion: These results suggest that this group of radiographers can report MRI breast examinations to a satisfactory level of competence to be of benefit to clinical departments committed to achieving recent guidelines. Further work is required to confirm the clinical application of these findings.

P053 Mammography in a nutshell for FRCR

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University Hospital of South Manchester

Learning objectives:

- To understand how a mammographic image is produced
- To interpret normal, abnormal and artefactual findings on the mammogram
- To appreciate how mammography is used in both symptomatic and screening settings.

Content: All radiology trainees undergo core breast training as part of the FRCR curriculum, and may encounter breast imaging cases as part of the 2A and 2B examinations. As well as a good understanding of mammographic



physics, technique and normal anatomy, trainees need to be able to interpret normal, abnormal and artefactual findings on the mammogram. An appreciation of how mammography is used in the screening and symptomatic settings is also important.

Summary: Here we provide a short revision aid for all radiology trainees, covering the essentials of mammography for the FRCR examination.

Clinical: Chest

P054 CT features do not predict histological diagnosis in lung cancer

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With the emergence of new treatments specific to histologic sub-types of lung cancer, the rapid assessment of likely histological sub-type without invasive testing would be attractive. We have carried out a retrospective analysis of CT features to establish whether particular CT features are predictive of histology.

Two hundred consecutive patients with biopsy proven lung cancer were identified. Demographic characteristics and CT features were analysed by fifteen variables, including age, sex, size, shape and location of tumour. The analysis was carried out blind to the eventual histologic diagnosis. A logistic regression was then carried out.

Small cell lung cancer was significantly more likely to present with smoothly marginated masses situated solely within or close to the mediastinum and significantly less likely to contain central cavitation or air bronchograms. However, no other correlation between tumour type and CT features was identified. It appears that CT scanning alone has little role in determining histological sub-type.

P055 Patient reported experiences of CT guided lung biopsy: A prospective cohort study

[Naomi Winn](#); [Jonathan Spratt](#); [Enid Wright](#); [Julie Cox](#)

County Durham and Darlington Foundation Trust

Background: CT guided lung biopsy is a commonly performed procedure to obtain tissue for a histological diagnosis in cases of suspected lung cancer.

Methods: This is a prospective cohort study to obtain information directly from patients about their experiences of the biopsy procedure, thus obtaining a more accurate picture of complications compared with previously performed retrospective reviews. Patients participated in a post-procedure telephone interview and information was gathered about any procedural complications and personal experiences. We also compared the patient reported complications with those obtained from a retrospective review of hospital databases, analogous to previously performed retrospective studies.

Results: In our patient group, reported procedural complication rates were 10% pneumothorax rate (4% requiring a chest drain) and 10% haemoptysis. Post-procedural pain and shortness of breath showed positive correlation, with one patient experiencing prolonged pain. No statistical difference was found between the patient reported complication rates and those obtained from retrospective review of the hospital database.

Conclusions: Our study demonstrates CT guided lung biopsy is a safe procedure and is generally well tolerated. Some patients may experience significant and lasting pain and should be counselled about this pre-procedure.

P056 Imaging for cancer in patients with unprovoked pulmonary emboli: The one-year Oxford Experience

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Oxford University Hospitals NHS Trust

Purpose: In 2013, the British National Institute for Health and Care Excellence recommended that in patients with unprovoked PE "consider further investigations for cancer with an abdomino-pelvic CT scan in all patients aged over 40 years...who do not have signs/symptoms of cancer based on initial investigation or a known diagnosis of cancer."



Our aim is to assess how many patients with unprovoked PE proceed to further imaging and how many have a new diagnosis of cancer.

Methods: A retrospective study of all computerised tomography pulmonary angiograms (CTPAs) performed in the Oxford University Hospitals between 1/1/2013-31/12/2013 was conducted.

Results: 443 of 1213 CTPAs were reported as positive for PE. 190 of these were unprovoked PEs. 39% (74/190) had some form of subsequent imaging of the abdomen/pelvis but only 27% (51/190) were requested as per NICE guidelines to assess for malignancy. The remaining 23 patients had imaging for other indications. The median length of time between a positive CTPA and further imaging was seven days. In our cohort, we identified 11 of the 51 (22%) as making a new diagnosis of cancer.

Conclusion: One in five cases of unprovoked PE may have an underlying malignancy. It is important to consider further imaging to exclude malignancy in patients over the age of 40 with no known history of cancer with unprovoked PE.

P057 Lung cancer associated with cystic lesions: raising awareness

[Iara Sequeiros^{1,2}](#); [Ladli Chandratreya²](#)

University Hospitals Bristol NHS Trust¹; North Bristol NHS Trust²

Aims/objectives: To raise awareness of primary malignant lung lesions that can arise from cystic air spaces within the lung.

Content: The poster will describe this unusual form of presentation of primary lung cancers, and illustrate it with case examples from our institution.

Discussion: Primary lung cancer arising from the wall of a pre-existing lung cyst is an unusual presentation, but has been reported since the 1940s. These include several cell types, such as adenocarcinoma, squamous cell, small cell and carcinoid. The tumours can present as growths abutting or in the wall of a pre-existing cyst, which are seen as thickening of the wall and subsequent emergence of a mural nodule on follow-up CT scans. The extent of wall thickening can vary, encompassing from 60 to 360 degrees of the circumference of the cyst. The nodule component can be either solid or subsolid. The pre-existing cystic lesion can be for example a bulla, a bronchiectatic airway or a pleural bleb. The literature suggests that these cancers can be slow growing, therefore follow-up should be prolonged, (median 35 months on a study by Farooqi et. al, 2012, after initial baseline CT obtained as part of a lung cancer screening programme). Possible mechanisms for the formation of these cystic lesions prior to the detection of the tumour include a check-valve obstruction at the terminal bronchiolar level by an inflammatory or neoplastic process. Careful inspection should be made of cystic lesions in patients with high risk for lung cancer, as progressive wall thickening may represent lung cancer.

P058 Documentation of chest X-rays in intensive care

[Stephanie Toner](#)

Altnagelvin Hospital

Aim: To improve documentation of chest X-ray reviews; thereby improving patient safety and clinical care.

Relevance: The National Patient Safety Agency found that between 2005 and 2011, 21 deaths and 79 cases of harm occurred due to misplaced NG tubes¹. Given the large number of chest X-rays requested in ICU; accurate documentation of chest X-ray findings are of significant importance.

Method: A retrospective analysis of 13 consecutive ICU in-patient stays. Clinical notes evaluated to assess documentation of chest X-ray reviews, focusing on placement of NG tubes, lines, chest drains and tracheal tubes. Time taken for images to be carried out also assessed.

Results: 51% (n=80) of images were reviewed and documented by medical staff. 42% (n=17) of images documented that confirm NG tube position. 50% (n=4) of tracheal tubes, 100% (n=7) vascular lines and 33% (n=3) of chest drain insertions had documented chest X-ray positioning. Images (n=3) requested >12 hours in advance had no



documented review. 52% of images were carried out within 30 minutes of request. Initial data was presented to the ICU medical team and an additional section reminding staff to review imaging was added to daily review proforma. Provisional reaudit data showed that 73% (n=70) of images were documented; 65% (n=26) of NG tubes, 54% (n=13) of tracheal tubes and 67% (n=18) of vascular lines were documented accurately.

Conclusion: The accurate documentation of chest X-ray findings in ICU improved following education and intervention. Nonetheless continued clinical efforts must be persistent to further improve upon documentation.

P059 The role of chest digital tomosynthesis in the diagnosis of pulmonary nodules

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University of Liverpool

Aims: To evaluate the role of chest digital tomosynthesis (CDT) in imaging pulmonary nodules.

Content: A literature review was performed using databases, PUBMED, SCIENCE DIRECT and DISCOVER. The medical keywords used were, “digital tomosynthesis”, “tomosynthesis” and “chest tomosynthesis”. Search criteria restricted literature to the last 10 years.

Relevance/impact: CDT is able to image the lungs whilst removing obstacles such as the ribs and mediastinum. Literature suggests CDT has higher sensitivity at detecting pulmonary nodules than plain chest imaging and can be performed with similar radiation levels as plain chest imaging.

Outcomes: The study has shown CDT to have an average sensitivity of 88% compared to 38% for plain chest imaging in the detection of pulmonary nodules. Mean effective doses ranged from 0.1-1.95mSv, although dose differences between CDT manufacturers were apparent. CDT can reduce costs and doses.

Discussion: CDT is significantly more sensitive at identifying pulmonary nodules than plain chest imaging. It has been shown to reduce costs due to reducing the need for computerised tomography and gives only slightly higher radiation dose levels than plain chest imaging. It should not, however, replace CT and only be implemented for inconclusive plain chest imaging and low risk lung cancer patient screening. Further research is needed with regard to further optimisation, reduced costs and improved diagnostic accuracy.

P060 CTPA - should we add CTV of the lower limbs?

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Royal Liverpool and Broadgreen University Hospitals NHS Trust

Aims: In the PIOPED II study, CTPA with CTV of the lower limbs increased detection of thromboembolism compared to CTPA alone, leading to the recommendation that a scanning protocol for detecting pulmonary embolism should include CTV. We aimed to estimate the impact that implementing this protocol could have on our department.

Content: We studied several factors including:

- How many CTPA studies were performed in a six week period and the scan results
- How many patients who underwent CTPA also underwent ultrasound scan of the lower limbs
- How many CTPA studies are performed per year.

Outcomes: 153 CTPA studies were performed over a six week period. 21(14%) were positive for PE, 38(25%) were considered of suboptimal quality by the reporting radiologist. 18 (12%) patients had ultrasound scan lower limbs within six months of CTPA. Of those two were positive for DVT. We performed 1,495 CTPA studies in total in 2013.

Impact: Using the data obtained by the audit, adding CTV to CTPA could prevent 164 ultrasound scans per year, however would mean increased radiation dose (approximately 1.5mSv per patient), reporting time and cost (approximately £79 per patient).

Discussion: Implementing the recommendations from the PIOPED II study of the addition of CTV to all CTPA studies could have important implications to a radiology department, both in terms of cost, radiation dose and reporting time. The reduction in ultrasound scans as a consequence of the addition of CTV is unlikely to compensate for the additional reporting time or cost.



P061 Audit of CT pulmonary angiogram (CTPA) requests and diagnostic yield

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NHS Ayrshire and Arran

Introduction: CTPAs are commonly requested investigations for the exclusion of pulmonary thromboembolism (PTE). Current guidelines recommend probability scoring using either Well's or modified Geneva systems. Additionally, d-dimer testing improves diagnostic yield when low clinical risk with high clinical suspicion exists. Therefore, most appropriate use of imaging should occur.

Aim: The aim was to investigate the diagnostic yield of CTPAs performed, if clinical management was otherwise improved and to determine appropriate documentation of probability scoring in CTPA requesting.

Methods: Data from all CTPAs conducted over a four-month period was retrospectively collected at University Hospital Ayr. Information on patient demographics, probability scoring, d-dimer tests, and imaging requests and reports were collected.

Results: 159 CTPAs were available. 23.3% (n=37) showed evidence of PTE. 10.7% (n=17) of the patients had a probability score documented on the request using the Well's score and of these n=3 had PE. 75.5% (n=120) of patients had d-dimer testing. The majority of those without PTE had infection (16.4%; n=20); others were heart failure, effusion and malignancy. Median time from request to CTPA was 1 day.

Conclusion: The majority of CTPAs requested were negative and probability scoring and d-dimer testing were inappropriately recorded. This suggests improving patient selection is necessary. CTPA is often a test of exclusion and probability scoring is necessary to satisfy IRMER guidance. Compulsory probability documentation prior to re-audit will minimise risk in those undergoing imaging. Moreover, prompt reporting minimises unnecessary anticoagulation.

P062 Would the use of an age adjusted D-Dimer adjusted according to age cut down the number of CTPA requests without compromising the ability to pick up pulmonary thromboembolism: A prospective study

[Mohamed Anwar](#); [Madeleine McCarthy](#); [Claire Wood](#)

NHS Forth Valley

Our study sought to compare the specificity and sensitivity of this age adjusted D-Dimer cut off value against the conventional D-Dimer (CDD) cut of when used as a rule out test in patients with low probability of PTE in patients over 50. Age adjusted D-Dimer (AADD) was defined as age x0.01 as published in a recent large BMJ meta-analysis.

Method: We collected data for all patients over 50 with a low pre-test probability score and a positive CDD who underwent a CTPA to exclude a PTE over a twenty week period. Each patient with a positive CDD was then assigned an AADD. We used PACs database to assess which of these patients then underwent a CTPA imaging and what the result of this was.

Results: Over 20 weeks there were a total of 120 patients eligible. There were 77 CTPAs done. 59 excluded PTE and 18 positive for a PTE. All 18 patients who had a positive PTE on CTPA would have also had a positive AADD. Using an AADD 10 CTPA could have been excluded without any impact on PTE pick up rate. The CDD had a sensitivity rate of 100% as did the age adjusted D-Dimer. Age adjusted D-Dimer cut off rate had a better specificity rate of 91% compared to 89% for the CDD.

Conclusion: Introduction of an AADD (age x0.01) would have avoided unnecessary CTPA in our cohort of low probability patients. This change would not compromise sensitivity but improves specificity and positive predictive value.

P063 Thoracic actinomycosis: a case report illustrating its non-specific presentation, with systematic literature review

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Nottingham University Hospitals NHS Trust



Background: Thoracic actinomycosis is an uncommon chronic suppurative pulmonary &/or endobronchial infection caused by *Actinomyces* species, particularly a gram-positive anaerobic organism called *Actinomyces israelii*. Definitive diagnosis on clinical grounds is difficult due to non-specific manifestations. The condition can mimic a range of other thoracic pathologies on clinical and radiological findings, therefore histological sampling and microbiology analysis are considered to be the definitive diagnostic tests for this condition.

Objectives: Our case illustrates the non-specific clinical and radiological findings of thoracic actinomycosis in a 44 years-old male patient. With a background of heavy smoking, this has initially presented with a productive cough, weight loss and a lung mass. Various clinical and radiological investigations had been performed and were not conclusively diagnostic. However, a final call to test for rare aetiologies has led the clinical team to identify thoracic actinomycosis not until the elapse of about two years from the first presentation. A systematic literature review has been conducted to collate the latest updates on imaging perspective, management and complications in current practice.

Conclusion: While clinical and radiological presentations are non-specific, it is imperative to consider thoracic actinomycosis as a differential diagnosis for a variety of radiographic presentations in thoracic imaging, and to perform relevant microbiological studies.

Clinical: Cardiac and Vascular

P064 T1 mapping in cardiac MRI: A pictorial review

[Samuel Leach](#); [Andrew Flett](#); [James Shambrook](#); [Charles Peebles](#); [Peter Weale](#); [Stephen Harden](#)

University Hospital Southampton

We present an educational poster explaining the role and benefits of T1 mapping in Cardiac MRI, with a pictorial review of example cases in which this technique can add value.

T1 mapping is an emerging approach to tissue characterisation in cardiac MRI, utilising native tissue T1 relaxation characteristics to identify areas of abnormal tissue such as fibrosis, oedema or fat which are often not identifiable on conventional cardiac MRI. The sequence we used is based on modified look locker inversion recovery (MOLLI). MOLLI provides accurate characterisation of even small volumes of abnormal tissue and localisation of scarring. MOLLI is quick to perform, taking less than 10 seconds and has inline motion correction, producing a colour map, with the scale indicating the T1 on a pixel by pixel basis. T1 mapping can be used without contrast in patients with renal failure, where there may be a reluctance to administer intravenous gadolinium agents.

We provide imaging examples of T1 mapping. These include patients who are post-myocardial infarction to confirm areas of fibrosis and oedema seen on late gadolinium enhancement MR, as well as cases where T1 mapping has characterised more equivocal abnormalities on conventional MRI sequences. We also present cases in which T1 mapping refined differential diagnoses in cardiomyopathies, such as the reduction in T1 seen with the intracellular fat accumulation typical of Anderson-Fabry disease and the increase in T1 seen in cardiac amyloidosis.

P065 Postoperative appearances of the aortic root, what every radiologist should know

[Marc Bramham](#); [Franchesca Wotton](#); [Vikram Raju](#); [Tinu Purayil](#)

Plymouth Hospitals NHS Trust

This poster aims to provide an overview of both normal and abnormal postoperative CT appearances of the aortic root. In general radiology, the heart has been largely invisible before now. With advancements both in surgical technique and in medical imaging, the importance of reviewing this organ is growing. There are now large numbers of patients passing through radiology departments who have had surgery to the proximal aorta. In many cases, they present with chest pain or cardiorespiratory compromise. When on call or managing an inpatient list, it is important that the postsurgical appearances can be readily recognised and evaluated as either normal or abnormal. The decision in this regard can be immediately relevant to the patient's management.



This poster is intended to show a selection of normal appearances and then to give a summary of the major complications which can develop as a result of these surgeries, with example cases and images. It is of value to general radiologists and radiographers doing on call work, as well as to those with a specific interest or those in training.

P066 Pictorial review of coronary artery anomalies

[Dina Hikmat](#); [Rosalind Joseph](#); [Farokh Setna](#); [Daniel Earnshaw](#); [Yvonne Jones](#)

Arrowe Park Wirral University Teaching Hospital

Anomalous coronary arteries are a varied collection of congenital heart disorders with a prevalence of around 1% in the population. With current imaging techniques, anatomical anomalies can be elegantly presented. The poster will present a pictorial review of the coronary artery anomalies.

Although rare, coronary artery anomalies can have a range of clinical manifestations and pathophysiology. This starts from simple dyspnoea to the most severe; sudden death syndrome in young healthy individuals.

In addition to the possibility of a serious clinical outcome, knowledge and understanding of the anatomical variants aids the diagnosis and management of these individuals, which may include invasive angiography to revascularisation.

In our review, we will outline anomalies of origin of the coronary arteries, myocardial bridging and benign and malignant courses of arteries where they originate from the opposite sinus; for example anomalous left main coronary artery (ALMCA) arising from the right sinus and anomalous right main coronary artery (ARCA) arising from the left sinus. The computed tomography coronary angiography imaging will demonstrate how clinical presentation may be influenced and explained by the vessel anomaly. We hope the review will provide educational benefit to those in general radiology, as well as those interested in cardiac imaging, in this rare but potentially devastating range of conditions.

P067 A review of the sensitivity, specificity, patient tolerance and safety of ultrasound and computed tomography in the imaging of abdominal aortic aneurysm in males over 65

[Samantha Moles](#); [Stuart Mackay](#)

University of Liverpool

Purpose: This literature review will compare the accuracy of Computed Tomography (CT) and Ultrasound (US) in the diagnosis and evaluation of abdominal aortic aneurysm (AAA) as US and CT are the most commonly utilised imaging methods for AAA. Comparators used were sensitivity and specificity, patient tolerance and safety.

Method: Google Scholar, Scopus and Web of Science were used to search for English language publications between the years 2004-2014. Articles were screened for quality and relevance before use in this review.

Results and Discussion: Both modalities show high sensitivity and specificity values in the evaluation of AAA. A study by Gabriel et al (2012) demonstrated that ultrasound was 98-100% sensitive and 98-99% specific and a study by Constantino et al (2005) calculated that ultrasound was 94% sensitive and 100% specific. Research carried out by Biancari et al (2013) found that CT was 98.3% sensitive and 94.9% specific and Constantino et al (2005) found that CT was almost 100% sensitive and specific. However, both modalities show size discrepancies in the measurement of AAA, as US can underestimate aneurysm size and CT can overestimate aneurysm size. There was no agreement regarding which measurement method to use for ultrasound assessment of AAA.

Conclusion: Ultrasound and CT are both accurate in the evaluation abdominal aortic aneurysm, but have distinct roles. It is apparent that more research needs to be carried out regarding the sensitivity and specificity of both modalities, in addition to establishing which ultrasound measurement method is the most accurate.



P068 Should we be accepting routine CTPA referrals for elderly patients?

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Stepping Hill Hospital

Objectives: Computed tomographic pulmonary angiography (CTPA) has been suggested as the first line investigation in patients over 50 with suspected pulmonary embolism (PE), due to the benefit of finding other causes of chest pain and dyspnoea, and artefacts from chronic airways disease (COPD) making planar ventilation perfusion (V/Q) scans difficult to interpret.

Methods and materials: We retrospectively studied the departmental records of all consecutive CTPA requests over a 12 month period. These were mostly from junior doctors, using a protocol (based on BTS guidelines) suggesting those aged over 65 had CTPA.

Results: 440 of 1214 referrals were for patients aged over 80. Initially 106 examinations were not done, most commonly due to renal failure, although subsequently 31 had CTPA, and 8 had V/Q of which only two were equivocal. 53 CTPAs were positive for PE; 194 were negative; 38 reported equivocal, but no large embolus; 18 were non-diagnostic. 60 had CT evidence of heart failure. In total 131 without a definitive answer had no further relevant imaging.

Conclusion: Elderly patients are more likely to have renal impairment or heart failure which can be exacerbated by contrast: if they have a normal CXR, V/Q scan should be considered instead of CTPA. Further imaging is not requested in most failed/equivocal exams, suggesting it is not necessary for management after senior clinical review. We suggest CTPA in patients over 80 should be regarded as high risk and only be justified on an individual case basis, after discussion with the consultant in charge.

P069 Computed tomography in transcatheter aortic valve implantation

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Singapore General Hospital

Transcatheter Aortic Valve Implantation (TAVI) is a procedure performed for the treatment of selected high-risk patients with severe aortic valve stenosis (AS) by implanting a prosthetic valve, using less invasive means than conventional major surgery. AS is a condition in which opening of the aortic valve is stenotic, obstructing the outflow of blood from left ventricle of the heart. This is a presentation on multi-detector computed tomography (MDCT) technique used at our institute in pre-TAVI patient workup to assess suitability for TAVI and the pertinent imaging findings on MDCT. Scanning parameters are presented with discussion on how MDCT helps in assessing patient suitability for TAVI procedure by measuring aortic root, aortic valve annulus, and relevant aortic and iliofemoral anatomy.

All scans are performed with retrospective ECG-triggered gated CT thorax alongwith non-gated CT abdomen and pelvis using Toshiba 'Aquilion One' scanner. Subsequently, images are analysed with multiplanar reformat on dedicated workstation using Fx Vitrea and Vitrea Core systems.

MDCT has emerged as an important imaging tool in aortic annulus sizing, which formerly relied on echocardiographic measurement, including transthoracic echocardiogram (TTE) and trans-esophageal echocardiogram (TEE). MDCT has also been used in determining TAVI implantation route, either via transfemoral, trans-subclavian or transapical approach. This is done by assessing for calcifications in the iliofemoral arteries, tortuosity and diameter of these vessels. MDCT's ability in multiplanar reformation also allows for better appreciation of prosthetic valve deployment angle. Finally, MDCT also has an important role for post TAVI imaging for suspected prosthetic valve migration.

P070 Retrospective re-audit of inferior vena cava filter retrieval

[Joanne Edwards](#); [Frances Colgan](#); [Simon Milburn](#); [Richard Hartley](#)

James Cook University Hospital

Aims/objectives: To assess temporary IVC filter retrieval rates since 2012 and the impact of the introduction of a departmental database on retrieval rate.

Content: All IVC filter insertions between February 2012 and July 2014 were identified using a search in PACS. Data



were entered into Excel, capturing inserted date, removal date, indication, re-attempt and duration. Analysis was carried out to determine retrieval rates.

Relevance/impact: Inferior vena cava (IVC) filters are often inserted by interventional radiologists at our institution for patients who are at increased risk of venous thromboembolism (VTE).

UK guidance from The British Society of Interventional Radiologists states that these filters should be removed within nine weeks.

A previous audit demonstrated that many temporary filters were not being retrieved. A database was established to aid the recall of patients who had a temporary IVC filter inserted.

Outcomes: 88 IVC filters were inserted during this period. 21 patients were deceased and were excluded from the data analysis. Overall, 79% of filters were successfully retrieved. Nine filters failed 1st retrieval attempt, 7 were successful at 2nd attempt.

Of the successful retrievals, 57% were carried out within the nine-week guideline. Median duration was 48 days, range 4-273 days.

Discussion: This re-audit has found a considerable improvement in retrieval rates compared with 2009/2012. Retrieval within the recommended nine-week timescale was only achieved in half of cases and further action is required to recall patients once anti-coagulation has been re-established.

P071 A completed audit cycle investigating patient satisfaction and QoL outcomes following venous sclerotherapy procedures in the management of venous malformations at Barnet General Hospital

[Jordan Green](#); [Christopher Tang](#); [Sara Zafar](#); [Yaron Berkowitz](#); [Kevin Lotzof](#)

Barnet Hospital

Purpose: Sclerotherapy is a management option for patients with symptomatic venous malformations, who have failed conservative management. We completed an audit cycle investigating the local venous malformation sclerotherapy service provided by the Interventional Radiology department at Barnet General Hospital, from 2010 to 2014. We investigated both patient satisfaction and quality of life (QoL) improvement, and examined whether there was improvement in these outcomes, following changes in patient education and clinical practice.

Materials and methods: Patients undergoing venous sclerotherapy from 2010 to 2014 were identified using departmental records. Patients were contacted via telephone, and QoL and patient satisfaction were assessed using a modified QoL questionnaire. The first audit cycle included patients from 2010-2012, with the re-audit cycle covering patients from 2012-2014. Changes implemented between the cycles included improved patient education regarding procedure expectations, as well as more aggressive treatment and closer follow-up post-procedure.

Results: A total of 16 patients were contacted during the first audit cycle, and of these 10 patients (62.5%) felt satisfied after the procedure. 11 patients (68.8%) noted an improved QoL post-procedure, with 4 patients (25%) experiencing worse QoL. On re-audit, 17 patients were contacted, with 14 patients (82.4%) feeling that their expectations had been met. In addition, 14 patients (82.4%) had improved QoL post-procedure, with 2 (11.8%) experiencing worse QoL.

Conclusions: This audit cycle has demonstrated improvements in both patient satisfaction and patient QoL post-sclerotherapy, following concerted changes in clinical practice, both in terms of improved patient education, as well as more aggressive treatment and careful follow-up of patients.

P072 Overview of the role of 4D magnetic resonance angiography (MRA) in the management pathway of a case study patient with an extremity arteriovenous malformation (AVM)

[Bianca Lottmann](#); [Darren Walls](#)

City University London

Aim: The aim of this poster is to provide an overview of the role of 4D magnetic resonance angiography (MRA) in the management pathway of a case study patient with an extremity arteriovenous malformation (AVM).

**Objectives:**

- Define an imaging protocol for 4D Contrast Enhanced (CE)-MRA for an AVM of the hand/ foot
- Discuss the advantages and pitfalls of the technique
- Include pre 4D CE-MRA and post Digital Subtraction Angiography (DSA) images for a case study patient who has been treated with embolization
- Discuss the implications for best clinical practice.

Content:

- A review of the relevant published literature
- An example of a clinical imaging protocol
- Case study medical images from both 4D CE-MRA and DSA
- Discussion of the different k space acquisition techniques that support 4D MRA
- Conclude with the implications for choosing MRA imaging in the assessment for pre planning embolization treatment.

Outcomes: 4D MRA using intravenous gadolinium can provide diagnostic information relating to vascular anatomy with high spatial resolution. This is in combination with an assessment of the flow characteristics of blood in a peripherally located AVM. The innovative methods to acquire k space filling facilitate high refresh rate dynamic scans.

Discussion: The diagnostic utility of conventional DSA as the gold standard in identifying the vascular anatomy and flow characteristics of AVM's could now be superseded. Advances in 4D CE-MRA are now establishing itself as an alternative to DSA.

P073 Serial ultrasound in the exclusion of deep venous thrombosis

[Srikanth Puttagunta](#); [Nemi Gandy](#); [Giles Roditi](#)

NHS Greater Glasgow and Clyde

Objectives: 80% of suspected DVTs have a negative result on initial ultrasound. Patients with a positive D-dimer and medium/high clinical pre-test probability should have a repeat doppler ultrasound scan to rule out DVT. RCR standards state 3-5% with medium pre-test probability and 20-30% with high pre-test probability should demonstrate an above knee DVT on serial ultrasound. The aim of our study is to assess if serial ultrasound is yielding the results expected as per guidelines.

Method: Retrospective review of results for doppler ultrasound scans carried out for DVT over six months in a central hospital. The original Wells score was used to determine clinical pre-test probability for DVT.

Results: 548 initial and 131 repeat doppler ultrasound scans were carried out over 6 months. Only 10% of initial scans for suspected DVT were positive. Of the repeat scans, 9% of medium pre-test probability scans were positive but only 8% of high pre-test probability scans were positive. 36% of repeat ultrasounds were carried out on patients with a Wells Score of 0 or less, none of which were positive.

Discussion: The audited department showed a low initial positive rate. The high clinical probability target for serial ultrasound (20-30% positive) was not met; this suggests that the target may be too high. Over one third of repeat scans were carried out on patients with Wells score 0 or less. Review of the local DVT protocol with a view to use multivariate analysis incorporating initial ultrasound result and Wells score may obviate repeat ultrasound in low clinical probability cases.

P074 Patient pathway for peripheral vascular disease

[Eilean Todd](#)

Robert Gordon University

This poster will describe the typical pathway a 75-year-old male patient would follow if he presented with the following symptoms: pain in his left foot on walking and a visible colour change to his foot. There are a wide variety of tests and images, which would be used during the differential diagnosis. There would be a brief account of



pathologies, which could explain the patient's presentation. The poster would focus on the idea that the patient has Peripheral Vascular Disease.

There are many imaging routes that could be used to confirm PVD including DSA, MRA, CTA and duplex ultrasound. The poster would make an analysis of these imaging techniques and subsequently discuss the potential treatment options. Overall the poster is designed to share the complete pathway of a patient and develop an understanding of the features of different imaging modalities. Also the presentation would allow others to appreciate the role of the radiographer in relation to the patient's care.

P075 Pick up rate of repeat Doppler ultrasound scans

[Adeel Syed](#)

Princess Alexandra Hospital NHS Trust

Relevance: NICE states that we should repeat proximal leg vein ultrasound scans 6–8 days later for all patients with a positive D-dimer test and a negative proximal leg vein ultrasound scan. For a busy department, this can significantly increase workload, therefore I audited this practice.

Aims: To assess:

- How many of these repeat ultrasound scans had a change in outcome?
- How many patients are getting repeat ultrasound scan within 6-8 days?

Content: 75 Repeat limb ultrasound scans carried out between Sept 2013 and Jan 2014 (excluding repeat ultrasounds done for 2 limbs on same day and scans repeated for technical factors).

Outcomes: Data showed that 75 patients with repeat scans carried out, 11 of which positive for DVT, 6 scans showed a change in result from negative to positive and 5 scans were positive on both scans. Therefore, 8.0 % of scans had a change in scan result from negative to positive for DVT 75 patients with repeat scans carried out, out of which 55 were within 8 days, and 20 were after 8 days therefore, 73.33% of repeat scans were carried out within the 8 days recommended by NICE.

Discussion: Since 8% of scans had a changed result for DVT, audits could be repeated elsewhere, and NICE informed regarding cost effectiveness of this procedure. 73% of repeat scans were done within 8 days as per NICE, suggested more out of hours work is needed to meet deadlines.

Clinical: Uroradiology; gynaecology; obstetrics

P076 Inadvertent scanning of the pregnant uterus - what it looks like and what to do

[Peter Logan](#); [Azadeh Taheri](#); [Rebecca Wiles](#)

Royal Liverpool and Broadgreen University Hospitals NHS Trust

Aims/objectives: Occasionally, despite best efforts of radiographers and radiologists, women who do not know they are pregnant inadvertently undergo radiological investigations. It is important that the practitioner is able to recognise the pregnant uterus on imaging and to know the implications that the radiological investigation may have on the woman and the foetus.

Content: The authors present the imaging findings in pregnancy using plain film, CT and MRI images. The authors also discuss the issues of radiation protection and MRI safety in pregnancy using the available guidelines, to enable the reader to be able to counsel patients if they have had an inadvertent radiation exposure or MRI study.

Relevance/outcomes: Although rare, inadvertent radiation exposures in pregnant women do occur. The authors aim that after reading this poster the reader will be better prepared to deal with this if required.



P077 Pictorial review of MRI findings in fallopian tube pathology

[Farhat Bano](#); [Chinedum Anosike¹](#); [Akash Ganguly](#)

Warrington General Hospital¹

Introduction: Although fallopian tube pathologies are common, they could be difficult to characterise on MRI, particularly when they are seen as incidental findings, more so for general radiologists.

Aim: The aim of our poster is to refresh local anatomy and assist reporting general radiologists to identify, recognize and characterise different fallopian tube pathologies, seen as direct or incidental findings on pelvic MRI.

Contents: The common conditions encountered include a spectrum of pelvic inflammatory disease ranging from salpingitis to pyosalpinx to tubo-ovarian abscess. Hematosalpinx can be an indicator of tubal endometriosis; however tubal torsion or malignancy should be excluded. Hydrosalpinx unilateral or bilateral can be secondary to obstruction of the ampullary segment; the most common caused being PID. Other causes include tubal ligation, hysterectomy without salpingo-oophorectomy, endometriosis, and tubal malignancy.

Impact: We will familiarize our viewers with the imaging appearances of the common conditions along with discussion on the differential diagnosis of benign and malignant fallopian tube disease as it is crucial to identify benign tubal pathology which can mimic malignant or complex adnexal or ovarian masses.

Outcome: To help in the optimal diagnosis and management of the patients with the pelvic diseases.

Discussion: Although ultrasound imaging remains the most common imaging modality for the initial assessment of pelvic disease, MRI has a recognized role in characterization of the tubal pathology encountered on sonography. Lack of familiarity with the imaging appearances on MRI can cause confusion and/or delay in the management of these patients. We bring a cohort of interesting and commonly encountered cases of tubal diseases to illustrate and reinforce the knowledge of general reporting radiologists.

P078 10 shades of grey. Optimum CT contrast dilution to opacify non-vascular body cavities

[Zeid Al-Ani](#); [Syahminan Suut](#); [Suraj Amonkar](#); [Brendan Hayes](#)

North Manchester General Hospital

Different types and dilutions of contrast materials are used to directly opacify various body cavities during CT studies (like CT cystogram, fistulogram and loopogram studies). There is very little literature on this; dilution is often done on guesswork without readily available guide. The aim of this pictorial presentation is to provide:

- Direct, comparable and practical visual guide for radiology departments to achieve the desired contrast opacification;
- Easily reproducible dilution calculations for different types and concentrations of commonly used contrast materials.

Different concentrations of Omnipaque 370 (370 mg of iodine/ml) were scanned using a multidetector CT scanner. Obtained densities will be shown in comparison to control (water) providing a direct visual guide for radiology departments to readily achieve the desired density. The iodine concentration for each density is calculated so that each specific degree of opacification is easily reproduced with alternative contrast materials. We will provide equivalency tables for all commonly used contrast media. CT scanner and patients factor will also be taken into consideration.

This pictorial guide will standardise the dilution technique used and help achieve consistent excellent contrast opacification according to the targeted study. This is vital to produce images of excellent diagnostic quality and avoid suboptimal/non diagnostic studies.

P079 Are national guidelines followed by sonographers when reporting on ovarian cysts?

[Rebecca Bird](#); [Jane Harvey-Lloyd](#)

University College Suffolk



Every sonographer has an individualised approach when composing reports; whether immediately after acquiring their images, or after several examinations. Whilst UKAS and RCOG guidelines have been in place since 2008/2010, there is still variation in practice resulting in inconsistent reports.

Aim: To determine whether guidelines set by national bodies are being adhered to by sonographers in the process of reporting on pelvic ultrasound examinations in women with findings of ovarian cysts.

Objectives:

- Design a suitable data collection tool to ascertain if sonographers are adhering to the RCOG recommendations and UKAS criteria for reporting on ovarian cysts.
- Undertake a retrospective audit to establish whether criteria is being followed systematically.
- Evaluate whether the departmental protocols meet the UKAS and RCOG guidelines.

Method: 138 ovarian cyst cases were retrospectively analysed against the criteria including menopausal status; examination method; pathological findings; measurements; description; recommendations made by sonographer etc. For each set standard, a 95% compliance rate was used as a target.

Results and conclusions: 74% of women were of reproductive age which potentially alters the recommendations made (if necessary) by the sonographer. Of the data collected, one example to note is that 32% of cases were septated and 30% of simple nature; however, interestingly, there was no distinguishment of singular and multiple septated cysts. This is an example of how crucial it is for detailed reports as outcomes for singular and multiple septations are completely different. In conclusion, the compliance rate for adherence to reporting was not reached.

P080 Image guided omental biopsy: a pictorial review of radiological and histological technique to improve diagnostic yield

[Henry Walton](#); [Vani Agarwal](#); [Sue Buckingham](#); [Samita Agarwal](#); [Sebastian Chang](#)

The Lister Hospital, Stevenage

Content: We present a pictorial review of 100 cases carried out in our institution over the past five years of radiological guided biopsies of peritoneal/omental thickening/nodules. We present classical CT and ultrasound features of omental disease and describe how to improve diagnostic yield of omental biopsy from our experience with emphasis on the practical radiological technique and the use of recent advances in immunohistopathological analysis.

Clinical: Omental/peritoneal disease is caused by a range of benign and malignant pathologies. Imaging and clinical features alone are unreliable for differentiating between these pathologies. Tissue biopsy remains the cornerstone of diagnosis.

Relevance/impact: Refining radiological biopsy and histological technique increases the diagnostic yield of biopsy and results in timely focussed treatment of the underlying disease process.

Outcomes: Image guided biopsies were performed in 100 patients. The range of pathologies identified was broad. The majority of patients had a malignancy with primary tumour sites including the lung, upper GI, lower GI, Gynaecological and prostate. Some patients were found to have benign peritoneal thickening such as tuberculosis. We describe the technique of omental/peritoneal biopsy with tips of how to ensure a diagnostic sample based upon our 5-year experience. We also present the imaging-pathological correlation with a description of how to diagnose omental disease from tissue samples using new immunohistopathological techniques.

Discussion: With refined image guided biopsy technique and histological analysis omental biopsy is an accurate, reliable way to diagnose the cause of omental disease and leads to timely focused treatment.

P081 Avoiding repeat CT examinations in renal colic patients

[Daniel Lyndon](#); [Nicholas Drinnan](#)

Frimley Park Hospital



Aims: To determine whether patients admitted with CT-confirmed ureteric colic also have an X-ray KUB to assess whether calculi are radiopaque thus preventing urologists from using X-ray rather than repeat CT during follow-up assessments.

Standard: RCR - If calculi can be identified on AXR or US, they should be followed up as such to minimise radiation dose from multiple CT examinations.

Local: X-ray KUB should be performed in patients with CT-confirmed ureteric colic to assess whether calculi are radiopaque.

Methods: Retrospective review of 45 patients who were admitted with CT-confirmed ureteric colic. PACS and Patient Manager records were reviewed to see whether a same day KUB or abdominal radiograph were requested and performed and whether these showed radiopaque calculi.

Results: 45 patients were admitted that had CT KUBs showing ureteric calculi. 22 of these (49%) had a contemporaneous X-ray KUB examination. 14 out of 22 (63.6%) radiographs showed radiopaque calculi. 27 patients were seen in follow-up stone clinic, 12 of which had no radiograph available(44.4%).

Outcomes: A trust ureteric colic guideline was produced which included a protocol for investigation and preferred management. This emphasised the importance of performing same day X-ray examinations and the using them in the follow-up of patients with radiopaque calculi where possible.

Discussion: Our protocol should raise awareness of using radiographs for investigation where possible and to avoid use of repeat CT and therefore higher radiation dosing and cost.

P082 Investigating suspected renal colic in women - should the current guidelines be set in stone?

[Alex Powles](#); [Greg Powles](#)

YDH NHS Foundation Trust

Background: CT of the urinary tract (KUB) is seen as the gold standard investigation for suspected renal colic in patients of all ages and both genders, but should we consider ultrasound in the female population where renal stones are less prevalent and a wider differential diagnosis exists?

Aims: To identify the rate of detection of ureteric stones and alternative diagnoses in patients undergoing CTKUB for suspected renal colic in a district general hospital emergency department, and to determine if there is a difference in detection rates between male and female populations.

Results: Reports of CTKUB scans requested from the emergency department over a seven month period were retrospectively reviewed. From a total population of 68 patients, ureteric calculi were detected in 51%, with an alternative diagnosis present in a further 10%. Splitting the population into male and female sub-groups (n = 35 and 33 respectively), ureteric calculi were detected in 66% of male patients compared to 36% of female patients, a significant difference (p-value <0.01 with a two-sample pooled t-test). An alternative diagnosis was detected in 3% of male patients, compared to 18% of female patients, such diagnoses including ovarian cysts and appendicitis.

Discussion: The dose of radiation for a CTKUB is certainly significant. Given that protocols for renal colic often allow for an 'in-hours' CTKUB, these results raise the question of whether there is still a place for ultrasound, such that female patients with alternative diagnoses such as ovarian cysts and appendicitis can be spared unnecessary radiation.

P083 Appropriate use of ultrasound for acute kidney injury. Is education a double edged sword?

[Fawad Shameem](#); [Raja Ezman Shariff](#)

Stockport NHS Foundation Trust

Acute kidney injury (AKI) is commonly seen in inpatients. It places a great cost on the NHS and the patient. Timely and appropriate management is not only nephron sparing but potentially lifesaving. Ultrasound scanning (USS) is a well-recognised method for stratifying patients. Subsequently the NICE AKI guidance has defined groups in whom



scanning is recommended within 6 hours of request, pyonephrosis and within 24 hours, obstruction/cause unknown. Interestingly they suggest that routine scanning isn't needed where the cause for the AKI has been identified.

- 92 inpatients underwent an USS over 3 months for AKI.
- 75% were requested for possible obstruction/unknown cause. 71% of patients with possible obstruction were scanned within 24 hours while only 50% of those with unknown cause.
- 10% of requests were for pyonephrosis. Only 33% were scanned within 6 hours and a further 33% within 24 hours.
- 15% of requests had a cause declared and so potentially did not require scanning. Evaluation of the patients' notes suggested further interesting findings. Firstly as many as 39% of patients had a known cause and so potentially did not need scanning subsequently the cohort of unknown cause/obstruction reduced to 45% but rather alarmingly the cohort of patients with possible pyonephrosis went up to 16%, suggesting that there may be under recognition of this life threatening condition.

We plan to highlight these findings within our institution and make changes to encourage more appropriate requesting and timely scanning. Time will tell if we manage to save or increase our costs in this cost conscious NHS. Fortunately though patient benefits seem to be guaranteed.

P084 Contrast induced nephropathy: Are we adhering to guidelines? A retrospective analysis and audit

[Geoffrey Chow](#); [Subhadip Ghosh-Ray](#)

Basildon Hospital

Aim: Our aim was to assess trust performance in identification and follow-up of patients at risk of contrast enhanced nephropathy (CIN).

Methods: A retrospective audit was performed against trust guidelines, with expected standards of 100% in the following criteria:

- 1) Established renal function prior to contrast;
- 2) Established renal function 48-72 hours following contrast;
- 3) Renal team follow-up if CIN diagnosed;
- 4) Assessment of renal function 5 days after CIN diagnosed. The sample group was 212 patients who had a CT pulmonary angiogram during January and June 2014.

Results: Renal function was established in 99% of patients pre-CTPA but only in 39% of patients following contrast. CIN was diagnosed in 8% of patients with pre- and post-contrast renal function assessment. The renal team followed up 33% of patients and 25% had follow-up renal function assessment. The diagnosis of CIN could not be determined in 63% of patients.

Discussion: Contrast induced nephropathy (CIN) is known to increase mortality. More patients are exposed to this risk as the contrast enhanced investigation demand rises. Standards were only met in assessment of renal function prior to contrast. This reflects a lack of awareness/compliance for trust guidelines for CIN. CIN could not be confirmed in a large proportion of patients due to lack of post-contrast renal function assessment, thus the true incidence of CIN remains unknown. Findings are awaiting local audit presentation. A proposal is being prepared in collaboration with pathology to update trust policy according to new Royal College of Radiology guidelines of CIN.

P085 3T dynamic MRI pelvis

[Mei Fang Tay](#); [Pik Hsien Chai](#); [Tee Meng Tan](#); [Yan Mee Law](#)

Singapore General Hospital

Introduction: Dynamic MRI of the pelvis is an excellent non-invasive modality for assessment of pelvic floor dysfunction in patients suffering from symptoms of pelvic organ prolapse, pelvic pain, constipation and fecal and/or urinary incontinence.

Objective: We share our experience in dynamic MRI pelvis performed with a 3 Tesla (3T) MRI unit and to discuss the imaging techniques employed.



Materials and methods: Retrospective review of all dynamic MRI pelvis performed in a single tertiary institution from January 2012 to November 2014. All patients were imaged in supine positions in following instillation of 50 ml of sonographic gel into the rectum.

Results: A total of 58 patients were identified. Mid-sagittal plane sequential rapid T2W imaging was performed at rest, during straining and defecation, followed by high resolution T2W small field of view of the pelvis performed in axial and coronal planes for assessment of the pelvic organs and musculature. After 15 May 2013, the sequential rapid T2W sequence was replaced by TrueFisp sequence.

Discussion: Patient cooperation is crucial for a successful examination. Explanation of the procedure and demonstration of correct breathing techniques during the examination is paramount in achieving a satisfactory examination. In our experience, the TrueFisp sequence is superior to rapid T2W sequence in demonstrating the extent of pelvic organ prolapse. High resolution T2W images of the pelvis provide important anatomical and morphologic information.

Conclusion: Dynamic MRI pelvis with a 3T MRI unit is an excellent modality for assessment of functional pelvic floor disorders, providing valuable functional and morphologic information that will aid in treatment and surgical planning.

P086 **IVU digital tomosynthesis: A pictorial review of pathology**

[Mark Thurston](#); [Angela Galea](#); [Simon Freeman](#); [Catherine Gutteridge](#); [Sam Crompton](#); [R Ward](#)

Peninsula Radiology Academy

Digital tomosynthesis for imaging the upper tract urothelium is an emerging low-dose high-resolution modality based on conventional tomography. It acquires multiple low-dose projections during a single X-ray tube sweep then reassembles these to provide high-resolution slices at different depths. Plymouth introduced IVU tomosynthesis over 6 years ago and have performed over 5000 studies.

Compared to conventional IVU, tomosynthesis, images are acquired faster and dose less than half a traditional IVU performed with tomography. In a study of 200 renal units performed in our institution, the diagnostic quality of tomosynthesis IVU was found to be superior to conventional IVU with 95% of tomosynthesis studies found to be of diagnostic quality when compared with 46% for the standard IVU examination.

The CT urogram is the gold standard modality for imaging upper tract urothelium providing exquisite detail of renal parenchyma and urothelium at the expense of a radiation dose that is 30 times more than tomosynthesis IVU. Due to the popularity and waiting lists for CT in many institutions, tomosynthesis IVU still holds a place in the armamentum of the urologist for investigation of haematuria, for surveillance of patients with urothelial tumours, in demonstrating renal tract anatomy in a variety of congenital and acquired conditions and as a precursor to stone surgery. We present a pictorial review of anatomy and pathology, correlated with CT findings where applicable:

- Transitional cell carcinoma
- Renal-tract urolithiasis
- Anatomical variants: horseshoe kidney, duplex, crossed fused ectopia
- Infections: scistosomiasis
- Miscellaneous: renal sinus lipomatosis.

P087 **Gastric diverticula: recognising an adrenal 'pseudomass' on CT**

[Gareth Lewis](#)¹; [Peter Strouhal](#); [Hiten Patel](#)²

*The Royal Wolverhampton Hospitals NHS Trust*¹; *University Hospitals Coventry and Warwickshire NHS Trust*²

Aims/objectives: A gastric diverticulum may simulate a left adrenal mass on cross-sectional imaging and is therefore a key adrenal 'pseudomass' to recognise. This poster familiarises radiologists with the common imaging findings of this phenomenon, and discusses its importance. We also highlight simple imaging strategies to help establish the diagnosis.



Content: We present CT imaging from three separate incidental findings of gastric diverticula simulating adrenal masses.

Impact/relevance/discussion: Adrenal nodules and masses are common incidental findings on CT, and may be benign or malignant. Whilst some lesions can be characterised on a single study as a benign adrenal adenoma, many are classed as indeterminate and require additional imaging, such CT (with and without IV contrast) or MRI. Gastric diverticula are a well-recognised cause of an adrenal 'pseudomass'. Familiarity with this entity is important for radiologists as it may prevent misdiagnosis and unnecessary further imaging. Use of multi-planar reformatting, or the presence of gas or oral contrast within the presumed adrenal lesion, can confirm the diagnosis.

Clinical: GI and hepatobiliary

P088 Is further imaging indicated after acute diverticulitis?

[Noor Dawn Assaf](#); [Andy Planner](#)

Great Western Hospital

Purpose: Acute diverticulitis is a common surgical admission. CT is a very sensitive investigation to confirm the diagnosis and assess for complications. There is an increasing trend for follow up imaging on these patients at an interval after their acute event. We explore if, who, when and how follow up should be performed in these patients.

Method: We performed an extensive literature search on Pubmed, looking at malignant potential, different imaging techniques and timing of any investigations.

Results: The American Society of Colorectal Surgeons suggests that follow up should occur 6-8 weeks after the resolution of an acute attack in patients with abdominal pain and colonic wall thickening using colonoscopy or CT colonography (CTC). However, they admit that evidence for this time interval is lacking.

The majority of studies assessed the use of direct colonoscopy after CT confirmed diverticulitis. However, a study has suggested that patients found CTCs less uncomfortable, with a good correlation between findings on CTC and colonoscopy.

In uncomplicated diverticulitis, studies have indicated that there is no increased risk of malignancy above the background population and further imaging is not recommended.

Multiple studies suggest an increased risk of malignancy with complicated diverticulitis - with one study suggesting increases of 4x with perforation, 7x with abscesses and 18x with fistulas.

Conclusion: Uncomplicated diverticulitis does not carry an increased risk of colorectal malignancy. Follow up imaging should be arranged for those with a more complicated picture. CTC may offer a safe and effective follow up tool but further studies need to confirm this.

P089 Comparison between combination and Gastrograffin only preparations for CT colonoscopies

[Noor Dawn Assaf](#)¹; [Lucia Chen](#)²; [Adrian Pollentine](#); [Paul McCoubrie](#)²

*Great Western Hospital*¹; *North Bristol NHS Trust*²

Purpose: To compare Gastrograffin only preparation to the traditional Bisocodyl, low density Barium and Gastrograffin combination for CT colonoscopies. To also assess the acceptability of the Gastrograffin only preparation regime for patients.

Methods and materials: Data was collected from the CT colonoscopies of 100 patients from each group. Six areas of the colon were assessed and a scoring system used to evaluate the volume and tagging of stool and fluid. 124 patient satisfaction questionnaires were collected from those who were given the Gastrograffin preparation.

Results: Using the t-test, stool and fluid volume and tagging showed no significant difference between the groups. There was increased variability in fluid volume in the Gastrograffin group but a more consistently high quality of fluid and stool tagging.



Out of the 124 patients who filled in the questionnaire, three could not take Gastrograffin. The reasons given were: severe diarrhoea and the bottle being difficult to open. 102 patients would be prepared to take Gastrograffin again and 10 would not. 111 patients had diarrhoea, making this the most common side effect.

Conclusion: There was increased variability in the amount of fluid present within the colon of those in the Gastrograffin group. The quality of fluid and stool tagging was more consistent in those who had taken the Gastrograffin preparation. The survey suggested that although side effects were common, this form of oral preparation was relatively well tolerated and safe. As such, the standard preparation prior to CT colonoscopies has been changed to the Gastrograffin preparation regime.

P090 CRAC Tool™. A self audit tool for advanced practice for CT colonography services

[Paul Clarke](#)

County Hospital, University Hospitals of North Midlands NHS Trust

As an advanced practitioner radiographer undertaking CT colonography, I am required to undertake on going audit of my practice. This poster presents the audit tool system & method I have developed to help effectively manage, simplify and reduce the time involved by automation of various aspects of the processes of auditing my CT colonography outcomes and practice.

My approach was to initially find an IT solution, as there were no suitable products available on the market, I have since developed my own suite of CTC self audit management tools. The audit tool software application will aid CTC advanced radiography practitioners with the management and evidencing of their required audit activities. The software was originally designed and developed specifically to cater for CT colonography audit management.

The audit tool will reduce the need for dedicated specialist audit personnel that are often required for time-consuming data collection and for processing data into a usable informative format. An early version of the tool has been in trial with success for over one year. The tool automates the production and reporting of the CTC advanced radiography practitioner's accuracy, specificity, sensitivity and positive predictive values, negative predictive values and prevalence statistical output information.

The poster will present the tool, elements and example output information from my own practice with one years statistical outcomes data produced for my CTC practice using the CRAC Tool™. Further development and widespread adoption of such software would reduce the amount of valuable time spent by clinical staff collecting, collating and producing accessible meaningful and timely output data. The audit tool produces and provides a snapshot of performance for immediate review by any practitioner using the latest version.

The tool can also provide useful health informatics, and evidence useful for service accreditation and professional accountability purposes.

P091 Pictorial review of the early signs of invasive colorectal cancer on contrast enhanced computed tomography

[Jawad Naqvi; Sharath Hosmane; Snehal Lapsia](#)

East Lancashire Hospitals NHS Trust

Background: Colorectal cancer is the second most common cause of cancer death after lung cancer in the UK. Earlier detection can allow treatment with curative intent and improve prognosis. Optical and virtual colonoscopy are widely used in screening for detection of colonic polyps and in those presenting with features strongly suggestive of colorectal malignancy. However, contrast enhanced computed tomography is still performed to investigate non-specific abdominal symptoms and to exclude any significant bowel related mass. Hence, a significant number of colorectal cancers are still identified on contrast enhanced CT.

Content: In our centre we have identified several signs, which when present in tandem, raise suspicion of colorectal cancer. These include circumferential or eccentric wall thickening >3mm, focal wall enhancement, peri-colonic fat stranding, a cluster of >3 local lymph nodes, enlarged lymph nodes >10mm in short axis and an intra-luminal mass.



Impact: We propose careful evaluation of the bowel on all CT abdomen studies despite lack of bowel preparation, and the presence of 2 or more of the above described features should warrant optical colonoscopy.

P092 The sensitivity and specificity of CT colonography in the diagnosis of colonic polyps in a symptomatic cohort

Tom Meagher; [Jonathan Jenkins](#); Sarah Johnson; Lokesh Saraswat

Buckinghamshire Healthcare NHS Trust

Aims: To evaluate outcomes in a cohort of patients having CT colonography for symptomatic indications including altered bowel habit, weight loss or bleeding.

Content: 295 consecutive CT colonographies were assessed from 2012. Follow up included a review of subsequent imaging on radiology management system over three years and of endoscopy records. Endoscopy records were used to identify patients where either a flexible sigmoidoscopy or colonoscopy were performed within 3 months of the CT. The agreed standards were sensitivity greater than 75% and specificity greater than 95% for polyps >1cm.

Outcomes: 70 of 295 patients had colonoscopy within 3 months of CTC. The sensitivity of CTC for all polyps was 64%, specificity 82%. Sensitivity for polyps greater than 1cm in size was 90% and specificity 84%. A total of 14 polyps were confirmed by endoscopy, five of which were not detected by CT. CT missed one polyp greater than 1cm, measuring 25mm. Sensitivity for neoplasms was 100%, specificity 95%. All five neoplasms were diagnosed by CTC and confirmed by endoscopy. For combined neoplasms and polyps >1cm the sensitivity was 93% and specificity 84%. Subsequent diagnoses included myeloproliferative disorders (3), pancreatic neoplasm (2), prostate carcinoma and mesothelioma.

Discussion: Symptomatic patients referred for CTC are a disparate group. Patients are frequently older presenting challenges for CTC and may have diverticular disease which may limit detailed assessment.

Conclusion: CTC met the audit standard for sensitivity of detecting polyps greater than 1cm in size – 90%. Specificity fell below the agreed standard at 84%.

P093 Small bowel obstruction on CT: a guide for the radiology trainee

[Beth Hankinson](#); Latha Rajan

St Helen's and Knowsley Hospitals NHS Trust

Aims/objectives: We present a pictorial review of the causes of small bowel obstruction and describe a systematic way of interpreting the imaging findings.

Content: We provide examples of common and uncommon causes of small bowel obstruction with illustration of key radiological signs. These include; extrinsic causes such as hernias, extrinsic masses (carcinoid tumours, appendicitis, metastases); intrinsic causes (adenocarcinoma, Crohn's disease, intussusception), mesenteric ischaemia and malrotation.

Relevance/impact: Small bowel obstruction is a common surgical emergency which represents up to 20% of all surgical admissions with abdominal pain. It is not unusual for patients with suspected small bowel obstruction to present out of hours meaning it is the role of the radiology trainee to review such cases, highlighting the importance of a systematic approach in interpretation.

Outcomes: Although plain abdominal radiograph is a low cost first investigation used in the emergency departments, it is only diagnostic in approximately half of cases. CT has now been established as the imaging modality of choice for confirming the diagnosis. CT provides essential pre-operative information regarding the site and cause of obstruction. It can also identify associated complications such as perforation.

Discussion: Accurate interpretation of imaging findings in patients with suspected small bowel obstruction is crucial for optimal patient management.



P094 How not to miss dying bowel

[Cairine Probert](#); [Ramya Dhandapani](#); [Sumita Chawla](#); [Anbu Nedumaran](#); [James Arthur](#); [Ashok Katti](#)

Aintree University Hospitals NHS Foundation Trust

Aims: To highlight different causes of small bowel ischaemia and the associated signs that may be missed when reporting CT scans of the acute abdomen.

Content: We present cases demonstrating a variety of causes of small bowel ischaemia and highlight what to look for when diagnosing it. We include causes of acute ischaemia such as arterial or venous thrombosis, closed loop obstruction, acute superior mesenteric artery syndrome and chronic ischaemia.

Relevance: Small bowel ischaemia is an important cause of acute abdominal pain that can be diagnosed with CT and which needs prompt diagnosis and treatment. There are many causes of small bowel ischaemia and these present with different imaging findings on CT scans of the abdomen. Some of the findings can be challenging to identify and therefore confidently diagnose small bowel ischaemia. If a radiologist is not aware of what to look for then cases of small bowel ischaemia may be missed, resulting in poor patient outcomes.

Outcomes: Readers should be able to identify small bowel ischaemia and its cause when reporting CT of the acute abdomen and help clinicians regarding appropriate treatment options including laparotomy.

Discussion: Small bowel ischaemia is a critical diagnosis and must not be missed on CT scan. We hope the readers will be confident diagnosing small bowel ischaemia on CT and identifying the cause after reading our poster depicting various case examples with causation factors and signs of bowel ischaemia with surgical correlation.

P095 Is MRI small bowel imaging being used appropriately? Auditing the first six months of the new small bowel MRI service at the Countess of Chester Hospital

[Kate Thomas](#); [Gian Abbott](#)

The Countess of Chester Hospital NHS Foundation Trust

Small bowel MRI (SBMRI) is the gold standard for assessing disease extent and activity in small bowel Crohn's disease (SBCD).

A new service was started at the Countess of Chester Hospital in January 2014 for the benefit of CD patients. The initial local standard stated that "SBMRI should be reserved for patients with either known CD (to assess for complications/activity) or for those in whom there is a strong suspicion of SBCD".

In total 50 requests were received and all were scanned. These can be broken down as follows: 18% were carried out on patients with known CD and 64% on patients with suspected Crohn's disease; 18% of scans were for non-CD patients, but these were deemed to be appropriate.

The results indicate the need to streamline referrals for new CD diagnosis as 56% of the scans carried out on patients with suspected Crohn's disease were normal. Previous imaging and/or endoscopy did not appear to improve the diagnostic success rate.

The results of this audit produced new guidelines that aimed to sieve out those patients who likely have IBS rather than IBD. This is to be done by checking a simple faecal calprotectin level, which, if negative (<50 µg/g), effectively rules out IBD, negating the need for further imaging and invasive diagnostic procedures.

P096 Oropharyngeal dysphagia resulting in aspiration

[Meilyr Dafydd](#); [Rwth Ellis-Owen](#); [Craig Parry](#)

University Hospital of Wales

We present a pictorial review of a wide variety of underlying causes for oropharyngeal dysphagia resulting in aspiration: mechanical and obstructive benign and malignant causes, neurological, neuromuscular, and iatrogenic causes.



Each case was demonstrated on videofluoroscopic assessment, and specific management plans were produced collaboratively with the speech and language team.

Dysphagia is a common problem, with reported incidence of up to 40%. This is often subdivided into high (oropharyngeal dysphagia) or low (oesophageal dysphagia). The patients may present with varying clinical symptoms, but laryngeal penetration or aspiration may not always be accompanied by symptoms of choking or coughing.

As demonstrated in our pictorial review, the underlying aetiology of oropharyngeal dysphagia with aspiration is very broad, and not always immediately apparent. However, an accurate diagnosis with the aid of videofluoroscopy is essential to guide definitive management for each patient.

P097 Variants of pancreatic duct anatomy

[Emer McLoughlin](#); [J.A Abdulkarim](#)

George Eliot Hospital NHS Trust

The aim of this poster is to review the embryologic development and normal anatomy of the pancreas and pancreatic ducts and to describe anatomic variants of these structures. In particular, we will demonstrate a pancreatic duct anomaly we have encountered not previously described in the literature.

The pancreatic duct system shows a wide spectrum of anatomic variations which can be seen on radiologic examination. MRCP is the primary imaging modality for the investigation of suspected developmental anomalies of the pancreas and pancreatic duct. MRCP allows noninvasive depiction of the course and drainage pattern of the pancreatic duct and can easily identify developmental anomalies of the pancreas. MDCT is also useful in identifying anomalies of the pancreatic duct and pancreas. An understanding of the embryologic development and normal anatomy of the pancreas and biliary tree is required to identify this group of disorders.

Anatomical variants of the pancreatic duct are most often detected as incidental findings in asymptomatic patients. However, some of these anomalies may be a cause of recurrent pancreatitis or gastric outlet obstruction. Recognition of these anatomical variants is important to guide management of these conditions, facilitate surgical planning and prevention of intraoperative ductal injury.

P098 Hepatocellular Carcinoma (HCC) presenting at a district general hospital - imaging characteristics, compliance and what matters

[Noor Dawn Assaf](#); [Anthony George](#); [Andy Planner](#)

Great Western Hospital

Purpose: To review the imaging features of all HCC diagnosed within our department. To also assess diagnostic criteria, and the value of complying with the Barcelona liver imaging criteria.

Methods and materials: Retrospective data was collected from the scans and pathology results of 28 consecutive patients who had been diagnosed with HCC between 24/04/2009 - 29/09/2014.

Results: The mean age at diagnosis was 70 years. 9/28 (32.1%) had a background of cirrhosis with 12 having an elevated AFP. All 28 patients had at least one lesion greater than 2 cm, with a mean size at diagnosis of 6.5cm. 9 had multifocal liver lesions and 2 had distant metastases. Only 13 patients (46.4%) had either a dedicated triple phase CT or MRI liver, of those, 12 (92.3%) displayed arterial enhancement with rapid portal phase washout. 14 patients had portal venous imaging only and 1 had an unenhanced study. All demonstrated hypoattenuating lesions. 18 patients went on to have a biopsy (16 liver and 2 metastases). Out of the 10 patients who were not biopsied, 9 fully met the Barcelona imaging criteria.

Conclusion: The majority of HCC patients presenting did not have cirrhosis or an elevated AFP, but all had low attenuation portal phase lesions that were greater than 2cm. 12 cases complied with Barcelona imaging criteria and in these cases the need for biopsy was avoided in 75% (9/12) of patients in this group. A biopsy was necessary in 18 patients to allow medical treatment and exclude other malignancies.



P099 Hepatic artery aneurysm - a case study: Do radiologists rely too much on the previous?

[Manika Jayawardena](#); [Haseeb Chaudhary](#)

Warrington and Halton Hospitals NHS Trust

Introduction: Hepatic artery aneurysms (HAA) account for nearly one fifth of all visceral artery aneurysms. The incidence of hepatic artery aneurysm has been on the rise due to the increasing numbers of imaging studies and biliary procedures being performed. The classical presentation comprising of abdominal pain, obstructive jaundice and hemobilia, has been reported in only one third of the cases. While the vast majority of cases remain asymptomatic, those which present clinically are the ones which rupture, which have an estimated mortality of 40%.

Content: A 90yr old lady presented with abdominal pain, jaundice and obstructive liver function tests to the ultrasound department. She had been imaged over two years with the same finding of a large calcified liver cyst which had not significantly grown in size. This same description had been reported by a number of different radiologists over the 2 year period. On the most recent ultrasound scan doppler flow was applied which showed the classic yin-yang sign for aneurysm. The patient had an urgent MRCP which confirmed the finding and its secondary compression of the CBD with intrahepatic biliary duct dilatation. The patient was not a candidate for intervention and so the case was conservatively managed.

Relevance and discussion: This case illustrates the importance of being aware of HAA as a possible differential diagnosis in patients presenting with abdominal pain, jaundice and cystic appearances on ultrasound imaging. Also on reflection as radiologists do we need to question our reliance on previous imaging and reports.

P100 Inside out - a pictorial review of intussusception in all ages and areas

[P Howes](#); [N D Assaf](#); [N T F Ridley](#)

Great Western Hospital

We aim to create a poster aimed at educating radiographers and students about how to identify the different forms of Intussusception in patients of all ages. We will include a selection of images from a variety of modalities, such as computed tomography and ultrasound, showing the different radiological features of Intussusception. We have examples of ileocolic, ileoileal, colonic and stomach intussusception. Intussusception occurs when one segment of bowel is pulled into itself (or a neighbouring loop of bowel) by peristalsis [1]. It is the most common cause of intestinal obstruction in children between 3 months and 6 years. Classical symptoms at this age include vomiting, abdominal pain and bloody stools [2]. In adults it accounts for only 1% of obstructions and only 5% of all intussusceptions [3]. Symptoms in adults are the same as those of other bowel obstructions.

It is important for radiographers to recognise the signs that indicate intussusception and to understand the significance of the pathology. In busy departments this knowledge can enable the team to issue prompt reports for any inpatients and stop outpatients from leaving the department without further review when required. Ideally, the poster will create a more knowledgeable diagnostic radiography department and enable better service for patients who may be suffering with the condition.

P101 What about the whirl?

[Ben Layton](#); [R Magennis](#); [V Rudralingam](#); [S Sukumar](#)

University Hospital of South Manchester

Learning objectives:

- Recognise characteristic CT appearance of the mesenteric “whirl sign”.
- Understand mechanisms of abnormal rotation.
- Differentiate radiological appearances of underlying causes.
- Identify radiological features of potential complications.

Background: The mesenteric whirl sign has a characteristic appearance on CT and relates to abnormal rotation of bowel around the mesentery. The whirl sign is recognised in small and large bowel volvulus, internal hernias and closed loop obstruction.



Findings: The whirl is best appreciated when the axis of rotation is perpendicular to the transverse scan plane but with the benefit of CT reconstruction, images can be optimised for demonstration of the whirl in any plane. The underlying cause and potential complications can also be identified.

Small bowel volvulus is rare but a life threatening surgical emergency. It can arise from post-operative adhesions or hernia, the fixed point acting as a pivot for rotation.

In closed loop obstruction, a bowel segment is occluded at two points. The narrowing at the root of the obstruction predisposes to twisting and resultant volvulus.

In both settings, the twist mechanism impedes the vascular supply with subsequent risk of bowel ischaemia/infarct.

Conclusions: We highlight the importance of recognising the mesenteric whirl sign in the acute setting. Prompt investigation and early surgical management is critical. CT is the modality of choice and allows evaluation of the underlying cause and exclusion of serious complications.

P102 Pictorial review of peritoneal disease

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Aberdeen Royal Infirmary

Aims/objectives: The abdominal cavity extends from the diaphragm to the pelvic floor, and is lined by a serous membrane known as the peritoneum. The peritoneum is a large serosal membrane; peritoneal folds suspend the various organs contained in the abdominal cavity. The peritoneum comprises of two layers; the parietal (lining of the abdominal cavity) and the visceral layer (enveloping organs). Within this potential cavity only trace of physiological fluid should be found. The peritoneal cavity and the specialized peritoneal folds, known as mesenteries, are important disease sites in the abdomen.

Relevance/impact: We present a selection of cases demonstrating different pathologies including peritoneal tuberculosis, lymphoma, mesothelioma and malignancy in order to highlight relevant pathology and differential diagnosis in a systematic way.

Outcomes: Using characteristic examples of the above presentations as well as an overview of common differential diagnosis, we aim to provide an approach to identifying and diagnosing peritoneal disease.

We hope this will facilitate a clearer understanding and enrich the ability of the clinical radiologist to formulate rational differential diagnoses.

Discussion: The peritoneal disease and the pathway of spread often proves tricky; but with consolidated knowledge and understanding clinical radiologists can improve their interpretation skills.

P103 SeHCAT testing in suspected bile salt malabsorption

[Hilary Matthews](#)¹; [Ghada Al-Bahrani](#)²; [Jackie James](#)²

*North Western Deanery School of Radiology*¹; *Nuclear Medicine Centre, Central Manchester University Hospitals NHS Foundation Trust*²

This educational exhibit provides a synopsis of everything a radiographer, radiologist or gastroenterologist should know about SeHCAT testing in suspected bile salt malabsorption.

We summarise all aspects of SeHCAT testing in the clinical setting, including a recap of the features of bile salt malabsorption and indications for referral for SeHCAT testing, basic pharmacology of the SeHCAT molecule and physiology of the enterohepatic bile salt circulation, what the testing procedure actually involves, interpretation of test results and available treatment options.

We include a review of 100 patients, for whom clinical follow up was available, referred to our unit for SeHCAT testing over a 3 year period, examining the correlation of percentage SeHCAT retention with clinical response to bile acid sequestrants in this patient cohort.



Results show some correlation between %SeHCAT retention and response to sequestrants, although a number of patients did not respond as predicted (either improving with sequestrants despite 'normal' SeHCAT retention, or failing to improve with sequestrants despite 'abnormal' SeHCAT retention).

SeHCAT testing is a useful tool in the investigation of suspected bile salt malabsorption but, as in many clinical situations, results and expected response to treatment may be confounded by a variety of factors.

Clinical: Paediatrics

P104 Assessing practice and timing of neonatal cranial ultrasound in a district hospital

[Emily Hurst](#); [Rubaraj Jayarajasingam](#)

Mid Yorkshire Hospitals NHS Trust

Background: Cranial ultrasound is used widely in neonates for detection and monitoring of pathology. The indications are diverse, and the frequency and timing of follow-up scans can be difficult. Within our unit we are guided by a regional modification of the British Society for Paediatric Radiology Guidelines, 'Technical Standards - Neonatal Cranial Ultrasound Scans'. We sought to establish our current practice relating to technical quality and timing of scans in order to guide departmental process.

Methodology: Retrospective analysis of all cranial ultrasounds performed over a 6-month period (n=147) within our district hospital. Each examination was assessed with reference to the information labelled on the scans, and technical quality of images. All premature (<33 weeks gestation) infants having their first cranial ultrasound within a 6-month period (n=23) were assessed in relation to the timing and frequency of scans.

Results: The technical quality of scans performed within our unit was excellent; the majority of examinations contained the recommended information (86-100%) and imaging views (88%). Most first cranial ultrasound examinations were undertaken at the recommended time, however 96% of patients did not follow the recommended plan for subsequent studies and only 50% had the recommended 36-week scan. The cause is multifactorial; appropriately trained staff not always available, and incorrectly timed clinical referrals.

Outcomes:

- Results presented locally.
- Further sonographers trained to perform cranial ultrasound to improve the service.
- Consideration of use of a proforma to guide scan timings and referrals.
- Encouragement of clinician scanning.

P105 Paediatric head injuries and computed tomography: are we following NICE guidelines?

[Ryan Connolly](#); [Robert Spence](#)

Altnagelvin Hospital

Introduction: Head injuries are a leading cause of mortality, accounting for 15% of deaths in children aged 1-15. Computed tomography has been documented as the primary investigation for clinically significant head injuries. However several studies have attributed higher rates of lifetime cancer risk to patients who receive irradiation at a young age. Recently NICE published updated guidelines for management of paediatric head injuries, emphasising risk stratification of high risk children requiring imaging whilst minimising radiation exposure in lower risk patients. We aim to assess adherence to this guidance within the hospital.

Method: This retrospective audit reviewed all paediatric patients admitted over a consecutive three month period with head injuries. Case notes and electronic records were analysed, assessing documentation of clinical findings and indications for CT brain. We subsequently evaluated adherence with NICE guidance CG176.

Outcomes: 27 patients were admitted for neurological observation over a three month period. 14 patients (52%) received a CT brain however 6 patients (22%) met NICE criteria for CT. One scan out of 14 showed a significant abnormality. Interestingly, 9/27 patients (34%) had no initial GCS score documented on admission notes.



Discussion: Our findings suggest a lack of compliance with NICE guidance and subsequent over-reliance on radiological investigations. To reduce unnecessary radiation exposure, we have increased educational awareness amongst clinical staff and distributed copies of NICE guideline algorithms. Following implementation of this PDSA cycle, it is hoped that our re-audit will show evidence of significant quality improvement.

P106 What is the value of a full skeletal survey in diagnosing child abuse?

[Jessica Smith¹](#); [Alan Sprigg²](#); [Isla Lang²](#); [Amaka Offiah²](#)

The University of Sheffield¹; Sheffield Children's NHS Foundation Trust²

Objectives:

- To determine the yield of hand, foot and spine fractures from initial skeletal survey and follow-up images
- Ascertain whether radiographs of these sites can be omitted
- Provide recommendations for an imaging protocol that provides sufficient diagnostic evidence whilst minimising radiation exposure.

Materials/methods: For this single centre retrospective study, the radiographs of 120 patients, under the age of three who had a full skeletal survey and follow-up imaging performed for suspected physical abuse were selected and anonymised.

Three consultant radiologists independently answered questions regarding presence of fractures or other abnormalities, first on the initial survey, and then from both initial and follow up images together.

Results:

- Interim results for the first 40 patients are presented;
- No hand, foot or vertebral fractures were reported by any of the radiologists;
- Readers 1 and 3 had 100% agreement, identifying no fractures in 23/40 (57.5%) patients;
- Reader 2 reported no fractures in 24/40 (%), reporting one false positive tibial corner fracture.

Conclusion: Yield of fractures of hand, foot and spine is low, suggesting that images of these sites may only be indicated in selected cases. Comparison with children with fractures at these sites may identify clinical indicators.

P107 Peer review exercise of paediatric skeletal survey reporting in suspected non-accidental injury

[Thomas Peachey](#); [Iwan Roberts](#); [Alan Sprigg](#)

Sheffield Children's Hospital NHS Trust

Objectives:

1. Present findings of a non-accidental injury (NAI) skeletal survey peer review exercise.
2. Summarise specific and general learning points.
3. Encourage interest and participation in peer review.

Content: Imaging staff were invited to report a series of eight anonymous skeletal surveys performed for possible NAI. The skeletal surveys provided a mix of pertinent learning points, common findings and normals. There were eight respondents. A highly experienced NAI expert witness provided a gold standard against which reports were evaluated. Individualised feedback was provided to participants.

Relevance: Up to 7% of children suffer serious physical abuse during their childhood. Radiologists play an essential role in the care and protection of children through reporting radiographic skeletal surveys. A standard set of radiographs is taken for suspected NAI, forming a skeletal survey. It is vital that reporting is correct and consistent.

Outcomes: Most reporters noticed when surveys were incomplete. Respondents performed well at spotting and aging most fractures, especially of the ribs and a variety of extremity fractures. Vertebral fractures and some subtle extremity fractures were poorly identified. There were some overcalls. The cohort was divided on whether a periosteal reaction was pathological or physiological. There was also disagreement on appropriate further imaging.



Discussion: Participation was voluntary and anecdotally reporters were keen to participate, valuing the opportunity for learning and practice validation. The cases were reviewed and discussed at an audit meeting, providing a further platform for reflection and peer learning.

P108 Completion of head CT request forms in cases of suspected infant abuse

[Jessica Smith¹](#); [Amaka Offiah²](#)

The University of Sheffield¹; Sheffield Children's NHS Foundation Trust²

Aims/objectives: To determine quality of head CT request forms in cases of suspected abuse in children under the age of 1.

Relevance/impact: According to 'Standards for radiological investigations of suspected non-accidental injury', neuroimaging should be performed in any child under the age of one where there is evidence of physical abuse.

The guidelines are currently being revised.

Radiation dose from head CT is significant. It is important that indications for the investigation are clearly conveyed. The quality of the radiological report (which is a legal document) is enhanced when a clinical history is available.

Material/methods: A search of PACS for children under the age of 1, who had a CT head scan performed in cases of suspected 'non-accidental injury' between 09/10/2012-10/10/2014 at one hospital. Each request form was assessed and scored out of 12 for several parameters including legibility of forms.

Outcomes: The mean score was 10.6 (range 9-12), 16% (11/70) scored a maximum 12 points. The average score for legibility was 1.5/2; 39 (56%) scored 2/2.

The section of the request form with the lowest completion rate was the bleep number of the requesting physician, with 29% (20/70) not being filled in.

All request forms gave a clinical indication, however, less than half, 32/70 (46%), mentioned suspicion for abuse.

Discussion: Overall request forms are filled out to a good level but there is room for improvement. In particular the need for legibility and avoidance of unusual acronyms should be emphasised.

P109 Sticks and stones but not broken bones: An audit of paediatric bone age radiographs and a review of alternative techniques

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Pennine Acute Hospitals NHS Trust

Purpose: At our trust the Greulich and Pyle method is used to assess paediatric bone age. We wanted to assess whether radiographs taken for paediatric bone age assessment were of adequate quality for diagnosis and whether the radiology report contained adequate information to aid the clinician in diagnosis and treatment. We also wanted to review potential alternative and newer methods for assessing bone age.

Method: The last 50 bone age examinations performed at the trust were identified. These were re-reviewed and the radiographic adequacy and quality were assessed according to local protocols including labelling and projection. The content of the radiology reports was assessed according to RSNA template recommendations.

Results: The correct projection was performed in only 88% radiographs. The correct side was labelled in 100% radiographs, however, gender was only labelled in 26%. There was great variation in the standard of the radiology reports with only 34% reports containing a conclusion/impression. Bone age was not included in all reports

Conclusion: A small number of radiographs were not of diagnostic quality. Radiology reports sometimes ambiguous and open to interpretation. A different method of evaluating bone age such as an online digital atlas may prove to be more accurate and reliable. Regardless of the method used to assess bone age, diagnostic quality films and standardised radiology reports would be the ideal standard.



P110 The value of the oblique paediatric wrist radiograph

[Rosalind Joseph](#); [Dina Hikmat](#); [Farokh Setna](#); [Rajeev Ravi](#); [Ursula Hughes](#)

Arrowe Park Hospital, Wirral University Teaching Hospital

In conventional radiography, a 3-view radiograph is usually advised in wrist trauma. However in the paediatric patient group, obtaining a third view potentially prolongs discomfort and increases radiation dose. Our local departmental practice sees 2 or 3 views performed with no formal protocol pertaining to the number of projections. The poster aims to examine the benefit of the oblique view in the paediatric trauma wrist.

Our findings will be presented from a retrospective study of 3 view wrist radiographs in the paediatric age group. The radiographs were analysed independently by a paediatric radiologist and a general radiologist, firstly with the oblique views obscured. A report was provided based on the AP and lateral views as either Normal, Abnormal or Equivocal. The oblique view was then reported in the same way.

The results showed that the oblique view of the semi pronated wrist did not provide any additional benefit in confirming or excluding a fracture. The study results suggests and recommends that only 2 views (AP and lateral) are sufficient for assessment of traumatic wrist injury in the paediatric population, importantly reducing radiation dose and increasing compliance. This was presented locally and has been put into practice. We hope this has contributed to a safer diagnostic pathway for a vulnerable patient group.

P111 Review of paediatric radiography of the elbow

[Sabah Awan](#)

Warrington and Halton Hospitals NHS Foundation Trust

Elbow fractures are the most common injuries in children and are therefore most commonly imaged by radiographers. The evaluation of a paediatric elbow radiograph can be challenging and this is usually due to the complexity and variability of the physal anatomy and development and also in the patterns of injury a paediatric experiences compared to an adult.

It is therefore important to understand the anatomy of a paediatric elbow because it helps to ensure that normal ossification centres are not misinterpreted as fracture fragments. It also helps in identification of an injury when the pattern is altered.

This poster will review the basic anatomy and provide an overview of radiographic technique. It will primarily enhance and develop the radiographers' image interpretation skills by providing a methodical review and thus the types of injury and their radiographic appearances.

P113 Paediatric dysfunctional voiding and the use of ultrasounds

[Kunal Patel](#); [James Green](#)

Barts Health NHS Trust

Our audit was to see whether imaging in children who have suffered a UTI is being performed according to the NICE guidelines. The key message from the NICE guidelines state that infants and children six months or older with a first-time UTI that responds to treatment, routine ultrasound is not recommended unless the infant or child has atypical UTI.

Data analysis involved a database search of patient records from an NHS District General Hospital, an NHS community clinics and private practice clinics covering the population of 350,000. The database search were for letters containing the words "infrequent voiding" and "voiding by the clock" of patients seen in secondary care between 2005 and 2014 at Whipps Cross Hospital, Waltham Forest community and Holly House and The Roding Hospital. Analysing data from 2009-13, we found that 1,562 children under the age of 18 were seen in the outpatients department. Of these, n=227 (6.9%) patients had dysfunctional voiding symptoms. This total was from a mixture of community clinics, private patients as well as from OPD in secondary care. 227 Patients were categorized into the following groups in order of their primary presenting complaint: UTI n=75 (39.6%), Enuresis n=70 (37%), Daytime Wetting n=36 (19%), Abdominal pain n=12 (6.35%), Penile pain n=11 (5.82%), Urgency n=7 (3.70%), Frequency n=7 (3.70%) and Haematuria n=5 (2.65%). Out of the 75 patients identified, 52 (69%) abdominal



ultrasounds were undertaken. On further analysis, only 1/52 (1.9%) had an abnormality. We had looked carefully at the scans performed for the 75 patients who presented with UTI's by looking through the request forms. It was clear that there were only 3 requests from the 52 found that were adhering to the NICE guidance.

These results show a low true positive rate. We proposed that an accurate history coupled with knowledge of the NICE guidelines for investigation of UTI could safely lead to a decrease in ultrasound investigations of children. This will not only relieve the pressures of scanning, but will inevitably reduce costs and valuable resources for the hospital.

P114 Gastrointestinal tract obstruction in the neonate - a pictorial review

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King's College Hospital NHS Foundation Trust

Aims/objectives: We present an overview of the key radiological features of various causes of gastrointestinal tract obstruction in a neonate. We aim to raise awareness to assist rapid diagnosis of these conditions which may lead to significant complications if undiagnosed in the new born period.

Content: This review contains a range of cases of gastrointestinal obstruction from the oesophagus to the anus. We include common cases such as pyloric stenosis, malrotation and Hirschsprung's disease as well as rare atresias. The key diagnostic features of the initial imaging will be highlighted through plain radiograph, ultrasound and fluoroscopic studies.

Relevance and impact: Unrecognized or delayed diagnosis of gastrointestinal obstruction may lead to rapid deterioration in neonates, with narrow physiological reserves, leading to increased complications, morbidity and mortality. Clinical history and examination are helpful but often non-specific and diagnostic imaging becomes the cornerstone in making an early definitive diagnosis.

Outcomes: This review will demonstrate key radiological signs for diagnosing various causes for gastrointestinal tract obstruction in neonates. Correct interpretation of initial imaging allows timely referral for surgical management or prompt further investigations to aid diagnosis and avoid unnecessary morbidity and mortality.

Discussion: Correct diagnosis of the cause of gastrointestinal obstruction in neonates remains challenging. There is a short time window to avoid complications and often the initial interpretation of the plain radiograph falls onto a non-paediatric trained radiologist. We aim to improve confidence of the DGH radiologists to allow prompt diagnosis and referral of cases of neonatal gastrointestinal obstruction.

Clinical: Multisystem disorders

P115 Imaging features of abdominal tuberculosis

[John Adu](#); [Huai Ming Phen](#); [Khawaja Shahabuddin](#)

Barts Health NHS Trust

Aims: Abdominal tuberculosis mimics many conditions both clinically and radiologically, and can result in significant morbidity. Familiarity with the imaging features and complications of the disease is essential in order to allow early diagnosis, initiation of appropriate treatment and to ensure a favourable outcome. The aim of this poster is to provide a pictorial review of the imaging findings of abdominal TB and to explore the features that will help the reporting radiologist to differentiate this condition from those of its mimics.

Content: We provide a pictorial review of ultrasound, CT and MRI appearances of:

- Tuberculous lymphadenitis
- Urinary tract tuberculosis
- Tuberculous peritonitis
- Gastrointestinal tract tuberculosis
- Hepatosplenic tuberculosis

- Tuberculosis of the biliary tract
- Pancreatic tuberculosis
- Adrenal tuberculosis.

Relevance: In London, the incidence of TB continues to climb. Specifically, in East London (where our hospital is based) there are up 119 cases per 100,000 people each year; higher than many African countries. In this context, TB must be considered in the differential diagnosis of patients who present with abdominal symptoms.

Discussion: Abdominal tuberculosis is difficult to diagnose due to its varied presentation. Although there are no pathognomonic imaging findings, several characteristic imaging features can be seen that are highly suggestive of TB. A high index of suspicion and recognition of the common imaging findings can lead to an early diagnosis and reduction in the long-term morbidity and mortality. Familiarisation with the characteristic features TB can facilitate differentiation of TB from other important inflammatory and neoplastic conditions.

P116 Audit on the current use of imaging in diagnosis of multiple myeloma

[Nathan Gupta¹](#); [Nadya Jabbar²](#); [Dina Hikmat²](#); [Edu Anosike³](#); [Nitin Rao²](#)

Wirral University Teaching Hospital; Warrington and Halton Group of Hospitals¹; Wirral University Teaching Hospital NHS Foundation Trust²; Warrington and Halton Hospitals NHS Foundation Trust³

Introduction: Skeletal survey (SS) remains the recommended modality of imaging for confirmation of multiple myeloma (MM) according to British Committee for Standards in Haematology (BCSH) 2014 guidelines. SS has poor sensitivity for the detection of osteolytic lesions and cannot detect extramedullary lesions, focal bone marrow involvement or measure response to therapy. MRI, CT and PET/CT can give additional information in MM.

Aims: To assess adherence to current BCSH guidelines for imaging in MM.

Methods: Retrospective audit of patients who underwent skeletal survey for suspected myeloma between 27/08/13 and 30/12/13.

Results: There were 51 patients (age range 44 to 100 years) in our audit. 39 patients were suspected of MM and 12 patients were known to have monoclonal gammopathy of unknown significance (MGUS). 7 patients had an incomplete SS. 7 patients showed lytic lesions on SS compatible with MM. 14 patients had indeterminate bony lesions and 25 patients had no bony lesions.

Conclusion: There was good adherence to current BCSH guidelines in our patient group. However, despite the poor sensitivity of SS, only 2 patients with indeterminate lesions had further imaging with MRI/CT for lesion characterization as recommended by the guidelines. SS still continues to be the recommended initial imaging for radiological diagnosis of MM. Other imaging modalities should be used where the SS is equivocal and/or when complications arise.

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2. Esther et al, Leuk Lymphoma. 2011 September 52(9)

P117 Heterotaxy

[Fiona Caswell](#); [Georgia Priona](#)

Aberdeen Royal Infirmary

Aims/objectives: The word heterotaxy is derived from Greek from heteros (ἕτερος=different) and taxis (τάξις=arrangement). It refers to abnormality in the usual arrangement of organs with regards to the right-left axis (Right-left isomerism) of the body. There are different forms of heterotaxy syndromes that can be placed under the umbrella of the cardiosplenic syndromes, a more pathophysiological approach to this magical phenomenon. There is a high association with complex congenital cardiac abnormalities, especially with the asplenia subtype, which can have a high mortality rate. Many systems can be affected in these complex syndromes and as such, careful evaluation is required.



Relevance/impact: We present two different cases of heterotaxy syndrome in order to demonstrate many of the radiological findings accompanied by tables explaining potential radiological findings.

Outcomes: This presentation will make you more clear about the nomenclature used and give an overview of the radiological appearances as well as the identification of patients at risk of fatal complications from the related cardiac, immune and gastrointestinal pathology.

Discussion: Although complex heterotaxy syndromes can be related to high mortality and morbidity. It is the radiologists duty and also of paramount importance to be aware of the heterotaxy presentations and the increased risk of congenital heart disease, immune deficiency (due to splenic absence) and catastrophic volvulus with malrotation.

P118 Paget disease: A pictorial review of its typical imaging characteristics and potential complications in our practice

[Saman Zaman¹](#); [Jenn Wong¹](#); [Elliot Rees²](#); [Catriona Reid¹](#); [Maria Johnson¹](#); [Ajay Sahu¹](#)

Ealing Hospital, London Northwest Healthcare NHS Trust¹; Plymouth Hospitals NHS Trust²

Introduction: Paget disease of the bone is a chronic bone disorder characterised by excessive abnormal bone remodelling. It is a common disorder affecting approximately 4% of patients over 40 years of age and 11% over the age of 80. The radiologist plays a pivotal role in the identification of disease, monitoring of progression, and early recognition of its complications.

Objectives: Our aim is to review imaging findings, natural history and complications of Paget disease. As only one-fourth of the patients are symptomatic at the time of detection of the disease, this is usually diagnosed incidentally. Polyostotic disease is more common than the monostotic type. The most frequent sites of involvement are spine, pelvis, skull and proximal long bones. We expect the radiologists to identify the disease and assess its stage-wise progression including complications.

Presentation and imaging findings: Plain films, CT, MRI, and bone scintigraphy images demonstrating varying manifestations of Paget disease will be provided. Cases showing lytic (incipient or osteoclastic activity), mixed (active osteoblastic and osteoclastic activity) and sclerotic/blastoid (late inactive) will be demonstrated. We endeavour to illustrate typical appearances such as osteoporosis circumscripta, cotton wool appearance, diploic widening, picture frame and squaring of vertebra, and asymmetric enlargement of the bones. Different radiographic examples of potential complications will include osseous deformity, bowing deformities, kyphosis, spinal stenosis, pathologic fractures, basilar impression, and sarcomatous degeneration.

Conclusion: Knowledge of the key imaging findings including potential complications is important to providing an accurate interpretation of patients with Paget disease.

Clinical: Intervention and trauma

P119 The utility of CT scanning for hip fractures from the Emergency Department

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Great Western Hospital

Introduction: CT is frequently used as follow up imaging to further investigate radiologically occult hip and pelvic fractures. The aim of this study is determine the value of Computed Tomography (CT) of the hips and pelvis in assessing for the presence of these occult fractures.

Methods: Retrospective data was collected from the scans and reports of CTs and X-ray of the hips and pelvises requested by the Emergency Department between 20/01/2013 and 19/11/2014. A total of 100 cases were reviewed.

Results: 44 CTs were positive, the most common fractures identified were those of the pubic rami (17), acetabulum (8), neck of femur (8) and greater trochanter (7). Out of the 44 patients with fractures, 27 (61%) had an X-ray



reported as normal. 12 patients had plain films reported as normal but had fractures visible in retrospect. The missed fractures were: 8 pubic rami fractures, 3 isolated greater trochanter fractures and 1 periprosthetic fracture.

Of the 56 negative CTs, only 4 (7.1%) had a fracture erroneously reported on their X-rays.

Conclusion: X-rays should remain the initial investigation of choice for possible hip fractures. However, CT is a good option for follow up imaging when there is a high index of suspicion and a normal X-ray.

P120 Pain in my hips! Pictorial review of complex pelvic and acetabular injuries and surgical management options from a trauma centre's perspective

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Aims/objectives: We present a pictorial educational journey of complex pelvic and acetabular injury from our experience at a major trauma center who were admitted after significant blunt trauma. We particularly highlight the importance of pre and postoperative imaging capabilities and various surgical fixation options.

Content: This is a comprehensive retrospective case review from a major trauma centre, which has vast experience and expertise in diagnoses and management of complex pelvic injuries with a multidisciplinary team approach with Radiologists and Orthopaedic Surgeons.

Relevance/impact: Pelvic injuries can be divided into anterior posterior compression, lateral compression, and vertical shear and combined mechanism of injuries. The pelvis is considered as the crossroads of the lower body and in order to treat injuries successfully, identification and management of bony, soft tissue, visceral and neurovascular injuries are necessary.

Outcomes: We concentrate on the importance of an accurate radiological diagnosis in identifying these significant injuries. so that surgical fixation can be successfully completed. The purpose of this exhibit is also to illustrate the value of joint Radiological and Orthopaedic management imperative for high quality patient care.

Discussion: Trauma imaging capabilities has dramatically improved with computed tomography (CT) and three-dimensional (3D) volume rendered images clearly demonstrating the complexity of pelvic injuries, which in turn aids surgical planning. We hope to empower the reader by presenting unique trauma cases which illustrate pertinent imaging points and surgical management review of complex pelvic and acetabular injuries.

P121 I've injured my ribs! A major trauma centre's experience of flail chest and multiple displaced rib fractures and the benefits of surgical fixation

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Objectives: We present a pictorial synopsis of a cohort of cases admitted to our major trauma centre following blunt thoracic trauma resulting in either a flail chest or multiple displaced rib fractures which are subsequently managed surgically.

Content: We will highlight cases of both flail chest and multiple displaced rib fractures pre and post-operatively using plain radiographs, computed tomography and three-dimensional (3D) volume rendered images. We also consider the clinical implications of such injuries alongside the indications for surgical stabilisation.

Relevance: As the number of rib fractures increases, there is a significant increase in mortality and morbidity. Flail chest can represent a life-threatening condition resulting in respiratory compromise. These injuries have previously been managed non-operatively using analgesia and mechanical ventilatory support. Recent studies have however indicated that surgical fixation substantially improves pulmonary function, reduces acute complications and ultimately improves critical care outcomes.



Outcomes: We hope to engage the readers to accurately recognise flail segments and multiple displaced rib fractures across various imaging modalities. We also concentrate on the importance of reporting these injuries so that surgical fixation can be appropriately implemented.

Discussion: The ambition of this pictorial educational exhibit is to facilitate the observer in better recognising complex chest wall injuries following trauma and their surgical management from a major trauma centre's perspective. We emphasise the crucial role that radiological imaging plays in both the prompt diagnosis and the surgical planning for these patients.

P122 The Trauma Multidisciplinary Team Meeting (MDTM) and the introduction of radiology input: How well is it working?

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Aintree University Hospital

Objectives: The Trauma Multidisciplinary Team (MDT) Meeting has been an integral part of patient management since the formation of the Major Trauma Centre (MTC). These meetings are held on a daily basis and are attended by various members of the Trauma MDT. We report the results of our survey of how well the Trauma MDTM is working in general and, more specifically, evaluate the regular contributions of Radiologists to the MDTMs.

Content: A prospective survey was conducted over a three-week period at our MTC which questioned the structure, scheduling, and attendance of the meetings and their subsequent impact on patient care. We also present respondent proposals for enhancing the service offered.

Relevance: Since July 2014, Radiology input has been introduced and is now provided daily during the week with the aim of contributing to the decision making process and arranging timely scans for patients where necessary.

Outcomes: The overall contribution of the Radiology department has been highly commended with 96% satisfied with the current set-up of Diagnostic and Interventional Radiologists in attendance. 92% thought discussion at the meeting influences patient management and 96% felt that the introduction of the MDTM has improved patient outcomes.

Discussion: The results of the survey are very encouraging and instrumental to the invaluable contribution that the Trauma MDTM makes to ensure that the highest quality of patient care takes place. Furthermore, this survey demonstrates that the Radiology department's regular presence in the meetings has an extremely positive impact on the work of the MTC.

P123 Traumatic injuries of the neck: Role of split bolus single phase in blunt injuries - experience of a level I major trauma centre in London

[Rashmeet Chhabra](#); [Janani Kumaraguru](#); [Asad Shah](#); [Ramya Balachandar](#); [Dylan Lewis](#); [Nagachandar Kandasamy](#)

King's College Hospital

With more and more major trauma centres, imaging the patient with major trauma has been transformed. CT imaging of the neck, chest, abdomen and pelvis with or without imaging the brain is an accepted norm and most CT examination protocols are now done with IV contrast.

Whilst images are obtained with IV contrast, imaging is not particularly done in the arterial phase. Whilst obvious vascular injuries in the neck following a trauma (either penetrating or non-penetrating) may be picked up on these protocols either based on a high index of clinical suspicion or severity of the injury, less conspicuous injuries (eg arterial dissection, pseudoaneurysms) may not be picked up in the immediate setting in view of the less than optimum sequences obtained to identify these abnormalities. However, most of these conditions can be identified if there is higher index of suspicion maintained by the radiologists and we illustrate a few cases in this regard. Identifying these abnormalities, which are usually silent at presentation and which may not affect immediate management in patients with more severe injuries is vital in terms of follow up and preventing delayed potentially life threatening/fatal events (eg stroke).



P124 A small-scale study comparing radiation dose of fluoroscopy to radiation free, electromagnetic navigation during the insertion of distal locking screws of intramedullary nails

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Background: Intramedullary nailing is the standard surgical treatment for mid-diaphyseal fractures of long bones; however, is also a high radiation dose procedure. Distal locking is regularly cited as a demanding element of the procedure and there remains a reliance on X-ray fluoroscopy to locate the distal holes. A recently developed electromagnetic navigation (EMN) system allows radiation free distal locking, with a virtual on-screen image.

Objective: To compare operative duration, fluoroscopy time and radiation dose when using EMN over fluoroscopy, for the distal locking of intramedullary nails.

Method: Consecutive patients with mid-diaphyseal fractures of the tibia and femur, treatable with intramedullary nails, were prospectively enrolled during a 9-month period. The sample consisted of 29 individuals, 19 under fluoroscopic guidance and 10 utilising EMN. Participants were allocated depending on the type of intramedullary nail used and surgeon's preference. These were further divided into tibial and femoral subcategories.

Results: EMN reduced fluoroscopy time by 49(p=0.038) and 28 seconds during tibial and femoral nailings. Radiation dose was reduced by 18cGy/cm²(p=0.046) during tibial, and 181cGy/cm² during femoral nailings when utilising EMN. Operative duration was 11 minutes slower during tibial nailings using EMN, but 38 minutes faster in respect of femoral nailings.

Conclusions: We have evidenced statistically significant reductions both in fluoroscopy time and radiation dose when using EMN for the distal locking of intramedullary nails. We expect that overall operative duration would decrease in line with similar studies, with increased usage and a larger sample.

Errors and discrepancies

P125 An audit of reporting of incidental vertebral fractures on CT imaging of the thorax, abdomen and pelvis

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Cambridge University Hospitals NHS Foundation Trust

Purpose: Vertebral fractures are often the first sign of osteoporosis to be recognised. It is important that they are identified so that the risk of further fractures can be reduced, by anti-osteoporotic agents e.g. bisphosphonates. Incidental vertebral fractures may be identified on CT performed for unrelated reasons. This audit investigated whether vertebral fractures are being sought on CT, whether fractures are being missed and whether sagittal reformatted images have a role.

Methods: The hospital electronic database was used to audit CT reports of patients aged >50yrs. It was noted whether the report commented on the bones and whether a fracture was unambiguously reported. The images were reviewed to see whether a sagittal reformat had been saved and whether a vertebral fracture had been missed, using Genant criteria.

Results: A pilot audit of 50 reports (January 2014) revealed that 20% of patients had vertebral fractures. Only 10% of these fractures were reported. A single sagittal reformatted image enabled identification of vertebral fractures in 98% of the patients, however this image had only been saved in 4% of cases.

After an educational campaign, 300 reports (April-May 2014) were audited. 11% of patients had vertebral fractures. 35% of these were unambiguously reported.

Conclusion: Incidental vertebral fractures detected by CT are rarely reported. Departmental awareness was raised at meetings and by posters, which slightly improved the percentage of fractures reported. Sagittal reformatted images are now being saved by the radiographers at the time of image acquisition - re-audit is planned in April-May 2015.



P127 Orthopaedic auto reporting and non-medical referral: reporting radiographers can address governance demands

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NHS Greater Glasgow and Clyde

Aims/objectives: Auto reporting and non-medical referrers are adopted by radiology and orthopaedics to meet increasing demand on imaging services whilst fulfilling IR(ME)R 2000 requirements. Without radiology input a governance risk is possible due to insufficient patient records updating. This study shows operational limitations of this system in two hospitals in one Scottish Healthboard and offers an approach to meet governance demands.

Content: One third of orthopaedic non-medical referrals were retrospectively evaluated between September and December 2013. The patient electronic portal was interrogated to identify if IR(ME)R reporting criteria were met. Physiotherapist, Podiatrist and Orthopaedic Nurse Practitioner comments were separately analysed to establish if practice differences existed.

Relevance/impact: An understanding of what is being appended to patient notes by non-medical, non-radiology reporters is necessary to ensure safe governance. Without this radiology may be held liable for errors.

Outcomes: From a total of 534 records examined 335 (63.7%) met IR(ME)R reporting requirements with the remainder either not documented or using one word reports such as 'satisfactory'. Comments provision varied between professions and focused only on the area of interest, with little or no radiological descriptive terminology featuring.

Discussion: This form of practice demonstrates significant clinical governance risk and fails the expectations of IR(ME)R or RCR. As ultimate responsibility can rest with the radiology department an opinion sanctioned by radiology should be provided. Reporting radiographers can meet this support role thus reducing impact on radiologists and address clinical governance issues.

P128 Assessing the technical quality of postero-anterior plain chest radiographs based on American College of Radiology (ACR) and European guidelines

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Fairfield General Hospital, Pennine Acute Trust

Aims/objectives: Trust wide retrospective audit conducted for assessment of technical quality of postero-anterior (PA) plain chest radiographs (CXR) based on established guidelines adopted by Royal College of Radiologists.

Content: There were 10 standards mentioned in guidelines, 5 technical (full inspiration, symmetrical reproduction of thorax, medial borders of scapula outside lung fields, no annotations obscuring lung fields, appropriate collimation) and 5 anatomical (visualization of both apices, whole supra-diaphragmatic ribcage, both costo-phrenic angles, retrocardiac lung shadows, spine through mediastinum). Each criterion required $\geq 95\%$ fulfillment.

All (A&E, OPD, IP, GP referred) adult chest PA films were included, no exclusions. Data collected from PACS and CRIS.

There were 1924 CXRs done over seven days, 924 in our four-day sample of which 418 were PA films. These were individually assessed for technical quality to confirm diagnostic validity for interpretation.

Relevance/impact: CXR is commonly requested investigation capable of yielding valuable information influencing patient management, provided it is of optimal diagnostic standard. This is dictated by the technical quality of the radiograph, which is dependent on multitude of factors.

Outcomes: 9 out of 10 criteria met standards. Breach of 'Medial borders of scapula' criterion - fulfilled in 53% of cases.

Discussion: Of 197 breaches, 57% were women, and average age was 57 years. Weekend films breached, when majority were A&E/inpatient referrals who were acutely unwell; possibly with poor positioning compliance.



Audit results were presented at trust-wide audit meeting, with recommendations - demonstrate positions to patients, patients to practice maneuvers and document reasons for non-compliance.

P129 Chest X-ray agreement: Comparative analysis between consultant radiologists, reporting radiographers and expert chest radiologists

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Homerton University Hospital¹; Canterbury Christ Church University²; Barts Health³

Purpose: Research evidence related to chest X-ray (CXR) interpretation by appropriately trained radiographers is limited to diagnostic accuracy studies undertaken in a controlled environment. The aim of this study was to examine agreement between expert radiologists and reports provided by radiographers and radiologists in clinical practice.

Methods and materials: Adult CXRs (n=193) from a single site were included; 83% randomly selected from CXRs performed over one year, and 17% selected from the discrepancy meeting. CXRs were independently interpreted by two expert chest radiologists (CC1/2). Clinical history, previous and follow-up imaging was available, but not the original clinical report. Expert and clinical reports were compared independently by two arbiters. Kappa (K) and McNemar tests were performed to determine inter-observer agreement. Ethical approval was obtained.

Results: CC1 interpreted 187 (97%) and CC2 186 (96%) CXRs, with 162 cases interpreted by both experts. Radiologists and reporting radiographers provided 96 and 97 of the original clinical reports respectively. Consensus between both experts and the radiographer clinical report was 71 (CC1; K=0.64) and 68 (CC2; K=0.61), and comparable to agreement between experts and the radiologist clinical report (CC1=72, K=0.68; CC2=68, K=0.64). Expert radiologists agreed in 124 cases (K=0.52). There was no difference in agreement between either expert radiologist, when the clinical report was provided by radiographers ($p>0.4$; $p>0.9$) or radiologists ($p>0.9$; $p>0.9$) or for the selected difficult cases from the discrepancy meeting ($p>0.17$; $p>0.9$).

Conclusion: No statistically significant difference was found in agreement between expert radiologists and radiographer or radiologist CXR reports in clinical practice at a single centre.

P130 Spontaneous cholecystocutaneous fistula masquerading as a soft tissue sarcoma: A pictorial review

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Wrightington, Wigan and Leigh NHS Foundation Trust

Cholecystocutaneous fistulas are rare and usually occur as a complication of post-cholecystectomy. Gallstone empyemas with subsequent perforation carry a high mortality and morbidity. Perforations cause peritonitis, small bowel (gallstone ileus), pericholecystic and hepatic abscesses and where chronic, fistula formation.

This 90 year old lady presented with intermittent rigors and acute confusion with initial observations depicting sepsis with a low blood pressure and tachycardia. The clinical examination was normal, apart from a 12 cm by 13 cm hard, erythematous, non-fluctuant tender mass overlying the right costal margin. This incidental right upper quadrant mass posed a surgical conundrum in this age group.

A CT abdomen and pelvic to identify the underlying cause of site of sepsis was performed. This revealed a small infra hepatic pocket of fluid and air extending to the anterior abdominal wall suspicious for a necrotic soft tissue tumour requiring a staging CT.

A pre-operative review suggested perforation of a non radio-opaque gallstone, rather than a necrotic soft tissue sarcoma. An ultrasound abdomen revealed a cholecystocutaneous fistula and abscess formation with a single migrated large gallstone.

Incision and drainage of the abscess was performed and the gallstone was retrieved under local anaesthetic. The lady had a full recovery.

The pictorial review demonstrates the diagnostic challenges in assessment of gallbladder disease by CT and highlights the importance of better resolution with ultrasound assessment.

P131 Pitfalls in gynaecological ultrasound scanning: - a pictorial review



[Sara Meredith](#); [Charles Hall](#); [Waheed Mustafa](#); [Rebecca Wiles](#)

Royal Liverpool and Broadgreen University Hospitals NHS Trust

Aims: Gynaecological ultrasound is one of the more common procedures performed in the radiology department. The normal findings of the gynaecological organs can vary considerably, particularly in premenopausal women. In addition, the appearance of pathology can be variable. Because of these and other factors, errors in scanning and interpretation of gynaecological ultrasound are encountered. Through this poster the authors aim to present some common discrepancies which may occur in gynaecological ultrasound with the aim that the reader will become aware of these and can avoid them in their future practice.

Content: The authors present several potential discrepancy cases using ultrasound images and cross sectional imaging correlation. These cases include:

- Corpus luteum interpreted as other more sinister pathology
- Misinterpreted haemorrhagic cysts
- Adenomyosis misinterpreted as a uterine fibroid
- Dermoid cyst where the fat component is poorly visualised due to intrapelvic fat
- Missed vaginal and cervical pathology on ultrasound.

Relevance/discussion: Through awareness of common pitfalls in gynaecological ultrasound the practitioner can ensure they avoid making similar errors.

P132 Inside out

[Jenna Millington](#)¹; [Nick Carter](#)²; [Mark Ballard](#)³

*MDHU Derriford, Plymouth*¹; *Med Reg, RAMC*²; *Royal Centre for Defence Medicine, Birmingham*³

In any Emergency Department (ED) where there are frequent trauma patients there should be an efficient process in place to ensure optimal care and balanced resources. In our ED a routine trauma involves decubitus chest and pelvis radiographs as part of assessment and triage.

Our institution receives battlefield casualties many times a day, and as a result there are many opportunities to learn from where care was sub-optimal. We will present a case where a patient was admitted to the ED having sustained a gunshot wound to the chest. A decubitus chest X-ray showed a right haemothorax and a bullet projected over the midline of the neck. This was recognised as probable extrinsic artefact by the radiologist but when the patient's necklace was removed there was no bullet attached.

The patient required a thoracotomy to control his thoracic bleeding, which was extended to a right neck exploration to retrieve the bullet and assess the damage. No bullet was found intraoperatively; it was later found underneath the patient, where it had lain trapped as the necklace was removed. This patient had been too unstable to undergo axial imaging which would have demonstrated the true three dimensional location of the bullet.

We will present further examples of projected foreign bodies with CT correlation to the plain film findings, demonstrate the myriad of potential radiographic pitfalls, and present the lessons learned to minimise error in the acute setting.

P133 Creating an educational/peer review tool for non-accidental injury

[Iwan Roberts](#); [Thomas Peachey](#); [Alan Sprigg](#); [Amaka Offiah](#)

Sheffield Children's NHS Foundation Trust

Missing fractures in young infants can have devastating consequences. This presentation describes the development of an educational tool to help radiologists interpret skeletal surveys and explores the role of a mentor in this process.

A separate submission describes the results of a peer review exercise for skeletal survey reporting in our department (8 surveys). This submission explores how we have exported these images to radiologists in other NHS trusts.

Following discussion with our local Risk Management service, anonymised skeletal surveys were exported to radiologists in 4 other trusts (arranged via PACS managers). Using the workbook devised for the peer review



exercise, these were then reviewed and reported on the local reporting workstations (not powerpoint or a web-site). A teleconference was arranged for discussion of results, during which the images were reviewed.

Participants described their interaction with the cases and their concerns about the possibility of "scoring" - as it was felt that this might deter people from wanting to participate in such a process. At the same time there was keen support for a timely discussion of results (rather than just being sent a set of "correct answers"). This has significant implications for cost as the review process took an average of 45 minutes (including set-up time as well as the discussion itself). There would also be a place for introduction of other anonymised case material during the discussion.

Creating relevant and challenging educational material will take time and effort. We present one example of how such an exercise might run.

P134 What are the medico-legal implications of anatomical side marker errors and discrepancies in radiology?

[Kerri Shortt](#)

Diagnostic Radiographer

Aims/objectives: To explore the medico-legal themes that impact the use of anatomical side markers (ASM) and their relevance in image interpretation and radiographic reporting.

Content: A presentation of the key themes (professionalism in practice; accuracy; negligence; errors and omissions; liability; legally admissible) identifying why it is imperative to accurately and consistently use ASM. Imaging examples demonstrating bad practice and best practice are examined.

Relevance/impact: As imaging evolves into the digital arena and teleradiology becomes more widely used, there are emerging implications for image interpretation and the importance of correct use of ASM remains; vigilance on the part of the technician and imaging team is therefore critical. The consequences of improper ASM use are discussed along with patient, Trust and employee repercussions and potential legal action.

Outcomes/conclusion: Forensic radiography and general radiography are not dissimilar in that ASM use should be consistently applied conforming to HCPC (2013) Standards of Proficiency and the Society of Radiographers (2013) Code of Conduct requirements. In practice, experience shows this does not occur 100% of the time due to a number of limiting factors.

Discussion: Constraints to correct ASM use are identified (tight collimation for radiation protection; primary beam awareness with direct digital radiography; infection control in newborn intensive care units and ITU; and human error) and potential remedies are suggested to overcome these issues.

P135 Improving patient safety using WHO inspired radiographic PAUSED acronym

[Sarah Durkin](#); [Simone Towie](#)

Royal Free London NHS Foundation Trust

Have you PAUSED recently?

Patient Safety Drive

In response to incidents reported within the radiology department, a poster using the acronym 'PAUSED' has been developed to implement the concept of the WHO surgical pause into daily practice and encourage staff to take a pause before proceeding with an examination or procedure. The information contained within the acronym is has been developed as a result of incidents where there has been a failure to comply with procedures, resulting in incidents.

Incident examples used to develop the poster included patient identification errors, equipment parameter selection faults, duplication of referral instances and referral errors. The poster steps through a standard process expected of Radiographers and Assistant Practitioners when assessing a request and performing an examination, from beginning to end.



Discussions within management groups, clinical governance groups and with the CQC have also driven the development of this poster and patient safety drive. Staff have been reviewed the document and fed back their thoughts and comments in regards to implementing the system into their daily practice. Other departments within the Trust have also taken on the format of the poster to apply to their own practice; the acronym is easily adapted to other specialities systems of work.

The department is sharing the poster amongst the wider profession to raise awareness of patient safety and will be reviewing incident trends in future to assess its impact.

P136 To 'err is human': Assessing pitfalls in contemporary radiography

[Christopher Hayre](#)

London South Bank University; Barking, Havering and Redbridge University Hospitals NHS Trust

This poster will discuss the findings uncovered from a PhD study conducted in the United Kingdom (UK). It will illustrate new errors in diagnostic radiography within the general radiographic environment, attributed to advancing technology. It highlights new challenges that radiographers and managers may encounter following the integration of digital radiography within a clinical environment, which can be overcome. The research demonstrates an awareness of potential pitfalls that X-ray operators can overcome. Through this awareness the future use of digital radiography can be enhanced, prevent radiological errors and facilitate optimum patient care delivery.

Molecular and functional imaging

P138 Impact of FDG PET-CT in gynaecological malignancy: Single institutional experience

[Yvette Griffin](#); [Reena Aggarwal](#)

University Hospitals of Leicester

Aim: To evaluate the clinical impact of PET-CT in gynaecological malignancy at our institution.

Method: Retrospective CRIS search for all patients referred for PET-CT from gynaecology at our institution. Comparison was made with previous MR/CT and subsequent histology/surgicopathological findings where available. Impact on treatment intent was assessed.

Results: 19 PET-CTs in 18 patients between March 2009 and November 2014. Primary sites included cervix (10), ovary (4), endometrium (2), vagina (1). 2 presented with vulval and retroperitoneal lesions respectively.

PET-CT indications included: diagnosis of primary cancer (2), initial cancer staging (2), to exclude extrapelvic metastases in known pelvic recurrence (7), for diagnosis of suspected recurrence (6), for restaging of recurrent disease (1) and to assess for residual disease post chemoradiotherapy (1).

PET-CT had major impact in 12 cases with detection of pelvic recurrence, occult colonic primary, breast pathology, nodal and bone metastases and characterisation of liver and adrenal lesions, indeterminate on CT. Minor impact with confirmation of suspicious findings at MR/CT but no change to management in 5 cases. No impact in 1 case. 1 false negative with PET-negative vaginal vault lesion and right external iliac node in patient with previous TAH and BSO for endometriosis. Subsequent vaginectomy and lymphadenectomy showed endometrioid cancer in atypical endometriosis.

Outcomes: PET-CT in gynaecological malignancy had major impact in 63% and excluded further metastatic disease in 26% cases.

Discussion: PET-CT had significant impact on patient management, stratifying into palliative or curative treatment and optimising radiotherapy planning. It is a useful adjunct to MR/CT.

P139 Local institutional experience of FDG PET-CT in plasma cell dyscrasias

[Yvette Griffin](#); [Reena Aggarwal](#)

University Hospitals of Leicester



Aim: To evaluate indications for PET-CT in plasma cell dyscrasia, its added value to other imaging modalities and impact on patient management.

Method: Retrospective CRIS search for all patients referred for PET-CT from haematology between October 2007 and March 2013. Indications, previous imaging and changes to patient management were evaluated.

Results: 19 PET-CT in 14 patients (11 male, 3 female).

Indications: Non-secretory disease (3), staging myeloma (4), plasmacytoma response to treatment (5), staging POEMS disease (4 new, 1 relapsed) and to look for MGUS transformation to myeloma (2).

Staging PET-CTs showed no active disease (2) and active disease in L2/sacrum (1). 1 case of diffuse spinal uptake classified as activated marrow or disease. In response to treatment, 2 showed residual or new active disease and 3 showed complete metabolic response. Positive PET-CT in all POEMS with active nodal and sclerotic bony disease. Incidental finding of adrenal adenoma and right cervical adenopathy in myeloma.

Outcomes: PET-CT was used for a number of indications which has influenced patient management in 95%.

Discussion: Although PET-CT is recommended by Durie-Salmon Plus, it is not widely adopted. RCR guidelines advise PET-CT for monitoring non secretory myeloma and assessing active disease. Our study shows that PET-CT is useful in staging myeloma, in detection of occult bone/nodal disease and in detecting residual active disease or recurrent disease post chemoradiotherapy/bone marrow transplant. It is of less value in diffuse bone marrow involvement. PET-CT has added value to conventional imaging techniques especially when they are normal, indeterminate or contraindicated.

P140 Assessment for a novel hybrid optical-gamma camera for lymphoscintigraphic imaging

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Space Research Centre, University of Leicester¹; Radiological and Imaging Sciences, Medical Physics and Clinical Engineering, Medical School, University of Nottingham and Nottingham University Hospitals NHS Trust²

Objectives: The Hybrid Compact Gamma Camera (HCGC) is a handheld device designed to enhance radioguided surgical procedures such as sentinel lymph node (SLN) biopsies. This study evaluates the performance of the HCGC for lymphoscintigraphic imaging utilising a bespoke melanoma lymph node phantom.

Materials and methods: The melanoma lymph node phantom simulates an injection site (IS), lymphatic vessel (LV) and a SLN in the presence of background activity. The phantom consists of two square Perspex plates (80×80mm) a 10mm diameter conical micro vial and 80mm capillary tube 1.1mm in diameter. 15MBq of ^{99m}Tc (0.5ml) was added to the micro vial to simulate the injection site.

A 7mm diameter hole in one plate was used to mimic a SLN. SLN activity:IS activity ratios ranged between 1:20 to 1:100 in 0.1ml solutions. The capillary tube contained the same activity in the SLN distributed over approximately 0.1ml. The second plate with a 70×70mm square hole was used to simulate the background containing one tenth of the SLN activity.

Results: Analysis was performed on gamma images with 1000frames (~100s) acquisition time. The HCGC could detect the SLN containing different radioactivity concentrations and under various scattering thicknesses (ranging between 5mm to 30mm) with high contrast-to-noise ratio (CNR) values (ranging between 110.8 and 11.6). Co-alignment between the gamma and optical images provided an accurate physical localisation of radiopharmaceutical uptake.

Conclusion: This study demonstrated the capability of the HCGC in an experimental setting and shows the potential for acquiring hybrid images containing sufficient clinical details for localisation purposes during surgery.

P141 Dynamic contrast-enhanced MRI in prostate cancer - our local clinical experience

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Dynamic contrast-enhanced MRI is a technique that provides functional information to aid in the diagnosis of prostate cancer. It uses a rapid acquisition of sequences to observe uptake and washout in the prostate before, during, and after the injection of an exogenous contrast agent. This technique relies on the angiogenesis and increased vascular permeability that occurs within malignant tumours. Cancer is expected to demonstrate increased maximum relative enhancement with fast uptake following injection, along with an increased area under the curve for enhancement. Normal peripheral zone tissues demonstrate a slower and less intense enhancement for the first three minutes following contrast injection.

Most centres use a combination of conventional T2 imaging and diffusion imaging for prostate cancer. We aim to show our methods and experiences of using dynamic contrast-enhanced MRI of the prostate in a tertiary urology cancer centre setting. We will show cases where this technique has made an impact clinically. We will also illustrate how benign findings can appear similar to cancer, limiting this technique's utility in localisation and staging. Crucially, we will show how a negative scan may be able to preclude biopsies in the correct clinical pathway.

P142 Audit: Accuracy of localisation of bone lesions with SPECT.CT

[Peter Strouhal](#); [Richard Gagen](#); [Arash Bakhtyari](#); [Tim Watts](#)

Royal Wolverhampton Hospital

Aim/introduction: Anecdotal evidence suggested appendicular focal bone lesions undergoing further evaluation with isotope bone imaging were not being fully covered by the standard rotational SPECT.CT acquisitions used at our institution. The aim of this audit was to confirm if this was a problem and amend our protocols accordingly.

Content: Targets of 100% for spine lesion coverage and 95% for appendicular lesions were used to measure performance of the existing protocol.

Relevance: We looked at adjusting our standard protocol to allow better evaluation of all bony lesions and considered dose impact and time penalties in undertaking this adapted scanning technique.

Outcome: 300 SPECT.CT scans were retrospectively reviewed from the previous 6 months. We found 100% coverage of spine lesions but <95% coverage of appendicular lesions. We assessed ways to optimise coverage, changing how we acquired spine and appendicular imaging in combination or appendicular lesions in isolation. Evaluated dose penalties and scan times suggested negligible difference between protocols.

Discussion: Pros and cons of our techniques will be reviewed along with limitations imposed by the gamma camera and patient/scan times.

P143 Computer aided-detection of sacroiliitis on MRI with Dynamika: pilot study

[Peter Strouhal](#)¹; [Olga Kubassova](#)²; [Diana Roettger](#)²

*Royal Wolverhampton Hospital*¹; *Image Analysis Ltd*²

Aims: Sacroiliitis can be difficult to diagnose and harder still to quantify or monitor in response to disease. Dynamika is a stand-alone, cloud-based software using complex algorithms to allow real-time, user-defined analysis of regions of interest in 2D/3D and allows (semi-) quantification of activity/signal intensity apparent within regions of interest on scans. The ROI evaluation technique in its simplest guise is used in isotope imaging but we aim to better those outcomes and show similar success with this software on STIR MR images as well as with bone scintigraphy.

Content: Data from 50 MRI and 50 bone scans has been analysed to evaluate initial validity of this software; some scans represent follow-up imaging, giving an insight how disease monitoring could be undertaken with this software. Dynamika analysis was benchmarked in bone scans against standard algorithm of analysis. This comparison data will also be presented.

Impact: Potential to grade and monitor disease with MRI, as well as show its superiority and zero radiation compared with bone scanning-though show utility of software with bone scans also.

Outcomes: Patients can be semi-quantitatively graded into mild, moderate or severe sacroiliitis with greater reliability using MRI and Dynamika than isotope scans; this software shows utility in bone scanning analysis also;



disease response to treatment on MRI can also potentially be graded using this software (but too few patients were present in this cohort to evaluate this fully).

Discussion: Needs validating in bigger studies but initial results of Dynamika software are promising and simple to reproduce in evaluating sacroiliitis.

Innovation in service delivery

P144 e-Hospital: The good, the bad and the ugly

[Ynyr Hughes-Roberts](#); [Scott McDonald](#); [Melanie Hopper](#)

Addenbrooke's Hospital

Cambridge University Hospitals NHS Foundation Trust was the first UK NHS trust to become a fully digitalised hospital with the introduction of its new tailor-made Electronic Patient Record (EPR) system. This was provided in partnership with EPR software manufacturer EPIC with the IT infrastructure provided by Hewlett Packard in a £200 million, 10-year investment.

The aim of e-Hospital is to provide easy and swift electronic access to all aspects of a patients medical record in order to facilitate timely, effective and safe delivery of medical care. All clinical documentation is now performed electronically. This gives any clinician access to any aspect of medical information at the bedside and at any terminal within the hospital. The aim of e-Hospital is to introduce a better quality of patient care implementing this safely, more timely whilst maintain a patient centric approach.

Specialist training was provided for every member of the Radiology team. A series of role specific training modules were designed for the various users in preparation of a global go-live scenario. We look at the impact e-Hospital had on the Radiology department. We surveyed members of the department in order to ascertain the personal impact of the introduction of e-Hospital on members of the multidisciplinary radiology team. Departmental reporting statistics were used in parallel to assess productivity changes.

P145 Paperless radiology - the Warrington strategy

[Gareth James](#)

Warrington and Halton Hospitals NHS Foundation Trust

This poster will document the processes put in place to identify and tackle the areas of clinical Radiology that use paper. Cost saving is the obvious benefit to going paperless, but the following principals guided the approach we adopted. Achieving one or more of these should be the driver for change:

- Safety - the new workflow must be at least as safe as the previous;
- Efficiency - the time the new method takes must not be significantly slower than the old one;
- Effectiveness - the ability to perform a task must not be hindered more using the new technique;
- Business Intelligence - ideally the new method should provide information we can analyse to improve services further.

We started out by mapping the entire patient journey and seeing which parts use paper, and why. We then created a trail for each of the types of paper, using the theory that you need to eliminate the dependency at the end before removing it from the beginning.

P146 Short term planning - intimations of disaster

[David Collier](#)

Australian Institute of Radiography

The paper considers the impact on the national health budget from a changing emphasis in service delivery. Using the Australian expenditure data where the average annual growth over the last decade of expenditure on health has been 5.1% but still the lowest growth the AIHW has recorded since the mid-1980s. Government health funding fell by 2.5% during a decade where overall government funding grew by 4.4%.



Private practice expenditure in contrast grew by 7.4%.

This informs the health professions that government funding on health is restricted - at the time when health usage is increasing as the result of the general population living longer.

In order to deliver more health care with less funding, the emphasis is on outsourcing (private practice) and faster turnaround in clinical places - earlier discharge in particular. Performance measures for private practices reward greater throughput.

Early discharge brings a measurable risk in the long term outcome of health care. The late and longer term effects of an incomplete recovery suggest that health expenditure for later remedial and chronic care will have a logarithmic effect on national health budgets.

The paper concludes with an analysis of the impact these later costs will have on the health budgets in 25-30 years' time; an impact which could largely be minimised through simple measures taken at the initial point of care, such as an extra day before discharge.

P147 Small time, big money? Proposed efficiency savings in MRI

[Claire Brettle](#); [Katie Bayly](#)

Great Western Hospitals NHS Foundation Trust

With current financial pressures, it is essential to ensure that radiology services are optimised to reduce waiting times and hospital stays. A potential for savings and service improvement has been identified in Lumbar spine MRI for inpatients within this DGH.

It has been noted that a number of inpatients who are requested for Lumbar spine MRI will be recalled whilst in hospital for the rest of the spine to be imaged, thus using additional ward slots, increasing the total cost of the scan and potentially extending the patients hospital stay (and that of others waiting for scans).

It is proposed that the addition of a T2 weighted sagittal scan of the upper spine at initial presentation would negate the need for recall in this cohort of patients, which according to the national tariff could save up to £160 per patient for the scan alone.

An audit of 6 months data was undertaken to evaluate the number of patients affected and of the 91 lumbar spine examinations performed on inpatients in this period, 10 were recalled for upper spine imaging. In addition, 5 patients would have potentially required recall, but the examination was extended during the initial scan by either the radiographer or the radiologist.

Combined, this equates to 16.5% of the total number of inpatient Lumbar spines and it is therefore believed that potentially significant time and financial savings can be made. This audit is on-going, and with more data, a true picture of potential savings will be possible.

P148 Handover of patients during radiology on-calls at Heartlands Hospital - a re-audit

[Madhuvanti Joshj](#); [Asiya Maheen Khan](#)¹; [Shahid Hussain](#)¹

*Heartlands Hospital - Heart of England NHS Trust*¹

Objectives: According to RCR guidelines and local policies, a handover policy was introduced in the Radiology department to ensure continuity of care during the transition from day to out of hours on-call cover.

The consultant covering the afternoon in-patient CT was to let the registrar taking charge at 5pm know of any patients awaiting a scan or any scans pending a report.

Methodology: To assess compliance, a prospective re-audit was conducted in a large trust hospital spread across three sites over 10 consecutive working days.

After qualitative and quantitative analysis of data, the results were compared with a similar audit from May 2013.

Results: Only 20% compliance was recorded in this re-audit as compared to 60% in the initial audit.



There were unreported scans on 4 occasions, out of which one had a clinically significant event (PE).

Discussion: In addition to scans awaiting a report, referrals accepted before 5pm need to be handed over. Improved co-ordination between registrars, consultants and radiographers ensures no scan is missed. Interacting with consultants during handovers serve as a fertile learning opportunity for the registrars.

‘Nothing to handover’ is also an important handover.

End of shift call from registrar to consultant to complete the loop.

Outcome: The audit was well received at the local clinical governance meeting. A more robust handover policy is in place now; this was devised in consultation with all the members involved. A re-audit is expected in 6 months

P149 "Fast track" protocol - can we reduce referral times for patients with suspected lung malignancy?

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Department of Radiology, Royal Infirmary of Edinburgh

Introduction: Lung cancer remains a significant public health concern. Referral guidelines recommend patients with suspected malignancy should be seen by a specialist within 2 weeks, and NHS Cancer Plan initiatives require commencement of treatment no more than 62 days from referral. Since 2011, the Royal Infirmary of Edinburgh (RIE) has operated a “Fast Track” service for GP-referred patients whose chest radiograph (CXR) is suspicious of lung malignancy. We aim to establish whether this service has reduced waiting times to computed tomography (CT) and specialist assessment, thus enabling timely diagnosis and treatment.

Methods: Patients with a new diagnosis of lung cancer following abnormal CXR were identified from lung cancer multidisciplinary team meeting records at the RIE between January and March 2012. Data regarding referral route and interval between initial CXR, CT and specialist respiratory assessment was obtained from electronic patient records (TRAK) and picture archiving and communication systems (PACS).

Results: 117 cases meeting inclusion criteria were identified. GP-referred patients investigated via the the “Fast Track” protocol (17%) underwent CT and respiratory assessment at 0.86 and 6.9 days respectively after CXR. Patients referred for CT from outpatient clinic waited 18.5 and 24.77 days respectively. Where GP’s arranged imaging, waiting times were 41.5 and 57 days.

Discussion: Radiology departments have an important role to play in helping to achieve referral targets. These results suggest that the “Fast Track” pathway could significantly reduce waiting times to CT scan and specialist assessment, supporting achievement of waiting time initiatives and reducing pressure on lung cancer clinics.

P151 Radiological perspective of the formation of pressure ulcers - a comparison of pressure and experience on two imaging surfaces

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School of Health Sciences, University of Salford¹; Haute Ecole de Sante Vaud - Filiere TRM, University of Applied Sciences and Arts of Western Switzerland, Lausanne, Switzerland²; Department of Medical Imaging and Radiation Therapy, Hanze University of Applied Sciences, Groningen, The Netherlands³; Lisbon Higher School of Health Technology, Portugal⁴; Department of Health, Radiography, Oslo and Akershus University College of Applied Sciences, Norway⁵; Nuffield Foundation; The Bluecoat School, Oldham⁶

Introduction: Pressure ulcers are a high cost, high volume issue for health and medical care providers, affecting patients’ recovery and psychological wellbeing. The current research of pressure on support surfaces as a risk factor in the development of pressure ulcers is not relevant to the specialised, controlled environment of the radiological setting.

Method: 38 healthy participants aged 19-51 were positioned supine on two different imaging surfaces (X-ray Table & Mattressed Table). Interface pressure data was acquired using the XSENSOR pressure mapping over a time of 20



minutes, preceded by 6 minutes settling time to reduce measurement error. Qualitative data regarding participants' opinion of pain and comfort was recorded using a questionnaire. Data analysis was performed using SPSS 22.

Results: Data was collected from 30 participants aged 19 to 51 (mean 25.77, SD 7.72), BMI from 18.7 to 33.6 (mean 24.12, SD 3.29), for both imaging surfaces, following eight participant exclusions. Total average pressure, average pressure for jeopardy areas (head, sacrum & heels) and peak pressure for jeopardy areas were calculated as interface pressure in mmHg. Qualitative data showed that a significant difference ($P < 0.05$) in experiences of pain and discomfort between the two surfaces. A significant difference is seen in average pressure between the two surfaces.

Conclusion: Pain and comfort data also show a significant difference between the surfaces. All findings support the proposal for further investigation into the effects of radiological surfaces and overlays as a risk factor for the formation of pressure ulcers.

P152 Accuracy of radiographer primary clinical evaluation of intraluminal pathology at computed tomography colonography

[Sue Rimes^{1,2}](#); [Karen Knapp²](#); [Danial Fox¹](#); [Robert Meertens²](#)

Taunton & Somerset NHS Foundation Trust¹; University of Exeter²

Objective: An audit was completed to determine the accuracy of a radiographer primary clinical evaluation of intraluminal pathology of computed tomography colonography.

Design: A retrospective audit using a validated audit tool was applied to a database of radiographer clinical evaluations to measure the accuracy against radiology reports, endoscopy and pathology findings.

Method: A database was designed to capture radiographer and radiologist reporting data. The radiographer's preliminary clinical evaluation of intraluminal pathology was given a score (PDS score) by the reporting radiologist based on the pathology present, the discrepancy between the preliminary clinical evaluation and the final report and the significance of that discrepancy on the clinical management of the patient. A one-way ANOVA was undertaken to assess for consistency in use of the audit tool by the radiologists. Accuracy of the radiographer primary clinical evaluation was assessed using percentage agreement and kappa scores. Significant discrepancies were compared against endoscopy and pathology reports.

Results: There was agreement with or an insignificant discrepancy between the radiographer primary evaluation and the final radiology report for 95.6% of cases. There was a significant discrepancy between findings in 2.7% of cases and a major discrepancy recorded for 0.3% of cases.

Conclusion: With suitable training radiographer primary clinical evaluation of intraluminal pathology of computed tomography colonography is accurate enough to provide a valuable contribution to decision making during the procedure and to support a double read reporting service.

P153 Feasibility study of a cost effective method for needle tracking

[Marc Edwards](#); [Nigel W John](#)

Bangor University

We present a feasibility study for using a cost effective 6 degree of freedom (6DOF) sensor to track a needle in vitro to assist with ultrasound guided interventional procedures. Such procedures are complicated by difficulties in visualising the needle and seeing its deflection thereby making it hard to avoid puncturing nearby blood vessels or organs. Needle tracking technologies exist and use either markers placed onto the needle for optical tracking, such as in ventricular puncture training, or an electromagnetic sensor that requires an electromagnetic field generator placed nearby.

Both technologies are on sale but cost thousands of pounds and have their weaknesses; needle markers have to be placed exactly for registration by cameras and electrical devices can interfere with electromagnetic sensors. The low cost 6DOF sensor (ca £5) are commonly used in drones (such as quad-copters) to keep them steady during flights contain an accelerometer and gyroscope that measure displacement and rotation, respectively.



The challenge in using this technology for needle tracking is twofold; (i) to house the 6DOF sensor onto the needle; (ii) to combine and filter measurements from the accelerometer and gyroscope. The feasibility study is currently assessing the accuracy of the measured displacement of the needle from 1D to 3D and in vitro using sheep liver. Future work will be to effectively house and protect the sensor assembly so that it can be sterilised and used without affecting the surgeons 'feel' of the procedure.

P154 RadAlert: Review of local practice

[Mohammed Nabi](#); [Maruti Kumaran](#)

Nottingham University Hospitals NHS Trust

Background: RadAlert is a system designed to prevent urgent reports being lost or delayed once identified by the reporting clinician.

Aim: To determine our compliance in the use of the local RadAlert policy for reporting urgent abnormalities found on imaging studies.

Methods: A retrospective review of the RadAlert e-mails sent to acute medicine specialties in May 2014. The period between the report and emailing RadAlert team was analysed. We also looked at the email subject and content sent by the reporters and the email content used by the RadAlert team when they emailed the clinical team. Our findings were compared with the local RadAlert policy.

Results: Out of the total 51 cases analysed, 45 emails were sent to the RadAlert team within 24 hours. Only one of the reporters used the email subject 'RADALERT' and two of them mentioned all the 5 items of the template recommended by the RadAlert policy. The RadAlert Team used the same template and included all the items mentioned by the policy in all the cases.

Conclusion: 100% satisfaction with the performance of the RadAlert team. Although 88% of the cases were notified to the RadAlert team by email within 24 hours, our target should be 100%. Improvement is also needed from the reporters in writing the email subject and template recommended by the local policy when sending an email notification to the RadAlert team.

Recommendations: To distribute the results of this audit to all of the NUH radiology reporters and re-audit after 6 months.

P155 Patient obesity and the practical experience of the medical imaging professional: an interpretative phenomenological analysis

[Amanda Woods](#); [Charles Sloane](#); [Paul Miller](#)

University of Cumbria

Aims: The purpose of this study was to discover the issues and problems that diagnostic imaging professionals encounter when imaging bariatric patients.

Method: A qualitative methodological approach was utilised which involved interviewing 8 clinical radiographers with experience ranging from 5 to 35 years. Five of the participants were active reporting radiographers. The subjects were involved in both the acquisition and interpretation of plain radiographic images. The interviews were analysed via Interpretative Phenomenological Analysis which generated a series of key themes which highlighted significant challenges faced by imaging staff when imaging the bariatric patient.

Outcomes: Four superordinate themes were identified which were: Communication issues, practical problems associated with image acquisition, technical difficulties related to equipment and issues related to effective diagnosis.

Discussion: The paper discusses the implications of the results for education, further research and the dissemination of best practice. Issues related to suboptimal image quality, embarrassment issues for both patients and staff and challenges related to safe manual handling.



Conclusion: The author will present a series of recommendations e.g. the dissemination of good practice and identify areas of further research such as the need to consult patients in relation to the most appropriate method of discussing potentially sensitive or embarrassing issues related to the practical conduct of imaging procedures.

Professional training and education

P156 Completion of imaging request forms at a private hospital: Do referrers take it for granted?

[Alan Tan](#); [Subashini M](#); [Maximilian Johnston](#)

Cromwell Hospital, London

Background: Private hospitals may be less inclined to reject inadequately completed imaging request forms due to the income-generating potential of radiological investigations. Consequently, referrers may be less motivated to fill in all necessary items on their requests. Instead, the onus is on Radiology staff to contact referrers for further information rather than returning incomplete requests. This reduces efficiency and may lead to errors. We audited the compliance of referrers to local and RCR standards in their completion of request forms at a private hospital.

Methods: Request forms received by our Radiology Department on two separate days in October 2014 were audited. For each form, the presence or absence of key items relevant to an investigation was recorded. For all items, the target was 100% compliance.

Results: There were 103 request forms. The modalities were: plain film (42%), ultrasound (25%), CT (15%) and MRI (18%). Excellent compliance (100%) was achieved for patient demographics and names of referrers. There was satisfactory compliance for provision of relevant background information (85.4%) and clinical question (82.5%). However, information on allergies (1.2%), infection risk (0%), contrast safety (33.3%), MRI contraindications (57.9%) and breast-feeding/pregnancy (40.9%) was poorly provided.

Conclusion: There is room for improvement. Plans are in place to increase awareness, including amongst resident medical officers who are frequently delegated to perform this task. There is also a drive to empower ward nurses to ensure compliance and to complete certain items, such as patients' MRSA status, given their better knowledge. A future re-audit will hopefully demonstrate positive changes in practice.

P157 i Refer or i just Refer!

[Matthew Jones](#); [Andy Beale](#)

Great Western Hospital

Objectives: To see if GPs are aware of and use the iRefer guidelines.

Method: A questionnaire was sent out to GPs working in North Somerset, Bristol and South Gloucestershire CCGs to try and ascertain the local knowledge and use of the iRefer guidelines.

Relevance: Primary Care provider referral rates to Secondary Care are under increasing scrutiny. This, along with access to online point-and-click requesting platforms such as the Integrated Clinical Environment (ICE) is likely to increase direct requests to diagnostic services from Primary Care.

The RCR has published online guidelines to facilitate best use of clinical radiology services - the iRefer Guidelines.

Outcomes: The majority of GPs are either unaware of the existence of the iRefer guidelines, did not know how to access them or did not use them. Some GPs are aware of older resources designed to help make use of clinical radiology services.

Discussion: Clinical radiology is becoming more sophisticated and is increasingly in demand. It is imperative that this resource is used in the most effective way to avoid unnecessary (and potentially harmful) tests and indirectly harm those whose tests have been delayed as a result. The iRefer guidelines provide an easily updatable, agile resource and its existence should be more widely publicised. This poster will demonstrate the limited awareness of iRefer by GPs working in a small geographical area, and, if extrapolated, provide an indication of the limited degree to which



the iRefer has been absorbed into practice within the wider population. The willingness of some GP's to use older resources suggests that there is a need for iRefer or equivalent. The use of Decision Support Systems (DSS) will also be discussed.

P158 Does the layperson misinterpret normal anatomy on routine radiographs?

Laila Alboloushi; [Craig Barnes](#); Lorna Briggs; Emma Fogarty; Demelza Green

University of Exeter

Our project aimed to assess whether the general public fully understand what they see when looking at normal radiographs. Lack of understanding may cause unnecessary anxiety and lead to poor patient outcomes.

We compiled a short questionnaire, which asked a convenience sample from a university campus population to look at X-ray images, including chest, abdomen, knee and paediatric wrist. Participants were required to state whether they thought the image was 'normal' or 'abnormal' and give reasons for their answer.

The UK government intends to grant the public online access to all of their medical records and diagnostic images by 2018 in an effort to streamline the healthcare system and put patients more in control of their own health. A high proportion of patient pathways involve the radiology department and patient interpretation of images is unknown.

Out of 69 participants approximately 59% of participants identified the chest as abnormal (wrist 37%, abdomen 42%, knee 55%). The reasons for assuming the image was abnormal varied, but common themes were identified such as thinking the heart was an abnormality. Our research demonstrates that the participants did not always have sufficient knowledge to accurately distinguish normal from abnormal radiographic anatomy. We anticipate that the public requires some form of education or support in place before they can access all the information healthcare professionals normally see. We propose the government look at providing education within school time for future generations, and systems for educating current generations as is currently done in other countries.

P159 CPD events - a platform for improving quality, patient care and supporting best practice

[Stefanie Azuga](#)

InHealth Group

Our department includes two MRI scanners and two ultrasound machines. We perform c.2,200 procedures per month, with patients being referred for musculoskeletal conditions by referrers including GPs and non-medically qualified professionals.

The RCR emphasises that referral guidelines should be reinforced through educational messages on reports and at clinical meetings to ensure greater awareness and a sustained reduction in unnecessary referrals.

In our experience some referrers lack knowledge in the use and value of diagnostic modalities - evident in referrals lacking information and clear clinical questions to be answered as well as subsequent queries to reporters.

We have established educational CPD programmes that bring together radiographers/sonographers, radiologists, specialist consultants and referring clinicians. Different conditions are presented by subject matter experts, providing referrers with case studies, information about the referral information needed, techniques to assess patients prior to referrals, and onward treatment pathways.

185 referrers attended 7 CPD events in the past year. More than 80% of attendees report that the events had improved their knowledge and understanding and that their learning objectives were met. Feedback enabled our radiologists to adapt reports to provide more guidance on onward treatment to referrers. We have seen a reduction in referral issues and post scan queries. We have improved our engagement with referrers, who feel more confident in seeking our guidance and support.

CPD events are an ideal platform to share and develop best patient care directly with our staff and referrers, ensuring continued best practice. Further topics are planned to build upon this engagement.

P160 Can professionalism and regulation of hours co-exist?

Thomas Booth¹; Joseph Collum²; Adam Moreton³; [Liam McKnight](#)⁴



Department Radiology, King's College Hospital¹; NHS North West Strategic Health Authority, Manchester²; Health Education North West, Manchester³, Murrison Hospital⁴

Objectives: To examine where a doctor's duty lies when legislation requires them to curtail their working day at a set time yet professional values dictate otherwise.

Relevance: There has been controversy and debate concerning the regulation of working hours for doctors in the UK. Specifically, the impact of reduced working hours on the overlapping themes of patient safety, training of doctors and medical professionalism. Two key regulatory sources are responsible for this: the junior doctors' contract - the 'New Deal'; and the UK Working Time Regulations (European Working Time Directive).

Outcomes: Modern medicine must embrace the necessary realities of shift work and the handover of care to allow professionalism to thrive. This must involve truly robust handover arrangements, supported by information technology solutions. In cultural terms, an acceptance of '24/7' health services is commensurate with the societal desire for high quality care at all times. The only way professionals can deliver this is through sustainable and careful workforce organisation and job planning. Alongside these changes, undergraduate and postgraduate medical training should emphasise the importance of effective shift working and robust handover as central pillars of professionalism.

Discussion: There appears to be broad agreement that hours regulation poses a challenge to professional values. However, professionalism is multifaceted, hard to define, and harder still to measure. There is also recognition that a modern health service must impose some restriction on the working hours of its professionals in the interest of quality, patient safety, and doctors' health.

P161 Undergraduate radiology teaching in a British medical school - an audit of current practice

David C. Matthews; [William Hedges](#); Peter Hutchison; Eilidh Cameron; Simon Glover; Jason Jacob; Laura Paul; Naomi Kelly; Susan Whiten; Peter Driscoll

University of St Andrews

Aims/objectives: To audit the content of radiology teaching to undergraduate medical students at a UK medical school.

Content: Teaching resources used during the academic year 2013-2014 were reviewed for radiology content.

Images or references to radiology encountered by students in lectures, clinical skill sessions, anatomy sessions or tutorials were analysed in their intended context. They were also assessed against standards set by the Royal College of Radiologists (RCR) undergraduate radiology curriculum.

Relevance/impact: The RCR undergraduate guidelines suggest that delivery of radiology teaching should be coherent, structured and clinically relevant. By auditing our current teaching we aim to develop a structured radiology curriculum consistent with RCR guidelines.

Outcomes: 767 images were identified: 44% (334) were used to demonstrate normal anatomy; 46% (349) were used to teach imaging interpretation. The RCR guidelines describe three sections: "fundamental principles", "common emergency conditions" and "imaging in common presentations". Despite the large number of images used, we found that multiple topics in each of these sections were not covered by current teaching.

Discussion: This project highlights the varying degree to which different areas of the RCR curriculum are being delivered to undergraduate medical students. Without a structured approach to the introduction of teaching on imaging, major topics can be inadvertently omitted. Using the results of our audit we will eliminate duplication, avoid omissions and bring the curriculum into line with current RCR guidelines. Our approach could be utilised by other universities to evaluate their undergraduate radiology teaching.

P162 Dim, describe and draw: Developments of an innovative method of teaching image interpretation

[David Roberts](#)



Abertawe Bro Morgannwg University Health Board

Background: Teaching on radiological image interpretation should be interactive and encourage students to consider the importance of how they report images, with whole class interactive teaching shown to improve the rate of learning by 41%. Describing images to those who haven't seen them is an important skill to develop, and in clinical practice this takes place when describing images via the telephone to seniors and other specialities.

Aims: To allow students to gain experience in interpreting and describing images, illustrating the importance of accurate descriptions.

Materials: Computer with PowerPoint, radiological images, pens & paper, blindfolds, headphones & music playing device.

Teaching Method: Selected students are shown a radiological image and write down their description. Students who have not seen the image then have to draw the image based on their colleague's description. The drawing is then compared with the original image, with the teacher and students giving feedback on the description and drawing. Blindfolds alone or blindfolds and headphones can be used to prevent the 'drawers' from seeing or hearing the other students talk about the original image, depending on group and room size.

Outcomes: Teaching sessions have been held on skeletal radiographs, CXR, AXR and CT Heads, and have received excellent feedback to date.

Discussion: I will discuss how I have developed this method for both for small and large groups, and how I setup, prepare and run dim, describe and draw sessions.

P163 Electronic clinical assessment of undergraduate radiographers: Experiences using MyKnowledgeMap

[Chris Wright¹](#); [Sarah Naylor¹](#); [Brigitte Kaviani²](#); [Gerard Nowak³](#); [Marcus Elkington¹](#)

Sheffield Hallam University¹; Sheffield Teaching Hospitals²; Barnsley Hospital NHS Foundation Trust³

Aim: Evaluate experiences of designing and implementing an electronic clinical assessment programme.

Content: Rationale for change, storyboarding, system building, benefits, limitations and experiences.

Relevance/impact: Regular contact with tutors has a positive effect on the student clinical experience. Feedback is timely and personal facilitating fast implementation of recommendations with easy follow up of impact and effectiveness regardless of geography. The system creates a student focussed dynamic environment between University and clinical staff. It enables equity in tutor/student time regardless of placement volume.

Outcomes: Going paperless has delivering a positive effect on the student experience and will now be implemented across all future cohorts.

Discussion: The Northern Counties clinical assessment scheme lies at the heart of the electronic system, enhanced by formative opportunities for feedback and student evaluation. The system is cloud based, available via computer, tablet, or smartphone 24/7; open to user choice within policy. The software enables almost limitless customisation and so careful storyboarding of the entire scheme prior to building is strongly recommended. The SHU model is easily transferable to other HEI's. This experience has highlighted the lack of parity in time spent between individual students and tutors whilst on clinical placement and the vast amount of travel time and cost expended. On-site tutor attendance is still required to maintain good clinical/academic ties and fulfil some of the broader roles but significantly less often. Regardless of the clinical visit regime, students feel that the electronic system keeps them 'connected' and highly value this support.

P164 An evaluation of service users as an educational resource in an undergraduate diagnostic radiography module

[Robert Meertens](#)

University of Exeter



In 2013, the HCPC announced a new mandatory standard to involve “service users and carers” in accredited education and training programmes. This new academic standard states that “Service users and carers must be involved in the programme”, reflecting a continuing shift in modern healthcare towards a patient-centred focus with increased active involvement from service users and carers. In line with this, our medical imaging programme has incorporated service users into its curriculum in a range of capacities.

The focus of this report was to critically evaluate a “service user session” where invited service users living with chronic health conditions discuss their experiences with small groups of students. Brookfield’s four lenses of critical reflection were applied to gauge current student, staff and service user opinion on the sessions, as well as service user involvement in the broader diagnostic MI programme. Insights gained were then put into context with the evidence base. Themes such as the benefits, praise, criticisms, barriers and potential improvements for the sessions were identified and explored, along with potential new ways of implementing service users as part of the MI programme.

Good patient-centred care and communication continues to be a strong focus in radiography. It has been shown to have far reaching effects such as improving diagnostic performance for radiographic examinations as well as improving patient attendance, compliance and satisfaction. Service user involvement in associated higher education courses can help students understand the importance of patient-centred communication and give student radiographers the confidence to improve their clinical practice.

P165 Enhancing reflective practice in student radiographers with the use of theme boards

[Jane Harvey-Lloyd](#); [Ruth Strudwick](#)

University College Suffolk

Purpose/aims: The aim of this presentation is to share our experience of using a theme board workshop with six diagnostic radiography students at the start of their second year.

Relevance/impact: The students were asked to reflect on their experience of practice learning and to build a theme board to illustrate those reflections. It is recognised that the use of imagery is a powerful way to encourage the reflection and evaluation of past events and was used to encourage the workshop participants to explore their experiences, feeling and perceptions of practice.

Design/method: The students were given some introductory information regarding the use of theme boards and their ability to capture experience, ideas, and moods thus enabling the person constructing the board to in some way crystallise these (Bligh, 1992). It is anticipated that this method will access memories of and feelings about experiences that may otherwise be forgotten (Leavy, 2009). At the end of the workshop each participant presented their theme board to the group during the plenary whilst interpreting the images used. This process is thought to play a significant part in the learning experience.

Outcomes: The data were collated and analysed using a thematic analysis.

Other experiences of utilising this approach will be shared, including the use of interprofessional groups and the potential for international audiences.

P166 Development and assessment of an innovative assignment to increase student engagement and learning of magnetic resonance imaging safety

[Helen Warren-Forward](#); [James MacDonald-Hill](#)

Medical Radiation Science, School of Health Sciences, University of Newcastle, Australia

Objective: While magnetic resonance imaging can be considered a safe modality in regards to its use of non-ionising radiation, the reality is that MRI can produce serious bio-effects and as such there are stringent safety guidelines that need to be followed by operators. To ensure that radiography students are fully informed of the risks associated with MRI, a multiple-step assignment task was devised. The content of the presentation will discuss the design of the assignment and provide feedback from students regarding their experiences.



Method: The assignment was centered on the reading of a MRI safety paper and the development and ultimate inclusion in a formal examination of questions that students believed to be important concepts of understanding for themselves and fellow students. At the completion of the assignment, students were asked to complete an anonymous on-line questionnaire aimed at assessing if they believed the assignment task increased their level of understanding more than a formal lecture.

Outcomes and impact: All of the 99 students replying to the survey stated that they understood why MRI safety is such an important topic and 79% reported to having learned a lot from undertaking the assignment with only 18% of students believing that they would have learned more through a formal lecture. Only 41% agreed that they would have read the paper if it was not examinable with 71% indicating that the assignment gave them an appreciation of the useful and important information to be found in the literature.

P167 Exploring the transition period of diagnostic radiographers during their first six months of practice

[Jane Harvey-Lloyd](#)

University College Suffolk

Introduction: The radiography profession is undergoing significant change in response to social, economic and political influences. This has resulted in increasing service demands and a requirement for graduates to possess a much wider range of skills (Decker, 2009). The pressures now being placed on newly qualified health and social care practitioners has initiated research in both nursing and medicine which has focussed on the transition of student to practitioner (Ross and Clifford 2002; Mooney, 2006). The aim of this project is to explore the experience of transition from student to practitioner in diagnostic radiography and to utilise the findings to improve transition in the future across a range of health professionals.

Method: An interpretive phenomenological approach has been adopted consisting of three face-to-face interviews of each participant at three months, six months and twelve months post qualification. These time intervals have been identified in the literature as critical times (Decker, 2009; Smith and Pilling, 2007). Thematic analysis is to be utilised in that through examining each individual experience, commonalities and relationships, including differences across the participants may be identified (Gibson and Brown, 2009).

Results: Stage one results of the three month interviews will be presented thematically alongside those from stage two at six months.

Discussion: The themes identified in the results will be discussed in view of current literature and contextualised in order to identify areas for improvement.

P168 Candidates' perspective of service user involvement in the selection process for diagnostic radiography

[Sarah Naylor; Ruth Wilkinson](#)

Sheffield Hallam University

Aim: The aim of this study was to explore the candidates' perspective of involving service users in the selection of diagnostic radiography students.

Content: This presentation discusses the responses of 43 out of 50 candidates who completed a questionnaire containing open and closed questions. These were completed immediately after two selection events held at one university.

Outcomes: The Health and Care Professions Council have recently added the requirement to involve service users and carers in education programmes. Findings revealed that involvement of service users in the selection of students was generally viewed as positive. Benefits were identified for the profession, the candidates and for the service users.

Discussion: Candidates taking part in selection events for a place on a course in diagnostic radiography thought that service users can be involved in a positive way in the selection of students. Service users can act as representation of the general public in ensuring that trainees are of a high standard. Candidates thought that it is good to get an opinion from a different perspective and it helped them to feel confident that they were assessed fairly and equally.



They thought that the service user will look at candidates as an individual and pay attention to the person rather than academic ability. Further evaluation is required to identify issues around this practice.

P169 A simple classification system for the evaluation of trauma imaging examination complexity

[Ann Newton-Hughes](#); [Leslie Robinson](#); [Frederick Murphy](#)

Directorate of Radiography, University of Salford

Aim: This presentation will provide an insight into the categorisation of examination complexity developed as part of an ethnographic investigation in to trauma radiography.

Content: As radiographers we work with a diverse client group with wide ranging needs for examinations which vary in complexity. As educators we must evaluate the student's ability to conduct a wide range of examinations and this process is typically staged over three years of an undergraduate programme with assessment in practice and simulation gradually moving from routine to complex as experience is gained. It is not clear from the literature how differentiation between routine and complex cases is achieved in radiography practice and thus how we ensure that the assessment of students is appropriate for their level of study and experience. With reference to the evidence base a simple classification process was devised to help categorise examinations into one of three groups: routine, intermediate and complex.

Relevance: While at present un-validated this system could be used to ensure that imaging examinations undertaken by students as part of the assessment process are matched to the skills required at each level of study i.e. students are not assessed on examinations or scenarios at too advanced a level for their current skills.

Outcomes: A categorisation tool has been developed which may be used to ensure that students are assessed conducting examinations of appropriate complexity for their level of study.

P170 Training and developing a competent and flexible workforce for DXA services

[Elaine Hamnett](#); [Wendy Wilkinson](#)

InHealth Group

GP referrals for DXA scanning are increasing in response to NICE guidelines for prevention and management of osteoporosis and the inclusion of a diagnosis register in the Quality and Outcomes Framework (2012/13).

We currently provide c.7,500 DXA scans per year across 8 locations. To train the workforce necessary to meet growing demand we established a competency framework and training programme accessible for clinical assistants as well as radiographers.

Individuals in our diagnostic departments who express an interest initially shadow a competent practitioner to understand the techniques and patients pathways. Theoretical content and practical training is delivered by a clinical lead who is also competent to report scans and supplemented by course materials. Trainees complete a log book of 50 scans under supervision. Competency is assessed to confirm technical knowledge including radiation protection, quality assurance and H&S, patient care, anatomy and positioning, data analysis, understanding of conditions and clinical risks, and ability to answer patients' question and problem solve. Training can be delivered to individuals or groups on demand.

In the past 5 years we have trained 5 radiographers and 5 healthcare assistants. Candidates complete the course in less than 6 months.

Our programme helps develop a competent DXA workforce. We are able to offer skills and career development to individuals and an effective use of human resources in multimodality settings. This programme ensures our service is resilient, flexible and planned for succession. It has a growing relevance as the use of DXA increases in response to national guidelines and incentives.



P171 A proposed model for standardisation of the ultrasound report

Nur Zulkarnain; [Gillian Crofts](#); [Farid Meziane](#)

University of Salford

Aim: To propose a model for standardising ultrasound reports.

Content of poster: Variation in writing style; content; format; and terminology in ultrasound reporting impact on the value of the report. Studies undertaken to address these limitations advocate the use of structured reporting systems (Bell, Greenes and Doubilet, 1992; Kuhn et al., 1993). A recent survey of Radiologists however identified some limitations to using structured systems (Powell and Silberzweig 2014) because of their inflexibility. Incomplete documentation relating to abdominal ultrasound reports has also been reported in as many as 20% of cases (Duszak, Nossal et al. 2012), which in turn has implications towards patient management and decision making. Structured reporting with the support of ontology as its knowledge base has been offered as a solution to improving the quality of reports (Kahn et al., 2009), however these systems offer limited adaptability.

We present a model for the standardisation of ultrasound reports using structured reporting with ontology as its knowledge base but with emphasis on human adaptability within the system.

Impact: This proposed model will recognise human attributes and use Natural Language Processing techniques to convert free text reports into the proposed model structure.

Outcomes: This model is unique as it allows for the system to adapt to reporter's preferences rather than forcing practitioners to adapt to the system.

Discussion: We argue that other than structured reporting and ontology, human adaptability is an important factor in successful standardisation of an ultrasound reporting system.

P172 Neuroradiology orange alerted reports

[Tarik Julius](#); [Richard Dyde](#)

Sheffield Teaching Hospitals NHS Foundation Trust

Aims/objectives: We aimed to measure local compliance with the standard that every 'orange' alerted neuroradiology report should be read by the relevant clinicians with evidence of discussion or relevant course of action documented in the patient's case notes. Our objectives were;

- 1) To measure compliance rates with the above standard
- 2) to make improvements to the service if compliance is below expected and
- 3) to report findings to our directorate and trust.

Content: The sampling criteria we used was adults undergoing neurological imaging within our neurosciences directorate between October 2013 to March 2014. The method of sample selection was simple random analysis. Data collection was via an existing (CRIS) database and case note review.

Relevance: A Safer Practice Notice from the National Patient Safety Agency in 2007 highlighted the need for early identification of any failure to act on radiological imaging reports.

Outcomes: 75% of patients had their Orange alerted report checked and verified within 24 hours of dictation. 68% of reports were e-mailed/telephoned within one working day. 85% of alerts were acknowledged in the case notes. The majority of patients (35/44, 80%) were outpatients. For inpatients/A+E patients 78% of reports were verified within 24 hours of dictation; 67% of reports were e-mailed in one working day.

Discussion: To ensure zero harm we should aim for 100% compliance with time to verification and informing clinicians. We could rethink communication pathways with clinical teams and aim to re-audit within the next 9-12 months.



P173 Cervical spine trauma imaging: Justification for additional swimmers projection of the cervico-thoracic junction

[Abigail Collings¹²](#); [Chris Wright¹](#); [Pauline Mitchell¹](#)

Sheffield Hallam University¹; Sherwood Forest Hospitals NHS Trust²

NICE Head and Cervical Spine Guidelines (2007) advocate three-view Plain Radiography over CT for the initial assessment of cervical spine trauma. However, they provide no indication of what protocol should be utilised when the cervico-thoracic junction is not visualised by the first attempt. This study aimed to evaluate current practice.

A retrospective audit of trauma patients was performed over a two month period (N=107).

The results demonstrated that whilst all patients received the standard AP, AP open mouth and lateral projections, 74% of cases failed to demonstrate the cervico-thoracic junction. 67% of this population received an additional Swimmers View with a 74% success rate.

The research findings highlight the practical limitations of the plain radiography technique. Whilst further training could perhaps reduce the non-visualisation rate of the cervico-thoracic junction, radiographers could in most cases predict the need for the additional swimmers projection and likelihood of success as part of the justification process. Whilst acknowledging the increase in thyroid dose by utilising CT, direct referral is perhaps justified in these cases, particularly if the patient presents with the clinical symptoms of cervical spine trauma.

P174 An ultrasound based protocol for vascular assessment of the diabetic lower limb in Zimbabwe

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University Of Salford¹; National University of Science and Technology, Zimbabwe; Mpilo Central Hospital, Zimbabwe²

Aim: The aim of the poster is to present an ultrasound based protocol for vascular assessment of the diabetic lower limb.

Content: Diabetes is a highly prevalent medical condition globally. There were 600,670 cases of diabetes in Zimbabwe in 2013 (IDF, 2014). Diabetes manifests as peripheral arterial disease in the lower limb, and is the main cause of lower limb amputation (Sun et al, 2013).

There are no published guidelines for the care of the diabetic lower limb in Zimbabwe and patients especially with type II diabetes often present late with severe consequences. Doppler ultrasound has been shown to be highly sensitive in the assessment of the diabetic lower limb (Park et al, 2012). Currently in Zimbabwe, ultrasound is not offered routinely during the management of the diabetes, but only in symptomatic patients.

An ultrasound based protocol that includes Ankle Brachial Pulsatility Index and Toe Pressure Index for vascular assessment of the lower limb will be presented with pilot study results.

Impact: If vascular assessment could be considered during low risk foot care in Zimbabwe, this could potentially improve the prognosis, and allow for early preventive measures in diabetic patients.

Outcomes: Early diagnosis and monitoring for peripheral arterial vascular disease in diabetic patients, could lead to fewer high risk cases.

Discussion: Ultrasound is cheap and readily available to the majority of the Zimbabwean population when compared to other modalities. This ultrasound based protocol provides the opportunity for ultrasound to be offered in rural clinics in Zimbabwe providing improved care for diabetic patients.

P175 MRI STIR imaging for tuberculosis spine

[Omashani Naicker](#); [Shyam Bheemreddy](#)

InHealth



Tuberculosis is a very rare disease in western countries but very common in densely populated countries like Asia and Africa. In our centre we scan patients from diverse backgrounds, but this disease is not very common in the UK. For any initial query of tuberculosis, sagittal and coronal stir imaging is helpful to aid diagnosis.

Having worked in India and South Africa, we scanned Tuberculosis patients daily and performed STIR sequence. It has demonstrated the pathology well thus been appreciated by our referrers and radiologists to aid diagnosis.

We currently work in a team of 9 radiographers and share good practice and scan techniques. We often include and discuss case studies for our CPD. When scanning tuberculosis patients we have shared and implemented this technique as standard. Short time Inversion Recovery (STIR) is a very useful sequence for this type of pathology and we have tracked feedback and case studies that supported our findings.

Following research, team discussions and feedback from radiologists and clinicians, we have found evidence that MRI detects early bone marrow changes and any infiltration to adjacent structures/psoas involvement and posterior elements. MRI imaging is mostly useful in delineating paravertebral bodies, epidural and intra osseous abscesses from Tuberculosis and to visualise cord compression.

We are planning to share further evidence of this based on clinical history, symptoms and origin of patients. In our presentation and poster we want to highlight STIR imaging as an important element within the patient pathway.

P176 Multi-site liver tumour ADC reproducibility at 1.5T MRI

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The Wolfson Molecular Imaging Centre, University of Manchester¹; Centre for Imaging Sciences, University of Manchester²

Apparent Diffusion Coefficient is a potential biomarker of cellular response to treatment. This study aimed to establish multi site mean ADC reproducibility (Liver). We used patient data to develop a model for measurement error, which quantifies the important predictable sources of variability. We could then predict more accurately, the expected reproducibility for an individual tumour, based on its characteristics.

Data from 19 patients from 4 sites and 3 different 1.5T vendors were used. 3D whole tumour and 2D ROIs were manually drawn. ADC maps were calculated using mono-exponential fits from 3 b-value images (b-100, 500 and 900 s/mm²). Overall Coefficient of variance (CoV) was 7.5%. Standard analysis suggested 3D ROIs were more reproducible and 1 site was less reproducible than the others. Using our error model to estimate the level of uncertainty for each measurement, a minimum size ROI can improve reproducibility up to 4 times, whether 2D or 3D ROI. When the data is adjusted to fit within the model of expected errors (i.e. factoring out differences in ADC due to predicted errors), the reproducibility measurements are quantitatively well predicted (95% within 2% change between baselines). Outliers were identified as having motion artifact. Reproducibility across sites and vendors were otherwise comparable.

Reproducibility of less than 4% is achievable but currently only for larger ROIs. Therefore, use of ROIs with a minimum number of voxels should be considered. Use of motion correction methods should make measurement of smaller ROIs (and smaller tumours) more viable.

P177 Investigating the use of an anti-scatter grid in chest radiography with a Computed Radiography imaging system

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Aims/objectives: The aim of this study was to investigate via simulation a proposed change to clinical practice for chest radiography. The validity of using an anti-scatter grid across the diagnostic energy range (60 - 125 kVp), in conjunction with appropriate tube current-time product (mAs) for imaging with a Computed Radiography (CR) system was investigated.

Content: A digitally reconstructed radiograph algorithm was used which was capable of simulating CR chest radiographs with various tube voltages, receptor doses and scatter rejection methods. Four experienced image



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

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

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

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

Patient dose measurement and management

P178 X-ray internal dose audit using diagnostic reference levels

[Daniel Ordidge](#)

Aintree University Hospital NHS Trust

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

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

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

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

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Guy's and St Thomas' Hospital

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

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



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

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

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

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

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Warrington and Halton Hospitals NHS Foundation Trust¹; University of Liverpool²

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

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

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

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

P181 Lifetime risk of radiation-induced cancer from screening mammography

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University Of Kufa, Iraq¹; University Of Salford²

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

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

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



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

Radiation protection and quality assurance

P182 CR mammography image uniformity

[Andrea Shemilt](#); [Maria Robinson](#); [Matt Dunn](#); [Marie Copland](#)

Nottingham University Hospitals NHS Trust

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

The objectives of the project were to:

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

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

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

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

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

[Ben Thomson](#)

Guy's and St Thomas' NHS Foundation Trust

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

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

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



Conclusion: These results highlight a lack of knowledge about radiation exposure and their risks among current medical undergraduates. Formalised departmental teaching can improve awareness and is popular amongst students. As future medical practitioners they will be better able to inform their patients of relative risks of investigations and help them avoid unnecessary exposure.

P184 Emergency department appendicular radiography referrals: do they meet IR(ME)R requirements?

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NHS Greater Glasgow and Clyde

Aims/objectives: Radiology requests are essential communication tools between the clinician and radiology. This study investigated IR(ME)R 2000 adequacy of appendicular X-ray requests to establish if rotational junior doctors changed request compliance compared with their placement start and following teaching/practical experience?

Content: 393 medical and non-medical referrals for Emergency Department appendicular plain radiography examinations during February and June 2014 were evaluated by reporting radiographers. Referral analysis asked whether trauma, mechanism of injury (MOI), specific site of concern and clinical question featured in requests. Clinical portal history details were compared with the request. This established if projections obtained or report content required change.

Relevance/impact: IR(ME)R requirements are not being met. This investigation establishes areas of weakness and whether in-house education is sufficient or requires change to have an impact.

Outcomes: 81% of staff was included in both months. Rotational doctors and nurse referrers made most requests. Doctors results overall showed no significant change however, consultant compliance almost doubled; Staff grade doctors improved inclusion of a clinical question and specifying site of concern. Junior doctors results decreased in most areas. Nurses included more MOI and Band 5 nurse referrers also included more trauma details.

Clinical history on portal was absent 39%; when available, 62% and 53% respectively matched requests with incorrect projections possible 6% of examinations.

Discussion: Referring staff require education on the requirements of IR(ME)R as radiographers follow protocol and reporters adjust interpretation to enhance patient pathway.

P186 Measurement uncertainties in diagnostic radiology QA testing

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Nottingham University Hospitals NHS Trust

Quality control on X-ray imaging systems involves making measurements of radiation quantities, for example radiation output or beam alignment using specialist testing equipment. Each measurement is compared to some expected value, or a baseline value to determine whether it is within tolerance. A report is prepared by medical physics staff that is sent to the radiology staff. It is important to ensure that the values reported to the customers together with the tolerances applied to these values are based on sound metrology.

National Physical Laboratory documentation was used to investigate the current method for assessing uncertainties. This method was used to create an educational presentation, an assessment tool and a spreadsheet to aid calculations. Within Diagnostic Radiology the tools were used to assess uncertainties across all modalities - radiography, fluoroscopy, CR, DR, CT, mammography, dental and specimen cabinets.

Sources and magnitudes of uncertainties for the input quantities of our calculations were determined. Uncertainties were assessed and combined using a standard summation in quadrature method.

Once we are aware of the measurement uncertainties, we have several choices of how to deal with them. We could accept the uncertainty, minimise it by measuring in a different way or using different equipment or report a different metric. Several worked examples are shown using the tools that were developed.

This work has informed improved testing, data analysis and reporting methods. We now have confidence in our measurements and our customers have reports that are consistent with the measurement techniques used.



P187 Radiology quality manager: Isn't it time you had one?

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Radiology Department, Great Western Hospital¹

Aims/objectives: Clinical governance (quality) is quite rightly increasing in importance in radiology departments. There is an increasing administrative workload as a result. This was impacting significantly upon the radiographer and radiologist who were the governance leads. We needed to find a solution. Due to the shortage of radiographers, the decision was made to create a specific administrative post of 'radiology quality manager'.

Content: The quality manager is crucial in ensuring effective delivery of clinical governance requirements, including effective implementation of policies, procedures and operational plans.

The role includes monitoring compliance of the quality performance indicators within the Radiology department. Complaints, incidents and concerns within the department need to be responded to appropriately and outcome measures implemented. The production of the audit plan, initiating audits in a timely manner and ensuring the learning outcomes are discussed and actions implemented is an important component of the post.

Relevance/impact: Safety is central to practice within the NHS. There is a significant administrative burden that goes with this. The development of a dedicated governance role in the department has significantly aided departmental governance and reduced pressure on clinical staff.

Outcomes: The most challenging role of the quality manager is to successfully develop and maintain a culture whereby clinical governance, quality and patients' safety becomes an integral part of Radiology processes.

Discussion: This has been a very successful appointment supporting busy medical staff in radiology. It is a solution that other departments may wish to emulate.

P188 Establishing a local CT dose reference level in a large hospital setting

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To establish a local CT diagnostic reference level (DRLs) in a large hospital (that uses 7 CT scanners) by collecting the radiation doses of the three most frequently performed CT examinations.

With the extensive use of CT scanners as a diagnostic tool but also the greatest potential for harm, some form of assessment is required to ensure that patient receives the lowest radiation dose possible. DRL will be the first step to ensure that variations in radiation dose for each CT scan across patients and facilities are consistent. Although DRL was recommended by ICRP in 1996, the only established DRL are from US and UK, which is not compatible to Asian context due to the difference in the body size. Thus, a local DRL would be preferred.

With availability of a local DRL, dose optimization can be achieved as it injects a form of stimulus for CT radiographers to observe and even boost their current practices for improvements in relation to radiation protection. DRLs can also be a form of quality control for optimizing scan performances on all of the CT scanners.

CT radiation dose data; CTDIvol and DLP of 10 average-sized patients from the three most commonly performed CT examinations were collected. Data of each category were calculated for the mean of CTDIvol and DLP value. The 75th percentile was used to calculate a local DRL for each of the three most commonly done CT examinations. The results obtained were then compared to US and UK DRL data.

P189 Are clinicians aware of referral criteria for medical exposures?: Legal obligations and practical considerations

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Norwich Radiology Academy

Aims/objectives: It is a legal requirement under IRMER for all radiology departments to supply clinicians with information about referral criteria and radiation doses. This audit was designed to assess the Norfolk and Norwich



University Hospital Trust's adherence to this statutory requirement. A possible link between access to such guidelines and awareness of radiation doses among clinicians was also assessed.

Content: The poster will outline how the information was obtained through an online survey with results displayed in a variety of graphs followed by analysis and discussion.

Relevance and impact: Most radiology departments are unaware of their obligations to provide clinicians with information about referral criteria and radiation doses. Lack of compliance could result in legal action under the Health and Safety Workers Act, and it might also lead to patient harm through inappropriate scans.

Outcome: Majority of clinicians at the Norfolk and Norwich University Hospital Trust were unaware of local or national radiology guidelines. A similar lack of knowledge of radiation doses of common investigations was also demonstrated.

Discussion: Lack of access to referral guidelines such as iRefer could explain the poor knowledge among clinicians of common radiological investigations, which might be impacting on patient care. Consequently an educational programme has been devised to address this issue. This includes promotion of current guidelines through Trust induction, emails and duty sessions. The effectiveness of this intervention will be re-audited in one year.

P190 Communicating risk in research involving ionising radiation

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There are many guidance documents relevant to ionising radiation used in medical research[1]. In the process of set-up for research involving the NHS, the application is reviewed by a research ethics committee, submitted to the competent authority and the NHS Trust sites involved, to obtain NHS Permission (R&D approval). Part of this review examines the articulation of radiation procedures and their risk, as described in the participant information.

The author describes the methodology of the radiation governance process for research, the various legislations and policies applicable to the context, and discusses the rationale behind articulating radiation exposures in the process of informed consent. Examples of proportionate, effective language describing ionising radiation in participant information are provided, as well as common mistakes in the chosen language of patient documentation.

[1] IR(ME)R 2000, The Medicines for Human Use (Clinical Trials) Regulations 2004, The Research Governance Framework for Health and Social Care 2nd Edition, Approval for research involving ionising radiation Version 2 September 2008

P191 Standardisation and optimisation of CT protocols using the Philips CT DoseRight 2.0 automatic exposure control system

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Given the increasing use of CT in the UK over the last 30 years, it is essential to ensure all imaging protocols are optimised to ensure radiation doses are as low as reasonably practicable, consistent with the intended clinical task. However, the additional complexity of modern CT equipment, with a range of 'dose saving' functions can make this task difficult to achieve in practice.

In our Trust, routine patient dose audits demonstrated clear differences between scanners for what were otherwise meant to be identical scan protocols. This was due to variations in CT protocol setup that were primarily due to drift in the setup of the CT Automatic Exposure Control on the Philips Brilliance DoseRight (version 2.0) systems. A simple technique that uses a uniform phantom to generate reference images for each clinical protocol has been developed, which has resulted in standardised and stable setup of all clinical protocols on four Brilliance scanners. This has been confirmed with subsequent patient dose audits. This technique has been extended to include matching imaging performance of these protocols to a Toshiba Aquilion 64, and the results of this exercise will be presented.



The results of this work have highlighted the importance of CT protocol harmonisation in a modern Radiology department to ensure both consistent image quality and radiation dose. Following this study, the average radiation dose for a range of CT examinations has been reduced without any negative impact on clinical image quality.

Other

P192 Non-destructive imaging: evaluation of archaeological dentition specimens

[Sophie Willis¹](#); [Paul Bland¹](#); [Michael Henderson²](#); [Don Walker²](#)

City University London¹; MOLA (Museum of London Archaeology)²

Key learning objectives: To review the role of radiographic imaging techniques used in the non-destructive investigation of archaeological dental bone specimens. To illustrate, with examples, the utility of extra- and intraoral radiographic imaging techniques in the visualisation of the dentition and surrounding bone.

Description: Caries and other abnormalities on the exposed surfaces of the teeth in archeological specimens can be detected by visual inspection, but abnormalities concealed on the interproximal surfaces are more difficult to detect. Radiographic analysis can reveal; apical infection, periodontal status, presence and position of unerupted teeth and root morphology, and a detailed evaluation of apical cysts and other lesions within the alveolar bone. Differences in bone preservation state require suitable adjustment of imaging parameters and the capability of digital image capture utilising extra- and intraoral techniques is of great benefit here. Specifically, soil invasion into the medullary cavity can be missed during macroscopic examination, but will appear as an artefact on a digital radiographic image; similarly differences in decay and diagenesis of remains after death can be accurately visualised by radiographic imaging techniques and enhanced during post-imaging manipulation of the digital data.

Conclusion: Both extra- and intraoral imaging techniques are deemed more sensitive than conventional methods to evaluate the dentition from archaeological specimens. Both techniques are capable of producing images in a variety of planes and demonstrating anomalies on interproximal surfaces of teeth, which provide archaeologist's and osteologists with accurate information in relation to understandings about the way of life of the individual and cultures studied.

P193 Multiparametric MRI of anterior prostate cancer with histological correlation

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Royal Glamorgan Hospital

Multiparametric MRI has emerged as an important tool in the diagnosis of clinically significant prostate cancer. The addition of functional imaging - Diffusion Weighted Imaging and Dynamic Contrast Enhanced Imaging to T1 and T2-weighted imaging has improved prostate cancer detection rates. Targeted biopsy based on prebiopsy MRI-detected lesion improve detection rates, volume and grade of anterior prostate cancer compared to standard systematic biopsy.

We present a pictorial review of patterns of anterior prostate cancer detected on multiparametric MRI with histological confirmation obtained using Trans Rectal Ultrasound Guided targeted biopsy with cognitive registration.

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