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Poster presentations

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## Clinical: Musculoskeletal

- P-001 **High resolution ultrasound features in early seronegative arthritis**  
*Jacob Oommen, Wrightington, Wigan & Leigh NHS Foundation Trust*
- P-002 **MRI of spondyarthropathies - a reaudit of standardised MRI protocols and the knock on effects of clinical referral patterns over three years**  
*Thariq Hajamohideen, University Hospitals of Leicester NHS Trust*
- P-003 **Size matters: Understanding and application of the true orthogonal view in the assessment of ulnar variance**  
*Philip Murray, Norfolk and Norwich University Hospital*
- P-004 **What the general radiologist needs to know about prosthetic orthopaedic implants; an aide memoire**  
*Gana Kugathanan, Plymouth Hospital NHS Trust*
- P-006 **Critical evaluation of the role of imaging modalities in decision pathways of osteosarcoma**  
*Farah Akram, Shaukat Khanum Memorial Cancer Hospital & Research Centre, Lahore, Pakistan*
- P-007 **A pain in the neck: Analysis of screening cervical spine CT based on NICE guidelines**  
*Kiran Reddy, University Hospitals Leicester*
- P-008 **The microcirculation of the intervertebral disc**  
*Rachel Palfrey, University of Exeter*
- P-009 **Role of Short Tau Inversion Recovery (STIR) sequence in community referred spinal imaging**  
*Omar Azmat, York Hospitals NHS Foundation Trust*
- P-010 **Review and update of correct nomenclature for lumbar spine disc disease**  
*Aneta Kecler-Pietrzyk, Tallaght Hospital, Dublin, Ireland*
- P-011 **The value of routine postoperative radiographs after elective lumbar spinal fusions surgery**  
*Syed Ali, University of Manchester*
- P-012 **Imaging post hip arthroplasty - what the orthopods need to see**  
*Victoria Ballard, Brighton and Sussex University Hospitals*
- P-013 **Revision hip arthroplasty: What the radiologist needs to know**  
*Rachel Magennis, Alexandra Hospital, Cheadle*
- P-014 **A pictorial review of the MRI appearances of the synovial disorders of the knee**  
*Ajay Sahu, Plymouth Hospitals NHS Trust*
- P-015 **Effects on function, bone mineral density and lean tissue mass 12 months following total knee replacement in a female postmenopausal population**  
*Karen Knapp, College of Engineering, Mathematics and Physical Sciences, University of Exeter*
- P-016 **Early magnetic resonance imaging features of seronegative arthritis of the ankle and foot**  
*Jacob Oommen, Wrightington, Wigan & Leigh NHS Foundation Trust*
- P-017 **A retrospective study of General Practice (GP) referrals for Dual-Energy X-ray Absorptiometry (DXA) scanning**  
*Penelope Bell, University Campus Suffolk*
- P-018 **The use of localising markers in foreign body radiography**  
*Aung Zaw Win, Calderdale and Huddersfield NHS Foundation Trust*
- P-019 **An exploration of the drivers and barriers surrounding radiographer commenting in the community hospital**  
*Morag Howard, Robert Gordon University, Aberdeen*
- P-020 **Documentation of referrer opinion on A&E radiographs**  
*Madhurima Rai, Department of Radiology, Stobhill Hospital, West of Scotland Deanery*

## Clinical: Head and neck

- P-021 **Assessing the quality of post-cochlear implant radiographs - an audit**  
*Elizabeth Loney, Bradford Teaching Hospitals NHS Foundation Trust*
- P-022 **Pearls and pitfalls when reporting MRI in the investigation of sensorineural deafness in adults**  
*Georgina Devenish, Abertawe Bro Morgannwg University Health Board*
- P-023 **Diagnostic accuracy of FNAC in neck nodes in lung cancer: A DGH experience**  
*Apurva Sinha, St John's Hospital, Livingston*
- P-024 **Cystic masses of the neck: A pictorial review**  
*Ahmed Ismail, Wrightington, Wigan and Leigh NHS Foundation Trust*
- P-025 **Confirmation of nasogastric tube position - are we meeting national guidelines?**  
*Thomas Osborne, Royal Surrey County Hospital*
- P-026 **A study to determine the spatial distribution of scattered radiation during dental intra-oral radiography (IOR)**  
*Sophie Willis, City University, London*
- P-027 **Pictorial review of dental anatomy and common dental pathology**  
*Amit Gupta, Leeds Teaching Hospitals NHS Foundation Trust*
- P-028 **The comet tail artefact and other echogenic foci in thyroid ultrasound - what is the clinical significance?**  
*Andrew Gemmell, Peninsula Radiology Academy, Devon*
- P-029 **Audit: Specimen adequacy of ultrasound scan (USS) guided Fine Needle Aspiration Biopsy (FNAB) of the thyroid in a District General Hospital (DGH)**  
*Nyla Khan, Queen Elizabeth Hospital, London*
- P-030 **Acoustic neuromas: Unusual features and differential diagnosis - an MDT experience**  
*Archita Gulati, Aintree University Hospitals NHS Foundation Trust*
- P-031 **New neurofibromatosis type 2 multidisciplinary team meeting - our initial radiological experience**  
*Jo Warner, Aintree University Hospitals NHS Foundation Trust*
- P-032 **The anatomy and pathology of the parapharyngeal space - a pictorial review**  
*Beth Hankinson, Aintree University Hospitals NHS Foundation Trust*

- P-033 A pilot study examining the role of diffusion-weighted MRI in high risk TIAs**  
*Misha Kathirgamanathan, Ipswich Hospital NHS Trust*
- P-034 Implementing radiographic CT head reporting: The experiences of students and managers**  
*Ruth Clarke, Birmingham City University*
- P-035 The development of a low cost cranial phantom for computed tomography that simulates common pathologies**  
*Martine Harris, Mid Yorkshire Hospitals NHS Trust*
- P-036 Are emergency department CT head requests adequately completed?**  
*Davina Mak, New Cross Hospital, The Royal Wolverhampton NHS Trust*
- P-037 Minimising claustrophobia in MRI radiotherapy planning of the head and neck**  
*Louise Jordan, Newcastle Upon Tyne Hospitals NHS Foundation Trust*



#### Clinical: Neuroradiology

- P-038 **Computed tomography referral practice - experience at a large academic hospital**  
*Sarah Hagi, King Abdulaziz University, Jeddah, Saudi Arabia*
- P-039 **New intracranial tumors - when is visceral CT useful?**  
*Nishant Omar, Leeds Teaching Hospitals NHS Foundation Trust*

#### Clinical: Breast

- P-040 **Mucinous carcinoma and fibroadenoma case study**  
*Claire Mercer, University Hospital of South Manchester NHS Foundation Trust*
- P-041 **A mammography image set for observer training and assessment in BI-RADS density classification**  
*Claire Mercer, University Hospital of South Manchester NHS Foundation Trust*
- P-042 **Factors affecting the reducibility of ADC measurements in breast cancer**  
*Shelley Waugh, Medical Physics, Ninewells Hospital, Dundee*
- P-043 **Visibility of cancer mimicking lesions in a poly vinyl alcohol (PVAL) breast phantom using mammographic imaging - relationship between phantom thickness and lesion visibility**  
*Peter Hogg, School of Health Sciences, University of Salford*
- P-044 **A call for client consistency in compression**  
*Claire Mercer, University Hospital of South Manchester NHS Foundation Trust*
- P-045 **The role of magnetic resonance image guided 2nd look ultrasound - effecting change in management for patients considered for breast conserving surgery**  
*Nikhil Rao, University Hospitals Coventry & Warwickshire NHS Trust*
- P-046 **MRI in the breast screening programme**  
*Orla McAvinchey, East Cheshire NHS Trust*
- P-047 **Comparative study of prognoses in screening and symptomatic Asian breast cancer patients based on Nottingham prognostic index**  
*Anil Jain, University Hospital of South Manchester NHS Foundation Trust*

#### Clinical: Chest

- P-048 **Lung cancer screening at a glance**  
*Sze Mun Mak, Chelsea and Westminster Hospital NHS Foundation Trust*
- P-049 **Lesion detection performance: Comparative analysis of low-dose CT on two hybrid imaging systems**  
*Peter Hogg, School of Health Sciences, University of Salford*
- P-050 **Vanishing lung: Going... going... bong**  
*Andy Beale, Great Western Hospitals NHS Foundation Trust*
- P-051 **Radiographic patterns of lung adenocarcinoma in Malaysia - an update**  
*Norafida Bahari, Universiti Putra Malaysia*
- P-052 **Multi-centre analysis of incidental findings on low resolution CT attenuation correction (CTAC) images**  
*Joanne Sil, School of Health Sciences, University of Salford*
- P-053 **An audit of use of Computed Tomography Pulmonary Angiography (CTPA) in the diagnosis of suspected pulmonary embolism**  
*Safia Rehman, George Eliot Hospital NHS Trust*
- P-054 **Computed Tomography (CT) attenuation values of pleural fluid: Can it be used to differentiate between exudate and transudate?**  
*Naveed Altaf, The James Cook University Hospital, South Tees Hospitals NHS Foundation Trust*
- P-055 **Incidental cardiac findings on CT thorax**  
*Madhusudan Paravasthu, Aintree University Hospital NHS Foundation Trust*
- P-056 **The influence of observer training for the detection of simulated pulmonary lesions on single computed tomography images of an anthropomorphic chest phantom: A jackknife alternative free-response receiver operating characteristic analysis**  
*Peter Hogg, School of Health Sciences, University of Salford*
- P-057 **Development and validation of a psychometric scale for assessing PA chest image quality: A pilot study**  
*Hafsa Momoniat, School of Health Sciences, University of Salford*
- P-058 **We refer: An audit of in-house radiology referral to ensure patients receive CT imaging for suspected bronchial neoplasm in a timely fashion**  
*James Chambers, St Helens and Knowsley Teaching Hospitals NHS Trust*
- P-059 **Pneumothorax... is the expiratory CXR needed?**  
*Adil Mahmoud, Glasgow Royal Infirmary, NHS Greater Glasgow and Clyde*
- P-060 **Pictorial review of pleural "masses"**  
*Madhusudan Paravasthu, Aintree University Hospital NHS Foundation Trust*
- P-061 **Introducing radiographer chest x-ray reporting at a cancer hospital**  
*Susan Todd, The Christie NHS Foundation Trust*
- P-062 **Radiologically guided percutaneous lung biopsies: Retrospective evaluation of diagnostic yield and complication rate**  
*Mohamed Elshafi, Galway University Hospital, Ireland*
- P-063 **Effects of tube potential and scatter rejection on image quality and effective dose in digital chest X-ray examination: An anthropomorphic phantom study**  
*Daniel Shaw, The Christie NHS Foundation Trust*

#### Clinical: Cardiac and vascular

- P-064 **Myocardial perfusion scintigraphy (MPS) referral indications: A re-audit of a regional service in South Wales**  
*Ali Ben-Mussa, Abertawe Bro Morgannwg University Health Board*
- P-065 **Correlation of coronary artery calcification with non alcoholic fatty liver disease**

- Sze Mun Mak, Chelsea and Westminster Hospital NHS Foundation Trust*
- P-066 **Pictorial review of pre TAVI CT aortogram: How, what and why**  
*Sze Mun Mak, Chelsea and Westminster Hospital NHS Foundation Trust*
- P-067 **Clinical validation of Dual Energy CT (DECT) for coronary and valve imaging in patients undergoing Trans-catheter Aortic Valve Implantation (TAVI)**  
*Chris Pavitt, Royal Brompton and Harefield NHS Trust*
- P-068 **Modern cardiac devices: Strictly on a lead to know basis**  
*Andy Beale, Great Western Hospitals NHS Foundation Trust*
- P-069 **Sarcoidosis: A pictorial review of the cardiothoracic imaging findings**  
*Franchesca Wotton, Peninsula Radiology Academy, Plymouth*
- P-070 **Applied physics of cardiac MRI - what, why and how?**  
*Madhusudan Paravasthu, Aintree University Hospital NHS Foundation Trust*
- P-071 **Cardiac CT dose and agaston calcium score in male and female patient cohort group**  
*Shahabaz Patil, Birmingham City Hospital*
- P-072 **Cardiac MRI: Enhancement patterns demystified**  
*Ajay Sahu, Plymouth Hospitals NHS Trust*
- P-073 **Incidental pulmonary emboli (PE) on non CTPA (CT pulmonary angiogram) computed tomography (CT) scans: The signs that work and the confusers to recognise**  
*Sarah Iddles, The Christie NHS Foundation Trust*
- P-074 **Comparison and predictive significance of pre test probability and calcium score in computed tomography coronary angiography**  
*Robert Parry, St Helens and Knowsley Teaching Hospitals NHS Trust*
- P-075 **Constrictive pericarditis - imaging review**  
*Madhusudan Paravasthu, Aintree University Hospital NHS Foundation Trust*
- P-076 **Morbidity and mortality associated with contrast venography proven distal deep vein thrombosis - a cause for concern?**  
*Gordon Cowell, Victoria Infirmary, NHS Greater Glasgow and Clyde*

#### Clinical: Uroradiology; gynaecology; obstetrics

- P-077 **An audit of ultrasound scanning using the Foetal Anomaly Screening Programme (FASP) Image Assessment Tool 2012**  
*Penelope Bell, University Campus Suffolk*
- P-078 **Pearls and pitfalls of female pelvic MRI: A whistle-stop tour from a district general hospital perspective**  
*Georgina Devenish, Abertawe Bro Morgannwg University Health Board*
- P-079 **Unusual manifestations of endometriosis and their imaging appearanceshiding?**  
*Dhivya Murthy Paravasthu, Aintree University Hospital NHS Foundation Trust*
- P-080 **Beware the mucinous ovarian tumour - ovarian, colonic or pseudomyxoma?**  
*David Little, Great Western Hospitals NHS Foundation Trust*
- P-081 **The clinical value of adding diffusion weighted imaging to standard T2 weighted sequences in the evaluation of prostate cancer with MRI**  
*Sophie Vaughan, University Hospital of Wales, Cardiff and Vale University Health Board*
- P-082 **Rapidly developing renal milk of calcium in a patient with myelomonocytic leukaemia**  
*Anika Morjaria, Southend University Hospital*
- P-083 **MR imaging of penis - what a general radiologist needs to know?**  
*Dhivya Murthy Paravasthu, Aintree University Hospital NHS Foundation Trust*
- P-084 **Clinical mimics of nephrolithiasis - findings on unenhanced CT of the urinary tract**  
*Carys Jenkins, University Hospital of Wales, Cardiff and Vale University Health Board*
- P-085 **Emphysematous infections of the abdomen and pelvis on plain films, ultrasound and cross-sectional imaging: A pictorial review**  
*Fiona Lyall, Plymouth Hospitals NHS Trust*

#### Clinical: GI and hepatobiliary

- P-086 **Evaluation of inguinal region hernias on CT**  
*Herb Imalingat, Southport and Ormskirk NHS Trust*
- P-087 **Contrast dose by patient weight in abdominal CT scanning: An evaluation of current practice**  
*Anthony George, Bristol Royal Infirmary, University Hospitals Bristol NHS Foundation Trust*
- P-088 **Abdominal CT: A patient weight-based approach to contrast dose**  
*Anthony George, Bristol Royal Infirmary, University Hospitals Bristol NHS Foundation Trust*
- P-089 **Pictorial review of imaging appearances of portal vein pathology and available portal venous interventions**  
*Dhivya Murthy Paravasthu, Aintree University Hospital NHS Foundation Trust*
- P-090 **Acute drop in Haemoglobin. Cause?**  
*Deepak Pai, Scunthorpe General Hospital, North Lincolnshire and Goole NHS Foundation Trust*
- P-091 **Intussuseption: The radiologists guide**  
*Laura Steinberg, University Hospital of South Manchester NHS Foundation Trust*
- P-092 **An audit on the validity of MRCP requests at a District General Hospital**  
*Raymond Rueben, Dumfries and Galloway Royal Infirmary*
- P-093 **A pictorial review of small bowel pathologies and their appearance on multi-slice computed tomography**  
*Rob Foster, Victoria Infirmary, NHS Greater Glasgow and Clyde*
- P-094 **The role of CT enterography in the assessment of small bowel Crohn's**  
*Oliver Nicholson, Stockport NHS Foundation Trust*
- P-095 **Rectal contrast: Uses in clinical radiology**  
*Sophie Vaughan, University Hospital of Wales, Cardiff and Vale University Health Board*

- P-096 **Uncommon anal canal lesions mimicking malignancy**  
*Dhivya Murthy Paravasthu, Aintree University Hospital NHS Foundation Trust*
- P-097 **A pictorial review of anatomy, typical appearances, and complications related to common gastrointestinal tract (GIT) surgeries**  
*Ajay Sahu, Plymouth Hospitals NHS Trust*
- P-098 **Percutaneous biliary stenting in a DGH - comparison with national audit**  
*David Little, Great Western Hospitals NHS Trust*
- P-099 **Combined fluoroscopic and CT imaging to improve the diagnostic accuracy of anastomotic leaks and intestinal fistulae**  
*Anesh Patel, Surrey and Sussex Healthcare NHS Trust*
- P-100 **A trainee's guide to hypervascular liver lesions**  
*Nadya Jabbar, Wirral University Teaching Hospital NHS Foundation Trust*
- P-101 **A pictorial review of unusual gallstone complications**  
*Nicola Ley, Yorkshire and Humber School of Radiology*
- P-102 **A pictorial review of endoscopic ultrasound of hepatobiliary system and pancreas: A checklist for the radiologist**  
*Ajay Sahu, Plymouth Hospitals NHS Trust*
- P-103 **A pictorial review of pancreatic and extra-pancreatic imaging findings in autoimmune pancreatitis**  
*Ajay Sahu, Plymouth Hospitals NHS Trust*
- P-104 **Radiological features of pathology in the appendix and right hemicolon: A pictorial review**  
*Syed Mustafa, University Hospital of Wales, Cardiff and Vale University Health Board*

#### Clinical: Paediatrics

- P-105 **In the neck of time**  
*Simon Ewart, Royal Devon and Exeter NHS Foundation Trust*
- P-106 **Imaging the submandibular gland and space in children - normal appearances and pathology**  
*Sacha Pierre, Royal Sussex County Hospital, Brighton and Sussex University Hospitals NHS Trust*

#### Clinical: Multisystem disorders

- P-107 **Extra-medullary haematopoiesis: A pictorial review of its typical and atypical locations in our practice**  
*Ajay Sahu, Plymouth Hospitals NHS Trust*
- P-108 **Manifestations of extra pulmonary lymphoma: A pictorial review**  
*Tarig Adlan, Plymouth Hospitals NHS Trust*
- P-109 **Extrapulmonary tuberculosis - re-emergence of the 'great pretender'**  
*Emma Phelan, Tallaght Hospital, Dublin, Ireland*
- P-110 **Unusual presentations of malignant melanoma metastases: A pictorial review**  
*Sophie Vaughan, University Hospital of Wales, Cardiff and Vale University Health Board*

#### Clinical: Intervention and trauma

- P-111 **A review of interventional radiology and its utilisation in trauma patients**  
*Sachin Modi, Heart of England NHS Foundation Trust*
- P-112 **Patients' experience of anxiety and pain during interventional radiology procedures**  
*James Roberts, Countess of Chester Hospital NHS Foundation Trust*
- P-113 **Inferior vena cava filters - an audit of their justification, planned longevity and retrieval**  
*Natalia White, Salisbury District Hospital*
- P-114 **The role of ultrasound guided hydrodistension in adhesive capsulitis**  
*Rubina Azam, Whipps Cross University Hospital, Barts Health NHS Trust*
- P-115 **Complications of the mynx arterial closure device**  
*Stuart Barnard, Middlemore Hospital (CMDHB), New Zealand*
- P-116 **Retrospective analysis of diagnostic yield and complication of percutaneous CT guided needle biopsy of pulmonary lesion**  
*Afaq Siddiqui, Huddersfield Royal Infirmary, Calderdale and Huddersfield NHS Foundation Trust*
- P-117 **Review of catheter directed thrombolysis for acute limb ischaemia**  
*John Asquith, University Hospital of North Staffordshire NHS Trust*

#### Errors and discrepancies

- P-118 **Discrepancy highlighting - system to highlight and potentially expedite patients with discordant radiology reports**  
*Caroline Blower, NHS Ayrshire & Arran*
- P-119 **Lump in neck GPs ability to refer to community ultrasound reduces work load of cancer pathway. But at what cost? Delayed diagnosis, professional and legal vulnerability**  
*Conor Aleman, Heatherwood and Wexham Park Hospitals NHS Foundation Trust*
- P-120 **Do you see what I see? Clinical review of discordant chest x-ray consultant radiologist and radiographer interpretations**  
*Nick Woznitza, Homerton University Hospital*
- P-121 **Missed lung cancers on chest radiographs**  
*Sze Mun Mak, Chelsea and Westminster Hospital NHS Foundation Trust*
- P-122 **Obesity increases precision errors in fat, lean and bone mineral density measurements on total body dual energy x-ray absorptiometry scans**  
*Karen Knapp, University of Exeter*
- P-123 **Mimics of pancreatic tail lesions on cross sectional imaging**  
*Dhivya Murthy Paravasthu, Aintree University Hospital NHS Foundation Trust*
- P-124 **Audit of the management of "adrenal incidentalomas"**

### Molecular and functioning imaging

- P-125 **How can PET/CT amyloid imaging aid in the diagnosis of alzheimers disease?**  
*Louise Jordan, Newcastle Hospitals NHS Trust*
- P-126 **Optimising body CT imaging for SPECT.CT tumour isotope imaging**  
*Peter Strouhal, Royal Wolverhampton Hospital*
- P-127 **"New clear" hybrid imaging for pulmonary emboli**  
*Peter Strouhal, Royal Wolverhampton Hospital*
- P-128 **Breast cancer: The curious incidence of the hot head on the bone scan**  
*Nicholas Ridley, Great Western Hospitals NHS Foundation Trust*

### Innovation in service delivery

- P-129 **The art of rejection**  
*Nicholas Taylor, Great Western Hospitals NHS Foundation Trust*
- P-130 **One stop orthopaedic clinic: Value-added musculoskeletal radiology in the new model of patient care cycle**  
*Ajay Sahu, Plymouth Hospitals NHS Trust*
- P-131 **Experiences of a new off site CT colonography service**  
*Helena Barton, North Bristol NHS Trust*
- P-132 **Implementing advanced practice in diagnostic radiography: The Scottish perspective 2013**  
*Ian Henderson, Robert Gordon University, Aberdeen*
- P-133 **How much does imaging influence speed of discharge in hospital?**  
*R Simon Davies, Abertawe Bro Morgannwg University Health Board*
- P-134 **A prospective audit into radiology requesting in an acute medical unit: Are imaging requests being processed within the recommended timeframe?**  
*Teresa Jacob, Basildon and Thurrock University Hospital*

## Professional training and education

- P-135 **Self-assessment = autonomous learner?**  
*Alexandra Partner, School of Health and Social Care, University of Derby*
- P-136 **An observational study of intercultural communication in diverse professional learning groups**  
*Peter Hogg, School of Health Sciences, University of Salford*
- P-137 **Partnership working: Changing cultures and winning awards**  
*Sophie Willis, Royal Free London NHS Foundation Trust*
- P-138 **Overview of a European summer school for diagnostic imaging research**  
*Peter Hogg, School of Health Sciences, University of Salford*
- P-139 **An evaluation of interactive sessions involving radiography students and a simulated patient**  
*John Huckle, Faculty of Medicine and Health, University of Leeds*
- P-140 **Integration of person centred care in radiography education**  
*Louise Mifsud, Robert Gordon University, Aberdeen*
- P-141 **Modelling the migration patterns of radiography undergraduates**  
*Chris Wright, Sheffield Hallam University*
- P-142 **Using social media to promote the radiography subject area**  
*Alexandra Partner, School of Health and Social Care, University of Derby*
- P-143 **Exploring the transition period of diagnostic radiographers during their first three months of practice**  
*Jane Harvey-Lloyd, University Campus Suffolk*
- P-144 **Radiology referrals: A call for further undergraduate radiology education**  
*Nishanth Sivarasan, Royal London Hospital, Barts Health NHS Trust*
- P-145 **Reporting by radiographers – computer tomography examinations of the head**  
*Paul Lockwood, Canterbury Christ Church University*
- P-146 **How advanced is our advanced practice? A survey of reporting radiography practice in England**  
*Victoria Ballard, Brighton and Sussex University Hospitals NHS Trust*
- P-147 **When are specialist registrars worth their weight in gold?**  
*Derfel Ap Dafydd, Imperial College Healthcare NHS Trust*
- P-148 **Establishing a postgraduate MRI training programme: 5 year review**  
*Wendy Wilkinson, InHealth Group*
- P-149 **Student perception of performance post recorded diagnostic radiography clinical simulation**  
*Louise Mifsud, Robert Gordon University, Aberdeen*
- P-150 **Does simulation enhance the experiential learning of diagnostic radiography students?**  
*Jennie Swift, Sheffield Hallam University*
- P-151 **Death and dying - are students prepared?**  
*Alexandra Partner, University of Derby*
- P-152 **An analysis of the student and tutor experience of an Erasmus funded residential research event**  
*Peter Hogg, School of Health Sciences, University of Salford*
- P-153 **The utility of applications (Apps) in the radiography curriculum: A baseline survey of student opinion**  
*Jane Harvey-Lloyd, University Campus Suffolk*
- P-154 **What, where, and how; a proposal for structuring preliminary clinical evaluations**  
*Chris Wright, Sheffield Hallam University*
- P-155 **The patient experience - are you getting it right? The use of scenarios to emphasise the importance of interactions within the clinical setting**  
*Georgina Howie, NHS Ayrshire & Arran*
- P-156 **Peer review in mammography - an essential part of learning and development**  
*Laura Starr, University Hospital South Manchester*
- P-157 **Investigating the use of positioning and lead shielding to reduce gonad dose in lumbar spine examinations**  
*Sarah Simpson, University of Salford*
- P-158 **The rules of the game**  
*Peter Winter, Cardiff University*

## Computer assisted detection/diagnosis and image perception

- P-159 **An investigation into perceived image quality by the application of colour scales to chest radiographs**  
*Peter Holden, University of Salford*
- P-160 **Iterative reconstruction for CT pulmonary angiograms: A phantom study to investigate potential dose reduction**  
*Ruth Clarke, Mid Yorkshire Hospitals NHS Trust*
- P-161 **CO2 angiography; why use it?**  
*Muhammad Yaman Adi, University Hospital Birmingham*
- P-162 **A method to investigate image blurring due to mammography machine compression paddle movement**  
*Peter Hogg, School of Health Sciences, University of Salford*
- P-163 **Development of personalised paediatric femora model using CT**  
*Xinshan Li, Department of Mechanical Engineering, University of Sheffield*

## Current and emerging techniques

- P-164 **Diffusion weighting in abdominal imaging – a problem solving tool**  
*Carys Jenkins, University Hospital of Wales, Cardiff and Vale University Health Board*
- P-165 **Peninsula Trauma Centre: Our experience of imaging of pelvic fractures with emphasis on review of anatomy, classification systems and associated injuries**



*Ajay Sahu, Plymouth Hospitals NHS Trust*

**P-166 Increasing SID for AP pelvis imaging - impact on radiation dose and image quality**

*Charlie Everton, University of Salford*

**P-167 Cone beam CT for upper and lower limbs: Scanning techniques**

*Veronique Sauret-Jackson, Cavendish Imaging Ltd*

**P-168 Dual energy computed tomography in tophaceous gout - an old disease with a new perspective**

*Emma Phelan, Tallaght Hospital, Dublin, Ireland*

**P-169 Evaluation of carbon fibre for use in MRI radiotherapy treatment planning**

*Louise Jordan, Newcastle Hospitals*

#### Clinical: Nuclear medicine

**P-170 Are current guidelines appropriate for repeat bone scanning in skeletal metastases?**

*Kenneth Murphy, NHS Ayrshire & Arran*

**P-171 An overview of lymphoscintigraphy; what is a positive result and how does this change the management?**

*Nicola Ley, Yorkshire and Humber School of Radiology*

**P-172 The value of I123 SPECT CT in the follow up of patients with differentiated thyroid cancer**

*Nicola Robson, Poole Hospital NHS Foundation Trust*

#### Patient dose measurement and management

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

*Edwina Peck, Addenbrooke's Hospital*

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

*Hishar Hassan, Centre for Diagnostic Nuclear Imaging, Universiti Putra Malaysia*

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

*Jeremy Nicoll, BreastScreen Aotearoa, National Screening Unit, New Zealand*

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

*Claire Mercer, University Hospital of South Manchester NHS Foundation Trust*

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

*Melissa McMurrin, NHS Ayrshire & Arran*

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

*Hishar Hassan, Centre for Diagnostic Nuclear Imaging, Universiti Putra Malaysia*

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

*Christian Burd, Chelsea and Westminster Hospital NHS Foundation Trust*

#### Radiation protection and quality assurance

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

*Conor Clancy, The Christie NHS Foundation Trust*

**P-181 Justification of polytrauma CT at a UK major trauma centre**

*Tharsi Sarvananthan, Radiology Department, Royal Sussex County Hospital*

**P-182 Can inter- and intra-observer variation in the assessment of threshold contrast detail detectability be improved?**

*Debbie Saunders, Cambridge University Hospitals*

**P-183 The radiation legislation awareness of foundation year doctors**

*Gary Cross, West Hertfordshire Hospitals NHS Trust*

**P-184 Low dose computed tomography for orthopaedic pelvic CT**

*Jacob Oommen, Wrightington, Wigan & Leigh NHS Foundation Trust*

**P-185 Evaluation of the appropriateness of whole body computer tomography (WBCT) in trauma patients in a tertiary trauma centre**

*Neena Kalsy, Aintree University Hospital NHS Trust*

**P-186 The use of real time dose monitoring within interventional radiology**

*Stephanie Dobson, Aintree University Hospital NHS Trust*

**P-187 Audit of the formal recording of inpatient plain film radiograph interpretation in patients' notes**

*Waheed Mustafa, Basildon and Thurrock University Hospitals NHS Foundation Trust*

**P-188 10 kVp rule - an anthropomorphic pelvis phantom imaging study using a CR system: Impact on image quality and effective dose using AEC and manual mode**

*Abdulfatah Ahmed, University of Salford*

**P-189 3 point patient ID check - Why, Who, When and What?**

*Nishant Omar, Bradford Teaching Hospitals NHS Foundation Trust*

**P-190 Comparing the Leeds Test Object TO.CTIQ phantom to the RMI Gammex IQ phantom**

*Paul Charnock, Integrated Radiological Services (IRS) Ltd*

#### Other

**P-191 Lymphoma - the great imitator**

*J.A Abjulkarim, George Eliot Hospital NHS Trust*

**P-192 You want to scan what? No worries**

*Elizabeth Davies, Toshiba Medical Asia Pacific*

**P-193 Developing and validating a psychometric scale for AP pelvis image quality assessment**

*Hussien Mraity, University of Salford*

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- P-205 **Imaging of hepatocellular carcinoma: A review of imaging techniques and appearances**  
*Julia Repas, City University London*

### P-001 High resolution ultrasound features in early seronegative arthritis

[Jacob Oommen](#); [Navtej Sathi](#)

*Wrightington, Wigan & Leigh NHS Foundation Trust*

**Objectives:** The Radiological course of seronegative arthritis is subtle and diagnosis is often delayed by 5-9 years despite clinical evidence of symptoms and signs of inflammation. The diagnosis is based on recognised clinical classifications. Radiological features are often at the late stages of the disease and often present as secondary osteoarthritic changes and may lead to unnecessary surgery. The assessment protocols with high resolution ultrasound required defining.

**Contents:** Retrospective review of distribution of features on high resolution ultrasound of hands and wrists of over 300 patients classified clinically as seronegative spondyloarthritis. Our emphasis is on high resolution ultrasound of the hands and wrists to demonstrate the peripheral component and the systemic nature of the disease.

**Outcomes:** Early Synovial inflammation is identified in over 80% of patients at the sites of the patients symptoms and swelling rather than the expected radiographic sites. The absence of hyperaemia and erosions of rheumatoid arthritis is a feature. Effusions are minimal and often suppressed by ongoing treatment.

**Impact:** The spectrum of florid features of rheumatoid arthritis are not featured in seronegative arthritis. The spectrum and distribution of inflammation redefined our ultrasound interrogation protocols.

**Discussions:** MRI often fails to demonstrate convincing evidence to correlate with the patients symptoms and signs. High resolution ultrasound provides an opportunity to confirm clinical symptoms and findings. Known radiographic distribution of the disease is misleading and the assessment is best tailored to clinical features. Various outpatient imaging protocols are described for rapid clinical diagnostic confirmation such as the US 7 technique is complimentary.

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### P-002 MRI of spondyarthropathies - a reaudit of standardised MRI protocols and the knock on effects of clinical referral patterns over three years

[Winston Rennie](#); [Thariq Hajamohideen](#)

*University Hospitals of Leicester NHS Trust*

**Background:** Several criteria exist for the diagnosis of spondyloarthropathies (SpA), a group of related rheumatological disorders. Many modifications to diagnostic criteria have been made, however, there continues to be a significant lag between disease onset and diagnosis. The new ASAS criteria may allow shorter diagnostic delay by incorporating MRI.

**Aims:** A reaudit of all MR performed to a locally developed Ankylosing Spondylitis protocol, to assess the positive 'hit rate' over one year. The initial audit was from 2009-10 and the current period is 2010-2012.

**Methodology:** A total of 76 patients were obtained using the CRIS software search function. Local and national standards were used for the audit.

**Relevance/outcomes:** Increase in mean age (38 to 42), rheumatology and consultant specific referrals (90%), SpA protocol and specialist MSK review were significantly increased in the reaudit, with a reduction in the time to report.

**Discussion:** Studies show standard clinical protocols may omit inflammatory lesions in thoracic region, which highlights the need for following spinal AS protocols. The numbers of patients scanned to a standard 'Neuroradiology' spine protocol have significantly decreased due to radiographer education across the Trust. During the reaudit period, requests for AS protocol increased as well as consultant only referrals. The majority of referrals for MRI spine were from rheumatology and remained within the main specialist centre. The emphasis on specialist input as well as appropriate protocol may contribute to the subsequent increase in diagnostic hit rate for inflammatory spine disease and SpAs.

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### **P-003 Size matters: Understanding and application of the true orthogonal view in the assessment of ulnar variance**

[Philip Murray](#); [Hameed Rafiee](#); [Tom Marshall](#); [Amanda Hards](#)

*Norfolk and Norwich University Hospital*

**Aims:** Evaluation of radiographer understanding and application of the true PA orthogonal view in the assessment of ulnar variance to ensure correct patient positioning, as inadequate technique can result in false interpretation of the radiograph and impact upon patient management.

**Methods:** A survey was conducted over a two week period of all radiographers specialising in plain film radiography within our radiology department. The survey was formulated by two specialist registrars in clinical radiology, one musculoskeletal consultant radiologist and one senior radiographer specialising in plain film radiography.

The standards were; 100% of radiographers understand the rationale and technique for using the orthogonal view and 100% apply this in their practice when asked to assess for positive ulnar variance.

**Outcomes:** Only 22% of radiographers knew the correct angle of abduction of the shoulder, while 92% knew the correct angle of flexion of the elbow. Only 32% of radiographers would always make a note if the arm could not be positioned correctly.

**Discussion:** The results demonstrate that within our department the plain film radiographers have a suboptimal understanding of the technique and application of the orthogonal view for the assessment of ulnar variance. The results have been fed back to the radiographers and other staff in the form of an audit presentation to highlight the importance of technique in the assessment of this condition, and the results will be re-audited in due course to ensure that there is an improvement in understanding and clinical practice.

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### **P-004 What the general radiologist needs to know about prosthetic orthopaedic implants; an aide memoire**

[Gana Kugathasan](#); [Hasan Nizami](#); [Tarig Adlan](#); [Prashant Sankaye](#); [Abdul Gafoor](#)

*Plymouth Hospital NHS Trust*

**Aims:** This presentation will provide an overview of common orthopaedic implants including their post operative radiographic appearances. Post operative radiographs have conventionally been used by the surgeons to assess for prosthetic position and post operative complications. These films are often reported by the general radiologist or a trainee registrar as 'metal work in situ, position as shown'. The aim of this poster is to familiarize the general radiologist with the different types of prosthesis and their range of normal post-operative imaging appearances including ideal positions and complications.

**Content:** We will present a pictorial series encompassing commonly used implants both in the acute and elective settings. These will include joint replacements and trauma prosthesis. For example a patient with a dynamic hip screw fixation following an extra capsular neck of femur fracture would require the tip apex distance to be within 2cm and centred within the femoral head for best results. We endeavour to encompass a range of prosthetic implants for example; different types of hip replacements, hip fracture fixation prosthesis like the dynamic hip screw/targon plate/cannulated screw fixation, femoral prosthesis like LISS plates and intra medullary nail fixations amongst others.

**Relevance:** The general radiologist / trainees need to be aware of the different types of commonly used prosthetic appliances, their normal/abnormal appearances and potential complications.

**Conclusion:** This would be an aid memoire to help the general radiologist identify normal and abnormal appearances of commonly used prosthesis in Trauma and Orthopaedics.

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### **P-006 Critical evaluation of the role of imaging modalities in decision pathways of osteosarcoma**

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**Aim:** This study aims to evaluate the role of diagnostic imaging investigations in management of osteosarcoma. It will also provide an insight of the role of multidisciplinary teams in clinical decision making process for the appropriate choice of imaging investigation and its influence on patient management. Recommendations from guidelines and international standards for the diagnostic pathway of osteosarcoma will also be discussed.

**Materials and methods:** Patients diagnosed with osteosarcoma were selected during multidisciplinary team meetings and followed prospectively. Patients' clinical notes and details of medical investigations were accessed



from the hospital information system (HIS) and Picture Archiving and Communication System (PACS). Patients' personal information ie. name, medical record number and Images of medical investigations were anonymised following the RCR standards for patient confidentiality and PACS (2008). Informed consent was obtained from patient before using patients' case notes. A critical review of all the imaging investigations was done comparing with the international standards.

**Conclusion:** Imaging examinations are essential in the work-up and staging of osteosarcoma. The critical role of diagnostic imaging modalities in detecting, staging and treatment planning was reviewed. This case-study highlighted unjustified imaging examinations and the decision making process at every step of patient management. The key to efficient patient diagnosis and management is proper utilisation of these imaging modalities by adhering to guidelines. Analysis of this case study provided an insight to achieve best patient outcomes.

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#### **P-007 A pain in the neck: Analysis of screening cervical spine CT based on NICE guidelines**

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*University Hospitals Leicester; Albert Einstein College of Medicine, USA*

**Background:** The 2007 National Institute for Health and Clinical Excellence (NICE) Head Injury Guidelines included imaging criteria to triage trauma patients for immediate computed tomography (CT) scan of the cervical spine (C-Spine). Inasmuch as our goal is to reduce unnecessary radiation exposure to the thyroid gland, which is 14 times greater for CT as compared to radiography, we evaluated CT request compliance with NICE criteria.

**Methods:** A retrospective assessment of all adult patients presenting to the Emergency Department (ED) for CT C-Spine imaging requested over a 6 month period were enrolled. The CT scans were reported to confirm the presence or absence of cervical spine fracture by a consultant radiologist. ED requests were evaluated for compliance with NICE criteria for immediate cervical spine CT.

**Results:** Of the 246 CT C-Spine examinations, 87.8% (216) were negative for the presence of C-spine fracture. Only 12.2% (30) were positive. 30 CT examinations which had fractures, 80% (24) met the NICE criteria and 20% (6) did not. When criteria were met (n=116), 20.7% (24) had fractures as opposed to 4.6% (6) when criteria not met (n=130). Applying NICE criteria identified a statistically significant number of fractures (P=0.00012004). The NICE criteria had a sensitivity of 80% and specificity of 57.41% for identifying C-spine fractures. The positive and negative predictive values were 20.69% and 95.38% respectively.

**Conclusions:** Strict application of the NICE Head Injury guidelines for imaging of the cervical spine would reduce over-utilization of CT and its potentially harmful radiation exposure.

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#### **P-008 The microcirculation of the intervertebral disc**

[Rachel Palfrey](#); [Ian Summers](#); [Peter Winlove](#)

*University of Exeter*

Low back pain is a costly societal issue. Although its aetiology is unclear, it has been associated with degeneration of the intervertebral disc, caused in part by poor nutrition. In this study the equine caudal disc is utilised as a model with which to study perfusion in disc tissue. X ray and MRI imaging and classical histology were employed to investigate the structural anatomy of the disc and the uptake of tracers within the disc tissue.

Though the anatomy of the human and equine caudal discs was similar, the equine annulus consisted of an average 5 lamellae with a width range of 140 to 1110 microns as opposed to 15 to 20 lamellae and a width range of 200 to 400 microns in the human. The equine discs were circular in transverse section and the endplates had concave superior and inferior surfaces. The nucleus showed local order in the orientation of collagen fibres.

It was found that to reach tracer equilibrium it took up to 22 hours in the outer anterior annulus for the manganese ion but only 5 ½ hours in the central nucleus with Gadovist. Diffusion was found to be fastest overall in Gadovist and slowest in manganese. Partition coefficients were also found to vary. A partition coefficient of 6 for manganese and 0.5 for Magnevist in the nucleus area was found.

These studies demonstrate that the perfused equine disc is a useful model in which to study nutrition and drug uptake which is of clinical importance.

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#### **P-009 Role of Short Tau Inversion Recovery (STIR) sequence in community referred spinal imaging**

[Omar Azmat](#); [Kate Kingston](#); [Charlotte Davies](#); [Neil Jenkins](#); [David King](#)

*York Hospitals NHS Foundation Trust*

**Aims:** To assess value of STIR sequence in MR imaging of community referred patients, mainly focusing on lumbar MR.

**Content:** Audit performed over a month's period, reviewing all spinal MRI performed. Two Consultant Musculoskeletal Radiologists and a Radiology Resident double read each examination (123 patients). All data was analyzed in an Excel word sheet, with graphical representation of the results. A final result, discussion and plan was put together. The final plan is set in accordance with American College of Radiology revised MR guidelines 2012.

**Impact:** All community-referred patients undergoing a spinal MRI at York District Hospital, along with sagittal T1 and T2 sequences undergo a STIR sequence. By assessing value of STIR in this setting, the sequence could be reserved for a selected patient cohort, decreasing examination time and improve throughput of the scanner.

**Outcomes:** On review of the lumbar spine STIR sequences, 4.83% had MR findings not seen with standard sagittal sequences (T1 and T2). On evaluation of further spinal imaging low value added in cervical and thoracic examinations.

**Discussion:** In summary, it would improve working efficiency of MR scanning, in the context of out patients, by selecting a cohort of patients where a STIR sequence would add value. This would be guided by the clinical history provided. In initial imaging for back pain, in potential surgical candidates with symptoms of radiculopathy or spinal stenosis, standard sagittal sequences (T1 and T2) should be employed and STIR only used where further clarification or confirmation is deemed necessary.

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#### **P-010 Review and update of correct nomenclature for lumbar spine disc disease**

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**Learning objectives:** To review, update and unify the classification in disc pathology nomenclature according to current recommendations to ensure accurate communication between radiologists and their referring clinicians.

**Background:** There is currently a wide variety of radiological interpretation of what constitutes a particular disc pathology. For example the distinction between a disc protrusion and an asymmetrical disc bulge is often open to individual interpretation. This lack of consistency is also prevalent in the literature with a variety of guidelines being used. We reviewed the database from our institution over the last 5 years and analyzed the number of MRIs performed of the lumbar spine and cross referred to findings of disc disease. In total 5, 860 lumbar spines were performed with reports and images available in 5, 223 cases. Out of these 3, 823 had disc disease. Cases from these cohort were utilized for this educational exhibit.

We reviewed the literature to assess best current practice in correctly diagnosing disc disease. Articles were mainly found in the orthopedic and radiological literature. In total 16 articles were found to be appropriate for reference sourcing. Illustrative diagrams defining disc pathology as well as representative images have been utilized in this exhibit to clearly define the correct interpretation of disc disease.

**Conclusions:** In this educational exhibit we illustrate the correct nomenclature of disc pathology based on the most current literature using both illustrative diagrams as well as cases from our cohort. We describe methods of standardization of language allowing for a unified approach to correct and reliable terminology of disc disease.

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### P-011 The value of routine postoperative radiographs after elective lumbar spinal fusions surgery

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*University of Manchester; Lancashire Teaching Hospitals Trust*

**Aims:** Both intra- and post-operative radiographs are traditionally obtained after instrumented lumbar spinal surgery; however the clinical advantage of routine post-operative images has not been demonstrated. This study aims to explore the usefulness of routine pre-discharge postoperative radiographs in patients undergoing instrumented spinal surgery.

**Methods:** Patients (n = 124) who underwent a lumbar spinal fusion were identified from a retrospective database, 58 patients were excluded. Unaltered intra-operative and pre-discharge post-operative PACS images for 66 patients were reviewed and were scored for: i) Quality (0 = non-diagnostic, 1 = suboptimal, 2 = diagnostic, 3 = good quality), ii) Focus (number of vertebra and disc seen), iii) Centering using a numbered (1- 9) grid system, and iv) Rotation.

**Results:** 66 radiographs were analysed for i) Quality: 60 AP and 56 lateral intra-operative images while 57 AP and 39 lateral postoperative images were diagnostic, ii) Focus: average number of unnecessary vertebra seen in intra-operative AP and lateral images were 0.89 and 1.09, while on post-operative AP and lateral images were 8.05 and 6.45 respectively, iii) Centering: 48 AP and 51 lateral intra-operative images, while 27 AP and 20 lateral post-operative images were adequately centered and iv) Rotation was adequate in both intra-operative and post-operative images.

**Conclusion:** Intra-operative images scored higher in all parameters suggesting that routine post-operative pre-hospital discharge radiographs are unnecessary unless specifically indicated and this practice should be discontinued with benefits including reduction of radiation dose (and subsequent sequelae), fiscal burden and length of stay.

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### P-012 Imaging post hip arthroplasty - what the orthopods need to see

[Victoria Ballard](#); [Siobhan Dallibar](#)

*Brighton and Sussex University Hospitals NHS Trust*

**Aims/objectives:** To evaluate post-operative hip arthroplasty complications demonstrated on plain film radiography.

**Content:** Comprehensive guide to post-operative hip arthroplasty complications, their radiographic appearances and implications.

**Relevance/impact:** Appreciation of what the orthopaedic team need from this imaging can help radiographers to achieve quality diagnostic imaging. Recognition of significant complications by the reporting radiographer can minimise the impact through rapid diagnosis and reduced misses.

**Discussion:** Plain film radiography is the primary method of follow up for hip arthroplasty complications. Comparison of initial post-operative and follow up imaging can reveal subtle abnormalities in the painful arthroplasty. Complications may be acute (eg. incorrect placement, infection, fracture, cement extrusion) or chronic (eg. loosening, hardware failure, fracture, heterotopic ossification). Such complications require monitoring and may lead to revision surgery.

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### P-013 Revision hip arthroplasty: What the radiologist needs to know

[Chris Marsh](#); [Adam Hoad-Reddick](#); [Rachel Magennis](#)

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Hip joint replacement surgery has improved quality of life by reducing pain and increasing mobility for many patients. A percentage will fail, often due to instability, infection and dislocation in the short term and mechanical loosening and late infection in the long term. With increased life expectancy and younger age at primary implant, revision surgery is an expanding field of orthopaedic surgery. Revision hip surgery is complex with critical pre-operative planning and a wide variety of implants available. The mechanism of failure is important in terms of the type of revision implant used and whether one or both components is replaced. Radiologists play an important role in detection of early signs of failure as well as requiring an understanding of revision techniques and some knowledge of the types of implants used and their expected radiological appearance.

Loosening may initially be asymptomatic and subtle radiologically, in contrast to the gross features of advanced osteolysis secondary to particle disease. Reduced bone stock has treatment implications and may require specialist reconstruction methods including bone grafting and mega-prostheses. Fixation of some implants is secondary to

bony ingrowth. Post-operative cables and wiring may be used following trochanteric osteotomy as part of revision surgery and longer stems with additional acetabular fixation are often seen.

We illustrate the common causes of failure, highlighting the spectrum of radiological features in differing patient populations. We describe the common revision implant types and correlate with radiographic appearances to guide radiologists through the essentials of this rapidly expanding field.

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#### **P-014 A pictorial review of the MRI appearances of the synovial disorders of the knee**

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*Plymouth Hospitals NHS Trust*

**Introduction:** Synovial disorders often affect the knee joint and are a common cause of morbidity. MRI is the imaging method of choice for detection and further characterization of predominantly soft tissue lesions around the knee. With the advances in MR imaging, more useful information can now be provided to referring clinicians regarding further management of the synovial disorders. MR is the imaging modality of choice for demonstrating synovial changes due to its superior soft-tissue contrast.

**Aims/objective:** The aim of this pictorial review is to highlight important MRI findings for articular mass like lesions with illustrative case examples from our institution. This presentation will help orthopaedic surgeons and MSK radiologists to understand important MRI findings to help diagnose and characterize mass like lesions adjacent to the knee joint in more detail.

**Materials and methods:** In this pictorial review, we will present common and interesting uncommon illustrative articular lesions simulating masses, with their MR imaging features. We will include conditions like focal or diffuse pigmented villonodular synovitis, scarring/capsulitis, siderotic synovitis, suprapatellar plica synovialis syndrome, synovitis, lipoma Arborescence, giant cell tumour of tendon sheath, synovial chondromatosis, osteochondromatosis, rheumatoid arthritis and rice bodies.

**Conclusion:** An understanding of the imaging characteristics of articular mass like lesions is important for making a diagnosis and alleviating patient's anxiety. This pictorial review will facilitate development of an easy systematic approach for their diagnosis.

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#### **P-015 Effects on function, bone mineral density and lean tissue mass 12 months following total knee replacement in a female postmenopausal population**

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Disuse osteopenia is a known consequence of reduced weight-bearing on lower limbs. Knee Osteoarthritis (OA) commonly necessitates joint replacement with limited mobility for a variable period post-surgery. Although OA is associated with higher levels of BMD, a significant increase in hip fracture incidence in the year following total knee replacement (TKR) has been demonstrated. This study investigated the extent of disuse-related bone loss at the hip following TKR and its potential contribution to post-surgical fracture risk.

DXA measurements (GE Lunar Prodigy) were taken of BMD at the neck of femur (NOF) and total hip (TH), and leg lean tissue mass (LLTM) in a sample of 19 postmenopausal female TKR patients compared to 43 controls. Ipsilateral/contralateral weight-bearing, lower-limb function, 3-day pedometer readings and falls were recorded. Data were collected at pre-surgery baseline and at six weeks, six and twelve months post-surgery.

Despite showing improvement in most areas of function and activity, recovery following TKR was slow and incomplete one year after surgery. The effects of immobilization following TKR were an immediate and statistically significant loss ( $p < 0.05$ ) of ipsilateral bone mass at the total hip and at the NOF (after 6 months), accompanied by significant ( $p < 0.05$ ) bilateral muscle atrophy that continued gradually over the following 6 months and remained one year after surgery. The clinical significance of these reductions in hip BMD are an increased risk of hip fracture that may be exacerbated by muscle loss which could affect patients' gait and postural stability thereby increasing the risk of falls.

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#### **P-016 Early magnetic resonance imaging features of seronegative arthritis of the ankle and foot**

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**Objectives:** Sero negative spondyloarthritis presenting as pain and swelling at the ankle and foot show subtle appearances on MRI and are often dismissed as osteoarthritis. The florid features of gross effusions and synovial thickening associated with rheumatoid arthritis is absent. The primary objective of ankle MR imaging is often as a prearthroscopic roadmap. The subtle inflammatory features are dismissed as osteoarthritis and may lead to unrewarding major surgical intervention. The objective is to demonstrate the nature of the disease and the spectrum of appearances on MRI to expedite the clinical diagnosis and medical management.

**Contents:** A retrospective review of 25 ankles with diagnosed seronegative spondyloarthritis.

**Impact:** Understanding the systemic nature of the disease and identification of the changes provides the ability not only to qualify the spectrum of appearances but also to quantify the disease severity. A check list of changes identified on MRI and supplemented by ultrasound findings provides the clinician with an early diagnostic tool.

**Discussion:** The diagnosis of seronegative spondyloarthritis is on accepted clinical classifications of presentations and the exclusion of rheumatoid arthritis. Radiographs demonstrate late features and clinical diagnosis is often delayed by 5-9 years. High resolution ultrasound is able to provide high resolution images of tenosynovitis and synovitis at the joint margins. MR imaging permits the early demonstration of synovial-enthesis complex inflammation within bone and soft tissues.

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### P-017 A retrospective study of General Practice (GP) referrals for Dual-Energy X-ray Absorptiometry (DXA) scanning

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*University Campus Suffolk; Ipswich Hospital NHS Trust*

**Introduction:** Dual Energy X-ray Absorptiometry (DXA) predicts fracture risk. General Practitioners (GPs) refer patients for DXA but waiting times are long. The Fracture Risk Assessment tool (FRAX) developed by the National Osteoporosis Guideline Group (NOGG) is based on patient risk factors. The score recommends either; 1/ lifestyle management, 2/ DXA, or 3/ medication only. The aim of this study was to determine if the patients referred for DXA by GPs would have been referred based on FRAX.

**Method:** The FRAX score was calculated for a cohort of consecutive GP patients (n = 141) referred for a DXA scan over a six month period at a district hospital. The number falling into each group, advise, scan or treat, was summarised to determine whether unnecessary scans had been requested.

**Results:** The FRAX score showed that 30% (n = 43) of patients required advice only, 60% (n = 84) required DXA and 10% (n = 14) direct treatment without DXA.

**Conclusion:** A total of 40% of DXA scans performed were unnecessary according to FRAX results. The FRAX tool is available to GPs both online, on paper and as an application for a smartphone. Promotion of FRAX to GPs could reduce the pressure on DXA scanning by substantially cutting down the number of GP requests for DXA. A larger study is recommended to further quantify the problem. Increasing GP awareness of FRAX may also reduce referrals, save time and cut costs.

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### P-018 The use of localising markers in foreign body radiography

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**Background:** Searching foreign bodies on the radiograph is a frequent encounter in day-to-day imaging practice. To confirm or confute the presence of foreign body in soft tissue could be a real challenge. Placing a localising marker at the point of skin entry helps immensely to tackle this.

**Aims:** To assess the compliance of our radiology department in the use of localizing markers in soft tissue foreign body X-rays.

**Methods:** A retrospective review of 100 soft tissue foreign body X-rays performed at the trust in December 2012.

**Results:** 100 soft tissue foreign body X-rays of head, neck, and limbs were evaluated. Age range: 1 to 87 years. Mean age: 32. Patients in 20s were the largest group. Male to female ratio was 3:2. The upper limb was most frequently involved while glass was the commonest foreign body concerned. In 85% of the radiographs, localising markers were used; either ballpoint pen, paper clip, or arrow marker. No markers were identified in remaining 15%. One reason for not using these was noted to be affected limb being fully dressed.

**Conclusion:** We aim to maximize the result by raising awareness and highlighting value of localizing markers among radiographers, radiologists and A&E staff, and ensuring availability of markers in all X-ray rooms. We also encourage to take foreign body radiographs prior to full dressing of the limb unless clinically indicated otherwise. Even if fully dressed, a marker can still be applied following locating the wound by the patient, or a nursing staff.

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#### **P-019 An exploration of the drivers and barriers surrounding radiographer commenting in the community hospital**

[Morag Howard](#)

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**Aim:** This study sought to explore the perceptions of radiographers (n=8) in North East Scotland in the community hospitals regarding the drivers and barriers to radiographer commenting on musculo-skeletal trauma images.

**Content:** The findings from this qualitative study using interviews will be discussed with regards to the perceived drivers and barriers to the practice of radiographer commenting in community hospitals.

**Relevance:** Radiographer commenting would appear to offer the prospect of benefiting the NHS by streamlining the patient pathway particularly in Scotland with its many remote and rural hospitals where radiological support is often limited.

**Outcomes:** This study revealed that radiographer commenting in the community provides a valuable opinion on musculo-skeletal trauma images which is appreciated by minor injury unit (MIU) staff. This appreciation induced feelings of job satisfaction and acts as a driver to provide a commenting service and thus enhance the patient pathway. A lack of support was deemed a perceived barrier to commenting.

**Discussion:** Research has revealed that MIUs are less likely to use radiographer abnormality detection systems (such as commenting) than larger centres with an emergency department. Additionally, it is proposed that due to a lack of on-site medical expertise patients attending MIUs could benefit more from a radiographer's opinion than those attending an ED.

However, Snaith and Hardy (2008) found that only 10% of the 30 Scottish departments that responded to their questionnaire operate a radiographer commenting scheme. The reasons surrounding this poor participation in Scotland is unknown.

1. SNAITH B, HARDY M. 2008. Radiographer abnormality detection schemes in the trauma environment – An assessment of current practice. *Radiography* 2008;14:277-281

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#### **P-020 Documentation of referrer opinion on A&E radiographs**

[Madhurima Rai](#)

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**Aims:** To determine the number of extremity radiographs from A&E have a documented referrer opinion prior to being viewed by a radiologist.

To evaluate the rate of discrepancies between referrer opinion and radiology report.

**Standard:** 100% of extremity films from A&E should have a documented referrer opinion.

**Methods:** Retrospective audit looking at 100 radiographs from A&E over a 2 month period.

**Results:** 89% of radiographs had a documented opinion from the referrer. The remaining radiographs without an opinion were mainly ankle and foot films. The rate of discrepancies between the referrer's opinion and final radiology report was 10%.

**Outcomes:** Results were shared with the A&E department where clinicians were reminded to document their opinion at the time of viewing the film. Local teaching was provided on ankle and foot films.

**Discussion:** It is a routine practice for many radiology departments to report extremity films from A&E in retrospect, well after the patient has been seen by the A&E clinician. In our hospital, the referring clinician from A&E documents his or her opinion of the radiograph electronically which is then attached to the film. This attachment is accessible to the reporting radiologist, who will be able to determine if there are any discrepancies between the referrer opinion and final radiology report. This is then highlighted to a senior on duty in A&E who will review the case and change patient management accordingly, thus improving overall patient safety.

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**P-021 Assessing the quality of post-cochlear implant radiographs - an audit**

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*Bradford Teaching Hospitals NHS Foundation Trust*

Bradford Teaching Hospitals is a supra-regional Cochlear Implant Centre with a large catchment area covering Yorkshire and beyond. Following implantation all patients currently undergo AP and modified Stenvers radiographs to assess the position of the device. A complaint from ENT regarding poor quality radiographs prompted this audit whose aims were to examine both the technical adequacy of these images and our ability to interpret them.

Over a 12 month period from April 2012 to March 2013 76 patients aged from 1 to 89 years underwent 77 procedures. 22 of these were right sided, 31 left sided and 24 bilateral implants. M:F (40:36). Using Departmental guidelines criteria were devised to assess the quality of the radiographs including penetration, positioning and coning. Results show that only 22% of AP views and 53% of Stenvers view were technically adequate when these were applied. Reasons for 'failure' include not centring unilateral AP radiographs over the orbit on that side resulting in exposure of both orbits to the primary beam. AP radiographs were often malpositioned craniocaudally with suboptimal placement of the petrous ridge over the orbit. On three radiographs the implant had actually been omitted from the film.

Despite this it was possible to assess electrode position clearly in 88%, with difficulty in 8% and not at all in 4%. Examples of good and poor radiographs will be shown along with the criteria used for assessment and relevant radiological anatomy. Discussion will cover factors contributing to poor technical results, improvements to be made and plans for re-audit.

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**P-022 Pearls and pitfalls when reporting MRI in the investigation of sensorineural deafness in adults**

[Georgina Devenish](#); [Christopher Goodwin](#)

*Abertawe Bro Morgannwg University Health Board*

**Aims:** To demonstrate the variety of pathologies that should be considered when interpreting MRI in the investigation for unilateral sensorineural deafness in adults.

**Content:** A pictorial review of the common pitfalls of imaging adults with sensorineural deafness and highlight conditions which may be easily overlooked.

**Relevance:** MRI brain with an internal auditory meatus protocol should be performed when evaluating the causes for sensorineural deafness in adults. When assessing these images a common error is to simply exclude a cerebellar pontine angle mass and not fully evaluate for potential underlying inherited conditions.

Sensorineural hearing loss can be hereditary or acquired and nonsyndromal or syndromal. Although the majority of inherited hearing loss occurs at birth, some children will inherit the predisposition to develop hearing loss later in life. Deafness during adulthood is often attributed to age related hearing loss or environmental triggers. Cholesteatoma and dysplastic conditions including vestibular aqueduct syndrome, otosclerosis & pagets disease as well as inherited disorders including absent VIII cranial nerve and pendreds syndrome are some of a few diagnoses which can cause adult onset hearing loss.

**Outcomes:** To provide a learning tool for radiologists when assessing MRI in adults with sensorineural deafness highlighting conditions which may be easily overlooked by radiologists.

**Discussion:** Interpreting MRI of the internal auditory meatus involves considering inherited and acquired causes of sensorineural hearing loss. As a general radiologist it is important to be aware of the common pitfalls of imaging adults with sensorineural deafness and we highlight conditions which may be easily overlooked.

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**P-023 Diagnostic accuracy of FNAC in neck nodes in lung cancer: A DGH experience**

[Apurva Sinha](#); [Peter Maclean](#); [Helen Reid](#)

*St John's Hospital, Livingston*

**Introduction:** Lung cancer is a leading cause of death in UK. Recent NICE and SIGN guidelines recommend the use of FNAC in N2/3 disease for staging and tissue diagnosis.

**Aim:** Our aim was to audit the efficacy, safety and diagnostic accuracy of FNAC for neck nodes in lung cancer patients. Target compliance for the diagnostic accuracy was set at 85% and complication rate less than 5%.

**Material and Method:** It was a retrospective audit of 52 patients in a District General Hospital, over a period of 2 years. Patients who underwent FNAC of neck nodes for other diagnoses were excluded from the study.

Data collected comprised of distribution of age and sex, sample deemed adequate by radiologist after the procedure, complications, pathology report and further interventions if the sample was insufficient.

**Result:** The diagnostic accuracy of the test was 91%. More than 85% of patients were between 60-80 age groups with nearly equal sex distribution. There were no reported post procedural complications. 96% of the target lesions were adequately visualized before the FNAC.

**Conclusion:** FNAC remains a safe, simple, quick and effective test for tissue diagnosis and staging in lung cancer patients. It has high diagnostic accuracy as seen in our study in DGH settings. Limitations of this test can be, that very small lesions may not be adequately visualized by US, or difficulties related to patient's habitus like having a short neck.

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#### P-024 Cystic masses of the neck: A pictorial review

Maria Chiphang; [Ahmed Ismail](#); Tyusha Devineni

*Wrightington Wigan and Leigh NHS Foundation Trust*

**Aim/purpose:** 1.Pictorial review of radiological features of various cystic lesions of the neck on ultrasound, CT and MRI. 2.To illustrate normal anatomical compartments of neck and relevant developmental embryology that contributes to clinical presentation.

**Content:** 1.This pictorial review describes and illustrates the typical ultrasound, CT, MRI radiological appearances of various cystic lesions of the neck like Ranula, Branchialcleft cyst, Thyroglossal Cyst, Internal and External laryngocele, Cystic lymphnodes, Cystic metastasis etc.

2. The poster also illustrates normal anatomical compartments in the neck and relevant developmental embryology that contributes to the clinical presentation.

**Relevance:** Imaging plays a vital role in the evaluation of cystic neck masses. In order to facilitate and aid correct diagnosis it is important for radiologists to recognise imaging features of cystic neck masses to enable accurate and prompt management.

**Conclusion** This exhibit would highlight the radiological features of various cystic lesions of the neck and various how different imaging modalities can compliment each other to arrive at accurate diagnosis and aid in relevant treatment.

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## P-025 Confirmation of nasogastric tube position - are we meeting national guidelines?

[Thomas Osborne](#); [Kathryn Smith](#)

*Royal Surrey County Hospital*

**Relevance/impact:** Nasogastric tubes (NGTs) are routinely inserted for the purpose of feeding. Historically, the main cause of patient harm and death resulting from accidental feeding into the lung was the misinterpretation of NGT position on chest radiographs. As a result, in 2011 the National Patient Safety Agency issued guidance focusing on safe interpretation of chest radiographs. They re-emphasised that pH testing should be used as the first-line test to confirm NGT position and that chest radiographs should only be used as a second-line test.

**Aims:** Our audit assessed:

- 1) The proportion of unjustified chest radiographs performed to confirm NGT position for the purpose of feeding.
- 2) Correct interpretation of NGT position on chest radiograph.
- 3) The adequacy of documentation surrounding NGT insertion.

**Content:** Causes of morbidity/mortality related to incorrectly placed NGTs.

Recommended algorithm to confirm NGT position.

Correct chest radiograph interpretation/documentation to confirm NGT position.

Audit method, results and strategies to improve current practice.

**Results:** 29% of cases with pH aspirate  $\leq 5.5$  had unjustified chest radiographs.

Only 17% radiographs were confirmed by two doctors or a radiologist.

Only 3% of chest radiographs had adequate documentation to confirm NGT position.

**Outcomes/discussion:** Educate healthcare professionals.

Encourage NGT aspirate result or justified reason for chest radiograph to be recorded on all x-ray request forms. This will empower radiographers to help prevent unnecessary imaging/reduce workload for the radiology department.

Encourage completion of NGT placement sheet.

Consequences of unjustified chest radiographs and poor documentation.

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## P-026 A study to determine the spatial distribution of scattered radiation during dental intra-oral radiography (IOR)

[Sophie Willis](#); [Stephen Green](#); [Christopher Cobb](#)

*City University London; Stephen Green and Associates Ltd; Norwich Radiology Academy*

**Rationale:** The use of digital imaging technology and X-ray tube operating potentials of 70kVp are now commonplace for IOR. Presently there is a lack of research investigating the scattered dose distribution that the implications for the preferred operator position during IOR in the absence of a barrier when undertaking contemporary IOR imaging.

**Aim:** To establish the spatial distribution of scattered radiation dose to the operator at different points around the patient's head during digital IOR.

**Method:** The experimental set-up used a Planmeca Intra X-ray Unit operating at 70kVp, rectangular collimation; anthropomorphic phantom and ionization chamber. The phantom and X-ray equipment was set-up in the erect position to mimic IOR of upper right pre-molar. Scattered radiation dose was measured at operator gonad height and distances from the patient's head ranging to 1.5m at 450 intervals. Three measurements were taken at each position to account for precision errors.

**Results:** At 50cm from the patient, scattered dose ranged from 50-124.3 $\mu$ Sv/hr. At the edge of the controlled area (1.5m), dose was highest in the forward scatter direction (aligned with the central ray). Lowest scattered dose (9.4  $\mu$ Sv/hr) was measured behind the X-ray tube. Dose reductions of 40.2% were measured when standing away from the imaging side of interest within the mouth.

**Conclusion:** The spatial distribution of scattered radiation was not the same in eight directions around the patient. Although the preferred position for the operator is behind a suitable barrier, the preferred position in the absence of a barrier is directly behind the X-ray tube.

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## P-027 Pictorial review of dental anatomy and common dental pathology

[Amit Gupta](#); [Rosalyne Clarkson](#); [Shishir Karthik](#); [Brenda Murray](#); [Fiona Carmichael](#)

*Leeds Teaching Hospitals NHS Foundation Trust*

**Aims/objectives:** Plain radiographs and CT are common modalities used for investigating dental pathology. Teeth and their associated supporting structures are routinely included on head and neck imaging. The aim of this review is to provide clinicians and radiologists with an overview of tooth anatomy, a systematic approach to image interpretation and common dental pathology that may be encountered.

**Content:** We present a pictorial review of tooth anatomy and common dental pathology seen on both plain radiographs and CT including caries and periodontal disease, periapical inflammatory pathology and trauma.

**Relevance/impact:** An understanding of the dental pathology will allow early diagnosis and appropriate referral to dental or maxillofacial surgeons to treat disease or manage trauma.

**Discussion:** Clinicians and radiologists who commonly deal with head and neck pathology/imaging should have a good understanding of dental development and pathology. Accurate image interpretation is key in establishing a likely diagnosis and guiding appropriate management.

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#### **P-028 The comet tail artefact and other echogenic foci in thyroid ultrasound - what is the clinical significance?**

[Andrew Gemmell](#)

*Peninsula Radiology Academy, Devon*

Thyroid nodules are very common; the vast majority are benign however there is approximately a 4-7% risk of malignancy.

The comet tail artefact, an inverted echogenic triangle, is one of several echogenic foci encountered during ultrasound examination of the thyroid.

##### **The purpose of this poster is to:**

1. Illustrate the appearance of echogenic foci during ultrasonographic evaluation of the thyroid.
2. Describe the clinical significance of echogenic foci.
3. To determine if modern ultrasound technology has an effect on the identification of such artefacts.

A Pub Med and Medline literature search of English language studies published between 2003 and 2013 was performed. Further relevant articles were identified from the reference lists of the articles obtained.

There is a degree of overlap in benign and malignant ultrasonographic features. No feature demonstrates both a high sensitivity and high positive predictive value for malignancy. Identification of the comet tail artefact in isolation is highly likely to indicate a benign lesion (colloid cyst). However, colloid may also be identified within malignant lesions.

Calcification increases the risk of malignancy; microcalcifications demonstrate the highest positive predictive value for malignancy.

No studies were identified which investigated the influence of modern ultrasound technology on the appearance of echogenic foci in thyroid nodules. With the continued use of ultrasonography in the assessment of thyroid nodules this topic is identified as a focus for future research.

The illustrations and literature review provide a summary of clinically relevant characteristic features that are encountered during ultrasonographic evaluation of a thyroid nodule.

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#### **P-029 Audit: Specimen adequacy of ultrasound scan (USS) guided Fine Needle Aspiration Biopsy (FNAB) of the thyroid in a District General Hospital (DGH)**

[Renu Gupta; Nyla Khan](#)

*Queen Elizabeth Hospital, London*

**Aims/objectives:** To assess the adequacy of Ultrasound scan (USS) guided fine needle-aspiration biopsies (FNABs) using liquid-based cytology as opposed to conventional smears for the assessment of thyroid nodules.

**Content:** We will review the results of a retrospective audit which determined the number of FNABs performed between 2010 and 2013, in the Radiology department of our district general hospital (DGH). Cytological assessment using Thy staging was recorded and used as the indicator for specimen adequacy.

**Relevance/impact:** CytoLyte solution is a useful preparation technique for FNABs. This has been used at our hospital since 2009 to assess thyroid nodules for suspected malignancy. A local standard was adopted. Thy1 samples are

considered non-diagnostic for cytological diagnosis and this should be no more than 30% of the samples. 70 - 80% of FNABs of thyroids should be adequate according to Thy staging.

**Outcomes:** 131 FNABs of thyroid nodules was performed at our hospital during the study period. 27% of these were Thy1 and insufficient for cytological analysis. 73% were adequate.

**Discussion:** Liquid-based cytology is a good technique to preserve specimens. To increase our diagnostic yield we could agree a protocol for referral for FNA. Patients are often anxious when they come to have the procedure therefore an information leaflet explaining the procedure would be useful. A combination of aspiration and non-aspiration techniques together with multiple passes into the nodule may also improve results.

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### P-030 **Acoustic neuromas: Unusual features and differential diagnosis - an MDT experience**

[Archita Gulati](#); [Beth Hankinson](#); [Jo Warner](#); [Gareth Lewis-Jones](#); [Radhakrishnan Jayan](#); [Huw Lewis-Jones](#)

*Aintree University Hospitals NHS Foundation Trust*

**Aims/objectives:** Acoustic neuromas are one of the commonest causes of referral to the skull base MDT. The aim of this poster is to provide an update on atypical features of acoustic neuroma that the diagnostic radiologist may encounter and the relevant differential diagnosis of more unusual cases of cerebello-pontine angle mass lesion.

**Content:** We present our experience as a tertiary referral skull base MDT in the area of acoustic neuroma imaging. We have collated several atypical features and incorrect diagnoses as part of reviewing cases for the MDT.

We discuss the unusual features of acoustic neuromas such as calcification, cystic change, documented shrinkage of acoustic neuromas without treatment, abnormal T2 signal suppression from the inner ear endolymph indicating permanent inner ear damage, association with neurofibromatosis type 2 and sarcomatous change in an acoustic neuroma associated with invasion of the adjacent brain stem.

We also present the several cases where initial imaging has suggested an acoustic neuroma but subsequent review indicated lipoma, meningioma, cholesteatoma and arachnoid cyst.

**Relevance/impact:** Although majority of acoustic neuromas may appear to be straightforward diagnoses, this poster will help the radiologist to consider the varied appearances of acoustic neuromas and provide a differential for the cerebello-pontine angle masses.

**Outcome:** This poster will assist the diagnostic radiologist in making an appropriate diagnosis of cerebello pontine angle lesion and alert them to more unusual presentations and other possible diagnoses.

**Discussion:** We present images predominately MR images but also some CT images to illustrate these cases.

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### P-031 **New neurofibromatosis type 2 multidisciplinary team meeting - our initial radiological experience**

[Jo Warner](#); [Beth Hankinson](#); [Neena Kalsy](#); [Archita Gulati](#); [Huw Lewis-Jones](#)

*Aintree University Hospitals NHS Foundation Trust*

**Aims:** In 2013 a new Neurofibromatosis type 2 MDT was established at Aintree hospital, Liverpool. We present our initial experience of the evaluation and presentation of the first 19 patients attending this complex multidisciplinary meeting. The multifocal nature of Neurofibromatosis type 2 makes assessment of these patients complex with all patients having multiple scans scattered through time and anatomical regions.

**Contents:** Of the 19 patients that's presented a total of 216 individual cross sectional imaging studies were reviewed. By far the commonest investigation was MR Brain and IAM (n=144) followed by MR scan of the whole spine (n=56).

**Outcomes:** 15 patients presented with bilateral acoustic neuromas, 5 with multiple meningiomas, 6 with solitary meningiomas, 2 with spinal ependymomas, 1 with spinal meningioma and 1 with spinal schwannoma. 13 of the 19 patients had multiple pathologies related to NF2.

Our initial assessment of MDT preparation for these patients indicated that a large amount of time is required to assess the multiple examinations presented and equal attention had to be given to each of the lesions and it's progression through time. It was very valuable to have clinical input at the MDT as this provided the relevant worsening symptomatology that would help to direct the most appropriate treatment.

**Conclusion:** Review of these interesting and complex cases was of value to the patients but it is essential that adequate resource be given to the Radiologist to review the multiple scans contained within this small population group.

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### P-032 The anatomy and pathology of the parapharyngeal space - a pictorial review

[Beth Hankinson](#); [Jo Warner](#); [Archita Gulati](#); [Neena Kalsy](#); [Gareth Lewis-Jones](#); [Radhakrishnan Jayan](#); [Huw Lewis-Jones](#)  
*Aintree University Hospitals NHS Foundation Trust*

**Aims/objectives:** The parapharyngeal space sits beneath the skull base. In this poster we aim to:

- 1) Demonstrate the anatomy and contents of the parapharyngeal space.
- 2) Discuss the direction and displacement of the parapharyngeal fat pad in relation to pathology.

**Content:** We present cross-sectional imaging of more than 15 cases of mixed benign and malignant pathology where involvement and displacement of the parapharyngeal space is of diagnostic importance.

**Relevance:** Understanding of the parapharyngeal space, particularly the anatomy, will aid radiologists with differential diagnoses of this space.

**Outcomes:** This poster provides an anatomy update and presents the differential diagnosis of parapharyngeal space mass lesions including a methodical approach to shortening the differential.

**Discussion:** The principle pathologies of the parapharyngeal space include deep lobe of parotid tumours, both benign and malignant, and neurogenic tumours arising from the area of the carotid space. These are the commonest pathologies to cause distortion of this space and the diagnostic differences of the two conditions are presented. We also present cases of tonsillar carcinoma where invasion of the parapharyngeal space elevates the stage to T3 and effectively precludes transoral laser resection as a diagnostic option. The space can be involved in patients who have tonsillar abscess and infection has spread through the deep parapharyngeal space. Recurrent head and neck squamous cell carcinoma has a predilection for involvement of the mandibular nerve and spread to this space via this route is a common feature.

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### P-033 A pilot study examining the role of diffusion-weighted MRI in high risk TIAs

[Misha Kathirgamanathan](#); [Atif Rao](#); [Muhibbur Chowdhury](#); [Katie Hawkins](#)  
*Ipswich Hospital NHS Trust*

MR is recognised as the imaging modality of choice in diagnosing Transient Ischaemic Attacks (TIAs). However due to limited access and long scan times MRI is not always available. DWI is a form of MR that relies on restricted diffusion of water molecules that occurs in cellular damage immediately following an ischaemic event. The short scan time in diffusion imaging, high sensitivity and specificity potentially allows limited sequences to be performed in selected cases thereby increasing patient turnover.

From April to July 2013, a pilot study was instigated at Ipswich Hospital University Trust. The pilot study was designed to test whether limited sequence DWI is beneficial in the diagnosis of high risk TIAs. Data was collected from all TIA clinic patients with high risk TIAs. High Risk TIAs were classified using an ABCD2 score of 4 or more. Radiologists allocated two daily DWI slots for high risk TIAs.

We looked at 64 patients, of those 32 patients had DWI scans. Where DWI was not available, they went on to have a CT instead (32 patients). Patients who had a CT did not have a follow up MRI. Results highlighted that 14/32 (44%) MRIs showed a positive scan and 9/32 (28%) positive CTs (p-value 0.3). Fisher analysis showed that although there were more positive MRIs than CTs, statistically this was not significant. Our results are limited due to our small sample size. DWI is a valuable tool in evaluating high risk TIAs. We recommend the use of DWI in high-risk TIA patients.

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### P-034 Implementing radiographic CT head reporting: The experiences of students and managers

[David Allen](#); [Ruth Clarke](#); [Paul Arnold](#); [Bev Snaith](#)

*Birmingham City University; The Mid Yorkshire Hospitals NHS Trust; Bradford University; The Mid Yorkshire Hospitals NHS Trust*

**Introduction:** In the face of growing demand in radiology, skill mix initiatives have sought to improve and expand service provision. Within the UK radiographer reporting is now widespread, although the growth in computerised tomography (CT) head reporting has not been as rapid as anticipated. The literature in this area is limited, but case studies have highlighted the successful implementation of this training through new radiographer roles in practice.

**Method:** A cross-sectional survey was developed to elicit information from radiographers and managers on their experiences before, during and after post-graduate training in CT head reporting.



**Results:** 71 responses were received comprising 48 past students (n=48/111; 43.2%) and 23 service managers (n=23/67; 34.3%). Key factor for the development were personal continual professional development for students and departmental need for managers. Challenges during training included lack of study time due to staff shortages and access to radiologist mentors. Only 48.8% of students responding have gone on to use the new skills in practice cited reasons include staff shortages, resistance from radiologists and increase in radiological staffing.

**Conclusions:** This study has demonstrated that those trusts who have implemented CT head reporting have evidenced perceptible benefits for both the department and individuals. Those radiographers who are successfully reporting have shown themselves to be highly motivated and persistent in their development.

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### P-035 The development of a low cost cranial phantom for computed tomography that simulates common pathologies

[Martine Harris](#); [Emily Lewis](#)

*The Mid Yorkshire Hospitals NHS Trust*

**Aims/Objectives:** To develop a CT test phantom that simulates common intracranial pathologies.

**Content:** This presentation will chart the development of a cranial phantom that simulates common intracranial pathologies and important cranial anatomy not ordinarily represented within traditional anthropomorphic phantoms (eg. the grey/white matter interface). This work was conducted in collaboration with an industry partner to ensure the tool will be accurate and reproducible.

The first stage was to explore and review a range of cranial phantoms that are currently available. The density of each of the pathological conditions of interest was then determined by identifying the average Hounsfield Units for each condition, this data was obtained from the literature. In an attempt to identify materials that would adequately simulate the required densities different strengths of gelatine, contrast solutions and everyday food items were scanned. Phantom development was then undertaken.

**Relevance/impact:** Technical advances and dose reduction initiatives are frequently being developed within CT. It is essential that these technological developments are tested and before being applied in clinical practice. Current phantoms available simulate certain tissue characteristics and densities but do not replicate the complexities of the anatomical structures and potential pathology within the cranium.

**Outcomes:** Testing is on-going but results from a prototype indicate promising results for simulation of normal and abnormal brain findings.

**Discussion:** Although further testing will be necessary research and evaluation undertaken with the resultant phantom is likely to have enhanced clinical relevance.

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### P-036 Are emergency department CT head requests adequately completed?

[Davina Mak](#); [Shahbaz Patil](#); [Mark Mantle](#)

*New Cross Hospital, The Royal Wolverhampton NHS Trust*

**Background:** If any discussion were required regarding a CT head scan from the Emergency Department the referrer may have finished their shift and the patient may no longer be in the department. Therefore, it is important that detailed and accurate clinical information is provided on the request form to aid the radiologist in addressing the clinical question. The Royal College of Radiologists guidelines state that a referrer has the responsibility to 'ensure the completeness and accuracy of data relating to a patient's condition'.

**Aims:** Establish if CT head requests from the Emergency Department are adequately completed giving information on: 1) Clinical history, 2) Clinical examination (stating Glasgow Coma Score [GCS], neurology examination findings and pupils), and 3) Clinical question.

**Method:** Retrospective data collection of 150 CT head requests from September 2013.

**Results:** 93% of requests provided a clinical history. Only 33% of requests provided some clinical examination findings and of these 65% provided neurological examination findings, 29% provided the GCS, 4% provided both GCS and neurological examination findings, and 2% provided GCS and pupil findings. 75% of requests stated a clinical question.

**Conclusion:** 93% of requests provided a clinical history, however, only a third provided clinical examination results. It is important for clinicians to recognise that providing a clinical history is not a substitute for examination findings.

The relevance of providing examination findings and a clinical question should be emphasized in order for the radiologist to provide a relevant report that will aid in the efficient management of the patient.

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### **P-037 Minimising claustrophobia in MRI radiotherapy planning of the head and neck**

[Louise Jordan](#)

*Newcastle Upon Tyne Hospitals NHS Foundation Trust*

**Aim:** MRI is a valuable tool in planning Radiotherapy treatment of head and neck tumours, however, refusal of MRI examinations due to claustrophobia has been reported to be up to 30%. Techniques must be adopted in order to minimise refusal of MRI in this claustrophobic and anxiety inducing situation.

**Background:** Claustrophobia is defined as a fear of confined or enclosed spaces with a fear of restriction and fear of suffocation as components.

Benefit of MRI in radiotherapy planning of head and neck tumours.

MRI is utilised in the radiotherapy planning of head and neck tumours as it offers excellent characterisation of soft tissue and visualisation of tumour extent.

The superior image contrast resolution results in improved multi-planar target volume delineation and assessment of planning margins compared to delineation on CT alone.

The benefit of MRI also applies to re-treatments by differentiating between changes due to recurrent cancer opposed to post treatment fibrosis.

The patient is strictly immobilised using a beam directional shell to plan and execute radiotherapy of head and neck tumours due to the sensitivity of adjacent anatomy such as optical structures, facial nerves, salivary glands and major blood vessels. Any discrepancies between planning scans and radiotherapy treatment could result in geographical miss and local failure causing catastrophic consequences.

This poster will highlight anxiety reduction techniques that can be incorporated into the MRI planning procedure in order to reduce claustrophobia and limit refusal rates.

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**P-038 Computed tomography referral practice - experience at a large academic hospital**

[Sarah Hagi](#); [Mawya Khafaji](#); [Naushad Ali](#); [Basheer Ahmed](#)

*King Abdulaziz University, Jeddah, Saudi Arabia*

**Objectives:** To evaluate the current computed tomography (CT) referral practice with emphasis on correct clinical data and examination choice. Our second aim was to investigate turnaround times on all brain CT scans included in the study.

**Methods:** A retrospective analysis of all CT examinations in the radiology information system database was carried out at King Abdulaziz University Hospital, Jeddah, Saudi Arabia. This study was conducted six months after hospital wide implementation of the iRefer criteria, the Royal College of Radiologists imaging referral guidelines. The review included all adult and pediatric patients who had attended the emergency department, out-patients, or were inpatients and had a CT request during the period from July to September 2012. Clinical data and indication for all subjects were evaluated and analyzed.

**Results:** 2322 records were investigated, of which 1695(73%) were adults and 627(27%) were pediatric patients. The majority of requests were for brain (36.9%). Of those, 46% were requested by the Emergency department, (86% adult and (14%) pediatric patients. The total number of examinations performed with inadequate clinical information was 111; among those were 17(15%) pediatric patient requests. Report turnaround time was 1 day with a range of 0 to 38 days.

**Conclusion:** There is a need to increase collaboration between clinicians and radiologists to follow appropriateness guidelines, attain dose reduction strategies, and avoid CT overuse. Changing the current referral practice will take time; however there are several forms of educational tools that could be used in raising clinicians' awareness on radiation dose from radiological investigations.

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**P-039 New intracranial tumors - when is visceral CT useful?**

[Nishant Omar](#); [Shishir Karthik](#); [John Straiton](#)

*Leeds Teaching Hospitals NHS Foundation Trust*

**Background:** Majority of new intracranial lesions, in the absence of a known primary malignancy elsewhere are likely to be primary brain malignancy. Literature review suggests that intracranial malignancies rarely metastasize. Based upon this knowledge, we propose that 'staging' CT of the chest/abdomen/pelvis should not be undertaken unless suggested by the Neuro-oncology MDT.

**Methodology:** A retrospective audit was undertaken. MDT notes for a period of 6 weeks were interrogated. Data collected included demographics, site of the lesion, impression of the Neuro MDT, any staging investigations undertaken, treatment offered and final histology.

**Results:** A total of 147 patients were identified. 105/147 were reported as primary based on radiological appearances. 42/147 were identified as suspicious based on radiological appearances and/or history of extra-cranial malignancy. 26/105 (25%) primary appearing lesions underwent staging CT thorax, abdomen and pelvis – none of which revealed primary malignancy. 37/42 suspicious lesions underwent staging CT thorax, abdomen and pelvis – 19/42 (45%) revealed new primary malignancy or recurrence or existing disease. 10/42 metastatic lesions on radiology were confirmed to be primary. The rest were confirmed metastases.

**Conclusions:** Our study has demonstrated that 'staging' investigations in primary appearing lesions is unnecessary and puts extra pressure on already stretched radiology services. It should be noted that making a firm distinction between primary or metastatic lesions is not always feasible for general radiologist. Hence, unless there is a previous history of cancer, all cases should be discussed in the Neuro-oncology MDT before staging investigations are undertaken.

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**P-040 Mucinous carcinoma and fibroadenoma case study**

[Claire Mercer](#); [Valerie Reece](#)

*University Hospital of South Manchester NHS Foundation Trust*

**Aims/objectives:** To investigate the possibility of the misdiagnosis of mucinous breast cancer for a common benign breast lesion eg., a fibroadenoma in the younger age group.

**Content:** 36 year old patient attended the symptomatic clinic with a palpable lump in the inner half of the right breast and a family history of breast cancer. It was initially thought to be a fibroadenoma but later confirmed by histology to be a mucinous carcinoma.

The case study includes images and reports of the following: mammogram, ultrasound, FNA, core biopsy, axilla ultrasound and pathology slide.

The patient was listed for WLE and sentinel node biopsy. The histology report demonstrated an invasive mucinous carcinoma grade 2. There were 0/1 lymph nodes with no lympho-vascular invasion. Low grade cribriform DCIS was also present.

**Relevance/impact:** There is a potential for misdiagnosis when two breast pathologies exhibit similar appearances on imaging and could have an effect on the correct outcome for the patient.

**Outcomes:** The MDT decision recommended adjuvant Radiotherapy and Endocrine therapy (Tamoxifen 20mg per day for 5 years). Local recurrence is a problem with mucinous carcinoma so good margins are required. The patient is awaiting radiotherapy and has been referred for egg preservation.

**Discussion:** The possibility of misdiagnosis can arise due to the fact that pure or nearly pure mucinous carcinoma accounts for no more than 2% of all breast cancers and it occurs more so in older women. This case study discusses other diagnostic differences between fibroadenoma and mucinous carcinoma.

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**P-041 A mammography image set for observer training and assessment in BI-RADS density classification**

[Claire Mercer](#); [Peter Hogg](#); [Judith Kelly](#); [Rita Borgen](#); [Sara Millington](#); [Beverley Hilton](#); [Patsy Whelehan](#); [David Enion](#)

*University Hospital of South Manchester NHS Foundation Trust; University of Salford; Countess of Chester Hospital NHS Foundation Trust; Burnley General Hospital; Countess of Chester Hospital NHS Foundation Trust; Burnley General Hospital; Medical Research Institute University of Dundee; Burnley General Hospital*

**Aims/objectives:** Breast density categorisation consistency is important when performing research where density is a relevant variable. Minimisation of inter and intra-operator variability is essential if findings are to be meaningful. This research aimed to validate a set of mammography images for visual breast density estimation to help achieve consistency in future research projects, and to determine observer performance (inter- and intra-observer agreement).

**Content:** A set of 50 film-screen mammograms was scored twice by each of eight observers, using the American College of Radiology BI-RADS (Breast Imaging Reporting and Data System) four-category density scale. Scoring agreement within and between observers was assessed.

**Relevance/impact:** This exercise has set a gold-standard score for the test set and enabled the observers' scoring consistency to be evaluated. This will facilitate rigour in future research where BIRADS mammographic density scores are relevant.

**Outcomes:** Six of eight observers achieved strong intra-observer agreement (Cohens' Kappa >0.81). Strong agreement between paired observers was demonstrated in 10 of 28 pairs on first scoring round, and 12 of 28 on second. No observers demonstrated a delta variance above 1. Fleiss' Kappa was used to evaluate concordance between all observers on first and second scoring rounds, with values of 0.64 and 0.56 respectively.

**Discussion:** We confirmed the 50 images suitable for observer training and assessment for research purposes. Some variability existed between observers, but density classification agreement was strong overall. Further work includes repeating this study for digitally acquired images.

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**P-042 Factors affecting the reducibility of ADC measurements in breast cancer**

[Lukasz Priba](#); [Shelley Waugh](#); [Sarah Vinnicombe](#)

**Introduction:** Magnetic Resonance Imaging (MRI) Apparent Diffusion Coefficients (ADC) are sensitive to therapy-induced changes in lesion cellularity, and their use as a biomarker is under evaluation. However little data is available on factors affecting ADC measurement reproducibility. This study characterised the uncertainty in ADC values arising from scanner instability, scan-to-scan variation and measurement repeatability.

**Methods:** All scanning was performed using a 3.0T MRI scanner.

Scanner stability was investigated using an ice-water phantom scanned weekly for six weeks using a standard diffusion sequence ( $b=50,800\text{s/mm}^2$ , voxel size:  $1.8\times 1.8\times 4\text{mm}$ ).

Scan-to-scan reproducibility was assessed by measuring ADC values in 10 healthy volunteers, scanned twice, 4 weeks apart. Axial images were anonymised and randomised, and ADC measured at nipple level in homogenous parenchyma.

Measurement repeatability was assessed using standard diffusion images from 46 patients with biopsy-proven cancer. Whole-tumour ADC was measured by two observers (technical and clinical) and repeated after one week.

**Results:** Scanner stability was excellent with an average  $\text{ADC}=1.089\times 10^{-3}\text{mm}^2/\text{s}$  and coefficient of variance of 6.6%. The coefficient of reproducibility (CoR) for the healthy volunteer breast parenchyma was 8.0% with average  $\text{ADC}_{\text{BASELINE}}=1.503\times 10^{-3}\text{mm}^2/\text{s}$  and  $\text{ADC}_{\text{FOLLOW-UP}}=1.544\times 10^{-3}\text{mm}^2/\text{s}$  and intra class correlation (ICC) coefficients of 0.811. In clinical, symptomatic patients, inter-observer repeatability was 17% and 11.1% for clinical and technical observers respectively. The inter-observer repeatability was  $\text{CoR}=0.302\times 10^{-3}\text{mm}^2/\text{s}$  ( $\text{ICC}=0.939;30.0\%$ ).

**Conclusions:** Inter-observer variability was the biggest factor affecting ADC measurements with CoR measures resulting in up to a 30% error of the average measurement value. This should be considered in departments with multiple reporting radiologists or in multi-centre studies.

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#### **P-043 Visibility of cancer mimicking lesions in a poly vinyl alcohol (PVAL) breast phantom using mammographic imaging – relationship between phantom thickness and lesion visibility**

MS Ossati ; Katy Szczepura; Ana Marono; Gunvor Wade; Julie Wilkinson; Kim Boerma; Paul Sanderson; Sanne Kramer; Susanne Evensen; Vanja Harsaker; [Peter Hogg](#)

*School of Health Sciences, University of Salford; Optimax Summer School*

**Purpose:** To determine the relationship between lesion visibility and phantom breast thickness in mammographic imaging.

**Method and materials:** Two PVAL phantoms, each containing a contrast enhanced lesion, were evaluated. The mechanical and x-ray attenuation properties of the phantoms and lesions were similar to fatty breast tissue and malignant disease. Images were obtained, under different thicknesses, using FFDM. Lesion visibility was assessed using visual analysis of the brightness and contrast using a 2 alternative forced choice (2AFC). The lesion size was measured and the contrast to noise ratio (CNR) was calculated.

**Results:** All results demonstrated a non-linear relationship between phantom thickness and lesion visibility. The initial thickness was 45mm.

The average 2AFC score in Phantom 1 ranged from 3.43 - 6.29 with the highest value at a thickness reduction of 40%. The average score for brightness and contrast in Phantom 2 ranged from 3.86 - 6.86 with the highest value at a thickness reduction of 62%.

The CNR in Phantom 1 ranged from 3.00 - 9.68 with the highest value at a thickness reduction of 62%. The CNR in Phantom 2 ranged from 4.29 - 10.69 with the highest value at a thickness reduction of 49%.

A linear relationship was shown between thickness reduction and the area of the lesion.

**Conclusion:** For the deformable phantom, using 2AFC, lesion visibility increases as thickness reduces to a certain point beyond which lesion visibility deteriorates. Further research is necessary to understand why visibility deteriorates.

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#### **P-044 A call for client consistency in compression**

[Claire Mercer](#); [Peter Hogg](#); [Katy Szczepura](#); [Judith Kelly](#); [Rita Borgen](#); [Erika Denton](#); [Sara Millington](#); [Beverley Hilton](#)



*University Hospital of South Manchester NHS Foundation Trust; University of Salford; Countess of Chester Hospital NHS Foundation Trust; Burnley General Hospital; University of East Anglia and Norfolk & Norwich University Hospital; Countess of Chester Hospital NHS Foundation Trust; Burnley General Hospital*

**Aims/objectives:** The application of mammographic compression force is influenced by the practitioner which may affect client experience. This study establishes if practitioners vary in compression force application, and the resultant compressed breast thickness, at 3 NHS Breast Screening Service (NHSBSP) sites.

**Content:** Each site provided data from 3 consecutive screens for 500 clients and recorded: practitioner code, compression force(N), breast thickness(mm), BI-RADS® density. Exclusion criteria: breast surgery, previous/ongoing assessment, breast implants. 975 clients met the inclusion criteria: 2925 images. Variation of compression force(N) and breast thickness(mm) were analysed.

**Relevance/impact:** Demonstrated that practitioners vary in compression force and resultant compressed breast thickness applied at different NHSBSP sites.

**Outcomes:** Compression force varied significantly between sites. Site 1 had three varying practitioner compressor groups each significantly different to each other. Site 3 had a protocol for required minimal compression of 100N.

**Results:** Sites 1&2 demonstrated no significant difference in mean, 1st & 3rd quartile compression force and breast thickness values CC( $p>0.5$ ), MLO( $p>0.1$ ); with sites 1&3 and sites 2&3 demonstrating a significant difference( $p<0.001$ ).

**Discussion:** The amount of compression force applied by practitioners and the resultant compressed breast thickness is not consistent across these 3 sites. Certain standardisation is found when guidance dictates minimum force in site 3. This may have a positive impact on image quality comparisons over time, radiation dose, potentially cancer detection. A large variation could negatively impact on patient experience; varying pain each attendance; potentially reducing rates of re-attendance and cancer detection. NHSBSP standards required to guide practitioners to ensure consistency in image quality and re-attendance over screens.

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#### **P-045 The role of magnetic resonance image guided 2nd look ultrasound - effecting change in management for patients considered for breast conserving surgery**

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*University Hospitals Coventry & Warwickshire NHS Trust*

**Introduction:** Magnetic Resonance Imaging (MRI) guided second look ultrasound (US) is an established technique for detecting areas of suspicious breast tissue adjacent to a primary breast carcinoma and distinguishing solitary from multifocal disease. It has the advantage of being able to identify and sample these lesions. This has a key role in determining whether breast conserving or mastectomy is performed.

**Methods:** A retrospective study of 50 cases in which MRI guided 2nd look breast ultrasounds was carried out over the period of 30th December 2011 to 3rd of July 2013 (18 months, 240 total MRIs). 90% of 2nd look US were performed by single MRI reporting radiologist. Data was analysed for 29 cases from our institution with completed information. This included; correlation between MRI and US findings, histology results and whether patient management was impacted, in terms of solitary or multifocal disease and subsequent treatment.

**Results:** Second look US was performed in 23 cases (2 cases excluded as these were not malignant). 17 out of 21 (81%) patients had positive US of which 14 patients had additional malignancies, resulting in a change in management (wider excision/mastectomy) in 82% of cases in which US was positive. US failed to identify 4 lesions (4 cases) seen on MRI and required further MRI guided biopsy - from which 3 were histologically benign.

**Conclusion:** We have demonstrated that MRI guided 2nd look US is effective for the detection of incidental further tumour foci and a cost effective method of altering patient management.

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#### **P-046 MRI in the breast screening programme**

[Chris Loughran](#); [Orla McAvinchey](#)

*East Cheshire NHS Trust*

**Introduction:** When an abnormality is identified on screening mammograms women are invited to re attend for further assessment of the putative abnormality. Standard evaluation includes physical examination, further mammography, ultrasound and needle biopsy. Magnetic resonance mammography (MRM), traditionally, has little

part to play. However, we have noted increasing numbers referred for MRM from the screening programme. This paper is a retrospective evaluation where we sought to determine the reasons for the MRM referral.

**Method:** A retrospective evaluation of all women referred for MRM from the local breast screening programme.

**Results:** 26 screening ladies had MRM over a 7 month period. 7 ( 27%) were for lobular carcinoma, 7 (27%) for disease extent prior to surgery, 6 ( 23%) where biopsy was not technically possible or where there were non compliance issues and 5 (19%) where additional reassurance was sought by the patient or referring surgeon.

**Conclusion:** There is demand from the breast screening programme in patients where more accurate evaluation of disease is sought. This is so with lobular neoplasia where multifocal disease may be occult and DCIS where standard imaging may be misleading. In ladies where conventional techniques point very heavily towards a benign diagnosis then MRM may be sufficient to allow a more conservative policy by, for example, follow up only. Finally some cannot tolerate biopsy or where a biopsy is technically demanding and in such instances MRM can be reassuring and allow a conservative approach.

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#### **P-047 Comparative study of prognoses in screening and symptomatic Asian breast cancer patients based on Nottingham prognostic index**

[Anil Jain](#); [Alexander Stewart](#); [Sigrid Whiteside](#); [Alix Hartley](#); [Jacqueline Serevitch](#)

*University Hospital of South Manchester NHS Foundation Trust*

**Aim:** To study prognostic differences in three groups of Asian breast cancer patients depending on age and presentation:

- 1) Screening >47yr
- 2) Older symptomatic > 47 yr
- 3) Younger symptomatic <47 yr

**Material and Methods:** Our study includes 100 Asian breast cancer patients (81% invasive, 19% DCIS) diagnosed between 2009-2013. These include:

Screening: 21 {13 (62%) invasive, 8 DCIS}  
Older symptomatic: 44 {36 (82%) invasive, 8 DCIS}  
Younger symptomatic: 35 {32 (91%) invasive, 3 DCIS}

For 81 invasive cancers tumour grade, size, lymph node involvement, ER/PR and Herceptin receptors status and Ki-67 have been recorded and Nottingham Prognostic Index (NPI) calculated. The screening histories of eligible patients have also been obtained.

**Results:** Asian women with screening detected breast cancer have a better prognosis than both the symptomatic groups with smaller average size, lower grade and less nodal involvement. However, there was poor screening attendance in older symptomatic Group.

The mean NPI ( $\pm$ SD) is  $3.81 \pm 0.96$  for screening detected Group and  $4.76 \pm 1.18$  for older symptomatic Group . This difference is statistically significant ( $p=0.008$ ).

The mean NPI for younger symptomatic Group is ( $4.56 \pm 1.23$ ) and is not statistically significantly different from older symptomatic ( $p=0.528$ ). The symptomatic tumour prognostic features are mixed with greater proportion of high grade tumours in younger symptomatic Group and more lymph node involvement in older symptomatic Group.

**Conclusions:** Asian women with screen detected breast cancer have the best prognoses. Older symptomatic patients however have poorer prognoses similar to younger symptomatic patients, highlighting the need that screening eligible Asian women should not miss their screening appointments.

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## **Clinical: Chest**

#### **P-048 Lung cancer screening at a glance**

[Sze Mun Mak](#); [Simon Padley](#)

*Chelsea and Westminster Hospital NHS Foundation Trust*

Lung cancer screening with low dose CT is a current hot topic within thoracic radiology. National Lung Screening Trial (NLST) showed promising results of a 20% mortality reduction in the United States. European trials are also under way, which will soon offer more evidence of mortality benefit of lung cancer screening. These include the

Nederlands-Leuven Longkanker Screenings Onderzoek (NELSON) trial, our own UK Lung Screening trial (UKLS), and several other trials by Italy, France, Denmark, and Germany. We present an up to date summary of the current evidence base.

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#### **P-049 Lesion detection performance: Comparative analysis of low-dose CT on two hybrid imaging systems**

Maryam Jessop; John D Thompson; Joanne Sil; [Peter Hogg](#)

*School of Health Sciences, University of Salford*

**Purpose:** Incidental findings, in low-dose CT images obtained during hybrid imaging, are an increasing phenomenon with advancing CT technology. Understanding procedural limitations, therefore, is important when reporting images and recommending follow-up. This study assesses lesion detection in CT images obtained during attenuation correction acquisitions on two SPECT/CT systems.

**Methods:** An anthropomorphic chest phantom, containing simulated lesions of varying size and density, was imaged on a GE Infinia Hawkeye4 and a Siemens Symbia T6 with low-dose CT settings used in myocardial perfusion imaging. On the Symbia T6, multiple reconstruction algorithms defined at acquisition enabled use of images from a sharp body kernel. Twenty-two observers completed a lesion detection task, assessing forty-six images (15 normal, 31 abnormal containing 41 lesions) from each SPECT/CT system. Data was analysed using the jackknife alternative free-response receiver operating characteristic (JAFROC) method.

**Results:** JAFROC analysis showed a significant difference ( $p < 0.0001$ ) in lesion detection with figures of merit 0.599 (95% CI 0.568, 0.631) and 0.810 (95% CI 0.781, 0.839) for Infinia Hawkeye4 and Siemens Symbia T6 respectively. Lesion detection on the Infinia Hawkeye4 was generally limited to larger, higher density lesions. The Siemens Symbia T6 images allowed improved detection rates with mid-sized lesions and some lower density lesions, but observers struggled to detect small lesions on both image sets.

**Conclusions:** Lesion detection is more reliable in low-dose CT images from the Symbia T6 than those from the Infinia Hawkeye4. This phantom based study gives an indication of lesion detection and its reliability in the clinical context, as shown by the systems used in this study.

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#### **P-050 Vanishing lung: Going... going... bong**

Katherine Klimczak; [Andy Beale](#)

*Great Western Hospitals NHS Foundation Trust*

**Aims/objectives:** To present the radiological findings in Vanishing Lung syndrome; to review the complications of misdiagnosis

**Content:** This poster will give a brief history of Vanishing lung syndrome, also known as idiopathic giant bullous emphysema. The aetiology and typical presenting features will be discussed. Cases from our institution will then be used in a pictorial review to highlight the radiological findings of the condition on plain film and CT, its complications, and the potential consequences of misdiagnosis.

**Relevance/impact/discussion:** Vanishing lung syndrome was first diagnosed in 1937. It is an uncommon condition that normally affects young males and has been associated with cannabis smoking. It is characterised by extensive paraseptal emphysema which merges into giant bullae, often in the upper lobes. The findings can be asymmetrical and the bullae often occupy more than one third of the hemithorax. Complications include compression of the remaining normal lung, infection, pneumothorax and increased rate of lung cancer. CXR appearances can be misdiagnosed for a pneumothorax which could lead to unnecessary needle aspiration in an emergency setting.

Although illicit drug use is reported to be on the decline, cannabis remains the most commonly used illicit drug, especially among the adolescent population. At the beginning of 2000, the UK had the highest level of cannabis use in Europe. In light of this, the incidence of vanishing lung syndrome will no doubt be on the increase and we as Radiologists need to appreciate the imaging findings to be able to suggest the diagnosis.

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#### **P-051 Radiographic patterns of lung adenocarcinoma in Malaysia - an update**

[Norafida Bahari](#); [Liza Faisal](#)

*Universiti Putra Malaysia*

**Introduction:** Lung cancer is the most frequently diagnosed cancer in the world, and the leading cause of death from cancer. The detection and diagnosis of lung cancer usually begins with a chest radiograph, either in a symptomatic patient or in a patient undergoing a chest radiograph for an unrelated reason. The appearance of lung cancer is

variable, and can range from a subtle finding, to the dramatic, depending on location, stage at presentation, and associated findings. Radiologic manifestations of bronchogenic carcinoma include obstructive pneumonitis or atelectasis, lung nodule or mass, apical mass, cavitated mass, or nodule or mass associated with lymphadenopathy. Chest radiography is a readily available, inexpensive, and useful imaging modality in the workup of patients with non-small cell carcinoma. Therefore, chest radiography is used most often as an initial investigation. Traditionally lung adenocarcinoma recognized as peripheral mass.

**Methodology:** Over 5 years' period, all cases of biopsy proven lung adenocarcinoma were included in the study. The chest radiograph/s at presentation was reviewed. Total numbers of 50 cases were collected.

**Results:** Age distribution is as seen in other malignancies generally; more in age group more than 50y.o with median age of 56y.o + 12 SD. Unilateral distribution is more common accounted for 86% of cases with no significant predominant side or zones. Solitary pulmonary mass is still the most common radiographic presentation (58% of cases) followed by consolidation (20%). 24 out of 29 masses located centrally, either at hilar/perihilar region or centrally located in the lung lobe, only 1 mass occupying the entire lobe and 4 masses are located peripherally. About only 10% of the masses forms cavity. Patients who presented with nodules are mainly small nodules which scattered in the entire lung field with area of confluent of nodules seen faintly on radiographs. This confluent area proved to a small mass-lesion on CT scan with positive tissue diagnosis histopathologically.

**Conclusion:** Chest radiography remains the primary means of radiographic assessment of lung carcinoma. The lung adenocarcinoma is no longer predominantly peripherally located. Patient with any suspicious radiographic presentations which is persistent or worsening are require CT scan of thorax and tissue diagnosis for further evaluation.

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#### **P-052 Multi-centre analysis of incidental findings on low resolution CT attenuation correction (CTAC) images**

[Joanne Sil](#); [Richard Lawson](#); [Tom Kane](#); [Mark Elias](#); [Andrea Howes](#); [James Birchall](#); [Peter Hogg](#)

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**Objectives:** To review new incidental findings detected on low resolution CT attenuation correction (CTAC) images acquired during SPECT-CT myocardial perfusion imaging (MPI). To determine whether the CTAC images had diagnostic value and warrant reporting.

**Methods:** A multi-centre study was performed in four UK Nuclear Medicine departments. CTAC images acquired as part of MPI performed using SPECT were evaluated to identify incidental findings. New findings considered to be clinically significant at the time of the radiologist written report were evaluated further. Positive predictive value (PPV) was determined at the time of definitive diagnosis.

**Results:** Of 1819 patients studied, 497 (27%) had a positive CTAC finding. 51 (2.8%) patients had findings that were clinically significant at the time of report and had not been previously diagnosed. Only 4 (0.2%) of these were potentially detrimental to patient outcome.

**Conclusion:** One centre using older equipment had a PPV of 0% and the study suggests that these CTAC images should not be reported. Two centres with more modern equipment had low PPVs of 0% and 6% respectively and further research is suggested prior to drawing a conclusion. The centre with best quality CT had a PPV of 67% and the study suggests that CTAC images from this equipment should be reported.

**Advances in knowledge:** Current literature relating to the prevalence and significance of incidental findings on CTAC images is limited. This study demonstrates that the benefit of reporting these images depends on the type of equipment used.

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#### **P-053 An audit of use of Computed Tomography Pulmonary Angiography (CTPA) in the diagnosis of suspected pulmonary embolism**

[Safia Rehman](#); [Stewart Mercer](#); [Enas Elamin](#); [Kunal Gupta](#)

*George Eliot Hospital NHS Trust*

CTPA is imaging modality of choice for PE diagnosis. This audit aims to check that clinical probability is assessed and documented for all suspected cases, D-dimer is used appropriately, clinical probability and D-dimer are stated on all requests and diagnostic yield of CTPA for PE is comparable to that expected (25%) as per BTS and NICE guidelines. A

retrospective study of 25 patients over one month is done. Our findings are that clinical probability is fully assessed and documented in only 3 cases, D-dimer is done in 15 including 2 high-risk, D-dimer result is stated on only 10. Clinical probability is clearly stated on only one request. CTPA results are positive for PE in 2 cases, both high risk. D-dimer is done in both cases. We recommend that clinical probability should be assessed, documented and stated on all requests. D-dimer should not be done in high risk cases. Clinical proformas should be introduced and used to make sure that there is compliance. Re-audit every year

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**P-054 Computed Tomography (CT) attenuation values of pleural fluid: Can it be used to differentiate between exudate and transudate?**

[Naveed Altaf](#); [Sze Mun Mak](#); [Aninda Saha](#); [Arivalagan Bapusamy](#); [Richard Hartley](#)

*The James Cook University Hospital, South Tees Hospitals NHS Foundation Trust; Chelsea and Westminster Hospital NHS Foundation Trust*

**Objectives:** To assess the utility of computed tomography (CT) in characterization of pleural effusion based on attenuation values.

**Methods:** We retrospectively analysed 107 pleural effusions of 107 patients. Mean age 69.9 years (range 4-93). 70 male and 37 female. All patients had diagnostic pleural tap and CT scan within 1 week of each other. Pleural fluid biochemistry results were analysed to classify effusion as transudate or exudate by using light's criteria. The mean Hounsfield unit (HU) of effusion was determined by a region of interest on the three slices with the greatest antero posterior diameter. Freeform cursor was used to determine the mean value. The association between mean Hounsfield unit and pleural proteins level was analysed by using Pearson's correlation test.

**Results:** 81 of the 105 effusions were exudate and 26 were transudate. The mean attenuation of exudate was 13.01 HU and standard deviation 3.9 HU. It was higher than transudate (9 HU/ SD 3.4). There was no positive relationship between pleural protein and mean Hounsfield units ( $r = 0.17$ ). There was overlap between exudate and transudate effusion in 10 – 15 HU range (57/107 – 53%), limiting the accuracy of attenuation values in differentiation between two.

**Conclusion:** Recently published study has shown lower attenuation values for exudates. Our study has demonstrated that attenuation value of exudate is higher than transudate and there is no co- relation between pleural protein levels and Hounsfield units.

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**P-055 Incidental cardiac findings on CT thorax**

[Madhusudan Paravasthu](#); [Dhivya Murthy Paravasthu](#); [John Curtis](#); [Erica Thwaite](#)

*Aintree University Hospital NHS Foundation Trust*

**Aim:** To present a series of incidental significant cardiac findings on CT of the thorax.

**Content:** A pictorial review of incidental significant cardiac findings identified on CT of thorax including atrial myxoma, myocardial infarction, pericardial disease, left atrial and LV thrombi, Septal defects, valve vegetation, anomalous origins of coronary artery etc with their respective multimodality imaging features.

**Relevance:** Cardiac abnormalities can be potentially missed on routine CT thorax as the examination is not routinely geared for the assessment of heart. Nevertheless it is imperative to be aware of these abnormalities which can be present incidentally and provide significant information towards clinical management of the patient. We present a review of such significant "incidental" findings identified on routine CT of the thorax. This is to emphasize the importance of assessing the heart and the pericardium and the coronary origins on routine CT of the chest. This review is intended to serve as an educational tool for the trainees and junior radiologists as well.

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**P-056 The influence of observer training for the detection of simulated pulmonary lesions on single computed tomography images of an anthropomorphic chest phantom: A jackknife alternative free-response receiver operating characteristic analysis**

[Carst Buissink](#); [John Thompson](#); [Marcel Voeta](#); [Audun Sanderund](#); [Larissa V. Kamping](#); [Laura Savary](#); [Misbha Mughal](#); [Cátia S. Rocha](#); [Gabrielle E. Hart](#); [Rute Parreiral](#); [Greg Martin](#); [Peter Hogg](#)

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**Purpose:** To determine the influence of both observer training in free-response methodology and simulated lesion appearances on an observer's ability to successfully localise simulated lesions within an anthropomorphic chest phantom on single computed tomography (CT) images.

**Materials and methods:** 34 undergraduate radiography students, attending an ERASMUS intensive programme, analysed 46 (31 abnormal containing 1-3 lesions, 15 normal) low-resolution CT images produced primarily for attenuation correction (AC) by two single photon emission computed tomography/computed tomography (SPECT/CT) systems. The evaluation was completed under two conditions, pre- and post-training, with a six-week wash out period between evaluations. Lesions were localised under the free-response receiver operating characteristic (FROC) paradigm and each evaluation was analysed separately using jackknife alternative FROC (JAFROC) analysis.

**Results:** JAFROC analysis revealed a statistically significant difference in lesion detection performance between the two sets of low-resolution CT images in both evaluations (pre-training,  $F(1,506) = 25.2$ ,  $p < 0.001$ ; post-training,  $F(1,1435) = 32.6$ ,  $p < 0.001$ ). In addition to offering a slight increase in statistical power, the figure-of-merit ( $q$ ) for all treatments was increased from the pre-training evaluation (0.684 (0.573,0.796) and 0.437 (0.334,0.540)) to the post training evaluation (0.784 (0.694,0.875) and 0.560 (0.464,0.655)). The incorrect localisation fraction was also reduced post-training (0.128) compared to pre-training (0.282).

**Conclusions:** Focussed training of lesion appearances and FROC methodology has a significant impact on a naïve observer's ability to localise simulated lesions on CT images produced with an anthropomorphic chest phantom.

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**P-057 Development and validation of a psychometric scale for assessing PA chest image quality: A pilot study**  
Hussein Mraity; Andrew England; Ifrah Akhtar; Aisha Aslam; René de Lange; [Hafsa Momoniati](#); Solange Nicoulaz; Ana Isabel Ribeiro; Sabah Mazhir; Peter Hogg

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**Purpose:** To develop and validate a psychometric scale for assessing image quality for chest radiographs.

**Methods:** A review of the literature was undertaken to identify items which could be used to evaluate image quality perception. A draft scale was then created and presented to a focus group (student and qualified radiographers). Within the focus group the draft scale was discussed and modified accordingly. Next, a series of seven postero-anterior chest images were generated using a phantom across a range of image qualities. Image quality was initially confirmed using signal-to-noise ratio (SNR) and group consensus. Participants were invited to independently score each of the images using the modified image quality scale. Bandura's theory was used to guide scale development. Cronbach alpha was used to test interval reliability.

**Results:** An image quality scale of 22-items was created. Forty participants used the scale to grade image quality on each of the seven images (SNR 17.2 to 36.5). Aggregated mean image score increased with increasing SNR from 42.1 to 87.7 ( $r=0.98$ ,  $P<0.001$ ). For each of the 22 individual scale items there was clear differentiation of low, mid and high-quality images. Cronbach alpha coefficient of  $>0.7$  was obtained across each of the seven images.

**Conclusion:** This study represents the first development of a chest image quality scale based on Bandura's theory. There was excellent correlation between the image quality scores derived using the scale and the SNR and group consensus. This pilot study will be followed by more detailed scale item and factor analysis.

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**P-058 We refer: An audit of in-house radiology referral to ensure patients receive CT imaging for suspected bronchial neoplasm in a timely fashion**

[James Chambers](#); [Jonathan Wide](#)

*St Helens and Knowsley Teaching Hospitals NHS Trust*

**Aims:** 1) To ensure patients with radiological signs of bronchial neoplasm receive CT imaging of the thorax within two weeks.

2) to assess the positive-predictive value of our departments coding for suspected bronchial neoplasm.

**Relevance:** Lung malignancy is the leading cause of cancer death in the UK. Government standards have been set to ensure that patients with diagnosed cancer receive treatment within 31 days from decision to treat or the earliest clinically appropriate date. CT imaging provides vital information used to determine definitive treatment of lung cancer and thus early imaging can reduce delays in patient care.

**Content:** We describe the role of in-house referral for CT imaging in suspected bronchial neoplasm, the processes involved in this and the associated patient benefits. We use our audit findings to discuss waiting times for such imaging and the ideal positive-predictive value for detecting bronchial neoplasm on plain film, providing both positive and negative examples.

**Outcomes:** 141 patients were identified retrospectively over a nine-month period. 1) 75% of all patients referred for CT imaging were scanned within two weeks, 22% were scanned within 3 weeks and 3% took over 3 weeks to scan. 2) 53% of chest radiographs coded as suspected bronchial neoplasm were positive for lung malignancy.

**Conclusion:** The vast majority of patients with suspected bronchial neoplasm on plain film received CT imaging within two weeks. However, our audit indicates there is still room for improvement. Further research is needed to determine the ideal positive-predictive value in this scenario.

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#### P-059 Pneumothorax... is the expiratory CXR needed?

[Adil Mahmoud](#); [Colin Noble](#)

*Glasgow Royal Infirmary, NHS Greater Glasgow and Clyde*

**Aim:** The aim was to assess the adequacy of the inspiratory chest radiograph (CXR) to exclude pneumothorax.

**Method:** Retrospective data collection was performed. The data sources were Clinical Portal and PACS. Patient included were those who referred for CXR to exclude pneumothorax (inspiratory and expiratory CXR) in Glasgow Royal Infirmary (GRI) for the period June - July 2013. Then all the included data were analysed and put in tables and graphics.

**Results:** Total number of included cases was 157 with age distribution was 14 to 92 year. As expected, the age distribution was skewed to the younger age groups (41 patients were in their twenties). Majority of the cases were male (63 out of 157). 88.5% of the patients were referred from Accident and Emergency department of GRI, while the others were from Acute Assessment Unit. Only 9 cases of pneumothoraces were diagnosed on radiographs. This equates to an incidence of 6%. 8 out of 9 were easily detected solely on the inspiratory CXR. The inspiratory CXR of the last case was independently reviewed by 2 Consultant Respiratory Radiologists in our department. The apical pneumothorax was not detected on the inspiratory film but was subsequently identified by both on the expiratory film.

**Conclusion:** 1 out of 9 pneumothoraces was not detected on inspiratory CXR alone, which equates 11%. This means we perform (157 X 2) CXR to confirm 1 pneumothorax.

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#### P-060 Pictorial review of pleural "masses"

[Madhusudan Paravasthu](#); [Dhivya Murthy Paravasthu](#); [Erica Thwaite](#); [John Curtis](#)

*Aintree University Hospital NHS Foundation Trust*

**Aim:** We aim to present a pictorial review of pleural mass lesions both benign and malignant, with conditions that mimic pleural masses.

**Content:** A pictorial review of a variety of cases of pleural masses is presented. Imaging appearances on different modalities is discussed for both benign and malignant pleural masses such as pleural fibroma, pleural plaques, mesothelioma, lipoma, pleural metastasis. We also discuss entities which mimic pleural masses such as neurofibromas, vascular anomaly, rib fracture etc.

**Impact/relevance:** Pleural masses are not uncommon and their imaging findings can be subtle on plain radiography and can often be missed or misinterpreted. A review of all pleural masses and their imaging appearances on plain radiography, CT, MRI is presented to provide a summary of these entities. Certain imaging features can confidently differentiate benign from malignant entities and awareness of these cannot be overemphasized. This review hopefully would serve as an educational tool and a quick revision of pleural based mass lesions for the trainees.

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#### P-061 Introducing radiographer chest x-ray reporting at a cancer hospital

[Claire Barker](#); [Susan Todd](#); [Susan Bird](#); [Fenella Wong](#)

*The Christie NHS Foundation Trust*

The majority of radiographs performed at our cancer hospital are adult chest x-rays. In line with best practice to formally report radiographs in a timely manner, we began training two radiographers to report chest radiographs in 2010. At that time, no other cancer hospital had radiographers reporting chest x-rays.

We present our experiences of formal training of reporting radiographers at a specialist cancer centre. Following completion of the Postgraduate Certificate in Clinical Reporting (Adult Chest), we implemented a further period of dedicated oncological training to ensure our training was specific to our patient group and to meet local clinical governance requirements.

We discuss the impact of chest x-ray reporting radiographers on the radiology department as a whole and as part of the reporting team, including a review of discrepancy audit findings.

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#### P-062 Radiologically guided percutaneous lung biopsies: Retrospective evaluation of diagnostic yield and complication rate

[Mohamed Elshafi](#); [Mohamed Ahmed](#)

*Galway University Hospital, Ireland*

**Introduction:** Radiologically guided lung biopsy is a relatively safe procedure to obtain tissue samples to aid the histological diagnosis of suspicious lung lesions.

**Objectives:** To determine the sensitivity and complication rate of radiologically guided percutaneous lung biopsies in our institution and compare those with standards set by the British Thoracic Society (BTS).

**Methods:** This is a cross-sectional study. All patients who had radiologically guided lung biopsy in a period of 10 months were included. Primary outcome was the ability to reach a histological diagnosis. Secondary outcome was the complication rate.

**Results:** 94 radiologically guided lung biopsies were performed. The procedure was done under CT guidance in 84 patients (89.4%), Fluoroscopy in 7 patients (7.4%) and ultrasound in 3 patients (3.2%). Core biopsies were taken in 90 (95.7%) procedures using co-axial needles while 4 patients had fine needle aspirations. The overall diagnostic rate for benign and malignant causes was 88.3%. Malignancy was diagnosed on 78 biopsies (83%). Sensitivity for detection of malignancy for lesions >2 cm. in size was (94.3%). False negative rate was 2.1%. The procedure was complicated by pneumothorax in 26 patients (27.7%). Only 5 (5.3%) patients required chest tube insertion. Other encountered complications were haemoptysis and parenchymal hemorrhage which occurred in 13 patients (13.8%). There was no procedure-related mortality in this group.

**Discussion:** We achieved higher diagnostic rate than the level set by the BTS but pneumothorax rate is slightly higher. This could be because the majority of our samples were taken using large bore cutting needles.

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### **P-063 Effects of tube potential and scatter rejection on image quality and effective dose in digital chest X-ray examination: An anthropomorphic phantom study**

[Daniel Shaw](#); [Stephen Rimmer](#); [Ian Crawshaw](#)

*The Christie NHS Foundation Trust; Leeds Teaching Hospitals NHS Trust; York Teaching Hospitals NHS Foundation Trust*

**Objectives:** The purpose of this study was to investigate the effects of tube potential and scatter rejection techniques on image quality of digital posteroanterior (PA) chest radiographs.

**Methods:** An anthropomorphic phantom was imaged using a range of tube potentials (81 to 125 kVp) without scatter rejection, with an anti-scatter grid, and using a 10cm air gap. Images were anonymised and randomised before being evaluated using a visual graded analysis (VGA) method.

**Results:** The effects of tube potential on image quality were found to be negligible ( $p > 0.63$ ) for the flat panel detector (FPD). Decreased image quality ( $p = 0.031$ ) was noted for 125 kVp relative to 109 kVp, though no difference was noted for any of the other potentials ( $p > 0.398$ ) for computed radiography (CR). Both scatter rejection techniques improved image quality ( $p < 0.01$ ). For FPD imaging the anti-scatter grid offered slightly improved image quality relative to the air gap ( $p = 0.038$ ) but this was not seen for CR ( $p = 0.404$ ).

**Conclusions:** For FPD chest imaging of the anthropomorphic phantom there was no dependence of image quality on tube potential. Scatter rejection improved image quality, with the anti-scatter grid giving greater improvements than an air-gap, but at the expense of increased effective dose.

CR imaging of the chest phantom demonstrated negligible dependence on tube potential except at 125 kVp. Scatter rejection improved image quality, but with no difference found between techniques. The air-gap resulted in a smaller increase in effective dose than the anti-scatter grid and would be the preferred scatter rejection technique.

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**P-064 Myocardial perfusion scintigraphy (MPS) referral indications: A re-audit of a regional service in South Wales**

[Ali Ben-Mussa](#); [Martyn Heatley](#)

*Abertawe Bro Morgannwg University Health Board*

**Background:** In 2011, the National Institute for Health and Care Excellence (NICE) revised its myocardial perfusion scintigraphy (MPS) guideline TA73 following earlier updates to its coronary artery disease (CAD) management guidelines CG95 and CG126. The revision expanded the role of MPS in the diagnosis and management of CAD.

**Aims:** This re-audit evaluates our service compliance with NICE and other guideline indications published in the United Kingdom, United States and Europe. Moreover, It ensures compliance with the ionising radiation medical exposure regulations 2000 IR(ME)R.

**Methods:** Convenient sampling of 70 recently booked referrals for the procedure. CAD indications for MPS were acquired from the updated NICE guidelines TA73, CG95 and CG126. Additional MPS referral indications were obtained from latest guidelines published by the British Nuclear Medicine Society (BNMS), the Society of Nuclear Medicine and Molecular imaging (TSNM), the joint American College of Cardiology Foundation and American Society of Nuclear Cardiology (ACCF/ASNC), and the European Society of Cardiology (ESC).

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**P-065 Correlation of coronary artery calcification with non alcoholic fatty liver disease**

[Sze Mun Mak](#); [Sophie Stevens](#); [Kesavans Kandiah](#)

*Chelsea and Westminster Hospital NHS Foundation Trust*

Recent studies have suggested that coronary artery calcification, an independent prognostic indicator for coronary heart disease, is associated with non alcoholic fatty liver disease. We retrospectively compare the coronary calcium score, with the ct attenuation value of the liver on non contrast ct, to assess whether there is a linkage in our local population.

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**P-066 Pictorial review of pre TAVI CT aortogram: How, what and why**

[Sze Mun Mak](#); [Simon Padley](#)

*Chelsea and Westminster Hospital NHS Foundation Trust; Royal Brompton Hospital*

Aortic stenosis occurs when the aortic valve is narrowed, reducing the blood flow out of the heart. Surgical aortic valve replacement (SAVR) may not be suitable for high risk patients, and transcatheter aortic valve implantation (TAVI) maybe a safer alternative. Unlike the former, direct visualization of the valve and annulus is lacking during the TAVI procedure. Imaging is hence pivotal to allow for suitable valve sizing. This is vital for some patients, as no suitable valve maybe available. Echocardiographic sizing is almost completely replaced by contrast enhanced CT, which has the advantage of also identify the most suitable peripheral access. It is important to understand the procedure, complications and imaging methods. We present a pictorial review of the anatomy of the aortic root, the measurements we take, and why they matter.

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**P-067 Clinical validation of Dual Energy CT (DECT) for coronary and valve imaging in patients undergoing Trans-catheter Aortic Valve Implantation (TAVI)**

[Chris Pavitt](#); [Rachel Mahoney](#); [Dan Gordon](#); [B Park](#); [Mike Rubens](#); [Ed Nicol](#); [Simon Padley](#)

*Royal Brompton and Harefield NHS Trust; Royal Marsden Hospital*

**Introduction:** Dual Energy CT (DECT) Virtual Non-Contrast (VNC) reconstructions may negate the requirement for traditional non-enhanced scans. We assessed the clinical validity of VNC reconstructions to perform coronary artery calcium (CACs) and aortic valve calcium scoring (AVCS) from cardiovascular CT scans (CCT) in a clinical cohort of patients undergoing trans-catheter aortic valve implantation (TAVI).

**Methods:** 24 consecutive patients undergoing TAVI had a 3-step CCT acquisition: 1) traditional CACS; 2) DECT coronary angiogram (CTCA); and 3) DE whole-body angiogram. Linear regression was used to model calcium scores from VNC reconstructed images with traditional scores to derive a conversion factor that was applied to all VNC-derived scores. CT Dose Index (CTDIvol) was used to derive effective radiation dose that was compared to a control group undergoing standard, non-DE TAVI acquisition. Bland-Altman analysis and the weighted kappa-statistic were used to assess inter-method agreement for absolute score and correct MESA-risk centile placement, respectively.



**Results:** Both CACS and AVCS from VNC reconstructions correlated well with traditional scores ( $r=0.94$ ;  $p<0.0001$  and  $r=0.69$ ;  $p=0.0005$ , respectively) with excellent risk stratification ( $k=0.99$ ). The radiation dose for the DECT protocol was 9% higher than standard acquisition even without a dedicated CACS (19.2 vs. 17.6mSv).

**Conclusions:** CACS and AVCS can be accurately quantified on DECT VNC reconstructions and used to risk stratify patients. However, this is at the expense of a higher radiation burden that is driven by the technical limitation of having to acquire DE CTCA using a retrospective protocol to generate images of sufficient quality for use in clinical practice.

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#### **P-068 Modern cardiac devices: Strictly on a lead to know basis**

[Katherine Klimczak](#); [Andy Beale](#); [Paul Foley](#)

*Great Western Hospitals NHS Foundation Trust*

**Background:** The introduction of novel implantable cardiac devices and recent developments in the use of other devices has resulted in a new challenge for the Radiologist. Appreciation of their normal appearance and varying lead positions on plain film is imperative when issuing a report. In the last decade there has been a huge increase in the number of patients with cardiac devices in whom radiological identification of misplaced leads is crucial to their care.

**Content:** This pictorial review focuses on the use of devices encountered at our institution with an emphasis on more modern devices and their correct radiological appearance and lead position. Examples of incorrect placement will be given with the subsequent complications.

**Relevance/impact/discussion:** In 2007, NICE approved cardiac resynchronisation therapy (CRT). Since then implant rates have increased on a yearly basis. New developments include multi-polar leads and sonar right atrial electrodes. The positioning of the left ventricular lead is crucial in CRT, and in view of the 10% left ventricular lead displacement rate, it is vital to correctly identify the position of the left ventricular leads to avoid future complication.

**Conclusion:** All Radiologists are responsible for reporting CXRs and therefore knowledge of the new devices that are used and their varying lead positions, along with their potential complications is essential for a meaningful report.

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#### **P-069 Sarcoidosis: A pictorial review of the cardiothoracic imaging findings**

[Franchesca Wotton](#); [Tinu Purayil](#); [Vikram Raju](#); [Richard Riordan](#)

*Peninsula Radiology Academy, Plymouth*

**Aims/objectives:** Sarcoidosis is a multisystemic, non-caseating, granulomatous disease of unknown aetiology which can affect any tissue throughout the body. Presentation is variable and dependent upon which and to what extent an organ is affected, with pulmonary involvement being the most common (90% of cases). Cardiac involvement is less common but is under-diagnosed, occurring in 25-50% at post mortem. Clinically, cardiac sarcoidosis is often asymptomatic, causing symptoms in around 5% of cases such as heart failure and life threatening conduction abnormalities. The aim of this pictorial review is to demonstrate the range of pulmonary and cardiac imaging findings and manifestations of sarcoidosis.

**Content:** This is a pictorial review of pulmonary and cardiac manifestations of sarcoidosis. There will be imaging examples to illustrate the spectrum of cardiopulmonary sarcoidosis including the diagnosis, staging and assessment of complications. For pulmonary sarcoidosis, examples will demonstrate the typical and atypical pulmonary findings across modalities such as chest radiograph and CT, and across the stages (0-IV). For cardiac sarcoidosis, examples will include the spectrum of common cardiac MR features of myocardial involvement.

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### P-070 Applied physics of cardiac MRI - what, why and how?

[Madhusudan Paravasthu](#); [Dhivya Murthy Paravasthu](#); [Neena Kalsy](#); [Erica Thwaite](#)

*Aintree University Hospital NHS Foundation Trust*

**Aim:** We aim to simplify and summarise the basic principles and applied aspects of physics behind cardiovascular MR imaging.

**Content:** The basic principles of cardiac MRI is discussed, in particular the basis of image formation, the need for cardiac synchronization, commonly used sequences and their purpose in clinical problem solving. Images of examples of the sequences with relevant pathology will also be described.

**Impact/relevance:** MRI physics is complex and cardiovascular MRI is a speciality in itself. The complexity of the underlying imaging principles makes this elusive to the trainees and junior radiologists and is often poorly understood. This exhibit is intended to provide a summary of the basics of cardiac MRI, the purpose of the commonly used sequences, demonstrate how it is different from MR imaging of other body parts and illustrate the utility of the imaging with examples of pathology and artefacts. We hope this would serve as an invaluable educational tool and provide a good grasp of applied physics of CMR.

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### P-071 Cardiac CT dose and Agaston calcium score in male and female patient cohort group

[Shahabaz Patil](#); [Sri Iyengar](#)

*Birmingham City Hospital*

Cardiac CT has come a long way and has become the first line of test for most radiologist and cardiac physicians. There are many new advances in the recent past in regard to maximizing dose reduction of cardiac CT. Our aim was to look at the cardiac radiation dose and calcium score.

**Methods and results:** A single center retrospective study of cardiac CT over a period of 6 months from April to September 2013. All the scans have been performed on 256-slice scanner. A total of 88 patients with 36 females and 52 males. Prospective gating was done in all our patients. Beta-blocker was used in intravenous form. The median KV and mA was 100 and 330 respectively. Coronary calcium was graded as per the Agaston score.

	Male	Female
<b>Age</b>	24-77(mean 50)	34-74 (mean 51)
<b>BMI</b>	20-34.9 (mean 27)	20-51 (mean 26)
<b>Baseline heart rate</b>	46-107 (mean 67)	60-126 (mean 65)
<b>Beta blocker</b>	0-50 mg (mean 13)	0-65 mg (mean 16)
<b>Acquisition heart rate</b>	46-75 (mean 53)	45-70 (mean 55)
<b>Agaston score</b>	0-346 (mean 73)	0-315 (mean 9.5)
<b>Radiation dose DLP</b>	27-376mGycm  (Mean 162 mGycm)	42-393 mGycm  (Mean 195 mGycm)

**Conclusion:** The p value is 0.11 for the cardiac CT radiation dose among male versus female patients, stating there is no significant difference between the two data sets. But there is significant difference in the coronary calcium score (p value 0.035)

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### P-072 Cardiac MRI: Enhancement patterns demystified

[Tinu Puthen Purayil](#); [Franchesca Wotton](#); [Vikram Raju](#); [Ajay Sahu](#)

*Plymouth Hospitals NHS Trust*

**Aims:** To demonstrate different Cardiac MRI Gadolinium enhancement patterns and its significance.

**Content:** Cardiac MRI is a non-invasive imaging tool used to look at cardiac morphology, function, blood flow, and myocardial perfusion in a single setting. Post gadolinium series are part of these studies and gives valuable information for differentiating various pathologies. Delayed myocardial enhancement is not specific for myocardial infarction and can occur in a variety of other disorders, such as inflammatory or infectious diseases of the myocardium, cardiomyopathy, cardiac neoplasms, and congenital or genetic cardiac pathologic conditions.

**Discussion:** Hyperintense areas will appear in the myocardium where necrosis, scar, fibrosis, or infections occur because they retain the contrast agent longer than healthy myocardium. Hyper-enhancement patterns can be found

with different types of pathology. Ischemic heart disease typically manifests as a sub-endocardial region of hyper-enhancement, which if extensive, may become transmural.

But the enhancement patterns in acute vs. chronic myocardial infarction, myocarditis, sarcoidosis, hypertrophic and dilated cardiomyopathy, vasculitis, cardiac tumors, arrhythmogenic right ventricle and in myotonic dystrophies are all different. We believe this poster with representative images will help Radiologist to recognise common and uncommon patterns of cardiac gadolinium enhancement.

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**P-073 Incidental pulmonary emboli (PE) on non CTPA (CT pulmonary angiogram) computed tomography (CT) scans: The signs that work and the confusers to recognise**

[Sarah Iddles](#); [Alison Kilburn](#); [Bernadette Carrington](#)

*The Christie NHS Foundation Trust*

**Aims and objectives:** To review the pathophysiology of PE, CT (computed tomography) pulmonary vascular anatomy, the CT signs of pulmonary emboli and potential mimics when screening non CTPA scans for incidental pulmonary emboli. To improve the identification of PE, (which is found in 4 to 6% of routine CT scans) and increase reporting accuracy.

**Content:** Pathophysiology of pulmonary embolism.

Pulmonary vascular anatomy.

CT signs of pulmonary emboli and their identification on routine, non CTPA examinations.

CT mimics of pulmonary emboli.

**Relevance/impact:** An educational resource to inform both radiographers and radiologists in detecting PE and help differentiate PE from other pathology.

**Outcomes:** This exhibit will help increase awareness of incidental PE and improve confidence in diagnosis by reviewing relevant anatomy and CT signs. There will be heightened awareness of the mimics of pulmonary emboli and how to differentiate between the two. Recognition of incidental PE is an important component of improving patient outcomes from venous thromboembolic disease in accordance with national aims and guidelines.

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**P-074 Comparison and predictive significance of pre test probability and calcium score in computed tomography coronary angiography**

[Robert Parry](#); [Clare Hammond](#); [Jonathan Wide](#); [Nabil Mohsin](#); [Donagh Whyte](#)

*St Helens and Knowsley Teaching Hospitals NHS Trust*

**Aim:** A retrospective analysis of predicting the likelihood of coronary artery disease (CAD) based on a combination of the pre test probability (PTP) and CT calcium score (CTCS).

**Method:** NICE guidelines suggest patients with a PTP of below 30% have CTCS as a first investigation PTP between 30 and 60% have functional testing by stress echo or myocardial perfusion imaging and over 60% PTP go straight to invasive coronary angiography. To meet 3 weeks targets we used CTCS for patients in all PTP categories.

Patients with a CTCS of 1 or greater proceeded to CT coronary angiography (CTCA).

**Results:** 273 patients had CTCA post CTCS, 169 had a PTP of below 30%, 99 fell between 30 and 60% and 5 had a PTP of over 60%. We evaluated all the patients in the PTP under 30% to correlate their CACS with findings at CTCA. We found that no patient with a CACS below 13 and a PTP below 30% had any CAD.

**Conclusion:** If our ongoing study bears out these results then in our population demographics patients in the PTP group below 30% who have a CACS below 10 can be reassured without the need for CTCA. This reduces the radiation burden allowing CT resources to be directed elsewhere. A CTCS of 0 in isolation does not exclude significant CAD.

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#### P-075 Constrictive pericarditis - imaging review

[Madhusudan Paravasthu](#); [Dhivya Murthy Paravasthu](#); [John Curtis](#); [Aleem Khand](#); [Erica Thwaite](#)

*Aintree University Hospital NHS Foundation Trust*

**Aim:** We aim to review all the imaging findings of constrictive pericarditis in various modalities.

**Content:** The imaging features of constrictive pericarditis is reviewed in all modalities including plain radiography, CT, MRI.

**Relevance:** Constrictive pericarditis is a clinical entity and is poorly understood by clinical radiologists as imaging features are only a supplement to the presenting signs. A variety of imaging features can help in making diagnosis of constrictive pericarditis or indicate the possibility of the diagnosis in the unsuspected cases. The review of imaging features on plain radiography, CT and MRI is intended to help the radiologists and trainees to reinforce their knowledge and to stress the importance of assessing the pericardium and heart routinely in reporting cross sectional imaging.

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#### P-076 Morbidity and mortality associated with contrast venography proven distal deep vein thrombosis - a cause for concern?

[Gordon Cowell](#); [Stephanie King](#); [John Reid](#); [Edwin van Beek](#); [John Murchison](#)

*Victoria Infirmary, NHS Greater Glasgow and Clyde; Royal Infirmary of Edinburgh; Borders General Hospital, Melrose*

**Aims:** To assess the effect of the presence and locality of deep vein thrombosis (DVT) on mortality and morbidity in a cohort of symptomatic patients investigated by contrast venography, particularly with a view to prevalence of post-thrombotic syndrome (PTS).

**Methods:** By retrospective case note evaluation and examination of mortality data, 347 patients with venography proven DVT were matched with venography negative controls. Long term complications including recurrent thromboembolic events and post-thrombotic syndrome were recorded, as well as mortality data.

**Results:** Of the DVT proven patients, 179 (51.6%) were deceased, with 8.5% a consequence of DVT or pulmonary embolism (PE). 23.3% of patients with proximal DVT suffered recurrent DVT as opposed to 12.6% in those with isolated below knee DVT. The 5 year survival of the below knee group was 64%, whilst the above knee survival was 74%. The relative risk for developing definite PTS was 0.544 for below knee DVT versus the above knee group.

**Conclusion:** As expected, morbidity is greater in the form of PTS in those patients with proximal DVT, however a smaller but significant proportion of patients with distal DVT also develop PTS, demonstrating the need for vigilance for this condition in order to correctly manage patients.

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### Clinical: Uroradiology; gynaecology; obstetrics

#### P-077 An audit of ultrasound scanning using the Foetal Anomaly Screening Programme (FASP) Image Assessment Tool 2012

[Penelope Bell](#); [Emily Weiner](#)

*University Campus Suffolk; Royal London Hospital*

**Introduction:** Accurate measurement of the foetal ultrasound components Nuchal Translucency (NT) and Crown Rump Length (CRL) are of great importance. Precise dating is required using CRL so that NT thickness can be compared to a reference range. Increased NT is linked to the presence of Down Syndrome. An audit standard, the Foetal Anomaly Screening Programme (FASP) Image Assessment Tool 2012, sets out the required scan criteria. It was used to measure ultrasound scans performed in a busy ultrasound department before and after ultrasound in service training.

**Method:** A retrospective audit of 100 nuchal scans, pre and post-training was performed. Component parts and overall images were scored against set criteria in FASP.

**Results:** The mean for meeting the audit standard across the 6 CRL criteria was 80% and, across the 4 NT criteria 82%, before training. After training the mean for CRL was 84% and NT 89%.

**Conclusion:** The percentage meeting the audit standard improved after training demonstrating the effectiveness of training. The two components which were difficult to scan correctly may warrant a discussion on their importance.

However, audits are judged against complete compliance therefore further improvement is needed to assure that all scans are 100% correct according to FASP. A re audit is recommended following further training.

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#### **P-078 Pearls and pitfalls of female pelvic MRI: A whistle-stop tour from a district general hospital perspective**

[Georgina Devenish](#); [Gareth R. Tudor](#); [W.T Young](#); [Sian Phillips](#); [Aisling Butler](#)

*Abertawe Bro Morgannwg University Health Board*

**Aims and content:** To provide an educational tool for assessment of the female pelvis with MRI through a comprehensive pictorial review and highlight cases with potential for misinterpretation.

**Relevance:** The requirement for pelvic MRI has dramatically increased in recent years due to the routine staging of most gynaecological malignancies but also the assessment of candidates for uterine artery embolisation (UAE). Pressures on tertiary centres and the ethos of patient focused care with local imaging where possible, have seen a perceived “specialised” service become the realm of the District General Hospital.

Accurate pre-treatment diagnosis is essential. In those referred for UAE, appropriate steps should be taken to ensure bleeding irregularities are not due to pathology other than fibroids. MRI may alter management in 20% of those referred for UAE.

**Outcomes and discussion:** Knowledge of patterns of disease is key to accurate pre-operative staging in malignancy, but an understanding of anatomical variants and benign processes is imperative in imaging interpretation. The female reproductive organs are frequently imaged incidentally when staging other neoplasms or during musculoskeletal MRI and thus regardless of radiological specialty, an awareness of these structures should be considered a core skill.

We perform MRI as a standard staging tool in all gynaecological cancers other than ovarian. We have an established UAE service with all candidates undergoing pre and post interventional MRI and we are increasingly imaging for subfertility. Through our wealthy imaging bank we take you on an educational journey through the female pelvis, emphasising clinical relevance and lessons learned.

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#### **P-079 Unusual manifestations of endometriosis and their imaging appearances hiding?**

[Dhivya Murthy Paravasthu](#); [Madhusudan Paravasthu](#); [Jayan Nair](#); [Ashok Katti](#)

*Aintree University Hospital NHS Foundation Trust*

**Aim:** To present review of the common and uncommon presentations of endometriosis and their imaging appearances on various modalities.

**Content:** We present a review of cases of endometriosis with common and unusual presentations and their imaging findings on US, CT and MRI. The unusual presentations include scar endometriosis, bowel serosal endometriosis, peritoneal endometriosis etc.

**Relevance/impact:** Endometriosis is commonly diagnosed and is known to have unusual presentations and the knowledge of this is important for general radiologists commonly involved in reporting cross sectional imaging. Unusual manifestations of endometriosis can include involvement of bowel, scar tissue, peritoneum and other solid organs. Some of these may mimic pathology in other organs/sites involved or are identified incidentally on imaging. This review is aimed at summarizing the unusual sites of endometriosis and would serve as an invaluable educational tool in differentiating from other pathologies.

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#### **P-080 Beware the mucinous ovarian tumour - ovarian, colonic or pseudomyxoma?**

[David Little](#); [Ann Jones](#); [Andy Planner](#)

*Great Western Hospitals NHS Foundation Trust*

**Aim:** To raise awareness of the CT appearance of ovarian metastasis which are of colonic or appendiceal origin.

**Content:** We present CT images from seven patients from our institution with ovarian tumours which were initially reported as primary ovarian origin. The histology obtained from peritoneal biopsies or ovarian cystectomy demonstrated that these were mucinous and considered likely of gastrointestinal origin. In four patients a review of the CT demonstrated previously unreported colonic tumours. In a further three patients colonoscopy was normal, but two of these were subsequently diagnosed with pseudomyxoma.

**Relevance:** Many ovarian cancers present at an advanced stage with a large complex ovarian cysts, ascites and omental thickening on CT. Metastases to the ovary from colonic or ruptured appendiceal tumours often have similar



appearances. Tumour markers cannot help differentiate the primary. Patients with ovarian metastasis from colonic tumours have a poor prognosis. Patients with no colonic cause found on CT or colonoscopy should have their appendix assessed at laparoscopy to assess the presence of an appendiceal mucocoele and or pseudomyxoma peritonei which requires an extensive and radical therapeutic approach.

**Discussion:** This presentation demonstrates the importance of a multidisciplinary approach to ovarian tumours. The radiologist needs to be aware of the colon as a review area when reporting CT scans in patients with mucinous ovarian tumours. Appendiceal assessment should be mandatory if conventional investigations yield no positive result.

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**P-081 The clinical value of adding diffusion weighted imaging to standard T2 weighted sequences in the evaluation of prostate cancer with MRI**

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*University Hospital of Wales, Cardiff and Vale University Health Board*

**Introduction:** Multiparametric (diffusion weighted and contrast enhanced) MR imaging in prostate cancer is becoming more widespread. Diffusion weighted imaging (DWI) is more rapidly acquired and less technically complex than contrast enhanced imaging and hence is more widely utilised in both the tertiary centre and the district general hospital.

**Content:** We present a series of cases where DWI made a significant impact on management decisions, either increasing imaging confidence or identifying occult tumours not sampled on standard templates (which can then be targeted for biopsy). We also show the limitations of DWI in its sensitivity to artefacts and its occasional failure to identify even quite high grade tumours.

**Discussion:** DWI sequences can add significant clinical value for prostate imaging. DWI can augment information obtained from T2 weighted sequences and also add new information, particularly in the central/anterior part of the prostate gland. DWI may also correlate more closely with Gleason grade than standard T2W sequences. Also, for accurate image interpretation, knowledge of DWI pitfalls is essential.

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**P-082 Rapidly developing renal milk of calcium in a patient with myelomonocytic leukaemia**

[Anika Morjaria](#); [Gowrie S Balasubramaniam](#); [Saman Perera](#); [M K Almond](#)

*Southend University Hospital*

Milk of calcium is a viscous colloidal suspension of calcium carbonate, phosphate or oxalate, or a mixture of these compounds. It can be found in the urinary tract, gastrointestinal tract, bronchogenic and adrenal cysts. We are uncertain how milk of calcium is formed however obstruction and infection are usually key factors. We describe a rare case of rapidly developing renal milk of calcium in a patient with myelomonocytic leukaemia. The patient presented to hospital with left iliac fossa pain and worsening renal function.

Two non contrast CT scans were performed on separate admissions five weeks apart, the second scan identified dense layering of a viscous calcium compound in a dependent distribution in the renal collecting system described as renal milk of calcium. Unique to this case, this phenomenon had not been found in the first scan indicating the rapidity in which the calcium compounds can form and precipitate.

Despite previous descriptions of renal milk of calcium, there have been no apparent medical treatments found, except symptomatic management. In extreme cases urosotomies and nephrectomies have been performed with some success. Therefore renal milk of calcium should be regarded as a rare differential diagnosis in patients with apparent ureteric obstruction to avoid unnecessary treatments such as shock wave lithotripsy.

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### P-083 MR imaging of penis - what a general radiologist needs to know?

[Dhivya Murthy Paravasthu](#); [Madhusudan Paravasthu](#); [Suzanne Amin](#)

*Aintree University Hospital NHS Foundation Trust*

**Aims/objectives:** To outline the role of MRI in diagnosis of penile conditions and describe the appropriate imaging protocol and imaging features of the common pathology encountered.

**Content:** We aim to familiarise the general radiologist with a review of the normal anatomy and imaging protocols and sequences used. Also a review of common and less common pathological entities eg., cysts, penile carcinoma, TCC of urethra, peyronies disease etc in the form of a pictorial review is included with relevant imaging features.

**Relevance/impact:** Trainees and radiologists are regularly involved in reporting cross sectional imaging however as the imaging for penile pathology is performed less frequent than other parts of the body, it is important to be familiar with imaging protocols, anatomy and the common pathological entities of penis. This educational exhibit is intended to summarise the same and serve as a refresher.

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### P-084 Clinical mimics of nephrolithiasis - findings on unenhanced CT of the urinary tract

[S Vaughan](#); [WR Thomas](#); [L Wheeler](#); [Carys Jenkins](#)

*University Hospital of Wales, Cardiff and Vale University Health Board*

**Introduction:** Unenhanced CT of the urinary tract is a well established, low dose technique for the detection of renal calculi in those patients who present with the typical clinical signs and symptoms of renal colic.

**Content:** We present a pictorial review of unenhanced CT examinations performed for the detection of urinary tract calculi, which have uncovered alternative renal pathology as a mimic of nephrolithiasis, including sepsis and malignancy.

**Discussion:** With the increasing use of low dose, unenhanced CT for the exclusion of renal calculi, radiologists must be aware of alternative pathologies that can be demonstrated on these examinations. It is also important to acknowledge the limitations of the non-contrast images, and as such, it is often necessary to recall the patient for further imaging.

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### P-085 Emphysematous infections of the abdomen and pelvis on plain films, ultrasound and cross-sectional imaging: A pictorial review

[Fiona Lyall](#); [J Ricketts](#); [C Chinake](#); [Ajay Sahu](#); [C Gutteridge](#); [S Jackson](#)

*Plymouth Hospitals NHS Trust*

**Introduction:** Emphysematous Infectious conditions of the abdomen are relatively rare in non-diabetic patients and may pose a diagnostic challenge for the radiologist to look for the possible cause. Awareness of these entities and knowledge with high index of suspicion is very important as there is significant morbidity and mortality associated with these conditions.

**Aims/objectives:** The goals are to describe the epidemiology, etiopathogenesis, and clinical manifestations of common emphysematous infections of the abdomen and to provide a comprehensive review of their imaging spectrum.

**Methods:** This pictorial review focuses on the multimodality imaging spectrum of various emphysematous infections such as emphysematous pyelonephritis, emphysematous pyelitis, emphysematous cholecystitis, emphysematous cystitis, and very rare emphysematous adrenalitis. The role of imaging-guided interventions in the diagnosis and management of these conditions will be described. We emphasise that the knowledge of the pathophysiologic characteristics, common predisposing conditions, and typical imaging features associated with gas-forming infections is crucial. We will also briefly discuss the microbiology spectrum in diabetic and non-diabetic patients.

**Conclusion:** Emphysematous infections of the abdomen may present with a wide spectrum of clinical and imaging findings. Knowledge of salient imaging features of these entities and their associated complications is of utmost importance, which impacts prognosis and management. It is of paramount importance for the radiologist to raise the alarm quickly, for these conditions on the basis of plain film and escalating for cross sectional imaging by being pragmatic in their approach. These potentially life-threatening conditions require aggressive medical and often surgical management.

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### P-086 Evaluation of inguinal region hernias on CT

Apam Chiphang; Herb Imalingat; Maria Chiphang

Southport and Ormskirk NHS Trust; Wrightington, Wigan and Leigh NHS Foundation Trust

**Aim/purpose:** 1. A pictorial review of cases of direct, indirect and femoral hernias and demonstrate their anatomic differences. 2. Aims to demonstrate key anatomic structures both on illustrated drawings and on axial CT that aid in radiological diagnosis.

**Content:** 1. Pictorial review of evaluation of inguinal hernias on CT, with relevant illustrated anatomy and key radiological features that aid in distinguishing direct, indirect and femoral hernias. 2. Discuss vascular road map - a 3 step algorithm related to inferior epigastric artery and femoral vein aiding in diagnosis of inguinal hernias. To discuss pubic tubercle as an anatomical land mark and use of lateral crescent sign in diagnosis of groin hernias.

**Relevance:** Differentiation of direct inguinal hernias, indirect inguinal hernias and femoral hernias is often difficult at clinical examination and presents challenges even on diagnostic imaging.

**Conclusion:** Familiarity and through understanding of the anatomical relationships in inguinal region on axial CT is critical to the diagnosis of differentiation of the three main types of hernias in this region. Radiologists ability to differentiate direct inguinal hernia from higher risk indirect and femoral hernias aids in prompt diagnosis and appropriate management.

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### P-087 Contrast dose by patient weight in abdominal CT scanning: An evaluation of current practice

Anthony George; Mark Hamilton; Nathan Manghat

Bristol Royal Infirmary; University Hospitals Bristol NHS Foundation Trust

**Purpose:** In our institution, when a portal venous phase CT scan of the abdomen is performed, a set protocol is utilised regardless of patient size (98ml of iodinated contrast delivered at 3ml/second with the patient being scanned at 60 seconds post administration at 100 kV). This results in a wide spectrum of vascular and solid organ enhancement due to variation in patient weight. The aim of this study was to objectively assess the correlation between enhancement patterns and contrast dose by unit weight.

**Methods and materials:** 50 consecutive cases were collected prospectively. Inclusion criteria were portal venous phase scans of the abdomen (with or without chest scanning) that utilised the department's standard protocol. Hounsfield units were measured at the portal vein in the porta hepatis, the mid abdominal aorta and the splenic parenchyma. These values were plotted against contrast dose per unit weight.

**Results:** The Hounsfield units in all three areas showed strong positive correlations with contrast dose per unit weight. (Pearsons correlation coefficients: Portal vein = 0.58 aorta = 0.55 Spleen = 0.59). All of these correlations were statistically significant ( $p < 0.05$ ). In addition to this, when images with data points closest to the portal venous trend line were presented to a group of radiology consultants, there was an objective increase in the quality of the image.

**Conclusion:** This data has shown that enhancement patterns are strongly related to contrast dose by patient weight and a fixed dose strategy fails to produce consistent image quality.

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### P-088 Abdominal CT: A patient weight-based approach to contrast dose

Anthony George; Mark Hamilton; Nathan Manghat

Bristol Royal Infirmary; University Hospitals Bristol NHS Foundation Trust

**Purpose:** In a previous study, our institution has showed that utilisation of a standard contrast protocol for portal venous abdominal CT scanning (ie. 98ml of iodinated contrast delivered at 3mls/second with the patient being scanned at 60 seconds post administration at 100 kV) without consideration of patient weight, resulted in a wide spectrum of vascular and solid organ enhancement since each patient had a different contrast dose per unit weight. The present study aims to assess the effect of a patient weight-based approach to contrast dose with a view to standardise contrast dose and optimise image quality.

**Methods and materials:** 50 consecutive cases have been collected prospectively. Inclusion criteria are portal venous phase CT scans of the abdomen (with or without chest scanning) that utilise a new algorithm to calculate contrast

dose per unit weight. Hounsfield units at the portal vein in the porta hepatis, the mid abdominal aorta and the splenic parenchyma were measured and these values were correlated against patient weight.

**Results:** Results have shown a reduction in the variation of contrast enhancement with a more consistent image quality in patients with a wide range of weights.

**Conclusion:** This study shows that weight based contrast dosing can provide a more consistent image in patient populations with differing weights. This should contribute to a reduction in the percentage of suboptimal studies and possibly a saving of contrast usage.

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#### **P-089 Pictorial review of imaging appearances of portal vein pathology and available portal venous interventions**

[Dhivya Murthy Paravasthu](#); [Madhusudan Paravasthu](#); [Ramya Dandapani](#); [Jayan Nair](#); [Pradesh Kumar](#)

*Aintree University Hospital NHS Foundation Trust*

**Aim:** We aim to present a review of imaging appearances of pathology involving the portal vein and the available therapeutic options.

**Content:** We review the various portal venous pathologies in cirrhotic and non cirrhotic patients and the associated complications on a variety of imaging modalities including Ultrasound, Doppler, CT, MRI and digital subtraction angiography. We also discuss the currently available image guided interventional procedures such as portal venous pressure measurement, catheter directed thrombolysis, mechanical thrombectomy, embolisation, recanalisation, percutaneous balloon angioplasty, stent placement and transjugular intrahepatic portosystemic stent (TIPS) insertion.

**Relevance/impact:** Nearly 75% of the liver blood supply is by the portal vein and portal vein pathology can potentially contribute to major morbidity and mortality. The most common complications in cirrhotic patients is portal vein thrombosis. The manifestation of portal vein thrombosis in non cirrhotic patients is under recognised. We also review other relevant abnormalities such as portal venous gas, aneurysms, cavernous transformation, congenital porto systemic shunt, bland vs tumour thrombus and agenesis of the portal vein etc. Interventional radiology is the preferred modality in the treatment of most of these conditions. We depict this with various case illustrations.

**Summary:** Portal vein pathology and associated complications need to be recognised early for appropriate treatment. Interventional radiology continues to play a major role in the management of portal vein pathologies.

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#### **P-090 Acute drop in Haemoglobin. Cause?**

[Deepak Pai](#)

*Scunthorpe General Hospital, North Lincolnshire and Goole NHS Foundation Trust*

**Objectives:** CT pictorial presentation of various causes of sudden drop in haemoglobin levels without evidence of GI haemorrhage.

**Content:** One of the potentially life threatening presentations of patients is that of acute drop in haemoglobin levels with not much clue in the form of per rectal bleeding, melena, haematemesis or history of trauma. Immediate identification of the cause for the same is very important as it can be treated surgically or by embolisation of bleeding vessels by the interventional radiologists or vascular surgeons.

We would like to present some examples which we came across in our practice over the few years. These are all CT findings showing various causes like hepatoma with spontaneous intraperitoneal haemorrhage, renal angiomyolipoma with retroperitoneal haemorrhage, pseudoaneurysm of gastroduodenal artery due to acute pancreatitis bleeding profusely, rectus sheath and psoas haematoma in a patient on Warfarin, intra peritoneal haemorrhage due to damaged superior rectal vessels, extensive intramural haematoma of the small bowel due to Warfarin, hepatocellular adenoma with spontaneous haemorrhage, renal cell carcinoma with spontaneous retroperitoneal haemorrhage etc.

This poster will educate the conference delegates to look for and think of few of the conditions when they come across such situation.

**Conclusion:** Acute drop in haemoglobin levels without evidence of external bleeding is life threatening and immediate search for the cause can be life saving. Pictorial review of the same will be demonstrated in the form of poster.

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## P-091 Intussusception: The radiologists guide

[Laura Steinberg](#); [Rachel Magennis](#); [V Rudralingham](#); [S A Sukumar](#)

*University Hospital of South Manchester NHS Foundation Trust*

Intussusception is a rare clinical entity in adults and occurs when one segment of bowel telescopes into an adjacent distal segment. Presentation may be acute or chronic, most commonly with abdominal pain, nausea and vomiting and only rarely associated with obstruction. Intussusception is an entirely different entity in paediatric and adult populations. In contrast to children, the majority of adults have underlying pathology, often identified on imaging at the time of diagnosis. Although surgery may be indicated where a lead point has been demonstrated, a significant group of patients have spontaneous subclinical intussusception requiring conservative treatment only. Radiology, CT in particular, plays a key role in demonstrating the intussusception and possible underlying cause in order to prevent potentially unnecessary surgery in this important subgroup of patients and facilitate surgical planning where appropriate.

Adult intussusception can be classified in terms of location and cause. It can occur from stomach to rectum. The majority of cases are tumour related (benign or malignant), post-operative, congenital or idiopathic, although there are a number of miscellaneous conditions also recognised. We describe the appearances of intussusception, demonstrating the findings diagrammatically and on CT. We illustrate the CT appearances of a wide range of underlying pathology including tumour (lipoma, carcinoma, lymphoma), congenital causes (duplication cyst, Meckels' diverticulum), post-operative (feeding tube) and inflammatory conditions such as Crohn's disease and cystic fibrosis. We highlight the importance of excluding a pathological trigger to intussusception to ensure appropriate patient management.

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## P-092 An audit on the validity of MRCP requests at a District General Hospital

[Raymond Rueben](#)

*Dumfries and Galloway Royal Infirmary*

In a district general hospital the radiologists that there were too many MRCP requests and many of these requests were possibly unnecessary. Hence this audit was undertaken to determine the validity of the requests made by clinicians.

**Objective:** To ensure that MRCP requests made by clinicians adhere to appropriate criteria and the aim was to improve the adherence of this criteria.

**Standard:** The following should be the basic criteria required in order to obtain an MRCP:

1. Deranged LFTs of an obstructive pattern.
2. Intra/extra hepatic ductal dilatation and or filling defects seen on USS/CT.
3. A combination of the above.

**Exceptions:** Patients who require that area of anatomy to be visualised for other reasons i.e. CBD injury post ERCP.

**Findings:** 105 patients from the period of 08/11 - 08/12 were recruited

Deranged LFTs= 46 (44%)

Abnormal USS/CT =16 (15%)

A combination of the above 1 and 2 = 35 (33%)

Exceptions to the criteria = 3 (3%)

Invalid requests = 5 (5%)

All 5% of the invalid requests had a normal MRCP, therefore it was a waste of resources.

Currently we are implementing a request proforma in order to obtain an MRCP. The aim is to reduce the invalid requests to 0%. Once this is implemented, the aim is to complete the audit cycle by June 2014.

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### **P-093 A pictorial review of small bowel pathologies and their appearance on multi-slice computed tomography**

[Gordon Cowell](#); [Rob Foster](#)

*Victoria Infirmary, NHS Greater Glasgow and Clyde*

**Aims/objectives:** To present a pictorial review of the varying range of small bowel pathologies encountered at Computed Tomography (CT).

**Content:** The widespread application of multi-slice CT in assessment of a range of presentations has resulted in an improvement in small bowel depiction, even without dedicated enteric preparation. A range of pathologies are presented, including tumours (adenocarcinoma, carcinoid, gastrointestinal stromal tumour, angiosarcoma and metastases), inflammation (inflammatory bowel disease, non-steroidal induced enteritis and radiation enteritis) and ischaemia, with common imaging features and techniques described, with multi-modality correlation as applicable.

**Relevance/impact:** This review will be of use to radiologists, radiographers and any other members of the multi-disciplinary team involved in imaging and management of small bowel disorders or investigation of gastrointestinal problems.

**Outcomes:** The importance of recognising and characterising the wide range of small bowel pathologies is demonstrated via a pictorial review of multiple small bowel pathologies evident on multi-slice CT studies.

**Discussion:** In addition to example imaging of small bowel pathologies, pertinent facts, common imaging features and clinicoradiological correlation will be addressed.

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### **P-094 The role of CT enterography in the assessment of small bowel Crohn's**

[Oliver Nicholson](#); [Srirupa Desai](#); [Mong-Yang Loh](#)

*Stockport NHS Foundation Trust*

There are an estimated 115,000 people in the UK with Crohn's disease. Approximately 70% of patients will have small bowel involvement. Imaging plays a key role in the initial diagnosis, management and identification of complications in this chronic condition.

CT enterography is a valuable imaging technique for the assessment of small bowel Crohn's and can complement MR enterography. It can be particularly useful in assessing patients with complex anatomy.

Our poster will aim to provide the radiology trainee or general radiologist with a pictorial overview of the features of small bowel Crohn's on CT enterography. We will discuss indications, technique and imaging features with an emphasis on cases where CT has proven particularly useful in providing diagnostic information.

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### **P-095 Rectal contrast: Uses in clinical radiology**

[Sophie Vaughan](#); [Carys Jenkins](#); [Rhodri Thomas](#); [Craig Parry](#)

*University Hospital of Wales, Cardiff and Vale University Health Board*

The role of fluoroscopic techniques in abdominal radiology has been largely superseded by CT imaging. However, this can pose specific challenges in patients with complex CT appearances, eg. in patients with previous extensive surgical history.

Rectal contrast is a useful tool when imaging complex pelvic disease and in particular is invaluable in the delineation of fistulous tracts and anastomotic leaks on CT.

We describe the techniques involved and provide specific examples of cases where the use of rectal contrast has proved essential.

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### **P-096 Uncommon anal canal lesions mimicking malignancy**

[Dhivya Murthy Paravasthu](#); [Madhusudan Paravasthu](#); [Jayan Nair](#); [Ashok Katti](#); [James Arthur](#)

*Aintree University Hospital NHS Foundation Trust*

**Aim:** We aim to present the normal imaging anatomy of the anal canal and unusual pathological mimics which could be confused for anal canal malignancy.

**Content:** We present a review of the imaging anatomy of the anal canal and a series of unusual cases is also presented with imaging findings that mimic anal canal malignancy and include benign pathological entities such as haemorrhoids, complex fistula, procidentia (Full-thickness Rectal prolapse), abscesses, Pagetoid dyskeratosis, anal

tags and tumours such as melanoma, neurofibromas and GIST (Gastrointestinal stromal tumours). The importance of the knowledge of normal anatomy is once again emphasized in recognizing the pathology or variants.

**Relevance/impact:** A detailed knowledge of the normal imaging appearances is necessary to diagnose pathological conditions and also normal variants. A variety of entities can mimic anal canal tumours and this review is aimed at presenting such mimics and will hopefully serve as an educational tool. Appropriate clinical history and findings and pathological correlation are paramount.

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#### **P-097 A pictorial review of anatomy, typical appearances, and complications related to common gastrointestinal tract (GIT) surgeries**

[Delilah Khan](#); [W Chong](#); [J Mullany](#); [A Gemmell](#); [Ajay Sahu](#); [S Jackson](#)

*Plymouth Hospitals NHS Trust*

**Introduction:** The most difficult emergency oncall scans to interpret for radiology registrars are considered the surgical post-operative scans. It is important prerequisite to be familiar with the common abdominal surgeries for further evaluation of any postoperative complications by the radiologist. It is usually not possible to get a gastrointestinal radiologists opinion till next morning. Radiology trainees early in their career are not experienced but imperatively encounter such scans during their oncalls. Hence it is crucial to have a basic understanding of these procedures.

**Aims/objectives:** The goal of our pictorial review is to schematically review common gastrointestinal tract surgeries regarding anatomy and illustrate normal postoperative appearances on CT scan.

**Methods:** We will provide a comprehensive overview of all abdominal operations involving the gastrointestinal tract, pancreas, hepatobiliary and genitourinary systems surgical appearances from our institution. We then will discuss and illustrate potential postoperative complications such as postoperative leaks, mesenteric ischaemia, anastomotic strictures, and internal hernias which will be described alongside imaging examples of the procedures. GI abdominal surgical procedures and their imaging appearances, such as those of Ivor-lewis oesophagectomy, colonic interposition, vagotomy, gastric bypass, Billroth procedures, Whipples procedure, chronic pancreatitis (Frey's, Puestow's and Berger's), total pancreatectomy, sphincterotomy), liver transplantation and resection, radiofrequency ablation, TACE, TIPSS, short bowel, blind loop and pouch syndromes, stomas and colonic resections (e.g., low anterior resection, abdominoperineal resection), mucous fistulas etc will be reviewed.

**Conclusion:** The knowledge of commonly performed gastrointestinal tract surgeries and their expected appearance and complications is of paramount importance for the radiology trainee.

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#### **P-098 Percutaneous biliary stenting in a DGH - comparison with national audit**

[David Little](#); [Atique Imam](#); [Andy Beale](#)

*Great Western Hospitals NHS Trust*

**Aims/objectives:** The aim of this audit was to compare the practice of biliary drainage and stenting in a large DGH with the First Biliary Drainage and Stent Audit Report 2009.

**Content:** We present the results of an audit of over 3 years of local practice of percutaneous biliary stenting including; patient demographics, operator experience, stenting success rate, reasons for failure, reduction in bilirubin and 30/80 day mortality.

**Relevance:** Interventional radiology provides a solution in those patients with biliary obstruction in which ERCP is unsuccessful. It is a relatively common procedure but due to the nature of the patients, is often a palliative treatment and carries a high associated morbidity and mortality. The 2009 national audit provides a standard for hospitals to compare themselves to.

**Outcomes:** The patient's age and gender were broadly similar between the local and national groups. The local stent success rate was 72% which is less than the national audit (98.7%), this may be due to a differences in data collection. The local 30 and 80 day mortality was 23% and 48% respectively, which was similar to the national audit.

**Discussion:** The national audit was a voluntary register which is subject to varying degrees of incomplete and selective data reporting. This may account for the difference in our institution compared with the national audit. Nevertheless, it is important to evaluate local practice to ensure a good standard of care.

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#### **P-099 Combined fluoroscopic and CT imaging to improve the diagnostic accuracy of anastomotic leaks and intestinal fistulae**

[Anesh Patel](#); [Naomi Sellars](#); [Chandani Thorning](#)

*Surrey & Sussex Healthcare NHS Trust*

**Aims/objectives:** To assess if the use of water-soluble contrast studies followed by CT improves diagnostic accuracy of leakage from bowel anastomosis or detection of intestinal fistulae.

**Content:** Reviewing departmental fluoroscopic images from 2013, we looked at how many patients with an unclear diagnosis of a leak/fistula immediately went on to have a CT, either to clarify its location, extent and anatomical significance, or to rule it out. Using abdominal CT following water-soluble contrast enema or small bowel contrast study there was no need for IV contrast and radiation exposure was kept to a minimum, thereby answering the clinical question and minimising patient risk.

**Relevance/impact:** This could change the method of diagnosing leaks and fistulae in those with diverticulosis, IBD and the competency of anastomosis following bowel surgery.

**Outcome/discussion:** In 86% of patients with an abnormality on fluoroscopy, the diagnosis was confirmed on CT (positive predictive value) and provided additional anatomical information vital to their care. However, 50% with no abnormality on fluoroscopy who later had CT due to clinical concerns showed there was a leak/fistula present (false negative). The sensitivity of combined fluoroscopic and CT imaging is 75% and the specificity is 66%. This suggests that even when fluoroscopy is positive, a CT may provide further relevant information. However, if no abnormality is detected but there remains clinical concern by the clinician a CT may still be needed.

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#### **P-100 A trainee's guide to hypervascular liver lesions**

[Nadya Jabbar](#); [Sumita Chawla](#); [Nuthan Gupta](#); [Ravi Adapala](#)

*Wirral University Teaching Hospital NHS Foundation Trust*

**Objectives:** 1. To guide the trainee radiologist in characterising incidentally detected hypervascular liver lesions.  
2. To act as a refresher to radiology trainees and consultants alike by reinforcing their knowledge on the imaging appearances of hypervascular liver lesions.

**Content:** With the increasing use of multidetector CT, hypervascular hepatic lesions are frequently detected, often as an incidental finding. They include benign conditions such as haemangiomas, FNH and adenomas and malignant lesions such as HCC and hypervascular liver metastasis.

Characterising these lesions can be a diagnostic challenge as they all may look very similar in the arterial phase. The dual supply of the liver enables imaging it in two separate phases, namely arterial and portal venous. Differentiation is done by looking at the enhancement pattern in other phases, gross pathologic features, clinical findings and most important, review of all previous available imaging.

With a high lesion-liver contrast and no radiation exposure, MRI has emerged as the imaging modality of choice for detection and characterization of liver lesions.

We present a pictorial review illustrating the commonly encountered hypervascular lesions and a step by step guide of how to characterise them based on US, CT and MR appearances.

**Impact:** This educational exhibit hopes to have helped the observer understand the spectrum of enhancement patterns of hypervascular liver lesions. As most of these are detected incidentally, the radiologist by characterising them has a particularly valuable role in guiding patient management.

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### P-101 A pictorial review of unusual gallstone complications

Nicola Ley; Daniel Raw; Nicholas Skipper

Yorkshire and Humber School of Radiology; Barnsley District General; Yorkshire and Humber School of Radiology

**Aim and objectives:** Gallstones are a common pathology and are often an incidental finding diagnosed in 10-15% of adult patients in the western world in 2012. This often harmless condition can have serious complications that need prompt recognition and management. Using a pictorial review we aim to highlight the imaging findings of some of the more unusual complications that we have encountered in clinical practice that have important acute and chronic implications for the patient.

**Method/pictorial review/content:** Using a range of imaging modalities radiographic findings of important gallstone complications will be covered including uncommon cases such as pseudo-aneurysm of the hepatic artery, cholecysto-duodenal fistula, intra-peritoneal abscess secondary to dropped gallstones, emphysematous cholecystitis and a large biloma secondary to retained CBD stones. Imaging examples of more common entities such as gallstone ileus, gallbladder empyema, hepatic abscess and porcelain gallbladder will also be reviewed.

**Discussion/impact:** Although often harmless, gallstones can have serious complications and it is important for the radiologist to be aware of the more unusual complications that need early recognition and diagnosis.

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### P-102 A pictorial review of endoscopic ultrasound of hepatobiliary system and pancreas: A checklist for the radiologist

Harriet Barber; D Shetty; A Gemmell; Ajay Sahu; K Giles; BM Fox

Plymouth Hospitals NHS Trust

**Introduction:** Endoscopic Ultrasound (EUS) is the procedure of choice in the evaluation of a dilated common bile duct (CBD) or in suspected biliary pathology when transabdominal ultrasound fails and patient cannot have MRI. Radiologists are well aware of the impact of cross-sectional imaging upon the diagnosis and treatment of hepatobiliary and pancreatic disorders. However, most upper GI surgeons and general radiologists have little familiarity with the increasing role of EUS.

**Aims/objectives:** This pictorial review aims to familiarize radiologists with the basics of EUS technique and its complementary role to cross-sectional imaging. The correlation between the morphologic features of lesions on cross-sectional imaging and EUS is pivotal in making important treatment decisions.

**Method:** This review will detail basic EUS technique and anatomy with particular emphasis on the hepatobiliary system such as the altered anatomy of the gallbladder and intrahepatic biliary tree, juxta papillary duodenal diverticulum, evaluation of the papilla and distal CBD, benign stenosis or adenomyomatous hyperplasia of the papilla. Pancreatic abnormalities such as solid pancreatic masses eg pancreatic adenocarcinoma and neuroendocrine tumours, cystic pancreatic lesions (pseudocysts, IPMN, serous and mucinous cystic neoplasms) and benign conditions such as chronic pancreatitis and autoimmune pancreatitis will be discussed.

**Conclusion:** EUS has shown great usefulness not only in its ability to make the diagnosis but also in its ability to biopsy the lesions. EUS must be looked upon as an important complementary tool to cross-sectional imaging in the evaluation of hepatobiliary and pancreatic diseases in the diagnostic algorithm for these disorders.

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### P-103 A pictorial review of pancreatic and extra-pancreatic imaging findings in autoimmune pancreatitis

J Taylor; Ajay Sahu; G Dack; A Gemmell; P Konala; Simon Jackson; A Abdellaoui

Plymouth Hospitals NHS Trust

**Aims/objectives:** To describe our experience with characteristic pancreatic and extrapancreatic imaging findings on CT and MRI for diagnosis and imaging findings in patients with autoimmune pancreatitis.

**Methods and materials:** Autoimmune pancreatitis (AIP) is a form of chronic pancreatitis characterised clinically by frequent presentation with obstructive jaundice, histologically by fibrosis, and therapeutically by a good response to steroids. It is crucial to diagnose and differentiate autoimmune pancreatitis from pancreatic cancer and other forms of chronic pancreatitis (such as alcohol) as steroid treatment is effective both in reversing morphologic changes but also to return pancreatic function to normal.

**Discussion:** We will look at the spectrum of pancreatic imaging findings suggestive of autoimmune pancreatitis on cross-sectional imaging. This pictorial review will show the characteristic imaging findings on CT and MRI with case examples including diffuse or focal swelling of the pancreas, enhancement patterns in the arterial and venous phase,

abnormal enhancement of the common bile duct, intrahepatic biliary ductal dilatation, and extrapancreatic findings in the kidneys, bile ducts, and peri-pancreatic tissues that will help in diagnosis and imaging findings on MDCT, including parenchymal changes in pancreas.

**Conclusion:** Characteristic pancreatic and extrapancreatic imaging features on CT will help the radiologist in the diagnosis of autoimmune pancreatitis, and it is important to know imaging features on cross-sectional imaging after steroid treatment that will help to assess appropriate response to therapy. For the diffuse form, it is imperative to consider lymphoma, plasmacytoma, pancreatic metastases, and diffuse infiltrative ductal adenocarcinoma in the differential diagnosis.

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#### **P-104 Radiological features of pathology in the appendix and right hemicolon: A pictorial review**

Moni Sah; Syed Mustafa; Jullian Chakraverty; Rwth Owen; Luke Wheeler

*University Hospital of Wales, Cardiff and Vale University Health Board*

**Aim:** To exhibit the imaging of a range of common and rare, but vital, appendix and right sided colonic diseases with unique examples from our clinical practice. Appropriate imaging will avoid unnecessary intervention and can help to plan treatment.

**Content:** This presentation will display radiological signs of various conditions such as infection (acute appendicitis, epiploic appendagitis, caecal diverticulitis, intestinal tuberculosis), inflammation (crohn's and ulcerative colitis), tumours (carcinoid of appendix, carcinoma of appendix, mucocele of appendix, caecal lymphoma, adenocarcinoma of colon) and miscellaneous diseases (endometriosis involving the appendix, caecal volvulus, caecal bascule, typhlitis and post-transplant lymphoproliferative disease).

**Relevance:** Pathologies of the right hemicolon and appendix are common acute surgical or medical emergencies. A meticulous history and detailed clinical examination is essential in planning appropriate investigation. However, radiological input is immense in identifying the cause and guiding the clinician's response. In addition, we will reveal tip and tricks and some of the challenges in making a radiological diagnosis.

**Outcomes:** This will enable the radiologists and clinicians to more accurately recognise various pathologies of appendix and right hemicolon. It will improve understanding of the pathological processes involved and direct appropriate management strategies.

**Discussion:** There is a spectrum of appendix or right hemicolon related diseases ranging from those which are common to rare entities. Few of these conditions may represent as serious life threatening or malignant conditions. It is imperative that a radiologist be able to confidently distinguish between these conditions and play an important and effective role in the clinical management.

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### **Clinical: Paediatrics**

#### **P-105 In the neck of time**

Simon Ewart; Kate Giles; Harriet Barber; John Apsey

*Royal Devon and Exeter NHS Foundation Trust*

**Objectives:** To review both the common and more unusual neck lumps referred for imaging including discussion of pathologies and imaging modalities.

**Background:** Neck lumps in Paediatric patients are a common cause for referral to Radiology. The most common finding on imaging of these lumps are lymph nodes, enlarged or otherwise. A confident diagnosis and the exclusion of other, more sinister or unusual pathology is welcomed by clinicians and parents alike. Whilst most neck lumps are imaged by means of Ultrasound, the appropriate use of other modalities can be of further benefit.

**Content:** Discussion of various head and neck lump pathologies along with their imaging findings and examples. This will include cases of parotitis and its chronic appearance, ranulae, thyroglossal cysts and bony lesions. The use of appropriate modalities for different lesions will be covered together with the types of lesion to consider as differentials in varying age groups. The imaging appearance of normal versus abnormal cervical lymph nodes will also be reviewed.

**Outcomes:** Paediatric neck lumps are a common cause for referral to the imaging department. A clear understanding of anatomy, appearance and modality of choice are vital for a reliable diagnosis.

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## P-106 Imaging the submandibular gland and space in children - normal appearances and pathology

Sacha Pierre; Teresa Kelly; David Howlett

Royal Sussex County Hospital, Brighton and Sussex University Hospitals NHS Trust; Children's Hospital Wisconsin; Eastbourne District General Hospital

**Aim:** To provide an understanding of normal imaging appearances, anatomy and specific pathological appearances of lesions in the paediatric submandibular gland and space.

**Content:** A quick review of the embryological, anatomical and imaging features that define the submandibular space (SMS) along with a systemic approach in localising and characterising paediatric SMS lesions using various imaging modalities, specifically ultrasound.

**Relevance:** There are a wide variety of lesions that may arise from the submandibular gland or from adjacent structures. Early encapsulation of the submandibular gland (SMG) makes it relatively impervious to pathology from surrounding structures. Determining whether a lesion is intra or extraglandular using specific landmarks and then categorising the lesions based on appearances (namely cystic, solid, complex or vascular with further subcategories).

**Outcomes:** SMS lesions can be localized by checking for displacement of the anterior facial vein (AFV) which serves as a useful landmark in determining whether the lesion is extra or intraglandular. Further categorisation into subgroups of congenital, infectious/inflammatory, vascular, post traumatic and tumours based on history, location and imaging appearances enable better diagnosis therefore enabling appropriate and timely management with avoidance of further unnecessary investigations.

**Discussion:** There is a wide spectrum of submandibular space pathology that can affect the paediatric patient. Differentiating between intra or extraglandular lesions, knowledge of the most common differentials and appearances of different pathologies using current imaging aid in the correct diagnosis of these lesions.

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### Clinical: Multisystem disorders

## P-107 Extra-medullary haematopoiesis: A pictorial review of its typical and atypical locations in our practice

F Wotton; Ajay Sahu; E Rees; A Galea; M Williams

Plymouth Hospitals NHS Trust

**Introduction:** Extramedullary hematopoiesis (EMH) is the formation of mature red blood cells outside of the skeletal system as a compensatory mechanism in patients with myelofibrosis and in hemoglobinopathies (especially thalassemia and sickle cell disease). As a result various extramedullary sites take on the role of blood formation.

**Presentation/imaging findings:** Extramedullary hemopoiesis favors certain sites such as the liver, the spleen, and the paraspinal regions of the thorax. However, in addition to these common sites of extramedullary hemopoiesis, the process can involve virtually any organ or tissue (usual locations eg. liver, spleen, lymph nodes, paravertebral regions and unusual locations such as intra-spinal canal, pre-sacral region, nasopharynx and paranasal sinuses). It can often manifest as a mass mimicking a neoplasm and then it can be symptomatic and may cause significant symptoms to the patients. The various imaging appearances of EMH will be presented and discussed to help guide the interpreting radiologist.

**Educational and teaching points:** In addition to common manifestations of EMH, unusual examples such as focal liver and splenic lesions, renal parapelvic soft-tissue masses, musculoskeletal masses, testicular lump etc are identified. EMH in unusual locations need to be monitored with follow-up imaging. Imaging characteristics included the presence of gross fat. Follow-up imaging studies demonstrated the evolution of soft-tissue masses into fatty masses.

**Conclusion:** Familiarity with the possible manifestations of EH will aid radiologists in the interpretation of imaging studies in patients with chronic anemia. In some cases, unnecessary additional tests or interventions may be avoided.

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## P-108 Manifestations of extra pulmonary lymphoma: A pictorial review

Tarig Adlan; Gemma Miles; Sahil Chhabda; Hasan Nizami; Joaane Gormally; R D Riordan

Plymouth Hospitals NHS Trust

**Introduction:** Lymphoma is multisystem malignant disorder arising as a consequence of malignant proliferation of lymphocytes. The site of origin varies from lymph nodes, bone marrow, spleen or other parts of the body. Lymphoma is broadly divided into Hodgkin and non-Hodgkin lymphoma based on the presence of Reed-Sternberg cells in Hodgkin's lymphoma.

The presentation of lymphoma is variable and can present with wide range of symptoms including fever, weight loss, anaemia, mass symptoms resulting from local compressive effect caused by abnormal nodes.

**Objective:** As we outlined above, lymphoma is a multisystem disorder that can affect wide range of organs and present with various clinical manifestations. We present a pictorial review of cases less commonly encountered, yet clinically important extra-pulmonary manifestations of lymphoma.

**Conclusion:** Recognizing the different presentations and imaging characteristics of lymphoma is of paramount importance and helps radiology trainees and radiologists consider and establish accurate diagnosis which is essential for subsequent management.

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#### **P-109 Extrapulmonary tuberculosis - re-emergence of the 'great pretender'**

[Emma Phelan](#); [Kate Harrington](#); [William Torreggiani](#)

*Tallaght Hospital, Dublin, Ireland*

The aim of this poster is to illustrate the many varied imaging findings of extrapulmonary tuberculosis and the diagnostic difficulties they present.

There has been a resurgence of tuberculosis worldwide. Extrapulmonary tuberculosis (EPTB) constitutes about 15 to 20 per cent of all cases of tuberculosis in immunocompetent patients and accounts for more than 50 per cent of the cases in HIV-positive individuals. The radiologic features of EPTB mimic those of many diseases. EPTB therefore presents a difficult diagnostic challenge for the radiologist and requires a high index of suspicion, particularly in high-risk populations. Here we highlight our institutions experience with EPTB presentations.

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#### **P-110 Unusual presentations of malignant melanoma metastases: A pictorial review**

[Sophie Vaughan](#); [Angharad Eynon](#); [Vineet Bhat](#); [Craig Parry](#)

*University Hospital of Wales, Cardiff and Vale University Health Board*

**Introduction:** Malignant melanoma is a highly aggressive malignancy of the skin, which frequently metastasises to involve the lymph nodes and other organs in the body.

**Content:** We describe some of the more unusual presentations and locations of metastatic malignant melanoma, as demonstrated by proven cases collected from a large teaching hospital over a 2 year period.

**Conclusion/discussion:** Our pictorial review illustrates the need for a high level of suspicion, particularly in those patients with a past history of malignant melanoma, as the metastatic disease can present in unusual locations.

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**P-111 A review of interventional radiology and its utilisation in trauma patients**

David Raven; Sachin Modi

*Heart of England NHS Foundation Trust; The Dudley Group NHS Foundation Trust*

**Aims:** To assess the utilisation of the Interventional Radiology service at a busy Trauma Unit from 1st January 2011 to 31st August 2012 and identify the common injury patterns and mechanisms of injury that lead to its usage.

**Methods:** Retrospective case review of all trauma cases and analysis of whether the Interventional Radiology service was activated, under what circumstances this was done, and what intervention was performed. A secondary review of mechanisms of injury that led to such interventions was performed.

**Results:** From 1st January 2011 to 31st August 2012, seven patients were taken to the Interventional Radiology suite for suspected ongoing traumatic haemorrhage. Two patients (28.6%) had interventions for splenic injury, 3 patients (42.8%) had procedures for pelvic bleeding and 2 patients had no ongoing haemorrhage. One patient died on the same day as the intervention from their injuries. The commonest injury patterns were falls from height or high speed RTC, both representing high mechanisms of energy transfer.

**Discussion:** Interventional radiology offers a minimally invasive alternative to open procedures for the control of haemorrhage. With the advent of Regional Trauma Networks, (RTNs), the pre-hospital triage tools that determine whether a patient should be taken to the Major Trauma Centre (MTC), will under-triage a proportion of patients with significant injury. Having a service in a Trauma Unit that offers minimally invasive techniques to such patients, will prevent unnecessary open damage-control techniques which in themselves can aggravate the coagulopathy that occurs in severely injured patients.

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**P-112 Patients' experience of anxiety and pain during interventional radiology procedures**

James Roberts; Gian Abbott

*Countess of Chester Hospital NHS Foundation Trust*

**Aims:** The aim was to assess the levels of anxiety and pain experienced during interventional radiology (IR) procedures. It was felt that many patients experience unreasonable levels of these but do not inform staff at the time. Pain relief at this centre is usually nurse led when an anaesthetist is not present. Pre-procedure medication with anxiolytics or analgesia is not currently given routinely.

**Methods:** Questionnaires were given to all adult patients immediately after undergoing elective IR procedures at our district general hospital over the course of three months. The questions were focused on patients' experience intra-procedure anxiety and pain as well as their overall satisfaction with the procedure.

**Results:** Data was collected from 60 patients after a wide range of IR procedures, the majority of whom received only lignocaine in the way of analgesia and no anxiolytics. Overall satisfaction was high among the patients questioned however there existed variance in levels of pain and anxiety between the types of procedures performed. Insertion and removal of nephrostomies, for example, was poorly tolerated with all patients experiencing moderate or severe anxiety and half experiencing moderate or severe pain.

**Discussion:** While patient satisfaction is high after IR procedures at our centre, some procedures are seemingly better tolerated than others and some patients are experiencing a significant amount of pain and anxiety. We suggest that it would be prudent to target anesthetic IR lists towards procedures where we have found higher levels of these in order to optimise use of analgesia and sedation.

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**P-113 Inferior vena cava filters - an audit of their justification, planned longevity and retrieval**

Natalia White; Liam Ingram; Christopher Watts

*Salisbury District Hospital*

Placement of inferior vena cava (IVC) filters can aid prevention of pulmonary thromboembolism in at risk patients. However IVC filters also carry potential complications and should be removed when no longer required in order to minimise risk. The British Society of Interventional Radiologists (BSIR) recently published the first UK IVC filter registry report in which it is recommended that all requests for filters should give appropriate justification, indicate whether the filter is to be temporary or permanent and, if temporary, to remove the filter within nine weeks. This audit examined all episodes of IVC filter insertion in a district general hospital over a five year period to determine compliance with BSIR recommendations.

A total of 47 IVC filters were placed over five years. In three cases (6%) there was documented evidence at the time of request as to whether the filter would be temporary or permanent. Of the 47 filters placed, 10 were removed in the same hospital (21%). Seven of these filters were retrieved within the recommended time frame of nine weeks. There was no evidence that the remaining 37 filters were removed, though one patient left the local area. Eighteen patients (38%) died with a filter in situ.

In this audit only a minority of requests demonstrated consideration of filter longevity. In view of these findings, an IVC filter pathway was introduced to ensure that BSIR recommendations are followed and, in addition to this, all cases should be discussed with a haematologist to minimise unnecessary IVC filter placement.

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#### **P-114 The role of ultrasound guided hydrodistension in adhesive capsulitis**

[Rubina Azam](#)

*Whipps Cross University Hospital, Barts Health NHS Trust*

**Introduction:** Adhesive capsulitis, also known as frozen shoulder, is a common condition characterized by pain and reduced range of motion in the affected shoulder. Treatment regimens for adhesive capsulitis include a trial of conservative therapy, followed by more invasive procedures for recalcitrant cases.

**Objective:** To explore the efficacy of Ultrasound guided hydrodistension in the treatment of adhesive capsulitis of the shoulder joint.

**Method:** We retrospectively evaluated 20 patients with adhesive capsulitis who had Ultrasound guided shoulder hydrodistension done between May 2012 to August 2013. All had continuous pain and significant range of motion (ROM) limitations of the shoulder joint. SPADI (Shoulder Pain And Disability Index) score was used to evaluate their symptoms before and after the procedure.

**Conclusion:** The evaluation of our data showed that out of total 20 patients, 2 patients had <40 % improvement in their symptoms, 7 patients had 40-50% improvement, 5 patients had 50-70% improvement and 6 patients had more than 70 % improvement.

**Discussion:** Ultrasound guided shoulder hydrodistension is a safe procedure which significantly improves pain and range of motion in the shoulder joint. When compared with other invasive procedures used for frozen shoulder, Ultrasound guided hydrodistension is a capsule preserving procedure which is less invasive with lesser risk of radiation exposure and fewer post procedure complications.

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#### **P-115 Complications of the mynx arterial closure device**

[Stuart Barnard](#)

*Middlemore Hospital (CMDHB), New Zealand*

**Purpose:** Vascular closure devices (VCD) have become very popular for the closure of common femoral arterial punctures after endovascular procedures. They decrease time to haemostasis and to ambulation and reduce patient discomfort. The Mynx VCD is one such device that was designed to leave no intravascular material but there have been reports that intravascular material is often seen post deployment and that pseudoaneurysm formation is a relatively frequent complication.

**Materials and methods:** Endovascular procedures performed in the radiology department in which the Mynx VCD was used after femoral puncture from 1/6/10 to 30/8/11 were retrospectively reviewed. The clinical records and radiology system were checked for any complications and all subsequent relevant imaging studies were reviewed for intravascular material or stenosis at the puncture site.

**Results:** One hundred and forty-nine patients' records were reviewed. Fourteen patients underwent bilateral punctures and 11 patients underwent repeat procedures (total 174 deployments). Clinical follow up ranged from 524 to 924 days (median 701 days). Relevant follow up imaging was available for 110 procedures (63%), with 357 studies showing the arterial puncture site. No intravascular material was seen and there were no instances of arterial stenosis attributable to the VCD. There were no serious complications and 13 (7%) minor complications. No blood transfusions or surgical procedures were required.

**Conclusions:** In this large series the Mynx closure device was not associated with intravascular material or arterial stenosis. The complication rate is comparable to other VCDs.

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#### **P-116 Retrospective analysis of diagnostic yield and complication of percutaneous CT guided needle biopsy of pulmonary lesion**

**Background:** Introduction of Computed tomography (CT) has helped in accurate localization of lesion, needle puncture and access to any area of the body. CT guided biopsy of lung lesions has rapidly emerged as a well established, less-invasive, rapid and fairly accurate diagnostic technique. Despite being high sensitivity, specificity and relatively cost effective the diagnostic modalities have its own pitfalls and complications.

**Aim:** To assess diagnostic yield of CT-guided lung biopsy and complications.

**Method:** Retrospective audit of 100 patients over 2 years. Data obtained from PACS, CRIS and histology from ICE software.

**Results:** 100 Patient (mean age 69 years; Median 72 yrs; male/female =42/58). Commonest tumour site RUL (25%) and common approach posterior approach 40%. Histology diagnosis of malignant 63 %, benign 11 %, insufficient sampling 11% and Infective or fibrotic 13%. The overall yield of the biopsy was 91 %.

**Complicaion:** Pneumothorax 30% (Asymptomatic n=23; Symptomatic n = 7) and 10 % required chest drainage (n=3). Hemoptysis 5 % and hemorrhage 3% but no significant major bleeding complications occurred. No correlation between the needle size and complications noted.

**Conclusions:** CT-guided lung biopsies is safe, minimally invasive procedure and has an excellent diagnostic accuracy with no mortality but has a reasonable rate of complication.

These complication rates can further be minimized by focused, dedicated and supervised training of junior trainees with regular feedback and organizing simulated hands on workshops. Further Maintaining standardizing data also facilitate for auditing, research and comparing between centers.

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#### **P-117 Review of catheter directed thrombolysis for acute limb ischaemia**

[John Asquith](#); [Matthew Burgess](#); [Vincent Leung](#); [Lorraine Corfield](#); [George Tenovici](#)

*University Hospital of North Staffordshire NHS Trust*

**Aims/objectives:** A retrospective review of patients who underwent percutaneous catheter-directed thrombolysis was performed. The results were compared to the Cardiovascular and Interventional Radiological Society of Europe (CIRSE) standards published in 2011.

**Relevance:** Intra-arterial thrombolysis is an established alternative to open surgery, but is only used in severe limb ischaemia due to the potential for complications.

**Outcomes:** 11 patients underwent thrombolysis during the three year study period. The mean age of the patients was 62 years, with 10 male and 1 female. All the patients were managed in appropriate high dependency beds.

The angiographic outcomes were categorised into groups: Complete Technical Success - 6 patients, Partial Technical Success - 4 and Failure of Thrombolysis - 1 patient. There was clinical success in 9 patients, but of these 4 required bypass operations to achieve this.

Two patients underwent subsequent amputation. Complications were classified as 1 major, which was an intra-abdominal haemorrhage and one minor, which was a groin haematoma.

**Discussion:** Despite being a tertiary vascular unit, catheter directed thrombolysis for acute limb ischaemia is an uncommon procedure in our centre. This is a time consuming procedure for interventional radiology, but can be useful for assisting in limb salvage.

Major complication rate was 9%, which is within the limits set by the CIRSE standards. However, small cohort size prevents statistically significant conclusions.

Overall there was good adherence to CIRSE guidelines. Possible areas for review include the greater use of pre-procedure non-invasive imaging and monitoring of acid-base balance.

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## **P-118 Discrepancy highlighting - system to highlight and potentially expedite patients with discordant radiology reports**

[Caroline Blower](#)

*NHS Ayrshire & Arran*

**Aim:** The aim of the discrepancy system is to adhere to the RCR guideline 'communication of untoward or unexpected findings'. Also the National Patient Safety Agency Safer Practice Notice 16: "Early identification of failure to act on radiological imaging reports".

**Content:** Prior to introduction of this service, possible missed fractures were taken to the Emergency Department (ED) on a rather adhoc basis.

Reports by the Radiographer Reporting service are timely but it was felt that a delay still occurred thereby potentially delaying any necessary re-call of patient's with missed fractures/pathologies (treatment discrepancies).

A robust system is now in place and every day (Mon-Fri) the reporting Radiographers check the ED computer notes for potential discrepancies between the report and the treatment of the patient. These cases are then highlighted to an ED Consultant who decides whether to recall the patient for clinical assessment or further treatment

**Impact/relevance:** This system has proven to be appropriate and timely and has had an impact on patient management. It has been used at the pilot site since May 2010 and many significant abnormalities have been picked up and re-called using this system.

The impact of the service is to improve patient care/outcome by immediate re-call of patients who may, previously have suffered morbidity due to a missed abnormality.

**Outcomes:** Discuss ongoing audits of the service including ED consultants opinions and also problems with implementation of the service

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## **P-119 Lump in neck GPs ability to refer to community ultrasound reduces work load of cancer pathway. But at what cost?: Delayed diagnosis, professional and legal vulnerability**

[Conor Aleman](#)

*Heatherwood and Wexham Park Hospitals NHS Foundation Trust*

Outcome for head and neck cancers is improved with early diagnosis. At our Local hospital a dedicated Lump in Neck Clinic (LINC) is the gateway for referral from GP to specialist otolaryngology surgeons and radiologists, with clinical examination, ultrasound scans and fine needle aspiration (FNA) to identify cancer with minimal delay.

GPs can refer directly to LINC or to a (cheaper) community Ultrasound scan (US). We investigate how GPs are referring patients for community imaging before referral to LINC, resulting in a possible delay in diagnosis.

Data collection includes all GP referrals for community Ultrasound neck or thyroid from January to March 2013. Including content on referral form, ultrasound operator, ultrasound report, advice for referral to LINC and patient outcome.

123 patients underwent community scans of which 23 were referred on to LINC. 6 underwent surgical procedures, with 1 diagnoses of cancer. 23 of the 123 community US reports advised referral to LINC clinic however 6 of these had no follow up locally. Of the 123 scans 98 were performed by ENT specialist radiologists with 100 being reported as benign.

In conclusion, GP scans reduce the workload for head and neck cancer pathways. However resulting in a delay to diagnosis of cancer and putting patients, radiologists and GPs in a vulnerable position should cancer be missed at initial GP US.

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## **P-120 Do you see what I see? Clinical review of discordant chest x-ray consultant radiologist and radiographer interpretations**

[Nick Woznitza](#); [Keith Piper](#); [Graham Bothamley](#)

*Radiology Department, Homerton University Hospital; Department of Allied Health Professions, Canterbury Christ Church University; Department of Respiratory Medicine, Homerton University Hospital*

**Aim:** 20% observer variation is reported in the literature for chest x-ray (CXR) interpretation. However, not all errors are clinically significant. We examined the clinical significance of discordant radiographer chest x-ray reports.

**Methods:** 100 CXRs were randomly selected from a consecutive series of 1,000 interpreted by a trained reporting radiographer in clinical practice. Three consultant radiologists (CR) independently assessed 50 CXRs for agreement with the radiographer report, with 50% overlap to assess inter-radiologist variation. Abnormal cases were categorised as clinically significant/insignificant. Clinical review of discordant cases provided the definitive diagnosis.

**Results:** 99 cases were available for review (40 abnormal, 30 significant). Seven CXRs were discordant.

CR1	CR2	CR3	Radiographer	Clinical-Review	Comments
AS	AS		AS	0	CR1 added "cardiomegaly"; CCF
		AS(X)	AS	√	COPD vs CCF
N			AN	0	Bronchial wall thickening
	AS	N(X)	N	X	Mediastinal lymph node
	AS(X)	N	AS	X	Rotation misinterpreted as consolidation
		N	AS	X	Composite misinterpreted as consolidation
	AS	AS	N	X	Linear Atelectasis

AS=Abnormal, significant; AN= Abnormal, not significant; N=normal; √=right; X=wrong; 0=immaterial

The reporting radiographer over-reported and under-reported two x-rays; one of each was also an error from a radiologist. Mediastinal lymphadenopathy was missed by both the radiographer and one radiologist; active tuberculosis was diagnosed after lymph node biopsy. In one case, the radiographer correctly diagnosed heart failure rather than COPD.

**Conclusion:** Chest x-rays are a frequent source of discordant interpretations. Disagreement between a reporting radiographer and consultant radiologists is similar to inter-radiologist disagreement.

### P-121 Missed lung cancers on chest radiographs

[Sze Mun Mak; Jonathan Spratt](#)

*Chelsea and Westminster Hospital NHS Foundation Trust*

Chest radiography is the most common clinical assessment of patients presenting with chest symptoms. It is vital to have a high standard of reporting by radiologists in order to detect lung cancer as early as possible, or to suggest appropriate follow up if features are suspicious on chest radiograph. The RCR National audit in 2005 used the following targets: (1) The lesion should be identified in >75% of chest radiographs performed within one year of the diagnosis (2) When a lesion is reported, further investigation should be recommended in >95% of cases.

The sample consisted of 40 patients diagnosed with lung cancer within the last 6 months. Patients were identified through lung cancer MDTs. Those without a chest radiograph within the last 12 months preceding the diagnosis were excluded from the audit. Radiograph reports were reviewed, and reports were categorized as: (1) Appropriate reports, lesion identified; (2) Appropriate reports, Lesion identified as indeterminate, and appropriate further investigation or follow up suggested; (3) Non-specific reports, lesion identified as indeterminate but no follow up suggested; (4) Missed cancers, lesion not identified; (5) Examination not reported.

Our institution met our modified standards for correct identification of >75% of malignancy on radiographs. Communication fell marginally below standards, with 85.1% of the reports deemed appropriate.

### P-122 Obesity increases precision errors in fat, lean and bone mineral density measurements on total body dual energy x-ray absorptiometry scans

[Karen Knapp; Susan Hopkins; Andrew Shallcross; Joanne Welsman; Ignac Fogelman; Glen Blake](#)

*University of Exeter; Babcock International Group; King's College, London*

This study investigated the effect of obesity on precision errors in total body (TB) dual energy x-ray absorptiometry (DXA) measurements.

144 female volunteers were recruited and underwent duplicate TB DXA scans (GE Lunar Prodigy, Bedford, UK) with repositioning between scans. The mean age was 41.04 ± 15.34, mean BMI 26.07 ± 5.55. Subgroups were created

based on the WHO criteria for body mass index (BMI) and on percentage body fat. The RMSCV% was calculated for each of the groups for TB and individual regions of interest (ROI's).

Total body DXA is increasingly being used for accurate assessment of body composition in research and clinical applications.

The RMSCV% (ROI's and TB) for BMD, fat and lean tissue ranged from 0.77 to 2.20, 2.98 to 6.81, 1.42 to 3.69, respectively for the optimal BMI group; 0.69 to 2.61, 1.72 to 8.62, 1.34 to 4.74 respectively for the overweight group and 0.91 to 3.30, 1.55 to 10.36, 1.68 to 8.15 respectively for the obese group. When the analysed by percentage body fat subgroups, those with >45% fat had the highest precision errors.

These data demonstrate increasing precision errors with increasing BMI, many of which are significantly greater than the 1% considered usual for DXA. This relationship is maintained when analysed using body fat cut-offs. The lowest precision errors were in the total body results and the errors increased when using compartmentalised measurements. It is important to consider the BMI of those undergoing TB DXA measurements to be aware of the associated errors.

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### **P-123 Mimics of pancreatic tail lesions on cross sectional imaging**

[Dhivya Murthy Paravasthu](#); [Madhusudan Paravasthu](#); [Jayan Nair](#); [Ashok Katti](#); [Anbu Nedumaran](#)

*Aintree University Hospital NHS Foundation Trust*

**Aim:** We aim to present imaging appearances on CT and MRI of entities that mimic lesions within tail of the pancreas.

**Content:** A series of cases of imaging mimics of normal pancreatic tail and pancreatic lesions including splenunculus, Splenic haemangioma, aneurysm, peritoneal deposit, pancreatic pseudocyst, pancreatitis, fat infiltration, distended pancreatic duct with stone, IPMN etc is presented with variety of cross sectional imaging appearances and pitfalls in recognition.

**Relevance/impact:** A variety of pancreatic and peripancreatic entities can mimic pancreatic tail pathology and a thorough understanding and knowledge of these is required to differentiate normal variants and pathological entities from pancreatic tail neoplasms. This can help reduce unnecessary further imaging, endoscopic interventions or surgery by differentiating pancreatic tail mimics and benign conditions from malignant lesions. This review is aimed at summarizing the commonly encountered entities that mimic pancreatic tail lesions outlining the salient imaging features, mainly on CT and MRI.

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### **P-124 Audit of the management of “adrenal incidentalomas”**

[Waheed Mustafa](#); [Lakshmi Kanagarajah](#); [Bhavin Upadhyay](#); [Sami Khan](#); [Qaiser Malik](#)

*Basildon and Thurrock University Hospitals NHS Foundation Trust*

**Aim/objectives:** To determine if evidence-based “adrenal protocol” was followed for managing the detection of adrenal incidentalomas at Basildon and Thurrock University Hospitals (BTUH).

**Content of presentation:** Standard and criteria - 100% of patients should have biochemical analysis (Endocrinology referral) to assess functionality of the incidental adrenal lesions. 100% of patients should have dedicated adrenal imaging for further characterisation.

**Methodology:** Reports of 760 patients with abdominal-CT over 6 months were reviewed retrospectively.

**Relevance/impact:** Adrenal incidentaloma is an unsuspected, asymptomatic mass detected on imaging, usually computed-tomography (CT), obtained for other purposes. Asymptomatic masses may later prove to be functional. They can be benign/malignant and functional/non-functional. The incidence is 4-5% on average. Evidence-based “adrenal protocol” needs to be followed on detection, consisting of biochemical analysis and dedicated imaging for further characterisation.

**Outcomes:** 21 patients were found to have adrenal lesions. 5 studies were being followed up for a previously identified adrenal lesion and therefore 16 (2.1%) were incidentalomas. 0% of the cases had biochemical analysis whilst only 27% of the cases had dedicated imaging for characterisation. Radiologists were lacking consistency in the reporting of adrenal incidentalomas.

**Discussion:** The audit was presented at BTUH Audit Meeting to highlight the current management guidelines based on non-enhanced-CT (NECT) and washout-CT detailing characteristics and size of lesion. Imaging algorithm was

implemented and data is being collected for future re-auditing. Emphasising the management of adrenal incidentalomas through this audit could reduce discrepancies nationally and improve patient safety.

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## Molecular and functioning imaging

### P-125 How can PET/CT amyloid imaging aid in the diagnosis of alzheimers disease?

Clare Moody; [Louise Jordan](#)

Newcastle Hospitals NHS Trust

**Aim:** How can functional imaging through Positron Emission Tomography (PET) aid in Alzheimers Disease (AD) diagnosis by detecting beta-amyloid neuritic plaques in the brain.

**Content:** Amyloid imaging for early AD diagnosis will be discussed in terms of its impact on the patient care pathway. A positive amyloid scan can increase the clinical certainty of AD whereas a negative scan can exclude AD from the diagnosis. Various radio-isotopes are available for use in amyloid imaging, although this focuses on 18F-florbetapir (AMYVID), which has FDA approval for clinical use.

**Relevance:** Amyloid imaging using PET/CT is a highly researched topic with several companies producing radio-isotopes. AD is a progressive and fatal neurodegenerative disease, early detection can increase the scope for improved management and treatment. Currently, clinical diagnosis may take up to 3 years and requires the patient to have onset of dementia. At this stage any treatments to reduce the build up and continued deposition of amyloid plaques may be too late, an early diagnosis could have a positive impact on the patient and also on NHS resources.

**Discussion:** Key issues concerning beta-amyloid imaging, voiced by the FDA and the Alzheimers Society, are image interpretation and inter-reader variability. Specific image interpretation training for all reporting clinicians has been introduced.

Studies are in progress on the use of these tracers as biomarkers of AD progression and to assess anti-amyloid therapies. It is hoped this will contribute to drug development in AD, provided that early responses to treatment are sensitive to changes detectable by PET amyloid imaging.

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### P-126 Optimising body CT imaging for SPECT.CT tumour isotope imaging

Davina Mak; [Peter Strouhal](#); [Peter Turner](#); [Fiona Whittingham](#); [Helen Balmforth](#)

Royal Wolverhampton Hospital

**Aims:** Artefacts are often seen on body CT scans as part of whole body isotope SPECT.CT scans, including respiratory motion and related to air in bowel or air-surface interface artefacts. We looked at ways to minimise these and so optimise CT images from a diagnostic perspective with minimal patient impact.

**Impact:** CT images acquired for localisation and attenuation as part of whole body SPECT CT tumour isotope scan have greater potential to provide additional diagnostic information, with no additional radiation burden, by the implementation of some or all of these manoeuvres.

**Outcomes:** Reduction in bowel gas artefacts can be achieved with oral contrast in MIBG and Octreotide scans; soft tissue-air interface artefacts can be mitigated with wedges to subtly alter patient position and normal saline bags for parathyroid scans; respiratory movement artefacts is markedly improved using end-expiration in any chest scans.

**Discussion:** Minor additional patient preparation with minimal inconvenience for patients or staff produces a greater diagnostic yield from the CT component of SPECT.CT in any neck, chest and abdominopelvic scans. Minimal/no associated risks are seen, no compromise on scanning time encountered and only a minimal increase in staff involvement required.

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### P-127 "New clear" hybrid imaging for pulmonary emboli

[Peter Strouhal](#); [Peter Turner](#); [Helen Balmforth](#); [Fiona Whittingham](#)

Royal Wolverhampton Hospital

**Aims:** To propose updated (hybrid) imaging algorithm for the detection of pulmonary emboli.

**Content:** Quick review of development of VQ planar imaging into SPECT and to illustrate how Q SPECT alone can be used as a gatekeeper for CTPA imaging; subsequently detailing a new technique of integrating this with CTPA images

(performed on same scanner or fused later), when needed, to identify only clinical relevant pulmonary emboli. Can also use Q SPECT to evaluate which PE identified on CTPA might be clinical relevant.

**Impact:** To streamline referrals for PE imaging, to reduce delays from non-diagnostic VQ or CTPA scans, to reduce negative PE detection rate from CTPA and avoid false positives as much as possible; to reduce the reliance on ventilation isotope imaging, which often limits the availability of VQ scans, so reduce costs.

**Outcomes:** Small numbers of patients only put thru this algorithm to date but >95% correlation between positive Q SPECT and CTPA; no patients with discordant Q SPECT and CTPA who were watched rather than treated proved to have PE; CTPA reduced referrals with improved rate of positive findings.

**Discussion:** Clear advantage to have a gamma camera with CT capability rather than separate scanners; need a nuclear medicine department but Q SPECT is more reproducible and more straightforward a technique than perhaps appreciated; need dedicated staff and fusion software to deliver the final outcomes/imaging.

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#### P-128 **Breast cancer: The curious incidence of the hot head on the bone scan**

Katherine Klimczak; David Little; [Nicholas Ridley](#); Sarah Taylor

*Great Western Hospitals NHS Foundation Trust*

**Aims/objectives:** To present the range of normal skull appearances on 99m-Technetium bone scintigraphy. To highlight the causes for increased uptake within the skull on bone scans in breast cancer patients

**Content:** This pictorial review will display a selection of normal bone scintigraphy images alongside the varying pathologies we have encountered in our institution over the last 5 years to highlight the causes for a 'hot head' on a bone scan in female patients with breast cancer.

**Relevance/impact:** Whole body 99mTechnetium methylene diphosphonate (99mTc MDP) bone scintigraphy is used commonly in patients with breast cancer for the early detection and staging of bone metastases. Bone scintigraphy is not without limitation and can give false-positive results in the presence of benign bone lesions that show increased osteoblastic reaction. It can also give a falsely reassuring negative result if the metastases present are not metabolically active enough to cause sufficient uptake.

This poster will focus on the causes of increased uptake within the skull on the bone scan and alert the reader to the potential for the possible alternative diagnoses than metastatic disease. The various pathologies we have encountered in our institution over the last 5 years include; metastases, Paget's disease, hyperostosis frontalis interna, previous craniotomy, benign bone lesions and sinus disease.

**Discussion/conclusion:** As bone scintigraphy remains a valuable tool in assessing the presence and extent of bone metastases in breast cancer, Radiologists must be aware of the other causes of increased skull uptake to ensure the accuracy of their reports.

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### Innovation in service delivery

#### P-129 **The art of rejection**

[Nicholas Taylor](#)

*Great Western Hospitals NHS Foundation Trust*

The presentation will explore how film rejection data from Computed and Digital Radiography (CR/DR) systems can be customised by the user and provide examples on how data collected from nine Fuji CR/DR workstations has been adapted, customised and standardised with analysis performed every monthly. Data from all workstations is exported as Excel spreadsheets along with jpegs of rejected images via data stick to a central data hub and amalgamated to a central spreadsheet allowing month on month comparisons between readers and departments as well as the main rejection criteria, namely, positioning errors, exposure errors and patient identification errors.

The analysis of the data has allowed trends between workstations, and departments to be tracked, as well as indicating areas for improvement/training needs, particularly when combined with the ability to review rejected images on the workstations at the time of data collection.

Exported jpegs permit a traditional review of overall image quality and rejection criteria as used with plain film. The benefit of the image being digital is that it can be reviewed on any PC, at any time, without the problems of storage, manual handling and disposal experienced before the advent of digital imaging in radiography.

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The ability to customise and export data direct from workstations can therefore help to reduce the time to taken to perform reject analysis and how it can be reviewed and shared with others to provide as much information as the user defines.

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**P-130 One stop orthopaedic clinic: Value-added musculoskeletal radiology in the new model of patient care cycle**

P Sankaye; J Crighton; A Gafoor; K Green; [Ajay Sahu](#); SP Suresh

*Plymouth Hospitals NHS Trust*

**Background information:** In the current era of healthcare reform and accountable care organizations in new look NHS, radiology faces a number of challenges as the delivery of healthcare continues to evolve in order to provide better patient care and reduce waiting lists. The purpose of this exhibit is to illustrate the importance of creating value-added radiology services such as One Stop Orthopaedic Clinic and areas to work toward creating better team working in the future.

**Material and methods:** We have started instant orthopaedic ultrasound for the patients in Orthopaedic and fracture clinic. This model has been running successfully for last three months and will complete a year at the time of presentation. We will concentrate on how to ensure fast and better imaging service throughout the patient care cycle. The patient care cycle starts by them being seen by the Orthopaedic surgeons and referred to the radiologists, who have a clinic room equipped with ultrasound machine and work station. We also provide guided injection at the same time, if needed. There are significant time saving and financial gains to the patient and the trust by this service, which have been proven by our initial audit. The patient satisfaction has also improved drastically as they are getting better and quick service.

**Conclusion:** The future of how we practice radiology is changing. It is essential to know and understand the changes and how we can provide value in the emerging healthcare models to continue to provide high-quality care to our patients.

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### P-131 Experiences of a new off site CT colonography service

Paul McCoubrie; [Helena Barton](#)

North Bristol NHS Trust

In March 2013, barium enemas were totally phased out from the local hospital trust. The existing limited CT colonography service at the acute hospital was replaced with CT colonography performed in a purpose-built, off-site CT scanner. This presentation will discuss the findings of a multi-faceted quality audit of 297 patients from the first two months of operation and is compared to data from the previous service.

#### Notable findings include:

- Dose reduction by half to 5.4mSv, becoming comparable with dose rates for barium enemas.
- Pick up rate for positive mucosal findings of around 10%, of which over 20% were confirmed malignant.
- Significant incidental findings (e.g. AAA >3cm) were reported in 5% of patients, which would otherwise not have been picked up on barium studies.
- Low complication rates and high completion rates.
- A purpose-built unit allows a calm and dignified service, attracting much praise from patients.

With this evidence, we have shown that CT colonography in an off-site scanner is a viable model for hospitals looking to transition away from barium enemas.

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### P-132 Implementing advanced practice in diagnostic radiography: The Scottish perspective 2013

[Ian Henderson](#); [Sandra Mathers](#); [David Minnoch](#)

Robert Gordon University, Aberdeen

Health policy in Scotland is devolved from the rest of the UK and explicitly promotes the development of extended scope/advanced practice roles for radiographers. Evidence indicates that the evolutionary rate of such roles differs in comparison to the rest of the UK. This study, supported by a CoRIPs award, examines the current situation in Scotland.

**Aim:** In context of Price et al's UK wide 'Scope of Radiographic Practice 2008', the primary aim of this research was to determine the scope of radiographic practice in Scotland taking into account health policy, professional factors, service pressures, demography and geography.

**Method:** A two stage exploratory study sought quantitative and qualitative data from lead radiographers in all Scottish hospitals with diagnostic imaging facilities (n=111) and strategic imaging managers across the 14 Health Board areas (n=14). Job specific questionnaires were distributed to both sample groups. Semi-structured interviews were undertaken with a sub-sample, to explore specific elements of the questionnaire responses. Quantitative and qualitative analysis was undertaken using SPSS-PC® and NVIVO®.

**Results:** Preliminary results indicate that the expected range of skill mix activities are undertaken with predominant activity (by department) relating to reporting in ultrasound (n=23); appendicular skeletal (n=12); axial skeletal (n=10); fluoroscopy (n=7) and breast (n=4). Hot reporting was carried out in 9 sites and 24 had image commenting in place.

**Conclusion:** There are notable disparities in the implementation of advanced practice roles and the drivers and inhibitors are multi-factorial. Strategic managers described a lead in time of 2-5 years for the development and effective establishment of advanced practice initiatives.

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### P-133 How much does imaging influence speed of discharge in hospital?

Basel Jaber; [R Simon Davies](#); [Sharon Evans](#)

Abertawe Bro Morgannwg University Health Board

There is increasing publicity both within the health service and the press about provision of consultant input to patient care at weekends to improve patient outcome. The majority of hospitals provide some form of service out of hours and in radiology this is often by consultants being first on call. Delays in radiological investigations are often blamed for delay in diagnosis and discharge, whereas we felt that radiology was rarely a cause of delay in discharge or diagnosis.

We therefore decided to look at all in patient investigations (excluding plain films) performed on patients over a seven day period in this busy general hospital. In all cases we documented the time of referral, time of scan and time

of report. A sample of patients with normal studies was selected and the notes retrieved to see if the patient was discharged immediately following the receipt of the results of any investigation.

The results showed that over 95% of all inpatient request for complex investigations were performed within 24 hours and that receipt of a normal radiological investigation often did not mean early discharge for patients.

The conclusion in our establishment is that radiology performs the vast majority of all investigations on in patients within 24 hours and is rarely the cause of delay in the treatment or discharge of in patients.

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#### **P-134 A prospective audit into radiology requesting in an acute medical unit: Are imaging requests being processed within the recommended timeframe?**

[Teresa Jacob](#)

*Basildon and Thurrock University Hospital*

Imaging is a key part of the assessment, diagnosis and management of acute patients. Our hospital provides clear guidance, in the form of a service level agreement (SLA), on the time frame for acquiring imaging and receiving a formal report for in-patients. A prospective study assessing the time delay between decision to image and imaging taking place over one week within the acute medical unit was conducted. 38 requests met our criteria, 71.1% of requests were not delivered to radiology and 86.8% of scans were not conducted within the recommended time frame. The reasons for this include; a limited number of junior doctors and porters on a 50 bed ward; and an overstretched radiology department.

The service provision within the hospital is clearly insufficient to meet ideal targets. To improve the quality of care, our hospital intends to implement a formal traffic light triage system on all imaging request forms. This aims to ease pressure on the radiology service and expedite patient care.

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### **Professional training and education**

#### **P-135 Self-assessment = autonomous learner?**

[Alexandra Partner](#)

*School of Health and Social Care, University of Derby*

##### **Aims/objectives:**

To identify the benefits and challenges to students who use self-assessment.

To identify a change in attitudes and behaviours of students who use self-assessment.

**Content:** What has the reaction been like to self-assessment, have attitudes changed? Take a look at the advantages and what skills this is giving the student and how it's preparing them for the future. We must also consider the limitations and barriers to a change in radiography education.

**Relevance/impact:** As a higher education institution offering a diagnostic radiography programme, our aim is to provide suitably qualified, confident students that can take on new challenges and have the confidence to practice autonomously out in the work place. With the introduction of self-assessment, it forces students to take responsibility for their work, to be honest, to self-evaluate and to consider improvement.

**Outcomes:** With newly qualified radiographers expected to be independent autonomous practitioners, we as educators must make sure we are pushing students further and giving them the confidence and skills to start their first post. Getting students involved in self-assessment is just one area that has aided in doing this.

**Discussion:** How can we develop this further? Trial self-assessment in clinical practice and consider this style earlier on in their studies. How the development is measured eg. NSS, module feedback and module results.

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### P-136 An observational study of intercultural communication in diverse professional learning groups

Leslie Robinson; Rob Higgins; [Peter Hogg](#)

*School of Health Sciences, University of Salford*

**Aims:** Facilitated by Erasmus, for three weeks during August 2013, the University of Salford hosted a unique programme for student and qualified radiographers. 67 students and tutors from UK, Switzerland, Norway, Portugal and the Netherlands participated. The programme engaged 6 multicultural groups to complete 6 different research experiments. By mid-November each group had prepared an article for journal submission.

This poster will concentrate on the interactions in one Erasmus group undertaking their research task. The aim was to explore the influence cultural diversity might have on group collaboration and learning goal.

**Content:** Three hours (2 learning episodes) of observational video data are reported using the Rapport Management framework of Intercultural Communication which considers the competing demands of 'face', 'interactional goal' and 'group rules/roles'.

**Relevance/impact:** To inform tutors facilitating short-term intercultural learning groups by identifying potential barriers to learning.

**Outcomes:** i) No intercultural pragmatic failure was apparent ii) For one, limited English language skills held her back for fear of face loss, others struggled with English when task discussion became complex. iii) Team working was not evident and there was no allocated leader. There was no delegation of tasks. This manifested in lack of role clarity and disengagement. iv) The group was goal-oriented, succeeding in this regard, however goal was prioritised over social interaction.

**Discussion:** The group dynamics of short-term multicultural groups require careful management. Establishing roles is important as is encouraging social interaction.

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### P-137 Partnership working: Changing cultures and winning awards

Sherrie Mokrian; Lucy Bond; Jane Cremer; Sarah Durkin; Richard Solomon; [Sophie Willis](#)

*Royal Free London NHS Foundation Trust*

**Background:** Radiography education programmes can effectively address the needs of students and consequently service users by ensuring that academic and clinical aspects of programme delivery are harmonised. Establishing effective working relationships can be demonstrated to have a multifaceted positive impact of all stake holders. Such benefits range from more positive student learning experiences during clinical placements; leading to reductions in attrition and increases in retention. For staff, working alongside motivated and engaged students fosters a supportive environment where teaching and learning can flourish. Equally, service users benefit from informed staff and students working together collaboratively to provide the highest possible standards of care.

**Aim:** Over the course of an academic year, new support structures were implemented to support both staff and students within an imaging department. Clinical and academic colleagues liaised closely to increase communication and promote positive learning and teaching experiences, often within a much pressured clinical environment and espouse a supportive learning culture.

**Outcomes:** This presentation will detail the positive changes in culture arising from both staff and student feedback as a result of the establishment of a new team of student coordinators within a diagnostic imaging department. Examples of successful learning initiatives and strategies within different areas of the department will be explored from both staff and student perspectives. And finally, to reflect on the success of being named regional 'team of the year' for the transformative learning culture changes that ensued as a result of a more effective working relationship between academic and clinical partners.

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### P-138 Overview of a European summer school for diagnostic imaging research

Leslie Robinson; Rob Higgins; [Peter Hogg](#)

*School of Health Sciences, University of Salford*

**Background:** Radiographers have a poor tradition of publishing quality research. European funding (€67,000) was acquired to subsidise a unique 3-week residential research summer school to give student radiographers, and other professionals (eg biomedical scientists), experience of conducting team-based research, in order to demonstrate its value and highlight research as a potential career pathway.

**Aim of poster:** Describe the summer school.

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**Content:** 67 students/academic staff from 5 countries participated, the majority were radiographers. 6 teams conducted research under laboratory conditions. Research focus was the optimisation of x-radiation dose and image quality. Research commenced 2 months prior to the residential component; it was completed within 6 months. The teams designed methods, collected/analysed data and wrote papers for journal submission. Several socio-cultural activities were organised to improve team cohesion and intercultural understanding.

**Outcomes:** Several multi-author papers were submitted to journals - six 'empirical research', three 'relevant literature reviews' and two 'qualitative evaluations of student/staff experience'. Questionnaire evaluation was highly positive for academic and social components. Funding (€67,000) has been awarded for a second pan-European research summer school.

**Discussion:** Our summer school lasted 6 months, with a 3 week intensive residential component. Participants, for the first time, engaged in team-based research under the supervision of an experienced principal investigator. Participants engaged in the complete process - from inception through journal peer review to publication. We believe this experience provides a comprehensive and realistic experience of research. Radiographers need to be more active in publishing research and innovative approaches like ours need to be considered.

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### **P-139 An evaluation of interactive sessions involving radiography students and a simulated patient**

[John Huckle](#); [Ann Westmoreland](#); [Susan Devine](#)

*Faculty of Medicine and Health, University of Leeds*

**Background:** The School of Healthcare, University of Leeds has adopted a workshop model involving simulated patients which has been used by the Faculty of Medicine, University of Leeds. This paper addresses the educational benefits for radiography students of workshops involving simulated patients in specific radiography professional scenarios, as part of their Diagnostic Imaging Technique module.

**Aim:** The aim of the workshops is to improve communication and interpersonal skills.

**Method:** Two second year radiography students volunteered to take part in two different radiography scenarios with a simulated patient (one student in each scenario). Following each scenario, the volunteer reflected on things they did well and things they would do differently next time. They shared this with the whole group and workshop members gave constructive feedback. Student feedback was obtained using questionnaires after both scenarios were completed.

The same scenarios were repeated the following day with a different group of radiography students, but with the same simulated patient.

**Conclusions:** Generally, students found the sessions useful, allowing them to strengthen areas of weakness in their interpersonal skills and learn from others' feedback. The feedback given from the simulated patient was found to be very helpful.

It was suggested that the sessions could be improved by having smaller groups and more simulated patients, so that more people can be directly involved in the scenarios.

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### **P-140 Integration of person centred care in radiography education**

[Louise Mifsud](#)

*Robert Gordon University, Aberdeen*

**Aim:** To experience a day in the life of a service user/supported person.

**Objectives:** To observe a range of activities experienced by the service user. To assist (where appropriate) with the needs and caring of the service user in co-ordination with the service user and their families/carers. To discuss the experiences of interactions with the health service. To identify any issues experienced (or potentially be experienced) with the radiography department.

**Content:** A discussion of the development/integration of care provision and empathy within challenging environments in radiography education. A unique opportunity, the service user (supported person) experience (SUE), is undertaken by each diagnostic radiography student during stage 2. Evaluations of student perceptions/experiences were conducted.



**Relevance/impact:** To prepare students for a range of challenges they can encounter and to gain an understanding of the complex and multiple issues experienced by people in their everyday lives and within a health context. Students reflected on the experience and considered changes in future practice.

**Outcomes:** Pre SUE most students expressed a positive anticipation with some low levels of anxiety due to the unknown element. Post SUE students gained more confidence in dealing with challenges and expressed a greater range and depth of empathy and care for their person. ☒

**Discussion:** By placing students with a person outside the hospital environment it helps to personalise the experience. It should have a lasting impact on the student and how they deal with people with chronic conditions within the imaging department.

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#### **P-141 Modelling the migration patterns of radiography undergraduates**

[Chris Wright](#); [Sarah Naylor](#)

*Sheffield Hallam University*

Research aim is to identify the geographical impact on students entering Higher Education and upon qualification, to explain the emerging patterns, and to model their impact. A quantitative study investigated 2012 graduates from all UK Universities offering undergraduate Radiography education.

For every 100 students who enter University, 53 will still live in the local area at the point of first post-employment. Only 2 return to their primary location having moved away to study. Of the 24 students who moved away to study, 17 will gain employment close to their University location. 30 students will ultimately reside in a tertiary location remote from their home or University cities.

The logic for students entering higher education has changed. Traditionally high flying students perhaps sought to attend the best Universities their grades would allow and went on to develop careers with little regard for geography. Today expectations are different with most students attending the nearest University to their home. Finance is the biggest concern. International students who come to study in the UK almost exclusively stay regardless of their University location.

An implication for clinical practice and the NHS is that recruitment of newly qualified Radiographers is likely to continue to be more difficult in areas remote from University cities. This situation is exacerbated in areas where the number of graduates per University is far less than the number of available jobs in that area. Universities are seemingly justified in focussing on local recruitment as this provides the dominate proportion of their cohorts.

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#### **P-142 Using social media to promote the radiography subject area**

[Emma Hyde](#); [Alexandra Partner](#)

*School of Health and Social Care, University of Derby*

##### **Aims/objectives:**

- To share our experiences of using social media to raise the profile of the Radiography Subject Area .
- To illustrate how social media can be used promote a team's authority to teach, and support recruitment.

**Content:** The Radiography Subject Area Facebook page was launched in January 2013. It was designed to raise our profile with potential students, current students, and stakeholders such as clinical partners. The Facebook page is used by the team to showcase innovative teaching sessions, and key events that the subject area is involved in. Alongside the Facebook page, a number of staff created their own LinkedIn profiles. These profiles allow staff to showcase their skills & expertise, and create links to work they have done eg. publications.

**Relevance/impact:** The reach of the Facebook page is proving substantial, with some posts (such as the heart dissection) being seen by over 400 people. The use of LinkedIn profiles has aided in networking by allowing staff to connect with both senior academics within our own institution, and key figures within the radiography profession.

**Outcomes:** The careful use of social media has many potential benefits to HE programmes, in particular for communication and networking (Jadu, 2009). As such it was part of our strategy for 2012-13 to embed social media into our subject area.

**Discussion:** There are plans to extend the use of Social Media to include a YouTube channel and to look at Twitter, Pinterest and Flickr. Promotion of our Facebook page is on-going.

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#### **P-143 Exploring the transition period of diagnostic radiographers during their first three months of practice**

**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).

**Stage one results:** Stage one results of the three month interviews will be presented thematically.

**Discussion:** The themes identified in the results will be discussed in view of current literature and contextualised in order to identify areas for improvement.

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#### **P-144 Radiology referrals: A call for further undergraduate radiology education**

[Nishanth Sivarasan](#)

*Royal London Hospital, Barts Health NHS Trust*

**Background:** During foundation years, trainees regularly encounter patients requiring imaging investigations. Current RCR guidelines suggest that every imaging request must be justified. Justification involves considering the risks associated with imaging and proceeding in view of a net benefit. We examined a cohort of foundation year trainees for their competence and confidence in making radiology referrals.

**Methodology:** Data was collected using printed multiple-choice questionnaires. Questions tested knowledge on relative radiation doses of basic investigations, confidence when making referrals and the choice of imaging modalities for specific clinical scenarios. Subjects were also tested on awareness of radiation regulations. Answers were evaluated with 'confidence' scores.

**Results:** The study achieved an 81% response rate (57 out of 70). Of the responders, only 1.8% had previously encountered radiation regulations. Only 21% identified the relative radiation exposure from abdominal x-rays; all other subjects significantly under-estimated the associated risk. None of the subjects correctly identified the exposure associated with CT abdomen/pelvis and only 14% knew the exposure from CT chest. On questioning referral experience, 74% admitted to making referrals, on behalf of seniors, without understanding the indication. A further 58% were unsure of the information required by radiologists for successful referrals.

**Evaluation:** Results demonstrate an alarming shortfall in confidence and basic radiation regulations amongst junior trainees. Further education is required at undergraduate level, to help junior doctors appreciate the risks associated with routinely requested radiology studies and to help develop an understanding of the indications for specific investigations.

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#### P-145 Reporting by radiographers - computer tomography examinations of the head

[Paul Lockwood](#); [Keith Piper](#)

*Canterbury Christ Church University*

**Aim:** To present the objective structured examination (OSE) results of the four cohorts (n=23) who have successfully completed a postgraduate programme (accredited by the College of Radiographers) which prepares radiographers to report computer tomography (CT) neurological investigations of the head.

**Method:** Twenty five CT investigations (prevalence of abnormal cases 48% n=12, normal 52% n=13) were used in the OSE which included the following abnormal appearances: traumatic haemorrhage/hematoma (acute/chronic) infarction (acute/chronic), degenerative conditions, and tumours (glioma, meningioma, and metastases). The radiographers indicated if the appearances were normal or abnormal and provided a description and interpretation of any abnormal appearances. Responses (n=575) were compared to the expected answers previously agreed with a three consultant radiologists / external examiners. 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 twenty three radiographers who successfully completed the postgraduate training correctly identified the abnormal cases (Sn=99.3%). The % rates (and 95% Confidence Intervals) for specificity and agreement were 95.6% (93.1- 97.7) and 90.7% (88.1- 90.8), respectively.

**Conclusion:** These results suggest that this group of radiographers can report CT neurological examinations of the head 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.

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#### P-146 How advanced is our advanced practice? A survey of reporting radiography practice in England

[Victoria Ballard](#); [Siobhan Dallibar](#); [Anita Montague](#)

*Brighton and Sussex University Hospitals NHS Trust*

**Aims/objectives:** To evaluate the scope of reporting radiography practice in NHS England.

**Content:** Questionnaires were sent to the Imaging departments of all acute NHS England hospitals regarding the structure of their reporting radiographer service and relevant associated governance measures.

**Relevance/impact:** Demonstration of the current situation can be used to benchmark individual Trust progress with advanced practice in this field and inform workforce development programmes.

**Discussion:** Suitably trained and experienced radiographers have been shown to be as effective at radiographic reporting as radiologists, initially MSK imaging progressing into CXR/AXR. This role is now being further expanded to include cross-sectional imaging although the uptake of this is varied across the country.

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#### P-147 When are specialist registrars worth their weight in gold?

[Derfel Ap Dafydd](#); [Aroon Baskaradas](#); [Shabnam Bobdiwala](#) [Bobdiwala](#); [Muhammad Saleem Anwar](#); [Iain Southerland](#); [Jeremy Levy](#)

*Imperial College Healthcare NHS Trust*

**Introduction:** In this challenging economic climate, we examine the value of specialist registrars. With various changes in training and medical practice, there is the perception that they are less valuable than they were.

The primary purpose of this study is to broadly quantify the service contribution made by registrars in various specialties, across a range of clinical activities - allowing for degrees of consultant supervision. We also explore the financial value of these activities to the trust.

**Methods:** 5 investigators (all specialist registrars), collected responses from trainees sampled from all main specialties, using a specifically designed questionnaire.

**Results:** A total of 66 responses (16.8% of the Trust's SpRs) were collected from from 39 specialities. Responders reported that on average they are autonomous in 51% of their overall clinical activities. Those involved in outpatient clinics do an average of 2.7 clinics per week, seeing 48% of the clinic's patients. Trainees spend an average of 3.5 sessions a week conducting ward work, 62% of which they perform without direct consultant supervision. Surgical trainees spend an average of 3.6 sessions a week in theatre and perform 54% of the operations independently.

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**Conclusion:** Our data shows that registrars are integral to all clinical areas and uniformly spend more than half their time practicing autonomously. They offer considerable value to NHS trusts, presently costing their employer only an on-call supplement in wages. This survey also potentially offers a frame of reference for future analyses, and even trainee appraisal and comparative analyses at other trusts.

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#### **P-148 Establishing a postgraduate MRI training programme: 5 year review**

[Sylke Grootoink](#); [Wendy Wilkinson](#); [Gill Winter](#); [Lizzie Rhodes James](#)

*InHealth Group*

We have developed a postgraduate MRI training programme which provides a valuable supply of trained and experienced radiographers to the healthcare workforce whilst also providing a personal career development path. Our programme was initiated in the context of a shortage of competent MRI radiographers, an increasing demand for the modality and the requirement for services to operate for extended hours.

The 15-month work-based training is interspersed with relevant taught elements and structured around a MRI competency assessment framework which is well embedded in our organisation. Based at one of our MRI centres, trainees carry out practical training under the supervision of experienced senior radiographers. Each trainee is supported by a workplace coach and professional mentor and has a personalised training and development programme.

Trainees develop robust knowledge and skills to increase their ability in performing 'right first time' examinations. As the programme is conducted in a real world environment, students develop additional skills in problem-solving, service efficiency, decision-making and multidisciplinary team working. Students on the programme develop a strong sense of loyalty to their department and to the organisation. This has benefits in terms of improving retention and reducing the overall cost of recruitment and staffing.

An in-house training programme makes us more self-supporting in skills development and allows newly-qualified radiographers to be exposed to a broad range of clinical activity. We will present the challenges of establishing the programme and key lessons learned from 5 years experience, as well as the learning and career outcomes of the trainee cohort.

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#### **P-149 Student perception of performance post recorded diagnostic radiography clinical simulation**

[Louise Mifsud](#)

*Robert Gordon University, Aberdeen*

**Aim:** To evaluate the effect of giving students access to digital footage of their performance during a diagnostic radiography simulation to supplement the existing feedback process.

##### **Objectives:**

- To ascertain if providing digital footage to the student has an impact upon their perception of their performance in the simulation.
- To explore if viewing the digital footage has an impact upon the process of reflection post simulation.
- To explore if the student feels differently about the simulation having had the opportunity to watch the footage following the simulation.
- To explore if the students place any value on receiving their digital footage.

**Content:** Clinical simulation with patient volunteers has been integrated into the diagnostic radiography (DR) program in Year 1.

**Relevance/impact:** Feedback is recognised as the most important aspect of clinical simulation. The combination of face to face feedback with the opportunity to view the video footage was to improve student confidence and to facilitate their reflective process.

**Outcomes:** All students had a more positive perception of their performance post viewing their individual recorded clinical simulation.

**Discussion:** The potential stress of the simulation can mask the student's abilities; therefore the opportunity to view the simulation at a later date can enable the student to be more objective of their own performance.

Student comments revealed that viewing the video footage helped to reinforce errors realised at the time of the simulation as well as recognise the positive aspects of their performance.

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### P-150 Does simulation enhance the experiential learning of diagnostic radiography students?

Ruth Wilkinson; Jennie Swift

Rotherham NHS Foundation Trust; Sheffield Hallam University

**Aims:** Technology enhanced simulation training is one of the latest learning, teaching and assessment tool available to educators. This study aims to identify strengths and weaknesses of this learning tool when preparing diagnostic radiography students to be able to work as part of a team during a medical emergency.

**Methodology:** Simulations were based upon individual and team training needs, previous critical incidents and national standards of care. Participants were introduced to the concept of simulation through an informal talk, which explained that simulation was to provide a more realistic learning experience in a safe environment. Three students on clinical training placement agreed to take part. Their experiences were assessed by means of a reflective diary, completed immediately following and 4-6 weeks post simulation.

**Outcomes:** Initial findings indicate that two students experienced a strong emotional response when the patient's distressed wife appeared demanding to know what was happening. This is an interesting point as human distress caused distress in the team. The mannequin did not elicit the same emotional response.

**Relevance/impact and discussion:** Providing a clinical atmosphere allows the students to practice their skills in a more realistic setting with real time pressures. By introducing actors, students can identify their own possible emotional triggers and then develop coping strategies to deal with situations, that they as individuals, find physically and emotionally stressful. Increased self-awareness may enable individuals to care for their patient and their relatives more effectively when next placed in this situation.

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### P-151 Death and dying - are students prepared?

Alexandra Partner; Kirsty Wood

University of Derby

#### **Aims/objectives:**

- To understand what students expectations are;
- To explore possible ways of delivering focused, curriculum based activities based on actual need.

**Content:** It is inevitable that radiography students will encounter death and dying patients during their pre/post registration experiences. Currently the extent to which students are adequately prepared for these encounters is unknown. Potential changes to the curriculum and how these may be delivered most effectively have yet to be explored.

Limited practical preparation is undertaken with regard to dealing with the emotional impact of these situations. Current curricula concentrate on clinical and administrative procedures rather than professional supervision and reflection.

**Relevance/impact:** Through personal tutor discussions and curriculum reviews, it has been identified that students have raised the issue of struggling to cope or feeling upset after these experiences on placement. With the care and compassion on the national agenda, we as educators must look at how we can implement this into the programmes. Addressing how students are prepared for dealing with these situations could not only help with retention figures but make a more empathetic healthcare professional.

**Outcomes:** A review of this topic within our school of health has led to a research proposal being devised to explore student's perceptions of their preparation for and expectations of dealing with death and dying patients.

**Discussion:** What is the best form of delivering of such topics, should it be introduced through an inter-professional learning approach?

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### P-152 An analysis of the student and tutor experience of an Erasmus funded residential research event

Robert Higgins; Leslie Robinson; Peter Hogg

School of Health Sciences, University of Salford

**Aim:** To explore the experiences of students and tutors who participated in a residential Erasmus funded residential 3 week research event during August 2013.



**Content:** Two semi-structured focus groups (student and tutor) were conducted to explore participant experiences. Both focus groups lasted 60 minutes and were audio recorded. The recordings were transcribed and coded to identify the main themes.

**Relevance/impact:** This was a unique event that engaged radiography, physics and biomedical students and tutors from the UK, Switzerland, Norway, Portugal and the Netherlands.

**Outcomes:** Students and tutors considered the residential summer school as a positive experience, especially with regards to collaborative learning. It was also seen as an opportunity to undertake research and share knowledge.

**Discussion:** A number of recommendations are suggested to ensure the success of future research-based Erasmus-funded multi-cultural and multi-disciplinary programmes:

- Tutors and students should have clarity about the primary research objectives.
- Tasks may take longer than expected with international and inter-professional groups; therefore allow extra time to complete research or learning tasks.
- The group size should be no more than 10 students, with at least two tutors per group to facilitate activities.
- Group work activities should commence as early as possible, preferably in the first week to help galvanize the group.
- Welcoming and social events help students and tutors to network, communicate with one another and facilitates group working.
- Lectures should be aimed at the appropriate level (undergraduate), not be too complex or unnecessarily long and relevant. Otherwise students will lose interest.

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### P-153 The utility of applications (Apps) in the radiography curriculum: A baseline survey of student opinion

Penelope Bell; [Jane Harvey-Lloyd](#)

*University Campus Suffolk*

**Introduction:** Hundreds of applications (Apps) are available for multiple platforms. Many students appear to own smartphones or devices as they are seen in classrooms by teachers on a daily basis. Harnessing familiar resources is cost effective, accessible, likely to be successful and student centred. This project aimed to discover through an online survey, the attitude and views of student radiographers regarding the use of devices, and potentially Apps, in the classroom.

**Method:** A questionnaire was developed on SurveyMonkey and emailed to all Diagnostic and Radiotherapy students registered at UCS. The survey questions included familiarity of device use, previous App use and attitudes toward potential inclusion of Apps as an optional classroom resource in the future.

**Results:** 118 (61%) of students responded from a total of 193 radiography students. 91% (n = 107) of respondents had used an App and 80% would like Apps to be suggested for modules.

**Discussion:** The response rate for the survey was very high. Almost all students had experience using at least one App. Comments were favourable to the idea of apps supported by faculty and most students wanted the option of suggested Apps for classroom learning to be taken forward. Many centres have provided students with a device in order to evaluate Apps use but that is temporary and lacks full commitment if the device is later to be returned. This project is practical in its approach of utilising currently available resources, fully familiar to the student, therefore more likely to succeed and be sustainable.

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## P-154 What, where, and how; a proposal for structuring preliminary clinical evaluations

James Harcus; Chris Wright

Sheffield Hallam University

The vision of the Society and College of Radiographer's to introduce commenting skills as a competency for Radiography graduates by 2010 has passed relatively unanswered. However, there are renewed calls for 'preliminary clinical evaluations' to be integrated into the training of new Diagnostic Radiographers (SCoR and RCR, 2013).

**Aim:** This paper looks to implement a method for structuring preliminary clinical evaluations (comments) in acute musculoskeletal trauma within an undergraduate training program. It outlines a simplistic but comprehensive method of constructing comments by students. Introduced early in the program, this will incorporate an understanding of common injury types, anatomical knowledge, and medical terminology into a product which is both accurate and informative for an acute clinical situation.

The method consists of:

- What is the abnormality?
- Where is the abnormality?
- How is it displaced?

**Discussion:** Used within the classroom and clinical practice setting it can enhance student understanding of theoretical concepts, and is readily open to assessment to demonstrate accuracy of diagnosis and content. The structure allows students to break down appearances into components and make sense of even complex traumatic radiographic findings, instilling a feeling of competence and understanding.

Practices of commenting in imaging departments appear not to have widely overtaken the traditional 'red dot' system as is the SCOR's aim. Producing graduates with these skills embedded will hopefully augment this transition.

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## P-155 The patient experience - are you getting it right? The use of scenarios to emphasise the importance of interactions within the clinical setting

Georgina Howie; Caroline Blower

NHS Ayrshire & Arran

**Aims/objectives:** To use scenarios to assess patient/radiographer interactions with focussed questions enabling proactive discussion on clinical practice.

**Content:** Evaluation of need - all other aspects of radiographic practice are assessed either pre registration or through peer review or audit. Although small numbers, the majority of complaints received pertain to the patient experience and it became evident that this aspect is never assessed.

Initial intent was to record actual patient experience however this was not possible. Therefore clinical simulation (filming) was used followed by several editing sessions.

The scenarios were piloted with small groups of staff so an evaluation of the subsequent discussions could take place. An evaluation form was also developed for participants that led to improvement of the focussed questions.

Discussion of current progress and future developments.

**Relevance/impact:** Scenarios were tailored to include appropriate patient care, radiographic technique and professional behaviours; in line with Quality Strategy (Scotland) and the Board's Organisational Values.

Organised discussion groups resulting in heightened awareness for Radiographers of the impact of professional behaviour when dealing with patients and colleagues.

Radiographic technique review for Continuing Professional Development Portfolio.

**Outcomes:** To improve radiographer awareness of:

- The effect of poor quality interactions with patients
- Routine application of clinical effectiveness
- The implications of poor radiographic technique
- Received suggestions for further scenarios from staff
- Developing for LearnPro (on-line learning resource)
- Develop Assessment Criteria in line with Quality Strategy (Scotland) for participant assessment

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## P-156 Peer review in mammography - an essential part of learning and development

[Laura Starr](#); [Claire Mercer](#)

*University Hospital South Manchester*

**Aims/objective:** A fundamental part of the National Health Service Breast Screening Programme (NHSBSP) is Quality Assurance (QA). The aim of QA in the NHSBSP is 'to maintain minimum standards and to improve the performance of all aspects of breast screening in order to ensure that women have access to high quality breast screening service'.

**Aim:** To develop and implement a robust, structured peer review system in line with NHSBSP QA standards.

**Content:** Develop peer review system that encouraged reflection, discussion and problem solving. Review of developed peer review sessions with information gained used to motivate individuals to acknowledge gaps and set goals. Important tool for learning; recognise the need for regular monitoring and review to be effective.

**Relevance/impact:** Implementation of structured peer review will take time to establish into practice. Initial feedback from team members is very encouraging. To develop in other NHSBSP units.

**Outcomes:** Commencement of sessions was established. Sessions have involved:

- Open critique, discussion and analysis of 10 mammograms (different mammograms at each session).
- Practitioners document findings on image analysis form.
- Key discussion points consolidated and fed back to the practitioners through feedback report and copy of the image assessment sheet for CPD use.
- Feedback reports monitored for key themes/ trends and further training needs identified.

**Discussion:** Being responsible for managing a screening service goes hand in hand with inherent systematic QA processes; one of which is ensuring that staff are aware of their own standards of proficiency and how those standards relate to those of their peer group and standards required by the NHSBSP. Following implementation of this new system we will continually monitor and update the process.

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## P-157 Investigating the use of positioning and lead shielding to reduce gonad dose in lumbar spine examinations

[Sarah Simpson](#); [Andrew Tootell](#)

*University of Salford*

Under the ALARP principle any acceptable method which would reduce dose to the patient should be utilised. In the case of lumbar spine examinations, which carry a high associated dose, there has been very little research in to how to optimise dose to the patient.

Thermoluminescent dosimeters were positioned within a dosimetry phantom at locations corresponding to the male and female gonads. The lumbar spine was imaged in the antero-posterior and posterior-anterior, with and without the use of gonad shielding on the tube side of the patient.

The results showed that for both males and females the PA position had a significant effect with a reduction from 0.0135mGy to 0.0035mGy for the testes and a reduction from 0.4555mGy to 0.131mGy seen in the ovaries. For female patients the lead shielding had no significant effect on the dose to the ovaries as it could not be placed directly over them as it would obscure required anatomy. For male patients the use of gonad shielding did have a significant effect in the AP position when used on the tube-side of the patient, with a dose reduction of 0.01mGy.

The results obtained recommend the use of PA positioning in both males and females, where the patient's condition will allow it, and recommends using gonad shielding on males in both the AP and PA positions.

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## P-158 The rules of the game

[Peter Winter](#); [Mark Linehan](#)

*Cardiff University*

**Aim:** Using Bernstein's theory of pedagogic discourse to explore how student radiographers determine whether radiographic images are normal or abnormal.

**Content:** A study focusing on third year student radiographer's image interpretation abilities using Bernstein's educational theoretical framework as an, in-depth analytical method to illuminate the tacit rules that underpinned their interpretive decisions.

**Relevance/impact:** Many higher education institutions have incorporated image evaluation skills into their pre-registration courses, ensuring that their students have acquired and developed these skills before graduation. Bernstein's framework can be utilised as a data analysis instrument providing educators with a deeper insight into the challenges that their students face when applying notions of normal or abnormal.

**Outcomes:** The students accurately produced notions of abnormality contingent with their learning environment across case 1 revealing their acquisition of the recognition and realisation rules. However, when presented with a more challenging image (case 2) weak realisation rules authorised some of the students (n=5) to deviate from legitimate meanings despite being empowered with the recognition rules.

**Discussion:** Bernstein's theory highlights two types of tacit rules embedded in the student's interpretations. Recognition rules, said to determine 'what' legitimate meanings (ie. trauma characteristics) might be put together, and realisation rules, which determine 'how' these meanings are put together during normal vs. abnormal. The recognition and realisation rules are useful for identifying whether students have acquired 'the rules of the game' and understand what is required of them to carry out a competent interpretation of an X-ray image.

## Computer assisted detection/diagnosis and image perception

### P-159 An investigation into perceived image quality by the application of colour scales to chest radiographs

[Peter Holden](#); [Katy Szczepura](#)

*University of Salford*

**Introduction:** Despite the concept of colour radiography first being brought about in 1951 and the great advances that have been made in modern digital systems, with their ability to manipulate data post exposure, little research has been undertaken in to the application of colour scales to medical radiographic images.

**Methodology:** Three sets of twenty four chest radiographs, one with an inverted greyscale applied, one with a fire scale and one with an inverted fire scale were compared against their greyscale equivalents by eight radiography students at the end of their final year of study and marked for specific image quality criteria using a five point Likert scale.

**Results:** Overall, the inversion of the greyscale was perceived to enhance the image quality the most, yielding an average score of greater than three for six out of seven of the image quality criteria, with a p-value of <0.05 being returned for four out of those six criteria . However some of the participants did favour the fire scale and inverted fire scale for specific image quality criteria.

**Conclusion:** The application of varying scales to chest radiographs can be used as a useful adjunct to traditional greyscale in the interpretation of chest radiographs.

### P-160 Iterative reconstruction for CT pulmonary angiograms: A phantom study to investigate potential dose reduction

[Ruth Clarke](#); [Emily Lewis](#)

*Mid Yorkshire Hospitals NHS Trust*

**Aims/objectives:** To establish whether iterative reconstruction (IR) algorithms can be applied to CT pulmonary angiogram (CTPA) examinations enabling radiation dose to be reduced whilst maintaining image quality.

**Content:** A retrospective review of CTPA image quality was conducted to establish baseline quality. A phantom study was then conducted using an anthropomorphic chest phantom with a contrast enhanced artificial main pulmonary artery inserted.

The scan exposure factors were reduced incrementally by reducing the effective mA whilst keeping the kV constant. Images were reconstructed using a combination of filtered back projection (FBP) reconstruction and IR with the number of iterations ranging from 0-5 for each exposure. Imaging was conducted on a Siemens Definition 128 slice scanner.

Image quality was evaluated using subjective and objective measures to include a blind review by radiologists and signal- and contrast-to-noise ratio within the main pulmonary artery.

**Relevance/impact:** IR is becoming more widely available yet few studies have evaluated the application to CTPA examinations.

**Outcomes:** Initial analysis indicates that a significant dose reduction is possible whilst maintaining the baseline image quality in terms of both subjective and objective measures. Further analysis is ongoing and will include an estimation of the potential radiation dose reduction.

**Discussion:** The results of this study are promising and suggest a reduction in radiation dose is possible whilst maintaining image quality. Further work is necessary to investigate the application of these findings to a patient population.

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### P-161 CO2 angiography; why use it?

[Muhammad Yaman Adj](#); [Jonathan Hopkin](#)

*University Hospital Birmingham*

Carbon dioxide (CO<sub>2</sub>) has been used as an alternative agent to iodinated contrast for angiography for more than half a century. It's popularity has grown slowly over the years, pioneered by Hawkins in the 1970s by the use of Digital Subtraction Angiography (DSA).

Due to the fact that CO<sub>2</sub> is a natural product within the humans, it has proven useful in cases of patients who require imaging but have an allergic reaction to iodinated contrast. CO<sub>2</sub> as a contrast medium has also been demonstrated to be very safe. It does not cause any significant renal toxicity, and is therefore the agent of choice for those with renal impairment and/or diabetes. Even large volumes injected intravascularly result in no changes in arterial pH, pCO<sub>2</sub> and pO<sub>2</sub>. Studies have demonstrated that the CO<sub>2</sub> is respired out of the lungs on first pass.

The use of CO<sub>2</sub> is however limited to the use of arteries below the diaphragm, due to the risk of spinal, coronary and cerebral artery gas embolisms. It is also not used in those with cardiac septal defects- which would cause a right to left shunt, thereby risking cerebral gas embolisms.

The introduction of CO<sub>2</sub> angiography into this institution will be described.

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### P-162 A method to investigate image blurring due to mammography machine compression paddle movement

[Wang Kei Ma](#); [Peter Hogg](#); [Judith Kelly](#); [Sara Millington](#)

*School of Health Sciences, University of Salford*

**Background:** Compression paddles can move during mammography exposures. Speculation suggests that this movement can cause image blurring. Our method and data demonstrate that paddle movement can cause image blurring.

**Aim:** Develop a method to determine whether paddle movement can cause image blurring.

**Method:** A Hologic Selenia Dimensions mammography machine calibrated to give compression force in Newtons (N) with 24 X 29 cm fixed and flexible paddles were used in this study. Previous phantom-based research has demonstrated that these paddles move (Hauge et al). Eleven metal ball-bearings with 1.50mm diameter were inserted onto the surface of a deformable breast phantom. The ball-bearings were placed at various points, from nipple to chest wall. The phantom was compressed using the foot pedal then hand wound to 80N and also 150N respectively to represent low and high compression forces used in clinical mammography. Under these conditions, 39 mammogram images were created by exposing the phantom/ball-bearings. Image blurring was determined by measuring the change in ball-bearing diameter (distortion) using computer software.

**Results:** Ball-bearing diameters increased, illustrating the effect of compression paddle motion on the images. The change in ball-bearing diameter is the highest around the nipple region for both fixed (1.688±0.013 at 80N, 1.694±0.005 at 150N) and flexible (1.714±0.003 at 80N, 1.661 ±0.005 at 150N) paddles.

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**Conclusion:** The increase in ball-bearing diameter suggests that paddle movement can be identified on mammography images. Increase in diameter can be used as an indicator of movement severity.

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#### **P-163 Development of personalised paediatric femora model using CT**

[Xinshan Li](#); [Marco Viceconti](#); [Gwendolen Reilly](#); [Matt Carré](#); [Amaka Offiah](#)

*Department of Mechanical Engineering, University of Sheffield; Academic Unit of Child Health, Sheffield Children's NHS Foundation Trust*

**Objectives:** Children younger than three years old are most likely to experience inflicted injuries. Current diagnosis is heavily dependent on clinicians' experience and lacks objective measurements. Individualised biomechanical models could be used to identify when the carers' narrative of the accident is physically incompatible with observed fracture. The first step towards this ambitious goal is to verify the feasibility to generate accurate biomechanical models from medical imaging data of very young children.

**Methods:** Ten QCT scans were performed as part of post-mortem examination of children (0-3 years) using a GE Lightspeed 64-slice CT scanner. The scans were segmented to create finite element models of the right femora. The stiffness (Young's modulus) of femur was estimated based on measured Hounsfield units using a well-established densitometric calibration protocol. Each model was subjected to a series of four-point bending simulations, representing various directions of impact perpendicular to the shaft.

**Results:** The cross-section of the femur at mid-shaft became elongated in the anteroposterior direction for older children. The mature cortical bone was present at a very early age. The load to fracture as predicted by the biomechanical model varied with age.

**Conclusions:** This preliminary study showed that the current approach was appropriate and capable of distinguishing effects of loading, mechanical properties and geometry. Both the length and diameter of the femur increase with age, while the stiffness becomes more differentiated. The model will be further developed to simulate loading scenarios during inflicted injury to help identify injury characteristics in suspected abuse.

### Current and emerging techniques

#### **P-164 Diffusion weighting in abdominal imaging - a problem solving tool**

[Carys Jenkins](#); [Sophie Vaughan](#); [Craig Parry](#)

*University Hospital of Wales, Cardiff and Vale University Health Board*

Diffusion imaging is a valuable tool in diagnostic magnetic resonance imaging. It is an established and well recognised technique, however is often under utilized in the investigation and diagnosis of abdominal pelvic disease.

The strength of diffusion imaging lies in its sensitivity and ability to detect inconspicuous lesions, but challenges occur in its interpretation due to susceptibility to artefact when acquiring different diffusion sequences

Diffusion imaging is often invaluable in the detection and characterisation of lesions, especially when evaluated in conjunction with standard abdominal MRI sequences. Occasionally it can prove the sole component of the study that determines clinical outcome.

We present a pictorial review to demonstrate the technical aspects of diffusion in abdominal imaging. Emphasis will be made on clinical cases such as cancer staging, which demonstrate its value in lesion detection and characterisation as well as the common pitfalls.

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#### **P-165 Peninsula Trauma Centre: Our experience of imaging of pelvic fractures with emphasis on review of anatomy, classification systems and associated injuries**

[H Barber](#); [Ajay Sahu](#); [J Crighton](#); [P Sankaye](#); [A Galea](#); [D Gay](#)

*Plymouth Hospitals NHS Trust*

**Introduction:** We come across a large amount of pelvic trauma as we are now the major trauma centres in the West Country and are called 'Peninsula Trauma Centre'. We see a significant volume of trauma in Southwest of England associated with Motorcross, horse-riding and surfing.

**Objectives:** We perform a Pan-trauma CT, for all the patients, who qualify the trauma criteria. The radiologist plays a significantly important role in making an accurate and quick diagnosis. The anatomy of the pelvic ring is quite complex and it is important to understand the mechanisms of injury that lead to disruption of the ring.

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**Methods and materials:** CT is the mainstay of imaging for the initial assessment of pelvic trauma. The commonly associated injuries such as Malgaigne fracture cannot be emphasized enough. Optimizing imaging techniques may help in making a quick and accurate diagnosis, in communicating the findings to the trauma team, and in surgical planning.

**Discussion:** This presentation will review anatomy of the pelvis with illustrations, radiographs, and CT images and the current major classification systems. We discuss pelvic imaging modalities with emphasis on the use of coronal and sagittal reformats. Associated injuries and complications such as urogenital and vascular injuries will also be addressed.

**Conclusion:** It is important that the radiologist makes a timely and accurate diagnosis in cases of major pelvic trauma. Using the versatility of the current CT scanners and advanced softwares help in detection of subtle fractures and associated injuries.

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#### **P-166 Increasing SID for AP pelvis imaging - impact on radiation dose and image quality**

Jenna Tugwell; [Charlie Everton](#); Aafke Kingma; Genevieve Pereira; Dennis Oomkens; Diogo Pimentinha; Coralie Rouiller; Silje Stensrud; Jose Jorge; Elin Kjelle; Peter Hogg

*University of Salford; Hanzehogeschool Groningen; Escola Superior de Tecnologia da Saúde de Lisboa; Høgskolen i Oslo og Akershus*

**Aim:** Determine whether increasing source to image distance (SID), with and without the use of automatic exposure control (AEC) for antero-posterior (AP) pelvis imaging, reduces dose whilst still producing an image of diagnostic quality.

**Methods:** Using a computed radiography (CR) system, an anthropomorphic pelvic phantom was positioned for an AP examination using the table bucky. SID was initially set at 110cm, with tube potential set at a constant 75kVp, with two outer chambers selected and a fine focal spot of 0.6mm. SID was then varied from 90cm to 140cm with two exposures made at each 5cm interval, one using the AEC and another with a constant 16mAs derived from the initial exposure. Effective dose (E) and entrance surface dose (ESD) were calculated for each acquisition. Seven experienced observers blindly graded image quality using a 5-point Likert scale and 2 Alternative Forced Choice software. Signal-to-Noise Ratio (SNR) was calculated for comparison. For each acquisition, femoral head diameter was also measured for magnification indication.

**Results:** Results demonstrated that when increasing SID from 110cm to 140cm, both E and ESD reduced by 3.7% and 17.3% respectively when using AEC and 50.13% and 41.79% respectively, when the constant mAs was used. No significant statistical difference ( $p=0.967$ ) between image quality was detected when increasing SID, with an intra-observer correlation of 0.77 (95% confidence level). SNR reduced slightly with increasing SID.

**Conclusion:** For CR, increasing SID significantly reduces both E and ESD for AP pelvis imaging without adversely affecting image quality.

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### **P-167 Cone beam CT for upper and lower limbs: Scanning techniques**

[Veronique Sauret-Jackson](#); [Michael Hanlon](#); [Diana Bernardino](#)

*Cavendish Imaging Ltd*

**Introduction:** CBCT scanners have long been associated with head and dental applications. The NewTom 5G is the first horizontal CBCT scanner in the UK to produce CBCT scans of limbs. This paper explains the imaging protocols and the associated positioning challenges for limb scans.

**Materials/methods:** The development of positioning and scanning protocols was done with a full-size skeleton. The various fields of view were investigated by repeated exposures of the skeleton limbs. Scans on feet, ankles, knees, hands, wrists and elbows were performed with the patient comfort and physical ability in mind. Lying down and seated positions were investigated. For the fore limbs, patient's entry in the scanner was investigated from either side of the gantry.

**Results:** With fields of view as small as 6cm x 6cm and a great versatility for patient positioning, it is a challenging scenario to visualise the limb anatomy in complete cranial, caudal, supine and prone positions (e.g. the hand or elbow being placed out-stretched from either side of gantry), instruct the patient and control the chosen position.

**Conclusion:** The NewTom 5G has various FOV selections with options for Hi-Res or Standard-Res scan and Regular or Booster dose. These combinations offer a higher range of scan options to show bony structures in the body. The radiographer should be aware to show caution in the initial set-up with the patient orientation and show consideration to patient physical ability and dose when selecting the best option for the requested CBCT scan.

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### **P-168 Dual energy computed tomography in tophaceous gout - an old disease with a new perspective**

[Emma Phelan](#); [Kate Harrington](#); [William Torreggiani](#)

*Tallaght Hospital, Dublin, Ireland*

The aim of this review is to describe the physics related to Dual energy computer tomography (DECT) and its relevance to gout diagnosis, monitoring, and prediction of outcome.

DECT characterizes the chemical composition of material according to its differential x-ray attenuation at two different energy levels (80 and 140 kVp). DECT scans were performed on 8 patients over a 12 month period, with clinical diagnosis of gout using a renal stone colour-coding protocol that specifically assessed the chemical composition of the material (ie, urate coloured in red, calcium coloured in blue). Here we review the analysis and outcomes of these patients.

Clinical diagnosis of gout is difficult and definite diagnosis with positive urate crystal aspiration often is made late in the disease process. DECT is a relative new non-invasive imaging modality that is able to distinguish urate crystals from calcium in soft tissue and synovial fluid. Going forward DECT imaging could also provide outcome measures, such as change in tophus volume, for monitoring the response to urate-lowering therapy and this is an important application in the clinical trial setting.

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### **P-169 Evaluation of carbon fibre for use in MRI radiotherapy treatment planning**

[Louise Jordan](#); [Jill Mckenna](#); [Pete Thelwall](#)

*Newcastle Hospitals*

It has been established that co-registration of pre-treatment MR and CT images is an effective method of gaining improved tumour target definition alongside geometric accuracy and electron density. Patient position must be replicated throughout planning scans to achieve successful co-registration.

Carbon fibre is the material of choice for couch tops and accessories used in contemporary radiotherapy treatment and planning, due to its high tensile strength, rigidity, low radiation beam attenuation and lightweight properties. As carbon fibre couch tops are readily available and already in general use in radiotherapy departments, incorporating them into the MRI planning process would be a cost effective and convenient method of reproducing patient position. However, there is little evidence available to determine the compatibility of carbon fibre couch tops and accessories for use in MRI.

The aim of this experiment was to establish whether carbon fibre is a suitable material to manufacture flat top couches for MRI radiotherapy planning scans.

### **P-170 Are current guidelines appropriate for repeat bone scanning in skeletal metastases?**

[Kenneth Murphy](#); [Shahid Rasul](#); [Jim McGarvie](#)

*NHS Ayrshire & Arran*

RCR guidelines state that for investigation of skeletal metastases from a known primary tumour, a nuclear bone scan is appropriate to assess treatment response. This should only be performed a minimum of six months after previous bone scanning to avoid 'flare phenomenon'. Guidelines state that only new symptoms merit repeat scanning within this six month period. However, frequently scans are repeated within six months in absence of new symptoms. This study aimed to determine if these scans are of value.

Patients within the health board who had bone scans in the previous three years were collated. Those who had repeat scanning within six months were included. The reason for the repeat scan was noted and the results of the scans assessed to determine if findings differed from the previous scan. The findings were then correlated to the request reason.

30 patients had a total of 37 repeat bone scans within six months. 13 scans were repeated due to new symptoms, 17 were to re-stage disease/establish treatment response and 7 were due to a PSA rise. Scans repeated to re-stage disease/measure treatment response garnered new findings in 59% of cases. Repeated scans due to a PSA rise revealed new changes in 14% of cases.

It can be concluded that of scans performed deviating from current guidelines, those done to assess treatment response or re-stage disease showed a sizeable rate of new findings. This conflicts with current guidelines. Those requested due to PSA rise did not which is in-keeping with present guidelines.

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### **P-171 An overview of lymphoscintigraphy; what is a positive result and how does this change the management?**

[Nicola Ley](#); [Eleanor Lorenz](#); [Jonathan Taylor](#); [Jane Harding](#)

*Yorkshire and Humber School of Radiology*

**Aim:** To review the use of lymphoscintigraphy in our institution detailing the indications, methods, different findings and clinical implications of a positive result.

**Content:** Lymphoedema is a chronic condition that can have serious physical and psychological implications for patients and early recognition increases the likelihood of successful treatment. Diagnosis is often clinical, however it is important to exclude treatable differential diagnoses such as venous stasis, obesity and systemic diseases such as hypoalbuminemia before instituting a lifetime management plan.

Lymphoscintigraphy has become an important tool in making a diagnosis of lymphoedema. We aim to review the clinical indications and methods for performing the scan. We will also demonstrate the different findings that can establish a positive diagnosis and how a definitive diagnosis of lymphoedema can change the patients management in our institution.

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### **P-172 The value of I123 SPECT CT in the follow up of patients with differentiated thyroid cancer**

[Nicola Robson](#)

*Poole Hospital NHS Foundation Trust*

**Aim:** To i) Determine the diagnostic impact of I123 SPECT CT versus neck ultrasound in follow up of patients with differentiated thyroid cancer; ii) Assess if neck ultrasound could be a safe alternative to I123 SPECT CT in low risk patients.

**Relevance/impact:** Current guidelines suggest patients with undetectable thyroglobulin do not require I123 SPECT CT. This study could change patient follow up.

**Methods:** All patients over an approximate 30 month period followed up after first ablative I131 treatment or investigated for rising thyroglobulin levels had data collected.

**Outcome:** 12 out of 54 patients had suspicious abnormal imaging, two others with mildly elevated thyroglobulin were satisfactory at follow-up. Of these 12, 5 were concordant with abnormal I123 SPECT CT, neck ultrasound and stimulated thyroglobulin level with additional disease demonstrated on SPECT CT I123 scans. Seven others had a normal neck ultrasound but elevated thyroglobulin level and abnormal I123 SPECT CT scan with 2 of these demonstrating non avid disease only. 1 patient however had a normal thyroglobulin level and neck ultrasound but confirmed abnormal SPECT CT I123 scan. None of the 12 patients would have been considered low risk if post ablation scan uptake outside the thyroid bed was also taken into account.

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

## Patient dose measurement and management

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

[Edwina Peck](#); [Oliver Morrish](#)

*Addenbrooke's Hospital*

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

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

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

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

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

[Hishar Hassan](#); [Mohd Hafizi Mahmud](#); [Fathinul Fikri Ahmad Saad](#); [Salasiah Mustafa](#); [Abdul Jalil Nordin](#)

*Centre for Diagnostic Nuclear Imaging, Universiti Putra Malaysia*

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

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

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

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

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

[Jeremy Nicoll](#)

*BreastScreen Aotearoa, National Screening Unit, New Zealand*



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

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

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

[Claire Mercer](#)

*University Hospital South Manchester NHS Foundation Trust*

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

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

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

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

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

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

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

Melissa McMurrin

NHS Ayrshire & Arran

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

### Content:

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

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

### Outcomes:

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

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

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

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Centre for Diagnostic Nuclear Imaging, Universiti Putra Malaysia; Department of Physics, University of Surrey

The aim of this present study is to investigate the alternative use of a new fabricated flat optical fiber with (6% mol Ge-doped concentrations) as a potential medical dosimeter in diagnostic examinations. The flat fibers were screened to establish dosimetric characteristics of such TL media, including reproducibility, linearity, fading and energy dependence. The fibers were calibrated against a parallel plate ionization chamber. Use was made of a 70 kVp energy, with 100 cm focus to surface distance (FSD), 10×10 cm<sup>2</sup> field size and delivered at a rate of 1.2 mAs, at the surface of a Perspex solid water phantom, using a kilovoltage x-ray machine located at Medical Physics Group, Malaysia Nuclear Agency.

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

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

[Christian Burd](#)

*Chelsea and Westminster Hospital NHS Foundation Trust*

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

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

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

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

## **Radiation protection and quality assurance**

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

[Conor Clancy; Andy Shaw](#)

*The Christie NHS Foundation Trust*

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

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

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

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

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

### **P-181 Justification of polytrauma CT at a UK major trauma centre**

[Tharsi Sarvanathan](#); [Sananda Haldar](#); [Charlie Sayer](#); [Ahmed Daghir](#); [Ruth Skipper](#)

*Radiology Department, Royal Sussex County Hospital*

**Aim:** Polytrauma CT scans are a key diagnostic tool for major trauma centres. Many decision algorithms are heavily reliant on urgent access to CT imaging that offers rapid and accurate diagnostic work-up of traumatic injuries. However these require irradiation to the whole body often in young patients. Justification therefore needs to be rigorous and should be based on evidence, particularly in the case of doubtful major trauma. Our aim was to identify benchmarks for justification of polytrauma CT requests and apply these benchmarks retrospectively.

**Method:** A literature search was carried out to identify indications for polytrauma CT scans from published research and guidelines. A suitable set of criteria was then chosen as a benchmark for justification. All polytrauma CT's were retrospectively reviewed using PACS request forms and patient clinical notes over a 2 month period following the launch of a major trauma status at our institution. Justification for polytrauma scans performed during this period was then assessed using the chosen benchmark. Injury severity scores (ISS) from the national trauma registry were also assessed.

**Results:** A literature review revealed a paucity of published information on the indications for polytrauma CT scans and no consensus currently exists. Although not validated, the indications set out in the REACT2 study were selected as the benchmark for justification. A total of 52 patients underwent polytrauma CT scans. Using this benchmark, 84% of polytrauma CT's in our audit were justified on the basis of request forms alone. When clinical notes were reviewed, 95% of scans were justified. 25% of scans showed no injury. Review of subsequent ISS showed 54% of patients scored greater than 15.

**Conclusion:** The proportion of polytrauma scans performed at our institution that were justified was satisfactory on the basis of the chosen benchmark. However there is a paucity of published information on the indications for these scans that carry a high radiation dose.

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### **P-182 Can inter- and intra-observer variation in the assessment of threshold contrast detail detectability be improved?**

[Debbie Saunders](#)

*Cambridge University Hospitals*

Assessment of image quality performance of digital imaging equipment includes testing the ability of the system to visualise objects of varying size. Leeds test object, TO20, may be used which contains details of varying diameter and thickness, each detail corresponding to a known contrast level. Observers score images of TO20 by counting the number of visible details in each row. These scores are then used to derive a threshold contrast index (HT (A)). The tolerance recommended by IPEM is a change in HT (A) of more than 30% from baseline.

This study investigates the magnitude of inter- and intra- observer variation in TO20 scoring and the impact of this variation on HT (A). Eighteen observers with a range of experience from one department were invited to score 27 images, comprising an assortment of images created using two nominally identical test objects.

The average results obtained for the two test objects are similar, although observer variation has a large impact on HT (A). The majority of observers' scores are within 20% of the mean HT (A) across the range of detail diameters, and the maximum intra-observer variation is approximately 50%. This makes application of the 30% tolerance difficult.

This presentation discusses how inter- and intra- observer variability may be improved, including discussion of the results of a re-audit. The effect of dissemination of the results to observers, training review, and the feasibility of applying observer correction factors will also be considered.

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### **P-183 The radiation legislation awareness of foundation year doctors**

[Gary Cross](#); [Fiona Lam](#)

*West Hertfordshire Hospitals NHS Trust*

**Aims:** More imaging requests are being made by junior doctors as a result of increased accessibility to imaging services. The Foundation Year (FY) Curriculum states that a foundation doctor should 'recognise that ionising radiation can be harmful and is able to justify radiation exposure'. We aim to assess awareness and knowledge of radiation legislation and exposure in FY doctors.

**Methods:** Paper questionnaires (taken from RCR AuditLive Recipe) were given to FY1 and FY2 doctors at the start of their mandatory teaching sessions. Responses were collected anonymously. The questionnaires requested yes/no answers.

**Results:** 57 completed questionnaires (response rate 53.7%) were returned. 56% (n=32) of FY doctors were not aware of any governmental regulations surrounding radiation. 33% (n=19) were not aware of any legal obligation to provide accurate information when requesting radiological investigations. Only 16% (n=9) were aware of the RCR guideline 'Making the Best Use of Clinical Radiology Services' (MBUR; latterly "iRefer"); and only 1% (n=1) had used this. Additionally, 79% of doctors have been asked by their seniors to submit imaging requests where they are uncertain of the indication.

**Conclusion:** The results of this study demonstrate an inadequate understanding of radiation legislation by junior doctors. This can potentially result in an offence being committed by violation of the IR(ME)R guidelines. A dedicated session on IR(M)E)R has now been implemented during the junior doctor induction period at the Trust.

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#### **P-184 Low dose computed tomography for orthopaedic pelvic CT**

[Jacob Oommen](#); [Barry Burgess](#)

*Wrightington, Wigan & Leigh NHS Foundation Trust*

**Objectives:** Computed Tomography of the pelvis in Orthopaedics is often used as a preoperative determination of the hip morphology but the patients are often young and in the reproductive age group. Standard CT pelvic imaging exposure doses are high even on newer machines using KV modulation. The emphasis is on mAs modulation for dose reduction.

**Contents:** Research findings of low dose Pelvic CT. Images were assessed for quality based on the ability to demonstrate cortical bone, trabecular bone, periosteal changes, soft tissue calcification and the ability to provide clarity on the reformatted images to be acceptable for both radiological and surgical interpretation.

**Impact:** We have by fixed mAs modulation able to reduce dose significantly (>60%) without a compromise in image diagnostic quality. The increased scatter in soft tissues is minimal and acceptable and does not influence image interpretation.

**Discussion:** Standard CT pelvis for bone morphology fails to resolve soft tissue changes and hence of little diagnostic or clinical use for determination of soft tissue changes. The standard CT Pelvis doses are high despite current modulation techniques. The advances in CT technology permits advanced reconstructive algorithms for image reformatting. The dose determining factor is the coronal dimension at the pelvis rather than the weight of the patient. This is due to the recognised differences in body habitus at the same body weight. The coronal dimension of the patient on scanograms in relation to the table permits a quick guide to level of the fixed mAs modulation. The beam hardening artefacts are also mitigated at lower doses and may be useful where metal internal fixation is present.

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#### **P-185 Evaluation of the appropriateness of whole body computer tomography (WBCT) in trauma patients in a tertiary trauma centre**

[Neena Kalsy](#); [Jolanta Webb](#); [Madhu Pravavasthu](#)

*Aintree University Hospital NHS Trust*

**Aims/objectives:** To assess appropriateness of WBCT request in a major trauma centre.

**Content:** Early identification of life threatening injuries by WBCT improves survival. However, easy accessibility of WBCT and defensive practice have led to increased number of WBCT requests, some inappropriate. This has a potential for excessive demands on radiology and unnecessary radiation to patients.

**Relevance:** Annual audit of justification in trauma imaging should be carried out by radiology departments. We have prospectively evaluated written requests for WBCT over two months and compared with the RCR standards for justification of polytrauma protocol MDCT.

**Impact:** To determine appropriateness of written request and adherence to current standards. This is part of a larger study to develop imaging guidelines for use by emergency and trauma specialists.

**Outcomes:** 56 WBCT scans were performed during the study period. 29% (16/56) requests were deemed by a radiologist to have insufficient information entered onto the electronic request. When more detailed information was verbally obtained from a trauma team leader, WBCT was deemed unjustified according to RCR standard in 6/16

patients. In addition another 6 patients with sufficient electronically information lacked justification for WBCT, giving a total of 21% patients who underwent WBCT without sufficient justification.

**Discussion:** Trauma lead directly requests radiographer to perform WBCT. In appropriate circumstances it has an immediate positive impact on patient's survival. However, some patients are exposed to unnecessary radiation and discussion with a radiologist should be performed prior to carrying out WBCT scan.

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#### **P-186 The use of real time dose monitoring within interventional radiology**

[Stephanie Dobson](#)

*Aintree University Hospital NHS Trust*

This project examined the use of real time dose monitoring within the Interventional Radiology department, specifically examining the work practises of the interventional team.

This was achieved using data collected from the real time system to examine the doses received by each member of the interventional team and how specific roles are affected more than others. This system has been used in addition to standard TLD/film badge monitoring and has not been implemented as a replacement, rather as a visual tool for improved practise.

The data collected has been examined for trends from both staff members and staffing groups eg. radiologists, Scrub Nurses. This data has been used to make changes in both individual and group work practises. The results have also highlighted specific examinations which have a greater impact on the working team. The data collected has been in the format of 'Job Badge' results, this required staff to sign up for the badges prior to use but has also allowed for unbiased analysis of the individual job roles as the raw data is not assigned to any staff member specifically.

The results have changed the work practises of many of the Interventional staff and have changed how the team works when undertaking specific examinations and the team roles within these exams, this includes how the different approaches for procedures (both operator and exam specific) have affected staff and how in-procedure requirements drug administration, patient concerns etc need to be carried out in a staff safe manner.

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#### **P-187 Audit of the formal recording of inpatient plain film radiograph interpretation in patients' notes**

[Waheed Mustafa](#); [Hiba Abbas](#); [Bhavin Upadhyay](#); [Lakshmi Kanagarajah](#); [A Anilkumar](#)

*Basildon and Thurrock University Hospitals NHS Foundation Trust*

**Aims/objectives:** To analyse the standard of documentation of inpatient plain radiograph assessment by the referring clinician in patients' notes at Basildon and Thurrock University Hospitals (BTUH).

**Content of presentation:** Standard, criteria and methods - plain radiographs of 100 in-patients, who had imaging in the previous 24 hours over 3 days, and their case notes were evaluated to look for a documented formal report by the clinician. Standard of 100% was chosen.

**Relevance/impact:** Ionizing Radiation Medical Exposure Regulations (IRMER) 2000 state that, "the employer shall take steps to ensure that a clinical evaluation of the outcome of each medical exposure is recorded in accordance with the employer's procedures" to ensure patient safety, to provide definitive proof of the plain film assessment and to provide a permanent record for medical litigation.

**Outcomes:** The result of first audit in September 2012 showed that documentation happened in only 53% of cases. Findings were disseminated to all departments in the Trust highlighting the importance of documentation. The re-audit in 9 months showed a significant improvement of 72% documentation.

**Discussion:** This audit highlighted an important clinical finding. By doing the first audit and disseminating its findings to relevant departments, resulted in an increase in compliance with IRMER. Some departments are now compliant with the standard whereas others are not. Hopefully, the re-audit will spur other departments to also become compliant. Presenting this audit Nationally will emphasise IRMER and improve patient safety.

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#### **P-188 10 kVp rule - an anthropomorphic pelvis phantom imaging study using a CR system: Impact on image quality and effective dose using AEC and manual mode**

[Luís Lança](#); [Loris Franco](#); [Abdulfatah Ahmed](#); [Ann Ritta Santiago](#); [Junior Ndlovu](#); [Marloes Harderijk](#); [Sadeeda Nasir](#); [Chloe Marti](#); [Miguel Oliveira](#)

*University of Salford; Haute Ecole de Sante Vaud-Lausanne, Switzerland; Lisbon School of Health Technology, Portugal; Hanze University of Applied Sciences, The Netherlands*



**Purpose:** This study aims to investigate the influence of tube potential (kVp) variation in relation to perceptual image quality and effective dose for pelvis using automatic exposure control (AEC) and non-AEC in a Computed Radiography (CR) system.

**Methods and materials:** To determine the effects of using AEC and non-AEC by applying the 10 kVp rule in two experiments using an anthropomorphic pelvis phantom. Images were acquired using 10kVp increments (60-120kVp) for both experiments. The first experiment, based on seven AEC combinations, produced 49 images. The mean mAs from each kVp increment were used as a baseline for the second experiment producing 35 images. A total of 84 images were produced and a panel of 5 experienced observers participated for the image scoring using the 2AFC visual grading software. PCXMC software was used to estimate the effective dose.

**Results:** A decrease in perceptual image quality as the kVp increases was observed both in non-AEC and AEC experiments, however no significant statistical differences ( $p>0.05$ ) were found. Image quality scores from all observers at 10 kVp increments for all mAs values using non-AEC mode demonstrates a better score up to 90kVp. Effective dose results show a statistical significant decrease ( $p=0.000$ ) on the 75th quartile from 0.3 mSv at 60 kVp to 0.1 mSv at 120kVp when applying the 10 kVp rule in non-AEC mode.

**Conclusion(s):** No significant reduction in perceptual image quality is observed when increasing kVp whilst a marked and significant effective dose reduction is observed.

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### P-189 3 point patient ID check - Why, Who, When and What?

[Nishant Omar; Ne Siang Chew](#)

*Bradford Teaching Hospital NHS Foundation Trust*

**Background:** The purpose of this study was to assess if patients attending radiology department were being correctly identified prior to the procedure by the operator/responsible health care professional. These are mandatory and included in IRMER 2000 (procedure 5 regarding identification process).

**Methodology:** Prospective audit was undertaken over a 6-week period across the department. Operators were unaware and were assumed to know about ID checks from local training. 3 variables used to ID patients were name, date of birth and address. All patients should have been correctly identified using all 3 variables before commencement of procedure.

**Results:** A total of 154 procedures were audited from ultrasound (136/154) followed by fluoroscopy (13/154), MRI (4/154) and CT (1/154). Majority of procedures were performed by Consultants (74) followed by Sonographer (51), Registrars (24) and Radiographers (5). Only 47/154 (less than 33%) procedures had a full 3-point identification performed prior to commencement of examination with all operators falling short of required standard.

**Conclusions:** Positive patient identification is an innocuous but an extremely important step prior to any diagnostic examination. Failure to correctly identify a patient can have serious consequences like delay of treatment and psychological and emotional trauma to the patient. Some situations can lead to great financial burden on the institutions from improper use of resources and medico-legal proceedings. We propose regular mandatory training of all staff and a mandatory 10 second time out pre procedure led by the operator, in line with WHO safety check list for interventional procedures.

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## P-190 Comparing the Leeds Test Object TO.CTIQ phantom to the RMI Gammex IQ phantom

Alexander Fergus Dunn; [Paul Charnock](#)

*Integrated Radiological Services (IRS) Ltd*

This work is an ongoing assessment of the Leeds Test Object TO.CTIQ phantom. The purpose of this phantom is to cover as much routine level B QA within a single scan to help make CT surveys more efficient.

This phantom is therefore being assessed with two aims, firstly, do the features accurately assess the recommended parameters as per current guidance, and secondly, does phantom choice affect future survey results in terms of baseline comparisons. This assessment will compare the TO.CTIQ against an older RMI Gammex IQ phantom.

The features assessed in the Gammex are:

- Density of: PMMA, Air, Cortical bone (equivalent), Blood (equivalent)
- Resolution
- Slice thickness
- Low contrast detectability

Features in the LTO are:

- Contrast resolution of: Air, Delrin, LDPE, PTFE, and PMMA
- Line Spread Function
- Slice width
- Geometric distortion

To compare test objects both were taken to scanner surveys for a period of 6-8 months. Tests, particularly focusing on noise measurements, were carried out on both phantoms. As the 5 materials in the LTO are used to test contrast and noise, they have a much smaller diameter than the 4 materials in the Gammex. This means that Regions of Interest have to be much smaller and can give higher standard deviation as a result.

The slice profile in the LTO phantom requires a profile to be plotted and the FWHM to be found before calculating slice width. This is sometimes made more difficult by the fact some scanners do not have profile functions, or very limited functions, so images must be exported before an assessment is made. This is not always possible when there are no staff on site that use the equipment and know the correct/best way to get DICOM images off the scanner.

This is a work in progress and both phantoms will be continued to be assessed, where time allows, so conversion factors can be calculated, allowing either phantom to be used.

## Other

### P-191 Lymphoma - the great imitator

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

*George Eliot Hospital NHS Trust*

**Aim/objective:** This poster provides a pictorial review of a selection of unusual presentations of Lymphoma on imaging. Our aim is to highlight the importance of considering Lymphoma in the differential diagnosis in a wide range of clinical presentations.

**Content/relevance:** Lymphoma can affect essentially all tissues in the human body producing a variety of imaging appearances. Like a number of other conditions, lymphoma is known as a “great imitator” and should be considered as a possible diagnosis in a wide range of clinical presentations. We retrospectively reviewed a selection of images demonstrating atypical presentations of Lymphoma. Lymphoma was definitively diagnosed on biopsy in all cases. In some patients, Lymphoma was considered in the differential diagnosis following imaging. However, in other cases the suggested diagnosis on imaging was a different diagnosis such as colonic cancer.

**Outcome:** Although the diagnosis of Lymphoma is usually suggested by widespread lymphadenopathy, we have showcased a selection of unusual presentations of Lymphoma occurring in the absence of significant lymphadenopathy. We have found that Lymphoma can manifest in many ways and can be seen to mimic different pathology. Lymphoma may present in a variety of different forms, therefore, it should be considered in the differential diagnosis of mass lesions.

**Discussion:** This pictorial review provides an insight into the varying presentations of Lymphoma and how it can imitate a wide variety of disease processes.

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**P-192 You want to scan what? No worries**

[Elizabeth Davies](#)

*Toshiba Medical Asia Pacific*

As a CT applications specialist I am fortunate to experience different and unusual uses of CT scanning. This presentation is a pictorial review of my experience installing a 16 slice CT scanner in a University Veterinary Centre followed by assisting in the installation of the equine table. I will introduce the audience to this versatile scanner and its technology. Show how the equine table is used in conjunction with the scanner and look at some interesting cases that have been done so far at the centre. These will include CT images of rescued native wildlife, trauma cases, and canine portography.

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**P-193 Developing and validating a psychometric scale for AP pelvis image quality assessment**

[Hussien Mraity](#); [Andrew England](#); [Peter Hogg](#)

*University Of Salford*

**Purpose:** To create and validate a psychometric scale for assessing image quality for antero-posterior (AP) pelvis radiographic images(digital).

**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(radiologist & radiographers, n=7). These items were reviewed and modified accordingly. Next, a series of seven AP pelvis images were generated using a phantom across a range of image qualities. Image qualities was initially confirmed using signal to noise ratio(SNR ranged from 10.9 to 35.1). In order to validate the scale a sample of 151 radiographers (under-and postgraduates) were invited to score image quality on seven images(of known qualities).

**Results:** Using the scale participants aggregated mean scores increased with increasing SNR (62.8 to 111.9,r<sup>2</sup> =0.93). Cronbach's alpha revealed that the scale items were consistent in measuring the image quality across the 7 images( $\alpha=0.823$  to  $0.913$ ;minimum  $\alpha\geq 0.6$ ). Factor analysis was conducted to examine how many factors can be extracted from the above set of items(ie. anatomical or technical). Redundant items were removed because they were either highly skewed(i.e. $\leq -1$ or $\geq 1$ ), introduce excessive amounts of error(i.e. $SD\geq 1.5$ ) or poorly correlated with other scale items (i.e. inter-item correlation cutoff point  $r \geq 0.25$ ) and resulted in a final 24 items scale.

**Conclusion:** This study presents the first development and validation of an image quality scale based on Bandura's theory. There was excellent correlation between the scale scores and the SNR and together with above stastical analysis the scale appears reliable and valid.

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**P-194 The evolution of X-ray diagnostics based on examples of the specific US Army hospitals in Kuwait and Multinational Division Central-South under Polish command in 2003-2004**

[Leslaw Kolarz](#)

*Polish Navy Hospital, Gdansk, Poland*

**Background:** Wilhelm Roentgen discovered X-rays on 8th Nov 1895. In March 1896, Kaiser Wilhem Academy in Berlin was equipped with the first military radiological unit. During the Greco-Turk War in 1897, military radiological equipment was ready to be tested by the English and German teams. It was necessary to wait until the War-in-India (1897-1898) for the the military radiological unit to appear on the battlefield. In 1898 the practical use of radiology enabled to conduct examinations during the Sudan War, where the electric batteries were charged by means of cycling! During the Boer War (1899-1902) doctor H. Kutter used petrol engine that he had requisitioned from a mine on the Rand to power his X-ray equipment.

**Materials and methodology:** The many difficulties encountered by the radiologists at war, included the summer head that softened the emulsion on the X-ray plates, the sand that stuck to the plates, the lack of adequate darkrooms for developing and the frequent lack of running water for washing the plates (Fort Klapperkop Military Museum–Boer War).

Evaluating the following X-ray offices: Camp Wolf (Kuwait), Camp Lima (Iraq, near Karbala), Camp Babylon (Iraq, 85km/53miles south of Baghdad), it may be concluded that in the age of electronic image editing, the difficulties mentioned above belong to the past. The fundamental issue of diagnostics' rate is currently the X-ray unit.

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**Conclusions:** The nature of soldiers' injuries and their mass-frequency explains the rapid introduction of X-ray diagnostic Lodox-System (low-dose whole-body x-ray), which enables safer and more efficient medical evacuation.

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**P-195 A closed loop audit of adequacy in completion of radiology request forms in general surgery at a large tertiary teaching hospital**

[Saranya Vickramarajah](#); [Krashna Patel](#); [RJ Davies](#); [N Fearnhead](#); [R Miller](#); [NR Hall](#); [P Set](#)

*Department of Colorectal Surgery, Addenbrookes Hospital*

**Background:** It is well known that the usefulness of radiological investigation is reduced if sufficient clinical details and the clinical query are not provided (IRMER 2000). Issues around completion of request forms appear to persist regardless of the introduction of electronic submissions. Patient demographics and requestor details are automatically populated but insufficient clinical information to validate requests continues to delay patient management.

**Materials/methods:** Retrospective data was collected of the first 100 Computerised tomography (CT) and Ultrasound (US) requests during two periods, from August 2012 (period 1), then December 2012 (period 2). Data was collected from the electronic PACS system and clinical details appropriateness decided by a consultant radiologist. In-between the two periods a briefing session was given to educate junior requestors on completing requests.

**Results:** In periods 1 & 2 patient demographics (name, age, address and number) and requestor details (name of requestor and consultant) were completed at a rate of 100%. In period 1 only 81% were indicated compared with a rate of 96% in period 2 (re-audit). Rates of specifying a presenting complaint rose by 32.4% (71% to 94%). By re-audit 98% posed a clinical question, compared with 67%. There was a significant increase in all domains investigated ( $p=0.01$ ).

**Conclusion:** Educating requestors improved adequacy of clinical details in all domains; however did not meet national target (100%). As a consequence radiology briefings will be incorporated into future departmental inductions and consideration for individual entry fields for presenting complaint and clinical question.

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**P-196 Cardiothoracic ratio: The effect of increasing breast size on heart magnification**

[Claire Melia](#); [Andrew Tootell](#)

*University of Salford*

**Introduction:** The cardiothoracic ratio (CTR) was established in 1919 by Danzer, whose data was primarily taken from a male sample. Only historical evidence suggests the PA chest projection, from which it is derived, is best practice, applicable to all physiques. This study sought to confirm whether the PA chest radiograph is accurate at reflecting the CTR of large-chested women.

**Methodology:** The anatomical CTR of a phantom thorax was calculated. Samples of bra-sizes were translated into object-to-image-distances (OID) for PA chest radiographs. In total 15 OID distances were applied, and 30 radiographs produced. Data was collected by measuring CD and TD to produce the radiographic CTR (rCTR). The data was analysed.

**Results:** The results for the 180cm SID set-up were consistent in revealing that the PA projection was accurate at demonstrating the CTR regardless of the increasing OID. However, under the 150 cm SID condition, the data revealed the rCTR to decrease

**Conclusion:** This study reassures practitioners faced with increased OIDs caused by the presence of large-breasts that the PA chest projection accurately demonstrates CTR. It also reveals the numerical value of CTR can inaccurately suggest heart pathology due to the individual dimensions contribution to the ratio calculation, reaffirming CTR only as an indicator, not a diagnosis of cardiac pathology.

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**P-197 Lord Kelvin and the discovery of X-rays**

[Clare Fenlon](#); [Brian Mucci](#)

*NHS Greater Glasgow and Clyde*

**Objectives:** Lord Kelvin was the pre eminent scientist of his day. He is widely quoted as saying "X-Rays will turn out to be a hoax". In this presentation we will show that in fact Kelvin embraced the discovery readily and was instrumental in the early use of the X-Ray for Diagnostic purposes.

**Materials:** Reviewing published accounts and the Kelvin archives at The University of Glasgow show that Kelvin was initially sceptical about X-Rays. However having been sent a proof copy by Roentgen on 1st Jan 1896 documents

show that he was immediately impressed and promptly wrote to Roentgen congratulating him. By passing the paper on Kelvin encouraged others to replicate the experiments and records show that this led directly to the establishment of the first Diagnostic X-Ray department in the United Kingdom.

**Discussion:** While Kelvin is correctly quoted as being initially suspicious about X-Rays he can be shown to have been immediately won over on seeing Roentgen's publication. Records show that he encouraged early repetition of experiments with X-Rays within the few days between receiving the proofs and their general publication. This led to John Stevenson's experiments and his early use of X-Rays for medical purposes in Glasgow. He corresponded with Roentgen, was an early subject of "X-Ray photography" and he supported the awarding of the Nobel Prize to Roentgen. We conclude that while Kelvin had a healthy distrust of X-Rays his open mind quickly saw the value of the work and its potential application in medicine and industry.

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### **P-198 Health physicists are from Mars, patients are from Venus**

[Simon Hook](#)

*University of Hertfordshire*

**Aim:** To explore the psychology behind lay-people's understanding of radiation risk from medical imaging, in order to understand the difficulties of communicating that risk.

**Content:** Radiology departments often have a table of analogies for explaining radiation risk to patients. There has been little research into which of these analogies patients find most reassuring/alarming. This quantitative study asked students at the researcher's University, with no radiation training, to rank these analogies by perceived risk.

Also the study asked students to complete the phrase "nuclear \_\_\_\_\_", to gauge their associations with the word. Additionally, imaging modalities were ranked according to their perceived typical dose and this list deliberately included "nuclear medicine" and "RNI", to consider whether the name carried with it greater perceived risk.

**Relevance/impact:** To assist radiographers/referrers gaining informed consent from patients, without causing unnecessary anxiety.

**Outcomes:** Respondents over 25 were more likely to complete the "nuclear" phrase with "bomb", "war", or "weapon", than more neutral terms. The majority estimated Nuclear Medicine as more risky than RNI. Radiation from bananas and air travel were most frequently perceived as the least dangerous analogies.

**Discussion:** The public's fear of radiation is drip fed by news stories of nuclear disaster. Additionally popular fiction frequently uses 'mutation by radiation' as a plot device. Risk perception is largely an emotional response and scientific information has little effect on patients' decisions to consent. Their choice is more likely to be based on psychological factors such as trust in the individual medical professional and feeling empowered by choice.

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### **P-199 The role of imaging in the research and diagnosis of neurodevelopmental delays in children under 5 yrs old**

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**Aim:** To examine the use of imaging in research of neurodevelopmental delays, in particular Autism Spectrum Disorders (ASDs).

**Content:** A critical review of the literature exploring neuroimaging in neurodevelopmental research was undertaken. This included a summary of imaging modalities most widely applied, images and an outline of diagnostic models for ASD using imaging.

**Findings:** Levels of specialism vary nationally and internationally, which have implications on availability of techniques and modalities, eg. fMRI and diffusion-tensor imaging. However, although some significant anatomical findings have been identified, due to the heterogeneity of the condition, none of them have been adapted for diagnostic use based on imaging alone. It would appear that clinical observations and parental report have greater diagnostic weight.

**Implications for imaging:** Imaging remains a collaborative source of information along with clinical findings and observations. As technological advances continue to impact imaging, the role and significance of specialist modalities is likely to increase in terms of research and the potential diagnosis of ASDs.

**Discussion and recommendations:** Changes in diagnostic criteria for ASDs since publication of DSM-V in 2013, have indicated the significance and role of clinical observations. There is need for a reliable repository of data and images

so that existing images can be shared and interrogated to identify common neuroanatomical traits in neurodevelopmental disorders (if any) before subjecting the young (usually children less than 5 years old) to neuroimaging.

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**P-200 The effect of Adaptive Iterative Dose Reduction 3D (AIDR 3D) on radiation dose in a cardiac CT practice: Reducing dose, improving practice**

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**Background:** In 2010 NICE recommended the routine use of cardiac CT in patients presenting with chest pain and a low pre-test likelihood of coronary artery disease. This carries a significant implication for radiation exposure.

**Objective:** To determine if an update in software to AIDR 3D and changes in practice could improve clinical care by significantly reducing radiation dose in CT coronary angiography (CTA).

**Method:** A Toshiba 160 slice CT scanner was used pre and post AIDR 3D software. Data regarding 50 patients before and after the introduction of the new software was collected and analysed. This included radiation dose, BMI, heart rate and beta blocker administration.

**Results:** Initially patients received an average DLP of 270.3mGy\*cm (118-400) or an effective dose of 3.8 mSv (k-factor=0.014) if acquisition of each volume occurred with one beat and 620mGy\*cm (256-919) 8.7mSv if acquisition of each volume with 2 beats. This was reduced by two thirds to an average DLP of 97.3mGy\*cm (33-190) 1.4mSv post AIDR 3D for 1 beat acquisition and 418mGy\*cm (177-833) 5.9mSv for two beat acquisition. There were consistently lower levels of radiation exposure in low BMI patients who were beta blocked to single beat acquisition.

**Conclusion:** ADIR 3D significantly reduces the radiation dose for CTA. Very low dose is possible with Toshiba's 160 slice CT scanner in low BMI patients beta blocked so as to allow acquisition of each of the two volumes in 1 heart beat. All patients are now beta blocked to a heart rate of 60bpm.

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**P-201 The role of multi detector computed tomography in the evaluation of the effects of Kawasaki disease upon the heart and coronary arteries: A comparison with invasive coronary angiography**

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**Aim:** To compare multi detector computed tomography (MDCT) and invasive coronary angiography (ICA) in the evaluation of the effects of Kawasaki Disease (KD) upon the heart and coronary arteries in paediatric patients.

**Methodology:** A review of current literature was carried out using appropriate terms. Additionally, references from appropriate articles were reviewed. Where possible, sources greater than five years old were excluded ensuring relevance and currency. Journals written in English worldwide were considered.

**Findings:** Dual source CT can result in less ED. MDCT is more cost effective than ICA in management of KD. MDCT is more patient friendly and carries less risk.

**Discussion:** MDCT continues to advance and develop while development of ICA is stagnant. It appears to be a matter of time before MDCT overtakes ICA as the standard for imaging in this field. MDCT is also useful in general angiography with those who can comprehend arrested respiration.

**Conclusion:** MDCT has the potential to be a valuable future resource. It appears to have significantly advanced to the point where it could replace angiography as the gold standard. It costs less, reduces ED, lowers risk and has greater patient acceptability. However large clinical trials of current generation scanners would need to take place before this occurs.

DS-MDCT provides additional functionality. The 264 and 320 detector row scanners currently being used in research could be instrumental in future paediatric cardiac imaging. However ICA remains a valuable imaging tool which can be used in cases where MDCT is inconclusive.

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**P-202 Contribution of fetal MRI in diagnosis of congenital lung lesions in clinical practice**

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**Hypothesis:** MRI has complementary function to US in the diagnosis of congenital lung lesion. Its performance in diagnosis of CLL is improving over time.

**Objectives:** To determine whether MRI is useful in diagnosis of different CLL in comparison to that of US and that its performance is improving over time.

**Methodology:** Retrospectively available data for all patients referred for MRI for suspected fetal lung malformations in the period between 2000-2013 have been reviewed. 167 fetus was recruited from which 85 had a complete data set available. Performance of MRI over the first part of this period is compared to the second part.

**Findings:** MRI diagnosis was accurate in 53.85% of cases, an incomplete diagnosis was reported in 14.26 % and and in- accurate diagnosis in 10.26% of foetuses. In the first part of the period MRI confirmed US finding in 76.9% , changed diagnosis in 17.9% and added information in 5.13% of cases. Whereas it confirmed US diagnosis in 36.59%, added information in 48.78% and changed diagnosis in 14.63 % of cases in the second part of the period. Congenital diaphragmatic hernia (CDH) was the most frequently diagnosed anomaly followed by bronchopulmonary sequestration (BPS) and congenital cystic adenomatous malformation (CCAM). Congenital tumour, bronchogenic cyst and emphysema are very rare.

**Conclusion:** MRI diagnostic accuracy has increased over time adding extra important details to help in patient counselling and enabling patients to make informed decision. Furthermore these details are helpful in the management strategy.

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### P-203 Congenitally absent piriformis muscle, a case report

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**Content:** We report a rare case of a congenitally absent left piriformis muscle that was discovered as an incidental finding on MRI scan in a 46 year old man with lower back pain. Anomalies of the piriformis muscle have been reported in the literature especially in relation to piriformis syndrome but to the best of our knowledge an absent piriformis muscle has not yet been reported.

**Relevance/impact:** Congenital muscle malformations can present in many forms and can be associated with symptoms and syndromes. However, the absence of a muscle or muscles can be an incidental finding as this report shows. This case report highlights how radiological imaging and in this case MRI scanning can not only provide information about the symptoms being investigated but can lead to other unexpected findings which may be useful in other clinical situations, for example in the planning of future intramuscular injections and surgical procedures in the anatomical area being investigated.

**Outcomes:** Subsequent assessment and investigation indicated the cause of the patients pain was degenerative disc disease and not associated with the absent piriformis muscle.

**Discussion:** The gluteal region is a common site for intramuscular injections; it is therefore important to be aware of any muscle anomaly as nerve damage in this region can lead to severe complications including impotence in the male patients. We highlight the importance of preparing patients for the possibility of incidental radiological findings which may have clinical significance.

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### P-204 An investigation into the use of unenhanced computed tomography kidney, ureter and bladder (CTKUB) examinations in diagnosing suspected acute renal colic at a NHS hospital in the United Kingdom

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**Aim:** To investigate the diagnostic yield of unenhanced CTKUB examinations that result in positive, alternative and normal findings.

**Method:** A retrospective audit of all unenhanced CTKUB examinations (n=463) was conducted from the 1st March 2013 to 31st October 2013. Cases were identified using the study description 'CTKUB'. The data was downloaded from the radiological database into an excel spreadsheet and then categorised into patient age, gender, clinical findings and diagnostic yield:

1. Positive if calculi was detected
2. Alternative/incidental if any other pathology was detected
3. Normal if no calculi or pathology was detected

**Result:** Results were then analysed using microsoft excel and SPSS software.

Diagnostic yield was 54% (n=250) positive, 24% (n=109) alternative and 22% (n=104) normal. The Royal College of Radiologists (2010) indicated CTKUB should detect calculi in 44-62% of patient with an alternative diagnosis in a further 6-18%. Of the positive results 69% (n=173) were male and 31% (n=77) were female. Chi square test indicated a significant correlation ( $p=0.001$ ) between gender and the presence of calculi. The Mann Whitney U test showed no correlation ( $p=0.697$ ) between patient age and the presence of stone.

**Conclusion:** CTKUB is superior at detecting calculi related to acute renal colic with a sensitivity of 97-98% and specificity of 96-100%. Although it is a relatively low dose examination (10mSv each), the dose is still significant. Therefore, their use should be monitored regularly to ensure examinations have a reasonable diagnostic yield and are not being used as screening tools for inappropriate, non-specific abdominal pain. Alternative modalities like plain X-ray should be considered where appropriate for example, follow-up after treatment.

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## P-205 Imaging of hepatocellular carcinoma: A review of imaging techniques and appearances

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**Key learning objectives:** To review the differential diagnosis of hepatocellular carcinoma (HCC) in patients with known liver cirrhosis. To illustrate with examples the typical multi-modality imaging features and highlight its radiological appearance.

**Description:** HCC is the most common type of primary liver cancer worldwide and in the UK, cirrhosis is the biggest risk factor and present in up to 95% of cases. Whilst elevated Alpha-fetoprotein (AFP) levels can potentially confirm diagnosis, this is not an unequivocal sign of HCC and elevated levels may be caused by other conditions, eg. intrahepatic cholangiocarcinoma. In the context of cirrhosis, HCC diagnosis can be made on observation of the 'HCC radiologic hallmark'; this refers to positive contrast enhancement during the arterial phase of dynamic imaging studies and negative enhancement (washout) seen on the portal venous phase. The radiologist can therefore be instrumental in making an accurate diagnosis in these cases. This exhibit will address the specific radiological features on 4-phase scanning using contrast-enhanced MDCT and contrast-enhanced MRI. The clinical symptoms and biological chemical findings will also be discussed in relation to EASL-EORTC guidelines and Map of Medicine.

**Conclusion:** Both contrast-enhanced MDCT and contrast-enhanced MRI are sufficiently sensitive to detect the 'HCC radiologic hallmark', necessary to non-invasively confirm HCC diagnosis. Both modalities are also capable of reproducing images in a variety of planes, which is useful for treatment planning. Although contrast-enhanced MRI has a better safety profile and superior tissue contrast, patient outcomes are unlikely to be detrimentally affected should contrast-enhanced MDCT be used instead.

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