

UKIO UK IMAGING & ONCOLOGY ONLINE 2020



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

Pathways and communication



ABSTRACT BOOK



SP1 Head & neck and neurology short paper presentations

SP1.1 Subarachnoid haemorrhage, CT head and lumbar puncture - Can our words influence clinicians' actions?

Matthew Spurr; Catrin Evans; Rebecca Hunt

North Bristol Trust

Background: Subarachnoid haemorrhage (SAH) accounts for 1% of headache presentations to the emergency department (Van Gijn, 2007). Current guidelines suggest a non-contrast CT Head (CTH) followed by lumbar puncture (LP) if the scan is negative and performed after six hours of symptom onset (Dubosh et al, 2016). This project aims to assess if LPs are performed per guidelines and establish whether report wording impacts LP rate.

Method: CTH studies were analysed in a tertiary neurosurgical centre over a 2 month period and scans performed for SAH identified. LP rate was assessed following a negative CTH. Report language was evaluated to see if it affected LP rate. 4 categories of clinical advice were identified: 1. No advice given 2. CTH cannot exclude SAH 3. No contraindication to LP 4. LP is advised

Results: 2433 CTH were analysed of which 88 were for SAH. 48% of patients with a negative scan underwent LP. If a report advised an LP, 80% of patients had one. If no advice was given 19% of patients underwent LP. Describing CTH limitations resulted in 40% of patients undergoing LP. Stating no contraindications to LP resulted a 64% LP rate.

Conclusion: 48% of patients had an LP following a negative CTH. Wording in a CT report had a large impact on LP rate. The most effective way for a Radiologist to affect clinical practice is to give instructional advice. Describing the limitations of Radiology was less effective and failure to give any advice resulted in the poorest guideline adherence.

1. Dubosh, N.M., Bellolio, M.F., Rabinstein, A.A. and Edlow, J.A., 2016. Sensitivity of early brain computed tomography to exclude aneurysmal subarachnoid hemorrhage: a systematic review and meta-analysis. *Stroke*, 47(3), pp.750-755.

2. Van Gijn, J., Kerr, R.S. and Rinkel, G.J., 2007. Subarachnoid haemorrhage. *The Lancet*, 369(9558), pp.306-318.

SP1.2 Neurovascular CT angiography image quality - A quality improvement project

Ashik Amlani; Dan Hodson; Ana Pascoal; Elizabeth Gabriel; Ian Honey; Ulrike Haberland; Amit Roy; Sundip Udani

Guy's and St Thomas' NHS Foundation Trust

Background: Neurovascular CT angiography (CTA) in our hospital was observed to be of poor quality when compared to a local tertiary neurosurgical centre, leading to potential misdiagnosis. A multidisciplinary team investigated this further.

Methods: A radiology registrar, two neuroradiologists, a CT radiographer, a CT manufacturer research scientist and two medical physicists compared and reviewed CTAs scanned locally and at the external institution. Analysis included the CT scan protocol parameters (CTDIvol, DLP, kV, mA, collimation, detector configuration, reconstruction filter and display field of view), IV contrast injection technique (flow rate and total contrast volume), as well as subjective expert visual review.

Results: Cases of missed aneurysms were reviewed and consensus was that local scans exhibited a high level of image noise. Quantitative analysis revealed that the dose (CTDIvol) delivered by the external centre scanner was 3-4 times larger and the dose to the patient (DLP) was 4-5 times larger compared to our hospital. The average (normalised) noise level for the local studies was 2-3 times that of the expert centre studies and the contrast-to-noise-ratio was correspondingly lower by a factor of 1.3-1.6. IV contrast injection protocols also differed.

Conclusion: A combination of protocol differences and lower radiation doses were the primary causes for the non-diagnostic image quality observed. Measures implemented included protocol standardisation and a graduated increase in the CTDIvol by 2x to mitigate the suboptimal image quality. We also modified the data series transferred to PACS to aid reporting. Further work is ongoing to further optimise patient care.

SP1.3 Optimising imaging and adherence to protocols in patients with Neurofibromatosis type 2

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Guy's & St Thomas' NHS Foundation Trust

Background: Neurofibromatosis type 2 (NF2) is an autosomal dominant disease characterised by multiple central and peripheral nervous system tumours. These patients are scanned regularly for treatment monitoring and surgical planning, with associated long scanning times traditionally involved. This negatively affects the patient experience, scan quality, efficiency and workflow. Specific MR protocols for adult NF2 patients undergoing neural axis imaging, including patients with cochlear implants, have been developed at our institution. These aimed to streamline imaging protocols to necessary sequences for diagnosis, disease monitoring and management decision making. This study assessed adherence to these protocols and following implementation of an e-vetting system for adult patients with NF2, assessment to measure compliance was undertaken to investigate the potential improvement of this intervention.

Methods: All adult NF2 patients who underwent an MRI head +/- spine between 01/03/2018 and 30/11/18 and second phase 14/02/2019 to 24/09/2019, respectively, were included.



Results: The first cycle and second cycle both included 50 patients. The initial phase showed that adherence to the correct imaging protocol was 17(34). Adherence to the correct protocol increased to 90% in the second cycle following implementation of the new e-vetting system and radiographer education.

Conclusion: Streamlined protocols integrated onto an e-vetting system which are automatically populated with the appropriate sequences have led to significant and potentially sustainable improvement, including shorter scanning times. This significantly improved the patient experience and clinical effectiveness through improving scan quality by reducing the motion artefact associated with prior longer scanning times. Improved departmental workflow and cost.

SP1.4 Apparent diffusion coefficient (ADC) of the spinal cord following palliative radiotherapy to the thoracic spine in metastatic prostate cancer

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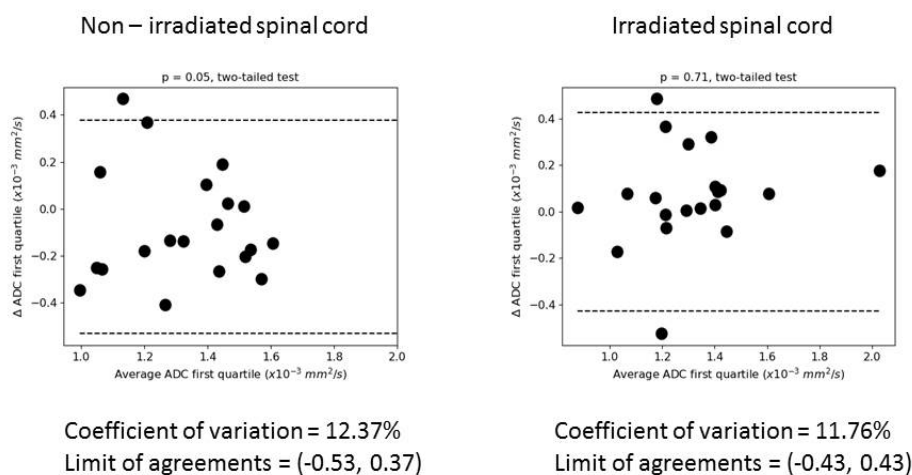
Introduction: Radiotherapy is an effective treatment for symptomatic bone metastases in advanced prostate cancer patients. Re-irradiation for symptomatic recurrence is performed in 8-20% but is limited by the potential cord toxicity. The ADC calculated from diffusion weighted MRI (DW-MRI) was reported to be more sensitive in detecting white matter radiation damage than T2W images, which may identify patients at risk of cord toxicity. We investigate the differences in the ADC following radiotherapy between irradiated (RxSc) and non-irradiated (NRxSc) spinal cord segments.

Methods: Twenty patients who received thoracic spinal radiotherapy for bone metastases and had DW-MRI pre- and post-radiotherapy were reviewed. We delineated the spinal cord and surrounding CSF on the ADC maps using an automatic segmentation software on the pre- and post radiotherapy MRIs. The median spinal cord ADC change on the pre and post-radiotherapy MRI were compared between NRxSc and RxSc spinal cord segments.

Results: Median ADC values ($\times 10^{-3}$ mm²/s) pre and post radiotherapy, were as follows: NRxSc: 1.92 (1.65-2.08) and respectively 1.73 (1.59-1.94); RxSc: 1.76 (1.55-1.83) and respectively 1.82 (1.63-1.98) expressed as median (first interquartile range- third interquartile range). The median ADC change pre-post radiotherapy in the RxSc measured as 0.1 $\times 10^{-3}$ mm²/s (-0.06; 0.2) was non-significant.

Conclusion: In this pilot study, we have documented the ADC spinal cord measurement variability. No significant change in the median ADC of the spinal cord post radiotherapy was observed. Further work will include correlation between the median ADC values of the spinal cord in areas requiring radiotherapy and patients' symptoms.

Fig.1 Bland-Altman plot – ADC 25th percentile



Lutz, S. et al. (2017) Palliative radiation therapy for bone metastases: Update of an ASTRO Evidence-Based Guidelines, Practical Radiation Oncology. Elsevier Inc., 7(1), pp. 4-12. doi: 10.1016/j.prro.2016.08.001.

Philippens, M. E. P. et al. (2009) Radiation effects in the rat spinal cord: evaluation with apparent diffusion coefficient versus T2 at serial MR imaging., Radiology, 250(2), pp. 387-97. doi: 10.1148/radiol.2502071374.

SP2 History of imaging short paper presentations

SP2.1 History and evolution of artificial intelligence

Elizabeth Beckmann

Lanmark

At this time of discussion about Artificial Intelligence in Radiology it is interesting to review the origins of AI. As early as the 1st Millennium BC, aspects of Mechanical or formal reasoning, where the human thought process can be mechanised were proposed by Chinese, Indian and Greek Philosophers. Over the centuries Aristotle, Euclid and Al-Khwarizmi who gave his name to the "Algorithm" developed their ideas. In the 17thC Leibniz began to articulate the physical system hypothesis that became the philosophy for research in AI. In Alan Turing's 1950 paper he referred to the possibility of machines that can think and



defined the "Turing Test" which was the first real proposal of Artificial intelligence. Walter Pitts and Warren McCulloch analysed the network of artificial neurons and in 1951 Marvin Minsky with Dean Edmonds built the first Neural network machine. At the Dartmouth conference in 1956 John McCarthy presented " Artificial Intelligence" as the name for the field. This is generally accepted as the real birth of AI. Research started on AI in Medicine in the 1960s. By the 1990s AI had been introduced into Radiology particularly in CAD and Expert systems. AI techniques are now integral in many clinical systems in Imaging and Therapy. This paper will review the history and origins of AI and in particular in Imaging and Therapy. Learning outcomes- participants will gain an understanding of the origins of AI and its development into the fields of Imaging and Therapy.

SP2.2 Early chest radiology pioneers and the beginnings of chest radiology

[Arpan K Banerjee](#)

British Society for the History of Radiology

Introduction: In this talk I will present some of the contributions of the early chest radiology pioneers including Francis Williams, Hugh Walsham, Holzkecht and Beclere's contributions to early chest radiology. Following Rontgen 's discovery it soon became apparent that the chest could be imaged with this technique and not just the bones.

Methods/results: In the USA Francis Williams was one of the first doctors to fluoroscope the chest in April 1896. His experience with a large number of cases led to him opening a department of Radiology at the Boston City Hospital in 1898 although several tests were still being conducted at the MIT. He wrote one of the earliest books on the subject in 1901 In the UK, Hugh Walsham a physician and pathologist became a pioneer of chest radiology at St Bartholomew's Hospital in London. He started of as an assistant to the electrical department in 1896 ending up as consultant in 1917. In 1906 he wrote 'The Rontgen Rays in diseases of the chest' with Harrison Orton which became the standard text in the UK. In Vienna, Guido Holzkecht pioneered chest radiology and wrote his textbook on the subject in 1901. Beclere in Paris the father of French radiology wrote his book on Chest tuberculosis in 1899. Beclere was instrumental in forming the French Society of Radiology which held its first scientific meeting in 1909.

Conclusion: Potted biographical sketches of these pioneers will be presented.

SP2.3 Miss Marion Frank (1920 - 2011) "I have never been a good radiographer, but I knew how to get out of trouble"

[Adrian Thomas](#)

Canterbury Christ Church University

This year of 2020 marks both the centenary of the Society of Radiographers and also of the birth of Marion Frank. Marion would have wanted to celebrate the centenary of the Society that she loved so dearly. Marion and her family left Germany in 1937 and came to England. Marion and her twin sister were working at the Royal Northern Hospital in London when they encountered the pioneer radiographer Kathleen Clara Clark who persuaded them to enter radiography. Marion progressed rapidly and became Head of Radiography at the Middlesex Hospital. She became President of the Society of Radiographers and said that she enjoyed herself and that her main role was that of communication. Marion Frank and Kathleen Clark were both involved in the foundation of the International Society of Radiographers and Radiological Technologists (ISRRT). Her hospitality was legendary and the door of her flat was always open to visiting radiographers. Marion was active in the British Institute of Radiology, the Osler Club of London and the British Society for the History of Radiology. She loved the Deutsches Röntgen Museum in Remscheid and took many students there for visits. Marion enjoyed life and her enthusiasm was contagious. Marion summed up herself by saying "I have never been a good radiographer, but I knew how to get out of trouble"! The regret of her final years was that she could not make that final visit to the museum in Remscheid that she loved so dearly.

Thomas, A.M.K. Global gathering celebrates life and career of Marion Frank (22 May 2012)

<http://www.auntminnieeurope.com/index.aspx?sec=sup&sub=xra&pag=dis&ItemID=606626>

SP2.4 Kathleen Clara Clark (1896-1968) and the need for standardisation

[Adrian Thomas](#)

Canterbury Christ Church University

The Society of Radiographers was set up 100 years ago in 1920, and in 1921 Miss Kathleen C Clark was one of 20 who passed the first examination of the new Society (the MSR). She had completed her training course at Guy's Hospital, initially working at the Princess Mary's Hospital, Margate, before moving to the Royal Northern Hospital in London. She founded a School of Radiography at the Royal Northern Hospital which became a model for schools elsewhere. She was President of the Society of Radiographers from 1935 to 1937. In 1935 she became co-founder and Principal of the Ilford Radiographic Department at Tavistock House, which conducted instruction and research into radiography and medical photography. Under her guidance the department developed a world-wide reputation. The first edition of her book 'Positioning in Radiography' was published in 1939. The book became the standard work of reference for radiographers and has been through many editions. 'Positioning in Radiography' standardized the radiographic projections and so similar projections were made in all hospitals. Secondly, the book is very artistic. The illustrations do not come across as cold and entirely objective scientific images. She was awarded the MBE in



1945. She was committed to fostering co-operation and contact between radiographers throughout the world and was a driving spirit behind the formation of the ISRR. Her contributions and lasting significance in this centenary year of the Society of Radiographers will be reviewed and assessed.

Thomas, AMK., Banerjee, AK. (2013) *The History of Radiology*. Oxford: Oxford University Press.

SP3 Workforce development short paper presentations

SP3.1 Radiographer advanced practice in paediatric interventional radiology - is it beneficial for patients and radiology departments?

Emma Rose; Clare Simcock; Premal Amrishkumar Patel

Great Ormond Street Hospital for Children

Background: Advanced practice and extended roles for radiographers is increasingly being seen in Interventional Radiology (IR) departments around the country. However, paediatric patients are often thought to be too complex, or too difficult for radiographers. We hypothesise that following appropriate training and supervision, clinical specialist radiographers (CSR) can independently and safely perform a variety of procedures on a range of children and contribute to department productivity. The aim of this study is to assess if training radiographers to undertake paediatric IR procedures is feasible and does provide benefit to patients and the department.

Method: Retrospective review of the electronic patient record system and procedural logbook of one CSR between July 2018 and July 2019.

Results: 5 consultants, 2 fellows and a CSR in the IR department performed 3933 procedures of which 1716 were procedures which the CSR is trained to do. Of these the CSR performed 427 procedures. Median patient age was 6.3 years (range: 0 -- 18). Procedures included all types of central venous access and gastro-intestinal intervention. This accounts for 25% of procedures that they could have performed and 11% of whole departmental workload.

Conclusion: The data demonstrates that radiographer advanced practice in paediatric IR is feasible and can contribute significantly to the department productivity. CSRs can perform paediatric IR procedures, this reduces waiting time for patients, provides a cost-saving mechanism for the department and allows radiologists greater time to focus on more complex vascular and non-vascular work. It also provides a valuable career progression opportunity for radiographers.

SP3.2 Student radiographers - Current career aspirations

David Palmer; Pauline Reeves

Sheffield Hallam University

Background: "Over 45 million diagnostic imaging tests are performed every year (NHS England 2019), which is an increase of 18.7% over the last five years (NHS England 2018). This shows a clear need to expand the current radiology workforce. The Society of Radiographers (2018) estimate there is currently a vacancy rate of 9.1%; highlighting a gap in the workforce.

Method: Students from across the United Kingdom were asked to participate in an online survey comprising of fifteen open and closed questions. Questions examined the intentions of students post-qualification; identifying which areas of radiology appealed most. Question themes centred on student demographics, pre-course aspirations, modalities of interest, and location. Results were analysed using descriptive statistics and thematic analysis. According to the Society of Radiographers, there are currently 2135 registered students currently undertaking the undergraduate Diagnostic Radiography course. This study required a sample size of 326 with a 95% confidence level and 5% margin of error.

Results: This survey gained 360 unique responses, generating a response rate of 16.8%. When asked which three specialities most appealed to students, Plain Film (n=149), Ultrasound (n=147) and Computed Tomography (n=137) were most popular. 42.8% of women selected ultrasound as their top choice, with this being the 5th most popular choice for men (29.9%).

Conclusion: The student career aspirations revealed in this study could be used to predict potential future workforce gaps. They could also be utilised to advertise less popular areas within radiography.

1. NHS England (2019) Diagnostic Imaging Dataset Statistical Release, Leeds, UK. <https://www.england.nhs.uk/statistics/wp-content/uploads/sites/2/2019/12/Provisional-Monthly-Diagnostic-Imaging-Dataset-Statistics-2019-12-19-1.pdf>.

2. NHS England (2018) Diagnostic Imaging Dataset Annual Statistical Release 2017/18, Leeds, UK. <https://www.england.nhs.uk/statistics/wp-content/uploads/sites/2/2018/11/Annual-Statistical-Release-2017-18-PDF-1.6MB-1.pdf>.

3. The Society of Radiographers (2018) Diagnostic Radiography UK Workforce Census 2018, London, UK. https://www.sor.org/sites/default/files/document-versions/diagnostic_workforce_census_2018.pdf.



SP3.3 How do we define advanced practice roles a document analysis of UK job descriptions?

Beverly Snaith¹; Martine Harris²; Helen Adamson¹; Beverley Foster¹; Nicholas Woznitza³

¹University of Bradford; ²Mid Yorkshire Hospitals NHS Trust; ³Homerton University Hospital NHS Trust

Background: Despite the concept of skill mix in radiography being well established in policy^[1,2] there remains concerns regarding the transferability and impact of roles, particularly at an advanced level. Job profiles^[3] were last updated in 2006, and therefore may not reflect the multi-professional advanced clinical practitioner (ACP) framework,^[4] This project sought to examine roles advertised at an advanced level for consistency and variation.

Method Roles advertised on UK NHS online job sites including the terms 'advance' or 'reporting' diagnostic radiographer were collated over a 6-month period. Content analysis of the job description (JD) and personal specification (PS) was undertaken evaluating role title, banding, role scope, modality and skill statements which were mapped to the national advanced clinical practitioner (ACP) framework.^[3]

Results: A total of 42 roles were analysed across a range of modalities, the most common involved disciplines were projectional radiography (n=20) and breast imaging (n=8). There was inconsistency in role title, and subsequent banding (6-8b). Mapping to the HEE ACP framework confirmed that expert clinical practice and leadership are universal whereas a marked variation in the inclusion of research and education competencies was evident.

Conclusion: There remains a lack of consistency in the application of advanced practice in radiography. Many roles purporting to be at this level not reflecting the recent national ACP framework. A review of national job profiles is needed to reflect contemporary practice.

1. Department of Health. Radiography skills mix: a report on the four-tier service delivery model. London: Department of Health; 2003.

2. Society of Radiographers. Diagnostic radiography: A survey of the scope of radiographic practice 2015. 2017.

3. NHS Employers. National profiles for diagnostic and therapeutic radiography. https://www.nhsemployers.org/-/media/Employers/Documents/Pay-and-reward/Diagnostic_and_Therapeutic_Radiography.pdf?la=en&hash=F999E0C2BDA2255B4361C7EB299D93CF55AE2DF4.

4. Health Education England. Multi-professional framework for England. <https://www.hee.nhs.uk/our-work/advanced-clinical-practice>.

SP3.4 Establishing the value of a supported return to training course for radiology trainees

Samira Rostampour¹; Jennie Wakefield²; Kate Hawtin³; Jane Young⁴

¹Imperial College NHS Foundation Trust; ²Oxford University Hospitals NHS Trust; ³University College London Hospital NHS Trust; ⁴Whittington Hospital NHS Trust

Introduction: On the basis of Health Education England's recently published Supported Return To Training (SuppoRTT) guidance, London School of Radiology has established a SuppoRTT Course for Radiology Trainees. Our course has been designed to help trainees returning to work after a period of absence and includes refresher lectures, practical simulation and interactive cases.

Method: A pre- and post-course survey was performed to measure the trainees' confidence, anxiety and overall excitement about returning to work. Analysis was performed using GraphPad Prism 5 using Wilcoxon Signed Rank Test. A total of 12 delegates attended the most recent course. 11/12 completed the post- course questionnaire. Paired data was obtained in six cases where trainees were willing to be identified.

Results: 91% (11/12) of delegates were returning after a period of maternity leave. The delegates were asked to rate their levels of confidence, anxiety and the extent to which they were looking forward to returning to work, on a scale from 1-5 (low-high). Anxiety levels about returning to work were reported to have reduced significantly after the course (P 0.03). Candidates also described improved levels of confidence, but this did not reach statistical significance (P 0.054). All delegates reported that they found the course useful and 100% would recommend the course to colleagues.

Conclusion: We have shown that attending a well-structured SuppoRTT Course prior to returning to training can reduce trainees' anxiety and improve confidence.

SP3.5 The personal impact of work-related musculoskeletal disorders (WRMSD) on sonographers

Gareth Bolton; Lisa Booth; Paul Miller

University of Cumbria

Background: Since 2005, the UK government's Migration Advisory Committee has listed sonography as an official 'shortage speciality' (Migration Advisory Committee, 2019). Work-related musculoskeletal disorder (WRMSD), already widespread among sonographers, is increasing due to the additional physical stresses of working in understaffed environments (Harrison & Harris, 2015). While contemporary research has described the broad picture regarding WRMSD in ultrasound (Bolton & Cox, 2015), none has, to date, extensively explored its personal and professional impacts.

Method: Extended semi-structured interviews with N=9 experienced sonographers working in the UK were conducted and analysed using Interpretative Phenomenological Analysis (Miller, et al, 2017). Core thematic areas that emphasised personal impacts of WRMSD were then further examined to highlight how participants specifically made sense of them.

Results: The key ideological tensions evident in the findings pertained to those between individuality and collectivity, and freedom and necessity. Evidence indicated that the participants held a range of perspectives highlighted in the following themes: (1) acknowledgement, or denial, in terms of experiencing symptoms of WRMSD (2) recognition of own vulnerability, (3)



'spinning plates' against emotional investment, (4) metaphorically 'jumping through hoops' and (5) total denial of the phenomenon.

Conclusions: Participants acknowledged their role as professionals, and also their own commitment to a broader altruistic model that reinforced their identities as good healthcare professionals. The 'personal self' provides a useful analytic framework for understanding some of the everyday feelings of sonographers towards the phenomenon of WRMSD. Further exploration of the conceptual facility thereof is recommended.

1. Bolton, G.C. & Cox, D.L. (2015) 'Survey of UK sonographers on the prevention of work related muscular-skeletal disorder (WRMSD)', *Journal of Clinical Ultrasound*, 43 (3), pp.145-152.
2. Migration Advisory Committee. (2019) Full review of the Shortage Occupation List Migration Advisory Committee. London: Migration Advisory Committee.
3. Miller, P.K., Woods, A.L., Sloane, C. & Booth, L. (2017) 'Obesity, heuristic reasoning and the organisation of communicative embarrassment in diagnostic radiography', *Radiography*, 23 (2), pp.130-134.
4. Parker, P.C. & Harrison, G. (2015) 'Educating the future sonographic workforce: membership survey report from the British Medical Ultrasound Society', *Ultrasound*, 23 (4), pp.231-241.

SP4 Radiotherapy treatments short paper presentations

SP4.1 Building research capability and capacity of therapeutic radiographers in a small radiotherapy department

Kirsty Farnan; Gareth Hill

NHS Tayside

Background: The Society and College of Radiographers (SCoR 2015) research strategy aims to embed research at all levels of Radiographic practice and education, although this can present a challenge to smaller radiotherapy departments with limited resources dedicated to research generation (Probst et al., 2015). Recognising that research is everyone's responsibility and local commitment to implementing college policy and strategy, it was necessary to ensure all staff contributed to audit and service evaluation activities to build research capacity.

Methods: A comprehensive review highlighted the need to carry out 15 service evaluations and audits to provide a more evidenced-based approach to service delivery. In an attempt to grow capacity, 15 teams comprising of experienced and inexperienced staff were formed, supervised by an advanced practitioner. Each team conducted data collection and analysis, resulting in evidence that reflected or changed practice. A mixed method survey monkey questionnaire was used to evaluate staff experience and attitudes towards this change of practice.

Results: Twenty-four respondents indicated a confidence level of over 60% when undertaking service evaluation; staff qualified the longest displayed lower confidence levels. Potential involvement in service evaluation and audit was indicated positively by 73%. Barriers identified by staff included time, opportunity and hierarchy. Twenty-three staff indicated being involved helped enhance their skills with 58% feeling this would benefit their future career.

Conclusion: Staff inclusion in audit and service evaluation within the department has overall been shown as positive. Resolutions to barriers identified will further build upon existing research capability and capacity within the department.

1. Society and College of Radiographers. (2015). *Society and College of Radiographers Strategy [2015-2017]*. London: SCoR.
2. Probst, H., Harris, R., McNair, H., Baker, A., Miles, E.A. and Beardmore, C. (2015). Research from therapeutic radiographers: An audit of research capacity within the UK. *Radiography*, 21(2), pp.112-118.

SP4.2 Improving patient pathways - 17 days from referral to radiotherapy treatment at Addenbrooke's Hospital

Nicola Twyman; Katie Bradshaw; Lynn Bridgehouse; Hannah Chantler; Jemma Chapman; Nick Early; Joanna Gemmill; Deborah Gregory; Andrew Hoole; Gail Horan; Katie Hutchinson; Rashmi Jadon; Sarah Knight; Simon Thomas; Mitch Wooding

Cambridge University Hospitals NHS Foundation Trust

In April 2019, staff in Addenbrookes' radiotherapy department resolved to improve their compliance with the NHS England's Service Specification that category 1 patients be treated within seventeen days from the decision to treat. Representatives from clerical staff, oncologists, radiographers, dosimetrists and physicists were brought together to review and improve our patients' pathways. The task appeared ominous. Methodologies, loosely based upon "The Theories of Constraints" (1) initially lent structure to the investigation; helping clarify and focus the work. The pathways were broken into chronological parts and the groups highlighted various issues causing delays. In-depth discussions involving the staff who actually encountered the issues, lead to ideas for routes forward and on to real changes. Following generalised discussions, the group reformed to concentrate on the Head and Neck patients' pathways and, subsequently, another specialised group worked with the cervix pathway. It has not been easy. Some improvements are staff and site specific, requiring continual interventions to maintain the results.

However, other ideas are departmental wide and should positively impact on all patients' pathways. To date we have monitored 2898 patients' pathways. Analysis of the 141 head and neck patients' pathways show, in the first quarter of 2019, only 6.1% were treated within 17 days of referral. However data for October and November, showed compliance had increased to 23.2% along with significant improvements to the median waiting time. Similarly cervix pathways (32 patients in total) improved from 33.3% to 80% compliance. We can share details on our pathway improvements, pitfalls and future plans

1. Cox, J. and Goldratt, E.M. (1986) *The Goal: A process of ongoing improvement*. Croton-on-Hudson, New York: North River Press.



SP4.3 Robust optimisation for SABR lung planning

Zoe Walker¹; Jane Rogers¹; Gareth Baugh¹; Robert Chuter²

¹University Hospital Coventry; ²The Christie

Background: Robust optimisation offers a solution to the inaccuracies using planning target volumes (PTVs) for lung planning, by including a full range of gross tumour volume (GTV) positions. The aim of this research is to evaluate the difference between methods of robust optimisation for SABR lung planning using 4DCT. The research extends existing work in this area as the methods will be evaluated using realistic breathing traces from patients rather than simplistic models.

Method: Fifteen VMAT lung SABR patients were planned in Raystation using a margin based PTV method, robust optimisation on a 3D scan and robust optimisation over ten 4D phases. Clinical goals were compared and robustness assessed by perturbing the dose. An in-house moving phantom was programmed with patient breathing traces obtained from 4DCT and on-treatment 4DXVi scans. Plans were delivered to the phantom to assess the dosimetry.

Results: The plan comparison results show that the robust optimisation on the 3D scan gives the same target coverage and similar doses to the organs at risk. The perturbed doses show that both plans have a comparable level of robustness with a dose to 99% of the PTV of 92.4% for robust plans compared to 92.1% for margin-based plans. Dosimetry results using patient traces from 4DCT and 4DXVi will be also be presented.

Conclusions: Results suggest that robust optimisation for lung SABR planning is comparable to margin-based planning. The clinical viability of using robust optimisation for photon lung planning will also be assessed.

SP5 Therapeutic radiography service improvement short paper presentations

SP5.1 Values versus evidence-based practice: Part 2 - Should the art of communication become a continuous training requirement of a competent therapeutic radiographer?

Joanne Mitchell; Donna Burns-Pollock; Lindsay White; Ana Azevedo; Joanne Mathieson; Linda Goodall; Eden Simpson; Josie Cameron

Edinburgh Cancer Centre

Introduction In 2018 a survey was undertaken examining the need for ongoing education, training and support allowing therapeutic radiographers (TR) to communicate effectively with patients in their care. Emotional resilience, due to the highly emotive nature of the role was also examined. Results highlighted effective communication skills are still regarded as being as important as technical skills. A significant number of staff however did not feel equipped to discuss issues concerning depression and anxiety, incontinence or sexual issues. A high level of respondents reported that they had experienced stress, low mood or anxiety as a result of a work related incident. The following supportive measures have since been implemented: * Communication Document (CD); * Values based reflective practice sessions; * Counsellor drop-in sessions.

Methods and Materials A follow up survey received 45 completed responses.

Results Whilst CD has improved general knowledge in advice to patients, stress levels have remained high. Comments received via the 2nd survey highlight new areas to be addressed. Regular positive peer review, more training/CPD time and mindfulness sessions have been suggested to support the emotional burden on staff.

Conclusion As a department we intend to use this evidence to continue in the creation of not only an evidence but values based workplace. In answer to the original question -Should the art of communication become a continuous training requirement of a competent therapeutic radiographer? Yes, but the communication needs to be not only with patients but amongst ourselves.

1. Bolderston A, Lewis D, Chai M.J.. The Concept of Caring: Perceptions of radiation therapists. Radiography 2010 16: pp198-208.

2. Probst H, Griffiths S. Retaining therapy radiographers: Whats so special about us? Journal of Radiotherapy in Practice 2007 6: pp 21-32.

3. Paterson M, Kelly E. Values -Based Reflective Practice. Practical Theology 2013 6: pp 51-68.

SP5.2 Developing a robust local framework for the development of advanced practice

Denyse Hodqson

Sheffield Teaching Hospitals

Since the vision for the development of the therapeutic radiographer workforce was first published, we have seen the growth of advanced and consultant practice roles. In particular, the advanced practice (AP) roles have developed as a response to service needs and focused mainly on tasks previously undertaken by the oncologist. Whilst the profession has been good at sharing practice, developments have varied between institutions. The success of roles is often down to the hard work and determination of individuals rather than a career structure that is recognised within organisations. This presentation focuses on the framework development in one department who were late in adopting the AP roles. The importance of support from the multi-disciplinary team and a shared vision were paramount to developing roles and ensuring appropriate training and support was in place. The challenges faced are explored, such as: territorialism, line management issues, professional recognition and funding. The benefit to patient outcomes and experience are discussed, along with improvements in service delivery, the impact for the profession and more effective inter-disciplinary working. It is important to recognise that recruiting individuals with the



right values and skills is the first step in the process and they require guidance and support to achieve their potential. Another vital aspect of the developing role is to demonstrate AP skill set and the impact upon on the service in terms of finance, work flow and patient experience. An evaluation strategy will be presented and results from work completed will be shared.

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SP5.3 Therapeutic radiographer-led sexual care clinic

Loryn Caulfield; Heather Nisbet; Sara Matthews

Oxford University Hospitals NHS Foundation Trust

Introduction: By 2034, 3 in 4 patients in England diagnosed with cancer will survive at least 10 years and they should be fully supported and the long-term consequences of treatment managed^[1]. High levels of unmet needs related to sexuality have been found at baseline and follow-up in patients who have had radiotherapy^[2]. Sexuality is a basic part of a person's identity and is closely linked with emotional and physical wellbeing. A cancer diagnosis and treatment can affect sexual self-concept as well as sexual functioning^[3]. Numerous women suffer for decades from the consequences of cervical cancer without accessing treatment that might improve their quality of life^[4]. In a 2006 survey of prostate cancer patients, 43% of respondents said that their sex life suffered^[5].

Method: Our Sexual Care after Radiotherapy service provides education, information and support patients with the sexual effects of radiotherapy treatment. It supports patients holistically providing advice, treatment and signposting for the management of sexual effects. The clinic is run by Therapeutic Radiographers trained in psychosexual support using the EX-PLISSIT model⁶. We provide leaflets and sign-post to resources/services as well as providing specific suggestions and interventions.

Results: Five patients have self-referred and five have been referred by their consultant. A friends and family questionnaire was completed by all patients attending. All of the patients said they would be "extremely likely" to recommend the service.

Conclusion: Our Sexual Care after Radiotherapy service offers an opportunity for support and advice to help improve our patients' quality of life.

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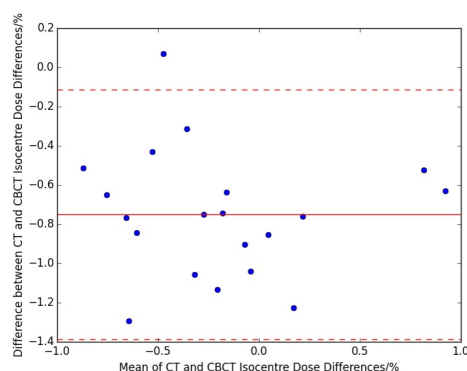
SP5.4 Using CBCT for dosimetric quality assurance of MR-only radiotherapy

Jonathan Wyatt; Rachel Pearson; Christopher Walker; Karen Pilling; Rachel Brooks; Hazel McCallum

Northern Centre for Cancer Care, Newcastle upon Tyne Hospitals NHS Foundation Trust

Introduction: Magnetic Resonance (MR)-only prostate radiotherapy using synthetic Computed Tomography (sCT) algorithms with high dosimetric accuracy have been clinically implemented^[1]. MR images can suffer from geometric distortions so dosimetric Quality Assurance (QA) using an independent image is required. The first-fraction Cone Beam CT (CBCT) has been proposed^[2], but has not been evaluated clinically. This study evaluated the clinical use of CBCT for dosimetric QA of MR-only radiotherapy.

Method: 34 patients treated with MR-only prostate radiotherapy were divided into two cohorts. The first (20 patients) received a back-up CT, whilst the second did not. All patients were planned using a sCT from MriPlanner (Spectronic Medical) and received daily CBCT imaging (Varian Medical Systems) with MR-CBCT soft-tissue matching^[3].



The treatment plan was recalculated on the first-fraction CBCT using the soft-tissue match in RayStation (RaySearch Laboratories) and the doses compared. For cohort 1 the sCT was also rigidly registered to the back-up CT, the plan recalculated and the doses compared.

Results: Mean sCT-CBCT dose differences across both cohorts were $-0.7 \pm 0.1\%$ (sem, range -2.3% , 0.6%). The CBCT underestimated the sCT dose in 30/34 patients. The mean gamma pass rate was (1%/1mm) $85 \pm 1\%$ (75%, 94%) and (2%/2mm) $95.6 \pm 0.6\%$ (85.4%, 99.7%). For cohort 1, sCT-CBCT dose differences correlated with sCT-CT differences (Pearson's $r=0.79$, $p<0.001$), with sCT-CBCT differences on average 0.7% larger and agreeing within $\pm 0.6\%$.

Conclusion: CBCT appears a promising method of dosimetric QA for MR-only radiotherapy, with dose differences and gamma pass rates showing good agreement with CT.



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2. Palmér E, Persson E, Ambolt P, Gustafsson C, Gunnlaugsson A, Olsson LE (2018) Cone beam CT for QA of synthetic CT in MRI only for prostate patients. *J Appl Clin Med Phys.* 19(6), 44-52.
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SP5.5 Can CT-Cone Beam Computed Tomography (CT-CBCT) matching skills be transferred to Magnetic Resonance-CBCT (MR-CBCT) matching for MR-only prostate radiotherapy?

Rachel Brooks; Hazel McCallum; Rachel Pearson; Karen Pilling; Jonathan Wyatt

Newcastle upon Tyne Hospitals NHS Foundation Trust

Background: Research to date has used online fiducial matching with an MR-only pathway^[2], yet in the UK, 66% of centres use CBCT soft-tissue matching for verification purposes^[1]. We have previously demonstrated MR-CBCT soft-tissue matching has minimal differences to CT-CBCT matching^[3]. This research assesses the transferability of radiographer skills and training needs for MR-CBCT prostate soft-tissue matching.

Method: Twenty-three radiographers with 3 months - 5 years' experience of online daily CT-CBCT soft-tissue matching prostate cancer patients participated in the repeated measures study between February and July 2019. Each participant completed 10 CT-CBCT prostate soft-tissue matches offline as a baseline for inter-user variability, followed by 10 MR-CBCT prostate soft-tissue matches. A MRI anatomy training intervention was delivered and the 10 MR-CBCT prostate soft-tissue matching exercise was repeated. Inter-observer error was calculated as the standard deviation of the matches across all observers per patient.

Results: Mean (\pm standard deviation) of the inter-observer error at CT-CBCT baseline were 1.4 (\pm 0.8), 1.2 (\pm 0.7), 0.4 (\pm 0.1), MR-CBCT matches prior to training were 1.5 (\pm 0.7), 1.5 (\pm 0.4), 0.6 (\pm 0.4) and after the training intervention 0.9 (\pm 0.3), 1.2 (\pm 0.4), 0.5 (\pm 0.1) (vertical, longitudinal, lateral). Results demonstrated inter-user variability reduced following the training intervention.

Conclusion: Therapeutic radiographers require minimal additional training to use MRI as reference data for online soft-tissue image matching for prostate patients despite having no prior experience of MRI. This suggests site-specific CT-CBCT analysis skills are transferrable to MR-CBCT and enables MR-only radiotherapy to be extended to other tumour sites without fiducial markers.

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SP5.6 Non-invasive cardiac radioablation for ventricular tachycardia -treatment delivery experiences from three centres

Karen Pilling¹; Rachel Brooks¹; Alison Blower²; Claire Huntley²; Debbie Gill³; Matthew Walsh³

¹Newcastle Upon Tyne Hospitals NHS Foundation Trust; ²South Tees Hospitals NHS Foundation Trust; ³Sheffield Teaching Hospitals NHS Foundation Trust

Introduction: Using SABR to treat Ventricular Tachycardia (VT) represents a novel treatment alternative for cardiac patients in whom conventional therapies, including invasive cardiac catheter ablation, have failed. This is the first completely non-invasive therapy for cardiac arrhythmias and could reduce procedure times for patients from up to 8 hours down to around 45 minutes, without risk of general anaesthesia or invasive ablation procedures.

Method: Radiographer training was initiated by all 3 centres using previous images from patients with implantable devices as a guide. This helped to determine accuracy of cardiac matching and familiarisation of anatomy. All patients will have implantable defibrillator wires close to PTV and the artefacts from these make CBCT matching difficult. As a result, individual CBCT parameters were developed to optimise image quality in preparation for treatment delivery using a combination of 3D and 4D CBCT, dose optimisation and scan speeds. Protocols were also developed to look at utilising both IV and oral contrast and the use of compression was assessed in all 3 centres. Surface guided monitoring was also utilised in 1 centre.

Results: Total doses of between 20Gy and 25Gy were delivered in a single procedure ranging from 6 mins to 25 minutes. A combination of 3D and 4D Pre and post treatment CBCT's were acquired and mid CBCT acquired to monitor intra-fraction motion.

Conclusion: This collaborative approach has enabled the implementation of non-invasive cardiac radioablation for ventricular tachycardia in all 3 centres, each of whom have treated 1 patient to date.

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SP6 Innovation and communication short paper presentations

SP6.1 RoboRad - a real-time system for monitoring and analysis of PACS reporting room occupancy and workstation utilisation

Bahman Kasmai; Hilmar Spohr; Martin Doddington; Ben Simpson

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Background: Planning and managing an efficient and cost effective radiology reporting activity requires real-time and cumulative reporting rooms occupancy and workstations utilisation data. We have developed an in-house system that provides users and managers with real-time information on availability and locations of PACS workstations.

Method: The system consists of a server application running on a standard PC that emulates a user's mouse and keyboard actions to obtain the basic reporting session data from PACS, without the need to interface to the PACS application. Using this method of interfacing allows the institution to avoid the complexity and the cost associated with classic programmatic methods of interfacing to PACS. In addition, the live workstation availability is pushed to an IoT web service (ThingSpeak, provided by The MathWorks). A Matlab script then converts the data into readable messages and sends an instantaneous Twitter message to registered users.

Results: The PACS workstation utilisation data has allowed the institution to get a better view of the frequency and occupancy of the diagnostic reporting rooms, resulting in better utilisation of the reporting resources. Initial trials with the Twitter-based messaging have resulted in very positive feedback as to its impact on reducing time to locate free workstations. The Tweets contain live information about availability of workstations in the relevant reporting rooms.

Conclusion: A PACS workstation utilisation and reporting room occupancy information system is a useful tool for resource management in a radiology institution.

SP6.2 Automated calculation of the RV:LV ratio in acute pulmonary embolism - a real-world feasibility and clinical impact study

Robert Foley; Sophie Glenn-Cox; Ben Hudson; Jay Suntharalingam; Rob Mackenzie Ross; Graham Robinson; Jonathan Rodrigues

Royal United Hospital, Bath

Introduction: The right ventricle to left ventricle (RV:LV) ratio >1 on CT pulmonary angiography (CTPA) is the most important predictor of adverse outcomes in acute pulmonary embolism¹ (PE). The 2019 National Confidential Enquiry into Patient Outcome and Death for PE demonstrates that this metric is poorly reported. We assess the feasibility of an entirely automated RV:LV analysis and determine its clinical impact in a real-world setting.

Methods: 50 consecutive patients with CTPA-proven acute PE (June 2019 to August 2019), identified via a Radiology Information System systematic search, were retrospectively analysed with automated post-processing software (Imbio, USA). RV and LV volumes were segmented on 1.5mm contrast-enhanced axial slices and maximal ventricular diameters were derived for RV:LV ratio. Mean attenuation values within RV and LV cavities were measured. Clinical reports were reviewed for mention of right heart strain. The automated RV:LV ratio was compared with clinical reports to determine how this would have altered practice if it has been available at the time of the report.

Results: Entirely automated RV:LV analysis was feasible in 86% (n=43). Where analysis failed, intra-ventricular LV attenuation was <100 HU. RV:LV ratios ranged from 0.85-2.09, with 60% (n=30) >1.0 . Where RV:LV was >1.0 , right heart strain was mentioned in 37% (n=11/30) clinical reports. Automated RV:LV ratio would have added important prognostic information in 63% (n=19/30).

Conclusion: In a real-world setting of acute PE, automated RV:LV analysis is reliable when LV intraventricular attenuation >100 HU. Applied routinely, this technology would improve risk stratification in the majority.

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SP6.3 Preparing patients for MRI with a free and easily accessible virtual reality experience

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¹Raigmore Hospital; ²NHS Highland; ³The Belfast Trust; ⁴King's College London

We have developed a virtual reality experience to prepare paediatric and adult patients for their MRI which is a freely downloadable app for mobile phones. The app, used with inexpensive google cardboard headsets, allows the patient to experience the entire journey of having an MRI from arriving at reception to having a scan. We use the resource in three ways; (1) we post out cardboard VR headsets for patients to use it at home, (2) it is used in the radiology department prior to the patient's MRI (3) it is used by play specialists on the children's ward. The resource was trialled on 44 children (4-12yrs) across two institutions booked for a head or spine MRI but with no previous experience of awake MRI. Parents and children completed a questionnaire regarding the VR MRI experience. We found our VR resource improves both patient and parent experience. Feedback scores were 9 out of 10 for fun, ease of use and for making both parent and child feel more positive about attending. All children recommended its use by others attending for MRI. We found the resource reduced anxiety associated with MRI and had potential to avoid the need for GA. Based on this success it is now implemented for routine clinical use at 4 UK hospitals. We hope to report the results of a randomised controlled trial currently underway which will assess the benefit of the resource to increase scan compliance, avoid general anaesthetic and reduce patient anxiety.



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SP6.4 Clinician and patient perspectives on the requirements for independent patient image access: a qualitative analysis

William AS Cox¹; Penelope Cavenagh²; Fernando Bello³

¹University of Portsmouth; ²The University of Suffolk; ³Imperial College London

Introduction: Advancing technologies offer novel opportunities to share diagnostic radiological images with patients (Imperial College Healthcare NHS Trust 2019). This sharing may occur within the clinical environment under the supervision of a clinician, or may involve remote, unsupervised access (Sectra 2019). A survey with over 500 respondents established the case for face-to-face image sharing with patients (Cox, Cavenagh & Bello 2019b). This paper analyses the follow up interviews to that survey to consider in depth the requirements for safe and effective remote image sharing (Cox, Cavenagh & Bello 2019b).

Methods: Semi-structured interviews were undertaken with clinical imaging experts and patients in order to explore respondent attitudes towards requirements for image sharing. Data were analysed using thematic analysis. The results are reported below.

Results: Salient issues raised included that: not all people may want to view their images, some may find this upsetting and different people may react differently to image sharing; the appropriateness of sharing depends on image type as some modalities and their findings, e.g. X-ray & fractures, are easier to understand than others; resources required to facilitate this, such as time and equipment, are a concern; sharing should be only after discussion with a clinician; there is a requirement for additional supporting information such as labels, flags, a simplified report, trusted pathology information and an element of interactivity or a contact mechanism.

Conclusion: Participants identified several requirements for enabling safe and effective patient access to imaging. There is a need, therefore, for further work to identify strategies for image sharing which meet the identified requirements.

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SP7 Prostate/Renal/MSK short paper presentations

SP7.1 Dynamic contrast-enhanced MRI (DCE-MRI) of the prostate: Limiting the acquisition duration

Eric Nduka Onwuharine; Alexander James Clark

University Hospitals of North Midlands

Background: DCE-MRI is useful in prostate assessment and prostate cancer (PCa) diagnosis. The parameters of DCE-MRI acquisition, including total acquisition duration, vary greatly across centres. It takes an average of 5 minutes to acquire DCE-MRI in many centres in the UK. However, the understanding of how to use DCE-MRI, when acquired as part of a multiparametric MRI (mpMRI) of the prostate, has evolved significantly in the last few years. Detailed enhancement curve analysis is now no longer recommended and the greatest values to be gained from DCE-MRI stem from the likelihood that significant PCa will have focal and usually early abnormal enhancement.

Purpose: To identify biopsy proven clinically significant PCa on mpMRI. To measure the time after injection of MRI contrast to the time when these foci of PCa are most conspicuous, quantified as a lesion to normal ratio (LNR). Use this data to streamline our DCE-MRI protocol.

Summary: From 150 pre-biopsy mpMRI studies of the prostate we identified 52 histologically proven significant cancers. The average time to PCa maximum LNR was 36 seconds, with a range from 22 seconds to 100 seconds. As a result, we have reduced our DCE-MRI scan time to 2 minutes 30 seconds. In our Trust, approximately 1500 DCE-MRI scans are performed per year. This means 62.5 hours scanner time saved.

SP7.2 Pictorial review of the shifting pattern of advanced metastatic prostate cancer in the era of multimodality imaging

Andra Curcean¹; Sebastian Curcean¹; Khobe Chandran¹; Juliet Carmichael¹; Maria Dolores Fenor de la Maza¹; Pasquale Rescigno¹; Alison Reid²; Julia Murray²; Siraj Yusuf²; Katja de Paep²; Aslam Sohaib²; Dow-Mu Koh¹; Nina Tunariu¹; Joshua Shur²

¹The Royal Marsden Hospital/The Institute of Cancer Research, London, United Kingdom; ²The Royal Marsden Hospital, London, United Kingdom

Background: The pattern of metastatic disease in advanced prostate cancer (APC) is changing. Increased use of imaging, newer imaging techniques with higher sensitivity for disease detection and patients receiving multiple lines of novel therapies with increased life expectancy are likely to be contributory. When biopsied, APC metastases may show characteristics of poorly differentiated adenocarcinoma and clones may not secrete PSA which can cause diagnostic uncertainty. Increased awareness of less common disease sites in APC is important to avoid unnecessary biopsies, imaging and for initiation of appropriate therapy.

Purpose: Illustrate the changing patterns of metastatic disease in APC and why this is clinically important. Highlight the utility and pitfalls when using novel and traditional imaging techniques such as CT, Bone Scan, whole-body MRI (WBMRI) and PSMA-PET in assessing APC, and how to incorporate this into clinical practice.

Summary: Educational pictorial review of changing and unusual presentations of APC. Cases include atypical lymphadenopathy (mediastinal, inguinal, porto-caval only), nodal morphology (infiltrative versus well-defined), predominantly lytic bone metastases and visceral metastases (liver, pleura, peritoneum or brain). Why is it important to recognise lytic metastases and infiltrative lymphadenopathy patterns? Discussion of the implications for clinical care and what to look for. Why is PSA trend not enough in APC? Cases illustrating radiological disease progression in the absence of PSA rise and in PSA non-secretors. Emerging role of PSMA-PET and WBMRI in APC. Cases illustrating the use of novel imaging techniques and how to overcome the challenge of prostate cancer heterogeneity.

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SP7.3 Initial experience of a new emergency referral pathway for pre-menopausal females presenting with acute renal colic

Mahdi Saleh; Soha Kadhim; Gerard Doyle

Countess of Chester Hospital

Background: NICE guidelines state that an urgent unenhanced CT should be performed first when investigating acute renal colic^[1]. It is already known that the alternative diagnosis rate and effective dose from ionising radiation is higher in pre-menopausal females. An emergency referral pathway was implemented at our institution to reduce unnecessary ionising radiation exposure in this group of patients.

Method: This is a single institution retrospective study involving pre-menopausal females who presented consecutively to A&E with acute renal colic. We present our findings comparing our previous practice of using CT first to our current practice of using ultrasound first using the new pathway.

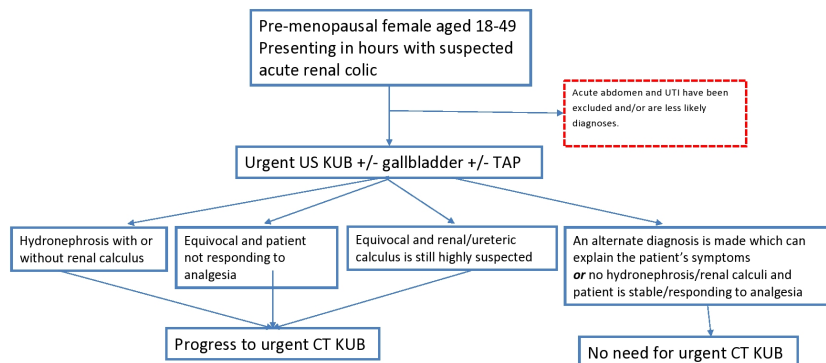


Results: There was a total of 61 and 85 consecutive patients over a 5 month period each in the pre-pathway (CT first) group vs post-pathway (US first) group, respectively. There was a significant difference in ionising radiation exposure between the two groups: CT first 61/61 (100%) vs US first 15/85 patients (17%), $p < 0.05$. In the US first group, CT provided a diagnosis in only 3/8

(37%) patients with an initial non-diagnostic US. The remaining 7/15 (47%) patients who underwent a subsequent CT did so as per the pathway and after initial US demonstrated hydronephrosis. 20/85 (24%) patients who had an US only demonstrated a range of alternate diagnoses.

Conclusion: The new pathway successfully reduced the number of patients undergoing unnecessary ionising radiation exposure. The use of CT was limited to patients with proven hydronephrosis on US where emergent intervention and stone characterisation was required.

1. Renal and ureteric stones: assessment and management. NICE 2018.



Note: Patients who are septic, haemodynamically unstable, or have only one kidney are excluded from this pathway. Patients who require subsequent CT should have it immediately. TAP = Trans-abdominal pelvis. Note: All patients with suspected acute renal colic should have bloods and urine dipstick performed first before referral onto this pathway.

SP7.4 Opportunistic screening for osteoporosis by abdominal CT in a British population

Sonam Vadera; Timothy Osborne; Vikas Shah; James Stephenson

University Hospitals of Leicester

Background: It has previously been shown that CT scans performed for other indications can be used to identify patients with osteoporosis. This has not yet been tested in a British population. We sought to evaluate the use of vertebral CT attenuation measures for predicting osteoporosis in a British cohort, using dual-energy X-ray absorptiometry (DEXA) as a reference standard.

Method: Patients who underwent an abdominal CT in 2018, and concomitantly underwent DEXA within a six-month interval, were retrospectively included. CT attenuation values in Hounsfield units (HU) were measured on the sagittal reconstruction by placement of a region-of-interest at the central portion of the L1 vertebral body, and then compared to their corresponding DEXA score. Receiver operating characteristic (ROC) curves were generated to determine sensitivity and specificity thresholds.

Results: 536 patients (394 females, mean age 65.8) were included, of which 174 had DEXA-defined osteoporosis. L1 attenuation measures were significantly different ($p < 0.01$) between the three DEXA-defined groups of osteoporosis (118HU), osteopenia (143HU) and normal bone density (178HU). The area under the ROC curve was 0.74 (95% CI 0.69 – 0.78). A threshold of 169HU was 90% sensitive and a threshold of 104HU was 90% specific for diagnosing osteoporosis.

Conclusion: Routine abdominal CT can be used to opportunistically screen for osteoporosis without additional cost or radiation exposure. The thresholds identified in this study are comparable with previous studies in other populations. We recommend radiologists engage with primary care and rheumatology providers to determine appropriate cut-off values for further investigation.

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SP7.5 Popliteal fossa ultrasounds - When are they clinically indicated?

Emily Mayo; Gareth Herdman

Princess of Wales Hospital

Introduction: Posterior knee swellings are frequently investigated via ultrasounds to confirm presence of a popliteal cyst or exclude other sinister pathology. A popliteal (or Baker's) cyst represents a communication between gastrocnemius-semimembranosus bursa and the knee joint. Usually these are self-limiting, secondary to underlying joint disease and warrant conservative treatment. Rupture is the main complication; usually managed conservatively. NICE Guidelines recommend adult ultrasound is performed only to exclude DVT, popliteal aneurysm or sarcoma. Surgical options typically involve closure or enlargement of the communication or management of underlying joint disease. We sought to review both incidence of popliteal cysts versus significant non-popliteal cyst pathology diagnosed via ultrasound and clinical indications on referral. We aimed to develop a more clinically relevant local referral pathway to promote effective use of resources, reduce unnecessary examinations and waiting times for musculoskeletal ultrasounds.



Methods: All ultrasounds of popliteal fossas were collected retrospectively between 01/05/2018 - 30/04/2019. Exclusion criteria were age <18 and investigations of tendon injury, bursae or as part of a Doppler study. Patients were sub-divided into groups based on the referred clinical information and NICE sarcoma guidelines: lump >5cm, pain, swelling or miscellaneous (e.g. query abscess).

Results: 68 inclusions. Age range 22-99 (mean 62 years). 40 (59%) uncomplicated popliteal cysts. 3 ruptured cysts. 17 NAD. 8 referred for further imaging with final diagnosis of 6 cysts, 1 myoliposarcoma, 1 AVM.

Conclusion: Only 2 clinically significant findings. We recommend that for patients above 18 years: referral pathway should follow NHS guidelines including investigating popliteal fossa mass lesions >5cm, or if an aneurysm or abscess is felt likely. This would open up the annual equivalent of 5 extra musculoskeletal ultrasound clinics to accommodate other referrals.

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SP7.6 Occluded colorectal anastomosis - A novel combined radiological and endoscopic technique to avoid further surgery and permanent stoma formation

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Royal Free London NHS Trust

Background: Occlusion rates of strictured post-operative colorectal anastomoses can be as high as 30%¹ and are usually a sequelae of inflammation or ischaemia. Patients then either require technically challenging surgical revision or remain defunctioned via a stoma. Restoring luminal continuity is challenging; from visualising the anastomosis to recanalizing without causing penetration injury. Few case reports exist. We present two cases of imaging assisted sharp recanalisation and covered stent insertion to allow tract formation through a completely occluded anastomosis.

Method: Case 1: 52 year old male underwent a total colectomy and ileorectal anastomosis with a defunctioning loop ileostomy (DLI) for synchronous colorectal cancers. Case 2: 57 year old male developed an anastomotic leak post anterior resection for rectal cancer requiring a DLI. Contrast-enema and sigmoidoscopy confirmed anastomotic occlusion, with no pinhole to allow standard guidewire passage and dilatation. Combined trans-stomal endoscopy and transrectal ultrasound were used to safely identify the centre of the anastomotic staple ring, allowing sharp recanalisation using a chiba needle through which a guidewire was placed into the proximal lumen. Small calibre balloon dilation allowed deployment of a 24mm diameter retrievable colonic stent to remain in-situ for 6 weeks to allow tract dilation and maturation.

Results: Both patients did not suffer any complications. Case 1: Asymptomatic, awaiting elective stoma reversal. Case 2: Successful ileostomy reversal. His anastomosis has remained patent to date (4 years).

Conclusion: We present two cases that illustrate a novel multimodality technique that allows safe restoration of luminal continuity in patients with occluded colorectal anastomoses.

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SP8 Breast short paper presentation

SP8.1 The role of imaging for a male breast lump

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University Hospitals of North Midlands NHS Trust

Introduction: Gynaecomastia is known to be more common than breast cancer amongst male patients presenting to the breast clinic. Furthermore, gynaecomastia is not a risk factor for developing cancer. Thus most patients need only a careful history and physical examination. The purpose of this study was to analyse whether mammography and ultrasound should be performed as part of the workup for men referred to the breast care unit with a lump or pain that is thought to be benign by the clinician.

Method: Patients who presented with a palpable breast lump or pain were included. Patients underwent radiological imaging either in the form of a mammogram or ultrasound depending on their age. We recorded the P grade on examination and the M/U value on imaging.

Results: 304 male patients were included in the study. 229 cases (75%) of radiological findings were gynaecomastia, 5 cases (1.6%) were malignancy (2 cases were CT detected). Other findings were lipoma (23), abscess (3), normal chest wall tissue (23), fat necrosis (1) and sebaceous cyst (3). 136 patients (45%) had a mammogram as the imaging method, 97 patients (32%) had only an ultrasound and 70 patients (23%) had both imaging modalities. A biopsy was performed in 13 cases and showed 5 cases of malignancy. The remaining biopsies were either normal breast tissue, infected cyst, fat necrosis or pseudo gynaecomastia.

Conclusion: We observed 100 % concordance between clinical diagnosis and imaging result. Therefore, in the case of clinical suspicion for gynaecomastia, further imaging is not indicated.



MSK POSTER PRESENTATIONS

P001 SPECT/CT spine – Correlation to MR and effects on management outcome

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Lancashire Teaching Hospitals NHS Trust

We present our local experience of a Tertiary Neurosurgical and Nuclear Medicine referral centre. We identified 98 patients with SPECT/CT spinal bone scans over an 18-month period. In over 90% the indication was back pain, not helped/cause identified on other imaging, with remainder due to lesions picked up on other imaging modality. 86% had positive findings, endplate changes being commonest followed by facet arthropathy. In 10% unexpected sacroiliac joint pathology was identified. We compared SPECT/CT findings to previous MR imaging, quantifying if findings were present on MR, compared to new diagnosis. Negative SPECT/CT helped guide management towards Pain Service. A quarter of patients had appropriate surgery after corroborating SPECT/CT with MR findings. Over 10% had injections, mostly therapeutic, some diagnostic. 5 went on to have discogram. Overall, 56% patients had a management change based on SPECT/CT findings. In 11% of cases SPECT/CT results not used to guide management. Used appropriately, SPECT/CT can be a valuable tool to problem-solve and help guide management in the majority of difficult or equivocal cases.

P002 Radiography for knee trauma – Clinical audit to ascertain compliance with the Ottawa Knee Rule

Joseph Dillon-Hearne

King's College Hospital

Objectives: Clinical audit to ascertain the proportion of traumatic knee x-ray requests that conform to the Ottawa Knee Rules (OKR), as per RCR and NICE guidelines.

Methods: A&E X-ray requests from King's College Hospital (KCH) were collected retrospectively from a nine-month period and coded to ascertain their conformity with the OKR. (n=1248).

Results: Initially 73% of referrals for patients presenting with traumatic knee injuries were compliant with the OKR, well below the guidelines of 95%. Two phases of interventions were implemented. The first consisted of posters around A&E and talks to A&E staff. A re-audit at this stage showed compliance improved to 81% (n=634). The second phase interventions consisted of altering the referral process to positively encourage referrers to comply with the OKR. A re-audit after this stage showed compliance rose to 99% (n=728).

Conclusions: By combining education, awareness, and workflow management compliance with the OKR was improved to the extend the Trust is now in line with RCR and NICE guidelines.

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P003 Adequacy of clinical information provided by emergency department staff with reference to the Ottawa ankle rules for traumatic ankle pain in a district general

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Great Western Hospitals NHS Foundation Trust

Background: The reported incidence of ankle fracture in patients presenting to the emergency department is relatively low (15%) but despite this the majority undergo radiography (Dowling, 2009). The Ottawa ankle rules (OAR) have been validated as an effective and highly specific tool to rule out ankle fracture without the need for x-ray (Bachman, 2003; Pascale, 2016). We aimed to evaluate the adequacy of clinical information provided on x-ray requests for traumatic ankle pain with reference to the Ottawa ankle rules in our district general emergency department.

Method: 100 consecutive requests from the emergency department of our DGH were reviewed to assess adequacy of the clinical information provided. The standard is that 100% of x-ray requests should satisfy the OAR. The radiologist report was viewed to assess incidence of fracture identified on plain film.



Results: The audit found that only 21% of requests provided adequate clinical information that satisfied the (OAR). The incidence of fracture was only 18%.

Conclusion: This audit highlights the need for education to improve adequacy of clinical information provided on x-ray requests with reference to the OAR. We have addressed this through introduction of information posters placed in key clinical areas around the department explaining the OAR and their utility. This will be re-audited post intervention to look for significant improvement, with further measures introduced if necessary. This is important to reduce the number of unnecessary radiographs in order to save clinical time, reduce cost, and reduce radiation exposure.

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P004 Short-term intra- and inter-operator precision errors of radiofrequency echographic multispectrometry bone density measurements at the lumbar spine using the Echolight scanner

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University of Exeter

Background: The Echolight is a new type of quantitative ultrasound scanner using radiofrequency echographic multispectrometry (REMS) to perform measurements at the clinically important fragility fracture sites of the lumbar spine and femoral neck using a hand-held probe. The aim of this study was to explore the intra- and inter-operator precision errors associated with REMS measurements at the lumbar spine.

Method: 32 participants were recruited who underwent REMS measurements at the lumbar spine using the Echolight (Lecce, Italy). The four operators were trained and had some practice sessions prior to conducting the study. Duplicate measurements were made by a single operator with repositioning between measurements. Additional operators undertook further duplicate measurements. The root mean square standard deviation (RMDS) and root mean square coefficient of variation (RMSCV%) were calculated for the intra- and inter-operator results.

Results: Participants' mean age was 27.9y (± 9.7) and their mean body mass index was 26.7kg/m² (± 7.3). Intra-operator and inter-operator precision errors ranged from RMSCV% (RMDS) 1.0% (0.01) to 6.5% (0.07) and 1.0% (0.01) to 6.6% (0.07) respectively. The worst precision errors were at L2. Some vertebrae were not captured on both scans for all patients, thus reducing the data contributing to these results. Combined L1-4 results were 1.9% for intra- and 1.9% for inter-operator precision errors.

Conclusion: These results demonstrate good precision errors, particularly when considering the combined L1-4 results. Inter-operator precision errors were not significantly greater than the intra-operator results suggesting that with adequate training different operators can produce repeatable results.

P005 Dual energy x-ray absorptiometry: The accuracy of measurements with increasing body fat on the GE lunar prodigy and the GE lunar iDXA: An in-vitro study

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Background: Obesity in the population is growing and dual energy x-ray absorptiometry (DXA) scanners are used in a wide range of patients. There is evidence of larger precision errors with increasing obesity^[1], but much less information on the accuracy of measurements in obese populations. The aim of this in-vitro study was to explore the impact of increasing body mass on DXA measurements at the lumbar spine.

Method: A PBU-50 phantom (Kyoto Kagaku, Japan) was scanned five times on a GE Lunar Prodigy and a GE Lunar iDXA (Bedford, UK) with repositioning between each scan on standard and thick mode. Fat and lean tissue layers^[2] were added to increase the phantom size and mimic the following body mass indexes (BMIs): 18.3kg/m², 29kg/m², 38kg/m², 42kg/m², 46kg/m². Data were analysed using percentage change and a one-way ANOVA.

Results: There were BMD reductions on the Prodigy of up to 7.7% for BMIs of 38kg/m² and above on standard mode and reductions of 0.5 to 6.3% for thick mode, with this greatest difference for the 46kg/m² phantom ($p < 0.001$). The iDXA standard mode BMD reduced between 0.2% to 5.7%, with the greatest reduction for the 29kg/m² phantom ($p < 0.05$). A similar pattern was seen for the thick mode, with reductions of 3.8% to 6.1% ($p < 0.001$).

Conclusion: These results demonstrate that changes in fat and lean tissue mass in this phantom-based experiment yield small, but significant differences in BMD. This in-vitro study supports the clinical evidence of large weight changes having an impact on BMD.

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P006 Multimodality imaging of greater trochanter lesions

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Greater trochanter lesions are relatively uncommon. They can be divided into traumatic such avulsion fractures, infective including tuberculosis or inflammatory and neoplastic, including primary and secondary (metastatic) osseous lesions using a diagnostic sieve. Neoplastic lesions involving this region, depend on patient's age, include benign (e.g. simple or aneurysmal bone cyst, enchondroma), locally aggressive (e.g. Giant cell tumour, chondroblastoma, eosinophilic granuloma), malignant (e.g. osteosarcoma, chondrosarcoma, metastases). Although imaging of greater trochanter lesions, including radiographs and MRI, remains critical in narrowing down differential diagnosis, image-guided biopsy is the mainstay for their final histological diagnosis and subsequent management.

P007 MRI improvements and its role in Pars interarticularis injury

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Medical imaging plays an important role in the diagnosis and monitoring of PARS fractures in young athletes. A pars stress fracture is the most common cause of lower back pain in elite athletes. As the use of plain radiography is no longer used at the elite level due to its poor sensitivity, CT has become the gold standard. It provides an excellent resolution and high contrast between bone and soft tissue and it allows detection of changes associated with pars injury. However, CT of the spine is a very high radiation dose. MRI is another modality of imaging used but it will depend on the stage of the injury and the sequences used. Routine sequences as T1/T2 AX weighted are not sensitive to detect the injury. However recent improvements in gradient sequences and the use of an isotropic 3D T1 VIBE has shown to be useful in the detection of pars fractures due to the sensitivity and specificity close to CT. One of the most important roles in radiography is justification for any imaging examination based on clinical indication, which includes the utilisation of the ALARP principles. This offers patients first-hand quality imaging to investigate PARS defects, which now can include 3D MRI VIBE scanning. In this paper, we will outline that MRI VIBE is an excellent tool to define and monitor PARS defects using the application of 3D MRI sequences.

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P008 Intervertebral disc sequestration: MR imaging patterns of posterior fragment migration

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Background: In the herniated intervertebral disc, the nucleus pulposus may maintain its connection with the parent disc, or become completely separate from the donor disc, forming a sequestered disc.

Purpose: Although sequestered disc fragments typically migrate in the anterior epidural space, posterior disc migration can become a source of severe clinical symptoms and signs. We will discuss the clinical and MR imaging findings of dorsal disc herniation, featuring epidural (posterior and anterior) and intradural migration of the sequestered lumbar disc. Clinical diagnosis of posteriorly migrated disc fragments can be puzzling as epidural disc material may need to be differentiated from a multitude of abnormalities associated with pain and neurologic deficit including infection, tumor, trauma, degenerative disease changes, and iatrogenic conditions. MR imaging can readily depict intracanalicular mass lesions with compression of the spinal cord, and may demonstrate the precise anatomic site of abnormal lodged extra- or intra- dural disc fragments after administration of contrast material. A tract-like structure connecting the sequestered disc with the posterior epidural lesion may be seen, pointing to the exact route of migration of the disc fragment. Surgical removal of the sequestered fragment is required to recover motosensory function of the lower extremities.

Summary: Clinical symptoms of dorsal disc herniation are similar to those of other causes of lumbar pain, radiculopathy or cauda equina syndrome. In the absence of a visible disc herniation, radiologists need to scrutinize the epidural (posterior and anterior) space as well as the cord for abnormal migrated disc fragments.

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P009 A service evaluation of MRI lumbar spine scans within a community-based diagnostic setting

Darren Hudson

InHealth

Background: InHealth has provided direct access to MRI within primary care across London for many years. With the ongoing demand for imaging, resources need to be managed whilst still maintaining patient relevant outcomes. This is a service evaluation of lumbar spine MRI scans within a community-based diagnostic setting. It aims to provide a review of current service usage, provide comparison between referrer type, review appropriateness of referrals being made, and the potential relevance of report outcomes. It provides insight into adherence to, and relevance of, guidelines in managing lower back pain and how access to community-based diagnostics could be better supported.

Method: Records on patient referrals booked over an 18-month period were extracted for trend analysis over time, between commissioning groups and referrer type. A randomised purposive sample was taken for more detailed analysis of each referral and radiological report. Data extracted provided information on demographics and prevalence of clinical presentation and report observations.

Results: There is significant variation in referral numbers seen across commissioning groups and in the proportion of non-medical referrals, suggesting differences in practice worth further exploration. Assessment against defined referral criteria was made, as well as judgement of report relevance against clinical indications. Lack of information was an important area highlighted in the review.

Conclusion: There was no difference in referral justification or report outcome seen between referral type. Patient age and associated leg symptoms were significant factors, and improved referral content would help adherence to guidelines and report relevance. Strategies to support improvements were outlined.

P010 Segmental neurofibromatosis of the upper extremity: MR imaging findings

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Background: Segmental neurofibromatosis (NF) is a rare variant of NF manifest with multiple neurofibromas limited to a single body part.

Purpose: We present the clinical and MR findings in a patient with segmental NF of the upper extremity to call attention to this challenging diagnosis. Lesions in segmental NF do not cross the midline and are not manifest with the typical clinical features of NF type-1. Typically, segmental NF occurs in the trunk and head region, with only a few cases reported in the upper extremity. A 35-year-old woman presented with multiple, large and painless subcutaneous masses in the dorsal and volar aspect of left arm and the volar aspect of the hand over the thumb and index finger. Past medical/family history was unremarkable. Mass lesions were not associated with any skin changes, including freckling. MRI of the brain was normal. MRI of upper extremity revealed numerous, well-defined nodular lesions that had intermediate T1- and high T2-weighted signal intensity. Prominent enhancement of the mass lesions was seen after the i.v. administration of a gadolinium compound. The nodules were fusiform and intimately related to different peripheral nerves. Because the lesion in the index finger compromised function, surgical resection was pursued. Histopathology confirmed diagnosis of neurofibroma. Due to the multiplicity of lesions, clinical absence of symptoms, and a high rate for recurrence treatment was nonsurgical.

Summary: Radiologists should be aware of the imaging findings of segmental NF, a subset of NF that is not associated with systemic disease.

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P011 Scope and indications of lumbar spine radiography for lower back pain in the South West

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Background: An RCR report in 2016 highlighted that radiology services are "on their knees"^[1]. Whilst urgent action has been called for in terms of addressing workforce and equipment shortfalls, other avenues to alleviate the burden on imaging departments need to be considered. The aim of this study is to explore referral information and clinical indications for lumbar spine projection radiography.

Method: Data on lumbar spine radiography within a 12-month period (2017-2018) were collected from one NHS Trust. Information collected included referral information. A pilot of 400 cases was undertaken to delineate appropriate categories for referral criteria. This identified 21 discrete categories encompassing neurological, inflammatory, oncological, trauma, surgical, atraumatic fracture etc. Once established, two coders categorised 100 examinations each, comparison of their data yielded agreement of 0.71 using Kappa. They then categorised the entire data set.



Results: Data for 2669 lumbar spine radiographs were obtained. Following data cleansing, 1781 were incorporated within the study. Reasons for exclusion were absence of clinical indications. Of the examinations reviewed 26% (n = 468) were referred with suspected fragility fracture; 24% (n = 437) for back pain; no neurological symptoms and 10% (n = 169) for back pain; neurological symptoms.

Conclusion: A significant proportion of individuals referred for lumbar spine projection radiography do not seem to fit within current NICE guidelines for the management of low back pain^[2]. Further work is needed to correlate these referrals with outcomes to ensure pathways are fit for purpose resulting in appropriate use of resources.

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P012 Missed fractures on x-ray by A & E doctors – Clinicians vs imaging

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Background: The diagnosis of an acute fracture is based upon appropriate imaging following an accurate history and a focused clinical examination. Fractures tend to be those high-risk diagnoses which when missed are among second highest payouts in legal proceedings. Missed fractures on radiological images form the majority of errors made in A & E.

Methods: We queried the database for missed fractures reported by radiologists from July 2019, through September 2019. Data collection was from the electronic reports of X rays and the interpretations done by A & E doctors.

Results: 49 patients were found to have missed x-ray pathologies. Notes were searched and assessed. Out of the 49 patient, 20 (40.9%) were found to be under 30 years of age and 29 (59.1%) were above 30 years. 53% of upper limb X rays, 28% lower limbs, 10% chest and 9% face fractures were missed. The data was further divided according to time and grade of clinician who saw patient in A & E. About 78% discrepancies were found in interpretations done at night vs 22% in morning. 30 (61.2%) patients were seen by ANPs, 12 (24.5) by SHOs, (10.2%) by ST3+ and 2 (4.1%) by consultants.

Conclusion: No harm was found to be done to patients as they were called back following the radiology reports. To reduce the number of missed orthopaedic injuries, emergency physicians should learn about the types of injuries that are missed most often, and be sure to check for them. There is ample evidence that double reading improves.

P013 Orthopaedic check x-ray audit: Do we document our findings?

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Background: Every examination which utilizes ionizing radiation must be reported by a doctor trained for the purpose¹. However due to insufficient resources to support this service the responsibility for reporting some plain radiographs may be transferred. The aim of this audit was to assess the effectiveness of arrangements to transfer the responsibility for the reporting of 'check x-rays following arthroplasty surgery' to referring surgeons within the Orthopaedic department.

Method: 50 patients audited from February to April 2019 in the first cycle of the audit. 46 patients audited from May to June 2019 during the second cycle. Cases were from both from trauma and elective wards and collected using electronic records as well as case notes.

Results: Out of the 50 patients audited, our results showed that 68% (n=34) of these x-rays had no or insufficient documentation of clinical interpretation in the patient notes. Around 72% (n=36) of these images had a radiology report but 28% (n=14) of these images were not reported. Following this cycle, the orthopaedic department were informed regarding the importance of documenting clinical interpretation of check x-rays. Following our interventions we saw a 51% improvement in documentation.

Conclusion: It is important for the orthopaedic team to ensure the findings check x-rays are clearly documented in the clinical notes as this can be a legal issue if there are post-operative complications related to the prosthesis following discharge. A statement such as 'Satisfactory appearances of joint prosthesis on check X-ray/radiograph, no peri-prosthetic fracture noted' was recommended.

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P014 Atypical femoral fracture: A case study

Vicky Ballard

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Atypical femoral fractures are an insufficiency/stress type of fracture. Bisphosphonate therapy has a known association with these atypical stress-fracture patterns, and should be a primary consideration in elderly female patients presenting with weeks/months history of thigh/groin pain. This medication is used for prophylaxis and treatment of osteoporosis, Paget's disease and bone metastases/multiple myeloma. Prolonged bisphosphonate is considered to suppress bone remodelling, which



leads microdamage that would normally be repaired but is inhibited, thus increasing skeletal fragility. The initial radiographic features are subtle with only cortical thickening and possible breaking of the lateral femoral cortex. Patients with pain and early stress reaction should be considered for prophylactic nailing and all patients with an atypical femoral fracture should have their contralateral femur imaged as these findings are commonly bilateral. Recognition of the early radiographic findings, along with the clinical presentation and medication history, allows for early intervention (prior to fracture) which has a huge positive impact on patient outcome which will be demonstrated using a case study.

P015 Imaging modalities in the diagnosis of cervical spine tuberculosis

Sarah Dawson

Barts Health NHS Trust

TB is an infective disease caused by Mycobacterium Tuberculosis and spread airborne in those with pulmonary TB. Spinal TB accounts for 15% of extra pulmonary TB. C-Spine TB is relatively uncommon, accounting for approximately 10% of cases, but is the most complex. Infection begins in the subchondral bone and spreads slowly to intervertebral disc spaces from adjacent vertebral bodies (VBs). Typical symptoms include loss of neck mobility and point tenderness, neurological deficit - particularly in lower c-spine involvement, and can eventually progress into tetraplegia. The progression of spinal TB is slow, with patients unlikely to present until there is pain, deformity or neurology in the further progressed stages.^[1-4]

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P016 Not all wounds are visible – Stay calm and see through the x-ray

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Background: Plain radiographs are commonly ordered for patients who arrive in the emergency department (ED), and interpretation of those radiographs is critical. Clinicians are prone to make wrong radiological evaluations due to off hours and long busy varying shift work patterns which lead to poor concentration and chronic fatigue.

Purpose: To emphasise the importance of checking what is not obvious. The poster will highlight the use of a systemic approach and two views as a simple aid to increase the conspicuity of fracture.

Summary: A Pictorial view outlining an interesting case that presented to A & E, along with tips for clinicians to educate them regarding subtle or radiologically occult fractures on plain radiographs.

P017 The appropriateness of x-ray lumbar spine referrals made by general practitioners: A retrospective review

Claire Bradley; Lisa Field

Mid Yorkshire Trust

Background: NICE guidelines for the management of lower back pain in adult's 2016, state x-ray imaging for low back pain should not be routinely offered, without specialist opinion or suspicion of serious underlying pathology. Inappropriate imaging is associated with ionising radiation risks and places burdens on imaging departments with little diagnostic yield in determining causation for the initial complaint.

Method: Referral and radiology report data on General Practitioner lumbar spine imaging referrals from one month was collected and retrospectively reviewed. Each referral was compared against NICE guidelines. The referral details were also recorded for identification of common themes. All results were compared against a previous retrospective review of lumbar spine referrals performed after the updated guidelines were published in 2016. Results A total of 138 exams were identified (mean age 61.5, range 12-91), compared with 222 exams (mean age 62, range 16-88) from the 2016 review. Referrals included 3 querying disc protrusion which cannot be diagnosed on x-ray, and 24 for osteoarthritis. The percentage of "unclear" referrals reduced from 27% previously to 22%. In total 43% of referrals did not reference the length of time the patient had experienced back pain.

Conclusion: Lumbar imaging referrals have dropped considerably since 2016 due to reinforcement of new referral criteria being communicated from the radiology department to referrers, resulting in more awareness of the guideline. However, some referrals still did not meet the NICE criteria. There is room for improvement, through improved training for referrers and staff justifying examinations.

1. National Institute for Health and care excellence. (2016) Low back pain and sciatica in over 16s: assessment and management.



HEAD & NECK / NEURO

P018 How quickly are we scanning our traumatic head injury patients at A&E?

Karen Man Yan Chan

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Background: Traumatic head injury is one of the most common causes of death and disability in the UK for the 1 to 40 years age group with an annual emergency attendance of 1.4 million and 200,000 admissions¹. CT head is the key primary imaging modality for prompt detection and timely intervention. There are NICE guidelines to assess local practice in terms of the time taken from CT head request to scan, time from scan to delivery of provisional radiology report and the indication for the scan. However, there has been no prior audit at our department.

Method: Retrospective analysis of a month's data of all patients with CT head was performed at the emergency department in a tertiary teaching hospital. The time taken for an emergency patient to be scanned, the time taken for a provisional CT head radiology report to be completed and the details of the CT head request were collected and evaluated.

Results: Results showed that 80.7% of patients had CT head scans within the time required; 66.3% of radiology reports were authorised within 1 hour; and 83.9% of the A&E requests had clear documentation of head injury risk factors. It was identified that most suboptimal results took place out-of-hours or during the weekends.

Conclusion: The results highlighted the poor level of radiology staffing during out-of-hours and weekends as a key issue in delivering optimal patient care. This concern will be investigated and a re-audit will be performed to assess the compliance.

1. National Institute for Health and Clinical Excellence. CG176. Head Injury: assessment and early management. London. January 2014.
<https://www.nice.org.uk/guidance/cg176>.

P019 A guide to vocal cord palsy for general radiologists

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The vocal cords are innervated by the recurrent laryngeal nerves and play a major role in phonation. Vocal cord paralysis may be the first presenting feature of serious pathology and often manifests clinically with voice hoarseness (Paquette et al, 2012). Nevertheless, up to 40% of patients with a vocal cord palsy may be asymptomatic and it is therefore crucial for radiologists to recognise the imaging appearances of vocal cord paresis (Dankbaar and Pameijer, 2014). A vocal cord palsy can be caused by a variety of neoplastic, inflammatory and vascular disease processes. Awareness of the range of pathologies and inclusion of the entire course of each recurrent laryngeal nerve within the imaging field (to aortopulmonary window for left and to brachiocephalic artery for right) are essential (Dankbaar and Pameijer, 2014). This poster focuses on the imaging features of a vocal cord palsy, the anatomy and course of the recurrent laryngeal nerves and highlights a number of common and important causes of vocal cord paresis.

1. Dankbaar, J.W. Pameijer, F.A. (2014). Vocal cord paralysis: anatomy, imaging and pathology. *Imaging Insights*. 5:743-751.

2. Paquette, C.M. Manos, D.C. Psooy, B.J. (2012). Unilateral vocal cord paralysis: a review of CT findings, mediastinal causes, and the course of the recurrent laryngeal nerves. *Radiographics*. 32(3):722-741.

P020 A 2-year retrospective analysis of the diagnostic performance of Core Needle Biopsy (CNB) versus Fine Needle Aspiration Cytology (FNAC) in the evaluation of parotid gland lesions

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University College London Hospitals NHS Foundation Trust

Purpose: Comparison of the relative diagnostic performance of FNAC and CNB in parotid gland (PG) lesions. **Methods:** Data from FNAC and CNB performed over a 2-year period were reviewed. Samples were included if the clinico-radiological suspicion was of a PG neoplasm. Biopsies of lesions arising outside the PG, metastases and microbiological aspirations were excluded as were recurrent pleomorphic adenomas. For excised lesions, final histopathology was assessed for concordance with the biopsy samples.

Results: 183 biopsies: 154 FNAC, 77 CNB. Of 154 FNAC, 27 were inadequate (82% adequacy rate), 85 yielded a cytological diagnosis (67% diagnostic rate) and 48 subsequently underwent CNB. From 76 CNB, 74 samples were adequate for diagnosis (97%), 61 yielded a histopathological diagnosis (80%). Of 12 inadequate FNAC who had a CNB, 10 (83%) were diagnostic. In 68 of 183 patients, final excision histopathology was obtained: 82% FNA concordance, 92% CNB concordance. FNA sensitivity for malignancy 60.0% (95% CI: 14.66%-94.73%), FNA specificity 90.2% (95% CI: 76.87-97.28%). CNB sensitivity 100.00% (95% CI: 73.54%-100.00%), specificity 93.75% (95% CI: 69.77%-99.84%). No complications.

Conclusion: CNB demonstrates superior performance with regard to sensitivity, specificity and histopathological concordance compared to FNA, with no complications in our study. This study is in line with published studies in this field suggesting preferential use of CNB over FNA may be warranted in the evaluation of primary PG lesions.



P021 Cone beam CT for 3D sialograms

Alexandros Leontaritis; Daria Cupurdija; Veronique Sauret-Jackson

Cavendish Imaging Ltd

In order to understand the diagnostic potential of Cone Beam CT (CBCT) sialograms, a retrospective radiology report investigation was conducted and case studies chosen to illustrate the CBCT capability for salivary gland exploration and give practical guidance on this new imaging technique to the radiography team. Referring criteria: questioning blocked duct, understanding the 3D location the duct system and anomalies in parotid and submandibular glands. Imaging: J Morita Accuitomo F170, unilateral parotid (9) and submandibular (3) CBCT scans. Radiation dose: 1310 mGy.cm² DAP for 8cm-diameter x 8cm-height cylindrical FOV. Findings: The isotropic dimension of the voxels (0.160mm resolution in x, y and z) and the contrast used (Omnipaque 300) allow pictorial 3D description and precise measurements of the extraglandular, intraglandular and accessory ducts, ductal stricture, saccular dilations, salivary cavities, filling defects and scarring of mural debris. Incidental findings included complex retained roots of wisdom teeth, periodontal disease and degenerative changes in the TMJ. For the radiographer, this study is extremely useful to illustrate the importance of careful positioning of the 8cmx8cm FOV using 2 orthogonal scout images because this was critical to image the exact shape of the whole duct system and encompass anomalies.

P022 Haemorrhagic vestibular schwannoma: A case study

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Basingstoke and North Hampshire Hospital

Case presentation: A 41-year-old male presented to the emergency department with sudden onset headache and left-sided facial weakness. Unenhanced CT head showed an area of haemorrhage at the left cerebellopontine angle measuring 2.4 cm with the suspicion of adjacent soft tissue (Figure 1). A subsequently performed post-contrast MRI brain revealed enhancing soft tissue at the anterolateral aspect of the haematoma extending into the left internal auditory meatus consistent with a haemorrhagic vestibular schwannoma (Figure 2). The vestibular schwannoma was excised three months after initial presentation by a trans-labyrinthine approach with near-complete excision leaving only a few mm of tumour capsule attached to the facial nerve. Three-and-a-half years post-surgery the patient is well with no evidence of recurrent or residual disease demonstrated on two interval MRI scans (Figures 3,4).

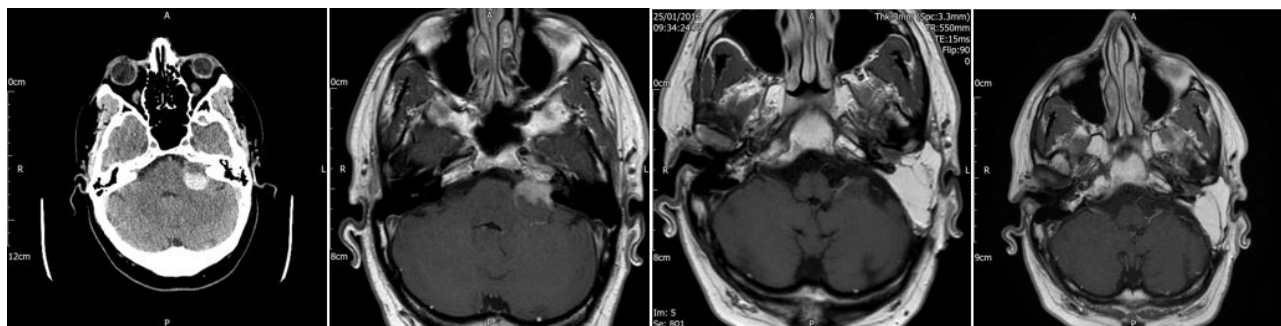


Figure 1

Figure 2

Figure 3

Figure 4

Discussion: Vestibular schwannomas are benign neoplasms of the vestibulocochlear nerve which commonly arise from the superior vestibular portion of the nerve. They account for 8-10% of all intracranial tumours and approximately 75% of cerebellopontine angle tumours (1). Intracranial haemorrhage occurs in approximately 11% of all brain tumours but haemorrhage associated with vestibular schwannomas occur in <1% of cases (2). Facial nerve palsy occurs in 31.3% of haemorrhagic vestibular schwannoma cases compared to 6% of non-haemorrhagic cases (3). Certain tumour characteristics such as hypervascularity, dilated thin vessels, cystic nature, rapid growth and large size can increased the risk of haemorrhage in vestibular schwannoma (3). Most cases of haemorrhagic vestibular schwannoma undergo surgical management, with a good prognosis overall (2).

1. Asari, S., Katayama, S., Itoh, T., Tsuchida, S., Furuta, T. and Ohmoto, T. (1992). Neurinomas Presenting as Spontaneous Intratumoral Hemorrhage. *Neurosurgery*, 31(3), pp.406-412.

2. Carlson, M., Driscoll, C., Link, M., Inwards, C., Neff, B. and Beatty, C. (2010). A hemorrhagic vestibular schwannoma presenting with rapid neurologic decline: A case report. *The Laryngoscope*, 120(S4), p. S204.

3. Niknafs, Y., Wang, A., Than, K., Etame, A., Thompson, B. and Sullivan, S. (2014). Hemorrhagic Vestibular Schwannoma: Review of the Literature. *World Neurosurgery*, 82(5), pp.751-756.



P023 Accuracy of FNA neck and radio-pathological correlation of BTA thyroid nodule classification

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Background: Lumps in the neck are common, and US guided FNA is an easy way to confirm or exclude pathology.

Objectives: To see if there is a change in adequacy rates for FNA, and more specifically thyroid FNA, following a change in practice in 2014 (publication of BTA guidance), and to compare the FNA thyroid nodule BTA classification with cytology/histopathology.

Standards: The US guided FNA neck samples must be satisfactory for cytological diagnosis in 80%. The US guided FNA thyroid samples must be satisfactory in 70% (RCR).

Method: A retrospective study was conducted of all patients who had US guided FNA neck performed by a single operator in Milton Keynes University Hospital from August 2017 - July 2019. Data collected from the PACS and ICE systems. Results of the FNA were compared with cytology/histopathology to assess the adequacy.

Results: 94% of the samples obtained from neck lumps and 89% of samples from thyroid nodules were satisfactory for cytological diagnosis. There was a significant decrease in the number of thyroid FNAs following publication of BTA guidelines, and an increase in thyroid FNA adequacy rates (89% in 2017-19 compared with 71% pre-2014). 100% of U5 nodules, 44% of U4 nodules and 12 % of U3 nodules were malignant.

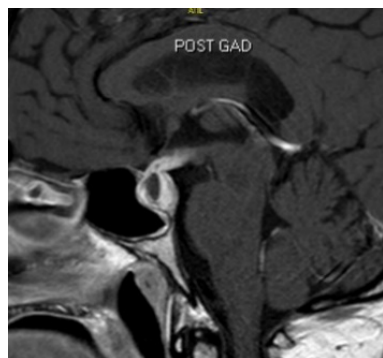
Conclusion: Discuss the results in the radiology department, share audit findings with Thyroid MDT and continue using BTA guidelines. Re-audit in July 2020.

P024 Pictorial review of MRI brain findings: Hypophysitis

May Ting Tan; Steven Yong Keen Hor; Joseph Alex; Deepak Pai; Hussein Hassan

Northern Lincolnshire and Goole NHS Foundation Trust

Background: A 56-year-old lady who presented with 6-8 weeks history of frontal headache with nausea and multiple episodes of vomiting up to 16 times/day, photophobia, double vision and an episode of transient loss of consciousness for 15 seconds. No history of trauma. On examination, all cranial nerves were intact, no obvious weakness in either upper or lower limbs, no cerebellar signs. CT head was done which showed enlargement of the pituitary gland and stalk. MRI confirmed pituitary macroadenoma with extensive suprasellar extension into the hypothalamic region.



Learning Points: Hypophysitis, is characterised by inflammation of the pituitary gland, usually resulting in hypopituitarism^[1]. The most common symptoms of hypophysitis is headache and visual loss. Patients may also develop symptoms of signs of endocrine insufficiencies such as diabetes insipidus, hypothyroidism and growth hormone deficiency. In primary hypophysitis, the idiopathic inflammatory process is confined to the gland while secondary forms are caused by definitive aetiology such as drugs or systemic diseases^[2]. Investigations of patients with hypophysitis include baseline bloods, early morning pituitary-related hormone profile, imaging, immunology profile and biopsy. Pituitary MRI is the preferred radiological choice of investigation. MRI findings may show homogeneously enhancing pituitary gland, absence of posterior pituitary bright spot, diffuse enlargement of gland or dural thickening^[3]. Various treatment for hypophysitis such as

immunosuppressive agent, surgery, radiotherapy and conservative options are available. Management of hypophysitis is mainly aimed at treating pituitary hormone deficiencies according to recommendations and to reduce inflammation or enlargement of the gland^[1].

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2. Prete A. and Salvatori R., 2018 Hypophysitis. In: Feingold KR, Anawalt B, Boyce A, et al., editors. *Endotext* [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000.
3. Faje, A., 2016. Hypophysitis: Evaluation and Management. *Clinical Diabetes and Endocrinology*, 2(1).

P025 Peripheral nerve imaging for the general radiologist: Don't be scared

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Background: Abnormalities of peripheral nerves are well recognized by MSK and neuroradiologists. Peripheral nerve abnormalities will present on scans reported by general radiologists. Therefore, a good understanding of the appearances of normal and abnormal peripheral nerves is required. Peripheral nerves can be evaluated by ultrasound and MRI. Standard MR neurography techniques have been employed both at 1.5 and 3T and, in addition, newer more advanced techniques such as diffusion tensor imaging have been used. An understanding of the appropriate MR technique to evaluate peripheral nerves is



needed. In addition, knowledge of the different pathologies that can affect the peripheral nerves with their imaging features is required.

Purpose: Discuss the imaging techniques used to evaluate peripheral nerves including DTI and demonstrate the important causes of abnormal peripheral nerves.

Summary: We aim to give a detailed description of the conditions that affect the peripheral nerves. We will highlight the important imaging features that differentiate these different causes. We will describe an imaging protocol that can be used when peripheral nerve conditions are suspected by referring clinicians.

P026 Evaluating the application of structural MRI neuroimaging and machine classification in the diagnosis of first-episode psychosis

Emma Rose; Stuart MacKay

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Background: Current NICE Guidelines^[1] do not recommend MRI Neuroimaging in the diagnosis of first-episode psychosis (FEP), instead ICD-10 or DSM-IV criteria is used. However, psychiatric assessment is subjective, depending on the clinician, the setting and criteria applied.^[2,3] Structural MRI neuroimaging is able to detect robust neuroanatomical biomarkers characteristic of FEP with high levels of accuracy; enlarged ventricles,^[4,5] decreased hippocampal volume^[6,7] and reduced grey matter.^[8,9]

Method: A literature review was conducted to identify relevant literature reporting the sensitivity and specificity of both MRI Neuroimaging and Psychiatric Assessment in the diagnosis of First-Episode Psychosis. Scopus, Medline and PsycINFO databases were searched from January 1999 to September 2019, with the findings discussed and data extracted.

Result: Psychiatric assessment gave a highly sensitive diagnosis of First-Episode Psychosis, (ranging from 0.51 - 0.87). However, few specificity values were reported, and those that were included were contradictory, decreasing the validity of research. Conversely, a diagnosis of FEP using MRI machine classification had high values of sensitivity (between 0.69-0.86) and high specificity (between 0.61-0.87).

Conclusion: Overall, MRI machine classification provided a more sensitive and significantly more specific diagnosis of FEP in comparison to psychiatric assessment. As machine classification diagnosis is based on quantitative neuroanatomical biomarkers this would overcome the subjectivity and interpretation bias associated with psychiatric assessment. Current reports state that machine-based classifiers are achieving accuracy levels of 75% - 95%,^[10] which is promising for future application. However, a large-scale study into MRI machine classification analysis has not been performed.

1. National Institute for Health and Care Excellence [NICE]. 2008 Structural Neuroimaging in First-Episode Psychosis. Technology Appraisal Guidance [TA136].

2. Del-Bem, C, Armanda C, Teixeira B, et al. 2010 Differential diagnosis of first-episode psychosis: importance of an optimal approach in psychiatric emergency 32;2.

3. Fusar-Poli, P, Cappucciati, M, Rutigliano, G et al, 2016 Diagnostic Stability of ICD/DSM First Episode Psychosis Diagnoses: Meta-analysis, Schizophrenia Bulletin, 42, 6 1395-1406.

4. Wright, I.C, Rabe-Hesketh, S, Woodruff, P.W et al. 2000 Meta-analysis of regional brain volumes in schizophrenia Am J Psychiatry, 157;16-25.

5. de Pierrefeu A, Löfstedt T, Laidi C, et al. 2018 Identifying a neuroanatomical signature of schizophrenia, reproducible across sites and stages, using machine learning with structured sparsity.

6. Nelson, M.D, Saykin, A.J. Flashman, L.A .et al. 1998 Hippocampal volume reduction in schizophrenia as assessed by magnetic resonance imaging. Gen Psychiatry, 55. 433-440.

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8. Fornito, A, Yücel, M, Patti, J, Wood, SJ, Pantelis, C. 2009 Mapping grey matter reductions in schizophrenia: an anatomical likelihood estimation analysis of voxel-based morphometry studies. Schizophr Res; 108: 104- 113.

9. Job DE, Whalley HC, Johnstone EC, Lawrie SM. 12. Grey matter changes over time in high risk subjects developing schizophrenia. Neuroimage. 2005;25 4:1023-1030.

10. Brammer M. 2009 The role of neuroimaging in diagnosis and personalized medicine-current position and likely future directions. Dialogues in clinical neuroscience, 11;4 389-396.

P027 Evaluating novel iterative reconstruction software on image quality for plain CT head scans

Nicholas Wong

Nottingham University Hospitals NHS Trust

Background: New reconstruction methods within computed tomography (CT) claim to reduce the dose of diagnostic scans while maintaining image quality. Evaluating these claims is important to ensure that patients are receiving the best from their diagnostic imaging. Previous studies have shown the effectiveness of novel iterative reconstruction (IR) methods in dose optimisation on body scans. However there is little evidence for the effectiveness of newer IR methods when considering neurological examinations.

Method: For this project the dose parameters were kept constant with the method of IR being the independent variable. Image quality of the scans was measured by radiologist review via visual grading analysis and by Hounsfield units.



Results: The results from this project found that there was little significant difference in image quality between the older and newer reconstruction methods when applied to plain head scans. Previous studies found that with body scans there was a significant increase in image quality, it seems neurological examinations may not be as greatly affected.

Conclusion: When evaluating newer IR software it is important to weigh up its true efficacy and the impact on the department in regards to cost effectiveness, ensuring resources are used efficiently. The results show that there is no significant difference between older and newer IR methods on head CT scans when changing the reconstruction method alone. However, changes in dose parameters were not explored which may be something to consider in future investigations.

P028 Rare case of cerebral aqueduct web in Neurofibromatosis

May Ting Tan; Steven Yong Keen Hor; Joseph Alex; Hussein Hassan; Deepak Pai

Northern Lincolnshire and Goole NHS Foundation Trust

Background: A 42-year-old lady with newly diagnosed neurofibromatosis type 1 was found to have raised blood pressure. 24-hour urine metanephrines and plasma metanephrines were consistent with excess metanephrines and normetanephrine's excretion. Hence she was diagnosed with pheochromocytoma. She is generally fit and well. MRI brain was requested to rule out cerebral neurofibroma or sympathetic chain paraganglionoma. Incidental findings of moderate ventriculomegaly of the lateral ventricles and the third ventricle were noted. There is also a very subtle focal area of bridging soft tissue in the aqueduct suspicious for a web with potentially impaired CSF transit across the aqueduct.



Discussion: An aqueductal web is a translucent membrane which is composed of fibrillary neuroglia with ependymal cell clumps^[1]. It is more commonly found in children with congenital aqueduct stenosis. Adults with aqueductal web usually present with chronic headache. Incidence of obstructive hydrocephalus in patients with neurofibromatosis is approximately 5%. Obstructive hydrocephalus secondary to cerebral aqueduct web is rare but has been reported^[2]. Recognising this bridging soft tissue is important as cerebral aqueduct web is curable by surgery^[3].

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2. Garg, P., Shruthi, K., Maheshwaran, V. and Devanand, B., 2016. Rare case of non-neoplastic aqueductal stenosis due to web in a patient with neurofibromatosis type-1. Neurology India, 64(6), p.1384.

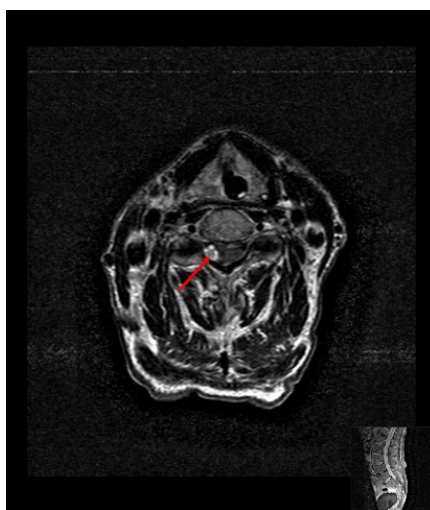
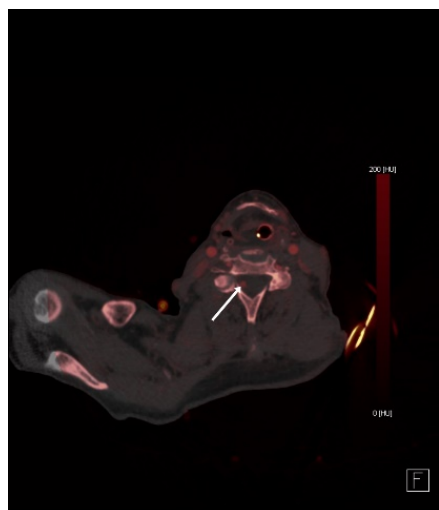
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P029 Multi-modality imaging features of an intradural extramedullary spinal venous varix

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¹University College London; ²Guy's and St Thomas' NHS Trust

Background: Intradural extramedullary venous varices are rare, with only a few cases being discussed in the literature, and can be radiographically challenging to diagnose. They can present similarly to other pathologies such as arterial venous fistulas, epidural haematomas and nerve sheath tumours but are a vital differential diagnosis to consider, as this can significantly affect patient management.



Purpose: An 86-year-old man presented with confusion, reduced GCS and pain when moving the upper limbs following a fall. The initial CT head did not demonstrate acute pathology. On the trauma body CT, a small hyperdensity was demonstrated in the spinal canal. As the patient was also on Clopidogrel, it was suspected that he had an epidural haematoma. This was further investigated with a dual energy CTA and MRI spine. The combination of imaging findings was more consistent with an intradural extramedullary venous varix at the level of C5 resulting in effacement of the cord. Arrow demonstrates the extramedullary venous varix on a dual energy CTA iodine map (far left) and Axial T2w MRI cervical spine (left).



Summary: Intradural venous varices are an important pathology to identify, as this will guide future patient management. The emerging role of advanced dual-energy CT in improving delineation of the lesion will be discussed as well as specific MRI imaging features to aid diagnosis (the 'doughnut-sign')^[1]. The use of time-resolved MRI sequences will be highlighted as a further adjunct to help clinch the diagnosis.

1. Huynh TJ, Willinsky RA. (2017) Intradural spinal varix: the doughnut sign on T2 weighted MR and confirmation with gadolinium enhanced arterial and blood pool MR angiography. *BJR Case Rep*; 2: 20160078.

P030 Central nervous system findings in Neurofibromatosis type 1: A pictorial review

Jay Patel¹; James Cusack¹; Athar Barakat¹; Maneesh Bhojak¹; Samantha Mills¹; Kumar Das¹; Shubhabrata Biswas¹; Shivaram Avula²

¹The Walton Centre; ²Alder Hey Children's NHS Foundation Trust

Background: Neurofibromatosis type 1 (NF1), also described as Von Recklinghausen's disease, is an autosomal dominant multi-system neurocutaneous syndrome, which results from mutation of the NF1 gene, a tumour suppressor gene, on chromosome 17. It is one of the RASopathies, caused by mutations of the Ras-MAPK pathway genes and it affects about 1 in 3000 people. The range of symptomatology in NF1 is variable, from mild to severe. Pathology can affect the central nervous system, peripheral nervous system, skin, skeletal system, lungs and vasculature.

Purpose: The aim of our poster is to familiarise the reader with common findings in NF1 in the CNS and to demonstrate various radiological features of NF1 related to the CNS. The lesions pertinent to the CNS include: waxing and waning focal white matter signal abnormalities, gliomas (particularly those involving the optic nerve and pathway), dural ectasia, lateral meningoceles, spinal cord tumours, vascular disorders and musculoskeletal dysplasias (including sphenoid wing dysplasia and kyphoscoliosis, among others).

The salient imaging features of the lesions are emphasised, helping in diagnosis and follow-up of the lesions. Relevant differential diagnoses are also described.

Summary: In summary, neurofibromatosis is one of the commonest neurocutaneous disorders, often associated with central nervous system abnormalities. Knowledge of the radiological findings of these lesions is important for diagnosis and management of the condition.

1. Genetics and Rare Diseases Information Centre. 2017. Neurofibromatosis type I. <https://rarediseases.info.nih.gov/diseases/7866/disease>.

2. StatPearls. 2019. Neurocutaneous Syndromes. <https://www.ncbi.nlm.nih.gov/books/NBK537001/>.

P031 Adult neuroimaging manifestations of early life insults: A pictorial review

Lucy Hilder

Oxford University Hospitals NHS Foundation Trust

The developing brain is susceptible to multiple insults in utero, and within the perinatal and neonatal periods. Imaging manifestations of pathologies such as intraventricular haemorrhage, perinatal/neonatal stroke, and congenital infection will be familiar to the paediatric radiologist, however the long-term sequelae can present a diagnostic puzzle to the adult radiologist if encountered later in the patient's life and without adequate clinical history. This pictorial review aims to highlight the adult neuroimaging features of some of the more common early life insults to help familiarise the general radiologist.

P032 Carotid CTA in hyperacute stroke: How to report

John Morlese¹; Zahida Hussain¹; Ruzeenah Begum¹; Sarah Yusuf¹; Atique Imam²

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Background: The treatment of hyperacute stroke has been revolutionized in the last few years. The introduction of mechanical thrombectomy for large vessel ischaemic stroke has improved patient outcomes. The radiologist's role has also changed and become more important. The CT imaging not only needs to be performed and reported quickly, but also a CTA (intracranial and neck) is additionally required. A detailed knowledge of the importance of this combined CT head and CTA protocol in hyperacute stroke is needed. Also, a detailed understanding is required of the information to be given in the report to aid the neurointerventionalist in determining which patients may benefit from mechanical thrombectomy. As a large volume of hyperacute stroke imaging is performed in non-specialist neuroradiology hospitals, the general radiologist needs a deep understanding of these issues.

Purpose: The aim of this pictorial review is to demonstrate the correct CT head/CTA protocol for the evaluation of hyperacute stroke patients and to describe an approach to reporting the CT head/CTA.

Summary: We aim to give a detailed description of the CT imaging technique required to investigate hyperacute stroke patients. We will provide a comprehensive approach to reporting CT head and CTAs in the hyperacute setting. Focus will be given to the imaging features that help the neurointerventionalist decide which patients are suitable for mechanical thrombectomy.



P033 Intracranial pseudoaneurysm due to non-traumatic ruptured aneurysm: A multimodal pictorial review

Jon Cleary; Cherry Sit; Lucy Childs; Amit Roy; Sundip Udani

Guy's and St. Thomas' NHS Foundation Trust

Background: Intracranial pseudoaneurysm due to ruptured non-traumatic aneurysm is rare, but may be misdiagnosed for mass lesions, with potentially devastating consequences for the patient.

Purpose: Using a case-based approach, this educational presentation aims to improve awareness by reviewing aetiology of intracranial aneurysms and pseudoaneurysms. Describing the radiological approach and imaging pitfalls in pseudoaneurysms, comparing appearances on unenhanced and contrast CT, CT angiography and MRI. Discussing the emerging role of advanced dual-energy CT (DECT) in improving delineation of lesions. Providing an overview of endovascular management.

Summary: Example cases include: A 69-year-old male admitted after a tonic-clonic seizure, who underwent unenhanced CT, dual-energy CTA and MRI -displayed side-by-side. Unenhanced CT revealed a large right temporal lobe soft tissue mass with associated white-matter oedema. Contrast-enhanced DECT was performed. This enables generation of iodine maps to assess intravascular contrast content. The patient later had an MRI brain with time-of flight MRA. Delayed CE-CT demonstrated typical 'snowman' appearances of an aneurysm at the right M1/M2 bifurcation (the 'head') with surrounding peripherally calcified pseudoaneurysm (the 'body'). Both were seen as a heterogenous low signal temporal lobe mass on T2-weighted MRI. Iodine maps from the DE-CTA delineated the aneurysm sac. The patient underwent further management from the local endovascular neuroradiology centre. While this entity is rare, pseudoaneurysm from an underlying aneurysm is an important differential in apparent mass lesions. DECT may have advantages over MRI in delineating vessel and aneurysmal sac from surrounding pseudoaneurysm. This may improve interventional planning.

1. Nomura M, Mori K, Tamase A, et al. Pseudoaneurysm formation due to rupture of intracranial aneurysms: Case series and literature review. *Neuroradiol J.* 2017;30(2):129-137.

P034 Chordoid glioma – A rare third ventricular entity

Weeratunge Malalasekera; Faraz Sheikh

Southampton University Hospitals NHS Foundation Trust

Background: Chordoid glioma is a rare, slow-growing glial tumour of the anterior third ventricle which, to date, has been reported in approximately 100 patients worldwide^[2]. It shows a 3:1 female preponderance and a mean age of presentation of 46 years old^[4] with its presenting clinical features being non-specific^[4-3]. Early diagnosis is important because tumour excision is a viable curative option although there are important differentials to consider for a tumour at this particular location^[1] which has implications for management.

Objectives: Description of the clinical, histological and radiological aspects of a case seen at our institution. Discuss important considerations relating to diagnosis and management. To gain an insight into the clinical, imaging, oncological aspects of this rare entity as well as diagnostic dilemmas and considerations for management. All professionals involved with neuro-oncology MDTs should find this useful.

Summary: We will present the case of a 45-year-old patient who attended with visual disturbance in a poster format. In depth clinical history, together with key CT and MRI (including post op MRI) imaging will be displayed. Many of the imaging features of our case are characteristic of what has been described for this entity and will hence be helpful to radiologists. We will also highlight any other features that were not seen in our case but are described in the literature for completeness. Important differential diagnoses to consider will be highlighted together with the impact of these on informing initial investigation.

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4. Smith, A., Smirniotopoulos, J. and Horkanyne-Szakaly, I. (2013). From the Radiologic Pathology Archives: Intraventricular Neoplasms: Radiologic-Pathologic Correlation. *RadioGraphics*, 33(1), pp.21-43.

BREAST

P035 A randomised clinical feasibility trial of a breast immobilisation device: The SuPPORT 4 All (S4A) Project

Heidi Probst¹; Heath Reed¹; Andrew Stanton¹; Clare Robertson²; Rebecca Simpson³; Stephen Walters³; Helen Simpson⁴; Gillian Brown⁴; Sarah Hielscher⁴; Kirsty Bryan-Jones⁴; Janet Johnson⁴; Janet Horsman³; Omar Din⁴

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Background: Improvements in cancer survival for women with early breast cancer have led to more focus on long-term toxicities of treatment. We have developed a novel support bra (S4A bra) to lift the breast away from the chest wall to reduce the dose to OAR, particularly suited for women with larger breast size.

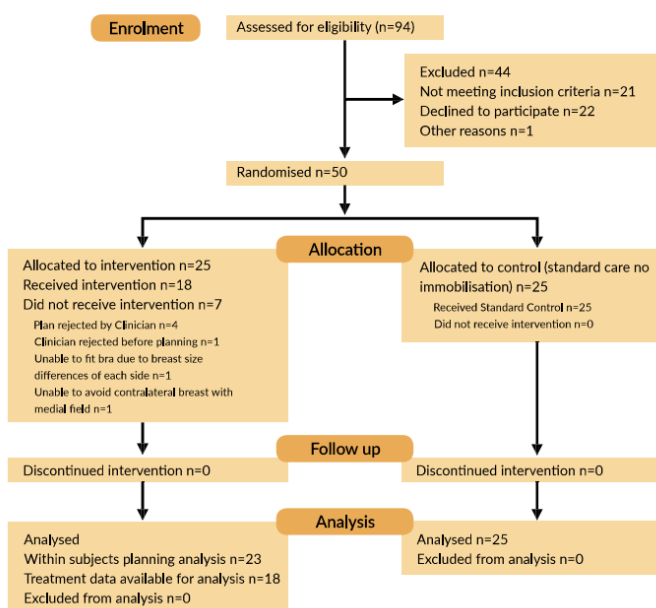


Method: A single centre randomised feasibility trial. Eligible patients were randomised via a remote computer-generated process to S4A bra (group A) or standard positioning without immobilisation (group B); randomisation was stratified by breast size. All patients received 40Gy in 15 fractions (3 weeks). Patients in group A received two planning CT scans; one wearing the S4A bra and one without the bra. Data on set up reproducibility were measured using 2D on treatment images (5 images per patient). Other outcome measures included assessment of acute skin reactions, moist desquamation in the inframammary fold, mean lung and heart doses, patient comfort and modesty, patient empowerment.

Results: Figure 1 shows recruitment and allocation. Population systematic errors for central lung depth was 0.9mm for the S4A arm, -1.5mm for the control (difference 2.4mm CI 0.9-3.9). Differences in random errors between the groups were all below 1mm except for superior-inferior movement where there was a small difference in favour of the control arm (2.4mm difference). RTOG scores were comparable between the groups. Table 1 shows an improvement in mean ipsilateral lung dose when using the S4A bra. There was improved modesty and dignity, and improved empowerment in the S4A arm.

Allocation	With or Without Bra	Side Treated	Ipsilateral mean (Gy)	Combined lungs mean (Gy)	Number (n=)
A	No Bra	Right	4.851	2.636	10
A	With Bra	Right	3.720	2.017	10
A	No Bra	Left	3.622	1.704	13
A	With Bra	Left	3.231	1.539	13

Figure 1 Consort Diagram:



1. Andrews CS. Developing a Measure of Cultural-, Maturity-, or Esteem-Driven Modesty Among Jewish Women. *Research and theory for nursing practice*. 2014;28(1):9-37.
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P036 Evaluating the tumour bed PTV margin for IMAT breast boost delivered in DIBH: A service evaluation

Sairanne Wickers¹; Amy Burt¹; Syed Ali Moinuddin¹; Rachel Bodey¹; Helen Grimes¹; Mark Gaze¹; Gary Royle²

¹University College London Hospital; ²University College London

Background: Whole left breast radiotherapy (RT) is delivered in deep inspiration breath hold (DIBH) to reduce heart and lung dose. The ability to deliver intensity modulated arc therapy (IMAT) boost in DIBH became technically possible following upgrade to TrueBeam treatment machines. The reproducibility of the tumour excision cavity [TB] (as defined by surgical clips), during DIBH delivery was unknown. Translating the 0.5 cm free-breathing (FB) planning target margin (PTV) to the DIBH technique may be inadequate. The aim of this pilot study was to determine an appropriate TB PTV margin when delivering IMAT boost in DIBH.

Method: Patients with outer quadrant tumours requiring boost had a 1.0 cm TB PTV margin. In addition to the standard daily corrective image protocol, post-treatment kV images of the TB clips were acquired to quantify inter-breath hold error. The Van Herk margin formula was used to confirm the TB PTV for the DIBH technique.

Results: 11 patients. Post-treatment kV clip match: Population mean error (cm); -0.06, -0.07, -0.06 (vert, long, lat). Population systematic error (cm); 0.08, 0.08, 0.09 (vert,

n11		Population mean Error (cm)	Population Systematic Error (cm)	Population Random Error (cm)	TB PTV Margin (VanHerk) (cm)
Post-Treatment kV Clip-Match	Vert	-0.06	0.08	0.17	0.32
	Long	-0.07	0.08	0.13	0.29
	Lat	-0.06	0.09	0.11	0.3



long, lat). Population mean error (cm); 0.17, 0.13, 0.11 (vert, long,lat). TB PTV margin (Van Herk) (cm); 0.32, 0.29, 0.3 (vert, long, lat).

Conclusion: This pilot study has supported using the current FB TB PTV margin of 0.5 cm for the new DIBH boost IMAT technique. This technique has been clinically implemented for all left breast boost referrals, and is subject to on-going audit using the pilot study methodology.

P037 Breast carcinoma: An educational review of image-guided pre-operative localisation pathways

Caroline Parkin; Mayada Haydar; Trupti Kulkarni; Emma Hall

Manchester University NHS Foundation Trust

Breast screening programmes and current breast imaging techniques facilitate the detection of small breast carcinomas. They are often non-palpable and require image-guided localisation prior to surgery. This is usually guided by ultrasound, mammography (stereotaxis) or digital breast tomosynthesis (DBT). Accurate preoperative localisation is a fundamental role of the breast imaging team and is crucial for successful surgical outcomes. This poster provides an overview of current localisation techniques including skin marks, wire localisations, Magseed and Radioguided Occult Lesion Localisation (ROLL). The advantages and disadvantages of each technique are discussed and compared. This poster educates the reader in relation to what techniques are currently available and clarifies the differences, benefits and drawbacks associated with the different pathways.

P038 More than just dilated ducts – Think about the pituitary

Arwa Jaly; Leena Chagla; Jane Harrison; Olga Harris

St Helens and Knowsley Teaching Hospitals NHS Trust

Educational pictorial case reports of 2 young male patients presenting to the breast clinic with milky nipple discharge in one case and unusual duct ectasia in the other who were subsequently found to have prolactinomas. Learning objectives: Demonstrate the imaging findings (breast and cranial) and discuss patient presentation and sequence of investigations that lead to diagnosis. illustrate the importance of considering diagnoses outside the breast in patients presenting with breast complaints Highlight the importance of the radiologist in alerting clinicians to such diagnoses.

P039 A qualitative study of the attitudes of radiographers and radiologists in Kuwait towards radiographers' role extension in mammography

Altaf Muhanna

Cardiff University

Background: Extending radiographers' roles has provided opportunities for them to develop their function, help with issues around a shortage of radiologists and increase job satisfaction. In the UK, radiographers' role extension in mammography has made progress compared to other modalities, showing a significant improvement in quality of the service provided. In other areas of the world, the use of role extension has been limited. Aim This research focused on the attitudes of radiographers and radiologists towards radiographers' role extension in mammography in Kuwait, especially in reporting mammography, performing breast ultrasound and biopsies. The research also aimed to understand radiographers' current scope of practice in the field of mammography.

Method: A qualitative case study research using semi-structured interviews assessed radiographers' and radiologists' attitude to radiographers' role extension in mammography. Purposive sampling was used to recruit the participants by multiple visits to governmental hospitals in Kuwait. The data was analysed using a thematic analysis method to highlight perceptions.

Results: 20 semi-structured interviews were completed with 10 radiologists and 10 radiographers. Both radiologists and radiographers showed interest in extending radiographers' role in performing ultrasound in breast imaging, however both groups showed doubts about giving radiographers responsibilities to report images and perform biopsies. Discussion The radiographers' limited knowledge compared to radiologists has been highlighted as the main barrier in extending the radiographers' role in Kuwait. Other reasons are lack of training courses, a lack of confidence by radiographers and radiologists' resistance to role extension.

Conclusion: Overall, participants demonstrated negative attitudes towards radiographers' role extension.

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- 4- Yin, R.K (2014). Case Study Research Design and Methods (5th ed.). Thousand Oaks, CA: Sage. 282 pages.



P040 Standardised mediolateral oblique mammographic positioning and compression protocol for use within breast screening and symptomatic services

Muniratu Osman; Claire Mercer; John Thompson, Katy Szczepura

University of Salford

Background: Mammography is associated with pain/discomfort and this is mainly due to the positioning and compression applied to the breast (Papas & Klassen, 2005). The aim of the research is to develop an evidence-based protocol that may help reduce pain/discomfort. The angle of image receptor (IR) on the mediolateral oblique (MLO) projection plays a vital role in the distribution of pressure through the breast. When the IR angle is perpendicular to the sternum during compression, there should be an even pressure balance and increased breast contact area (Hogg et al., 2015).

Method: A phantom study was conducted on a model torso with breast attachment. A digital inclinometer was used to take the angle of model's sternum before it was positioned for MLO. Xsensor pressure mat was secured to the surfaces of the compression paddle and IR to read and record pressure distribution applied on the breast phantom. Compression of 10daN was applied to breast phantom and pressure readings and breast footprint were recorded with the IR at various angles in the multiples of 5 from 400 to 750. Numerical pressure data recorded on the mat was transferred onto excel and analysed.

Results: IR angles at 550 to 650 produced a more even pressure and area balance. The recorded sternal angle of model was 600.

Conclusion: When the IR angle is parallel or close to the angle of the sternum, there is an even distribution of pressure and area balance.

1. Hogg, P. P. e., Kelly, J. e., & Mercer, C. e. (2015). Digital mammography: a holistic approach. In: Cham, Switzerland: Springer.

2. Papas, M. A., & Klassen, A. C. (2005). Pain and discomfort associated with mammography among urban low-income African-American women. *Journal of Community Health*, 30(4), 253-267. doi:10.1007/s10900-005-3704-5.

P041 Therapeutic mammoplasty: Need for pre-operative MRI prior to complex oncoplastic reconstruction?

Sonali Shah; Tamara Suaris; Shefali Dani

Barts Health NHS Trust

Background: Therapeutic Mammoplasty (TM) is an effective oncologically safe breast conservation technique to facilitate wider resection margins in larger tumours and ptotic breasts with good aesthetic outcomes. There are no national guidelines as regards the need for preoperative MRI, our aim was to evaluate its effectiveness prior to complex oncoplastic reconstructions.

Method: We performed a retrospective study of all patients who underwent TM at our centre over a 4 year period (Jan 2016-Dec 2019), the data was retrieved from the electronic surgical diary. All imaging and histology was reviewed for possible upgrades with particular attention to breast density and tumour subtype.

Result: 52 patients underwent TM over this period, average patient age was 58 years and mean tumour size was 53 mm. 79% of the cancers were diagnosed on screening mammograms, 63% patients underwent a preoperative MRI. Non-performance of MRI was related to calcified DCIS in non-invasive tumours and involuted parenchyma. 3 patients upgraded on MRI with more extensive disease leading to significant impact on tumour assessment, surgical planning and outcomes; all of these patients had dense breasts category C/D. 13% patients underwent completion mastectomy.

Conclusion: The local policy at our high-volume teaching hospital centre mandates an MRI prior to TM. However, based on our study, in patients undergoing complex reconstructions, we recommend a pre-operative MRI only in patients with dense breasts, unexpected tumour histology (i.e. presence of invasive disease in calcified DCIS) and certain lobular histology. Careful planning can identify those most likely to benefit.

1. The role of MRI in preoperative planning for patients undergoing Therapeutic Mammoplasty. *ISRN Oncol.* 2013:260260. doi:10.1155/2013/260260 G Hicks, N Sharma.

2. Preoperative Breast MRI for patients undergoing mammoplasty *ClinicalTrials.gov Identifier:* NCT03173469.

P042 PROSPECTS trial: Impact on routine breast screening clinics

Patricia Pires Rodrigues; Emma Hay

NHS

Background: PROSPECTS is a national trial to evaluate the cost effectiveness of a Tomosynthesis in the breast screening programme. This trial has an impact on Mammographers daily routine and efficiency of running static and mobile clinics. From the pilot PROSPECTS trial best practice learned for running successful breast screening PROSPECTS clinics.

Purpose: Synopsis of experience to date of radiographic team in PROSPECTS trial implementation.

Summary: Staff engagement with PROSPECTS delivery. Standing operating procedures: developed to provide guidance to the Radiographers. Risk/Governance: outline assessments undertaken to prevent any adverse incidents and safeguard quality standards. These are reviewed as the trial has progressed. Training requirements: Mammographers, CRN and Admin. Protocols amendments. QA processes. Workforce: Role extension for Assistant Practitioners to allow their participation in the trial through extended scope of practice. This is in terms of screening and consenting. Problem solving. Challenges: Having the Radiographers consenting prior to perform the exam and the impact on clinic running times where was not given any extra time during the



clinics. Variation in demographics and correlation to uptake. Variation in the process of consenting in static and mobile clinics. Reflections: Lessons learned, frequent asked questions, most common errors and what happens after the first round?

CARDIAC / VASCULAR INTERVENTION / CHEST & LUNG

P043 Pulmonary artery dissection: CT findings of fatal acute vascular emergency

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Background: Pulmonary artery (PA) dissection is a rare complication of pulmonary hypertension that has been sporadically reported. This condition usually progresses rapidly to death due to bleeding before any surgical intervention is attempted.

Purpose: We discuss the clinical-imaging presentations of PA dissection to call attention to this vascular emergency. In most cases, dissection of PA is associated with chronic pulmonary hypertension secondary to congenital cardiovascular abnormalities or mitral stenosis. Other conditions that may be seen in association with PA dissection include endocarditis, trauma, amyloidosis, and atherosclerosis. Most dissections affect the PA trunk. Patients typically present with acute onset of severe chest pain, dyspnoea, and haemodynamic decompensation demanding admittance to the emergency room. This is usually followed by sudden death as the dissection transects into the pericardium causing cardiac tamponade, or the mediastinum. Radiographic findings may include pleural and pericardial effusion, and mediastinal widening, in addition to marked widening of the PA and increased cardiac size due to the co-existent pulmonary hypertension. Chest CT supplemented with CT-angiography (CTA), is well suited for demonstrating the presence and extent of PA dissection. CTA with multiplanar reconstruction is extremely helpful in the accurate, direct and quick display of the dissection that is crucial for supportive or surgical management of these patients. If there is indication for immediate thoracic intervention, that may include placement of a vascular prosthesis or aneurysmorrhaphy.

Summary: Radiologists play a key role in early, correct and definitive diagnosis of life-threatening PA dissection that may enable immediate treatment.

1. Neimatallah MA, Hassan W, Moursi M, Al Kadhi Y. (2007) CT findings of pulmonary artery dissection. *Br J Radiol* 80(951):e61-63.
2. Khattar RS, Fox DJ, Alty JE, Arora A. (2005) Pulmonary artery dissection: an emerging cardiovascular complication in surviving patients with chronic pulmonary hypertension. *Heart*. 91(2):142-145.
3. Song EK, Kolecki P. (2002) A case of pulmonary artery dissection diagnosed in the Emergency Department. *J Emerg Med*. 23(2):155-159.

P044 Are we adequately labelling angiograms in interventional radiology?

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¹West Hertfordshire NHS Trust; ²Isaac Newton Academy

Introduction: It is essential for radiographs to be adequately labelled with key information; however, no national guidelines exist for labelling angiographic images in Interventional Radiology. The aim of this study is to evaluate how consistently angiographic examinations are labelled and to develop a mechanism to improve labelling rates.

Methods: All angiographic images were assessed to determine whether they were labelled with the following parameters: laterality, post-procedure (if applicable) and type of devices deployed (if applicable). All annotations were assessed for legibility. Data were collected retrospectively for 100 consecutive lower limb angiograms performed over a 12-month period (June 2018 - May 2019). A reassessment was performed four months after implementation of improvements (June to September 2019). A total of 32 cases were examined post-implementation.

Results: In the first cycle, only 15% of angiograms were labelled for laterality; this was 38% for post-procedure and 0% for devices deployed. Significant improvement was noted in the second cycle, 69% of images were labelled for laterality; this was 66% for post-procedure and 50% for devices deployed. In both cycles, all image labelling were considered legible.

Conclusion: Prior to the implementation of the recommendations, angiographic labelling was poor. After implementation, there was a significant improvement in labelling rates. The inclusion of a reminder in the WHO checklist and raising awareness among radiographers have been important factors contributing to this improvement. Regular departmental meetings and a reassessment in 6 months is proposed to ensure 100% angiographic labelling is achieved.

P045 Manifestations of COVID-19 on plain film radiograph: A pictorial review

Khaoula Bessame; Leo Smith

Kingston Hospital NHS Foundation Trust

Background: Coronavirus-induced disease 2019 is a highly infectious disease caused by severe acute respiratory syndrome coronavirus. As the prevalence of COVID-19 increases, it is crucial for radiologists and clinicians to recognise the manifestations of the infection on a chest radiograph that may be performed for a suspected case, or for other purposes. The British Society of Thoracic Imaging (BSTI) has advised imaging is not appropriate to screen for, and diagnose COVID-19, but chest radiography may be useful as a first-line imaging modality when polymerase chain reaction (PCR) is unavailable, or the patient is seriously ill.



Furthermore, it can help deal with complications or look for an alternative diagnosis. Current radiological literature on COVID-19 is focused on CT findings, and further studies are needed to further our understanding of radiographic features.

Purpose: Based on a comprehensive literature review, we aim to illustrate the radiographic manifestations of COVID-19 infection, with case examples from our institution.

Imaging findings: Cases include: 1. 45-year-old male with difficulty in breathing, and productive cough. Admission chest radiograph showed mild pulmonary congestion only. A repeat chest X-ray showed progressive bilateral consolidation. 2. 75-year-old male with shortness of breath, productive cough, and confusion. Initial chest radiograph revealed consolidation in the right mid zone and mild pulmonary congestion. 3. 51-year-old male with a dry cough, fever, and shortness of breath. Admission chest radiograph showed consolidation in the left lung base. Subsequent X-rays showed patchy consolidation.

P046 Gentle reminder – Anatomical variants seen in chest x-ray

Lawman Chiwome

University Hospitals of Morecambe Bay NHS Foundation Trust

Background: One of the most common imaging investigations is a plain chest x ray. It is a simple and quick test, therefore helps clinicians where urgent information is needed to make a diagnosis and promptly manage patients usually in chest and abdominal emergencies. Chest x-ray can be used to diagnose many pathologies but its comprehensive anatomy can make diagnosis difficult. In the vast majority of time chest anatomy is similar irrespective of race, geographical location or sex, however there are few differences that a clinician might encounter when evaluating a chest radiograph. Anatomical variation refers to an anatomic structure that is different from normal but it is mostly non pathological. They are not disorders and most variants are discovered incidentally when the patient is being evaluated for something else.

Purpose: These normal variations sometimes mimic significant pathology and this might lead to a wrong diagnosis. Each and every one of us is different, some have minor variations and some have major variations so it is the responsibility of the clinician or the radiologist to identify it. This poster seeks to remind clinicians and radiologists of the normal variants found on chest radiographs through pictures of chest radiographs.

Summary: This poster will have pictures highlighting the normal variants on chest x ray and brief explanations.

1. Miller, J. et al. (1998) Common anatomic variants simulating mediastinal pathology on chest radiographs: Confirmation with alternate imaging modalities. *Emergency Radiology* 5, 219-230.

P047 Evaluation of one year of implementation of the National Optimal Lung Cancer Pathway at a pilot institution

Teresa Jacob; Julia Hine; Claudette Phillips; Joanna Moser; Sisa Grubnic

St George's University Hospitals NHS Foundation Trust

Background: Lung cancer is the third commonest cancer in the UK but accounts for the most deaths. Survival rates are lower than many other European countries, with patients often diagnosed at a late stage. The national optimal lung cancer pathway (NOLCP) aims to promote early diagnosis and shorten times from diagnosis to treatment. Our institution is an NOLCP pilot centre. We audited the radiology components of the NOLCP during its first year (April '18- March '19). This included: referral origin onto NOLCP, CXR to CT interval, imaging reporting times, CT-guided lung biopsy timing and cancer detection rate. Pathway standards include: CXR and CT reported within 24hours and CT within 72hrs of abnormal CXR.

Purpose: Outline background and details of the NOLCP. Share learning from implementation at our institution, including audit results and an insight into benefits and challenges.

Summary: Background, Steps in the pathway and differences to previously (flow charts) and Audit results (graphical presentation): 285 patients entered the pathway. 72% of CXRs were reported in ≤ 24 hours and 95% ≤ 5 days. 200 patients underwent thoracic CT. Interval between CXR report and CT was: 14% ≤ 72 hrs; 61% ≤ 7 days. 57% of CTs were reported on the same day. 18 patients underwent CT-guided lung biopsy and 22 underwent tissue sampling via EBUS/bronchoscopy/FNA. Cancer was diagnosed in 31/285 (11%) and 16% of those who had CT. Discussion including improvements made and challenges faced (suitability of referral, bottlenecks in capacity).

1. De Angelis R, Sant M, Coleman MP, et al. (2014) Cancer survival in Europe 1999-2007 by country and age: results of EURO-CARE-5 - a population-based study. *Lancet Oncol*; 15:23-34.

2. <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/cancersurvivalinengland/adultstageatdiagnosisandchildhoodpatientsfollowedupto2016>.

3. "Implementing a timed lung cancer diagnostic pathway", A handbook for local and care systems, NHS England, April 2018.

4. Public Health England. (September 2015). Routes to Diagnosis 2006-2013; preliminary results. A National Cancer Intelligence Network short report. <https://www.gov.uk/government/news/cancers-are-being-diagnosed-earlier-in-england>.



P048 Comparison of 3D and 4D tumour volumes for lung treatment planning

Zoe Walker; James Best; Jo Hamilton

University Hospital Coventry

Background: Radiotherapy for lung cancer now routinely uses 4DCT for accurate delineation of the tumour volume. The aim of this work is to assess the effect 4DCT has had on delineated volumes and treatment plans for photon lung planning.

Method: Forty radical lung patients had volumetric modulated arc therapy (VMAT) plans with internal target volumes (ITVs) outlined using a 4DCT with a 0.5cm isotropic planning target volume (PTV) margin. The tumours were re-outlined by clinicians using a 3DCT with an anisotropic margin of 1cm left/right/ant/post and 1.5cm sup/inf. The PTVs were compared and volumes that were exclusive to each method were calculated. The patients were re-planned using the 3DCT volume and the clinical goals compared to the 4DCT plans.

Results: To date, seventeen patient outlines have been analysed. The 3D-PTV was larger than the 4D-PTV for fourteen of the patients and was 20% larger on average (range 72% to 150% of the 4D-PTV). Two patients had small sections (<2cc) of the 4D-GTV that were outside the 3D-PTV. Sixteen patients had sections of the 4D-PTV that were outside the 3D-PTV ranging up to 16% of the initial 3D-PTV volume. The 4D plans showed decreased doses to the organs at risk compared to the 3D plans whilst still achieving the target clinical goals.

Conclusions: The 4D-PTVs covered areas that were not covered by the 3D-PTVs, suggesting the 4D method is more accurate than using large margins and a 3D scan. The 4D plans have also reduced doses to the organs at risk.

P049 Neuroimaging in staging patients for curative intent stage II and III non-small cell lung cancer

Siona Growcott; Joseph Page; Julie Walther; Sarah Foster

Musgrove Park Hospital, Taunton

Background: Approximately 10% of patients with newly diagnosed non-small cell lung cancer (NSCLC) will have brain metastases. ^[1,2] National Institute for Health Care Excellence (NICE) recommend that patients with curative intent stage II and III NSCLC should proceed to CT or MRI head, respectively, prior to treatment. ^[3] Early detection and management of brain metastases may slow disease progression and increase overall survival.

Methods: Patients diagnosed with curative intent stage II and III NSCLC between January to October 2019 were audited for pre-treatment neuroimaging. Local imaging portal (PACS) was used to obtain neuroimaging details. Results 31 patients had been diagnosed with stage II - III NSCLC. Of those patients with stage II disease (n= 7), 5 were treated with curative intent: 40% had CT head; 0% had MRI head; 60% had no neuroimaging. Of those with stage III disease (n= 24), 10 were treated with curative intent: 20% had CT head; 40% had MRI head; 40% had no neuroimaging.

Conclusion: Our audit highlights that our centre is not currently meeting NICE guidance. Further work is needed to ensure that patients with stage II and III NSCLC intended for curative treatment have appropriate neuroimaging staging. Proposed interventions: present results at Departmental Respiratory meeting and/or Lung MDT, create laminated aid memoir to be available at every MDT, consider automated radiology addendum to prompt neuroimaging and re-audit at 6 months.

1. Schuette, W. (2004) Treatment of brain metastases from lung cancer: chemotherapy. *Lung Cancer*. 45(suppl 2): S253-7.

2. O'Dowd, E.L., Kumaran, M., Anwar, S., Palomo, B., and Baldwin, D.R. (2014) Brain metastases following radical surgical treatment of non-small cell lung cancer: is preoperative brain imaging important? *Lung Cancer*; 86(2), 185-9.

3. National Institute for Health Care Excellence. (2019) Lung cancer: diagnosis and management, <https://www.nice.org.uk/guidance/ng122/chapter/Recommendations#further-staging>.

P050 Innovative use of DIBH in SABR

James Barber; Caroline Sisodia; Teresa Guerrero Urbani; Stephen Morris; Asad Qureshi; Cushla Edwards; Nikesh Hanumanthappa

Guy's and St Thomas' NHS Foundation Trust

Background: When delivering SABR treatment, minimising margins and OAR (Organs at Risk) dose is a critical concern for safe delivery of the highest possible ablative dose. Use of breath-hold in lung SABR has been well documented to eliminate respiratory motion and reduce dose to normal lung tissue. We report the dosimetric outcomes of a planning study using DIBH in patients with non-lung thoracic metastasis.



Method: 3 cases have been considered at MDM. A mid-sternal bone metastasis [1], a manubrium (with the patient in a thermoplastic shell) [2] and a patient with IMC recurrence directly anterior to a previously irradiated oesophageal volume [3]. Of the above, 2 DIBH plans were delivered to patients with both cases planned in both free-breath and DIBH. A summary of the

Table 1:			
Case [1]			
	Free-breath	DIBH	Difference
V50 (cc)	56.63	54.3	2.33
V30 (cc)	108.32	93.98	14.34
Heart (Gy)	25.41	22.64	2.77
Case [2]			
	Free-breath	DIBH	Difference
V50 (cc)	54.2	45.79	8.41
V30 (cc)	108.32	93.98	14.34
Greater Vessels (G)	12.62	10.46	2.16
Trachea (Gy)	4.73	2.43	2.3

dosimetric impacts is shown in table 1. DIBH also results in a reduction in plan uncertainty as defined by the likelihood of the target volume moving outside the ITV during respiration while treating in free-breath.

Results: The dosimetric advantages and successful delivery shows that DIBH has applications for SABR beyond those typically considered. Treatment for these cases was delivered with standard departmental techniques as used for mediastinal lymphomas, both on a thoracic board and in a thermoplastic shell.

Conclusion: DIBH is dosimetrically advantageous for SABR treatment to non-lung thoracic metastasis. Further work will be done to evaluate the efficacy of breath-hold in other non-standard sites. The discussion of these cases also further reinforces the value of a multi-disciplinary radiotherapy discussion of SABR cases.

P051 A pictorial review of chest radiograph learning opportunities from a five-year database review of challenging cases

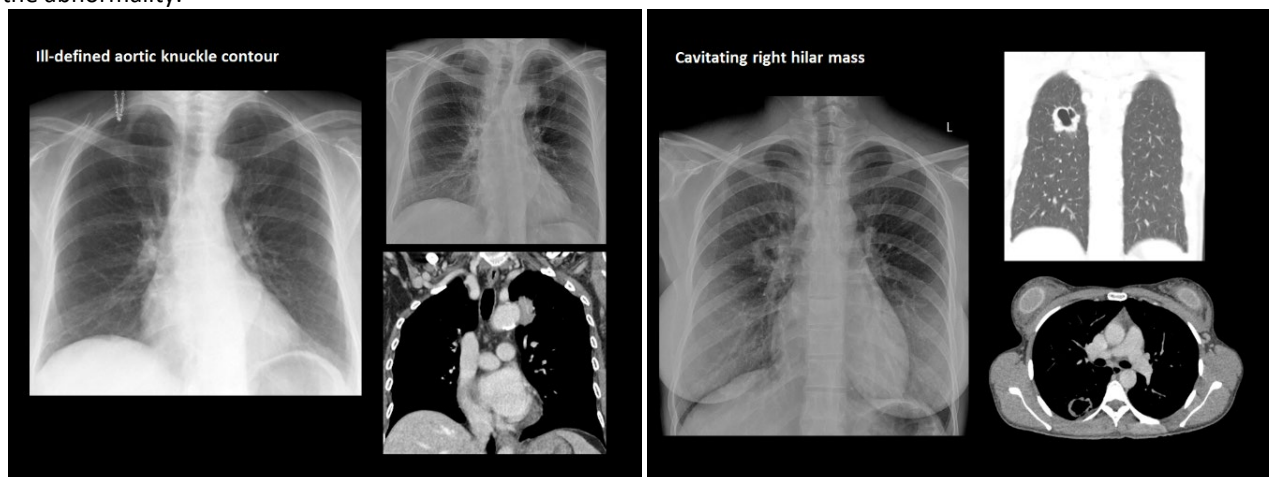
Carina Brolund-Napier; Sowmya Veerasuri; Garrett McGann

Gloucestershire Hospitals NHS Foundation Trust

Background: The chest radiograph remains one of the most frequently performed investigations in every radiology department. The composite nature of imaging inevitably makes some clinically important pathology difficult to interpret. We performed a five-year retrospective review of chest radiograph learning cases identified in our trust, the majority obtained from formal discrepancy meetings, with a view to identify any patterns and emphasise these review areas.

Purpose: Using this data, we present a pictorial review to highlight important chest radiograph review areas using a combination of CT correlation and clinical follow-up.

Summary: The poster will briefly summarise the findings from our retrospective five-year review of chest radiograph learning cases which included 25 instructive cases. In common with national reviews, we found that pathology is most commonly missed in the hilar region (50%) followed by the mediastinum and lung apices. The pictorial review will include nine chest radiograph learning cases including; a cavitating hilar mass, an ill-defined aortic knuckle contour indicating an adjacent mass, a sclerotic lesion in a thoracic vertebra which led to a diagnosis of bone metastases, rib notching suggestive of coarctation in a young man who presented with tiredness, a retro-cardiac mass and a variety of hilar and apical lung masses. The positive findings and learning points will be described under each radiograph. Subsequent cross-sectional imaging will be included to demonstrate the abnormality.



Roddie, M. (Oct 2019) *Spotlight on: Common pitfalls in interpretation of the chest radiograph; why the lateral projection is important.* REAL Newsletter. Case 090, Issue 2.

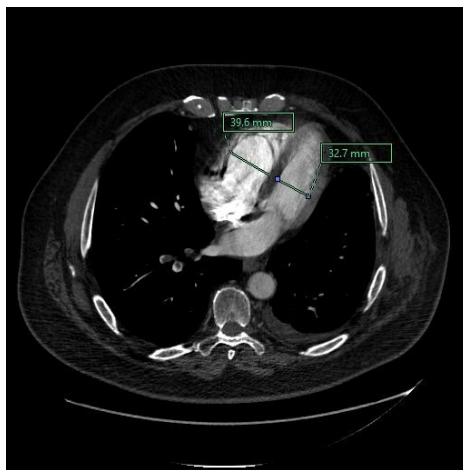
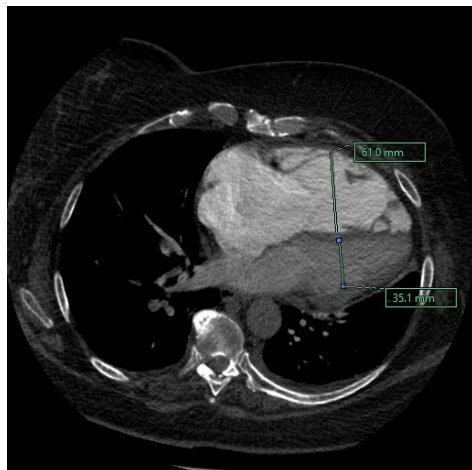


P052 CTPA for the assessment of right ventricular dysfunction in pulmonary embolism – Are we using the correct methods?

Charles Fee; Sophie Glenn-Cox; Paul McCoubrie

North Bristol NHS Trust

Background: Right ventricular (RV) dysfunction is the major cause of morbidity and mortality in acute pulmonary embolus (PE). Computed tomography pulmonary angiography (CTPA) is accurate in diagnosis of both PE and subsequent RV dysfunction. The 2019 European Society of Cardiology guidelines on management of PE^[1] advocate for risk-stratification of patients to determine appropriate therapeutic management. Specifically; they advocate the measurement of right ventricle:left ventricle (RV:LV) diameter >1 on CTPA as a reliable sign of RV dysfunction. Our aims were to establish (i) if RV dysfunction is accurately assessed by radiologists (ii) if RV:LV diameter is used for assessment.



Method: We evaluated 216 consecutive patients undergoing a CTPA during January 2019. 50 patients (23%) were diagnosed with PE. Their RV:LV diameter was measured on reformatted long axis views. The text of the radiology report was analysed. **Results:** Sixteen patients (32%) with PE were reported as having "right ventricular strain". This was qualified with a descriptor of the specific features of RV strain in 13 cases (76%), however RV:LV diameter was only used in 4 cases (33%). Poor qualifiers such as contrast reflux into

the IVC were otherwise used. Reanalysis showed 2 of these 16 had no CT features of RV dysfunction and 2 patients with RV dysfunction were not identified. Sensitivity and specificity for RV dysfunction was 87.5% and 94% respectively.

Conclusion: Radiologists are reasonably accurate at assessing RV dysfunction in patients with PE. However, more rigorous assessment and more consistent reporting would help in risk stratification of these patients.

1. Konstantinides S et al.(2019) ESC Scientific Document Group, 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS): The Task Force for the diagnosis and management of acute pulmonary embolism of the European Society of Cardiology (ESC). European Heart Journal 00, 1-61.

P053 Do the British Thoracic Society guidelines reflect advances in practice in CT guided lung biopsy?

Charlotte Thompson; Christopher Cook

Weston Area Health Trust

Background: Lung biopsy diagnostic accuracy and complication rates are measured against the British Thoracic Society (BTS) guidelines (2003). However, since 2003, lung biopsy technique has changed both in biopsy of small central lesions rather than proceeding directly to surgery, and the histological requirement for core biopsy rather than fine needle aspirate. This change has altered diagnostic accuracy and complication rates, however BTS guidelines remain unchanged since 2003.

Purpose: The purpose of this project was to evaluate local practice against current (2003) BTS guidelines for CT guided lung biopsy, and in particular if biopsy complications and diagnostic rate still lie within these guidelines, which remain unchanged.

Summary: An audit of local practice showed that pneumothorax rate increased from 16% overall (0.5% drainage) in 2007-14 when FNA or core biopsy was performed, to 18% overall (2.9% drainage) in 2014-19 when all cases underwent core biopsy. This data is still within the BTS target of <21.5% overall (and <3.1% drainage). Diagnostic accuracy improved from 85% (2007-14) to 92% (2014-19) (BTS target 85-90%). We demonstrate that a change in practice has improved diagnostic accuracy of malignancy with an increased the risk of complication. Although our figures are still within BTS guidelines, we await other studies as to whether an update of the BTS guidelines may be necessary to reflect these changes in outcome and safety.

Manhire, A., Charig, M., Clelland, C., et al (2003). Guidelines for radiologically guided lung biopsy. Thorax, 58, pp.920-936.



P054 Degree apprenticeships – The whys and the wherefores in diagnostic radiography

Julie Mills; Christine Heales

University of Exeter

Background: The Integrated Degree Apprenticeship (IDA) for Diagnostic radiography was published in 2019 and Higher Education institutes are currently preparing for delivery of this programme.

Purpose: The aim of this poster is to explore the rationale for degree apprenticeships within education in general and also in relation to diagnostic radiography.

Summary: This poster will consider a brief of history of radiography education, that has led to current degree level pre-registration qualification. An overview of the political landscape that led to the implementation of the apprenticeship levy will be discussed along with a summary of the subsequent development of degree apprenticeships in healthcare. This will conclude with a brief overview of the IDA in diagnostic radiography.

P055 A rare case of a biopsy-proven solitary cardiac metastasis in a young patient with rectal adenocarcinoma

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Patients with inflammatory bowel disease are at increased risk of colorectal neoplasia. Malignant transformation of chronic perianal lesions to squamous cell carcinoma or adenocarcinoma is a very rare but known complication, especially in patients with Crohn's disease^[1]. Colorectal cancers tend to metastasise to lymph nodes, liver or lungs, although rectal cancers more commonly metastasise to the thorax than colonic tumours^[2]. Metastasis to the heart is rare, especially in rectal cancer^[3], with only a few cases described in the literature. We describe a case of a young female with Crohn's disease who developed a rectal adenocarcinoma within a chronic peri-rectal fistula tract. The patient underwent chemo-radiotherapy and post-treatment pelvic MRI demonstrated a partial response. Interval routine post-treatment CT revealed a large necrotic mass arising from the interventricular cardiac septum. The patient was admitted to hospital shortly after the CT with tachycardia and pyrexia and was treated empirically with antibiotics for suspected endocarditis. Cardiac MRI confirmed a large right ventricular mass invading the cardiac septum with a mobile component prolapsing into the tricuspid valve. PET-CT demonstrated intense uptake of the cardiac mass with no other areas of pathological uptake. Cardiac biopsy was performed as imaging findings were concerning for a solitary metastasis. Endomyocardial biopsy proved metastatic adenocarcinoma consistent with the primary rectal histology. This case presented a diagnostic challenge due to the unusual location of metastasis with no other evidence of metastatic disease. Cardiac biopsy is high risk, but multi-modality imaging findings provided sufficient concern to prove this rare metastasis.

1. Laurent Abramowitz, L., Beaugerie, L., Fléjou, J-F., Laurent Siproudhis, L., Magali Svrcek, M. and Andrew Wisniewski, A. (2017) Anal Neoplasia in Inflammatory Bowel Disease: Classification Proposal, Epidemiology, Carcinogenesis, and Risk Management Perspectives. *J Crohns Colitis*, 11(8), 1011-1018.
2. Hemminki, A., Hemminki, K., Riihimäki, M., Sundquist, J. (2016) Patterns of metastasis in colon and rectal cancer. *Sci Rep* 6, 29765.
3. Ayyala, S. S., Kannarkatt, P. T., Kovacs, J. E., Terrigno, N. J. and Urcuyo, D. M. (2017) A Rare Case of Atrial Metastasis From a Rectal Adenocarcinoma. *J Clin Med Res*, 9(10), 886-888.

GI UPPER AND LOWER AND HEPTOBILIARY

P056 Outcomes of radical radiotherapy (55Gy/20#) for oesophageal carcinoma at Clatterbridge Cancer Centre NHS Foundation Trust, UK (CCC) between Jan 2014 and May 2016

Joachim Chan; Cheng Boon; Caroline Brammer; Rajaram Sripadam; Helen Wong; Chinnamani Eswar

Clatterbridge Cancer Centre NHS Foundation Trust

Where chemoradiotherapy is contraindicated, a definitive treatment for oesophageal carcinoma is radical radiotherapy (RT). At CCC, standard dose fractionation is 55Gy/20#. We performed a retrospective audit to assess outcomes. Patients (pts) were identified who received this treatment between Jan 2014 and May 2016. Clinical records including letters, histology and imaging reports were used. 26 pts were identified. Median age was 72 years; 15 were SCC, 11 were adeno; 2 were T1, 13 were T2, 11 were T3; 12 were node positive. For RT technique, 18 had 3D CRT (69%) and 8 had VMAT (31%). Median volume of GTV was 37 cm³ and of PTV was 217 cm³. All pts completed RT treatment. Symptomatically, 19 had response (73%), 5 had no response (19%), and 2 had unknown response to dysphagia (lost to follow-up). Radiologically at first imaging within 6 months of RT: 3 had complete response (12%), 5 had partial response (19%), 9 had stable appearances (35%), 4 had no response (15%), and 5 had unknown response (19%). Overall, 10 had no radiological recurrence (38%), 13 had radiological recurrence (50%), and 3 had unknown recurrence status (12%) as no subsequent scan. Median overall survival (OS) was 11 months (range 3 to 50 months). 1, 2- and 3-year OS rates were 46%, 23%, and 12%. Median disease-free survival was 7 months (range 3 to 38 months). 1, 2- and 3-year disease free survival rates were 35%, 15%, 4%. Pearson correlation coefficient for GTV and OS was -0.3 (p = 0.13).



P057 Adhesional small bowel obstruction: Are early abdominal radiographs useful in deciding who needs surgery?

Pedro Santos Jorge; Sophie Coles; Victoria Beynon; Cleo Kenington

St George's University Hospital NHS Trust

Background: Adhesional small bowel obstruction (aSBO) is a common cause of emergency surgical admission, carries significant morbidity and mortality, constituting major indication for emergency laparotomies. Gastrografin(GG) has been demonstrated to help identify which patients will need surgery. However there are no clear guidelines on if and when an AXR will guide management. Variation in frequency/timing of AXRs is observed. 4-6hrs post-GG film plus a 12-16hrs one are frequently advocated. We aim to evaluate the impact of these x-rays on patient management.

Methods: Retrospective analysis of all patients presenting with adhesional SBO confirmed by CT on same or previous admission between August-October 2019. Data extracted from electronic medical records, noting time Gastrografin administration, AXRs; time of bowel opening; further imaging/management.

Results: 26 patients with adhesional small bowel obstruction received Gastrografin and were included in the study: AXRs were performed at 4-6hrs in 24 (92%) cases and after 12 hours in 34% of cases. 19 (73%) patients the obstruction resolved and were discharged without further treatment: 14 (53%) in <12hrs, 3 (11%) in 12-24hrs & 2 (8%) in 24-36hrs. Of the 7 (27%) patients who failed to open bowels, 5 (19%) had a laparotomy & 2 (8%) died, as not-fit-for-surgery.

Conclusions: This study has demonstrated that regardless of x-ray findings, it is opening of bowels after gastrographin administration, that guides further management, not the findings. It is recognised that AXRs risk exposure to unnecessary radiation and stretch NHS resources. Recommendation is that imaging be performed at least 12hrs post-GG.

1. Branco, B.C. et al., 2010. Systematic review and meta-analysis of the diagnostic and therapeutic role of water-soluble contrast agent in adhesive small bowel obstruction. *Br J Surg.* 97:470-8.
2. Ceresoli, M. et al., 2016. Water-soluble contrast agent in adhesive small bowel obstruction: a systematic review and meta-analysis of diagnostic and therapeutic value. *Am J Surg.* ;211(6):1114-25.
3. Di Saverio, S. et al., 2013. Bologna guidelines for diagnosis and management of adhesive small bowel obstruction (ASBO): 2013 update of the evidence-based guidelines from the world society of emergency surgery ASBO working group. *World journal of emergency surgery: WJES.* 8(1):42 4.

P058 Congestive hepatopathy (nutmeg liver): Let us think beyond Budd-Chiari

Santhi Ann George; Zahida Hussain; Sarah Yusuf; Rehaan Nensey; John Morlese

Sandwell and West Birmingham Hospitals NHS Trust

Background: Perfusion changes in liver secondary to hepatic venous congestion leads to the 'nutmeg liver' appearance. This is classically associated with Budd-Chiari syndrome, the main pathophysiology of which involves partial or complete occlusion of hepatic veins. However, there are other conditions leading to hepatic venous congestion which can give rise to similar appearance. The important ones among these are related to cardiopulmonary diseases like pulmonary embolism, congestive heart failure, etc. The pathophysiology of nutmeg liver appearance in these cases is secondary to increased central venous pressure causing passive hepatic congestion. It is important for radiologists to be aware of these causes and be able to actively look for these when encountered with the nutmeg liver appearance.

Purpose: The aim of this pictorial review is to demonstrate the various causes of nutmeg liver appearance. We aim to include Budd-Chiari syndrome, pulmonary embolism, congestive heart failure and pulmonary artery hypertension and to guide Radiologists to look for causes other than Budd-Chiari syndrome which could cause similar appearances.

Summary: We aim to give a description of the pathophysiology of congestive hepatopathy. The main content of this poster would be CT and MR images of various causes of congestive hepatopathy with appropriate explanation and pointers. We aim to show appearances of liver in conditions like Budd-Chiari syndrome, pulmonary embolism, pulmonary artery hypertension and congestive heart failure.

P059 The effectiveness of abdominal x-ray in the cause of non-traumatic abdominal pain in emergencies

Winnie Tam

University of Exeter

Background: Abdomen x-rays (AXR) are a commonly requested radiographic examination for non-specific acute abdominal pain. However, recent evidence indicates that one in three patients are discharged from A&E without a diagnosis for their abdominal pain, questioning the role of abdomen x-ray in this clinical pathway.

Method: A literature review of studies and guidelines, dated from 1964 to 2018, was conducted, looking at AXR's effectiveness. The algorithm was constructed based on BMJ best practice guidelines and was coded with Python 3.6.

Result: Despite the documented ineffectiveness of AXR for supporting a definitive diagnosis or leading to a correct treatment alternation and the advancement in CT and ultrasound, there was no dramatic decrease of the AXR used. Only 32% of AXR requests adhered to the Royal College of Radiologists guidelines, which may contribute to the high rate of further imaging and insignificant findings. Since abdominal pain is a symptom for all the justified and most of the unjustified indications, a way to help referrers to distinguish differential diagnoses is urgently required.



Conclusion: The conflicting evidence-base reflects the complexity of the use of AXR, and the issues around guidelines and departmental cultures. More research on this topic is required in the context of the resource usage and radiation risk involved in AXRs. An algorithm was constructed using BMJ Best Practice guidelines to assist referrals for acute abdominal pain. However, this study suffered from a few limitations. The algorithm has not been used clinically; further testing is needed.

P060 Gastrointestinal stromal tumours (GIST): Role of imaging in diagnosis, staging and response assessment – A pictorial review

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The Royal Liverpool University Hospital

Background: Gastrointestinal stromal tumours (GIST) are mesenchymal tumours that arise from the gastrointestinal (GI) tract. They most commonly occur in the stomach but can also be found throughout the GI tract. Radiological manifestations of GISTs are highly varied and treatments include surgery and tyrosine kinase inhibitors such as imatinib. Measuring tumour size using computed tomography (CT) is an unreliable method of assessing response to imatinib and the Choi response criteria for GIST (assessing size and attenuation characteristics) is more commonly used¹. Functional imaging using positron emission tomography (PET) can also be used in the initial staging of selected cases and in assessing treatment response of these tumours.

Purpose: The purpose of the poster is to provide an educational pictorial review for radiology trainees and general radiologists of the different radiological manifestations of GISTs and the different locations where these tumours can occur in the GI tract. The poster will provide insight into staging, complications of GIST such as bleeding, assessing tumour response following imatinib using the Choi response criteria and also highlight the role of PET-CT in selected cases.

Summary: Pictorial review of selected cases to illustrate the CT and PET imaging features of GISTs to guide initial diagnosis, staging and assessment of treatment response.

1. Choi, H., Charnsangavej, C., Faria, S., Macapinlac, H., Burgess, M., Patel, S., Chen, L., Podoloff, D. and Benjamin, R. (2007). Correlation of Computed Tomography and Positron Emission Tomography in Patients With Metastatic Gastrointestinal Stromal Tumor Treated at a Single Institution With Imatinib Mesylate: Proposal of New Computed Tomography Response Criteria. *Journal of Clinical Oncology*, 25(13), pp.1753-1759.

P061 Actionable reporting of emergency CT abdomen and pelvis

Roshini Ravindran; Mujahid Abdalla; Anitha James

Royal Stoke University Hospital

Background: Audit exploring whether emergency CT abdomen and pelvis are 'actionable' reports. The Royal College of Radiologists (RCR) presented standards for actionable reporting. Reports should answer the clinical question posed by the referrer, accurately describe findings and diagnoses, with appropriate advice on next step of patient management.

Method: The first 75 Emergency CT abdomen and pelvis with contrast from the beginning of August 2019 were evaluated. We assessed whether: the report answered the clinical question; a tentative or differential diagnosis was given when an abnormality was described, next step advice was given and whether this advice was appropriate. Registrar reports were used for data analysis. Reports were deemed to have answered the clinical question if was explicitly or indirectly addressed. If there was no Registrar report, Consultant report was used. If neither Registrar nor Consultant provided next step advice, the report was deemed 'normal' and therefore 'appropriate' with regards to next step advice.

Results: 100% of all reports answered the clinical question. Of these 85% explicitly answered the clinical question. 98.7% of all reports provided tentative diagnosis. 81.8% of scans that provided next step advice were deemed to be appropriate.

Conclusion: Largely, we are meeting targets as per RCR standards, however there is scope for improvement. Overall, we are performing best in the domain of answering the clinical question (explicitly or indirectly). Followed by providing a (tentative) diagnosis. The area with most room for improvement is providing appropriate next step advice.

1. RCR. (2018) Standards for interpretation and reporting of imaging investigations. 2nd ed. BFCR (18)1 London, Royal College of Radiologists.

P062 All that glitters is not gold – A case report of peritoneal amyloidosis

Yong Keen Hor; Deepak Pai

NHS Northern Lincolnshire and Goole

Introduction: Imaging is done on patients for various reasons. These images may show mass lesions of varying nature from benign, inflammatory, metabolic or malignant. Without histological assessment, it is difficult to comment on the definitive diagnosis.

Case report: We report a case of 66-year-old man with history of haematuria and raised PSA. CT KUB with triple phase and MRI prostate were done but no cause of haematuria was identified except for incidental findings of multiple foci of small soft tissue lesions with calcifications within the peritoneal cavity, presacral region at S1 and the left par spinal region at T11. MRI prostate showed similar finding at S1 suggestive of soft tissue lesion with calcification. PET was recommended as significance of the findings were unclear. PET showed moderate avidity within these foci. CT guided biopsy of the par spinal lesion was



recommended as the significance of these lesions were uncertain. Up to this stage, the first differential diagnosis was malignancy. The final diagnosis of amyloidosis was made histologically.

Conclusion: Amyloidosis includes a group of diseases where there is extracellular deposition of amyloid. The deposition may be systemic, organ-limited or localized. Localised amyloidosis is uncommon. Imaging characteristics are nonspecific and can lead to clinical suspicion of malignancy. Learning points: Unusual calcifications should not be disregarded as benign or non-significant. Amyloidosis can mimic malignancies and hence biopsy is mandatory. All that glitters are not gold and all that look abnormal on imaging is not cancer.

1. Krishnan J, Chu W, Elrod JP, Frizzera G (1993) Tumoral presentation of amyloidosis (amyloidomas) in soft tissues. *American Journal of Clinical Pathology* 100(2): 135-144 (PMID: 8356946).
2. Czeyda-Pommersheim F, Hwang M, Chen SS, Fuhrman C, Bhalla S (2015) Amyloidosis: modern cross-sectional imaging. *Radiographics* 35: 1381-1392 (PMID: 26230754).
3. Urban BA, Fishman EK, Goldaman SM et al (1993) CT evaluation of amyloidosis: spectrum of disease. *Radiographics* 13: 1295-1308 (PMID: 8290725).

URORADIOLOGY GU / ENDOCRINE

P063 Comparison of inter-observer variability (IOV) in prostate IGRT using 3D-CBCT fiducial or soft tissue registration

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¹West of Scotland Cancer Centre; ²Sheffield Hallam University

Background: Knowledge of IOV is essential when calculating clinical target volume (CTV) to planning target volume (PTV) margins in prostate radiotherapy. With daily IGRT, set-up error is corrected and other sources of uncertainty become more important. Our aim was to quantify IOV for prostate RT when using 3D-CBCT fiducial match (FM) or prostate soft tissue (ST) match.

Methods: This retrospective study included low/intermediate risk patients completing 60Gy/20 fractions. Patients either had FM or ST for registration. Anonymised CBCT images for 1 fraction per patient were: set to acquisition position, re-registered (either FM or ST) and analysed. Observers were blinded to match values. Vertical, longitudinal and lateral values recorded. Two-way ANOVA was performed and plotted using Modified Bland Altman limits of agreement (LoA), and descriptive statistics reported.

Results: A total of 6 patients with FM, and 6 patients with no markers were analysed. Each image set was registered by 10 observers i.e. 120 registrations. IOV CBCT-FM, 95% mean LoA was ± 1.7 mm, ± 2.2 mm and ± 0.7 mm in vertical, longitudinal and lateral axes. No statistical significance (<0.05) was found within the FM group in vertical, longitudinal or lateral axes ($p=0.27$, $p=0.82$, $p=0.21$). For CBCT-STs, 95% mean LoA was ± 2.6 mm, ± 3.1 mm and ± 0.7 mm. Statistical significance was found in ST group on vertical axis only ($p=0.04$) but not lateral or longitudinal axes ($p=0.07$; $p=0.43$).

Conclusion: IOV is larger when registering to ST than FM. When attempting to reduce PTV margins, IOV should be understood and applied to margin calculation.

P064 Leiomyoma of the urinary bladder: A pictorial assay of a rare tumour

Gasim Ahmed; Hamza Imran; Usman Saeed

Royal Blackburn Hospital

Introduction: Bladder leiomyoma is the most frequently encountered benign mesenchymal vesical tumour and, in itself, constitutes less than 0.5% of all tumours of bladder origin. The body of literature describing the condition is very scarce with less than 250 cases being reported over the last century. Here, we present three cases of vesical leiomyoma and review the literature pertaining the condition. Clinical presentation: The mean age of presentation is 52 years (23 to 77 years) with a literature discrepancy regarding gender distribution although a female to male ratio of 3:1 has been reported. Lesions can be intravesical, mural, or extravesical. While the vast majority of extravesical and mural lesions are asymptomatic, the presentation of intravesical neoplasms may include haematuria, urinary frequency, mass effect, or bladder outflow obstruction.

Radiological features: On ultrasonography, leiomyoma is a typically smooth-walled, homogeneously hypoechoic, solid neoplasm with a thin echogenic surface. On computed tomography, it appears as a hypodense lesion with poor to moderate enhancement characteristics. Magnetic resonance imaging is superior to ultrasound and computed tomography and helps in differentiating between benign leiomyomas and malignant leiomyosarcomas. Leiomyoma has a low to intermediate signal intensity on T1 and low signal characteristics on T2 weighted sequences. Contrast enhancement is variable and is usually absent in degenerating lesions.

Treatment: Treatment of bladder leiomyoma is surgical resection. While transurethral resection of bladder tumours is generally preferred for small-sized neoplasms with intravesical localisation, partial cystectomy and segmental resection are preferred for larger lesions.



P065 Bladder preparation in abdominal US exam for suspected pelvic pathology audit

Gasim Ahmed; Hamza Imran; Usman Saeed

Royal Blackburn Hospital

Introduction: For optimal pelvic organ assessment, a full urinary bladder is required to act as an acoustic window through which pelvic organs are evaluated^[1]. Assess the degree of urinary bladder preparation and its influence on the degree of reporting confidence in addressing the referring query. Goal: All non-emergency inpatients attending for an abdo-pelvic ultrasound for a suspected pelvic pathology should have a full urinary bladder when being scanned.

Method: Screening extended from June to October 2019. Paediatric/emergency cases and patients with no suspected pelvic pathology were excluded. Bladder preparation was defined as 'full', 'partially full', and 'empty'. Reporting confidence was classified as 'confident', 'equivocal', and 'failure'. Only reporting limitations attributed to bladder preparation were included.

Results: Out of 350 scans evaluated, 136 scans were included in the final analysis. Overall, only 40% of patients had a 'full' urinary bladder while 38% and 22% had a 'partially filled' or 'empty' bladder, respectively. In the partially filled/empty bladder cohort, the report was able to 'confidently' address the presenting query in 34% of the cases. The report was 'equivocal' or has 'failed' to address the query in 49% and 16% of cases, respectively. In the full bladder cohort, the report 'confidently' addressed the query in 92% of the cases and 'failed' in only 2% of scans.

Conclusion: Urinary bladder preparation in the studied cohort is suboptimal which negatively impacted the degree of reporting confidence. Tools to address this issue will be introduced and evaluated in the second cycle of the audit.

1. Guidelines for professional ultrasound practice: Society and college of radiographers and British medical ultrasound society. December 2019. https://www.bmus.org/static/uploads/resources/SCoR_BMUS_Guidelines_Amend_March_2019_final.pdf.

P066 The role of high-resolution MRI in men with spaceOAR hydrogel undergoing radiotherapy for prostate cancer: A step towards clinical effectiveness

John Paul Sahibbil

GenesisCare UK

Background: Prostate cancer is the most commonly occurring cancer and the leading cause of cancer death in men worldwide. Radiation therapy has been considered an effective modality and established treatment for prostate cancer that can result in improved clinical outcome. However, there are concerns about dose escalation including the risks of rectal toxicity. Interest has grown to the novel approach of inserting spaceOAR hydrogel, a water-soluble gel that creates a temporary gap of 10–15 mm between the prostate and anterior rectal wall, making it much less likely that the rectum is exposed to radiation. The position of the gel in the rectal lumen is often not clearly definable on CT but more visible in MRI.

Purpose: This presentation is to detail the role of MRI in assessing the placement of hydrogel spacer by using a high-resolution scanning protocol. The aim of the presentation is to educate the reader on various MR techniques and appreciate the characteristic appearance of spaceOAR, and be able to discriminate the gel, not as a mass, nor fluid collection or any other pathological conditions.

Conclusion: At our institution, we have developed a protocol that depicts the spacer and pelvic anatomy. Over the past months, it has improved and implemented high-resolution MR-based planning successfully and now locally routinely used in clinical practice. This review provides an optimal MR imaging protocol to assist in hydrogel and rectal delineation and thus, facilitates an accurate treatment planning.

1. Alfieri, F., Van Gysen K., and Eade T. (2014). The Use of SpaceOAR Hydrogel in Dose-Escalated Prostate Cancer Radiotherapy and Its Impact on Rectal Dosimetry. *Journal of Medical Imaging and Radiation Oncology* 58 (SUPPL. 1): 186. <https://doi.org/http://0-dx.doi.org.lib.exeter.ac.uk/10.1111/1754-9485.12223>.

2. Fischer-Valuck, Benjamin W., Anupama Chundury, Hiram Gay, Walter Bosch, and Jeff Michalski. (2017). Hydrogel Spacer Distribution within the Perirectal Space in Patients Undergoing Radiotherapy for Prostate Cancer: Impact of Spacer Symmetry on Rectal Dose Reduction and the Clinical Consequences of Hydrogel Infiltration into the Rectal Wall. *Practical Radiation Oncology* 7 (3): 195–202. <https://doi.org/10.1016/j.prro.2016.10.004>.

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P067 Comparing verathon bladder ultrasound scanner and CBCT bladder volumes

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Imperial College NHS Healthcare Trust

The Verathon Ultrasound Bladder Scanner is routinely used in our Radiotherapy department to verify bladder size for pelvis patients before setting up on the treatment couch and using Cone Beam CT (CBCT) image verification. The current protocol is to treat prostate patients with an empty rectum and comfortably full bladder. At their planning CT scan, they are scanned with a Bladder Scanner to obtain a reference bladder volume. Subsequently, before each treatment fraction the size of the patient's bladder is measured using the Verathon Bladder Scanner and this has been shown to reduce the number of repeat CBCT images required due to insufficient bladder preparation. A setup audit was performed to evaluate the set-up accuracy and reproducibility of patients receiving radiotherapy for prostate cancer. Correlation between the bladder volumes obtained with



the Verathon Bladder Scanner to the CBCT images would allow an assessment of the efficacy of the current department protocol and the results would determine tolerance levels for bladder scanner measurements. Daily CBCT images were acquired and reviewed for 17 consecutive patients, a total of 583 images. The bladder was outlined on each image by a single experienced observer and the patient treatment cards reviewed for the Bladder Scanner volumes recorded for each fraction. The average bladder scanner volume for all fractions was 257 ± 74 ml, whereas the average Bladder CBCT volume was 292 ± 73 cm³. Statistical analysis showed a strong correlation of the Bladder scanner volume and the CBCT bladder volume as expected.

P068 Introduction of a prostate information seminar: Enhancing patient experience

Michelle Forshaw; Michelle Cain; Philip Reynolds; Sophie McConkey

The Clatterbridge Cancer Centre NHS Foundation Trust

Background: Preparation for prostate radiotherapy is commonplace within the modern radiotherapy setting. Limiting bowel and bladder side effects enhances patient quality of life (QOL) (Jayadevappa et al, 2006 and Mullaney et al 2014). This enables a reduction in late side effects to pelvic radiotherapy (Krol et al, 2018). Interfraction motion is significant (Barney et al, 2011). At the practice environment implementation of CBCT for patients in the PIVOTAL Boost clinical trial allowed visualisation of such effects. Both bowel and bladder variations have been observed even though rectal and drinking protocols are in use.

Purpose: Enhance treatment experience for all prostate cancer patients Reduce treatment related toxicities, including late effects; through improving quality of information and consequently adherence to bladder and bowel protocols. Improve patient QOL.

Summary: The introduction of a voluntary pre-treatment prostate information seminar has been implemented at the trust. Provision of in-depth information regarding treatment preparation and its necessity was delivered in the form of a power point presentation, covering all aspects of pre-treatment processes, treatment experience and the early and late side effects. A patient experience video clip of a previous patient is also included. A patient feedback questionnaire is completed at each session. All patients who have attended the seminar found the presentation useful and positively impacted the patient experience. Future provision will make this session mandatory for all prostate patients.

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P069 Prostate cancer in women and other patient specific issues: A national service evaluation of radiography staff's management of transgender patients

Eimear Lacey

NHS

Around 300,000 people in the UK experience some degree of gender non-conformance (GIREs 2009) and 6.3% of the population do not identify as heterosexual (ONS 2015). Literature shows that these communities face multiple health risks and healthcare disparities, as well as wider social problems, disproportionately in transgender communities. Yet, there is a lack of research into the provisions in healthcare that these individuals require, and what those provisions should be. A 22-question online survey was constructed and emailed to 88 service managers of radiotherapy departments, receiving valid 67 responses. As it was asked that the questionnaire be shared throughout the department, we cannot garner a response rate from this figure. This questionnaire aimed to give a brief insight into training, radiography staffs' ideas of transgender patient needs and how well staff feel they can meet these needs. This study found that radiography staff have a good understanding of terminology and awareness that outside social factors can impact a person's experience. A need for further training has been shown from responses: staff must be more aware of what constitutes transphobic behaviour and appropriate language. Further focus must also be placed on patient centered care: as the "one size fits all" approach to patients is detrimental to patient dignity.

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P070 Assessing PI-RADS use in prostate MR imaging

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Pennine Acute Hospitals NHS Trust

Background: PI-RADS (Prostate Imaging Reporting and Data System) is a standardised reporting structure for prostate MRIs. It has been proven to increase the detection of tumours with malignant potential, is better than transrectal ultrasound guided biopsy at detecting cancer and has a good interreader agreement. We performed a full cycle audit to assess the local implementation of this system.

Methods: Patient data was collected through retrospective, consecutive sampling of all MRI prostate scans in 2018. Patients were stratified according to the reporting radiologist and the first 20 patients each radiologist reported were analysed. 140 scans from 7 consultants were assessed.

Results: Between audit cycles primary outcomes demonstrating PIRADs use increased. Prostate dimensions were described in 97.8% of patients (2018-63.1%) and zonal anatomy with a PIRADs score was described in 93.7% of patients (2018-90%). Secondary outcomes looking at invasion of adjacent structures (prostate capsule, seminal vesicle, bladder) did not show significant improvement.

Conclusion: This audit showed that key aspects of the PIRADS system had been successfully implemented. Secondary objectives implementing routine reporting of normal peripheral structures were not achieved as consultants felt 'fatigue' doing this. To overcome this we created a proforma with these details pre-populated to ease adoption.

P071 A pictorial review of significant non-urinary tract pathology found on an audit of CT KUB examinations

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Gloucestershire Hospitals NHS Foundation Trust

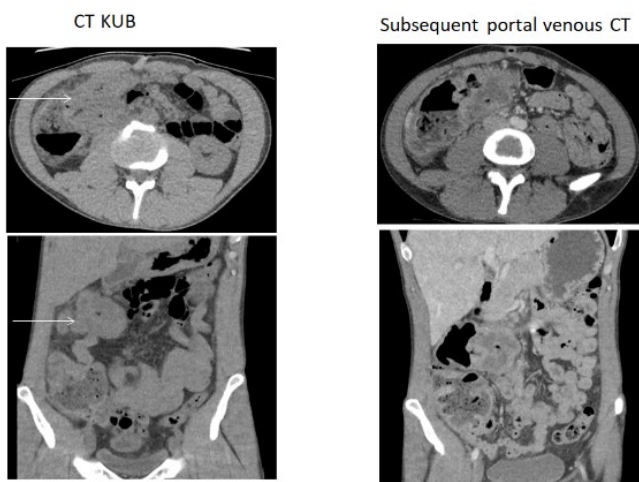
Background: Loin pain is a common presenting complaint in the emergency department, of which renal colic is often a top differential diagnosis typically investigated with low dose unenhanced computed tomography of the kidneys, ureters and bladder (CT KUB). Following a near miss in our institution an audit of CT KUB examinations was undertaken which showed a high

proportion of important pathology was identified on these studies outside of the urinary tract.

Purpose: A pictorial review to highlight important pathology that may be missed on CT KUB examinations and to make the case that patients who present with atypical clinical features have a contrast enhanced portal venous phase CT, rather than a non-contrast CT KUB.

Summary: The poster will briefly summarise the audit findings and present a range of pathologies identified in our audit which radiologists must be mindful to look for in the emergency setting of patients presenting with loin pain. Important cases included are colon cancer, ovarian cancer, diverticulitis, appendicitis and a range of other important pathology. We retrospectively audited 136 consecutive CT KUB examinations performed over a three-month period. Our results showed 55 CT KUB scans were normal and 81 abnormal. Ureteric stones were identified in 32% (44) and significant non-urinary tract pathology was identified in 12% (16) of CT KUB examinations.

Colonic tumour



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P072 Timing pre-treatment KUB radiographs following incidental detection of renal tract calculi on contrast enhanced CT: An audit

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Background: The imaging modality of choice for patients presenting with renal colic is a non-contrast CT of the urinary tract, with a 95% detection rate of calculi^[1,2]. However the presenting symptoms are not always typical of renal colic in which case renal tract calculi may be diagnosed on contrast enhanced CT (CECT). In the process of determining whether a patient is suitable for Shockwave Lithotripsy (SWL) under fluoroscopy, the urologists may require a plain abdominal x-ray to assess if the calculus can be visualised. If the urinary tract calculus was diagnosed on CECT, the KUB radiograph should be performed after 24 hours thus allowing sufficient time for the contrast to be excreted and thereby avoiding a non-diagnostic radiograph^[3].



Purpose: The aim of this audit was to assess our local practice and issue local guidelines if the 24-hour target was less than 100%.

Summary: We have reviewed the A&E CECT scans performed in our institution over a period of 9 months using CRIS-PACS. We have identified 19 cases of obstructing renal tract calculi with follow-up x rays. 11 out of the 19 had these radiographs within 24 hours of the CECT. 8 of these 11 had residual contrast on the KUB radiograph limiting its interpretation. 7 out of 19 had KUB radiograph between 24.5 - 72 hours. None had residual contrast visible. Results are discussed and limitations identified. The poster displays inconclusive radiographs performed too soon after CECT - showing varying amounts of contrast.

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P073 Assessment of appropriateness and outcomes of CT KUB in women

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Introduction: Renal colic is an acute pathology and is more common in men. CT KUB is the gold standard investigation for renal colic due to its high sensitivity and specificity and associated low radiation dose. The aim of this audit is to assess the appropriateness and outcomes of CTKUB in women with suspected renal calculi.

Methods: All consecutive CT KUB's performed between October and November 2019 were retrospectively analysed. Patient demographics, presentation, urine analysis and CT results were reviewed.

Results: 137 patients with a mean age of 47 years (range 17-88) underwent CT KUB. Whilst 68 were men, 69 were women. Positive diagnosis of a renal calculi was established in 48 patients (35%). This was much lower in women 26%(18/69) compared to men 44%(30/68). Signs of recent passage were noted in 5(3%) patients. Of the remaining 84 patients without renal calculi (men=34; women=50), alternate diagnosis was established in 31(37%) patients; a significant proportion of whom were women (61%).

Conclusion: Our results demonstrate that approximately only one in four CT KUB's in women is positive for renal calculi. Alternative diagnosis and further imaging rates were also higher compared to men. This study highlights the need to design improved imaging pathway that effectively triage women for more appropriate imaging investigations if the presentation is atypical for renal calculi.

P074 Two-year retrospective audit: Nephrostomy success rates and complications at South Eastern Health and Care Trust

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South Eastern Health and Social Care Trust

Nephrostomy insertion is a procedure commonly performed by Interventional Radiologists and Urologists. Indications include urinary obstruction, diversion, endourological procedures and diagnostic testing. Risks associated with the procedure include haemorrhage, septic shock, bowel perforation and pleural complications e.g. pneumo/haemothorax. The Royal College of Radiologists suggest technical success rates should be $\geq 88\%$ with major and minor complication rates of $\leq 8\%$ and $\leq 15\%$ respectively. The American College of Radiologists suggests success rates should be $\geq 85\%$ with major complications of $\leq 4\%$. This audit set out to determine the technical success and complication rates at a large NHS district general hospital. All patients who underwent nephrostomy insertion at the centre were identified using a PACS search. Electronic care records and radiology reports were used to determine whether successful nephrostomy insertion had been achieved and whether associated complications occurred. In total 123 nephrostomy insertions were performed in 115 patients over a two-year period, 8 of which were bilateral. 120 of these attempts were successful, giving a success rate of 97.5%. Nephrostomy insertion was not possible in just 3 cases. No significant complications occurred. Minor complications were described in 9.7%. The presence or absence of complication was not mentioned in 7 cases, highlighting a need for complete documentation in future. Nonetheless, figures fall within ACR acceptable range at 15%. This audit underlines the high success rates and low complication rates at this centre. It is expected that complication rates will remain low and that documentation of such will be 100% at re-audit.

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P075 Diagnostic accuracy of multi-parametric(mp) MRI in prebiopsy prostate: A comparison with histology

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NHS Northern Lincolnshire and Goole Trust

Background: Prostate cancer is the most common cancer in men^[3]. Multiparametric(MP) prostate cancer MRI is recommended as first-line investigation for people with suspected prostate cancer prior to biopsy^[1,2]. The study aimed to assess the diagnostic accuracy of using mpMRI to detect prostate cancer against histology as benchmark.



Methods: Retrospective review of 100 consecutive patients who undergone mpMRI reported using Prostate Imaging -- Reporting and Data System (PI-RADS) with score ≥ 3 followed by prostate biopsy between April 2017 to November 2017. Data were collected around patient demographics, MRI reports to score lesion level of suspicion and location, and correlated to Gleason grading from histology.

Results: The overall positive predictive value of mpMRI lesions for all prostate cancer is 80%. Suspicious lesions (PI-RADS score 4 and 5) have a positive predictive value of 83%. For clinically significant cancer (Gleason ≥ 7), the figures were 59% and 61% respectively. 93% of clinically significant cancer lesions were targeted correctly on MRI influenced biopsy. All highly suspicious lesions (PI-RADS 5) on MRI but negative on biopsy, showed histological features of inflammation or high-grade prostate intraepithelial neoplasia (PIN).

Conclusion: There is significant association between PI-RADS score and cancer detection rates. The use of prebiopsy prostate MRI has shown to have high positive predictive value in detecting and localising prostate cancer, which makes it a useful tool for targeting biopsy and detection.

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P076 A decade comparison of renal biopsies in Glasgow between 2008 and 2018

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Aim: To audit and compare the change in both ultrasound and CT-guided renal biopsy practice, lesion characteristics and lesion histopathology over a decade in three Southern Glasgow hospitals and audit the results with reference to published literatures^[1-3] and the Scottish Renal Registry.^[4]

Methods: All of the percutaneous core renal biopsies performed in Southern Glasgow sector hospitals in 2008 and 2018 were analysed looking at patient demographics, lesion characteristics, complication rates and sample histopathology. The results for 2008 and 2018 were compared.

Results: A total of 39 renal biopsies were carried out in 2008 and 107 in 2018. We observed a significant rise in total number of biopsies performed and a marked shift from ultrasound to CT over the decade with 80% ultrasound in 2008, compared to 15% in 2018. The technical difficulty of the biopsy has increased dramatically with a large reduction in lesion size and an increase in lesion biopsy depth. Despite the increase in technical difficulty the complication rates remained low and in line with the published literature, with a major complications occurring with a rate of 1.8% (2 of 110). Diagnostic yield of renal biopsies in 2008 and 2018 were 100% and 95% respectively.

Conclusion: In the last decade, we are being asked to perform biopsies on smaller and deeper lesions. As a result there has been a trend to perform biopsies under CT guidance rather than ultrasound. Despite the increase in technical difficulty the complication rates remain low and diagnostic yield high.

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P077 The role of diagnostic imaging in Cushing's disease

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Background: My diagnosis of CD took me on a tortious diagnostic journey taking almost 6 years to diagnose. CD is said to be a rare condition and often found to be, 'mysterious,' in its origin. Patients with unequivocal progressive signs and symptoms of this condition require surgical intervention. Advances in MRI and Radio-nuclide imaging have improved the diagnostic capabilities and enhanced the ability to perform microadenoma resection surgery safely.

Methods: As part of my PhD study, a systematic literature review was conducted in order to ascertain the current views on imaging of the pituitary gland for CD. Endocrinologists (3), a Neurosurgeon, and 3 Radiologists were also consulted and asked which modalities they recommended to confirm a diagnosis of CD. Nine Cushing's members of the PF, UK were asked using a questionnaire, which imaging modalities were used in order to diagnosis their CD.

Results: The Consultants unanimously agreed that MRI of the pituitary gland was the modality of choice, for the diagnosis of CD and that occasionally, IBPSS is performed and a PET-Dotatate scan recommended for NETS. One hundred per cent of the Cushing's participants had an MRI scan of their pituitary gland, 2 (10%) had an additional IPSS.



Conclusion: Diagnostic imaging plays a major role in the diagnosis of CD. Current debates regarding the strength of magnetic are ongoing for microadenomas (<10mm). Few radiologists have performed IPSS although this is said to be a procedure which can confirm a source of ACTH- overproduction when MRI and/or biochemical evaluation are inconclusive.

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P078 Cushing's syndrome and disease: A diagnostic challenge

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Background: CS and CD, a baffling portmanteau of symptoms, each often ascribed to other medical conditions, but together representing diagnostically, challenging medical conditions which can occur if the body produces too much of the hormone cortisol. Often coming, 'disguised', as other stand-alone conditions such as obesity, hypertension, osteoporosis and psychological disorders Cushing's can be present, but misdiagnosed for years. This study explores the level of awareness of these medical conditions by Health Professionals; if they are knowledgeable of the CS signs and symptoms and if they practice effective communication in order to improve their patients' health outcomes.

Methods: A pilot study was conducted during 2019 on Cushing's members of the PF, UK in order to ascertain their pathways to diagnosis, treatment and their HRQoL Questionnaires were sent to twelve Cushing's members. Quantitative and qualitative analysis was performed on the data, including a scaling system which was used to measure the participants HRQoL during and post treatment.

Results: The response rate was 92%, the median age range 47 years. All participants were female and had consulted between 3 and 8 Health Professionals prior to their definitive Cushing's diagnosis. Time scale for diagnosis ranged between 2 months and 25 years and each participant had between 6 to 10 diagnostic tests prior to their diagnosis and included multimodality imaging.

Conclusion: The comorbidities and time delays in diagnosing affected their HRQoL even after, 'cure' and was compounded by the failure to diagnose due to a lack of Health Professionals awareness.

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P079 A single-centre retrospective analysis of treatments, side-effects and early recurrence in adjuvant therapy for stage-1 endometrial cancer patients

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Background: Endometrial cancer is the most common gynaecological malignancy¹. Adjuvant radiotherapy is indicated in early-stage disease for selected patients based on risk of recurrence. Vaginal brachytherapy (VBT) is seen to be as effective as pelvic external beam radiotherapy (EBRT) in reducing local recurrence in intermediate risk, with less toxicity.

Methods: Patients diagnosed with stage-1 endometrioid endometrial cancer between 2015-2019 in one teaching hospital were identified. A retrospective analysis of treatments, side-effects and early recurrence in those offer adjuvant therapy was performed using patient records and clinic letters.

Results: 62 patients with stage-1 endometrioid, clear, serous or mixed histology were offered adjuvant therapy, 9 of whom declined. Patients were grouped into VBT (n=15), EBRT (n=14), EBRT+VBT (n=12), Chemotherapy + EBRT (n=1), Chemotherapy+ EBRT+VBT (n=10) and Chemotherapy only (n=1). The average time to first adjuvant treatment was 83.5 days from diagnosis. There were 4 cases of recurrence despite adjuvant therapy (8%), including a single death (2%). 53% of all treated patients experienced some form of late toxicity but there was only a single case of severe toxicity across all treatment groups. EBRT



patients reported more bowel and urinary symptoms than VBT patients. Of those who declined treatment, one patient (11%) had a recurrence, which led to the only death in this group.

Conclusion: Local experience is consistent with existing literature in stage-1 disease. Recurrence and toxicity with adjuvant radiotherapy are infrequent in intermediate-risk patients. VBT appears to result in fewer side-effects than EBRT. These results have improved service planning and patient education.

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P080 Service evaluation of pulse dose rate (PDR) brachytherapy pathway for the treatment of endometrial cancer

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Background: Pulse Dose Rate (PDR) brachytherapy is used for patients with early stages of gynaecological cancer. This treatment is invasive and painful. It can be difficult for the patient to tolerate due to bed bound requirements¹. Although this treatment can be delivered in 12 to 21 hours, treatment times within the local department have been recorded as 28 hours. A service evaluation was undertaken to review the delivery of the service, to discover trends or bottlenecks to improve patient experience.

Method: A timestamp survey for all patients receiving PDR for endometrial and cervical cancer between February to September 2019 was undertaken. A data collection log was co-designed between key stakeholders to record the 19 activities, time taken to complete and any supplementary information relevant to the duration of the activity.

Results: The data for twenty patients was collected. The analysis identified 5 potential areas of delay; transfer of patient, plan optimization, physics checks, ward ready to start treatment and consultant contouring. On review of the qualitative notes, these could be attributed to poor communication, shortage of staffing, misplacements of documents, technical issues, patient related issues, staff awareness and availability of clinicians.

Conclusion: The evaluation highlighted the need to review several practices undertaken as standard during the PDR pathway. Making simple modifications to practice will streamline the process for these patients, reducing the PDR pathway and improving patient experience. This can be archived with library plans integration and by establishing a standard operator procedure for this pathway.

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P081 Sarcomas of the uterus

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To illustrate the imaging findings of Sarcomas of the uterus. To demonstrate examples of leiomyosarcoma, endometrial stromal sarcomas and rhabdomyosarcoma. To discuss common imaging features and important differentials. To illustrate the role of various imaging modalities in establishing diagnosis. Uterine sarcomas are a heterogenous group of rare tumours that cannot be differentiated on imaging alone. Leiomyosarcomas are the most common. Endometrial stromal tumours are rare accounting for less than 2% of all uterine tumours with rhabdomyosarcoma being even less common. Patients may present with non-specific symptoms such as abdominal pain and bloating, urinary symptoms or altered bowel habit. Ultrasonographic findings may initially be subtle and may be mistaken for fibroids or other benign pathology. We illustrate various cases of sarcomas of the uterus and discuss the imaging features encountered.

P082 Hysterosalpingography (HSG): Debunking some myths – Tips, tricks and challenges

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Hysterosalpingography, a method of imaging the female genital tract, is commonly performed to investigate sub-fertility and other reproductive disorders. A number of myths surround hysterosalpingography which extensive experience of over 15,000 cases suggest need to be debunked. Myth 1: an HSG is just a test for tubal patency. Nice Guidelines suggest that hysterosalpingography is performed to assess tubal patency in women with no known co-morbidities. In reality referral is made not only to assess patency but also to delineate the site and nature of tubal disease, as a precursor to selective salpingography, to evaluate the uterine cavity and to assess the cavity and tubes following surgical intervention such as ERPC, myomectomy, UAE and tubal surgery. Myth 2: an HSG is inevitably painful. An internet or literature search suggests that hysterosalpingography is associated with severe pain. That is not the authors' experience, we discuss how to minimise pain and discomfort during hysterosalpingography. Myth 3: performing an HSG is a simple and straightforward examination that can be delegated to inexperienced or junior staff. An HSG that is well tolerated and answers the clinical questions raised by the referral requires



meticulous procedural and radiographic technique. A detailed knowledge of relevant anatomy, physiology and pathology and an understanding of the physical and emotional complexity of subfertility is essential. The authors' will demonstrate that to provide a comprehensive HSG service requires experienced and empathetic operators, extensive clinical knowledge, a range of equipment, the technical skills to utilise it and close co-operation with referring clinicians.

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P083 Down under: Ultrasound below the cervix, pathology and anatomy explained

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Background: When assessing the uterus and ovaries during transvaginal ultrasound, common radiological blind spots include the vagina and urethra. Pathology in this region can include Bartholin, Skene and Gartner duct cysts. Varices may be identified.

Urethral pathology can include diverticulae, silicone injections and the effects of prolapse. Incidental soft tissue masses such as lipomas may also be seen. Malignant lesions include vulval carcinoma.

Purpose: It is important to be aware of pathology in this region. A careful and deliberate review of these areas by the operator may reveal a diverse range of clinically relevant pathology. An understanding of the anatomy and use of trans-perineal scanning when required can aid this.

Summary: We present a pictorial review and explain the relevant anatomy and scanning techniques.

PAEDIATRICS

P084 Variation in laryngeal mask airway positioning and its impact on a proton beam therapy plan – A case study

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Introduction: Proton beam therapy (PBT) dose distributions are particularly sensitive to density changes, which alter Bragg peak position, potentially leading to under dosing the target and overdosing of normal tissue. In our photon practice, paediatric patients treated under daily general anaesthetic (GA) require a laryngeal mask airway (LMA) for airway maintenance. We have observed variation in LMA position and resultant soft tissue and airway displacement on CBCT. This study aims to quantify this variation and explore the potential impact on a PBT plan.

Method: A case study was carried out on a patient with a target adjacent to the LMA. The airway and LMA were contoured on the planning CT scan and 4 weekly CBCTs. The volumes of the structures (cm³) were then compared and the dice coefficient calculated to quantify similarity. A PBT plan was created and recalculated with density overrides.

Results: The average dice coefficient between the contoured airway volume on the planning scan and CBCT scans were 0.54 (range: 0.5-0.59). The average dice coefficient between the contoured LMA on the planning scan and the CBCTs were 0.26 (range: 0.15-0.36). The density changes affected the planned PBT dose distribution and deposited large hot spots in the plan.

CBCT number	Planning Airway Volume (cm ³)	CBCT Airway Volume (cm ³)	Overlap Volume (cm ³)	Dice Coefficient
CBCT1	58.9	59.9	32.51	0.55
CBCT2	58.9	52.94	32.89	0.59
CBCT3	58.9	45.57	26.23	0.50
CBCT4	58.9	45.38	27.86	0.53

Conclusion: This case study demonstrates variation in LMA position during treatment can cause density changes within a patient with a target volume adjacent to the LMA. In this case, the planned dose distribution in the PBT plan was affected, which could have a potential clinical impact.

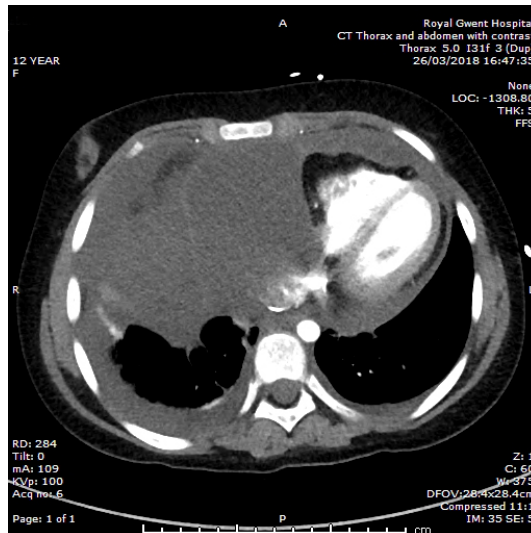


P085 Mediastinal teratoma presenting with abdominal pain: An unusual presentation

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Introduction: Mediastinal teratomas are a rare finding in children, comprising of 1-5% of all tumours found in the mediastinum. Teratomas are of embryonic origin composed of tissue or organs derived from the three germinal layers, most frequently occurring in the gonads followed by the mediastinum. Teratomas vary in presentation, often grow slowly and can present when the tumour has grown to a large size; therefore there are a wide variety of considerations which determine its management. We present a case of successful management of a large intrathoracic teratoma in a child.



Case report: A 12-year-old female presented acutely with symptoms of abdominal pain, vomiting and chest tightness. She was pale, tachycardic and pyrexial. Her inflammatory markers and troponin were high, chest x-ray revealed right sided consolidation. Her tachycardia persisted, CT was performed which revealed compression of the right heart by a mass with pericardial effusion. She was managed by the

paediatric cardiology and cardiothoracic teams, following which she had a successful excision. The tumour was encapsulated and extending into the pericardium. She made an uneventful recovery and has no signs of recurrence.

Discussion: Mediastinal germ cell tumours represent 24% of anterior mediastinal tumours which are mostly benign. Teratomas can remain undetected because of expansion at the cost of compliant thoracic tissues with abundant functional reserve. Compression symptoms are a common presentation. There have been some reports of tumour rupture leading to life threatening complications. The treatment of choice is complete surgical excision with long term follow up.

P086 A retrospective analysis and application of the paediatric reflux grading system in reporting of micturating cystograms by advanced practitioner radiographers

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Background: Vesicoureteral reflux (VUR) can be graded according to the international reflux grading system^[1]. VUR can lead to renal scarring^[2] therefore diagnosis management and treatment is critical^[3]. Advanced practitioner (AP) radiographers at the trust have been reporting on paediatric micturating cystograms (MCUG) since 2013. From a previous audit (2018) assessing accuracy and quality of MCUG reports AP's achieved 100% in specificity, sensitivity and accuracy. However, no comment is made on the international grading of the VUR present.

Purpose: To review the VUR international grading system. To conduct a retrospective audit to collect data for all positive MCUG's for reflux. To review imaging and grade the VUR reflux accordingly.

Summary: The poster shows details of a local audit undertaken. The content will include the background of VUR and AP reporting at the trust. Describes the methodology, results and discussion for undertaking the audit. Radiological imaging pictorial review of the international grading system. The findings resulted in a change to local procedure for reporting of MCUG's with a VUR grade placed in the summary of the report.

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P087 Top 10 CT head review areas in the fitting infant

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Background: CT imaging is often the first line investigation when a fitting infant is admitted as an emergency to hospital. In the District General Hospital these studies are requested infrequently but accurate reporting is essential as positive findings will usually direct immediate patient management. The infant (less than 2 years) brain is difficult to assess due to lack of myelination, normal age variants and the often subtle appearances of pathology. Clinical history may be misleading and add to the challenges surrounding image interpretation.

Purpose A pictorial review highlighting the important areas for review in the infant brain to assist the infrequent reporter. The pathologies which may clinically present with fitting will be discussed and radiological findings reviewed. Common areas where pathology can be missed will be demonstrated and expected normal differences in the young child's brain discussed.

Summary: CT imaging of the fitting infant is an important tool to help identify the cause of seizures and to plan patient management. It is essential for the reporter to be aware of the pathologies which may present with fitting and to recognise the radiological features of these. We hope to improve confidence for reporters and the accuracy of reports to ensure optimal patient management.

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P088 Microphthalmia: Born with the imaging findings of an ocular anomaly associated with blindness

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Background: Microphthalmia (MO) refers to presence of small eye(s) within the orbit(s). With an estimated birth prevalence of 0.01%, MO accounts for severe visual impairment in up to 11% of blind children.

Purpose: We present the imaging findings of MO, in a newborn. A premature (postnatal 35wks) neonate had narrow palpebral fissure and bilateral deeply set appearance of the eyeballs. The baby could not open his eyes and the eyeballs were not palpable on physical examination. Because ophthalmologic evaluation was practically not feasible imaging studies were pursued. CT of the skull/brain revealed no osseous deformity in the skull and the orbits, or brain abnormality. The eyeballs occurred small-sized and of normal density. MRI revealed bilateral distinctly small eyeballs, measuring 5.2mm on the left and 5.4mm on the right side (normal, 9-10.5mm). Vitreous cavity appeared normal. The optic nerve and chiasm, and the oculomotor muscles appeared unremarkable. Brain morphology was normal, with no associated pituitary defects or extraocular findings involving the craniofacial region (i.e., anomalies of the face, neck and ear). Visual potential of the neonate was not appreciated, and the newborn was scheduled for follow-up ocular examination. Parents were informed about possible removal of the globes, with insertion of a conformer to expand the orbits within the first year of age.

Summary: MO is an ocular malformation that needs to be diagnosed and treated early in infants. Imaging studies may provide valuable anatomic and morphologic information that would not be apparent on the ophthalmology examination alone.

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P089 Behaviours of student radiographers towards infection control on the neonatal intensive care unit

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Sheffield Hallam University

Currently, there is limited literature evidencing the knowledge and behaviours of student radiographers towards infection control on the neonatal intensive care unit (NICU). Radiography students spend a lot of time on NICU during placement over their 3 years at university. However, this research found that there is a significant difference in compliance rates of students, particularly between 2nd year and 3rd year students. This poster will present the findings of the primary study. A primary research study was conducted where a NICU based scenario was set up. 50 students were then directly observed as they worked through the scenario, designed to check compliance. Once they completed the practical element, they were given a questionnaire to complete, designed to understand knowledge. This method allowed the researcher to find out what the students did in practice compared to what they knew in theory. Comparing practical performance to theoretical knowledge identified the knowledge gaps. The results showed that compliance varied widely. The overall mean mark on the practical element was 51%. On the theoretical aspect the mean mark was 79.5%. The findings are consistent with literature which supports that compliance was inconsistent. Confirmation that compliance of student radiographers was low and knowledge of correct infection control on the NICU was inadequate. Considerable disparities between year groups, theory and practice. Knowledge gaps between second year and third year students was expected, however, the evidence of such significant knowledge gaps was unanticipated. Clear need for more robust and consistent infection control mandatory training with neonates.



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P090 'Playing a part in the performance' of a child's X-ray procedure

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There is increasing evidence of children's engagement in health services. Less is known about children's experiences of X-ray procedures or the ways they communicate during the procedure. Data were generated through non-participant observations of children undergoing X-ray procedures. Children and their parents were invited after the procedure to take part in a semi-structured interview. Children, parents and radiographers played specific parts during the X-ray procedures and this influenced communication. Three different categories of communication were developed but are not presented as a hierarchy of the communication children preferred. The first category was communication where a child was involved; children's voices were sought with the expectation that they could influence what happened during the procedure. The second category was communication where a child was interrupted; children's voices were replaced because of the bigger roles adults played. The third category was communication where a child was ignored; children's voices were overlooked, silenced or not sought by adults. Children in these procedures had a small role and little power to influence what happened during their procedure. The findings have been discussed using dramaturgical metaphors of roles, scripts and front and backstage performances that unified the three developed categories and lead to the theorisation of a core category of 'Playing a Part in the Performance'. Children are able and value being engaged in meaningful communication during their X-ray. Different roles and interactions can close down or open up children's opportunity and ability to play an active role in their procedure.

ARTIFICIAL INTELLIGENCE / IMAGING TECHNOLOGIES

P091 A review of the current and future use of artificial intelligence (AI) in diagnostic radiology

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Background: AI is on the forefront of health innovation, especially in radiology. The development of deep learning models such as convolutional networks has enabled programmers to design systems that are able to complete many radiological based tasks e.g. image analysis and segmentation.

Purpose: The aim of this poster is to; introduce AI and the underpinning principles and ideas, review the current AI developments taking place within chest and breast imaging, and understand the potential benefits, risks and limitations associated with the implementation of AI into clinical radiology.

Summary: We present a literature review of the different uses of AI within chest and breast imaging. Furthermore, we define the key terms of associated with AI; machine learning, deep learning and convolutional neural networks. We also illustrate the current issues surrounding AI and its application. Within chest imaging, AI programmes have been designed that detect diseases such as tuberculosis and pneumonia. In breast imaging, deep learning programmes have been developed that can aid in breast cancer screening and diagnosis. The main imitation surrounding AI research and development is the lack of number and quality of training datasets. It is important for radiologists to adapt and benefit from using AI; this is achieved through understanding and appreciating the theory and its application. Additionally, a standardised set of guidelines needs to be developed to validate and assess the effectiveness and safety of AI. The next step for advancement is the integration of AI systems into the clinical workflow.

P092 Evaluating the stability of PET radiomic features to expectation-maximization reconstruction iterations

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¹School of Engineering, Cardiff University; ²Wales Research & Diagnostic PET Imaging Centre

Background: Positron emission tomography (PET) imaging plays a fundamental role in the assessment of cancer^[1]. The maximum likelihood expectation maximization (MLEM) algorithm is a common iterative image reconstruction approach used in clinical routine. Increasing the number of iterations can increase image sharpness. However, a trade-off exists between image sharpness and image noise^[2]. Therefore, radiomic analysis may be affected as consequence of increasing the number of iterations^[3].

Purpose: To evaluate the impact of the number of iterations upon stability of PET radiomic features.

Methods: A Mediso Nanoscan PET/CT was used to scan 8 mice, with 4T1 tumours, injected with 10.0 ± 2.0 MBq. Scans were reconstructed with five different numbers of iteration (1, 3, 6, 8, 10) and SPAARC (In-house developed tool built on Matlab^[4]) was utilised to extract 138 radiomic features (bins=32)^[5]. Coefficient of variation (COV) was calculated for each feature for each number of EM reconstruction iterations. Features were classified based on their COV values into four groups^[6].



Results: Of the 138 radiomic features, 63 showed large variation (COV > 20%), 29 showed intermediate variation (10%-20%), 15 showed small variation (5%-10%) and 31 were found to be stable (COV < 5%). **Conclusions:** The number of iterations has the greatest impact on NGTDM features. This highlights the need for radiomics studies to utilise protocols with defined methods of reconstruction to ensure consistency. A model that makes use of features sensitive to EM reconstruction iterations may struggle to generalise.

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P093 Artificial intelligence in radiology – How medical students perceive it?

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¹University of Birmingham Medical School; ²Kettering General Hospital; ³Royal Orthopaedic Hospital

There has been lot of hype and excitement of artificial intelligence (AI) in medical imaging. Potentially, AI will be an integral component of radiology in future. We performed a survey of medical students to ascertain the effect of AI perceived by them. A survey was created on survey monkey, sent to over 100 medical students in the UK and India and the results were analysed. The questions included role of AI in reporting X-rays, CT, MRI, and its effect on choosing specialty in future. Amongst medical students completed the survey, majority, 65 (65.66%) agreed that AI is going to play a crucial role in radiology and 29 (29.29%) were unsure about the impact of AI; whereas only 5 (5.05%) believed that AI will not impact radiology services in future. About a quarter of respondents were of the opinion that AI will report x-rays, CT and MRI. Around 50% of respondents were equivocal with a view that AI might report studies. About half (46%) of the medical students felt that AI is crucial factor in deciding specialty, with 45% of the opinion that there will be less doctors in future. Based on the results, we feel that AI, inevitably, is going to be integral part of future hospitals and radiology services and should be embraced. Medical students should be primed of this, possibly by including into the curriculum.

P094 Using AI to reduce dose in CT thorax, abdomen & pelvis scans

Christopher McLeavy; Rachel Gravell; Mohamed Chunara; Richard Hawkins

Leighton Hospital

Background: We know AI can streamline workflow and detect subtle lesions but did you know it can also reduce the dose of CT scans? Canon have developed a deep-learning algorithm called Advanced intelligent Clear-IQ Engine (AiCE) which they claim can provide 31% dose reductions in body imaging whilst still maintaining spatial resolution, "natural" appearing images and low contrast resolution. Unlike model-based iterative reconstruction, which took too long for use in everyday practice, AiCE uses supercomputers to ensure images are produced in a timely manner. Having recently purchased a Canon Aquilion One Genesis with AiCE we have been impressed with the image quality and put the dose reduction claims to the test on CT Thorax, Abdomen & Pelvis scans against our other scanners and the national Diagnostic Reference Limit (DRL) of 1000 mGy cm.

Method: The first 100 CT Thorax, Abdomen & Pelvis scans acquired using AiCE in September 2019 were selected. The Dose Length Product (DLP) for that scan was measured and the patient's most recent prior scan acquired on a different scanner.

Results: The mean DLP for scans performed using AiCE was 316.4 mGy cm (range 93.6 -- 998.7; n=100) whereas on all others the mean DLP was 719.2 mGy cm (range 117.6 -- 3006.5; n=58). The mean dose reduction was 51.3% (range 12.2 -- 82.0%) meaning scans were on average 68% less than the national DRL.

Conclusion: AiCE reconstruction can provide dose reductions of up to 82% and are on average 68% less than the national DRL.

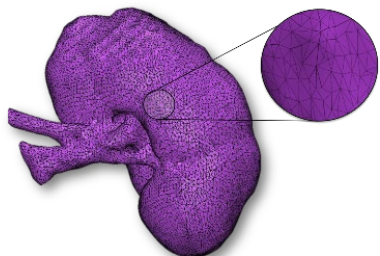


P095 3D Printing: A guide for trainees in the field of radiology – Everything you wanted to know, but were too afraid to ask!

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¹Guy's and St Thomas' NHS Foundation Trust; ²King's College London

3D printing is an exciting technology that has multiple, rapidly-evolving applications in medicine. As many of these applications rely on imaging data from CT and MR scanning, professionals working in the field of radiology are uniquely placed to assist with and lead 3D printing projects. However, the process and terminology is often not well understood. This educational poster seeks to illustrate the rationale and basic processes behind 3D printing in medicine. In particular, it summarises the principle current applications of medical 3D printing pertaining to radiology and follows the steps required to create a 3D model from medical imaging data (typically encoded in Digital Imaging and Communications in Medicine (DICOM) format). The poster also describes different segmentation and printing techniques, facilitating an understanding of relevant terminology. Ultimately, we hope that the resource will prove useful to professionals and trainees working in all radiological disciplines and encourage engagement in collaborative projects.



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P096 Quantification assessment of bone healing: A feasibility study into the use of CT to assess the progression of fracture healing

Patrice Burke

Nottingham University Hospitals NHS Trust

Background: Fractures are serious injuries, causing morbidity and mortality if not managed appropriately. There is no consensus about the optimum method for assessing fracture union, nor are there clear gold standards for parameters that confirm early fracture healing radiographically. The use of CT scans is recommended for assessment of fracture healing in trials, as they reveal healing markers much earlier than plain X-rays. To our knowledge, CT scanning has not been used for quantitative assessment of normal fracture healing progression, which is the aim of this work.

Method: Ten patients who had suffered a Weber Type B (ankle) fracture underwent ankle CT scan every two weeks for 13 weeks. Each patient's 7 scans were co-registered, and five ROIs along the fracture line were identified. In each region, trabecular bone, cortical bone and callus were segmented, and the variations of the contents over time were compared quantitatively, based on CT number. The 70 images were also presented blind in random order to two trained, experienced raters who scored them against agreed criteria.

Results: Quantitative assessment of the changes in CT number of the trabecular bone and callus regions showed evidence of healing; this was in good agreement with the scores of the raters (Cronbach's alpha scores of 0.804 and 0.874 for overall scores). (Further results to follow.)

Conclusion: This feasibility study shows the potential to use CT images to quantify the process of fracture healing. This could be used in the future to inform clinical management, but further research is warranted.

P097 Voice recognition errors: Categorisation, frequency, and how to avoid them

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The Royal Liverpool University Hospital

Background: Voice recognition technology has been used in radiology reporting as early as the 1980s. Initially, voice recognition aimed to reduce turnaround times and increase the efficiency of radiology reporting. However, it has been shown that reports formulated with voice recognition can have significantly higher levels of inaccuracy when compared to the more traditional method of dictation^[1,2]. In an era where voice recognition is becoming part of everyday practice, the potential impact an error may have on the interpretation of a report can have significant consequences on patient management. Currently, there is a paucity of literature on the types of errors made, the circumstances in which they occur and a structured approach on how to avoid them.

Purpose: To classify the types of errors commonly made by radiologists, the circumstances in which they may potentially occur, and to develop a systematic approach that every radiologist can use to avoid making them.

Summary: This educational poster is based on 200 consecutive CT radiology reports divided equally between reports made during the day and during out of hours reporting. The data collected included the body part scanned, total number of errors per report, grade of reporting radiologist, and the length of the report. The data was then used to divide the errors into minor,



moderate, and major categories. Based on the classification and data obtained, a systematic approach was designed to aid radiologists in reducing the chance of making an error when using voice recognition software.

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P098 Stroke detection by scanning with low intensity radio frequencies

David Heatley; Mohamed Abdel-Maguid

University of Suffolk

Strokes are the 4th highest cause of death and the highest cause of long-term invalidity in the UK. ~110,000 people experience a stroke each year and ~1.2M people are already living with the consequences. The treatment and rehabilitation for these patients, together with social care entitlements and the decline in workplace productivity, costs the NHS and UK economy around £26bn annually¹. The authors report on their development of an innovative new medical scanner that will help to dramatically reduce these costs. The latest test results are presented. The new scanner uses low intensity radio frequencies to determine whether a stroke has occurred. It is intrinsically safe for the patient and operator(s) and avoids the costly shielding and specialist infrastructure required by CT/MRI. This, combined with the inherently low cost of its component parts and the prospect of a compact, lightweight and portable construction, enables it to be carried in ambulances and first response vehicles and used on-scene, e.g. the patient's home or workplace. This avoids the delays in transporting the patient to a hospital to be scanned using CT/MRI before a diagnosis can be made and treatment commenced. The new scanner will greatly increase the percentage of stroke patients who are assessed, diagnosed and receive initial treatment within the 'golden hour': the first hour after their stroke. This will improve the outlook for these patients and reduce the number who require costly rehabilitation and long term care, which will help to reduce the enormous cost of stroke to the nation.

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DOSE OPTIMISATION AND MEASUREMENT

P099 Optimisation and implementation of size-specific pelvic CBCT

Megan Couper; Kirsty Farnan; Kirsty Muir

NHS Tayside

Background: During the introduction of pelvic cone-beam CTs (CBCT's) for on-treatment verification imaging, the default manufacturer protocols were used on both Varian Clinac and TrueBeam linear accelerators. As experience with the imaging system increases, size-specific CBCT's are required to ensure imaging doses are optimised and justified in accordance with IR(ME)R 2017.

Method: A retrospective planning CT audit was performed to identify patient size categories. Imaging doses were quantified using 'PCXMC2.0Rotation' simulations with dose-area product (DAP) as the dose input. Quantitative image quality analysis was performed using size-specific Catphan annuli. A working party was created to qualitatively evaluate the clinical image quality of the size-specific protocols.

Results: Audit identified three patient size categories: small, medium and large. The default Varian protocol was assigned to the large category. To ensure equivalent imaging dose for all patients, small and medium size-specific protocols were developed with reduced mA. Quantitative analysis confirmed the image quality of the size-specific protocols were comparable to that of the Varian default protocol for the relevant size category. Twenty small and medium sized patients had their first CBCT using the Varian default protocol and subsequent CBCT's using the appropriate size-specific protocol. Qualitative analysis between the default and size-specific images identified no clinically relevant change in image quality, for treatment set-up purposes, due to the change in protocol.

Conclusion: Based on this work, size-specific pelvic CBCT protocols were clinically implemented, with the resulting imaging dose for medium and small sized patients reduced by up to 30%.

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P100 A comprehensive analysis of radiation dose to eye lens during external beam radiotherapy of head and neck cancer patients

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Background: The present study aims to evaluate and compare eye lens radiation doses in head and neck cancer patients treated with EBRT among various RT treatment delivery techniques.



Method: The present study recruited a total of sixty patients with head and neck cancer. The patients treated with conventional 2DRT, 3DCRT and Rapid ArcTM in separate treatment arms. All the patients were planned and treated with conventional fractionation regimes. The eye lens doses were assessed by placing the OSL dosimeter as close as possible to the eye.

Results: The average eye lens dose during 2DRT, 3DCRT and Rapid ArcTM treatment was measured 9.05 cGy, 3.84 cGy, 1.26 cGy per fraction, for a mean dose delivery of 200 cGy/#, i.e. 4.50%, 1.92% and 0.63% of the tumor dose respectively. EBRT of Nasopharynx and maxilla carcinomas treatment found to contribute significant dose to eye lens. The highest radiation dose to eye lens was observed in Telecobalt conventional 2DRT treatment. The possible cause of increased radiation dose is due to large collimator opening of field without conformity of radiation beam using MLC. Rapid ArcTM treatment were found to contribute lowest eye lens radiation dose as compared to Siemens 3DCRT treatment. The probable reason is use of tertiary MLC by Varian which provided slightly more radiation protection to eye lens during treatment as compared to Siemens secondary MLC in machines.

Conclusion: Treatment planning of patient, immobilization devices, beam shaping devices, treatment delivery modalities plays a vital role in reduction and magnitude of eye lens dose.

P101 Optimisation of on-board imaging protocols for patient positioning verification using Elekta's XVI (R5.0) cone-beam computed tomography system

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University Hospital Southampton NHS Foundation Trust

An optimisation review was carried out on three imaging protocols used for patient positioning verification (Elekta XVI (R5.0) system) with a focus on reducing dose with no reduction in image quality. The protocols chosen included the one with the single highest dose and the two most commonly used (Pancreas and two Pelvis protocols respectively). Using a phantom based approach (Catphan®503_The Phantom Laboratory, Salem, NY) image quality (IQ) was scored following variation of multiple exposure parameters including kV, mA, ms and rotation speed. Image analysis software IQWorks was used to calculate low contrast visibility, percentage uniformity, signal to noise ratio (SNR), modulation transfer function (MTF) and point spread function (PSF) of all image volumes acquired. Spatial resolution was scored visually. IQ was found to improve, for almost all IQ measures, with increasing current-time product. Improvement in both percentage uniformity and SNR from an increase in the rotation speed was also observed. Reduction of tube potential did not identify an optimisation strategy due to a calibration issue with 110kV and no clear IQ improvement at 100kV. Spatial resolution was found to be comparable for all combinations of exposure parameters tested, whilst analysis of MTF and PSF did not yield useful results. There is an opportunity to optimise two of the three clinical protocols, through an increase in the acquisition rotation speed coupled with an increase in mA to deliver an equivalent or slightly lower total mAs, with potential dose savings of up to 25% whilst maintaining, or even improving the IQ.

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P102 Optimisation of CT mandible protocol

Suzannah Patel; Cherith Desmeules; Andy Shah; Subhadip Ghosh-Ray

Paul Strickland Scanner Centre

Background: CT scans of the mandible provide high resolution images to assess the position of impacted molars, prior to surgical extraction. Measurements determine the position of teeth in relation to adjacent structures.

Purpose: The aim of this study was to reduce the radiation dose in patients referred for CT of the mandible by decreasing the reference mAs and reducing the scan range. A retrospective audit was carried out to record the radiation doses (CT dose index, CTDi and Dose length product, DLP) of patients referred for CT scan of the mandible using the default reference 88mAs. Images were evaluated by a Consultant Radiologist and the image noise and quality graded. The reference mAs was gradually reduced to 72mAs, 68mAs and 58mAs respectively. After each change in mAs the doses were collected, and an image audit undertaken. Following discussion with referring maxillo-facial surgeons, it was agreed the scan range could be reduced when assessing the proximity of the inferior dental canal to surrounding teeth. Subsequent scans of the mandible with the limited range were undertaken, doses recorded, and an image audit completed.

Summary: After decreasing the reference mAs: The reference mAs was able to be reduced from 88mAs to 68mAs. The CTDi vol was reduced from 11.35 mGy to 8.8mGy. DLP reduced from 164mGycm² to 114mGycm². The image audit showed diagnostic quality was maintained. After decreasing the scan range: The CTDi vol increased slightly to 9.97mGy. The DLP reduced to 90.4mGycm². The image audit showed good diagnostic quality.



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P103 Optimisation of technique for plain radiography of the chest when exceeding the diagnostic reference level

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Background: The National DRL (Diagnostic Reference Levels) values should be considered by employers when setting their local DRLs as required by the Ionising Radiation (Medical Exposure) Regulations 2018 (Northern Ireland). As Digital Radiography (DR) does not give a visual indicator whether an image is underexposed or over exposed, it is important that dose to the patient is continually monitored. This study explores reasons for exceeding DRLs and discusses corrective measures taken.

Purpose: The learning outcomes will be applicable to staff using Computed Radiography and DR. Evaluate the results of an audit of radiation dose levels. Describe how to investigate examinations exceeding the DRL. Recommend corrective measures to reduce doses below the DRL.

Summary: The poster will include the results of an audit of 13 x-ray rooms in one hospital Trust. Data will discuss the range of patient weight, exposure factors given, dose received and detector dose indicator (DDI) relevant to each manufacturer for patients between 50kg to 90kg. Initial results demonstrated that two of the DR systems were consistently above the DRL. Interrogation of the images showed sub optimal radiographic practice and suggested little evidence of collimation of the radiation field. Training sessions were held for staff and sample images were used to discuss corresponding image quality, collimation and dose levels. A repeat radiation dose investigation was undertaken after a period of 4 weeks. Results showed that all radiation doses were below the NDRL, resulting in the establishment of a new local DRL.

P104 Optimising default radiographic exposure factors using deviation index

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University Hospital Coventry and Warwickshire

Background: Radiographers have a duty to ensure that radiation doses to patients are as low as reasonably achievable. With digital technologies employing post processing algorithms there are limited visual cues allowing radiographers to evaluate the appropriateness of exposures. Exposures used clinically have also been observed to increase gradually over time, a phenomenon known as 'dose creep'. In direct digital radiography the Deviation Index (DI) value provides the radiographer with feedback on the appropriateness of the exposure. This study reports on the utilisation of DI to optimise default radiographic exposure factors as part of a departmental quality assurance programme.

Method: In November 2017 exposure logs were extracted from six x-ray systems, collated and analysed. Five examinations were identified which frequently produced DI values outside the optimal range, classified as 'high' or 'very high'. Incremental improvements were made to the default exposure settings via a cyclical process of modification and re-evaluation, prior to a repeat of the full data collection exercise in April 2019.

Results: At baseline 10,658 of 29,637 (36.0%) of exposures had DI values outside the optimum range; for some individual examinations the proportion was as high as 547 of 725 (74.5%). Following multiple optimisation cycles, the overall proportion of examinations outside the optimal range had fallen to 7611 of 26,759 (28.4%). Default mAs values for the optimised examinations were reduced by between 22% and 50%.

Conclusion: Significant reductions in patient doses can be achieved through a departmental programme of DI value monitoring and targeted optimisation of default exposure settings.

P105 Radiation dose considerations in hybrid imaging

Amy Bishop

Hywel Dda University Health Board

Background: Hybrid imaging has increased the sensitivity of nuclear medicine procedures, due to image fusion for anatomical localisation and attenuation correction. The radiation dose from nuclear medicine procedures has increased by a factor of 8 from 1984-2006, this is partly due to a tripling in the amount of procedures, the founding of higher dose procedures and the implementation of hybrid imaging. Both gamma and x-rays contain ionising radiation which can cause stochastic and deterministic effects. To ensure nuclear medicine practitioners abide by current legislation it is vital patient doses are kept as low as a reasonably achievable.

Purpose: The main aims of this poster are to assess the appropriateness of ARSAC limits and recognise the implementation and importance of local/national diagnostic reference levels for SPECT/CT examinations. Highlight the benefits of delegated authorisation guidelines for SPECT/CT examinations, identify the importance of staff training and discuss advantages and pitfalls of retrospective fusion.

Summary: To abide by IR(ME)R 2017 practitioner's need to ensure that doses are kept to a minimum. Including considerations regarding ARSAC limits and the establishment of local DRL's and ensuring patients receive "the right test with the right dose



should be given to the right patient at the right time". If patients have had an appropriate anatomical examination effort should be made to establish if these are appropriate and fusible prior to authorisation of an additional CT scan. Staff training in the field of CT could aid with authorisation and image processing.

RADIATION PROTECTION AND QUALITY ASSURANCE

P106 New threshold detection references for DR systems

Mahyar Azimi

Radiological Protection Centre

Aim: The aim of this research is to present new TCDD curves for Konica, Fuji, Samsung, Philips, and Trixell DR systems. The TCDD data can also be used to provide an image quality factor (IQF) using the threshold detection index from the reference curves.

Detail diameter (mm)	Samsung	GE	Konica	Philips	Fuji	Trixell
11.1	32.2	32.2	29.2	23.4	29.5	27.5
8	41.5	39.5	31.8	32.5	36.4	29.1
5.6	54.9	48.9	39.9	37.9	49.4	39.7
4	48.7	49.1	43.1	41.9	53.3	43.8
2.8	61.6	63.8	49.6	52.6	68.2	57.7
2	77.4	74.4	53.3	58.3	84.0	63.5
1.4	50.6	48.2	46.3	53.1	57.0	51.1
1	59.4	52.6	46.9	61.5	69.3	61.9
0.7	64.4	53.2	51.6	67.1	69.2	65.0
0.5	27.9	29.3	26.4	34.7	32.0	32.1
0.35	29.1	33.4	25.9	30.0	31.1	27.2
0.25	28.0	33.5	21.6	30.2	33.1	21.1
Reference detector dose (μGy)	3.8	3.3	4.1	4.2	4.2	4.1
No. of detectors	10	6	17	8	17	12

Method: Dose to the detector was measured using a calibrated RTI Piranha dose meter. The grid was removed and the TO20 or TCD9 test object was placed on the detector and the detector was exposed to a known dose of $\sim 4 \mu\text{Gy}$ at 75 kV with 1.5 mm Copper filtration positioned as close to the X-ray tube as possible. The test objects were scored on a radiology reporting workstation according to the original test object manual, using a fixed viewing distance and with low ambient light conditions. The results were used to calculate reference data for each system.

Results: Table below shows the TCDD data for different DR systems. The data can be used to plot the best fit curves.

Conclusion: In DR systems, as expected, the same detector dose resulted in an improvement in TCDD performance comparing to CR systems. Although

caution should always be taken when comparing TCDD data due to potential set up differences, scoring criteria and experience of the scorers, these data will prove useful for accepting new equipment, to give an indication of the expected image quality for new DR system.

P107 Utilising integrated dose monitoring software in radiology and its advantages for business management

Nicholas Wong

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Background: The optimisation and regular monitoring of patient radiation doses is a requirement for radiology departments within the UK as stated by IR(ME)R 2017. This may prove challenging, especially within large Trusts, as significant amounts of data are needed to be sorted and evaluated for many different protocols. Dose Monitoring Software can be used to automatically collect relevant data from devices within departments. However it is up to the department to utilise this data in a meaningful way.

Purpose: This poster will outline the processes and tools which has enabled the efficient and regular monitoring of dose data within Nottingham University Hospitals (NUH) NHS Trust. Steps such as gathering raw data, standardisation, benchmarking, creation of dashboards and progress trackers are explored, as well as the business impacts these tools can make available to radiology departments. The role of multidisciplinary working between radiographers, clinical scientists and medical physicists is also highlighted.

Summary: Dose monitoring software provide a great amount of information to radiology departments. However if this information is not harnessed properly, the benefits of this information is lost. This poster highlights the processes which led to an efficient way of evaluating and monitoring doses within NUH, ultimately changing practice within the department in order to adhere to the optimisation regulations of IR(ME)R 2017.

P108 Audit of eye lens irradiation during CT Head scanning

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Sandwell and West Birmingham Hospitals NHS Trust

Background: The lens of the eye is highly sensitive to irradiation. Exposure to too much radiation will result in the formation of cataracts. Consequently in the Ionising Radiation Regulations 17, dose limit for exposure to the lens of the eye has reduced from 150mSv to 20mSv per year. To help achieve this, the Royal Collage of Radiologist state that the lens of the eye should be excluded from the scan field 100% of the time.

Method: Retrospective study looking at a sample of 100 routine CT Head scans performed within the trust found that only 3% of scans avoided the lens of the eye. The study was then repeated 6 weeks later after a poster and email campaign to increase radiographer awareness of issue and techniques to avoid lens irradiation. An emphasis on patient positioning ('chin



down')/gantry tilt (where available) to scan from supraorbitomeatal baseline 50 (suitable) consecutive patients were gathered from each site. The data collection was performed in real time by the radiographers to help maintain a focus on the issues.

Results: 68% of the scans avoided both lenses. Scanners with offered a gantry tilt performed better.

Conclusion: Campaign to raise awareness and importance of continued Lens avoidance in CT scanning was a success. Potential bias introduced into the study with radiographers collecting data. A further retrospective image review in 6 months' time is required to ensure good practice is maintained.

P109 Errors in radiology requests sent by A & E doctors (wrong site, side or procedure requested) – A retrospective survey

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Background: Junior doctors are prone to make wrong radiological requests due to off hours and long busy varying shift work patterns which lead to poor concentration, chronic fatigue and bad communication between health carers. Wrong radiology requests can put patients at risk of getting unnecessary radiological studies resulting in exposure to radiations. Clinicians are required to provide accurate information when requesting radiological investigations, as required legally by UK government legislation.

Methods: We queried the database for radiology events from Aug 1, 2019, through Nov 30, 2019. On various occasions¹ radiographers found wrong radiology requests sent by A&E team. 227 events were identified.

Results: Out of 227 incident, 86 (37.9%) were reported in August, 39 (17%) in September, 50 (22%) in October and 52 (23%) in November. 149 (65%) requests comprised of wrong X ray side, 4 (1.8%) were found to have wrong X ray site and 74 (32.6%) to have wrong procedure being requested.

Conclusion: To our best knowledge, no individual did get the wrong radiations and it was caught by the radiographer and the wrong requests were cancelled. To ensure patient's safety, the referrer (clinician) has a responsibility to provide accurate and necessary information to the radiological practitioner. A two-person verification of patient identifiers is recommended. Educating juniors is important, so they have the knowledge of implications of a radiological investigation, medical errors and the adverse affects of unnecessary radiation exposure.

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P110 Out with the old, in with the new? Are radiographers still applying radiopaque markers – A clinical audit

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Aim: The aim of this project was to audit the application of anatomical side markers in an accident and emergency department in a local NHS Trust. The 'good practice' audit standard was 100% compliance.

Background: Anatomical side markers (ASM's) are annotations used to mark the "Left" and "Right" side of a medical image (Barry et al, 2016). Since the rise in digital imaging, there has been a substantial decrease in pre-exposure markers (Attard et al, 2017), as well as an increase in incorrect or missing ASM's placed on images (Platt & Strudwick, 2009).

Method: 720 examinations were retrospectively audited from a 6-month time frame. 2 focus groups were conducted with band 5 & 7 radiographers. Content and thematic analysis were performed on transcripts to identify key themes.

Results: A chi square test demonstrated statistical significance between the type of marker applied and the time the image was acquired ($p=0.02$). 647 examinations displayed a digital marker (90%), leaving 73 with a radiopaque marker (10%). No images were identified without a marker. 3 key themes from the thematic analysis were: training and the environment, factors affecting ASM application and reasons why radiographers use ASM's.

Conclusion: Digital markers are being used more than radiopaque markers and good practice is not being followed. Radiographers believe that availability and cost are the main barriers to applying a radiopaque marker.

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P111 Radiology non-medical referral education development: A Scottish health board perspective

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The 2020 Vision envisages NHS Scotland achieving an integrated health and social care service, a focus on prevention, anticipation and supported self-management. Hospital treatment outside in a community setting using day case treatment approaches as the norm. Care provided to the highest standards of quality and safety whatever the setting. Returning people into their home or community environment as soon as appropriate, with minimal risk of re-admission. This will require large numbers of non-medical staff to refer for radiological examinations to meet demand. Through a NHS Education for Scotland (NES) Fellowship working with the Diagnostics Directorate Health Physics Team the below objectives were addressed. 1. Establish the current referral pathway range amongst non-medical referrers; 2. Identify imaging requesting needs of staff referring for ionising radiation based imaging; 3. Establish factors for a common educational package for image referral preparation; 4. Propose a foundation course of study with the health physics team. Other national initiatives and trialling of new working approaches necessitate standardised imaging referral education. Role transformation is bringing new professions forward as non-medical imaging referrers; this project provides a method of standardised ionising radiation-based image requesting education. Referral pathways are varied for service delivery. Significant variation in educational preparation exists between differing non-medical staff. Surveys, IR(ME)R17 and IRR17 document analysis and evaluation of current educational delivery has defined common educational content. A course has been proposed. Advanced Practice areas have been defined and a baseline education system developed.

P112 Practical training of Speech-Language Therapists undertaking videofluoroscopic swallowing studies: The role of the radiographer

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Background: A video-fluoroscopic swallowing study (VFSS) is a fluoroscopic examination conducted to assess dysphagia and involves the specialisation of radiographers and speech language therapists (SLTs). The radiographer is responsible for all technical aspects of the study and should consider radiation safety of all staff. As the SLT is directly involved in the study, they should have some knowledge of radiation safety. However, previous studies have shown that SLT knowledge is limited. The main study aims were to assess radiation protection practices utilised by SLTs and whether radiographers have a role in providing practical training.

Methods: An online questionnaire was distributed to SLTs from six different countries (Australia, Canada, Ireland, New Zealand, UK and USA). Responses were analysed quantitatively and supported through written responses.

Results: Other SLTs (64%) have the largest contribution in influencing SLTs radiation protection practices, the radiographer (57%) closely followed. Written comments revealed the significance of the radiographer in providing training as "radiographers are excellent at ensuring we [use] right equipment, stand in the right places and use exposure monitoring". The thyroid shield (93%) and full lead gowns (72%) were commonly used, with 61% of SLTs reported that they always wore a radiation badge. These were mainly worn outside (64%) of shielding near the thyroid (73%), although there were significant differences between countries.

Conclusion: This research identified inconsistencies in radiation protection practices amongst SLTs in different countries and has highlighted the important role that radiographers have in providing practical advice to ensure that SLTs are consistently practicing safely.

WORKFORCE DEVELOPMENT

P113 Research and clinical trial radiographers (RaCTR) network: Establishment of a specialist interest group (SIG)

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Introduction: The Society and College of Radiographers' (SCoR) overarching vision for research is to improve patient care and outcomes by continuing to develop, grow and implement a high-quality evidence-base that addresses patient-focussed research priorities [1]. The strategic aims outlined by the SCoR's are integral to achieving this vision. Embedding research at all levels of radiography practice and education. Raising the impact and profile of radiography through high quality research focussed on improving patient care and/or service delivery. Expanding UK radiography research capacity through development of skilled and motivated research-active professionals [1]. Trusts and radiotherapy department managers have responded positively to the strategic outline, establishing a number of research leads and clinical trials posts over the last four years, complementing the



already established workforce. Many therapeutic radiographers in these posts however work independently from a team and are often trailblazers in their departments.

Method: In December 2016 the Research and Clinical Trial Radiographers Network (RaCTRN) was established by clinically based research and clinical trials radiographers from across Yorkshire and the Midlands.

Results: Registered as a Society of Radiographer Special Interest Group (SIG), membership now stands at over 70 and continues to grow.

Conclusion: The increase of RaCTR's necessitates the continued growth of a specialised network and SIG to provide support and facilitate the sharing best practice. Bringing individuals together will not only reduce work being undertaken in silos it will unite individuals, providing opportunity for collaboration and knowledge dissemination across the UK.

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P114 Simulation training for managing medical emergencies in the Radiology Department

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Medical emergencies are not uncommon in the Radiology Department, but many department staff are not confident in managing them^[1]. Medical emergencies can occur at any time and if Radiology Department staff are the first on the scene it is vital they are familiar with the correct initial management. Simulation training is widely used in other specialities, and has been found to be an effective tool in improving management of common and serious medical emergencies^[2]. Our aim was to evaluate the use of simulation in enhancing staff confidence and skills within the Radiology Department. We devised three scenarios: anaphylaxis secondary to intravenous contrast, hypotension/collapse following liver biopsy, and VF cardiac arrest. These scenarios were delivered in the Radiology department by simulation-trained clinicians. Each scenario was attended by doctors, nurses, radiographers and other departmental staff. A debrief was conducted immediately afterwards with all participants using a formal feedback structure. Anonymous feedback forms were also collected. Feedback from all participants suggested that the scenarios were useful, relevant and they would feel more confident managing similar clinical scenarios in the future. Many also wanted further regular simulation training as a part of departmental teaching. This pilot showed that simulation can be an effective training method in Radiology, and we plan to make this a regular part of our departmental teaching program.

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P115 A scalable interactive mixed reality escape room virtual escape room – Anatomy (VERA)

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An escape room is an adventure game usually used for team building and communication, but can also be used to enhance group learning experiences, as teams need to solve problems to escape a locked room, in a given time. Immersive technology such as Mixed Reality (a combination of physical reality, virtual reality and augmented reality) makes it possible to enhance users' experience of physical escape rooms with rich digital context. However, most Mixed Reality designs require special equipment or applications to be installed and it is problematic to make the system scalable. Whilst, most commercial products are used for entertainment purposes; in this paper, a scalable interactive Mixed Reality escape room simulation, for radiographic anatomy problem-based learning is introduced. This paper outlines the background, design concepts, implementation and test result. It demonstrates how to make good use of MR technology in a standard room setting, whilst combining the learning resources within an escape room, to provide a better learning experience in radiographic human anatomy.

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P116 A study to evaluate CPD opportunities through everyday work-based practice for radiographers in a multi-centred NHS Trust

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Background: A varied CPD profile is a requirement of maintaining registration with Health and Care Professions Council. Research in relation to radiographers and CPD is primarily concerned with attitudes and perceptions. Frequently cited barriers are lack of staffing, lack of time and lack of consideration for the wider range of work-based learning opportunities available.



This study investigates perceptions of CPD activities of radiographers working within a multi-centre NHS Trust and evaluates CPD opportunities through every-day work-based practices.

Method: 149 radiographers and assistant practitioners were invited to take part in this study with two phases. Phase 1: quantitative cross-sectional survey to explore perceptions, attitudes and understanding of CPD via an online questionnaire. Phase 2: participants are provided a list of primarily work-based activities along with the optional use of recording diary sheets to assess and provide insight into CPD activity in the Trust and allow comparison with phase 1.

Results: Response rate was 27.5% (n=41/149). Time at work is perceived as both the biggest barrier and key facilitator of radiographers CPD engagement. In phase 1, formal/traditional activities gained the biggest response for what constituted CPD and work-based learning options had lower responses. Phase 2 demonstrated wide engagement with work based CPD activities.

Conclusion: Findings show radiographers perceive time at work to be the greatest issue relating to CPD participation. However, work-based activities that constitute CPD are frequently engaged with and awareness of this improves CPD participation. In addition, the availability of a paper-based reflective diary facilitates recording of CPD.

P117 Learning at lunchtime: Drivers and barriers to lunchtime CPD session attendance

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Background: Continuing Professional Development (CPD) is essential for the delivery of high-quality services but previous studies suggest that many radiographers are failing to undertake sufficient CPD^[1-4]. A programme of lunchtime presentations was introduced to increase CPD participation. This study sought to evaluate participant perceptions of the sessions and to identify interventions with the potential to increase future attendance.

Method: Between October 2018 and February 2019 general radiographic staff at a UK university teaching hospital were invited to complete a printed survey. Likert scales, multiple choice (multiple responses permitted) and free-text response questions assessed the participants' opinions of the presentations, and explored the drivers and barriers to their attendance.

Results: 65 responses were received. 78%(n=51) had attended at least one presentation, all of whom rated the delivery, content and relevance as either 'good' or 'excellent.' Barriers to attendance included the inability to be released from their clinical area 75%(n=49) and forgetting that presentations were scheduled 43%(n=28). A small minority of respondents 12%(n=8) objected to undertaking CPD during lunch breaks. Popular interventions to improve future attendance include holding the presentations at different times 51%(n=33), repeating the presentations on more occasions 45%(n=29), extra reminders when the presentations are happening 37%(n=24) and making recordings of the presentations available online 25%(n=16).

Conclusion: The presentations were well received but clinical workload limits attendance. Repeating sessions over a range of days/times and providing regular reminders may improve attendance. The results of this study may also be of interest to other departments planning a lunchtime CPD programme.

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P118 The future of ultrasound Advanced Clinical Practitioner education: Mapping the views of clinical leads in the public and private sector

Paul K. Miller; Meaghan Grabrovaz; Gareth C. Bolton; Lorelei Waring

University of Cumbria

Background: There can be little doubt that current models and mechanisms involved in ultrasound Advanced Clinical Practitioner education, at UK University Level 7, are in need of change to adapt to the challenges of a rapidly changing public healthcare environment, while functioning alongside newer 'direct entry' educational routes into ultrasound (Miller, Waring, Bolton and Sloane, 2018; Waring, Miller, Bolton and Sloane, 2018). This research, funded by Health Education England, explores the views of clinical leads in UK ultrasound departments regarding the facility of current education, the changes needed now and the changes that are likely necessary to future-proof the curricula.

Methods: With institutional ethical approval, semi-structured interviews were conducted with N=10 clinical leads in public and private ultrasound units. Data were transcribed verbatim, and transcripts analysed using the thematic approach outlined by Braun and Clarke (2008).

Results: Four interlinked global themes emerged. Soft Skills: The present and increasing need for better and more flexible verbal/written communication skills, plus team working and management/leadership training. Non-Genericism: The need to prepare sonographers for progressively more varied and/or difficult patients and working environments. Specialisation in



Diversification: The need to prepare sonographers for a greater range of diagnostic and interventional tasks in more specific domains of ultrasound. Evolving CPD: Developing new CPD models to facilitate greater ongoing involvement.

Conclusion: While the participants were broadly very content with current models/standards of Ultrasound ACP education, the findings underscore a range of concerns they held regarding its adaptation in the short-to-medium terms.

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P119 The future of ultrasound Advanced Clinical Practitioner education: Mapping the views of programme leads in the UK
Meaghan Grabrovaz; Paul K. Miller; Lorelei Waring; Gareth C. Bolton

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Background: The apparatus presently involved in ultrasound Advanced Clinical Practitioner (ACP) education, at UK University Level 7, is in need of radical change to adapt to the challenges of a healthcare environment in extraordinary flux (Sloane and Miller, 2017). These challenges are, furthermore, exacerbated by an overall shortage of sonographers that is increasingly proving to be damaging to both patient service and practitioner wellbeing, albeit in a highly uneven manner across the country (Miller et al., 2019; Waring et al., 2018). The research reported herein, funded by Health Education England, explores the views of UK ultrasound programme leads regarding the facility of current educational strategies for addressing contemporary troubles in clinical ultrasound, and the adaptations that are likely necessary to render ultrasound education in higher education fit-for-purpose in coming years.

Methods: With institutional ethical approval, semi-structured interviews were conducted with N=10 ultrasound leads in UK universities. All data were transcribed verbatim, and corollary transcripts analysed using the thematic approach described by Braun and Clarke (2008).

Results: Four Global Themes emerged from the analysis. Managing students' current ability to flexibly interpret clinical guidelines for everyday practice. Highlighting students' own accountability in ongoing professional development. Foregrounding the importance of "soft skills" in learning. Foregrounding the importance of teamwork across clinical disciplines.

Conclusion: While the participants were generally content with current standards of Ultrasound ACP education, they also voiced a range of extant issues, born of recent experience, that might inform future curriculum adaptations to changing healthcare contexts.

1. Miller PK, Waring L, Bolton GC and Sloane C (2019) Personnel flux and workplace anxiety: Personal and interpersonal consequences of understaffing in UK ultrasound departments. *Radiography* 25(1), 45-50.
2. Sloane C and Miller PK (2017) Informing radiography curriculum development: The views of UK radiology service managers concerning the fitness for purpose of recent diagnostic radiography graduates. *Radiography* 23(1s), S16-S22.
3. Waring L, Miller PK, Sloane C and Bolton GC (2018) Charting the practical dimensions of understaffing from a managerial perspective: the everyday shape of the UK sonographer shortage. *Ultrasound* 26(4), 206-213.

P120 Managing the initial transition from student to professional radiographer: Making induction and preceptorship count
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Background: Today, increased marketisation of the higher education (HE) and health sectors requires that students in allied healthcare disciplines make an almost instantaneous shift upon qualification from a consumer identity to that of service provider, with a range of sharp corollary impacts upon their senses of self and accountability (Sloane and Miller, 2017). In these terms, how the earliest days of post-qualification employment are managed can have profound and long-lasting consequences. In this paper, emergent of a broader study funded by the College of Radiographers Industrial Partnership Scheme, findings around this initial transition period in diagnostic radiography are investigated.

Methods: With institutional ethical approval, N=20 (f=13, m=7) junior diagnostic radiographers working across the UK were recruited for extended, semi-structured telephone interviews. Verbatim transcripts were analysed using Straussian Grounded Theory (Waring et al., 2018).

Results: Participants reported a range of nuanced positive experiences of individually-tailored induction and preceptorship, which had smoothed the pathway into practice in both the short and longer terms; they helped rapidly align personal identities/expectations with that of a "real radiographer." While actively negative (often generic) experiences were reported to have stymied this process, an overall absence of induction/preceptorship was received more variably. While some participants felt undermined, others claimed that it had boosted their resilience and made them more ready for the challenges ahead.

Conclusion: Findings echo the concerns of Yale (2019), regarding personal tutoring in HE; it may be the case that no transition-management is better for new radiographers' adjustment than something too generic and/or inflexible.

1. Sloane C and Miller PK (2017) Informing radiography curriculum development: The views of UK radiology service managers concerning the 'fitness for purpose' of recent diagnostic radiography graduates. *Radiography* 23(1s): 16-22.



2. Waring L, Miller PK, Sloane C and Bolton GC (2018) Charting the practical dimensions of understaffing from a managerial perspective: the everyday shape of the UK's sonographer shortage. *Ultrasound* 26(4): 206-213.
3. Yale AT (2019) The personal tutor-student relationship: student expectations and experiences of personal tutoring in higher education. *Journal of further and Higher Education* 43(3): 533-544.

P121 Generation Z hits higher education

Sarah Naylor; Sarah Booth; Richard Tucker

University of Derby

Background: Generation Z are hitting universities. This generation, born 1995-2012 are said to be the only generation to be raised with technology and accustomed to interacting in a digital world (Chicca and Shellenbarger, 2018). It is also suggested they have underdeveloped social and relationship skills, at increased risk of isolation, anxiety and mental health issues (Chicca and Shellenbarger, 2018). Research undertaken in America has shown Generation Z want practical, relevant information; learning that is individualised (Seemiller and Grace, 2016). They want fast delivery of content, kinesthetic, experiential learning (Rothman, 2014). This will impact on Universities who will need to reflect on their current delivery methods. Are they meeting the requirements of generation Z students within this consumerist environment?

Purpose: The aim of this poster is to share the experiences at one university delivering a course to Generation Z and the outcomes of an evaluation of the learning styles of Generation Z Diagnostic Radiography students.

Summary: The poster highlights the findings from one university's evaluation of their Generation Z Diagnostic Radiography students. It suggests strategies for providing an effective learning environment for today's students who are technologically savvy, have information at their finger tips and are accustomed to instant feedback.

1. Chicca, J. and Shellenbarger, T., 2018. Connecting with Generation Z: approaches in nursing education. *Teaching and Learning in Nursing*, 13(3), pp.180-184.
2. Rothman, D.A., Tsunami of learners called generation Z. 2014. URL: http://www.mdle.net/Journal/A_Tsunami_of_Learners_Called_Generation_Z.pdf.
3. Seemiller, C. and Grace, M., 2016. *Generation Z goes to college*. John Wiley & Sons.

P122 Radiographer career development: Are we pushing the right buttons?

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Great Ormond Street Hospital

Background: Radiography as a career has expanded in a wide range of directions over recent years, and now offers an extended range of possibilities for a varied career. However, these possibilities may seem "out of reach" and "not for me" to the majority of radiographers currently working in full time clinical posts. This poster aims to dispel this myth, encourage Radiographers to investigate Advanced Practice opportunities and to share our department's experience of radiographer role extension.

Purpose: To increase awareness of the four main directions of career development for radiographers, encompassing clinical practice, research, education and leadership. This includes: 1. Reporting Radiographer - Specialising in MRI paediatric neuro-oncology image interpretation/clinical reporting. 2. Clinical Specialist Radiographer - independently undertaking procedures in Interventional Radiology 3. Research opportunities, at Masters, Doctoral and post-doctoral level 4. Management roles - from a modality, service level or departmental perspective We outline career pathways and the way in which these have been integrated into a specialised London teaching hospital. The poster will act as career inspiration and give real-world examples of specialists who have successfully extended their careers in a wide variety of directions.

Summary: The poster will be a visual representation of the different career opportunities, acting as a focus point for discussion with UKIO participants. We will encourage current radiographers to consider these pathways, maximise their potential and develop their own individual career pathway. These opportunities allow for increased staff morale, career fulfilment and staff retention for the whole radiographer.

P123 The degree apprenticeship route into diagnostic radiography: Implications for the workplace

Christine Heales; Demelza Green

University of Exeter

Background: The diagnostic radiographer degree apprenticeship standard was approved for delivery in April 2019^[1]. This apprenticeship route into diagnostic radiography offers an employment-based way into the profession. A key difference between this and undergraduate routes are that the learners are now employees of a department, and the department procures the services of an education provider rather than the education provider identifying clinical placement sites for its students. The qualification and level are the same as for conventional undergraduate programmes; the outcome measure is still a degree level qualification, although an independently assessed 'End Point Assessment' is integrated into the degree. Education providers are still required to obtain HCPC approval for their apprenticeship programmes, and meet their own internal requirements for degree level education. However, the key difference is that the degree apprenticeship is delivered principally through workplace-based learning.



Purpose: The aim of this poster is to describe the implications for clinical departments who may be looking to support apprentice diagnostic radiographers. Key differences between conventional undergraduate programmes and the workplace learning that is at the core of apprenticeship education will be outlined.

Summary: An approach to the design and delivery of an apprenticeship programme in diagnostic radiography will be outlined. Examples will be given of workplace-based learning activities that would, in an undergraduate programme, be delivered in the academic setting. The implications for the clinical workforce who will be supporting the apprentice learners will then be considered.

1. <https://www.instituteforapprenticeships.org/apprenticeship-standards/diagnostic-radiographer-integrated-degree/>.

P124 Stress and the undergraduate radiographer: An interpretative phenomenological analysis of the experiences of final year mature radiography students

Julie A. Mawson; Paul K. Miller

University of Cumbria

Background: Alongside the now well-documented stresses of undertaking an undergraduate university degree (Regehr et al., 2013), contemporary healthcare students must also adapt to the pressures of a progressively greater clinical workload. To date, however, relatively little research has explored how the challenges and responsibilities of clinical placement specifically interact with the often-complex life circumstances of mature healthcare students, and none has addressed how the associated stresses affect the undergraduate experience of mature student radiographers.

Methods: With institutional ethical approval, extended semi-structured interviews were conducted with N=6 (four female, two male) final year Diagnostic Radiography students aged 25 and over. At the time of interview, participants were placed in six different hospitals in the north west of England. Recorded data were transcribed verbatim, and investigated using the established techniques of Interpretative Phenomenological Analysis (Smith et al., 2009).

Results: Analysis of data gave rise to N=3 pertinent superordinate themes; everyday sources/impacts of stress, stress manifestations in the clinical environment, and constructive management of stress. Participants variably asserted that their status as mature students could engender both greater and lesser stress than was apparent among their younger counterparts, and sometimes both concurrently. All, however, reported that placement-related stress had at some point impacted upon their physical, psychological and social well-being, with most reporting that such stress had negatively affected perceived competence - and thus confidence - in the clinical environment.

Conclusion: It is contended that the nuanced, experiential findings can inform prospective discussions regarding curriculum development and placement management in diagnostic radiography.

1. Regehr C, Glancy D and Pitts A (2013) Interventions to reduce stress in university students: A review and meta-analysis. *Journal of Affective Disorders* 148(1): 1-11.

2. Smith JA, Flowers P and Larkin M (2009) *Interpretative Phenomenological Analysis: Theory, Method and Research*. London: Sage.

P125 An investigation of undergraduate diagnostic radiographer expectations of clinical role development

Anthony Manning-Stanley; Mike Kirby

University of Liverpool

Background: Radiographer reporting is an advanced practice set to grow as workforce pressures continue and reporting service needs increases, through e.g. early diagnosis initiatives. The aim of this study was to explore modality preferences of undergraduate students with a specific focus on the reporting role.

Method: University ethical approval was granted for a survey-based questionnaire, using paper and social-media formats. Informed consent was obtained prior to collection from respondents (final year diagnostic radiography undergraduates at UK HEIs). Responses were collated and summarised in Excel for descriptive statistical analysis, and transferred into SPSS for inferential statistical analysis.

Results: Response rates were 100% (n=34) and (estimated) 2.4% (n=18) for the university-based and Twitter surveys. The overall combined preferences were for reporting (22.8%); CT (21.5%); MRI (13.4%), with 73.5% anticipating specialising in less than 2 years. No respondents anticipated specialising in over 4 years. The correlation between modality preference and clinical/university experience of the modality was higher for the Twitter cohort (clinical: $r_s = 0.589$; university: $r_s = 0.592$) compared to the university cohort (clinical: $r_s = 0.327$; university: $r_s = 0.371$ respectively).

Conclusion: Identification of reporting as the most preferred modality is a novel finding in the context of UK HEIs; differing from previous literature where CT and MRI have been identified as more popular modalities. The anticipated time to specialise is slightly more ambitious than seen previously, with weak to moderate correlations of preference to clinical/university experience, thereby counter to published qualitative findings that experience and preference are strongly correlated.



P126 "Looking back at my student years now...": Recently-qualified radiographers' retroactive understandings of key resilience sources

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Background: The rapid evolution of healthcare provision models in the UK has left many Higher Education curricula in the medical imaging sciences struggling to fully equip their graduates for engagement with the vagaries of full clinical practice upon qualification (Sloane and Miller, 2017). Emerging from a national study of the practical experiences of recently qualified diagnostic radiographers, however, this paper addresses key aspects of the participants' undergraduate experience that had directly informed their subsequent resilience in the workplace.

Methods: With institutional ethical approval, N=20 diagnostic radiographers of one to two years post-graduation experience, working across the UK, sat for extended, semi-structured telephone interviews. Verbatim transcripts were analysed using Straussian Grounded Theory (Miller et al., 2019).

Results: Participants accounted that they had sourced resilience from many aspects of their undergraduate experience. Four issues, however, were recurrent in nearly all interviews. 1. Positive clinical experiences during placement routinely reassured participants they were ultimately "up to the job." 2. "Errors without insults" during placement were taken to be highly constructive development experiences. 3. Strong link-tutoring provided intellectual reinforcement of practical and social skills during placement. 4. Academic content that unambiguously elucidated its functional value was essential in providing confidence in procedural knowledge.

Conclusion: Observably, the strongest sources of resilience for participants with respect to their subsequent clinical practice were themselves practical in nature. While some found no difficulty in extracting confidence from more theoretical aspects of curricula, those aspects were still most successful when actively framed in the most practical terms possible.

1. Miller PK, Waring L, Bolton GC and Sloane C (2019) Personnel flux and workplace anxiety: Personal and interpersonal consequences of understaffing in UK ultrasound departments. *Radiography* 25(1): 45-50.

2. Sloane C and Miller PK (2017) Informing radiography curriculum development: The views of UK radiology service managers concerning the "fitness for purpose" of recent diagnostic radiography graduates. *Radiography* 23(1s): 16-22.

P127 MRI radiographer training – The good, the bad and the ugly

Elizabeth Ashburner

Northern Care Alliance NHS Trust

Background: MRI is a complex and rapidly expanding modality which the Radiography workforce is striving to keep up with demand for. BAMRR state "The science of MRI and technological developments in equipment and device implants evolves rapidly and radiographers must ensure that their knowledge, skills and competencies keep pace with these advances in order to ensure a quality and safe service." (British Association of MR Radiographers, 2016) MRI is mostly taught 'on the job' with very little formal education available outside of short courses or MSc. Most departments have their own training programme that includes locally set competencies which must be completed. Although there is now a 'standard' set by Skills for Health (Skills for Health, 2019) which describes the skills set required by Radiographers working in MRI, there is no standardised format for the assessment of these standards and structuring training.

Purpose: The poster aims to highlight the importance of a well-constructed, relevant and user-friendly training package for MRI Radiographers, which results in evidence of proficiency. It is hoped that this poster will encourage evaluation and review of on the job MRI training and how this is evidenced to improve clinical practice.

Summary: The poster will discuss the existing standards for MRI Radiographer training. It will include a critical evaluation of an existing in-house training package, and the changes which have been made to make it efficient, engaging and effective at guiding training and demonstrating proficiency.

1. British Association of MR Radiographers (2016) BAMRR MR Safety Publication, 8.

http://www.bamrr.org/media/uploads/scor.bamrr_2016_mr_safety_publication_update_final.pdf.

2. Skills for Health, 2019. Cl.E.(2019) Produce Magnetic Resonance images (MRI) for diagnostic purposes.

<https://tools.skillsforhealth.org.uk/competence/show/html/id/4304/>.

P128 A picture of extended and advanced radiographic practice in the UK (with a focus on independent clinical reporting)

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Background: Despite an established history of role development in the UK previous research has demonstrated variation in the adoption and utilisation of in practice.^[1-3] This objective of this research was a contemporary scoping of radiographic roles.

Method: A cross sectional electronic survey of NHS diagnostic imaging departments across the UK was undertaken in autumn 2019. The survey sought to identify advance practice across modalities, role titles, pay banding, expectations of involvement in leadership, education and research and accreditation with the professional body.



Results: There was a response rate of 42.9%, including all 4 home countries. Only 4 sites (5.1%) do not employ radiographers in advanced roles. The most common approach to recruitment to adv posts is to train staff locally (n=64/75; 85.3%), with 23 also recruiting qualified external staff into such roles. The pay bands were broad (6-8B), with high pay being related to individuals also holding leadership/management roles. The majority require postgraduate education but do not expect staff to have accreditation at an advanced level.

Conclusion: Despite advanced practice being common, the remains inconsistency in role implementation both across modalities and NHS Trusts.

1. Milner RC, Snaith B. Are reporting radiographers fulfilling the role of advanced practitioner? *Radiography* 2017; 23: 48-54.
2. Society of Radiographers. *Diagnostic radiography: A survey of the scope of radiographic practice 2015*. 2017.
3. Henderson I, Mathers SA, McConnell J. Advanced and extended scope practice of diagnostic radiographers in Scotland: Exploring strategic imaging service imperatives. *Radiography* 2017; 23: 181-6.

P129 Don't fear the theatre? Newly-qualified qualified diagnostic radiographers' tales of conflict and camaraderie

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¹University of Cumbria; ²University of Derby; ³University of Edinburgh

Background: The rapidly changing landscape of healthcare provision in the UK has left many medical imaging curricula struggling to fully equip their graduates for immersion in clinical practice upon qualification (Sloane and Miller, 2017). The national study from which the findings reported below are drawn aimed to explore the practical experiences of recently qualified diagnostic radiographers, with a view to highlighting how well-prepared they had found themselves to be in professional contexts. A key emergent concern related to working in operating theatres.

Methods: Extended semi-structured telephone interviews were conducted with N=20 radiographers (f=13, m=7) working at sites across the UK. All had graduated a maximum of two years previously. Transcribed data were investigated using the techniques of Straussian Grounded Theory (Waring et al., 2018).

Results: Theatre-related experience addressed four core key participant concerns. (1) A lack of academic and placement-based preparation regarding "what to expect" in theatre, both of which brought into sharper relief: (2) A sense of unpreparedness for the technical expectations of a radiographer in theatre, and (3) the often highly pressurised - and sometimes inferably hostile - interpersonal environment therein. The latter, however, was to some extent offset by (4) a reported strong sense of camaraderie and support among radiographers themselves, and particularly immediate peers, around theatre work.

Conclusion: These findings confirm and develop upon a number of concerns raised by Naylor and Foulkes (2018) regarding student radiographers' readiness for the technical and social demands of theatre, and underscore a possible shortfall in current curricula and placement structures.

1. Naylor S and Foulkes D (2018) Diagnostic radiographers working in the operating theatre: An action research project. *Radiography* 24(1): 9-14.
2. Sloane C and Miller PK (2017) Informing radiography curriculum development: The views of UK radiology service managers concerning the 'fitness for purpose' of recent diagnostic radiography graduates. *Radiography* 23(1s): 16-22.
3. Waring L, Miller PK, Sloane C and Bolton GC (2018) Charting the practical dimensions of understaffing from a managerial perspective: the everyday shape of the UK's sonographer shortage. *Ultrasound* 26(4): 206-213.

P130 Actionable reporting audit: Are radiologists appropriately answering the clinical question?

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Introduction: As per the Royal College of Radiologists (RCR), all radiology reports must meet certain criteria to ensure they are informative, concise and can be appropriately acted upon by the requesting clinicians^[1]. Actionable reporting has been shown to improve patient management and clinical outcomes^[1]. Radiologists should be achieving 100% in the following standards: 1) Did the report answer the clinical question,

2) Was a tentative/differential diagnosis provided, 3) Was advice provided regarding the next step, 4) Was the advice provided appropriate.

Methods: Retrospective data was collected regarding 100 CT abdomen-pelvis reports at a London-based DGH between February-March 2019. This included elective and emergency scans, and excluded scans reported as 'normal'. Interventions were carried out as below and re-audited in November 2019. Qualitative analysis was independently carried out by two junior doctors supervised by a consultant radiologist.

Results: Initial data showed standards 1 and 2 were relatively well met at 98% and 95% respectively. Standards 3 and 4 were considerably lower at 55% for both. The results were presented locally to radiologists and posters were disseminated throughout the department to increase awareness and remind staff of the expected RCR standards. Results of the re-audit after the interventions were implemented showed an improvement of all standards, particularly 3 and 4, which both improved to 90%.

Conclusion: Actionable reporting can be achieved through regular audit and improving awareness. This has a significant impact on patient care as reports not meeting the desired criteria can result in avoidable delays and impact patient outcomes.



1. The Royal College of Radiologists. (2018) *Standards for interpretation and reporting of imaging investigations, Second Edition*. London: The Royal College of Radiologists.

P131 Image interpretation – Celebrating 10 years of improving patient care

[Dorothy Keane](#)

The Society and College of Radiographers

Background: 38% of health professionals in England use e-learning for healthcare for their own learning (HEE Towards Maturity Index). The purpose of this poster is to reach out to the 62% who don't use the e-LfH resources. To share details on how they can access the materials, why it is relevant and what is available to them. This poster highlights the 10th Image Interpretation programme which celebrates 10 years of providing e-learning for radiographers.

Purpose: This poster will enable learners to: register for free CPD materials, find content relevant to their practice and reflect on how they can use these learning materials in their practice.

Summary: The poster will show a 10-year development timeline that highlights content on different modalities and specialities. Information on how to access the content will be provided as well as statistics on the usage of the programme, and ideas for embedding the learning in practice. User feedback will be invited. We envisage this submission as a poster and/or oral poster in the education strand.

HEE Towards Maturity Index (In print).

P132 Emotional effects impacting diagnostic radiographers in oncology: Are current support structures fit for purpose?

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The Royal Marsden Hospital NHS Trust

Introduction: Radiographers have regular and repeated contact with oncology patients and compassion fatigue can be caused by repeated exposure to stressful situations^[1]. Few studies have looked at the risk of emotional exhaustion radiographers^[1-3], but the limited evidence suggests an issue exists^[3]. This study aimed to identify the extent of emotional exhaustion in diagnostic radiographers, and whether current support services offered by the Trust meet the needs of staff.

Method: A questionnaire was sent electronically to all diagnostic radiographers in an oncology centre. The questionnaire was non-validated, but pilot tested and scrutinised by an internal audit committee. Anonymous data was gathered, and results discussed with internal staff support service leads.

Results: The response rate was 57.8%. Direct questions found that staff felt working in oncology was different from other sites. There was evidence of a high impact on mental and physical wellbeing of staff. Most staff requested services offered by the Trust but there were issues in accessing them. There was support to develop a new radiographer focussed discussion group. Themes identified centred around staff mental health concerns, maintaining work-life balance, maintaining the clinical service and perceived views of other staff. The privacy of such sessions was also raised.

Conclusion: Diagnostic radiographers experience emotional stresses similar to other oncology staff. This was a single centre study, showing that oncology radiographers work in a specific environment, and have different emotional needs. Current support structures need to be enhanced and there is a need to develop more radiographer specific support.

1. Singh, N., Knight, K., Wright, C., Baird, M., Akroyd, D., Adams, R. and Schneider, M. (2016). Occupational burnout among radiographers, sonographers and radiologists in Australia and New Zealand: Findings from a national survey. *J Med Imaging Radiat Oncol*, 61(3), pp.304-310.

2. Jones, M., Wells, M., Gao, C., Cassidy, B. and Davie, J. (2011). Work stress and well-being in oncology settings: a multidisciplinary study of health care professionals. *PsychoOncology*, 22(1), pp.46-53.

3. Murray, N. and Stanton, M. (1998). Communication and counselling oncology patients—are diagnostic radiographers adequately supported in this role?. *Radiography*, 4(3), pp.173-182.

P133 Prison life and cancer care; A case study

[Anne Jessop](#)

Weston Park Cancer Centre

There are 83,014 prisoners detained within the UK penal system the majority of these being of male population (79,205) (gov.uk 2019). Gov.UK state: Prisoners get the same healthcare and treatment as anyone outside of prison. Treatment is free but has to be approved by a prison doctor or member of the healthcare team. Most problems are dealt with by the healthcare team. If they can't, the prison may: get an expert to visit the prison, arrange for treatment in an outside hospital. The UK in 2015 documented 359,960 new cases of cancer, 183,000 of those being males (Cancer Research UK 2019). Cancer Research also states that the lifetime risk of developing cancer is 1 in 2. It is likely that there are males within the prison system with a cancer diagnosis. Visits outside prison require prisoners to be escorted by prison officers; their job is to maintain a secure environment. There could potentially be conflict between care and custody as there needs to be some degree of flexibility in order to cater for the individual needs of patient /prisoner. Attending for radiotherapy can be daily visits over several weeks, prison staff need to be available to accompany the prisoner to all appointments. Attending for radiotherapy can be a stressful and anxious time for



many patients; the same can be said for a person attending from prison. Daily travel to the radiotherapy department may be seen as a positive an opportunity to view the outside world.

1. <https://www.cancerresearchuk.org/health-professional/cancer-statistics-for-the-uk#heading-Zero> [Nov] [2019].
2. www.gov.uk/government/statistics/prison-population-figures-2018 [Nov] [2019].

P134 Investigation of cranial nerve V (trigeminal) neuralgia with MR imaging: The way to go
Stavroula Theodorou¹; Daphne Theodorou²; Vasiliki Tsaggou²; Soultana Papadopoulou¹; Anna Gotsi²

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Background: Multiple pathologic conditions can cause trigeminal neuralgia including microstructural abnormalities of the trigeminal nerve (TN) (cranial V) itself, or the perineural anatomic structures.

Purpose: We present the conventional MR imaging/MR-angiographic findings of neurovascular compression of the TN. Trigeminal neuropathy is a facial pain syndrome characterized by the sudden onset of intense pain that can last from a few hours to several days. The TN is divided into four intracranial (brainstem, cistern, the Meckel cave and cavernous sinus), and the extracranial segment. Consideration of the pathologic conditions affecting the TN by these anatomic locations is helpful in differential diagnosis. Among the intra- and extracranial causes associated with trigeminal neuralgia are multiple sclerosis, infarct, aneurysm, neurovascular compression, acoustic or trigeminal schwannomas, meningioma, and malignant tumors. MR imaging may allow identification of the site of nerve dysfunction, because it affords scrutiny of the entire course of the TN and surrounding structures. A 63-year-old man presented with trigeminal neuralgia, numbness of the muscles of mastication on his left cheek, and headache. The patient reported paroxysmal neuralgia for years. On the axial T2-weighted and FLAIR images of the brain and the skull base there was abnormal configuration of cranial nerve V in the region of the brainstem, on the left side. MR angiographic images revealed neurovascular compression of TN by the anomalous, curved and deviated left vertebral artery, comprising vertebrobasilar dolichoectasia.

Summary: MR imaging can prove helpful in the investigation of trigeminal neuralgia caused by various causes including neurovascular compression.

1. Lutz J, Linn J, Mehrkens JH, Thon N, Stahl R, Seelos K, BrÄ¼ckmann H, HoltmannspÄtter M (2011) Trigeminal neuralgia due to neurovascular compression: high-spatial-resolution diffusion-tensor imaging reveals microstructural neural changes. *Radiology* 258(2):524-530.
2. Majoie CB, Verbeeten B Jr, Dol JA, Peeters FL (1995) Trigeminal neuropathy: evaluation with MR imaging. *Radiographics* 15(4):795-811.

P135 Intracranial metastases – Putting the pieces together
Amina Odeh¹; Mohammed Babsail¹; Mufudzi Maviki²; Anthony George¹; Martin Tapp¹

¹Torbay Hospital; ²University Hospitals Plymouth NHS Trust

Background: Intracranial metastases represent the majority of central nervous system (CNS) tumours and are considered to be one of the leading causes of cancer mortality. It's also worth noting that intracranial metastases can be the first presentation of an extra-cranial primary malignancy.

Purpose: Illustrate common imaging characteristics of intracranial metastases. Outline different mechanisms of disease dissemination. Discuss relevant differential diagnoses.

Summary: Common primary tumours which metastasise to the CNS include lung cancer, breast cancer, renal cell carcinoma, melanoma and colorectal carcinoma. Intracranial metastases have different distribution patterns depending on the aetiology of the primary malignancy. Parenchymal brain metastases usually manifest at the grey white matter interface of the cerebral hemispheres. The majority of such metastases are intraaxial and commonly spread in a haematogenous manner. Metastatic disease may disseminate via the cerebrospinal fluid (CSF), infiltrate adjacent structures or spread in a perineural/perivascular distribution. The second most common site of intracranial metastases are the cranial vault and dura. These predominantly originate from primary breast and prostate cancer. Calvarial and dural metastases tend to present as solitary deposits, as opposed to parenchymal metastases. Leptomeningeal metastases represent approximately <5% of metastatic brain disease. In contrast to other intracranial metastases, these deposits most commonly stem from primary brain tumours, namely lymphoma and glioblastoma. Intracranial metastases have several distribution patterns. Radiologists can deduce potential sources of a primary malignancy based on deposit location and imaging characteristics. Correctly identifying these lesions ensures patients are managed appropriately.

1. Fink J.R (2013) Imaging of brain metastases. *Surg Neurol Int.* 2013;4: 209-219.
2. Grant L. A. and Griffin N. (2018) Grainger's & Allison's Diagnostic Radiology Essentials, 2nd edition. Elsevier.
3. Hedlund G. L., Osborn A. G., and Salzman K. L. (2017) Osborn's Brain, 2nd edition. Elsevier.
4. El-Feky M and Orton T et al Brain metastases, *Radiopaedia*, 17/12/18.



P136 How frail is the patient population in the outpatient radiotherapy department?

Jakov Tiefenbach; Harriet Dulson; Adam Wild; Emma Megarry; Angus Boyd; Denisa Stronceková; Luke Thompson

University of Edinburgh

Patients requiring outpatient radiotherapy treatment are often elderly with a large number of associated co-morbidities. Many of these patients will live far away from the hospital and find daily commutes burdensome. The aim of our study was to evaluate the extent of frailty amongst the radiotherapy outpatient population over 65 and discuss the potential implications of these findings. A data collection form was compiled using modified Balducci criteria. The information for this study was gathered retrospectively from patient notes who attended radiotherapy at the local general hospital. The data was input into an excel sheet and analysed accordingly. The average frailty levels by cancer type, age and underlying frailty factors were calculated. 217 patients attended radiotherapy, of whom 84 patients (38%) met the inclusion criteria. 41 patients (49%) of the study cohort were categorised as frail. The median age was 73.4, whilst taking 5+ medications was the primary reason for frailty classification, present in 70.7% of the frail population. The most common co-morbidity was hypertension (75.6%), while atrial fibrillation was found to be most strongly associated with frailty. The prevalence of frailty varied widely by cancer type. 49% of outpatients from this snapshot sample were deemed to be frail by modified Balducci criteria. This figure is much higher compared to the general population and highlights the need for better care of this patient group. A new standard patient clerking proforma form may be beneficial to identify frail patients and tailor their radiotherapy.

P137 Discovering the lyre sign: A case presentation and overview of carotid body tumour

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Background: We report the case of a 72-year-old lady presenting to A&E with a neck lump and dysphonia. Initial US Neck revealed a hypervascular mass at the Carotid Body. Subsequent CT demonstrated the "Lyre sign"^[1] and in conjunction with MRI, a diagnosis of Carotid body tumour was made. Carotid Body Tumours are uncommon neoplasms, arising from paraganglionic cells in the adventitia layer of the carotid artery, usually at the common carotid artery bifurcation. Despite their rarity in the population, these tumours account for 65%^[2] of all head and neck paragangliomas, and thus commonly present as neck mass, dysphonia and cranial nerve palsies. They can be categorised anatomically by the Shamblin classification and the gold standard treatment is surgical resection.

Purpose: Using a case presentation we aim to highlight: i) The appearance of Carotid body tumours in various imaging techniques, ii) the appearance of the radiological "Lyre sign", iii) and to raise awareness that a differential diagnosis of carotid body tumour should be considered in a patient with a neck mass.

Summary: Educational poster, presenting a case of a carotid body tumour to highlight the aetiology, radiological appearances, brief classification and management of these tumours.

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2. Robertson, V. et al. (2019) A Systematic Review and Meta-Analysis of the Presentation and Surgical Management of Patients With Carotid Body Tumours, *European Journal of Vascular and Endovascular Surgery*. W.B. Saunders Ltd, pp. 477-486. doi: 10.1016/j.ejvs.2018.10.038.

P138 Pre-operative embolization of the uterine artery prior to vaginal mass excision

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Torbay and South Devon NHS Trust

Background: Vaginal wall masses are considered rare neoplasms with broad differentials including malignant pathologies. There are no standardised recommendations due to the low incidence, but the general consensus recommends excision and histology examination to determine further clinical management. <1> Lesions of the lower female genital tract is considered a diagnostic challenge to the radiologist pertaining to the presence of broad range of tissue in a limited anatomical region.

Purpose: To discuss the diagnostic approach to vaginal masses from a radiological perspective. To highlight suggestive imaging features of myofibroblastoma. To illustrate the contribution of the radiologist in the patient's diagnostic and therapeutic experience.

Summary: A case review of the clinical presentation, radiological imaging, interventional and surgical management is presented with a focus on the role of the radiologist in this patient's hospital experience.

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SHARING BEST PRACTICE

P139 Assess the feasibility of therapeutic radiographers undertaking a brief geriatric assessment during routine radiotherapy practice

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Background: Age-related decline in health deems radiotherapy as an attractive treatment option for people with cancer compared with surgery or chemotherapy^[1]. However, even low-grade side effects may significantly impact older patients' health and quality of life^[3]. The use of a geriatric assessment (GA) prior to undergoing cancer treatment has been advocated to identify areas of frailty that are potentially treatable to improve patient health outcomes and enhance quality of care^[2]. This project aimed to assess the feasibility of therapeutic radiographers undertaking a Geriatric Assessment.

Method: A therapeutic radiographer undertook an adapted geriatric assessment with 15 patients with training and supervision from an occupational therapist. The primary measure of feasibility is the time taken and skills required to complete the GA effectively.

Results: 67% of the patients were identified as having unmet needs, of which 53% had functional, psychological, nutritional and fatigue respectively. Time required to undertake the GA ranged from 20-90 minutes. An additional 1-5 hours were spent undertaking interventions post assessment. 33% of patients had low level needs that could be met by the radiographer.

Conclusion: This project suggests that with appropriate training radiographers have the potential to be able to assess for frailty and deliver low level interventions. However, a large barrier to this is the time constraints imposed by the service. This piece has also highlighted the need for greater Multidisciplinary Team working, so that appropriate and timely interventions can be provided to support patients, undergoing radiotherapy who's needs require specialist intervention.

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3. O'Donovan, A., Leech, M., and Gillham, C. (2017). Assessment and management of radiotherapy induced toxicity in older patients. *Journal of Geriatric Oncology*, 8(6), 421-427.

P140 Simple radiological investigation to detect cancer; Are they slipping through the net?

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Queen Alexandra Hospital

Background: According to British Thoracic Society, patients with Community Acquired Pneumonia (CAP) with higher risk of malignancy (over 50 or smokers/ex-smokers) require follow up chest x- rays 6-8 weeks post discharge. This is to ensure resolution of pneumonia and early detection of underlying malignancy.

Methods: Study looked at 20 medical wards at QAH between September and December 2019. Electronic discharges that coded CAP and met the inclusion criteria were screened. Those that had x-ray reports of pneumonic changes were identified. PACS imaging was analysed to see if a follow up x-ray had been performed.

Results: A total 907 patients coded for CAP in the 3-month period. 101 patients were deemed high risk, 50 of these patients were analysed. The remaining 51 were either readmitted, died, had existing lung cancer or were miscoded. 23/50 (46%) received x-ray follow up within 8 weeks. Of these 23 patients, 17 were followed up by the GP and 6 by the hospital. The respiratory ward scored 76%, compared to geriatrics ward with 11%.

Conclusion: Across the 20 medical wards at QAH, there is a lack of awareness and education regarding BTS guidelines for follow up x-rays. There is a discrepancy amongst respiratory and non-respiratory wards, highlighting the possible lack of familiarity. There may also be a disconnect between primary and secondary care. We aim to improve on the above factors and target 100% for follow up CXR in 6 months.

P141 Is your radiology department prepared for COVID-19? Lessons from SARS -CoV-1

Khaoula Bessame

Kingston Hospital

Background: Although Radiology is not traditionally viewed as a frontline clinical service, SARS and now COVID-19 outbreaks reveal a different perspective. The operational response of the radiology department during a novel infectious disease outbreak is pivotal. It extends beyond the timely provision of radiologic results to identify cases, to ensuring protection of patients and staff by keeping infection control in the forefront. In addition, maintaining the morale of staff is paramount, as people are the most important resource during a crisis.

Purpose: The poster examines the radiology preparedness policies to be adopted during an infectious disease outbreak to ensure continued radiology services, without compromising the safety and well-being of our patients, staff and the community. The study consisted of a literature review that was designed to explore the operational changes instituted in tertiary hospital



radiology departments, in countries that were deeply impacted by both SARS, and COVID-19 outbreaks. The aim is that the lessons they learnt will be useful in preparing radiology departments elsewhere in facing the COVID-19 pandemic, and similar crises in the future. **Summary:** A0 portrait style, with subheadings (background, purpose, summary), tables highlighting the 5 key areas for a radiology department to address (1. Integration of the radiology department into the hospital's outbreak response. 2. Infection control. 3. Leveraging equipment and processes. 4. Timely and accurate provision of radiologic results. 5. Human resources).

P142 An analysis of 30 day mortality post palliative radiotherapy for malignant spinal cord compression: Can we safely reduce the fractionation for poor prognosis patients by using biomarkers and performance status?

Josie Cameron

NHS Lothian

Background: Malignant spinal cord compression (MSCC) is classed as an oncological emergency and approximately 5 -- 10% of patients with cancer will go on to develop MSCC^[1]. However, patients presenting with MSCC have a poor prognosis with a median survival of 2 -3 months^[2]. A guideline published in 2012^[3], suggested that less than 20% of patients receiving palliative radiotherapy should die within 30 days of treatment. This project was designed to analyse the 30 day mortality post palliative radiotherapy for MSCC patients to identify if radiotherapy fractionation can be reduced in patients likely to die within 30 days by monitoring biomarkers and performance status (PS). The literature suggests^[4-6] that by monitoring both biomarkers and PS it may be possible to identify in advance a cohort of patients who will die within 30 days of MSCC treatment.

Methods: A 6-month cohort of patients treated for MSCC, radiotherapy date, date of death, biomarkers, PS and fractionation was recorded. An analysis was performed to look for correlation between biomarkers, performance status and prognosis.

Results: 30 day mortality rate = 16.8% A positive correlation between worsening PS and rising CRP (biomarker) levels was found with a correlation coefficient of 0.7, suggesting a moderate to high level of correlation. There was negligible correlation found between PS and decreasing Albumin levels with a coefficient of -0.2.

Conclusion: Monitoring biomarkers and PS throughout a patient's cancer journey can provide valuable information on disease progression and should be considered as part of routine investigations.

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P143 Implementation of nomenclature standardisation

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Background: Patient throughput within a radiotherapy department requires a robust and efficient planning process that spans from the clinicians outlining, to planning solutions and treatment delivery. Implementing the American Association of Physicists in Medicine (AAPM) task group (TG) 263 standardised nomenclature model¹ in our planning process allows frequent use of automated planning tools; standardisation of outlining and planning routines leads to robustness in planning, which reduces errors and subsequent plan delays. Research can be improved with increased collaboration between centres using standardised nomenclature.

Method: We reviewed standardised nomenclature models and compared them against the department's needs whilst allowing flexibility for customisation. All staff groups were consulted, final clinical structure templates were established, and consistency was maintained throughout sites. Care was taken with non-alphanumeric characters to eliminate known conflicts with other software systems within the patient pathway.

Results: The "reverse" AAPM TG 263 model has been chosen as it best meets the departmental needs for labelling, laterality and non-alphanumeric characters. Automated, site specific structure templates following the established model have been generated for most treatment sites where possible. The use of a prefix to identify non clinical volumes e.g. training and support volumes has been implemented.

Conclusion: The standardisation of nomenclature ensures clarity from prescription to plan review. Implementation of this system makes outlining and planning less prone to errors, minimises subsequent treatment delays and improves departmental



workflows. Class solutions and clinical goals have been developed using standardised nomenclature for multiple planning techniques.

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144 Treating pelvic sarcoma patients with proton beam therapy – What can be learnt from current clinical practice?

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Background: Unlike conventional photon radiotherapy (XRT), protons are more sensitive to changes in density and patient weight. The current target verification protocol within the XRT department is daily, orthogonal, kV x-rays and weekly cone-beam CT (CBCT) in the treatment position. Due to the physical properties of protons, our current clinical practice needs to be evaluated to establish whether the same verification process could be utilised for PBT.

Method: Weekly CBCTs of 10 pelvic sarcoma patients, who received XRT between 2016 and 2019, were retrospectively analysed. The primary consideration during analysis was a change in patient separation (i.e. whether the patient gained or lost weight) as this might impact the dose to the target. For each CBCT, 4 measurements of separation were taken at the level of the isocentre from the anterior, posterior, left and right aspect of the body contour.

Results: The mean number of weekly CBCTs was 6. 64 CBCTs were analysed giving 256 measurements of separation change. 138 measurements indicated a separation change of more than 0.3cm. The most common change in separation was between 0.5 and 1cm (n=67). There were 17 measurements where separation had changed more than 1cm. 7/10 patients had a separation change due to muscle clenching or relaxing, as opposed to actual weight loss or gain.

Conclusion: The findings of this study will be evaluated within the wider MDT to determine if there would be a dosimetric impact within a PBT context, as this could go on to affect our PBT imaging protocol.

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P145 Butterfly volumetric modulated arc radiotherapy (B-VMAT) with deep inspiration breath hold (DIBH) for mediastinal lymphomas

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Background: Radiotherapy for mediastinal lymphomas is effective, but is associated with significant long term side effects particularly to the heart, lungs and breasts. The butterfly volumetric modulated arc radiotherapy (B-VMAT) technique can reduce dose to these organs at risk^[1]. The butterfly technique with deep inspiration breath hold (DIBH) was implemented in a radiotherapy department at a district general hospital. Voluntary breath hold was performed without the aid of on-treatment respiratory gating systems.

Method: T-test analysis was used to compare retrospective heart and lung dose data from 12 patients who had undergone DIBH B-VMAT in the department with 6 patients who had 3D conformal radiotherapy (3DCRT). In the 3DCRT group CTV-PTV margins were 15mm in the superior/inferior plane, 10mm in other planes. A 10mm isotropic CTV-PTV margin was used in the DIBH B-VMAT group. Offline imaging data was used to assess the reduced CTV to PTV margins with the Van Herk formula^[2].

Table 1: Comparison of the 2 planning techniques

	Group 1 (n=12)	Group 2 (n=6)	Difference (95% CI)	p-value
	Mean (95% CI)	Mean (95% CI)		
Heart	7.4 (4.8 to 9.9)	17.2 (8.5 to 26.0)	9.9 (3.8 to 15.9)	0.003
Lung	7.3 (6.3 to 8.4)	11.9 (9.9 to 13.9)	4.6 (2.7 to 6.4)	<0.001

Table 2: Van Herk calculated CTV to PTV margins

Anteriorly/posteriorly	Superiorly/inferiorly	Laterally	Mean
7.6mm	8.5mm	5.9mm	7.33mm

Results: DIBH B-VMAT has significantly reduced the mean heart and lung dose (P < 0.05) (Table 1). Van Herk calculated CTV to PTV margins demonstrate that the current margin of 10mm used is appropriate (Table 2). DIBH B-VMAT takes longer to deliver; average treatment times have increased from 17 minutes to 31 minutes.

Conclusion: DIBH B-VMAT without on-treatment gating has been successfully implemented within our department. Although average treatment times have increased, the technique has resulted in significantly lower mean lung and heart doses. Future work is being undertaken to determine if margins can be individualised.

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P146 Modified butterfly IMRT technique for mediastinal lymphoma

Julian Phillips; Peter Anthony

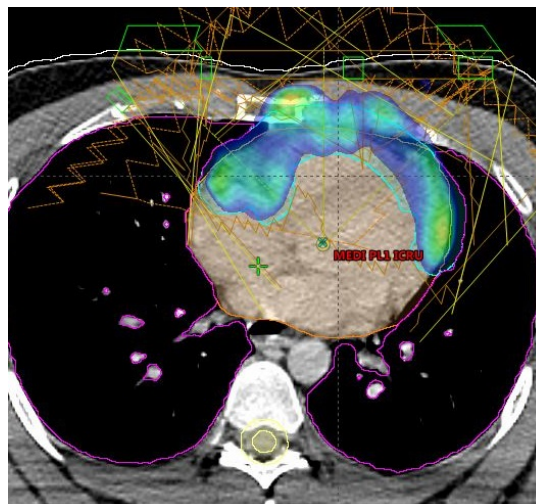
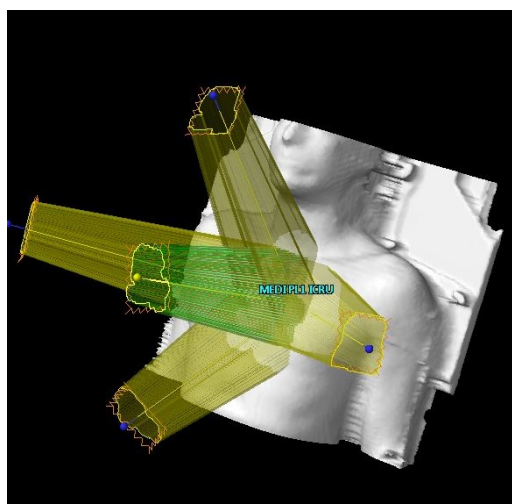
Norfolk & Norwich University Hospitals NHS Foundation Trust

Background: Post-chemotherapy lymphoma patients requiring mediastinal radiotherapy would traditionally be treated with a parallel-opposed pair but this would result in high heart and lung doses. This was a particular problem due to the often young age of the patient group and high cure rate of the disease. Many centres used a "butterfly" VMAT technique but this was limited at the centre to pelvic patients and due to be rolled out to other body sites first. Could we achieve similar results to butterfly VMAT using similar angles but as fixed-field IMRT?

Method: Eight patients aged 20-50 were treated to 30Gy/15# using fixed-field IMRT. A non-coplanar Beam arrangement with anterior beams was used, optimised to keep heart and lung doses as low as achievable. Dose receiving 5Gy for lung (V5) and mean dose for heart (DMean) were recorded.

Results: V5 was kept below 50% for all patients and varied between 12.5% and 47%. DMean varied from 3Gy to 16.5Gy. Good PTV coverage was achieved on all plans.

Conclusion: Results comparable to butterfly VMAT can be achieved using IMRT fields in a similar non-coplanar arrangement. Lung and heart doses could be reduced without the additional work and delay in introducing a new VMAT technique.



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P147 Clinical research and trials in radiotherapy and cancer care: Experience of research nursing assistants in the recruitment and consent pathway

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To describe the experiences of research nursing assistants (RNA) in the recruitment and consent process for clinical trials and research in radiotherapy and cancer care. Clinical research and clinical trials in cancer care are an integral process in diagnostic and treatment development. Nipp et al, 2019, stated that "clinical trials are imperative for...determining the best treatment strategies to enhance outcomes" A cure for cancer is the "holy grail" however, improvements in treatment are vital in the contribution to long term survival or improvements in quality of life in the short term. It is vital that recruitment to clinical trials is performed with care and compassion but also following strict guidelines in accordance with Good Clinical Practice (GCP). Clinical trials aim to explore what is the best treatment for patients with minimum risk in a controlled and methodical way. Unger et al, 2017, reported that fewer than 5% of adult cancer patients enrol in cancer clinical trials so it is vital to reflect on both positive and negative experiences to improve the patient pathway, future training and communication with the patient. It is important to realise that although the success of a trial can be dependent on numbers of patients involved, it is also vital to follow the guidelines, learn about the characteristics of the trial and be able to describe it to the patient in detail.



The patient can then make an informed choice. This poster will utilise diagrams, flow charts and reflective learning to describe these processes.

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P148 Raypilot: The patient experience

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The Micropos Raypilot device is an electromagnetic GPS tracking system used in prostate SBRT to record motion of the prostate gland throughout treatment. The device is surgically implanted using a transperineal approach and remains in situ for the duration of the radiotherapy treatment. In some cases this can be up to six weeks. Currently the only centre in the UK trialling this is the Edinburgh Cancer Centre. Vast data has been collected on the clinical efficacy of the Raypilot device by utilising CBCT and KV imaging, however, it is imperative that patient experience data from surgical implantation to device extraction is collated and assessed. Once the device is in situ the patients are given information in being mindful of the external component of the device (30cm cable). Patient compliance and their experience can lead to problems with the device and can negatively impact the clinical use of the device as it can become redundant. So far ten patients have had the Raypilot device surgically implanted. 95% suggest that there is mild discomfort in the hours following implantation but that this dissipates quickly. 80% suggests that the device placement is a mild source of annoyance. Two patients had the device removed prior to SBRT commencing due to device migration. 100% of patients reported that they would have the implantation repeated as any ill effects were minimal. 90% of patients had no clinical issues with device removal. Overall the Raypilot device is well tolerated by the patients.

Micropos Medical Systems. Raypilot. 2019. <http://www.micropos.se>.

P149 Exploring the perceptions of therapeutic radiographers in using the IIEF-5 questionnaire for the management of erectile dysfunction experienced by prostate cancer patients

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Background: Erectile dysfunction (ED) is a common side-effect of radical prostate cancer treatment. Despite its prevalence ED can infrequently be discussed with patients due to perceived feelings of embarrassment and awkwardness^[2]. This results in poor referral rates to support services and ineffective management which can lead to negatively impacting on quality of life^[1]. The International Index for Erectile Function-5 questionnaire^[3]. (IIEF-5q) was introduced into the review process at a UK cancer hospital to address this concern. The aim of this study was to explore the impact of the IIEF-5q on discussions around ED.

Method: Two focus-groups were conducted exploring the perceptions of therapeutic radiographers who use the IIEF-5q within their on-treatment review of patients during radiotherapy. Radiographers were asked to share their thoughts and experiences of the IIEF-5q prompting discussions of ED.

Results: A total of seven on-treatment review therapeutic radiographers attended the focus-groups. Thematic analysis highlighted three main themes: impact of using of the IIEF-5q, its implementation and recommendations for future use. Radiographers found the IIEF-5q an effective tool at promoting discussions around ED and increasing referrals, yet the tool itself was deemed too direct and its method of implementation increasing the stigma around ED.

Conclusion: The IIEF-5q was effective at prompting discussions around ED, yet the IIEF-5q may not be suitable within the review setting. Providing patients with a simple questionnaire consisting of potential side effects prior to the review session may assist in tailoring the review to the patient's needs, thus improving the quality of care provided.

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P150 Is 2D/3D kV image verification comparable to 3D/3D CBCT image verification? A pilot study

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Introduction: Advanced radiotherapy techniques require precise patient positioning through image verification. The six degrees of freedom couch enables rotational corrections through pitch and roll adjustments. The gold standard for image verification is



CBCT, however, given the associated increased dose and acquisition time of this modality, 2DkV imaging with 2D/3D registration will be investigated as an alternative.

Methods: The CIRS Stereotactic End-to-End Verification Platform (STEEV®) head phantom was scanned in a custom made BDS and a treatment plan created with setup fields in Eclipse. Ten head and neck treatments were simulated using various positions to emulate variable clinical setup. Anterior and lateral kV images were acquired, 2D/3D registered, volume of interest (VOI) selected and auto-match function applied (Image 2). The match was checked and accepted by two experienced imaging radiographers. Vertical, longitudinal, lateral, yaw, pitch and roll displacements were recorded but not applied. A CBCT was acquired, 3D/3D registered, VOI similar to the kV selected and auto-matched and accepted (Image 2).

Results: The kV and CBCT results were compared and differences calculated (Image 1). In the translational planes there were no differences. The rotational measurements were compared in SPSS using a t-test for normally distributed data. There was no statistical difference between the imaging methods (p=0.916).

Conclusion: This small study suggests that 2D/3D kV imaging is comparable to 3D/3D CBCT and must be considered as an alternative modality to ensure practice is reflective of the ALARP principle.

kV 2D/3D						Rot CBCT						Rot Difference								
Vert	Long	Lat	Yaw	Pitch	Roll	Magnitude	Vert	Long	Lat	Yaw	Pitch	Roll	Magnitude	Difference	Vert	Long	Lat	Yaw	Pitch	Roll
0	0	0	0.1	0.4	0.1	0.4	0	0	0	0.3	0.2	0.1	0.4	0.1	0	0	0	0.2	0.2	0
0	-0.3	-0.3	-0.5	-0.8	-2.8	3.0	0	-0.3	-0.3	-0.1	-0.9	-3	3.1	0.2	0	0	0	0.4	0.1	0.2
0	0	0.1	-0.9	-0.2	0.1	0.9	0	-0.1	0.1	-1.2	-0.2	0.1	1.2	0.3	0	0.1	0	0.3	0	0
0	-0.8	0.6	0.9	-1.5	5.3	5.6	0	-0.8	0.6	0.7	-1.7	5.9	6.2	0.6	0	0	0	0.2	0.2	0.6
0.3	0.6	0	-0.8	-4	0.9	4.2	0.3	0.6	0	-0.9	-3.9	0.8	4.1	0.1	0	0	0	0.1	0.1	0.1
0	-0.2	0.4	-3	1.2	1.5	3.6	0	-0.3	0.4	-3.1	0.9	1.5	3.6	0.0	0	0.1	0	0.1	0.3	0
0.4	1.6	0.5	0.1	-4.5	6.1	7.6	0.4	1.6	0.5	0.3	-4.6	6	7.6	0.0	0	0	0	0.2	0.1	0.1
0.7	3.1	-0.4	-1.2	-7.8	-2.4	8.2	0.7	3.1	-0.4	-1.1	-7.8	-2.5	8.3	0.0	0	0	0	0.1	0	0.1
0.3	1.1	-0.5	-2.5	-4.6	-4.5	6.9	0.4	1.1	-0.5	-2.6	-4.8	-4.4	7.0	0.1	0.1	0	0	0.1	0.2	0.1
0.3	0.6	-0.5	-1.7	-4.2	-3.3	5.6	0.3	0.6	-0.5	-1.2	-4.3	-3.8	5.9	0.3	0	0	0	0.5	0.1	0.5



P151 Streamlining the image-guided radiotherapy process for proton beam therapy: A service evaluation

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Background: Modern radiotherapy requires image-guidance to ensure precision and accuracy of treatment delivery^{1,2}. To implement image-guided proton beam therapy at our Proton Beam Therapy Centre, the following 3-step image workflow was implemented: (i) 2-dimensional kilo-voltage (2DkV) image acquisition for gross positioning assessment, (ii) 3-dimensional cone-beam computed-tomography (CBCT) acquisition to assess target volumes and organs at risk, and (iii) repeat 2DkV to confirm translational and rotational corrections, before delivering treatment. This study reports on an evaluation to assess the feasibility of reducing this to a 2-step imaging process, thereby reducing overall treatment time and unnecessary imaging doses.

Methods: Imaging data was collated from 20 patients to evaluate (i) initial 2DkV imaging dose, (ii) elapsed time between 2DkV and 3DCBCT acquisition, (iii) concordance of set-up error for 2DkV and CBCT image registrations, using Pearson's Correlation Coefficient.

Results: 229 fractions were evaluated (per patient: range 8-19). 19 (8.3%) fractions required patient repositioning following the initial 2DkV. The 3-step imaging process increased the imaging dose by 3.4mGy on average for all patients over a whole treatment course, and required a mean additional time of 5.1 minutes (range: 3.3 to 9.9) compared to the 2-step process.



Correspondence between the mean displacements from the initial 2DkV and CBCT images for all treatment sites was high, with $R=0.94$, 0.94 and 0.80 in the anterior-posterior, superior-inferior and right-left directions respectively.

Conclusion: A 2-step workflow reduces imaging dose and treatment times, thus improving efficiency and overall service capacity and has been implemented at our Centre in non-GA cases.

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P152 Perception of diagnostic radiographers on oncology care: An effective use of skills for a quality cancer care

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GenesisCare UK

Background: Numerous approaches and growing attention have been devoted in the oncology unit to improve the value of patient care. However, in diagnostic imaging, there are limited efforts that clearly address the needs and requirements of oncology care. In addition, diagnostic radiographers perspective in the context of cancer care are not explicitly defined. The present research aims to develop a framework to optimize patient care. More specifically, the study examined the providers' perceptions concerning the activities they perform to meet the needs of a cancer patient. The results are to be framed within the existing literature as a measure of the quality of the healthcare service provided.

Method: A qualitative research using an online focus group was done. Diagnostic radiographers completed a survey monkey questionnaire to assess their perceptions of oncology care. The study was conducted in 5 private oncology units in the UK.

Results: The result explicitly identifies key principles for oncology care: providers' interpersonal skills, defining provider care roles, patient education to care information and individualized patient care. The correlation of reports was assessed and linked to relevant literature that closely reflects the ideas of personalized care.

Conclusion: The proposed framework highlights the importance of incorporating providers' perspectives into shared cancer care plans. This consideration has promoted the perception of diagnostic radiographers in creating models that may thus be encouraged to benefit patients in the oncology setting. In line with the relevant literature, technical and professional skills of practitioners concur to define the framework of overall enhancement

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P153 A narrative comparison of therapeutic radiographer competencies in Croatia, Slovenia and the United Kingdom

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Background: Therapeutic radiographers (TR) are members of multi-disciplinary-team (MDT) consisting of oncologists, physicists and dosimetrists as well as nurses. RT's are professionals directly responsible for daily administration and clinical treatment of patients. The term 'competence' is defined as accomplishing a task gaining the knowledge, skills and behaviour required. Despite national guidelines and regulations, there are similarities, but also differences in competencies of TRs in Croatia, Slovenia and the United Kingdom. Working in these countries, I have gained enough knowledge and experience to narratively compare those competencies.

Purpose: The European-Society-for-Radiotherapy-and-Oncology (ESTRO) published a core curricula for educating the MDT to promote and encourage harmonised education programmes, facilitating mobility between European union (EU) member states reflecting the rapid development these professions. Cultural differences play a major role which is considerable between Slavic and Anglo-Saxons cultures. I narratively compare educational systems, their differences and would suggest that majority of them have foundations in education, despite ESTROs efforts and recommendations to harmonise the education system. Development of radiotherapy is dynamic contributing to quick progress and expansion of TR's knowledge and competencies. At the same time RT's have become a critical member of the team. With the evolution of radiotherapy, competencies should follow that and adjust roles, duties and responsibilities.

Summary: The EU offers an opportunity for free flow of workforce and knowledge, and therefore our profession should be more connected in order to diminish discrepancies. Mutually we should share experiences and make contributions to understanding and overcoming of differences adjusted to changes in radiotherapy.



P154 An assessment of health workers' perception of cancer screening participation in Nigeria

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Background: Breast and Cervical cancers are a global public health problem. Internationally, there has been substantial rise in the incidence of Breast and Cervical cancer and cancer screening has been advocated as a means of reducing cancer mortality. Cancer screening participation has been low in Nigeria due to various factors. This study aimed to assess health workers' perception of five factors affecting uptake of breast and cervical cancer screening by Nigerian females.

Methods: A cross-sectional study of fifty health workers from healthcare facilities in Lagos, Nigeria was carried out. Questionnaires were used for data collection and statistical analysis done using Statistical Package for Social Sciences (SPSS) version 20.

Results: 64% of the respondents were within the age bracket of 25- 39years, while 74% of them are married. 56% of the respondents were female and respondents were mostly doctors (38%) and radiographers (42%). The years of experience of the respondents were within 5-15years (52%) and less than 5years (30%) respectively. Majorly, Government owned health workers (86%) were the respondents of this study. Current equipment to patient ratio (40%) was rated as bad. 60% of respondents rated patients' perception of female screening staff as good, while staff availability (48%) and training programs for screening staff (42%) were majorly rated as fair and bad respectively.

Conclusion: Female screeners are preferred by patients, compared to male screeners. More screening staff and training programs for screening staff are required, increased number of equipment needed for screening is also indispensable for improved screening participation.

SERVICE DELIVERY AND INNOVATION

P155 To formulate and implement a robust feasibility governance pathway for the use of 'healthy' volunteers for research test scans within the Imaging department at the University Hospital of North Midlands NHS Trust

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An incidental finding (IF) recommending further follow up care by a radiologist on a healthy volunteer research test MRI scan was found not to have been acted upon 15 months after the examination by a small audit. This 6 month project considered the causes that led to this incident and put forward a case for change, using both quantitative and qualitative data with the aim of improving governance for healthy volunteers using the model for improvement (plan do study act) approach. A pathway for the management of incidental findings for healthy volunteer scans, including the need for consent was formulated as this was found to be supported by literature and a wider audit. Measuring volunteer experience was also deemed crucial to the project to reflect the importance of patient experience within the context of the wider NHS constitution. Analysis of the methodology and findings and personal reflections on leadership skills and development were also incorporated into the project to emphasise lessons learned providing vital experience and knowledge for future projects. Despite a delay to implementation there is confidence that the pathway will improve governance for volunteers, however this will take time to measure as on average only 1 volunteer is scanned per month. Embedding the changes within the department will be the main challenge as research shows that up to 70% of change fails to survive (NHS 2010). In response to this the Sustainability Model (NHS, 2010) was used to identify strengths and weaknesses increasing its probability of success.

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P156 Eliciting consent from patients with dementia in general X-ray departments: Law, ethics and interpretation of context

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Background: While the numbers of individuals suffering from dementia syndromes in the UK steadily increase, many practitioners in the allied healthcare professions, and particularly junior staff, still feel ill-equipped for face-to-face communicative encounters with such individuals (Miller et al., 2019; Tullo et al., 2016). An elemental feature of effective communication in healthcare contexts is the seeking of proper consent to perform given procedures. The propositions above, however, raise questions regarding how 'properly' consent is being acquired when dementia is at stake. This paper, thus, reports findings from a qualitative study of general radiographers' experiences of acquiring consent from patients with dementia, specifically exploring participants' interpretations of correct legal and ethical practice therein.

Methods: With institutional ethical approval, N=6 general radiographers with less than ten years of clinical experience were recruited to sit for extended interviews. Verbatim transcripts were analysed using the domain-established techniques of Interpretative Phenomenological Analysis (Miller et al., 2017).



Results: Four key areas of extremely variable interpretation and practice were identified. (1) How to assess capacity for informed consent; (2) How to effectively modify communication when gaining consent; (3) Managing carer involvement during consent-acquisition and; (4) Constituting the 'best interest' of the patient.

Conclusion: Participants' own accounts often indicated that they were often not lawfully implementing the Mental Capacity Act (MCA) when acquiring consent. Moreover, as previously identified by Miller et al. (2019), the situational confusion did little for participants' confidence, with prospectively damaging import for future encounters. Stronger training in practical application of the MCA is recommended.

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Miller PK, Woods AL, Sloane C and Booth L (2017) Obesity, heuristic reasoning and the organisation of communicative embarrassment in diagnostic radiography. *Radiography* 23(2): 130-134.

Tullo ES, Young TJ and Lee RP (2016) Medical students' views about person-centred communication in dementia care. *Dementia* 17(5): 573-584.

P157 Imaging silver trauma: Outcome and resource implications

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Introduction: Elderly trauma (>65 years old) accounts for more than 20% of all major trauma in the UK^[1]. Older patients inevitably have reduced physiological reserve and a higher incidence of co-morbid disease, resulting in trauma such as low-level falls leading to significant injuries requiring radiological investigation. This has increased the demand on radiological services. Our study explored the differences and impact of trauma imaging on patients aged below and above 65.

Methods: A retrospective study was performed on all patients (n=213) referred for a trauma CT scan at West Middlesex University Hospital, a district general hospital in London from January to December 2018. Data regarding scan timings and report findings was collected.

Results: It took significantly more time from clinician request to CT scanning (p=0.0001), and from CT scanning to reporting (p=0.0099) for post-65 year olds compared to pre-65 year olds. Only 61% of scans were being reported within the 1-hour time-frame expected by RCR standards^[2]. There were no liver, spleen or kidney trauma related injuries reported within both age groups. Furthermore, a higher number of incidental findings were reported amongst the post-65 age group. This included insignificant findings (p=0.00065) requiring no follow-up, and significant findings (p=0.00026) such as potential malignancies requiring further medical assessment. Follow-up imaging of this cohort reported no confirmed malignancies.

Conclusion: Our results suggest that silver trauma scanning is significantly more resource intensive and requires greater medical input. This calls for re-evaluation of trauma and radiological services to meet the increasing demands of silver trauma.

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P158 Redefining best practice in radiology for patients with cognitive impairments experiencing 'Sundowning' phenomenon

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It has long been reported that there is often a difficulty in obtaining optimal imaging in patients who are suffering from Alzheimer's or Dementia. This can result in a stressful experience for not only the patient, but also for staff and family/care-givers. A study was undertaken with the aim of reducing these stressful situations by educating staff and utilising the information about the patient not limited to just the clinical question. Sundowning is a phenomenon which is characterised by the emergence of symptoms such as agitation, confusion, anxiety and aggressiveness, particularly in the late afternoon ^[2]. Studies suggest that up to two-thirds of patients with dementia can suffer from this condition ^[3]. Initially, information was gathered from Radiographers about the compliance of patients in this patient group. It was found that more successful examinations were performed in the mornings ^[1], with most difficulty in the late afternoon/early evening. In order to improve the situation for both patients and staff, referrers were asked to provide information about the patients cognitive state at the time of request, in a separate field to the clinical question and justification of the examination. This allowed Radiology staff to utilise this information to tailor the time of the examination to the needs of the patient whenever possible, allowing for a stress-reduced and patient focussed service for this those with cognitive impairment. Patients are given priority for early appointments. Initial feedback from care-givers and staff demonstrate an improvement in patient experience.

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P159 New Concept: 'TARN Friendly Trauma Reporting' (What Radiologists say really does matter)

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The regional trauma network consists of 1 trauma centre and 4 trauma units with an overarching governance structure. Trauma Audit Research Network (TARN) provides a national benchmark and assessment of networks, providing reports on mortality and key performance indicators at regular intervals. TARN database requires accurate injury description to provide an Injury Severity Score (ISS) which informs performance and best practice tariff (BPT), of which the majority of data is extracted from imaging reports. 6 months of TARN data was reviewed across the 5 trusts with information on imaging undertaken, MOI, ISS and injury descriptors. Patients with an ISS near to a BPT boundary of 9 and 16 (5-8 and 11-15) then had their imaging reviewed by radiology trainees with direct reference to the ISS coding manual. Injuries were then re-coded and ISS recalculated. 1693 patients were identified from the 5 hospitals over the 6 months. 169 (9.9%) patients met the inclusion criteria for review. 38 (22.4%) had a change in abbreviated (region specific) injury code, with 33 (19.5%) a change in the resultant ISS. 3 had a decrease in ISS and 30 increased ISS with all 30 moving across an BPT and 3 moving across 2 payment tariff boundaries. Data analysis demonstrated that with re-coding a potential of £15000 of lost revenue from the MTC alone. Reporting with reference to ISS description improves accuracy of ISS significantly. Radiologists improving the description specific injuries and adopting a TARN Friendly reporting may improve data accuracy for TARN and both performance and finances of the trust.

P160 Primary care imaging pathway audit; Evaluating the effectiveness of a local GP CT KUB referral pathway

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Acute renal colic is common, 12% of men and 6% of women. Gold standard for imaging acute renal colic is CT KUB. GP CT KUB pathways offer general practitioners direct access CT imaging for patients with suspected renal colic, avoiding the emergency department. This audit aims to evaluate the effectiveness of the local primary care renal colic pathway.

Methods: Retrospective study obtaining data from radiology database CRIS: 01/04/2017 - 17/04/2019 all patients on GP CT KUB pathway at a tertiary NHS trust. Renal colic defined as a stone within the ureter, or evidence of recent stone passage.

Alternative radiological diagnoses explaining symptoms were recorded. Demographics stratified patients into gender and age: 18-49 years and those aged > 50 years. Standards used were the CT KUB primary care pathway audit 2016.

Results: 521 patients; average positive renal colic 9% (47/521), significant alternative diagnosis 4% (20/521). Largest patient cohort female aged 18-49 years; lowest positive renal colic results 1.6% (2/148) and highest alternative diagnosis rate 6% (9/148). Conversely, male patients aged 18-49 years, smallest patient cohort; highest positive renal colic rates 15% (16/104) with lowest alternative diagnosis 1.9% (2/104). Male patients 50 years or older were most likely to have cause for their symptoms diagnosed 20.2% (29/143).

Conclusion: Imaging pathway at our institution has low yield and limited management impact as compared to the standard (diagnostic yield 20%). Recommend local GP forum feedback with pre-test probability STONE score to target imaging. Consider alternative diagnosis/referral delay in females 18-49 years.

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<https://www.rcr.ac.uk/audit/radiological-investigation-renal-colic-following-introduction-ctkub>

2. Moore C et al. Prevalence and clinical importance of alternative causes of symptoms using a renal colic Computed Tomography protocol in patients with flank or back pain and absence of pyuria' *Acad Em Med* 2013; 20: 470 - 478.

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P161 Adequate contrast enhancement of CT pulmonary angiograms

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¹Royal Albert Edward Infirmary; ²University Hospital Coventry & Warwickshire; ³The Pennine Acute Hospital NHS Trust; ⁴Nevil Hall Hospital

Background: Suboptimal enhancement of pulmonary angiograms leads to non-diagnostic studies and therefore unnecessary exposure to contrast and radiations. Published research suggests that a level of 210 HU is required in a vessel to identify chronic thrombus from enhancing thrombus. Acute thrombus has lower attenuation than chronic and therefore the vascular enhancement can be lower but still distinguishable from the thrombus.

Method: A retrospective study was done by evaluating 50 consecutive CTPAs -- June to August 2019. Level of 210HU in the main pulmonary artery was defined as level for acceptable enhancement. Target was defined as no more than 11% of CTPAs having HU <210 in the main pulmonary artery.



Results: 4 out of 50 scans had suboptimal opacification. It was found that overall 8 % of CTPAs had HU <210 in main pulmonary artery.

Conclusion: Researchers have suggested that approximately 10.8% of CTPAs can be suboptimal based on all causes including poor contrast enhancements and motion artefacts. Based on this Optimal enhancement target was achieved. However, it was advised to further educate the team and repeat audit in a year time to ensure that standards are maintained.

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P162 Learning from radiation incidents: A 4-year evaluation of the causative factors in a single NHS Trust

Helen Adamson

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Background: Patient safety is a national priority and learning from incidents is an important method in improving safety in healthcare environment.^[1] Although the number of nationally reported radiation incidents dropped in 2017-18, CT continues to yield a large proportion.^[2]

Method: A retrospective mixed methods project was undertaken at a single multi-site NHS Trust. All incidents involving a CT radiation dose greater than intended were examined using data from the DATIX system (online incident reporting system), root cause analysis minutes and the radiology information system. Thematic analysis of the qualitative data was undertaken.

Results: A greater number of incidents were recorded on Mondays and Wednesdays, consistent with national data. Eight key themes were identified, including supply chain management, high reliability working, culture (both poor and open). The results revealed there is a 1:1000 chance of an incident occurring at this Trust with no significant difference between sites.

Conclusion: Where a systems approach to the incident review and management was adopted, the causative element was not repeated, whereas the person approach did not prevent recurrence.

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P163 Audit cycle on image guided biopsy: Success rates, complication rates and documentation of consent

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Background: Image guided biopsies require appropriate and contemporaneous consent^[1]. This enables clinicians to explain and justify their involvement in the consenting process later. Inadequate biopsy samples cause diagnostic delays if on-site services are not available to assess adequacy of the sample at the time of the procedure.

Purpose: To assess 100% documentation of consent for all image guided biopsy procedures at our Trust. To report image guided biopsy yields with a view to build a case for introducing pathology services checking adequacy of samples for lab analysis if yields are deemed low.

Summary: Computerized Radiology Information System (CRIS) was searched for Ultrasound and CT guided biopsies occurring between January-December 2018. Data collected included written documentation of consent, adequacy of sample and any diagnostic delay. The re-audit included data between August-September 2019. Through random sampling, 60 biopsies were included in the initial audit with 58 adequate samples (96.7% yield) and a diagnostic delay of 3 months each for the two inadequate samples. Appropriate documentation of consent was done in 67% of cases. The audit was presented and discussed at the departmental meeting. Biopsy yields were deemed within acceptable levels. Plan agreed to standardize consenting by scanning all completed consent forms onto CRIS. Staff informed using email, posters and discussions. Re-audit included 50 biopsies with 48 adequate samples (96% yield) and no diagnostic delays. 100% of the procedures had appropriate consent documentation. Our audit led to a direct positive change in practice for consent documentation.

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P164 Prudent reporting of plain films

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Introduction: In our local hospital all emergency department (ED) plain film reports are printed and physically delivered to the referrer, often several days after the x-ray examination. Individual communication methods vary regarding highlighting abnormalities ahead of formal reports. This historical arrangement reflects the ED paper-based notes system. Following mis-delivery of a radiology report, an ombudsman's report recommended robust systems to ensure the referrer reviews radiology reports appropriately and responsibly. We approached contemporary Radiology departments to compare local practice.

Methods: An electronic survey was emailed to Wales-based Radiologists and reporting radiographers. Questions explored how abnormal x-rays are communicated and recorded; who actions advisory repeat films and which reports are printed. Responses were collected over a 4-week period.



Results: 27 individuals from 6 health boards responded. 47% indicated all radiology reports are printed; 5% print abnormal films only. 38% were unsure which are routinely printed. 75% were unaware if plain film abnormalities have been identified prior to the formal report unless electronic radiographer highlights are placed. 70% highlight important findings to the referrer verbally or via email. 74% indicated ED actions advisory repeat films; 24% were unsure who actions them.

Conclusion: Inconsistency across South Wales was demonstrated regarding awareness of ED reporting practices, highlighting of plain film abnormalities and paper printing. Paper printing practice is a significant ongoing administrative cost and risks information governance breaches. We consider there to be an overwhelming argument for a national paper-free electronic reporting system to reduce printing cost and improve communication between clinicians and radiology.

P165 Improving access to complex imaging for suspected scaphoid fractures: A feasibility study of extremity CT

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Background: The confirmation, or exclusion, of scaphoid fractures is a diagnostic challenge with centres being unable to implement the 2016 NICE guidelines^[1] around MRI as a first-line imaging tool. Clinical pathways vary across the UK with most following an overtreatment regimen to minimise morbidity and litigation.^[2,3]

Methods: A 2-month prospective single-centre study has evaluated the impact of a new pathway incorporating cone beam CT (Carestream OnSight 3D Extremity System) on the day of initial ED attendance with virtual follow-up to ensure patient recovery. Comparison with a retrospective cohort has enabled comparison of healthcare resource utilisation, including imaging tests and patient visits.

Results: Data collection and analysis is ongoing. The CBCT scan has been effective in streamlining the patient pathway. Early results demonstrate greater efficiency, reduced staff time and patient follow-up whilst maintaining the quality of clinical care. Validated patient reported outcomes measures for this cohort are being used to determine the benefit of early access to CBCT.

Conclusion: The integration of new technology into patient care pathways requires robust evaluation. The reduction in patient and health service costs justifies the adoption of new technologies into practice however further research is required to compare different diagnostic pathways.

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P166 Introducing audiologist led referrals for MRI scans of the IAM

Darren Hudson; Mohammed Al-Khateeb

InHealth

Background: InHealth aims to deliver quality added diagnostics by introducing innovative pathways and extra procedures which will help audiologists manage patients more appropriately and guide GPs to better onward referrals. In keeping with our focus on innovation, we have set up an internal direct referral pathway allowing an audiologist to request MRI scans for patients presenting with certain clinical manifestations.

Purpose: Direct referral to MRI scan from audiology departments with suspected hearing loss is now becoming standard practice nationally, providing appropriate training and pathway(s) are in place. Traditionally, where unilateral symptoms exist, Audiologists refer to ENT, however it is becoming increasingly more common practice for Audiologists to refer directly to MRI. Audiologist led MRI direct referrals bring clinical, operational and financial benefits to the healthcare system. Clinical benefits include; reduced patient anxiety, rehabilitation and intervention. Operational benefits include; shorter waiting times, better appointment utilisation, less referrals made and direct access. Financial benefits include the elimination of two medical professionals (ENT and GP) unless relevant abnormal results are detected.

Summary: This poster provides an overview of the change in patient pathway as a result of introducing audiologist led referral to MRI and provides an outline of training given to support safe and effective referrals by this group of non-medical referrers.

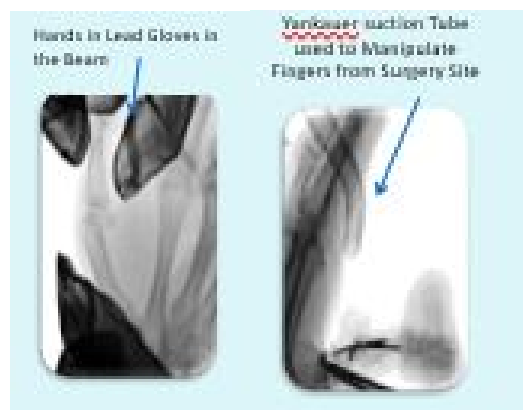


P167 Radiology and theatres collaboration – Innovative idea to explore dose reduction and optimisation for image intensifier (mini c arm) - hand surgery

Janet Dark

Queen Victoria Hospital

Background: IR(ME)R17 Section 12 Optimisation of Radiation dose as per Mini Image Intensifier Standard Operating Procedure, Radiology monitor mini II usage, recording dose, screening times and reviewing the saved images (a representation of the surgery performed). The images are reviewed: surgeons hands do not appear in the main beam, no excessive amount of 'non-essential' metal work present, the radiation dose is to be kept below a 9.44 cGycm². Radiology wanted to offer an alternative solution to assist with dose reduction and optimisation. Specialist Hand surgeons require the digits to be moved during surgery



for assessment. Explore innovative ideas to reduce dose by reducing amount of metallic instruments used to move digits.

Methods: The suggestion to use of an alternative plastic instrument was taken by 2 leading hand surgeons and trialled. Selection criteria for any substitute/alternative should consider the following: as long as the forceps are rigid, not metallic or dense material, readily available, sterile already, no 'significant' cost implications and suitable for purpose First step answer: trial a Yankauer Suction tube.

Results: Radiation dose - No recordable change Surgeons Review - A very positive first step. Unexpected measurable result- Recorded 'fingers in the beam' cases have reduced by approx. 50% (2018 to 2019). It has assisted in bringing Radiation Awareness to the forefront for Consultants, Registrars and Theatre Staff alike.

Conclusion: Positive steps in raising Radiation Awareness. Collaboration and thinking outside of the box is how innovative ideas are born.

P168 Cauda equina syndrome (CES): Are we scanning quick enough?

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Introduction: Cauda equina syndrome (CES) is a severe type of spinal stenosis where the nerves in the lower back become severely compressed (NHS, 2018). This audit aims to investigate the timescale in which patients attending accident and emergency (A/E) are scanned after presenting with CES symptoms, since implementing the trust's rapid access spine pathway (RASP). RASP gives referrers the opportunity to discharge patients and organise an urgent MRI scan for the patient the following day as an outpatient. Prompt surgery is the best treatment for patients with CES and preferable within 48 hours for a more positive prognosis (AANS, 2019).

Method: A retrospective audit was undertaken sampling all accident and emergency (A/E) patients that had CES symptoms from October 2018-November 2019 (Including RASP patients). The time scale was measured from when the request for the scan was put on the Radiology Information System (RIS), to when the patient was scanned and then the scan was reported. The data will then be put into categories of 1-6, 6-12, 12-18, 18-24 and >24 hours.

Results: 378 patients were scanned during this period. 94.9% of patients were scanned within 24 hours. 128 were scanned in the first 6 hours. 19 scans were scanned after 24 hours. 93.4% of scans were reported within 3 hours of being scanned.

Conclusion: Recommendations from the audit include Band 6 radiographers being able to vet CES examinations. A designated CES scanning slot being made available daily for patients being discharged overnight to ensure a more efficient RASP.

1. American Association of Neurological Surgeons AANS (2019) Cauda Equina Syndrome <https://www.aans.org/Patients/Neurosurgical-Conditions-and-Treatments/Cauda-Equina-Syndrome>.

2. NHS (2018) When its used? Lumbar decompression surgery <https://www.nhs.uk/conditions/lumbar-decompression-surgery/why-its-done/>.

P169 An analysis of referral pathways for open and upright MRI – Is there a variation in referrers' policies?

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Background: Open MRI scanners lack a tunnel-like bore, being open at the front or sides, and so may be preferable for claustrophobic or larger patients. Most also allow upright scanning. A need exists to refer NHS patients for investigations using this niche imaging service. This study critically analysed NHS referral policies to document variations and suggest improvements.

Method: A search for policies in England relating to referral for open MRI available on the internet was undertaken. Selection criteria were applied including NHS referrers only and policies issued since 2016.

Results: 16 policies were identified. All allowed referral for large patients in terms of size, weight or obesity, ten related only to obese patients. 15 allowed referral for claustrophobic patients. 14 specified claustrophobic patients must have first attempted a



conventional MRI under sedation. Upright scanning was not routinely funded in 7 policies. 6 would allow referral if the patient was unable to lie flat, and 5 stated the patient must experience pain when lying flat. Only 4 would consider open upright referral if a weight-bearing scan was needed. Justification for non-referral for upright scanning was evidenced using literature but references were largely out-of-date.

Conclusions: Regional policy variations mean referral is inconsistent. Policies could be better constructed to take account of patient size rather than obesity alone. Policies need to acknowledge that many claustrophobics are unable to tolerate conventional MRI even with sedation. Upright referrals should not rely solely on pain criteria. Policies need up-to-date literature to justify decisions.

P170 Post-mortem computed tomography in clinical application

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The introduction of multi-detectors row CT in post-mortem examinations has been recent innovative method of identifying the cause of death. Relatively low costs, quick turnover time and ease of operation make this more attractive to the conventional autopsy examination. Several studies in the literature have confirmed both post-mortem CT and conventional autopsy provide comparable findings with higher sensitivity of CT for skeletal and vascular lesions. With shortage of forensic pathologist in the NHS, the clinical utility of post-mortem CT is going to expand further. The purpose of our pictorial review is to familiarise audience with this innovative but expanding approach to identify cause of death. A brief discussion on imaging techniques will be outlined along with examples of interesting cases in our clinical practice at first NHS hospital to provide such a service to the local coroners.

1. Jeffery AJ. The role of computed tomography in adult post-mortem examinations: an overview. *Diagnostic histopathology*. 2010;16(12):546–551.

2. Roberts IS, Traill ZC. Minimally invasive autopsy employing post-mortem CT and targeted coronary angiography: evaluation of its application to a routine Coronal service. *Histopathology*. 2014;64(2):211–217.

OTHER

P171 Are you sitting comfortably? Tips for designing an ergonomic radiology reporting workspace

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Background: With the ubiquitous use of digitized reporting, radiologists are amongst the most sedentary of doctors, spending up to 8 hours daily sat at reporting stations^[1]. In addition to the inherent increased cardiovascular risks of IT based working, poorly designed workspaces can lead to musculoskeletal pain, headaches, eyestrain and fatigue^[2]. Conversely, well designed, ergonomically considered workspaces have multifaceted benefits. By serving to improve staff wellbeing and health by preventing workplace injuries (e.g RSI) and improving comfort, staff absences are reduced and productivity increased leading to better workflow efficiency and preventing reporting backlogs. By reducing fatigue and providing efficient soundproofing and lightening, diagnostic accuracy is improved and clinical errors reduced^[3].

Purpose: As many hospital radiology departments plan to expand or redesign their reporting workspaces in response to increasing work volume, this poster offers a guide based on our recent experience at the Royal Cornwall Hospital, drawing on Health and Safety Executive workspace and Display Screen Equipment regulations and Royal College of Radiologists Ergonomics guidance. This poster details design features specific to the radiology reporting workspace with regards to soundproofing, lightening, temperature control and ventilation. Monitor and mouse placement, desk and chair ergonomics with particular reference to sit/stand desks are discussed including some features unique to our department which we feel improves our working environment and team cohesion.

Summary: After the successful redesign of our reporting environment at Royal Cornwall Hospital we would like to share this pictorial guide to designing ergonomic reporting spaces, summarises the relevant HSE/DSE regulations and RCR guidance.

1. Lamar et al. 2015. Sedentary Behaviour in the Workplace: A Potential Occupational Hazard for Radiologists. *Curr Probl Diagn Radiol*. 2016 Jul-Aug;45(4):253-7.

2. Carter JB, Banister EW. Musculoskeletal problems in VDT work: a review. *Ergonomics* 1994; 37:1623-1648.

3. Harisinghani et al. 2004. Importance and Effects of Altered Workplace Ergonomics in Modern Radiology Suites. *RadioGraphics* Vol. 24, No. 2.

P172 JREQUEST – Appropriate clinical information pending

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Background: The request information for each radiological study is the only formal communication between the referrer and the reporter. Accurate and relevant clinical information greatly aids the reporter in interpreting the study and leads to better and safer patient care^[1].

Methods: A 'JREQUEST' audit code was added to each report in all modalities where the reporter deemed the clinical information inadequate. A CRIS search between 13/08/19 - 31/10/19 produced 202 results. The data collected included study



type, date, referrer name, department and grade. Each study was then evaluated to determine the cause and appropriateness of the audit code and the impact on image interpretation.

Results: The audit code was used appropriately in 191 of the 202 studies. Of these, a lack of clinical information in the following categories were identified: previous cancer history (51%), previous relevant surgical intervention (24%), lack of presenting complaint (9%), relevant medical history (8%) and location of symptoms (6%). Inadequate clinical information affected image interpretation in 66% of the studies, of these, the primary diagnosis was affected in 77%. The most common referring departments were A&E (38%), Medicine (30%), Surgery (16%) and GP (14%). The most common imaging modality affected was CXR (93%).

Conclusion: A lack of relevant oncology and surgical history led to unnecessary ambiguity in image interpretation (predominantly CXR's) and identification of the pertinent findings. It is important to demonstrate the value of accurate clinical information to the referring clinician as this will aid the work of the reporter and ultimately improves patient care.

1. The Royal College of Radiologists. Standards for interpretation and reporting of imaging investigations, second edition. London: The Royal College of Radiologists, 2018. Ref No. BFCR (18).

P173 Accuracy of patient positioning in abdominal CT examinations

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Background: Previous research has confirmed that when utilising dose modulation patient positioning in the isocentre of a CT scanner is required to optimise radiation dose and image quality. All CT radiographers therefore should be aware of the need to ensure correct positioning of patients, however recent literature has suggested this is not the case.

Method: A random sample of 100 abdomen & pelvis CT examinations were reviewed covering an 8-month period across 3 hospital sites. Table-height data for each event was recalled. The AP diameter, and the midpoint, of each patient was calculated from the CT images, enabling direct comparison with the isocentre. Acceptable positioning was considered to be +/-3cm of the isocentre. Patient referral route and arm position was also recorded for each event. Radiographer anonymity was maintained.

Results: Only 29% of patients were positioned in the isocentre. On average patients were positioned 4cm below the isocentre (range -10 to +2cm), with no notable differences between hospital sites. The patient referral type or arm position (arm-up or arm-down) did not appear to influence the outcome.

Conclusion: CT staff may be unintentionally positioning patients in a position that they feel is correct, but is in fact too low. It is feasible that the scanner parameters could be reduced while maintaining image quality and thereby optimising radiation dose.

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2. Habibzadeh, M.A., Ay, M.R., Asl, A.K., Ghadiri, H. and Zaidi, H., 2012. Impact of miscentering on patient dose and image noise in x-ray CT imaging: phantom and clinical studies. Physica Medica, 28(3), pp.191-199.
3. Kaasalainen, T., Palmu, K., Reijonen, V. and Kortensniemi, M., 2014. Effect of patient centering on patient dose and image noise in chest CT. American journal of roentgenology, 203(1), pp.123-130.
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6. Sukupova, L., Vedlich, D. and Jiru, F., 2016. Consequences of the Patient's Mis-centering on the Radiation Dose and Image Quality in CT Imaging Phantom and Clinical Study. Universal Journal of Medical Science, 4(3), pp.102-107.
7. Toth T, Ge Z, Daly MP. The influence of patient centering on CT dose and image noise; Med physcis assessment
8. Zhang, Jie & Raslau, Flavius & Hill, Nathan & J Escott, Edward. (2016). Patient positioning when using a bowtie filter in computed tomography imaging. Radiologic technology. 87. 680-685.

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