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# An evaluation of a training tool and study day in chest image interpretation

Mc Laughlin, L., Johnstone, G., Nesbitt, L., McFadden, S., Hughes, C., Bond, RR., & McConnell, J. (2022). *An evaluation of a training tool and study day in chest image interpretation*. 12. Abstract from UK imaging and oncology congress, Liverpool, United Kingdom.

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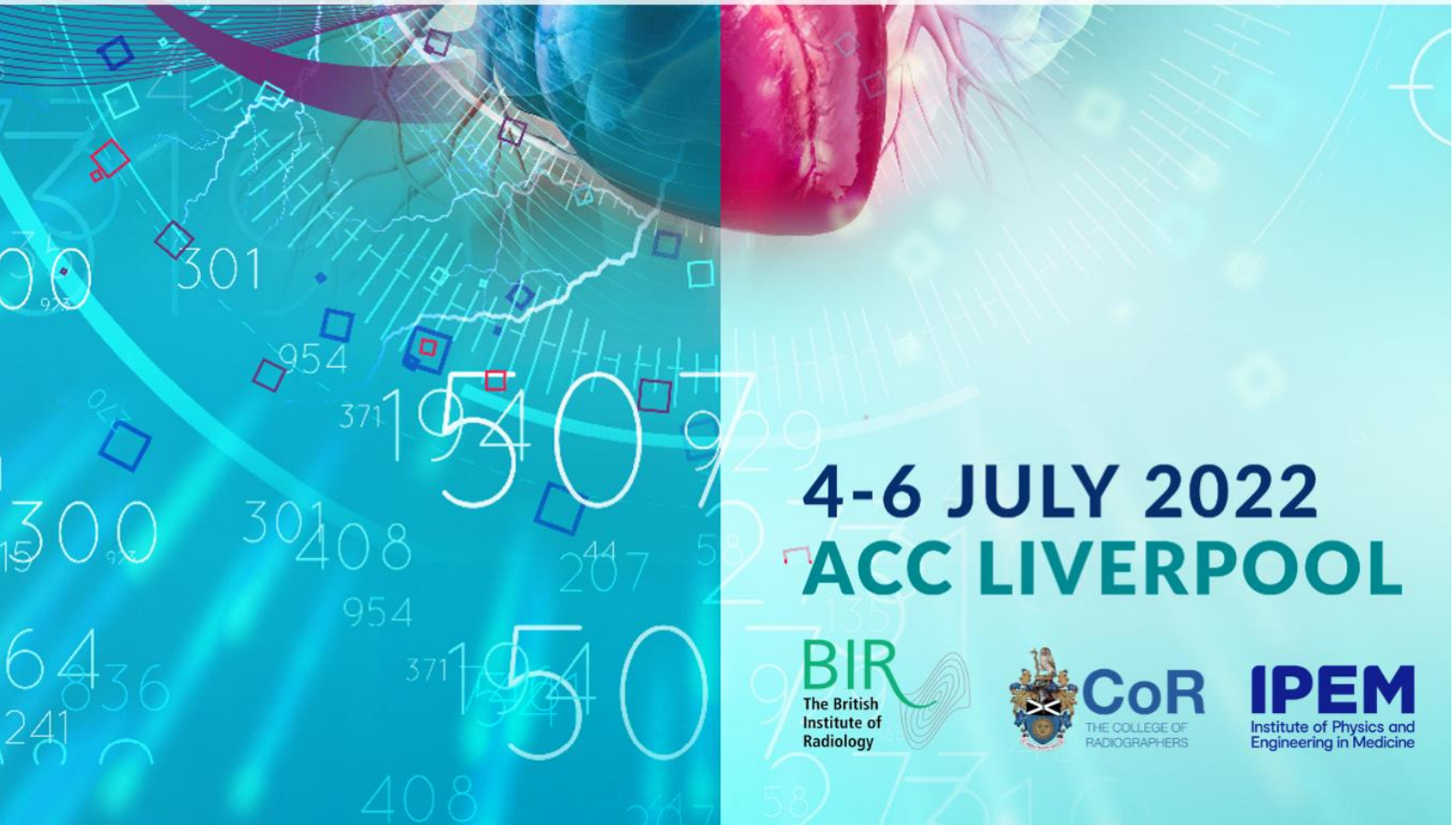
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CONGRESS 2022



# HARNESSING DISRUPTION

## CLINICAL EXCELLENCE IN A TIME OF CHAOS

# ABSTRACT BOOK



**4-6 JULY 2022**
**ACC LIVERPOOL**

BIR The British Institute of Radiology

CoR THE COLLEGE OF RADIOGRAPHERS

IPEM Institute of Physics and Engineering in Medicine

# Proffered papers: Patient-centred

## B5.1 Exploring patient perceptions of compulsory face mask wearing due to Covid-19 pandemic regulations during magnetic resonance imaging examinations

*Alexandra Partner; Carolyn Costigan*

Nottingham University Hospitals NHS Trusts

**Background:** Historically, healthcare staff are trained to wear PPE in a clinical environment. For patients, wearing masks during procedures and scans is a new experience and one that should be evaluated. Anxiety in patients undergoing MR imaging has long been recognised, along with the causes and strategies to support patients through this (Quirk et al 1989, Enders at al 2011 and Dewy et al 2007). It is already known that some low-cost interventions such as sensory stimulation involving sound or olfactory can improve patient experience (Stanley et al 2016) but patient experience of wearing masks remains unknown.

**Methods:** The overarching approach to this research is phenomenology. The study explores the experiences of patients wearing surgical grade masks for MRI scans during the C-19 pandemic. This is a qualitative study using thematic analysis to analyse the data collected. Inductive thematic analysis was undertaken to look for key themes or patterns in the open comment questions (Boyatzis, 1998). An electronic survey was the source of data collection. Ethical approval was granted from the research and ethics committee for this study. Purposive sampling will be utilised to include anyone who has had an MRI scan of any body part during C-19 in the United Kingdom. Inclusion criteria will state that only adults over the age of 18 who were asked to wear a mask are included. This study was funded by CoRIPS.

**Results:** Data collection is ongoing and will be complete in the new year.

**Conclusion:** Conclusions from the study will be drawn once data analysis is complete.

1) Boyatzis,1998). RE. Transforming qualitative information: thematic analysis and code development. Thousand oaks CA: SAGE Publications; 1998 2) Dewey M, Schink T, Dewey CF: Claustrophobia During Magnetic Resonance Imaging: Cohort Study in Over 55,000 Patients. J Magnet Reson Imag. 2007, 26: 1322-27. 10.1002/jmri.21147. 3) Enders, J. Zimmermann, E. Rief, M. Martus, P. Klingebiel, R. Asbach, P. Klessen, C. Diederichs, G. Bengner, T. Teichgraber, U. Hamm, B and Dewy, M. (2011). Reduction of claustrophobia during magnetic resonance imaging: methods and design of the "CLAUSTRO" randomized controlled trial. BMC Medical Imaging volume 11, Article number: 4 4) Quirk, M. Letendre, A. Ciottone, R and Lingley, J (1989). Anxiety in patients undergoing MR imaging. Radiology. Vol 170 [2] 5) Stanley, E. Cradock, A. Bissett, J. Mcentee, C and O'Connell, M. (2016) Impact of sensory design interventions on image quality, patient anxiety and overall patient experience at MRI. British Journal of Radiology. 89. 20160389

## B5.2 It's personal: Patient-reported data and the future of the diagnostic pathway

*Clare Webber[1]; Tim Williams[2]; Lesley Ann Smart[3]; Peter Strouhal[1]*

[1]Alliance Medical; [2]My Clinical Outcomes; [3]GE Healthcare

**Background:** Patient Related Outcome Measures (PROMs) can better personalise and optimise patient care than looking at measurable processes, like scan to report turnaround times. My Clinical Outcomes' web-based platform that remotely automates collection and analysis of data (PROMs) could give better insight into patient access for scans and treatment outcomes.

**Purpose:** Alliance Medical looked at lymphoma patients attending for PETCT scans throughout their treatment journey, from diagnosis to follow-up, across England; meaningful variation in outcomes can be identified by comparing differences between sites, clinician and treatment cohorts e.g. access by postcode; treatment success/failures. Results are available in real-time in patient and clinician dashboard to inform individual patient care. Advanced analytics and AI on the platform enable detailed statistical evaluation of aggregate data to help increase value by focussing improvement efforts and reducing less effective processes or treatments.

**Summary:** Alliance Medical invited all eligible lymphoma patients to register (several hundred); completing validated cancer Quality of Life assessments at multiple time points from before their first PETCT scan just after diagnosis and throughout the treatment journey; analysing ease of access, referrer and region, symptomatology - at each scan visit and in between. Review of the data analytics will be discussed to illustrate where improvements can be made by the service provider (including any interim changes implemented) for patients and clinicians. The new approach will be

evaluated from a patient, referrer, and service value perspective with opportunities to adjust and expand the approach assessed.

1. Devlin, N.J., et al., (2018). *Valuing health-related quality of life: An EQ-5 D-5 L value set for England*. Health economics, 27(1), pp.7-22.
2. Scott, NW, et al. & EORTC Quality of Life Group (2008), *EORTC QLQ-C30 Reference Values Manual*. 2nd edn, EORTC Quality of Life Group, Brussels, Belgium

### B5.3 Patient Reported Experience Measures (PREMs) across the North-west of England

*Daniel Hutton[1]; Thomas Hall[2]; Shelley Shuttleworth[3]; Paul Booker[3]; Tony Murphy[1]; Daniel Saunders[2]; Helen Clements[3]; Lesley Woods[4]*

[1]Northwest Radiotherapy Network; [2]The Christie NHS Foundation Trust; [3]Lancashire Teaching Hospitals NHS Foundation Trust; [4]Clatterbridge Cancer Centre NHS FT

**Background:** Existing cancer patient experience surveys are valuable, although lack a focus on radiotherapy. This promoted the Northwest Radiotherapy Operational Delivery Network (NWRODN) to develop a specific radiotherapy survey. The Northwest Radiotherapy Patient Experience Survey: this was distributed to patients across the three North West radiotherapy providers. The results will aid the network by identifying areas to focus on to enhance the quality and experience of services.

**Methodology:** A project team was established who reviewed the 2012 National Radiotherapy. Through collaboration the survey was reformed, ensuring it reflected the present healthcare settings. The survey was restructured, including removal, retention and addition of new questions. This was distributed in the summer, utilising digital rollout via text message and also codes. Therapeutic Radiographers supported as clinical champions to assist patients completing the survey in the departments.

**Results:** There were 651 respondents. Key results revealed that 98% of patients rated care as very good/excellent. Also 94% were treated with dignity. In addition, 98% had confidence in their health professionals. However, 25% of patients did not receive written information about post treatment care and 13% were not offered a copy of their consent. 61% reported receiving their treatment at or within 20 minutes of the specified time. When delayed, 28% reported not being kept informed.

**Conclusions:** The results are reassuring and also identify some areas for improvements, such as post treatment care and improving daily waiting times. The intention is to run the survey nationally in 2022 using the Radiotherapy ODN structure.

### B5.4 Patients' unmet needs - a patient-centred approach to care

*Margot McBride*

Lancaster University

**Background:** Although willing to strive towards a more patient-centred approach when diagnosing and treating our patients, time to do this, is often our greatest challenge. The use of Health-related Quality of Life (HRQoL), studies have enabled practitioners to unambiguously measure health status allowing an objective assessment of the impact of a disease, the efficacy of a medical intervention; and their patients perceptions of care. Sadly, growing referral lists, treating patients' unmet needs can be forgotten.

**Method:** A 2020 HRQoL survey was conducted on 86 patients diagnosed with Cushing syndrome. Included in the survey questionnaire were questions related to their unmet needs. The transcripts of the answers were analysed using thematic analysis.

**Results:** The overarching themes identified that patients often feel panic, fear and anger when waiting too long for their appointments and the psychological effects of waiting for their results causes undue stress. Patients' rarely share these feelings with their physicians. Lack of time during the visit, embarrassment over their own feelings, thoughts, and concern about, "bothering," their healthcare provider with "minor," problems, are some of the reasons why certain psychosocial needs remain unaddressed. Misconceptions about the consequences of their condition prevents patients from elaborating adequate strategies of psychological adjustment. Patients would like to receive more information on procedures, therapy options, consequences of treatment, pathogenesis and psychological support.[1]

**Conclusion:** Health services should be proactive in informing their patients on how to self-manage and develop coping and adaptation strategies as part of their patient-centred care and encourage them to join focus groups and patient education programmes.

1 McBride M et al, (2021). Quality of Life in Cushing syndrome. Best Practice & Research Clinical Endocrinology & Metabolism. January 2021, Vol. 35, Issue 1, 101505

### B5.5 Research exploring lung cancer patients' experience of radiology and radiotherapy services

*Meera Sharma[1]; Charles Simpson[2]; Rosemary Godbold[2]*

[1]City University; [2]University of Hertfordshire

**Background:** Lung cancer is the leading cancer death worldwide and the third common cancer in the UK (World Health Organisation (WHO), 2020 & Cancer Research UK, 2021). The technological advances for support, diagnosis or management for patients' conditions and the growing population has increased demands of healthcare including radiology and radiotherapy services. The UK population is estimated to rise to 72.9 million by mid-2041, of which 54% will be from direct and indirect migration (Office for National Statistics (ONS), 2017). This suggests an increase in NHS use and a need to transform practice to uphold the NHS constitution and values within the context of such populations. Early diagnosis and screening with appropriate treatment improves survival outcomes. However, health inequalities in lung cancer incidence and mortality exists amongst deprived communities including people from ethic minority and poor socio-economic groups (Powell, 2019). These individuals are unlikely to access services affecting their health and survival outcomes.

**Aim:** To investigate patients' experiences accessing radiology and radiotherapy services for lung cancer diagnosis and treatment. The study will explore patient diversity including ethnicity and generic determinants of health variables.

**Methodology:** Recruitment for this mixed study is purposive sampling including patients following the lung cancer referral, diagnosis and treatment using open interviews. The eligible participants to be recruited through NHS trusts.

**Impact:** It will be used to inform education, future practice and lung cancer strategies in the UK. It will identify the drivers and barriers patients encounter accessing radiology and radiotherapy services including invitation uptake.

1. Cancer Research UK (2019) Lung Cancer Mortality. 2. ONS. (2017, May 20). Office for National Statistics. Retrieved from Office for National Statistics: https://www.ons.gov.uk/ 3. Powell, H.A. (2019) Socioeconomic deprivation and inequalities in lung cancer: time to delve deeper? Thorax, 74(1), 11-12. 4. World Health Organisation (2020) WHO Report on Cancer: Setting Priorities, Investing Wisely and Providing Care for All.

### B5.6 The impact of moulage on emotional labour

*Naomi Shiner*

University of Derby

**Background:** The practice of emotional labour is used to display an organisational acceptable demeanour; however, it is associated with burnout. Emotional reactions can alter behaviours when working with patients with open wounds, potentially negatively impacting the student and patient. This research evaluated the use of moulage to prepare students in advance of clinical placement.

**Method:** A longitudinal quasi-experimental design and mixed methods approach captured students (n=97) feelings related to seeing open wounds. Visual analogue scales recorded students' emotional trends pre- and post-simulation and in clinical practice. Twenty-four focus groups (n=5) were analysed thematically following the simulation debrief. Semi-structured interviews (n=7) were undertaken with students following clinical practice. These were analysed using Interpretative Phenomenological Analysis. All three data sets were triangulated to develop meta-inferences.

**Results:** Statistically significant changes were found in students in the simulation group, with improved emotional preparedness and a reduction in negatively valenced emotions. Three meta-inferences were developed: Simulation to reality, knowledge is power and emotional support.

**Conclusion:** The simulation provided additional experience improving students' emotional preparedness and reducing anxiety in clinical practice. The use of moulage promoted a similar emotional trend as experienced in a real situation. Students gained a better understanding of their emotions, patient-centred care, teamwork, and peer support. Information transfer and emotional support between radiographers and students requires improvement. Evidence indicates the implementation of a simulation using moulage to introduce students to an open wound ahead of clinical placement, has a positive impact on emotional labour.

# Proffered papers: Novel education

## C7.1 Development of a virtual reality (VR) tool to support therapeutic radiography (TR) students in dealing with difficult or challenging conversations

*Nick White[1]; Thomas Hughes-Roberts[2]; Vanessa Cui[1]*

[1]Birmingham City University; [2]University of Derby

**Background:** Higher Education Establishments (HEIs) are currently under increasing pressure to recruit and retain therapeutic radiography students.1 Initial experiences of clinical placement are associated with placement-shock 2 as students are faced with cancer patients for the first time. This can include difficult or unexpected conversations. Such experiences may not match students' previous assumptions regarding placement. Effective strategies are therefore required by HEIs to prepare students for these interactions.

**Purpose:** This paper reports on our progress of a project in which a VR tool has been developed and piloted. We have created practice-situated VR simulations that focus on scripts based upon experiences that current students have had with patients during their placements. These are designed to be appropriate to new students but retain those elements that make the experience relatable and therefore meaningful and impactful. We will present detail regarding the bespoke prototype design and research methodology of this study.

**Summary:** The design stage of our work was informed by four sources of knowledge: 1. Insights provided by students and staff; 2. literature review on learning to deal difficult/unexpected conversations 3. Theories on human behaviour and reflective learning on situated experiences; 4. Current practical and theoretical knowledge on VR and conversation simulation. Analysis of interviews with students has provided rich data which have realised scenarios which enable novice learners to engage with challenging situations within a virtual reality radiotherapy clinic. These have enabled our development of a teaching and learning tool that enables a new pedagogical approach to placement preparation.

1. Health Education England. 2018. Reducing Pre-registration Attrition and Improving Retention Report. Available at: https://www.hee.nhs.uk/our-work/reducing-pre-registration-attrition-improving-retention accessed December 2021 2. Hyde, E. 2014. A critical evaluation of student radiographers' experience of the transition from the classroom to their first clinical placement. Radiography, 21. 242-247.

## C7.2 New models of clinical education - pre-registration IV cannulation training for student radiographers

*Jennifer Jones*

University of Plymouth

**Background:** The skill of intravenous cannulation has been a prerequisite for diagnostic radiographers working in MRI/CT/IVUs since 1996. However, the training is undertaken after graduation and as a qualified radiographer. The training itself is usually at Level 6, which is the same as the 3rd year in an undergraduate diagnostic radiography programme. With an increase in cross-sectional imaging, and in preparation for more radiographers required in these modalities, the University of Plymouth incorporated IV training into the undergraduate syllabus. This training follows the College of Radiographers guidance.

**Purpose:** This module has run for the first time in September 2021 and the aim of this paper is to show the steps required to ensure that competence is achieved on service users, how this was achieved, and if there were any barriers to this skill being learnt, especially as previously it is the remit of HCPC registered radiographers. In order to ensure the students are not overwhelmed with content in this module, and using a spiral curriculum, certain aspects including anatomy and physiology, medicines management, contrast media and management of emergencies are taught in previous modules and revisited in this module.

**Summary:** An overview of the steps required; input from service departments and feedback from students.

1. College of Radiographers;Course of Study for the Certification of Competence in Administering Intravenous Injections. Society of Radiographers https://www.sor.org/getmedia/fcc1fc7c-d02d-4707-b9a5-a385b48cbf80/SoR_IV_Document_proof3.pdf_1

### C7.3 Realising the potential of podcasting as a tool to drive continual professional development and service improvement in cancer care

*Jo McNamara; Naman Julka-Anderson*

Imperial College Healthcare NHS Trust

**Background:** By 2024 it is expected that 19.39 million people will be listening to podcasts. Currently 40% of 26 - 39-year-olds listen to podcasts on a weekly basis (Statista, 2021). Rad Chat is the first oncology specific podcast designed for cancer patients, healthcare professionals, researchers and academics. Two hosts Jo McNamara and Naman Julka-Anderson are therapeutic radiographers with unique backgrounds, bringing specialist knowledge and skill into the conversation. The podcast promotes radiotherapy and the role of therapeutic radiographers, attracting a wider demographic of audience and links patient experience to healthcare transformation and improvement in an accessible way. The need for more inclusive and diverse methods of Continual Professional Development (CPD) have been recognised in response to healthcare practitioners disclosing their learning needs.

**Purpose:** The hosts are interviewing guests, including patients, experts and professionals from across oncology, relying on semi-structured interviews. The content of each podcast must fit within one of the core themes: education and workforce development, people living with and beyond cancer, equality, diversity and inclusion and leadership. Evidence based practice and research is important to feature in all episodes, as the podcast is accompanied by reflective questions for those wishing to use it to evidence accredited CPD.

**Summary:** So far, 2,914 listens, 273 subscribers from 9 countries across the world in two months. Higher Education Institutes from across the world are integrating the podcast into the curriculum. Patients are accessing support and services advertised through the podcast and HCP's have improved and developed practice as a result of listening https://radchat.transistor.fm/.

1. Statista (2021) Podcasts in the UK, Statistics and Facts. https://www.statista.com/topics/6908/podcasts-in-the-uk/ (accessed 14.12.21).

### C7.4 Unlock your career potential: An escape room initiative

*Kathryn Jones*

University of Cumbria

Radiography as a career has advanced and there are now a wide variety of opportunities and pathways available in the field. However, for many students, there seems to be a heavy emphasis on, and education towards, conventional routes such as X-Ray, CT, and MRI. Little discussion of alternative avenues such as forensic and interventional radiography overtly take place. Consequently, a notion arises as to whether we are doing enough to promote career progression and transferability to the future workforce.

Supported through the Council of Deans Student Leadership Programme, this poster showcases an escape room initiative to explore alternative career pathways using puzzles to unlock different career talks. Developed by an undergraduate radiographer, this initiative was undertaken to increase student and early-career radiographer engagement in, and awareness of, 8 less conventional pathways. The initiative demonstrated that a career in radiography does not need to be linear, and once qualified different roles can be built upon to formulate a diverse career portfolio, with no limitations or requirement to remain within conventional routes. This poster aims to inspire people to think more widely about radiographer careers and provide insight into student engagement using an innovative concept to provide information and impact student perceptions.

This poster will be a visual representation of the virtual escape room career event initiative, acting as a focus point for discussion with UKIO participants. It will encourage students and current radiographers to develop and maximise their own career pathways and hopefully improve retention and fulfilment of the future workforce.

### C7.5 What is 'knowledge mobilisation' and how can it improve radiography education?

*Kirsty Patel*

Birmingham City University

**Background:** Knowledge mobilisation (KMb) can be described as sharing knowledge across communities to stimulate change (1). It is an emerging topic within health and education literature (2), and particularly effective in both facilitating collaboration across stakeholder boundaries (3) and promoting evidence-based practice (4). Within the diagnostic radiography (DR) profession, KMb has been explored briefly regarding research implementation (5,6,7) yet

this research tends to focus only on explicit, research-based, forms of knowledge. There is also a gap in the literature linking the use of KMb specifically to DR education.

**Purpose:** The aim of the poster is to introduce KMb theory to the radiography profession and the potential for further research with relation to DR education.

**Summary:** This poster will give an overview of KMb research associated with health and education. It will also provide a critical review of the current portrayal of knowledge and knowledge sharing in DR education literature. Further to this, it will examine the potential for KMb to be used as a tool for further research to be carried out in this area.

1. Wye, L., Bolton, H., Thomas, C., Hopewell-Kelly, N., & Gibson, A. (2021). Knowledge Mobilisation, Communications & PPI Compared. NIHR Health Protection Research Unit in Behavioural Science and Evaluation at University of Bristol. Available at: https://www.hprubse.nihr.ac.uk/knowledge-mobilisation/ [Accessed: 07/12/2021] 2. Davies, H. T., Powell, A. E., & Nutley, S. M. (2015). Mobilising knowledge to improve UK health care: learning from other countries and other sectors-a multimethod mapping study. Health Services and Delivery Research, 3(27). 3. Appleby, B., Cowdell, F., & Booth, A. (2020). Knowledge mobilization in bridging patient-practitioner-researcher boundaries: A systematic integrative review. Journal of Advanced Nursing, 77(2), 523–536. 4. Ferlie, E., Crilly, T., Jashapara, A., & Peckham, A. (2012). Knowledge mobilisation in healthcare: A critical review of health sector and generic management literature. Social Science and Medicine, 74(8), 1297–1304. 5. Di Michele, L., Thomson, K., McEntee, M. F., Kenny, B., & Reed, W. (2020). Knowledge translation: Radiographers compared to other healthcare professionals. Radiography, 26, S27–S32. 6. England, A., & McNulty, J. P. (2020). Inclusion of evidence and research in European radiography curricula. Radiography, 26, S45–S48. 7. Munn, Z. (2020). Why isn't there an evidence-based radiography? Reflections and a call to action. Radiography, 26, S14–S16.

## Proffered papers: History

### D8.1 A history of PET|PET-CT in the UK

*Arpan K Banerjee[1]; Wai-Lup Wong[2]*

[1]International Society for the History of Radiology; [2]Mt Vernon Hospital

Positron Emission Tomography [PET] and more recently Positron Emission Tomography/ Computed Tomography [PET/CT] are the two most recent diagnostic modalities to be introduced into clinical practice. Paul Dirac first postulated the existence of the positron particle in 1928 and Carl D Anderson in 1932 introduced the term positron. David Kuhl and others introduced the concept of emission tomography in the late 1950's in Pennsylvania and work by Phelps and others in Washington led to further developments with Phelps credited with inventing the first PET camera in 1973. Early scanners were confined to imaging the brain. The first whole body PET scanner became available in 1977. The production of isotopes for scanning became available due to the work of Ernest Lawrence on the cyclotron in the 1930's at Berkley, California. The Massachusetts General Hospital in Boston (G Brownell and colleagues) also played a major role in advances in PET scanning. PET/CT was initially proposed by David Townsend (at the University of Geneva), Ronald Nutt (at CPS Innovations in Knoxville, Tennessee, USA) and colleagues. An early prototype system was installed in 1998 in Pennsylvania, USA. PET- CT hybrids came into use from about 2000 onwards and improved image resolution. In this talk the development of clinical PET services in the UK will also be discussed.

Reference Wong W L and Banerjee A.K (2021) A brief history of PET and PET/CT services in the UK Invisible Light: The Journal of the British Society for the History of Radiology 49 p5-12

### D8.2 L.H Gray (Physicist and Radiobiologist): His life (1905-1965), laboratory (1957-2008) and legacy

*Edwin Aird*

Retired Physicist

LH Gray has been called "the Father of Radiobiology' by E Powers when he was writing an appreciation of the impact Gray had in the USA.

His early life will be described, leading to the establishment of: "The Gray Laboratory "at Mount Vernon Hospital, Northwood in 1957.

His Legacy will be discussed, which includes President of BIR 1949-1950; seminal papers (1953,1955) considering the role of oxygen in tumours and the possibility of manipulating the oxygen level in the body to enhance tumour damage; and the Bragg-Gray theorem that links the ionisation in a small air volume to absorbed dose, the unit of which: The Gray, was adopted by the ICRU in 1975.

Hal Gray was a true polymath. In 1982 Peter Wardman (Joint Executive of The Gray with Barry Michael in 1999) wrote: "Gray must have been the first scientist to have a thorough appreciation of current activity in all 4 sectors of radiation research: physics, chemistry, biology and medicine".

His studies in tumour hypoxia, taken forward by his colleagues at the Lab, are his most important legacy.

### D8.3 Exploring the equilateral: Why are medical images rectangular?

*Michael Jackson*

Royal Hospital for Children and Young People, Edinburgh

Radiological images are almost exclusively constructed and viewed in a rectangular format - a seemingly obvious and banal statement to imaging professionals. However, the origins of rectangular image format and the constraints it imposes upon how we view the body requires consideration to fully understand the past and present of medical imaging, and to help shape its future in the best interest of patients. This paper draws upon early precursors of digital image capture including tapestry and the reticolato grid used by early pioneers of linear perspective, together with more recent rectangular framing devices (such as cinematic aspect ratio) to demonstrate why a well-rounded approach to imaging individuals will be required in the era of Artificial Intelligence.

### D8.4 Neuroradiology and philology as presented in *The Doctor is sick* of 1960 by Anthony Burgess

*Adrian Thomas*

Canterbury Christ Church University

The relationship between a patient and radiography is developed in The Doctor is Sick written by Anthony Burgess (1917-1993) in 1960. Edwin Spindrift, the central character, is investigated in the neurosurgical department of a London hospital for a suspected brain tumour. Edwin is a linguist and there is much discussion of words and their origins in the book. The book is semi-autobiographical since Burgess himself collapsed whilst teaching history. The character of Doctor Eddie Railton, who looks after Edwin in the novel, is based on Sir Roger Bannister (1929-2018) the London neurologist who looked after Burgess and arranged for the investigations. The relationship of the patient to the image of the patient, and to how the image is obtained is a complex one. The description by Burgess of being on the receiving end of medical imaging is a fascinating account by a writer of the first order. Maintaining the correct balance between efficiently obtaining a diagnostic result from a complex radiological study and the patient not becoming simply a passive object is not an easy one, either then or now. The themes of the relationship between image and reality are even more relevant now than in 1960, as the virtual and the real become progressively less distinct and will be discussed.

Burgess, A. (1960) The Doctor is Sick. Heinemann: London. Thomas, A.M.K. (2022) The Invisible Light. Boca Raton: CRC Press (in press)

## Proffered papers: Paediatrics and Head & Neck

### E5.1 The role of the radiographer in a children's hospital during the COVID-19 pandemic

*Clare Simcock*

Great Ormond Street Hospital for Children NHS Foundation Trust

**Background:** The impact of the COVID-19 pandemic is far reaching, and radiographers have played a vital role in the diagnosis of this new virus. Fortunately, most children don't become seriously unwell with COVID-19. Despite increased rates of infections in children, hospitalisation rates remain very low at 1-5 in 100,000. [1]. However, a very rare and new condition associated with COVID-19 infection has been identified called Paediatric Multisystem Inflammatory Syndrome (PIMS-TS). This has led to a new referral pathway for imaging of these patients and required adaptation to current clinical practice.

**Purpose:** This poster aims to describe this new syndrome and its associated symptoms. Children with paediatric multisystem inflammatory syndrome temporally associated with COVID-19, develop a significant systemic inflammatory response. This rare syndrome shares common features with other paediatric inflammatory conditions including Kawasaki disease, staphylococcal and streptococcal toxic shock syndromes, bacterial sepsis and macrophage

activation syndromes. It can also present with unusual abdominal symptoms with excessive inflammatory markers. Early recognition by paediatricians and specialist referral including to critical care is essential [1]

**Summary:** This poster will describe the clinical pathway for these patients and the diagnosis, imaging and management of this newly emerging syndrome. This poster will demonstrate imaging findings associated with a number of a cases who presented at our institution and their associated clinical outcomes.

[1] 2021 RCPCH Guidance: Paediatric multisystem inflammatory syndrome temporally associated with COVID-19 https://www.rcpch.ac.uk/resources/paediatric-multisystem-inflammatory-syndrome-temporally-associated-covid-19-pims-guidance (Accessed 12.12.21)

### E5.2 Don't get your bowels in a twist

*Nida Mushtaq; Elliot Elwood; Josephine Bretherton*

Chelsea and Westminster Hospital NHS Foundation Trust

**Background:** Acute intestinal obstruction is a common paediatric surgical emergency and should be considered in any child presenting with vomiting, abdominal pain, and abdominal distension. Many causes of bowel obstruction arise from congenital anomalies and two or more anomalies can be present. In these rare cases, recognition of the underlying cause of obstruction can be particularly challenging on imaging [1,2]. We describe an interesting case of a 19-month-old-boy who presented acutely with non-bilious vomiting and symptoms of bowel obstruction. CT imaging was performed after an abdominal x-ray and ultrasound did not narrow the diagnosis. Interpretation was particularly challenging, and a dilated tubular structure seen in the left upper quadrant was felt to represent an inflamed appendix with an associated bowel obstruction. A background of a rotational bowel anomaly was also thought to be present given the SMA/SMV orientation and left-sided large bowel loops [3]. Intraoperatively this patient was found to have Meckel's diverticulitis which was seen as the dilated tubular structure on CT and resulted in acute bowel obstruction. These findings were seen on a background of intestinal malrotation.

**Purpose:** This case turned out to be an excellent learning case and highlighted some key learning points which were particularly useful regarding image interpretation on the background of rotational bowel anomalies. The poster will feature key CT images which correlate with the intra-operative findings.

1. Applegate KE, Anderson JM, Klatte EC. Intestinal malrotation in children: a problem-solving approach to the upper gastrointestinal series. Radiographics 2006; 26: 1485–1500 2. Pickhardt PJ, Bhalla S. Intestinal malrotation in adolescents and adults: spectrum of clinical and imaging features. AJR Am J Roentgenol 2002; 179: 1429–35 3. Joshi A, Kale K, Patil SB, Sankhe A. Isolated hindgut malrotation: a rare variant of intestinal malrotation. IJSS 2016; 2: 1.

### E5.3 Imaging and management of traumatic scalp artery pseudoaneurysms

*John Asquith; Mary Jones; James Davies*

University Hospital of North Midlands

**Background:** Pseudoaneurysms of the scalp arteries are rare. However, a pseudoaneurysm should be suspected in a scalp swelling that persists, particularly if following head injury. Superficial temporal artery pseudoaneurysms are more common than occipital. Investigation can be made by various imaging modalities and ultrasound can often be diagnostic without the need for ionising radiation or invasive angiography. A range of treatment options for scalp pseudoaneurysm have been described, which include direct pressure, surgical excision, thrombin injection and embolization. Due to the extensive collateral supply over the scalp surgical ligation is often the mainstay of treatment.

**Purpose:** We illustrate the imaging of scalp pseudoaneurysms. We consider and discuss different treatment options.

**Summary:** We present the imaging of occipital and temporal pseudoaneurysms and discuss the different management options, which include interventional radiology. Occipital artery pseudoaneurysms are relatively rare.

### E5.4 Radiological imaging of children with Osteogenesis Imperfecta at Great Ormond Street Hospital

*Jessica Eaton; Alistair Calder*

Great Ormond Street Hospital for Children NHS Foundation Trust

The term Osteogenesis imperfecta (OI) describes a group of genetic disorders characterized by bone fragility; In 85-95% of cases, the disorder is caused by heterozygous mutations in genes encoding type I collagen chains (Marini, 2020). Also known as "brittle bone disease", OI is characterized by varying degrees of bone fragility, deformity, low bone mass density and connective tissue problems. Approximately 300 children under 16 in England have severe, atypical or complex OI (DeVile et al, 2019). At Great Ormond Street Hospital (GOSH), the OI service is one of four

highly specialised services in England and provides care for approximately 100 of these children. The Trust provides a multidisciplinary care model, including highly specialised input from pharmacology, physiotherapy and imaging. This comprises of a weekly multidisciplinary clinic, an outreach service and an inpatient service for drug treatment and therapy interventions. This poster aims to showcase the radiographic techniques used at GOSH to monitor children with OI. It will outline imaging techniques used, the rationale behind them and how this method harnesses the clinical expertise of the Radiology team to provide an evidence-based, high-quality imaging service for children with OI. Learning outcomes include, how to safely image children with "brittle bones" and the importance of a multi- imaging modality approach. Most importantly, we aim to highlight that this multidisciplinary approach is essential for successful diagnosis and management of the condition.

### E5.5 Referred otalgia - pearls and pitfalls for the general radiologist

*Richard Chayto; Alan Eccles; Jack Looker; Nick Hollings; Ben Rock*

Royal Cornwall Hospitals NHS Trust

**Background:** Pain referred to the ear, known as referred (or secondary) otalgia, is a common presentation to the ENT surgeon. Its mechanism is complex, due to the confluence of multiple sensory pathways that include the cranial nerves V, VII, IX, X and cervical nerves C2 and C3, resulting in uncertainty of the central nervous system to pinpoint the exact location of the abnormality.
Referred otalgia is a 'reg flag' symptom for ENT surgeons, necessitating a thorough clinical history and examination, which includes review of the ear, oral cavity, teeth, temporomandibular joint, neck/cervical spine and fibreoptic nasendoscopy of the upper aerodigestive tract. It is common for the site of pathology to be clinically occult, especially if pathology lies at the skull base, postcricoid, submucosal or parapharyngeal spaces for example. Therefore, imaging plays a vital role in the diagnostic workup of referred otalgia.
It should be noted that the diagnostic yield of referred otalgia imaging for significant pathology is low (except in patients with past history of head and neck cancer). [1]Nevertheless imaging remains central to the referred otalgia diagnostic pathway to minimise risk of missing head and neck malignancy.

**Purpose:** To review the sensory pathways that supply the ear, to explore the regions of the head and neck that also share sensory innervation, and to demonstrate the important pathologies causing referred otalgia.

**Summary:** The poster will present a pictorial review of the relevant anatomy and important pathologies relevant to referred otalgia imaging, aimed at both general and head & neck radiologists.

1. Ainsworth, E., Pai, I., Kathirgamanathan, M. and Connor, S.E.J. (2020) Diagnostic Yield and Therapeutic Impact of Face and Neck Imaging in Patients Referred with Otalgia without Clinically Overt Disease. *American Journal of Neuroradiology*, 41(11), 2126-2131.

## Proffered papers: Imaging technology

### F6.1 Cardiac sorting in routine 4DCT data

*Mark Wrobel[1]; Lauren Pearson[1]; Alan McWilliam[1]; Mark Gooding[2]; Corinne Faivre-Finn[3]; Marcel van Herk[1]*

[1]University of Manchester; [2]Miranda Medical; [3]Christie NHS Trust

**Background:** 4DCT scans of lung cancer patients are used for radiotherapy planning. Respiratory motion is currently well defined. However, the heart is blurred due to cardiac motion leading to poor definition of substructures to be spared in the future. This leads to potential excess damage of such structures during radiotherapy. This project aims to correct standard 4DCT for cardiac motion and improve image quality.

**Method:** DICOM data from ten radiotherapy 4DCT scans (Phillips Brilliance Big Bore) was registered on the heart to compensate respiratory motion. Next, we find and merge slices acquired in different cardiac phases. The mean area of all slices as function of time shows pulsation of blood vessels in the neck. Fourier transform was performed to detect the heartbeat frequency and exact frequency and phase found by fitting a trial function to the data. Finally, the 4DCT scans slices were sorted based on the parameters and merged to obtain cardiac sorted scans.

**Results:** The heart can be seen at different points in the cardiac cycle in Fig.1. The beating heart outside diastole is shown in the left image causing blurriness and doubling of calcifications. Conversely, the right image shows the same slice location in diastole: the heart's vessels, chambers, calcifications and edge are sharp and well defined.

**Conclusion:** We are the first to post-process 4DCT data for radiotherapy to correct for cardiac motion. However, the method has only been tested in a limited number of patients and needs improvement for reliability.

1. Banfill, K., Giuliani, M., Aznar, M., Franks, K., McWilliam, A., Schmitt, M., Sun, F., Vozenin, M.C. and Finn, C.F., 2021. Cardiac toxicity of thoracic radiotherapy: existing evidence and future directions. Journal of Thoracic Oncology, 16(2), pp.216-227
2. McWilliam, A., Kennedy, J., Hodgson, C., Osorio, E.V., Faivre-Finn, C. and Van Herk, M., 2017. Radiation dose to heart base linked with poorer survival in lung cancer patients. European journal of cancer, 85, pp.106-113
3. McWilliam, A., Khalifa, J., Osorio, E.V., Banfill, K., Abravan, A., Faivre-Finn, C. and van Herk, M., 2020. Novel methodology to investigate the effect of radiation dose to heart substructures on overall survival. International Journal of Radiation Oncology* Biology* Physics, 108(4), pp.1073-1081
4. Van Herk, M., McWilliam, A., Banfill, K. and Faivre-Finn, C., 2020. PO-1742: Post-processing 4DCT to improve delineation of heart substructures. Radiotherapy and Oncology, 152, p.S967
5. Wolthaus, J.W.H., Sonke, J.J., Van Herk, M. and Damen, E.M.F., 2008. Reconstruction of a time-averaged midposition CT scan for radiotherapy planning of lung cancer patients using deformable registration a. Medical physics, 35(9), pp.3998-4011

### F6.2 Development of 3D-printed bolus to replace wax in head and neck radiotherapy

*Rhys Jenkins*

South West Wales Cancer Centre

Radiotherapy bolus refers to tissue-equivalent material placed on the patient's surface used to alter the dose delivery to superficial areas, such as skin. Wax is a well-known bolus material but presents issues such as variations in positioning compared to the treatment plan, inconsistencies in bolus thickness and the presence of air gaps between bolus and thermoplastic shell (Fujimoto et al., 2017). We sought a more robust and accurate alternative. 3D printing courses and visits to other departments helped in researching the most suitable, cost-effective printer and material, polylactic acid (PLA), as well as establishment of a pathway from planning to printing. Commissioning testing of the material took place including comparisons to wax, such as physical checks, surface measurements, percentage depth dose (PDD) measurements and uniformity testing as well as more clinical comparisons such as gamma evaluations of a standard VMAT plan with materials moulded to an anthropomorphic phantom. A quality control procedure was also designed to check the pathway from planning to printing. Printed bolus 'fits' into place on the thermoplastic shell with evidently less air gaps compared to wax. Positioning on shell is marked for more accurate reproducibility. 100% density PLA features comparable surface dose measurements and PDD profiles to wax. Gamma analysis for PLA was also comparable, with no unusual results. Water equivalence testing also allowed us to use 9mm-thick bolus rather than 1cm, saving printing time. 3D-printed bolus has now started to be used clinically, with improved dosimetry, timesaving for staff and positive feedback from treatment radiographers.

Fujimoto, K., Shiinoki, T., Yuasa, Y., Hanazawa, H., & Shibuya, K. (2017). Efficacy of patient-specific bolus created using three-dimensional printing technique in photon radiotherapy, *Physica Medica* 38, 1–9. https://doi.org/10.1016/j.ejmp.2017.04.023

### F6.3 Is Clarity ultrasound imaging an accurate method of localising the prostate compared to Cone Beam Computed Tomography (CBCT)- with fiducials?

*Harley Stephens*

University Hospitals Bristol

**Background:** Although fiducial marker insertion is regarded as the gold standard in terms of IGRT (1), its application must be considered carefully as the procedure can be invasive, time-consuming, and reliant on consultant expertise (2). Precision of the fiducial markers is dependent on these markers remaining in the same location and on the prostate not changing shape during treatment (3). To facilitate the acquirement non-ionising IGRT and intra-fractional prostate tracking, Clarity TPUS® (Elekta, Stockholm, Sweden) was developed (4). The main benefits of Clarity TPUS are that it is non-invasive, non-ionising and cost-effective (5). Other studies have compared fiducials to transabdominal US, which has since been proven to not be as accurate as trans-perineal, seen in this study.

**Method:** CBCT fiducial translations and Clarity TPUS translations for 12 prostate patients as part of the PACE-C trial were retrospectively evaluated by 3 imaging specialists.

**Results:**

Average shifts between 3 observers for CBCT+FM vs TPUS

| | Left/right | Sup/inf | Ant/Post |
|---|---|---|---|
| Pearson r | 0.821 | 0.916 | 0.849 |
| Average diff with 95% Confidence | -0.03 ± 0.33 cm | 0.12 ± 0.29 cm | -0.02 ± 0.39 cm |

The intra-class correlation coefficient (ICC)

| | L/R | S/I | A/P |
|---|---|---|---|
| CBCT+FM | 0.97 | 0.99 | 0.99 |
| TPUSS | 0.95 | 0.93 | 0.96 |

**Conclusion:** TPUS has the benefit of no additional dose and intra-fractional monitoring, and results show a high correlation between the different modalities. Inter-observer variability is to be considered, and further research with a larger population would be of benefit.

Srinivasan, K. Mohammadi, M. and Shepherd, J. (2014) Applications of linac-mounted kilovoltage cone-beam computed tomography in modern radiation therapy: a review. Polish journal of radiology, 79, pp.181 De Los Santos, J. Popple, R. Agazaryan, N. Bayouth, J. Bissonnette, J. Bucci, M. Dieterich, S. Dong, L. Forster, K. Indelicato, D. and Langen, K. (2013) Image guided radiation therapy (IGRT) technologies for radiation therapy localization and delivery. International Journal of Radiation Oncology• Biology• Physics, 87(1), pp.33-45 Han, B., Najafi, M., Cooper, D. (2018). Evaluation of transperineal ultrasound imaging as a potential solution for target tracking during hypofractionated radiotherapy for prostate cancer. Radiat Oncol 13, 151. Lachaine, M. and Falco, T. (2013.) Intrafractional prostate motion management with the Clarity Autoscan system. Medical physics international. 1 pp. 72–80

### F6.4 Muon tomography for clinical imaging: preliminary modelling-based results

*Jorg Tiit[1]; Karen Knapp[2]; Andi Hektor[1]; Madis Kiisk[3]; Märt Mägi[3]; Christina Hrytsiuk[1]; Egils Avots[1]; Volodymyr Gulik[1]; Andrea Giammanco[4]; Eduardo Cortinagil[4]; Jack Spencer[2]; Haitham Zaraket[5]*

[1]KBFI, Akadeemia tee 23; [2]University of Exeter; [3]GScan OU; [4]Université catholique de Louvain; [5]Université Libanaise

**Background:** Development of ultra-high angular resolution tracker technology means that muons can be used for medical imaging for the first time. The purpose of this study was to provide an understanding of a cosmic-ray based tomographic system's theoretical capability of detecting osteoporosis.

**Method:** We built the simulation models using CERN's Geant4 software, paired with CRY (Cosmic-Ray Shower Generator), with three cases compared - healthy bone, low bone density and osteoporosis consisting of: 34% Hydroxyapatite (HA), density 1.59g/cm3; 24% HA, density 1.46g/cm3 and 14% HA, density 1.35g/cm3 respectively. We simulated the detector hardware with 12 particle-tracking layers, combined with a cosmic-ray source (CRY). Particle counts corresponded to 3 and 15 minutes exposure at sea level. Analysis was performed using machine learning methods, based on Leave One Out Cross-Validation (LOOCV).

**Results:** A Kolmogorov-Smirnov test yielded a peak p-value of 9.96E-24 for a comparison between a healthy bone and osteoporosis, and 4.04E-09 for a healthy bone and a low bone density case, with respective D-Values of 0.02316 and 0.01415. Kullback-Leibler Divergence was 1.000 for 3min and 0.967 for 15min acquisitions, with respective RMSE of 0.600 and 0.533.

**Conclusion:** The modelling indicates that it would be possible to measure different densities and compositions of bone using cosmic-ray tomography. It underpins the potential of cosmic-ray tomography as a tool for early detection of osteoporosis without involving any additional ionizing radiation.

### F6.5 PACS: Direction of travel

*Pauric Greenan*

Greater Manchester Health and Social Care Partnership

PACS has always been in a continuous evolutionary state. 5-years is a time period that most consider a generation in PACS. Integrated Care Systems and Imaging Networks are now in charge, focusing on regional sharing and providing care as close to home as possible. Collaboration between hospitals, CDCs, and remote access comparable to in-hospital are key. The inclusion of 'other ologies' is now given and current trends are PACS-based-reporting, web, cloud, and integrated AI. Digital Pathology to set to explode and expects to slot onto PACS architecture! Fewer big players exist with two providers now having a 66% monopoly with most of the UK out to tender as part of large consortia. And with radiology arms of EPRs replacing traditional RISs, where will the cards land? There is the inherent contradiction of owning your own data yet handing it over to public cloud providers like AWS, Microsoft and Google. And with everyone moving to cloud, what happens with another WannaCry, how does your business continuity stack

up? The incessant overload of AI image reading algorithms (over 70 now), when the biggest need is for AI to do its magic on workflow! Boris scanners moving waiting for a scan, to waiting for a report. And if Covid highlighted anything it was the complete inadequacy of BI in current form, absent from any live or predictive modeling. This presentation will continue the conference disruptive adoption theme by leveraging on a recent very large UK PACS procurement across Greater Manchester to discuss current trends and direction.

## Proffered papers: Advanced practice & workforce development

### G7.1 An evaluation of a training tool and study day in chest image interpretation

*Laura McLaughlin[1]; Graham Johnstone[2]; Linda Nesbitt[3]; Sonyia L McFadden[1]; Ciara M Hughes[1]; Raymond Bond[4]; Jonathan McConnell[2]*

[1]School of Health Sciences, Ulster University, Northern Ireland, UK; [2]Queen Elizabeth University Hospital, NHS Greater Glasgow and Clyde, Scotland, UK; [3]Golden Jubilee National Hospital, NHS Golden Jubilee, Scotland, UK; [4]School of Computing and Mathematics, Ulster University, Northern Ireland, UK

**Background:** With the use of expert consensus a digital tool was developed by the research team which proved useful when teaching radiographers how to interpret chest images. The training tool included A) a search strategy training tool and B) an educational tool to communicate the search strategies using eye tracking technology. This training tool has the potential to improve interpretation skills for other healthcare professionals.

**Methods:** To investigate this, 31 healthcare professionals i.e. nurses and physiotherapists, were recruited and participants were randomised to receive access to the training tool (intervention group) or not to have access to the training tool (control group) for a period of 4-6 weeks. Participants were asked to interpret different sets of 20 chest images before and after the intervention period. A study day was then provided to all participants following which participants were again asked to interpret a different set of 20 chest images (n=1860). Each participant was asked to complete a questionnaire on their perceptions of the training provided.

**Results:** Data analysis is in progress. 50% of participants did not have experience in image interpretation prior to the study. The study day and training tool were useful in improving image interpretation skills. Participants perception of the usefulness of the tool to aid image interpretation skills varied among respondents.

**Conclusion:** This training tool has the potential to improve patient diagnosis and reduce healthcare costs.

1. McLaughlin, L., McConnell, J., McFadden, S., Bond, R. and Hughes, C., (2017). Methods employed for chest radiograph interpretation education for radiographers: A systematic review of the literature. Radiography, 23(4), pp.350-357. 2. McLaughlin, L., Woznitza, N., Cairns, A., McFadden, S.L., Bond, R., Hughes, C.M., Elsayed, A., Finlay, D. and McConnell, J., (2018). Digital training platform for interpreting radiographic images of the chest. Radiography, 24(2), pp.159-164. 3. McLaughlin, L., Hughes, C.M., Bond, R., McConnell, J., Cairns, A. and McFadden, S.L., (2021). The effect of a digital training tool to aid chest image interpretation: Hybridising eye tracking technology and a decision support tool. Radiography, 27(2), pp.505-511.

### G7.2 Experience of a diagnostic radiographer establishing a vague symptoms cancer pathway

*Julie-Ann Moreland[1]; Brian Nicholson[2]; Fergus Gleeson[3]*

[1] Macmillan Right By You; [2]Nuffield Department of Primary Care; [3]Churchill Hospital

**Background:** Vague symptoms pathways were developed in England by Cancer Research UK and Macmillan Cancer Support as part of the Accelerate, Coordinate and Evaluate Program. Funding was awarded to successful Hospital Trusts and Commissioners to develop their own vague symptoms pathway. The ambition of the program was to contribute to efforts to improve the numbers of early-stage cancer diagnosed and consequently improve survival. Our pathway was coordinated by the diagnostic radiology department working with primary care and general medicine within secondary care. The pathway is led by a diagnostic radiographer in a 'Navigator' role based in the diagnostic radiology department. GPs refer patients with vague symptoms potentially due to cancer but with no other 2 week wait referral symptoms. Patients have an assessment by the Navigator, a CT Chest Abdomen and Pelvis and routine screening bloods as initial investigations.

**Learning outcomes:**

- Rigorous referral and vetting procedures
- Creating a specific and explicit reporting proforma

- Development of the 'Navigator' role, creating the job description to fit the needs of the pathway
- Establishing relationships of follow up care within secondary care to reduce the 'bounce' of patients between hospital specialties
- Training needed for radiographers who wish to pursue this evolving area of advanced practice

This presentation will explore some challenges and successes of setting up a vague symptoms pathway based within diagnostic radiology. We will also examine the importance of the Navigator role, and how this has become an emerging area of advanced practice for diagnostic radiographers.

### G7.3 Exploring local expectations of the reporting radiographer (advanced practice) role

*Sophie House[1]; Bev Snaith[2]*

[1]Rotherham NHS Foundation Trust; [2]University of Bradford

**Background:** Literature and personal experience have highlighted variability in plain film reporting radiographer roles, specifically whether these posts operate at an enhanced or advanced level of practice, and their implementation in practice (Milner and Snaith 2017; Snaith and Beardmore 2021; Woznitza et al. 2021).

**Method:** A multi-method approach was utilised to scope the plain film reporting radiographer role across a single Integrated Care System (ICS); with the aim being to establish how such roles sit within local workforce structures and ascertain if they fulfil an enhanced or advanced level of practice. Additionally, role expectation from the perspective of organisations, trainee and qualified reporting radiographers and their managers/mentors were evaluated.

**Results:** Across the appraised ICS setting, there was inconsistency in role titles, job descriptions and notable differences in reporting scope of practice. Additionally, there was variation in how plain film reporting radiographer roles operate, seemingly due to the opportunities and time available for staff to develop experience and capability across the four pillars of advanced practice.

**Conclusion:** Determining the status of the current plain film reporting radiographer workforce across a single ICS has provided opportunity to assess and reflect upon current role implementation and utilisation and has offered an insight into expectations of the reporting radiographer role. Results of the project may aid future workforce planning, by ensuring reporting radiographer roles are being utilised to their maximum potential, and to contribute towards creating standardisation and consistency in reporting radiographer roles.

1. Milner, R. C. and Snaith, B. (2017) Are reporting radiographers fulfilling the role of advanced practitioner? *Radiography.* 21(1), 48-54.
2. Snaith, B. and Beardmore, C. (2021) Enhanced practice: A strategy to resolve the inconsistencies in advanced practice implementation. *Radiography.* 27(supp 1), S3-S4.
3. Woznitza, N., Pittock, L., Elliott, J. and Snaith, B. (2021) Diagnostic radiographer advanced clinical practice in the United Kingdom - A national cross-sectional survey. *BJR Open.* 3(1).

### G7.4 Into the matrix - the novel use of the Q-Pulse people module for IR(ME)R entitlement

*Kelsey Normand; Gareth Hill; Damian Parr*

NHS Tayside

**Background:** Standard 17(4) of the Ionising Radiation (Medical Exposure) Regulations 2017 requires employers to "keep and have available for inspection an up-to-date record of all relevant training [1]." Despite successful local implementation of a paperless clinical workflow, staff training records have remained on paper [2]. This makes monitoring compliance with 17(4) challenging.

**Method:** An audit was undertaken to assess compliance with 17(4). This involved assessment of 691 paper records for 33 therapeutic radiographers. Excel was used to plot training records against entitlements to highlight gaps in evidence. Entitlements and corresponding records were then embedded into the Q-Pulse people module and the audit was repeated. The timeliness of results and percentage of staff missing relevant evidence were compared.

**Results:** The initial audit of paper records took approximately three months. 11/33 radiographers (33%) were missing evidence of training that was relevant to entitlements. Furthermore, during the audit there were continuous updates to staffing and scopes of practice, making it difficult to classify results as up to date. After embedding records into Q-Pulse, the follow-up audit completed using the matrix function took 60 seconds. Gaps in evidence could be appreciated in real-time and responded to immediately. Consequently, 0/35 current radiographers (0%) are missing evidence of training relevant to entitlements.

**Conclusion:** Embedding training records in the Q-Pulse people module has greatly improved the ease of evidencing and therefore ensuring compliance with IR(ME)R 17(4) during the continuous process of training. Data can now be easily digested and harnessed for service, role and professional development.

1. Ionising Radiation (Medical Exposure) Regulations, c.17. Available at: https://www.legislation.gov.uk/uksi/2017/1322/contents/made (accessed 10 December 2021). 2. Muir, K and Parr, D. 2019. *Maximised efficiency, minimised waste.* [poster]. Annual Radiotherapy Conference, 25-27 January, Hilton Newcastle Gateshead.

### G7.5 Sonographer led discharge in a deep vein thrombosis clinic - a feasibility study

*Catherine Lee[1]; Rita Phillips[2]; Simon Patten[1]*

[1]Royal Devon and Exeter NHS Foundation Trust; [2]University of the West of England

**Background:** Radiographer led discharge is not a new concept, but there is a lack of evidence exploring the role of sonographers in improving patient flow through hospitals. NHS Improvement and NHS England (2018) promote utilising Allied Health Professionals (AHPs) in care pathways to increase efficiency. We establish if sonographer-led discharge could be employed in a deep vein thrombosis clinic to improve efficiency without detrimental effect on patient satisfaction and safety.

**Method:** A prospective mixed methods service evaluation was completed. Length of appointment times between the control group who see an Advanced Clinical Practitioner and a sonographer, and the intervention group who see a sonographer only were compared. Patient views were collected in a survey. Discharge summaries were assessed blindly for quality by acute medical consultants.

**Results:** Patients in the sonographer group had a statistically significant shorter appointment time than those in the control group. Patients did not have a preference about which professional group cared for them, provided the staff were competent to do so. There was no impact on patient satisfaction or safety when seen by a sonographer alone.

**Conclusion:** This study has confirmed that sonographer-led discharge is feasible, efficient and has no detrimental effect on patient safety or satisfaction. It also has the possibility to enhance professional practice of sonographers. Work such as this is in line with national initiatives to improve patient flow through hospitals by incorporating the skill mix of AHPs into new patient pathways. Role extension such as sonographer-led discharge could provide supporting evidence for advanced practice portfolios for sonographers.

NHS Improvement and NHS England (2018) Allied health professions supporting patient flow: a quick guide. Available at: https://nhsicorporatesite.blob.core.windows.net/green/uploads/documents/AHPs_supporting_patient_flow_FINAL_.pdf (Accessed 22 September 2021).

### G7.6 The experiences of an advanced practitioner | consultant therapeutic radiographer in providing personalised patient care

*Jennifer Thompson*

Nottingham University Hospitals NHS Foundation Trust

There is research to evidence the challenges of advanced practitioners in cancer care. The skill set of advanced practitioners varies between centres in the UK and is very much driven by the service needs of each particular department. A framework was developed in 2017 by Health Education England, that all advanced practitioners work by so that their is consistency in these roles. These include the four pillars - clinical practice, leadership/management, education and research. The author will use various case studies to highlight the impact that this role has on personalised care throughout the patients radiotherapy pathway. Focusing on the changes to practice in the last year due to COVID. To encourage other health professionals into these roles and the positivity it has on not only job satisfaction of the individual but also the service user. As a non-medical prescriber the ability to compliment the oncologists and others in the MDT in manging patients effectively and developing their current role as a consultant therapeutic radiographer.

1. Caulfield, L., 2021, A literature review exploring the perceived impact, challenges and barriers of advanced and consultant practice in therapeutic radiography. Radiography, viewed October 2021; . 2. Henwood, S., et al, 2015, Reflections on the role of consultant radiographers in the UK: The perceived impact on practice and factors that support and hinder the role, Radiography, Volume 22(1), 44 - 49. 3. NHS Employers 2021, Advanced and Enhanced clinical practice, viewed 10 December 2021; . 4. The Society of Radiographers; .

## G7.7 Assessing the implementation of interventions to recruit and retain the Therapeutic Radiography workforce

*Mandy Tuckey; Nicky Hutton*

Society and College of Radiographers

**Background:** The impact of Health Education England's Reducing Pre-registration Attrition and Improving Retention (RePAIR) initiative was measured within Radiotherapy by a HEE funded, SoR led project. Mapping and identifying areas of good practice, opportunities and challenges of the RePAIR recommendations including the impact of Covid-19.

**Method:** Multi-method survey of Radiotherapy approved Higher Education Institutions (HEIs) (n=10), Radiotherapy Healthcare providers (HCPs) (n=51) and Therapeutic Radiography students (n=20) on a placement expansion programme. Followed by semi-structured interviews and Dual Moderator focus groups with key stakeholders.

**Key findings:** 100% HEI and 88% HCP survey response rate. 80% of HEIs and 98% of HCPs were in favour of standardising clinical assessment documentation. On average, stakeholders felt simulation could replace up to 20% of clinical practice. Physical and mental health and wrong career choice were the most common reasons for attrition. Recruitment initiatives were evident in all HEI's and in 82% of HCP's, however, only 27% of HCP's were involved in retention initiatives. Formal use of 'culture of care' tools was not standard practice. 80% of HCP's had a preceptorship programme with 20% collaborating with local HEI. Awareness of RePAIR was low (20%).

**Conclusion:** Priority areas were identified and developed into 6 workstreams forming an online toolkit -- AHP Support.

Programme for Implementing Recruitment, Retention and Engagement (ASPIRRE) Further projects were identified: 1.National project exploring requirements of implementing standardised clinical assessment. 2.Professional body guidance document on simulation within pre-registration Therapeutic Radiography education and training programmes

1. Health Education England. (2018). Reducing Pre-registration Attrition and Improving Retention. Available at https://www.hee.nhs.uk/our-work/reducing-pre-registration-attrition-improving-retention.

## G7.8 The opportunities and challenges of radiographer reporting within plain radiography in a specialist paediatric tertiary hospital - legal, ethical and clinical dilemmas

*Rebecca Scott[1]; Jerry Hughes[2]*

[1]Central Manchester NHS Foundation Trust; [2]London South Bank University

**Background:** Whilst the reporting of plain radiographs by radiographers is now commonplace in the UK, with up to 80% of musculoskeletal (MSK) and visceral (chest and abdomen) images being reported by radiographers in some trusts (Culpan et al., 2019), studies have shown inconsistencies in working practices (Milner et al 2016).

It has been demonstrated that radiographer reporting within paediatrics is often restricted and a reporter's scope of practice is often narrowed by the age of the patient (Stevens, 2019). There is very little research published that evaluates the types and causes of error in paediatric radiology (Taylor et al., 2010) nor the scope for advanced practice and radiographer role extension within this specialty of radiology.

**Purpose:** The opportunities and challenges related to reporting within plain radiography in a specialist paediatric tertiary hospital will be explored with specific reference to legal, ethical and clinical dilemmas.

**Summary:** The content of the poster will critically evaluate each issue individually, drawing on examples from the literature and clinical practice. The evidence presented will provide a strong justification in favour of this advanced practice role, on the proviso that there is the correct training and support system is in place.

1. Culpan, G., Culpan, A.-M., Docherty, P., Denton, E., (2019) Radiographer reporting: A literature review to support cancer workforce planning in England. Radiography 25 p155-163. Available from: https://www.researchgate.net/publication/331738012_Radiographer_reporting_A_literature_review_to_support_cancer_workforce_planning_in_England.
2. Milner RC, Culpan G, Snaith B. (2016) Radiographer reporting in the UK: is the current scope of practice limiting plain-film reporting capacity? British Journal of Radiology [online] 89: 20160228. Available from: https://pubmed.ncbi.nlm.nih.gov/27376784/
3. Stevens, B.J. (2019). A survey assessment of reporting radiographers' scope of practice in the West Midlands region of the United Kingdom. Radiography, [online] 25(3). Available at: https://www.sciencedirect.com/science/article/pii/S1078817418302244.
4. Taylor, G.A., Voss, S.D., Melvin, P.R. and Graham, D.A. (2010). Diagnostic errors in pediatric radiology. Pediatric Radiology, [online] 41(3), pp.327-334. Available at: https://pubmed.ncbi.nlm.nih.gov/20827471/



# Proffered papers: AI

## H6.1 Automated quantification of fat infiltration in paraspinal muscles on MRI scans with U-Nets

*Bertrand Nortier[1]; Karen M Knapp[1]; Jonathan Fulford[1]; Greg Slabaugh[2]; Richard Seymour[3]; Liliana Rodrigues[1]; Abdullah Al-Qahtani[1]; Jude Meakin[1]*

[1]University of Exeter; [2]Queen Mary University; [3]Torbay and South Devon NHS Foundation Trust

**Background:** Fatty infiltration in the paraspinal muscles is frequently observed on MRI scans; it is considered to be a marker of deconditioning. Without quick and reproducible methods for quantification, the diagnostic importance cannot be explored. Artificial Intelligence (AI) technologies provide a tool for easy quantification of fatty infiltration.

**Method:** An MRI dataset of 39 images was used to train and test an automated spinal muscle segmentation method. Manually created binary masks indicating the location of the left erector spinae were used to train (36 images) and test (3 images) using U-Net. Blurring and thresholding was used to determine which pixels in the muscles were likely to be fat; four fatty infiltration indicators were calculated. 1: calculated percentage fat, 2-4 modified fat percentage using weighting factors to measure fat-dispersion within the muscle. The methods were compared using the ranked values calculated for each image.

**Results:** On average, the trained U-Net correctly classified 99% of the muscle pixels in the test images. The muscle fat percentage ranged from 13% to 24% (mean 17%). The fatty infiltration indicator calculated using Method 2 was most different to Method 1, indicating it provided the greatest differentiation of fat dispersion between the images.

**Conclusion:** A trained U-Net can automatically extract the erector spinae from MR images with good accuracy and measures of fatty infiltration can assess differences in fat content and distribution within the muscles. With larger training sets, these methods could be applied to assess deconditioning of the paraspinal muscles.

## H6.2 Curating large datasets for artificial intelligence tool development: our experience of participating in the ProCAncer-I project

*Robby Emsley; Sharon Vit; Dow-Mu Koh; Christina Messiou; Tiaan Jacobs; Ana Ribeiro*

The Royal Marsden NHS Foundation Trust

Prostate cancer is the most prevalent cancer in men in the UK (1). It is critical to distinguish between clinically relevant disease and low-risk disease at diagnosis to guide management. Multiparametric MRI (mpMRI) is now widely used to evaluate and stage prostate cancer due to its high sensitivity and NICE guidelines (2019) recommending mpMRI prior to prostate biopsy (2). Artificial intelligence (AI) techniques show early promise in automatic assessment of diagnostic imaging, including assessment of mpMRI. Large, annotated datasets of scans and clinical information are necessary to test and validate AI algorithms. ProCAncer-I is a Europe-wide consortium who are collating an anonymous dataset of 17,000 mpMRI prostate scans that can be used for research, including AI algorithm development. Curating datasets for imaging repositories from routine clinical infrastructure requires careful patient cohorting, image preparation, review, and annotations to be useful in AI tool training. We share our approach to preparing and managing large datasets, including the associated processes and governance needed to support projects of this nature. Our multidisciplinary approach -- involving research radiographers, radiologists, informatics scientists and data analysts; working together in an AI research hub environment, has proven key to the success of projects of this nature. The poster will include a description of the primary aims and objectives of the consortium project and an assessment of the benefits and challenges of being a part of projects of this nature, including the complexities of case selection, data and image collection, and the importance of good data management and GDPR compliance.

1. Cancer Research UK (2021) Prostate cancer statistics | Cancer Research UK, Cancer Research UK. Available at: https://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/prostate-cancer (Accessed: 2 December 2021) 2. National Institute for Health and Care Excellence (NICE) (2019) Prostate cancer: diagnosis and management. NG131. Available at: https://www.nice.org.uk/guidance/ng131 (Accessed: 2 December 2021)

### H6.3 Deep learning approach for lung segmentation in computed tomography pulmonary angiography (CTPA)

*Krit Dwivedi[1]; Michael Sharkey[2]; Michail Mamalakis[1]; Peter Metherall[2]; Louis Rees[1]; Caitlyn Hawkesford-Johnson[1]; Samer Alabed[1]; Robin Condliffe[2]; David Kiely[2]; Andrew Swift[1]*

[1]University of Sheffield; [2]Sheffield Teaching Hospitals NHS Trust

**Background:** Lung segmentation in Computed Tomography (CT) involves detection of the anatomical lung boundary on every slice of the study and is an important step in artificial intelligence (AI) approaches. Most current applications are limited to non-contrast CT, however CTPA is commonly performed in clinical practice. We developed a lung segmentation model in CTPA using the state-of-the-art nnU-net deep learning (DL) method.

**Methods:** 226 patients with thin-slice (≤ 0.625 mm) CTPA imaging were identified from a tertiary center. 50 cases were manually segmented using MIM software. 29, 8 and 13 cases were used for training, testing and validation respectively. A single fold training approach with data augmentation, consisting of 1000 epochs with 250 mini-batches per epoch was used. Further clinical validation was performed on 173 unseen cases by a radiologist. Cases were evaluated and classified as 'optimal' if radiologically there were no significant segmentation errors, 'borderline' if ≤10 slices had errors, and suboptimal if >10 slices had errors.

**Results:** Mean DICE score and accuracy across the segmented validation cases was 0.998 and 0.989 respectively. On radiological review, 144 (83.2%), 20 (11.6%) and 9 (5.2%) scans were classified as optimal, borderline, and suboptimal respectively. There were no failures. Common reasons for suboptimal performance were peripheral consolidation, atelectasis and pleural effusions.

**Conclusion:** An DL segmentation algorithm can successfully segment the lung on CTPA. This is an important prerequisite step in the development of clinical AI models such as pulmonary embolism detection, vessel analysis or imaging-based biomarkers. Further studies involving larger external cohorts are warranted.

1. Isensee, F., Jaeger, P.F., Kohl, S.A.A. et al. nnU-Net: a self-configuring method for deep learning-based biomedical image segmentation. Nat Methods 18, 203-211 (2021). https://doi.org/10.1038/s41592-020-01008-z 2. Ronneberger O., Fischer P., Brox T. (2015) U-Net: Convolutional Networks for Biomedical Image Segmentation. In: Navab N., Hornegger J., Wells W., Frangi A. (eds) Medical Image Computing and Computer-Assisted Intervention - MICCAI 2015. MICCAI 2015. Lecture Notes in Computer Science, vol 9351. Springer, Cham. https://doi.org/10.1007/978-3-319-24574-4_28

### H6.4 Early experiences of research radiographers working in an artificial intelligence imaging hub

*Sharon Vit; Robby Emsley; Dow-Mu Koh; Christina Messiou; Ana Ribeiro; Janet Macdonald; Georgina Hopkinson*

The Royal Marsden NHS Foundation Trust

**Background:** Radiographer role extension and advanced practice in areas such as reporting and intervention are well established but few radiographers have support to undertake research [1]. Furthermore, while approximately 65% of radiographers say they understand the term artificial intelligence (AI) only 31% said they felt confident using AI technologies [2], suggesting limited involvement in AI research. Therefore, the opportunity to work as radiographers in an AI research hub within a multi-disciplinary team, undertake tasks traditionally completed by a radiologist, develop a research portfolio and contribute to and influence developments in AI in imaging is novel and exciting.

**Summary:** This poster is a SWOT analysis of radiographers in an AI research team and will illustrate the particular skills and benefits radiographers can bring and outline suggestions to mitigate weaknesses that may currently prevent radiographer participation. It will also survey the many opportunities being a research radiographer in AI development brings to the individual, the profession and our patients; as well as the threats that can prevent effective engagement and research in the AI field.

**Learning outcomes:** Awareness of AI, its role in medical imaging and how AI applications can inform commissioning of scanners and information systems. Appreciate the valuable skills that a radiographer can bring to this new and exciting field; as well as new skills that radiographers may need to develop. Reporting of first-hand experience of working within an AI research hub as a Radiographer.

1. College of Radiographers (2020) 'Research Strategy 2021-2026' Available: https://www.collegeofradiographers.ac.uk/getattachment/Research-grants-and-funding/cor-research-strategy/cor-research-strategy-2021-26.pdf?lang=en-GB [Accessed: 30/11/2021] 2. Rainey C, O'Regan T, Matthew J, Skelton E, Woznitza N, Chu K-Y, Goodman S, McConnell J, Hughes C, Bond R, McFadden S and Malamateniou C (2021) 'Beauty Is in the AI of the Beholder: Are We Ready for the Clinical Integration of Artificial Intelligence in Radiography? An Exploratory Analysis of Perceived AI Knowledge, Skills, Confidence, and Education Perspectives of UK Radiographers.' Frontiers in Digital Health 3 739327. doi: 10.3389/fdgth.2021.739327

### H6.5 Retrospective analysis of screen detected cancers not recalled by artificial intelligence

*Samantha Smith[1]; Sally Bradley[2]; Katie Walker-Stabeler[2]; Cashmere Olipas[2]; Sarah Gascoigne[2]*

[1]University Hospital Birmingham NHS Foundation Trust; [2]NHS

**Background:** Analysis of artificial intelligence demonstrates its great potential to perform as an independent reader in a screening double reading process and non-inferiority to human reader on screening key performance indicators. There is little literature available which describes the subsets of negative and positive discordant cases identified with artificial intelligence versus human reader. We review the screen detected cancers at this institution which were not recalled by artificial intelligence.

**Method:** A retrospective analysis of 37,764 screening mammograms was performed (April 2015 and March 2018). The subset of images with a positive cancer diagnosis at screening assessment which were not recalled by artificial intelligence were highlighted as discrepant cases and reviewed by a panel of film readers.

**Results:** Out of the 37,764 cases, there were 27 discrepant cases which artificial intelligence did not recall to assessment and resulted in a positive cancer diagnosis at assessment. The results show 27 women with an age range of 48-72; 3 prevalent and 25 incident round. There were 11 non-invasive and 16 invasive cancers. The mammographic features varied; 9 calcifications, 8 asymmetric densities, 8 masses, 2 distortions, 1 asymmetric density with calcification. 3 of these cases were subsequently excluded (2 invasive and 1 non-invasive), 2 were incidental findings within the contra-lateral breast. One was downgraded from non-invasive.

**Conclusion:** Artificial intelligence missed cancers with a variety of mammographic features. 58% of the cancers were invasive and 42% in situ.

### H6.6 The impact of AI on radiographic image reporting - perspectives of the UK reporting radiographer population

*Clare Rainey[1]; Tracy O'Regan[2]; Jacqueline Matthew[3]; Emily Skelton[4]; Nick Woznitza[5]; Kwun-Ye Chu[6]; Spencer Goodman[7]; Jonathan McConnell[8]; Ciara Hughes[1]; Raymond Bond[1]; Christina Malamateniou[9]; Sonyia McFadden[1]*

[1]Ulster University; [2]Society of Radiographers; [3]School of Biomedical Engineering and Imaging Sciences, King's College London, St Thomas' Hospital, London, U.K.; [4]Department of Radiography, Division of Midwifery and Radiography, School of Health Sciences, City, University of London, London,; [5]University College London Hospitals, Bloomsbury, London, England; [6]Department of Oncology, Oxford Institute for Radiation Oncology, University of Oxford, Oxford, UK; [7]The Society of Radiographers; [8]NHS Scotland, Greater Glasgow and Clyde, United Kingdom; [9]City, University of London

**Background:** It is predicted that medical imaging services will be greatly impacted by AI in the future. Developments in computer vision have allowed AI to be used for assisted reporting. Studies have investigated radiologists' opinions of AI for image interpretation (Huisman et al., 2019 a/b) but there remains a paucity of information in reporting radiographers' opinions on this topic.

**Method:** A survey was developed by AI expert radiographers and promoted via LinkedIn/Twitter and professional networks for radiographers from all specialities in the UK. A sub analysis was performed for reporting radiographers only.

**Results:** 411 responses were gathered to the full survey (Rainey et al., 2021) with 86 responses from reporting radiographers included in the data analysis. 10.5% of respondents were using AI tools? as part of their reporting role. 59.3% and 57% would not be confident in explaining an AI decision to other healthcare practitioners and 'patients and carers' respectively. 57% felt that an affirmation from AI would increase confidence in their diagnosis. Only 3.5% would not seek second opinion following disagreement from AI. A moderate level of trust in AI was reported: mean score = 5.28 (0 = no trust; 10 = absolute trust). 'Overall performance/accuracy of the system', 'visual explanation (heatmap/ROI)', 'Indication of the confidence of the system in its diagnosis' were suggested as measures to increase trust.

**Conclusion:** AI may impact reporting professionals' confidence in their diagnoses. Respondents are not confident in explaining an AI decision to key stakeholders. UK radiographers do not yet fully trust AI. Improvements are suggested.

1. Huisman M, Ranschaert E, Parker W, Mastrodicasa D, Koci M, Pinto de Santos D, Coppola F, Morozov S, Zins M, Bohyn C, Koç U, Wu J, Veean S, Fleischmann D, Leiner T, Willemink MJ. (2021a) An international survey on AI in radiology in 1,041 radiologists and radiology residents part 2: expectations, hurdles to implementation and education. European Radiology. . https://doi.org/10.1007/s00330-021-07782-4 2. Huisman M, Ranschaert E, Parker W, Mastrodicasa D, Koci M, Pinto de Santos D, Coppola F, Morozov S, Zins M, Bohyn C, Koç U, Wu J, Veean S, Fleischmann D,

Leiner T, Willemink MJ. (2021b) An international survey on AI in radiology in 1,041 radiologists and radiology residents part 1: fear of replacement, knowledge, and attitude. European Radiology. doi: 10.1007/s00330-021-07781-5 3. Rainey, C., O'Regan, T., Matthew, J., Skelton, E., Woznitza, N., Chu, K-Y, Goodman, S., McConnell, J., Hughes, C., Bond, R., McFadden, S., Malamateniou, C. (2021) Beauty is in the AI of the beholder: are we ready for the clinical integration of artificial intelligence in Radiography? An exploratory analysis of perceived AI knowledge, skills, confidence and education perspectives of UK radiographers. Frontiers in Digital Health (3) https://doi.org/10.3389/fdgth.2021.739327



## Proffered papers: Wellbeing and workforce

### I7.1 Picturing the wellbeing of radiotherapy students on placement using emoji

*Jenny Callender; Pete Bridge; Daniel Blair; Flora Al-Samarraie*

The University of Liverpool

**Background:** Many Health professional students starting higher education in 2020 embarked on clinical placement with no prior face-to-face contact with peers. COVID-19 social restrictions undoubtedly impacted the mental wellbeing of young people. Attempts to evaluate wellbeing via conventional survey methods often result in poor engagement and do not capture regular fluctuations in emotional state. Increased use of smartphones for social interaction suggests that short message service (SMS) functionality can provide rapid data. This pilot project tested the feasibility and validity of gathering anonymous data from students concerning mental wellbeing on clinical placement via free text emoji and SMS.

**Method:** Year 1 radiotherapy students were asked to provide anonymous daily emoji representing their mental wellbeing via WhatsApp. Weekly prompts sought textual responses relating to factors impacting wellbeing. Post data analysis, participants were asked to complete a short anonymous online survey to validate researchers interpretation of responses and provide feedback on the method.

**Results:** Fifteen participants provided 254 emoji responses, using 108 different emoji; these were supported with weekly texts. 'Happy' emoji were used most frequently, with social interaction and levels of fatigue identified as important factors regarding wellbeing. Anonymity and opportunity to feedback via SMS were viewed positively, and the ease and rapidity of response engendered engagement throughout the 3-week study.

**Conclusion:** Use of emoji for rapid assessment of cohort mental wellbeing is valid and potentially useful alongside more formal evaluation mechanisms and individual support strategies. Capturing simple wellbeing responses enabled a wider cohort perspective to be established, and implementation of generic support.

### I7.2 Meeting their needs? A qualitative exploration into the clinical support needs of mature therapeutic radiography students

*Leah Untisz[1]; Amy Taylor[2]; Alex Robinson[3]*

[1]Weston Park Cancer Centre; [2]University of Exeter; [3]Sheffield Hallam University

**Background:** Attrition in radiotherapy education is traditionally high [1]. A compounding factor is the changing demographic of learners joining Higher Education Institutions (HEI) with an increasing number of 'mature' students aged 21+ returning to academia [2]. Previous research across healthcare programmes identified mature students often struggle to balance their studies with 'other' commitments thus requiring additional or different models of clinical support than school leavers [3]. To assess the support needs of mature students within radiotherapy and help review existing models, the research aimed to explore mature student experiences of support on clinical placement.

**Method:** A qualitative method underpinned by a constructivist epistemology was adopted to explore through semi-structured interviews, the lived experiences of mature student therapeutic radiographers. Host HEI ethical approval was obtained and eligible students undertaking their training at a single radiotherapy department were invited to take part.

**Results:** 11 interviews were completed (two male and nine female, age-range 21-45, mean-age 32). Four key themes emerged from the data; i) established models of support, ii) placement challenges, iii) positive training environment and iv) programme changes. Overarching, the themes illustrate that timely communication and a flexible approach would help students balance their other commitments. The findings also provide recommendations to support mature students including a "buddy system".

**Conclusion:** A conscious approach to the variations between students and flexible solutions to help support them to manage their situational variances will assist mature student retention and could be fundamental in achieving the Governments priority to increase Therapeutic Radiographer numbers to meet increasing service demand [4,5].

1. McNamara, J. (2010) The recruitment and retention of therapy radiographers International Journal of Therapy and Rehabilitation, 17:5, 225-225. 2. The Universities and Colleges Admissions Service (UCAS) Mature Students Guide. doi://www.ucas.com/file/35436/download?token=2Q6wiw-L#:~:text=Mature%20students%20are%20defined%20as,What%20are%20the%20benefits%3F 3. Trotter, E. & Cove, G. (2005) Student retention: an exploration of the issues prevalent on a healthcare degree programme with mainly mature students. Learning in Health and Social Care. 4(1);1473-6853. 4. Borras, J. Lievens, Y. Barton, M. Corral, J. Ferlay, J. Bray, F. Grau, C. (2016). How many new cancer patients in Europe will require radiotherapy by 2025? An ESTRO-HERO analysis. Radiotherapy and Oncology, 119; 5-11. Retrieved from: http://www.thegreenjournal.com/article/S0167-8140(16)00074-8/pdf 5. NHS England. (2017). Cancer Workforce plan. Phase 1: Delivering the cancer strategy to 2021. 2017. Available at https://www.hee.nhs.uk/sites/default/files/documents/Cancer%20Workforce%20Plan%20phase%201%20-%20Delivering%20the%20cancer%20strategy%20to%202021.pdf

### I7.3 Is support continued from classroom to clinic? A neurodivergent call to action

*Ben Potts*

Birmingham City University

**Background:** Being neurodivergent (i.e., autistic, dyslexic, dyspraxic, have ADHD, etc) can present challenges in the neurotypical world. These challenges can be disabling and thus, in accordance with the Equality Act 2010, reasonable adjustments should be made. Adjusting academic elements of university studies is a thoroughly practised and rigorously researched topic. However, there is little work investigating the experiences of, and therefore support needed for, neurodivergent students on clinical placements. This is especially true in radiography research, which is pertinent considering the potential for neurodivergent disabilities to interact with the demands of the role. Worthy of note, there is no research exploring the experiences of autistic students, dyspraxic students or students with ADHD. Due to this, it is impossible to know what radiography-specific support is needed.

**Purpose of poster:** The poster is a call to action. It intends to expose the radiography research deficit and outline the possible issues with its existence. The aim is to raise awareness, provoke discussion and effect improvement of student experience and student retention.

**Summary:** The poster will convey the key conclusions from an extended literature review investigating the placement experiences of neurodivergent students from other healthcare professions. It will explain the current gap in knowledge and consider the impact this could be having on radiography education. It will challenge the reader by questioning what they are doing to support the neurodivergent student radiographers they teach, supervise or work with. Finally, it will offer evidenced guidance on methods of support taken from other healthcare professions.

Equality Act 2010 c. 15. Available at: hhttps://www.legislation.gov.uk/ukpga/2010/15/contents (Accessed: 10 December 2021).

### I7.4 Educating diagnostic radiography undergraduates for the future workforce - are we hitting the mark?

*Hilary Baggs; Dorothy Cox*

University of Gloucestershire

Traditionally, undergraduate diagnostic radiography students are educated in a variety of plain film imaging techniques, to reflect the demand within the clinical department. Indeed, this is a requirement within the HCPC's Standards of Proficiency, for students to be able to perform the full range of standard imaging techniques. Whilst this is recognised as an essential role for the radiographer, and a skill all students need to master, there are, more recently, additional imaging modalities that students need to be proficient in. The HCPC's standards of proficiency also state that students need to be able to perform a standard head CT, which is normally assessed at level 6, just prior to qualification. These requirements seem to fall short of what employers want from a band 5 radiographer on qualification. In Sloane & Miller's (2017) study, service managers highlighted an increase in cross sectional demand, with placement structure not promoting quick enough application of skills. With the advent of newer technology and the proliferation of CT examinations, traditional education programmes are not preparing students for the future workforce and leaving employers responsible for much of their CT education. Within the newly launched programme at the University of Gloucestershire, there is a particular emphasis on CT scanning. On graduation, students will have completed assessments in CT head (level 5), multiphase CT and bolus tracked CT. This goes beyond the current requirements of the HCPC, but is addressing the need from employers and creating a radiographer who can hit the ground running in CT.

1. Health and Care Professions Council (2013) The standards of proficiency for radiographers. Available at: https://www.hcpc-uk.org/resources/standards/standards-of-proficiency-radiographers/ {accessed Dec 2021}
2. Sloane, C., & Miller, P. K. (2017). Informing radiography curriculum development: The views of UK radiology service managers concerning the 'fitness for purpose' of recent diagnostic radiography graduates. *Radiography*, *23*, S16-S22. https://doi.org/https://doi.org/10.1016/j.radi.2017.05.013

### I7.5 An evaluation of an 'independent study option' module in undergraduate diagnostic radiography

*Victoria Hughes; Colette Bennion; Pauline Pilkington; Stuart Mackay; Anthony Manning-Stanley*

University of Liverpool

**Background:** The importance of independent learning is emphasised in healthcare programmes internationally, with peer learning considered a useful support mechanism. Integration of theory and practice, while developing autonomous practitioners, who are effective communicators, are also essential. Additionally, the UK has seen increasing emphasis on student training within specialist imaging modalities, with rapidly increasing demand for these services. Enabling students to study a modality of their choice in depth could help inform future career pathway. A new 'Independent Study Option' within Year 2 of our undergraduate programme, incorporates these elements, initiating student directed, active learning, enhancing motivation to learn. Students select an imaging modality of interest, then evaluate its application in diagnosing a chosen medical condition. Additional clinical placements in the modalities enable direct links with practice. Assessment is via assignment and verbal presentation, developing communication skills. Peer seminars provide social constructivism and formative feedback, minimising disadvantages of independent learning. Direct relevance to clinical practice, along with development of communication skills through delivery of a presentation, add authenticity to assessment.

**Purpose:** The module completed its first iteration in May 2021, during the additional challenge of the COVID pandemic. A research project has been conducted with the aim of establishing the success of the approach in facilitating student learning, and potential impact on career pathway. The methodology was via focus groups run by an independent researcher. Data is currently being collated and analysed.

**Summary:** The outline of the module structure, and themes arising from the focus groups will be presented, along with future recommendations and implications for practice.

1. Cadorin, L; Suter, N; Dante, A; Naskar Williamson, S; Devetti, A; Palese, A. (2012) 'Self-directed learning competence assessment within different healthcare professionals and amongst students in Italy,' Nurse Education in Practice, 12(3), pp. 153-158. Available at: https://doi-org.liverpool.idm.oclc.org/10.1016/j.nepr.2011.10.013 2. Elshami, W; Abuzaid, M; Abdalla, M.E. (2020) 'Radiography students' perceptions of Peer assisted learning,' Radiography, (26(2) pp.e109-e113. Available at: https://doi-org.liverpool.idm.oclc.org/10.1016/j.radi.2019.12.002 3. Gqweta, N. (2012) 'Poor academic performance: A perspective of final year diagnostic radiography students,' Radiography, 18(3), pp. 212-217. Available at: https://doi-org.liverpool.idm.oclc.org/10.1016/j.radi.2012.04.002 4. Health and Care Professions Council (HCPC). (2017) Standards of education and training Available at: https://www.hcpcuk. org/standards/standards-relevant-to-education-and-training/set/ 5. Knowles, MS. (1984) Andragogy in action. San Francisco: Jossey-Bass, 1984 6. Linaker, KL. (2015) 'Pedagogical Approaches to Diagnostic Imaging Education: A Narrative Review of the Literature,' Journal of Chiropractic Humanities, 22(1), pp. 9-16. [online] Available at: http://dx.doi.org/10.1016/j.echu.2015.09.005 7. Moghadari-Koosha, M; Moghadasi-Amiri, M; Cheraghi, F; Mozafari, H; Imani, B; Zandieh, M. (2020) 'Self-Efficacy, Self-Regulated Learning, and Motivation as Factors Influencing Academic Achievement Among Paramedical Students: A Correlation Study,' Journal of Allied Health, 49(3), pp. e145-e152. Available at: https://www-proquestcom.liverpool.idm.oclc.org/docview/2441571861/fulltextPDF/A9D43609FAC84983PQ/1?accountid=12117 8. Naeger, DM; Straus, CM; Phelps, A; Courtier, J; Webb, E. (2014) 'Student-created Independent Learning Modules: An Easy High value Addition to Radiology Clerkships,' Academic Radiology, 21(7), pp. 879-887. 9. National Health Service (NHS) (2019) Rapid Diagnostic Centres Vision and 2019/20 Implementation Specification, Available at: https://www.england.nhs.uk/publication/rapid-diagnostic-centres-vision-and-2019-20-implementation-specification/ 10. Sheakley ML; Bauler TJ; Vandre DD; Woodwyk A; Dickinson BL. (2019) 'Effectiveness of instructor-guided independent learning in comparison to traditional didactic lecture in the preclinical medical curriculum: A retrospective cohort study,' Medical teacher, 41(7), pp. 795-801. Available at: https://doi.org/10.1080/0142159X.2019.1580355 11. Spence, B. (2019) 'Practical Applications in Radiography Education,' Radiologic Technology, 90(4), pp. 369-386. 12. Sloane, C; Hyde, E. (2019) 'Diagnostic Radiography Education: Time for Radical Change?' Imaging & Therapy Practice, (Aug 2019), pp.5-10.

### I7.6 The importance of virtual simulation provided by the placement provider in reducing apprehension levels of students

*Thomas Welton*

Society of Radiographers (BigRadTom)

The constructs of clinical education for diagnostic radiographers has been somewhat pulled into question through this recent pandemic. with widespread staff shortages and clinical pressures hitting unprecedented levels, a fresh approach to the pedagogical approach is required. Routinely, extended reality (XR) simulated learning has been reserved to some HEI's due to the centralised nature of the educational delivery. With the need to expand student numbers into a volatile clinical environment, is it time to truly appreciate the importance of simulated learning to

maximise the students learning in a safe and robust manner. The purpose of this study is to highlight a best practice project that aimed to immerse the student in the clinical setting through virtual reality technologies. Outcomes from this project include an increased knowledgebase on the subject of intensive care imaging, understanding on roles and equipment within this area, imaging competence, as well as reducing apprehension towards working in this area. Embracing digital technologies in the clinical environment can support learning constructively. Although not designed to replace patient contact, digital technologies using XR can compliment the clinical curriculum. This study outlines experiences gained using XR technologies from a clinical placement provider. Proving the students openness to said sessions and it's effectiveness to reducing apprehension in a safe and constructive environment.

## Proffered papers: Service delivery and late-breaking

### J3.1 Development of a pan-London ST1 Pre-On-Call Assessment (SPOCA) and Training Modules

*Cherry Sit[1]; Alan Campbell[2]; Jane Young[3]*

[1]Guy's and St Thomas' NHS Foundation Trust; [2]University College London Hospitals NHS Foundation Trust; [3]Health Education England / Whittington Health NHS Trust

**Background:** Online education and training is now an established part of Radiology training. Starting out of hours (OOH) work in Radiology is a challenging time for junior radiology trainees and the level of knowledge and skills and the preparation and assessment varies across London's radiology training schemes. A recently published national trainee on-call survey [1] demonstrated an appetite for a "formal on-call assessment prior to commencing on-call work" amongst trainees and that "introducing a standardised and validated examination per scheme would highlight and facilitate more targeted practice in areas of deficiency prior to commencing on-call work."

**Purpose:** To develop pan-London virtual teaching events and online training modules and pan-London ST1 pre-on-call assessment (SPOCA), with comparison to existing local assessments. This will cover the major acute pathologies and systems so that all trainees have common access to high-quality, acute radiology training and are assessed similarly across the region. This is a current work in progress (as of December 2021), with a planned delivery date of early May 2022.

**Summary:** Examples of the teaching events, online training modules and assessment, including a description of the design process. A presentation of the initial outcomes and feedback from the pilot teaching and training events and assessment (with delivery planned by early May 2022). Presentation of the comparison between pan-London SPOCA and local assessments.

1. Tofeig, M. et al. (2021) National radiology on-call survey: a cross-sectional survey investigating diagnostic radiology on-call provision by trainees out of hours. Clin. Rad. 76(2021), 918-923.

### J3.2 How will artificial intelligence change the practice of interventional oncology of the future?

*Joshua Wong*

Nottingham University Hospitals NHS Trust

Artificial intelligence (AI) is the use of computational algorithms to mimic human cognitive abilities and perform tasks which normally require human intelligence. From robotic surgery to clinical simulation training, AI has had a significant impact on healthcare provision. Interventional oncology is a field that has vastly benefited from the significant amount of research in AI. This poster aims to introduce AI and define branches of AI and their underpinning principles, such as machine learning and deep learning. This is followed by a review of the potential applications of AI in interventional oncology. One example involves a technique that integrates pre-procedural images with patients' clinical information, allowing prediction of therapeutic outcomes in patients with hepatocellular carcinoma undergoing trans-arterial chemoembolisation. Further techniques, such as the use of augmented reality to create USS-CT fusion-images to improve precision in image-guided procedures, as well as the recreation of three-dimensional anatomical holograms from pre-programmed CT/MRI scans to visualise tumour characteristics and key structures during oncological interventions, are described and evaluated. AI has the potential to enhance efficiency, efficacy and safety in the practice of interventional oncology. However, it also comes with limitations including regulatory barriers, a lack of data for training machine learning algorithms, hurdles to computer-physician integrating workflow, patient data confidentiality and ethical challenges. Most studies on AIs are performed under a controlled, laboratory environment.

Nevertheless, with appropriate validation and correct translation into clinical practice, it could provide a growing impact to the field of interventional oncology and could mean a promising future for patients.

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### J3.3 A systematic review of reproducibility studies of Diffusion Tensor Imaging of cervical spinal cord

*Hussein Al-shaari; Jonthan Fulford; Christine Heales; Marios Politis*

University of Exeter

**Purpose:** Diffusion tensor imaging (DTI) technique is a potential diagnostic tool for the evaluation of cervical spinal cord (CSC) diseases. This systematic review aims to evaluate studies that examined reproducibility of DTI when investigating the CSC.

**Methods and materials:** A search in the PubMed, Scopus, Web of science and MEDLINE (Ovid) database between January 1990 and February 2022 was conducted for articles related to the reproducibility of DTI in evaluating the CSC. DTI studies that presented full statistical analysis of reproducibility tests of CSC in peer-reviewed full-text articles written in English were included. Articles that include at least one of the search terms supplied in the search keywords (in their titles or abstracts) were identified.

**Results:** Six studies fulfilled the search criteria and are included in this review (n=104 subjects). Studies were assessed for different characteristics, including sample size (334), re-test time interval up to 3 months, test-retest reliability scores and acquisition method. Six studies reported reproducibility of fractional anisotropy (FA) and was poor (ICC 0.37) in one study, fair to moderate reproducibility (ICC 0.420.75) in two studies, moderate to good reproducibility (ICC 0.750.90) in two studies, and good to excellent reproducibility (ICC 0.910.99) in one study.

**Conclusion:** DTI and its related measures have the potential to be a very useful clinical technique in evaluating CSC changes. However, reproducibility results are varied and illustrate the technical challenges associated with CSC assessments.

1. Mohamed, F.B., et al.,(2011) Diffusion tensor imaging of the pediatric spinal cord at 1.5 T: preliminary results. 2. Barakat, N., et al., (2012) Diffusion tensor imaging of the normal pediatric spinal cord using an inner field of view echo-planar imaging sequence. 3. Mulcahey, M., et al.,(2012) Diffusion tensor imaging in pediatric spinal cord injury: preliminary examination of reliability and clinical correlation. 4. Barakat, N., et al.,(2015) Inter-and intra-rater reliability of diffusion tensor imaging parameters in the normal pediatric spinal cord. 5. Peterson, D., et al., (2017) Test-Retest and Interreader reproducibility of semiautomated atlas-based analysis of diffusion tensor imaging data in acute cervical spine trauma in adult patients. 6.Lee, E., et al., (2020) Reliability of pre-operative diffusion tensor imaging parameter measurements of the cervical spine in patients with cervical spondylotic myelopathy.

### J3.4 Is mean diffusivity of Diffusion Tensor Imaging in assessment the cervical spinal cord reproducible?

*Hussein Al-shaari[1]; Jonthan Fulford[2]; Christine Heales[2]; Marios Politis[2]*

[1]Najran University; [2]University of Exeter

**Purpose:** Diffusion tensor imaging (DTI) is a technique that can be used to diagnose disorders of the cervical spinal cord (CSC). The aim of this systematic review is to assess studies that looked at the reproducibility of Mean Diffusivity (MD) when evaluating the CSC.

**Methods and materials:** Between January 1990 and February 2022, literature on the repeatability of DTI in evaluating the CSC were searched in PubMed, Scopus, Web of Science, and MEDLINE (Ovid). Studies that have extensive statistical analysis of CSC reproducibility tests in peer-reviewed journals written in English were involved. Articles containing at least one of the search criteria (in titles or abstracts) were identified.

**Results:** Six studies (n=104 subjects) met the search criteria. The study's sample size (3-34), re-test time interval (1-3 months), test-retest reliability scores, and acquisition method were all evaluated. In the included studies, the reproducibility of MD was low (ICC 0.37) in one, fair to moderate (ICC 0.42-0.75) in two, moderate to good (ICC 0.75-0.90) in two, and good to excellent (ICC 0.91-0.99) in one.

**Conclusion:** MD may be highly effective in assessing CSC changes. However, the results of reproducibility demonstrate the technical constraints of CSC examinations.

1. Mohamed, F.B., et al.,(2011) Diffusion tensor imaging of the pediatric spinal cord at 1.5 T: preliminary results. 2. Barakat, N., et al., (2012) Diffusion tensor imaging of the normal pediatric spinal cord using an inner field of view echo-planar imaging sequence. 3. Mulcahey, M., et al., (2012) Diffusion tensor imaging in pediatric spinal cord injury: preliminary examination of reliability and clinical correlation. 4. Barakat, N., et al., (2015) Inter-and intra-rater reliability of diffusion tensor imaging parameters in the normal pediatric spinal cord. 5. Peterson, D., et al., (2017) Test-Retest and Interreader reproducibility of semiautomated atlas-based analysis of diffusion tensor imaging data in acute cervical spine trauma in adult patients. 6.Lee, E., et al., (2020) Reliability of pre-operative diffusion tensor imaging parameter measurements of the cervical spine in patients with cervical spondylotic myelopathy.

### J3.5 Impact of immediate AI enabled patient triage to chest CT on the lung cancer pathway (LungIMPACT) - a study protocol

*Nick Woznitza[1]; Richard Lee[2]; Neal Navani[3]; Arjun Nair[3]; Surahbi Srivastava[4]; David Baldwin[5]*

[1] Canterbury Christ Church University; [2]Royal Marsden Hospital; [3]University College London Hospitals; [4]Qure.ai Technologies; [5]Nottingham University Hospital

**Background:** Chest X-rays (CXRs) are a high-volume test, performed for many reasons including the investigation of lung cancer. The National Optimal Lung Cancer Pathway (NOLCP) emphasises the importance of rapid diagnostics(1). Best case implementation of NOLCP has all imaging investigations performed as a single diagnostic episode, with immediate CXR reporting and same day CT chest where appropriate. Previous work found shorter time to diagnosis of lung cancer with immediate reporting but a low lung cancer prevalence(2). qXR is a class II CE approved medical device that detects and localises the presence of lung nodules on a CXR. qXR is intended to support consultant radiologists and reporting radiographers for clinical decision making. The aim of the study is to determine if artificial intelligence triage of CXRs can shorten the time to diagnosis of lung cancer.

**Methods:** The study will be a multi-centre, prospective, randomised controlled trial, with block randomisation of radiology sessions to those with and without AI triage. Seven centres will participate with 150,000 CXRs. Primary outcomes are difference in time (in days) to lung cancer diagnosis and agreement between reporting practitioner (radiologist or reporting radiographer) and qXR with independent expert arbitration between discordant decisions. Secondary outcomes include proportion of urgent 2WW lung cancer referrals with a non-cancer diagnosis and a health economic evaluation. The study is powered (p=0.05, power=0.90) to detect a small difference (1 day) in median time to diagnosis of lung cancer and a difference in reporter/qXR agreement of 0.01 with a prevalence of diagnosis of 0.006.

1. NHS England. National Optimal Lung Cancer Pathway For suspected and confirmed lung cancer: Referral to treatment: NHS England, 2020. 2. Woznitza N, Devaraj A, Janes S, et al. Impact of radiographer immediate reporting of chest x-rays from general practice on the lung cancer pathway (radioX). Lung Cancer 2019;127:S13. doi: 10.1016/s0169-5002(19)30073-x

## Proffered papers: Research

### K7.1 A five-year impact evaluation of an established medical radiation sciences Twitter journal club

*Amanda Bolderston[1]; Kim Meeking[2]; Bev Snaith[3]; Julia Watson[4]; Adam Westerink[5]; Nick Woznitza[6]*

[1]University of Alberta; [2]Translational Research in Oncology; [3]University of Bradford; [4]Queensland University of Technology and Translational Research Institute; [5]Royal Brisbane and Women's Hospital; [6]University College London Hospitals

**Introduction:** Twitter journal clubs are a relatively new adaptation of an established continuing professional development (CPD) activity within healthcare (Stoneman and Hiremath, 2020). The medical radiation science (MRS) journal club (MRJC) was founded in March 2015 by a group of academics, researchers, and clinicians as an international forum for the discussion of peer-reviewed papers. To investigate the reach and impact of MRJC, a five-year analysis was conducted.

**Methods:** Tweetchat data (number of participants, tweets and impressions) for the first five years of MRJC were extracted and chat topics organized into themes. Fifth birthday MRJC chat tweets were analysed and examples of academic and professional outputs were collated.

**Results:** A total of 59 chats have been held over five years with a mean of 41 participants and 483,000 impressions per hour-long synchronous chat. Ten different tweetchat themes were identified, with student engagement/preceptorship the most popular. Eight posters or oral presentations at conferences, one social media

workshop and four papers have been produced. Qualitative analysis revealed five core themes relating to the perceived benefits of participation in MRJC; (1) CPD and research impact, (2) professional growth and influencing practice, (3) interdisciplinary learning and inclusion, (4) networking and social support and (5) globalisation.

**Conclusion:** MRJC is a unique, multi-professional, global community with consistent engagement. It is beneficial for both CPD, research engagement, dissemination and socialisation within the MRS community.

1. Stoneman, S., & Hiremath, S. (2020). Twitter-Based Journal Clubs: Bringing Critical Appraisal to the Social Table. Seminars in nephrology, 40(3), pp.264-272.

### K7.2 Bridging the theory-practice gap - a multi-case study from the perspective of clinical teachers in diagnostic radiography

*Ciara McNally; Jessica Pool; Ash Bardwell; Atique Hussain*

University of Bradford

**Background:** Clinical teachers have evolved to support the integration of clinical and academic practice across organisational boundaries. This paper explores the lived experience of clinical teachers in diagnostic radiography supporting an undergraduate diagnostic radiography programme at a UK Higher Education Institution.

**Method:** A multi-case study approach was used to evaluate the impact of the clinical teacher role on student experience and education satisfaction. Coupled with a self-reflective narrative of the clinical teachers' experience, we describe the influence of personal experience and individual professional interests on role development.

**Results:** Students reported greater confidence in clinical skills development and personal support from clinical teachers. They perceived the clinical teachers as 'peers' and thus more accessible compared to university academics. Students valued the role of clinical teachers as advocates within the clinical setting and appreciated the constructive feedback provided. Clinical department leads acknowledged the importance of a consistent and accessible point of contact with whom concerns, issues and student praise could be conveyed within an informal but safe environment. The diversity of personal and professional backgrounds and interests within the clinical teacher team ensures an inclusive approach to learning that allows students to explore differing perceptions and break down educational stereotypes.

**Conclusions:** Clinical teacher roles transcend the theory-practice gap and have supported a paradigm shift in the delivery of undergraduate radiography education. Accessibility, learning applicability and student advocacy are the fundamental attributes on which the role will continue to develop.

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Taylor, D. and Quick, S. (2020) Students' perceptions of a near-peer Objective Structured Clinical Examination (OSCE) in medical imaging. Radiography 26 (1), 42-48.

### K7.3 Educator perspectives of simulation in sonographer education: a constructivist grounded theory study

*Catriona Hynes; Julie Nightingale; Mark Collins*

Sheffield Hallam University

**Background:** Simulation encompasses a wide variety of teaching methods, and it is increasingly used in healthcare education. The development of high-fidelity ultrasound simulators has increased the potential of this educational approach, but there is limited evidence on how simulation can effectively support sonographer education.

**Method:** Ethical approval was obtained from Sheffield Hallam University. A constructivist grounded theory approach using qualitative interviews explored the views and experiences of twelve ultrasound educators using simulation for sonographer education. Individual interviews were conducted using online video conferencing. Interviews were recorded, transcribed and analysed using an inductive, constant comparative approach.

**Results:** Simulation is regularly used in sonographer education, mainly using high fidelity task-trainers for self-directed student learning. The use of simulation learning is currently limited by availability of space and equipment, costs, time, and limited educator training in simulation as a pedagogical tool. Sonography educators showed enthusiasm for simulation learning, but simulation was not always embedded throughout the curriculum, and there is potential to use a wider variety of simulated learning more consistently in sonographer education

**Conclusion:** There is huge potential to include a wide variety of well-designed simulations in sonographer education to enhance student learning, and to relieve some pressures on clinical trainers in busy and understaffed ultrasound departments. To facilitate this, time for design and planning, educator training and capital investment are required to allow simulation to be used to its' full potential for sonographer education.

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### K7.4 Findings of two parallel projects looking at experiences of radiotherapy for gynaecological cancers

*Lisa Ashmore[1]; Daniel Hutton[2]; Mette Kragh-Furbo[1]; Lorraine Salisbury[3]; Lynda Appleton[3]; Hilary Stewart[1]; Vicky Singleton[1]*

[1]Lancaster University; [2]The Christie NHS Foundation Trust; [3]Clatterbridge Cancer Centre NHS FT

**Background:** Radical radiotherapy for gynaecological cancers is extremely challenging for patients. Experienced long-term effects of treatment are inadequately researched and discussed.

**Method:** People receiving radiotherapy for gynaecological cancers were recruited from one cancer centre in northwest England. Participants were invited to submit narratives (handwritten, voice recorded, typed) from day one of radiotherapy to 6 months following completion. Patients over 18 years undergoing radiotherapy for any gynaecological cancer were recruited between September 2020 and August 2021. 77 patients were approached, 35 consented and 16 submitted at least one narrative. A parallel project recruited participants online, gathering narratives from any participant who had treatment for gynaecological cancer in the UK. In this project, 17 participants submitted 31 narratives representing 1 month to 25 years post treatment. Narratives were analysed collectively by the research team including social scientists; therapeutic radiographers, including on-treatment review radiographer; and a cancer research nurse. The team read narratives independently and identified areas of interest for discussion from which themes were generated.

**Results:** Participants discussed accepting and enduring effects of radiotherapy treatment, 'getting on with it' and 'it'll get worse before it gets better,' despite the disruption effects caused. Information leaflets offered practical ways of delivering key information but were criticised for offering simplified messages.

**Conclusion:** Discussions of effects of radiotherapy for gynaecological cancers served to normalise wide ranging impacts, leaving gaps in care. Consent procedures and information provided through information leaflets minimised the severity of potential effects of radiotherapy at the expense of personalised care.

### K7.5 Retroperitoneal lymphoceles in cases of multi-fibroid uteri observed on MRI

*Isabel Haines; Naomi Fenton; Tamas Schiszler; Carina Brolund-Napier*

Bristol Royal Infirmary

**Background:** To establish the rate of retroperitoneal lymphoceles in women with multi-fibroid uterus.

**Method:** Prospective observational study of incidental extra-uterine findings on MRI scans performed for multi-fibroid mapping and/or consideration of fibroid embolization. Data collected at our tertiary centre between September 2020-2021. Clinical information and imaging reviewed independently by two FRCR-qualified radiologists and findings recorded.

**Results:** 61 MRI studies performed. Age range 27-71 years (mean 46 years). 22 (36%) patients had extra-uterine incidental findings. 6 patients (27% of incidental findings and 10% of all patients imaged) were shown to have a retroperitoneal lymphocele. 4 of the 6 cases were bilateral and 2 ipsilateral, both left sided. 4 of the 6 had anteverted uteri with the other 2 cases demonstrating an axial lie. Patients with a pedunculated subserosal fibroid were more likely to have a unilateral retroperitoneal lymphocele. 5 of the 6 demonstrated concurrent venous compression. No coexisting hydronephrosis. 11 of the 22 incidental findings (50%) were within the retroperitoneum and 12 of the 22 (55%) had incidental findings secondary to mass effect.

**Conclusion:** Our rate of incidental retroperitoneal lymphoceles on fibroid MRI (10% of all patients scanned) is greater than the rate reflected in the current literature. 83% of these patients also demonstrate coexisting venous compression. These findings reflect significant mass effect within the pelvis and should not be overlooked. This study highlights the need for retroperitoneal review when reporting these cases.

### K7.6 See, Radiographers Can Do Research Too!

*Ian Simcock[1]; Ruth Reeve[2]; Clare Simcock[1]; Neil Sebire[1]; Owen Arthurs[1]*

[1]Great Ormond Street Hospital for Children NHS Foundation Trust; [2]Portsmouth Hospitals University NHS Trust

**Background:** Clinical research is the study of health and illness, enabling innovation and improvement in clinical practice to improve healthcare and experiences for patients and their families. Clinical academics are clinically active professionals that simultaneously research ways to improve current patient care [1]. New clinical-academic career pathways as recognised by the Society of Radiographers in 2021 [2] seek to formalise the roles/experience expected for these professionals at differing career levels and provide guidance to managers to implement these roles within clinical departments. Research by radiographers as principal investigators provides multiple benefits to patient care and the radiography profession. Heightening awareness of clinical-academic roles and the wider benefits will ensure that more radiographers engage with research and influence positive changes in clinical practice.

**Purpose:** This poster aims to share the authors' personal experiences of their clinical-academic career to date, highlighting the widespread advantages for clinical, academic, and professional practice and career development.

**Summary:** There are numerous advantages and challenges to clinical academic careers which we detail within the poster. Advantages of this career pathway include development of innovative practice, the ability to use, imbed and implement research into practice in a scientific manner, and academic, clinical and leadership skills. Despite the advantages, there remain some challenges to clinical academic careers including, funding, time, role security and imposter syndrome. Evidence shared through the authors' personal experiences seek to encourage more radiographers and radiology service managers to consider and support clinical academic careers.

1. Baltrucks D, Callaghan P. Nursing midwifery and allied health clinical academic research careers in the UK. Council of Deans. 2018:1 - 21. 2. The Society of Radiographers. Clinical-Academic Radiographer Guidance for the support of new and established roles. 2021:1-26.



# Proffered papers: Oncology service delivery

## L7.1 Evaluating the need for CBCT imaging in Breast patients receiving radiotherapy to the IMC

*Olivia Channon; Oliver Steel; Ruth McLauchlan; Kavit Dixit; Leah Godman; Katie Perkins; Marwa Hag-Abdalla*

Imperial College NHS Healthcare Trust

This study was designed to determine the feasibility and value of undertaking CBCTs in patients receiving radiotherapy to breast and associated nodal groups, specifically in patients receiving radiotherapy to the internal mammary chain (IMC). The current image verification technique for breast patients in our department uses MV imaging to check breast contour, CLD, CFD and inferior coverage. For SCF/IMC patients an additional kV anterior image is taken to verify positioning in the longitudinal direction. As part of an audit 18 patients had CBCTs acquired in DIBH on fractions 3, 6 and 11, alongside the standard MV/kV image verification.

Population, random, and systematic errors were calculated across the three imaging modalities and were found to be reasonably similar. There were large magnitudes of rotational shifts apparent when considering the PRR (pitch, roll, rotation) shifts. It was found that for 8% of images in the audit, the PRR was greater than ±3°, which would have required a re-set up. 6/18 patients on the audit had CBCTs where, at acquisition, the IMC PTV was not covered as the patient was off in the anterior/posterior direction, sometimes by almost 1.0cm. Using auto bone match on the CBCT offline improved coverage greatly.

The results of this audit showed that using CBCT for IMC patients improves the localisation and provides information about IMC coverage that otherwise would have been missed. As a result, the department has implemented online matching CBCT #1-3 and weekly for all IMC breast patients, replacing the current standard of MV imaging.

## L7.2 Evaluation of the novel guided reporting strategy: quality and time of radiology report creation in MR mammography using a dedicated software

*Alexander Huppertz[1]; Daniel Lorenz[2]; Marina Walter[3]; Martin Maurer[4]*

[1]University of Potsdam; [2]Neo Q Quality in Imaging GmbH; [3]Hasso Plattner Institute for Digital Engineering gGmbH; [4]Inselspital, Bern University Hospital

**Background:** Unstructured free-text dictation (FT), the current standard is considered being too time-consuming and error prone.

**Method:** To assess usability and performance of a software-based guided reporting strategy (GR, RadioReport pre-marketed v0.8, NeoQ, Germany) in MR mammography. Eighty examinations evaluated previously (>8 weeks) with FT including mass, focus/non-mass enhancement, normal findings were reevaluated using GR by three specialized radiologists. Usability was assessed by subjective feed-back, quality by comparing automatically generated GR to FT for completeness. Errors in GR were categorized and analyzed for debugging in marketed v1.3. Reporting time and learning curves were analyzed.

**Results:** Usability was rated high by all readers. No nonsense, omission/commission, and translational error were detected in GR. Spelling/grammar error were observed in GR in 3/80 patients (3,8%), exclusively in the free-text discussion section, and 36/80 in FT (45%). Content differences between FT and GR revealed no difference in 41 patients, minor difference (33 patients), major difference resulting in treatment change (6 patients). All patients with differences were categorized content omission error in v0.8, caused by insufficient software operation or error by missing contents in v0.8 but displayable with v1.3. Mean reporting time was 576 seconds (SD 327; minimum 155; maximum 1517 seconds). Mean times per reader were 485, 557, 754 seconds.

**Conclusion:** Overall time is, therefore, significantly shorter compared to references from FT process1,2. Mean reported time for FT of MRI examinations was 1059 seconds and decreased by 42,3% using GR. GR allows for complete reporting while minimizing error rate and significantly reducing time.

1. Cowan, I.A.; MacDonald, S.L.; Floyd, R.A. (2013) Measuring and managing radiologist workload: measuring radiologist reporting times using data from a Radiology Information System. J Med Imaging Radiat Oncol. 57(5), 558-566. 2. Pitman, A.; Cowan, I.A.; Floyd, R.A.; Munro. P.L. (2018) Measuring radiologist workload: Progressing from RVUs to study ascribable times. J Med Imaging Radiat Oncol. 62(5), 605-618.

### L7.3 Implementing the findings from the reducing pre-registration attrition and improving retention (RePAIR) project - developing an AHP support programme for improving recruitment, retention and engagement (ASPIRRE)

*Mandy Tuckey; Nicky Hutton*

South West AHP Workforce, Society of Radiographers

There are a wealth of resources available that support educators and clinicians to reduce attrition and improve retention of students and newly qualified staff within radiotherapy and other health care disciplines. There is no central online repository where resources can be uploaded, shared, reviewed and developed. A toolkit was developed from the descriptive statistical analysis of a mixed method survey undertaken in Spring 2021 of 10 higher education institutions (HEIs) providing therapeutic radiography education, 51 radiotherapy healthcare providers and 20 therapeutic radiography students on a placement expansion programme, in England. 6 key themes emerged from the data analysis that formed the priority areas of the toolkit Effective recruitment initiatives (including outreach) Effective retention initiatives including student support, return to practice Strategies to increase student placement capacity (including simulation and non-traditional placements) Placement allocation and funding support Standardised clinical assessment documentation Preparation for practice (including preceptorship) Each priority area of the toolkit is populated with examples that include: Recruitment initiatives e.g. department open days, podcasts, virtual tours Examples of buddy schemes and peer support programmes, non-traditional placements including research, leadership and internships Innovative working patterns to increase student training capacity Simulation strategies and practical examples Example templates to support students to secure placement accommodation Initiatives from other professional groups that have implemented standardised assessments in clinical practice. Transition to professional practice initiatives and preceptorship examples The ASPIRRE toolkit enables a wide target audience to access a range of resources to be able to continue to develop new and existing ideas for supporting recruitment and retention initiatives, explore placement expansion and transformation agendas within radiotherapy.

1. Health Education England (2018). Reducing Pre-registration Attrition and Improving Retention [online]. Available at https://www.hee.nhs.uk/our-work/reducing-pre-registration-attrition-improving-retention.

### L7.4 Renal cell carcinoma audit - preoperative radiological TNM staging versus histological outcomes

*Fathallah Islim[1]; Fawad Shameem[2]; Haroon Motara[3]*

[1]; [2]Mid Yorkshire Hospital Trust; [3]Mid Yorkshire Hospitals NHS Trust

**Background:** 13,300 new renal cell cancer (RCC) cases in the UK every year. Overall, 5-year mortality is high -35% (4300 deaths/year). Staging by CT is crucial and forms the basis for surgical planning, allowing multiplanar tumour margin and vascular supply assessment. Literature suggests staging accuracy rates of around 80%.

**Purpose:** We present our results and 5-year postoperative survival from 2016 and use it to highlight common pitfalls with cases and images.

**Summary:** 50 patients underwent nephrectomy (38) or partial nephrectomy (12) for RCC in 2016. All had documented preoperative staging based on CT and MDT discussion. Radiological and histological TNM staging mismatch occurred in 13/50 cases (26%). Seven related to radiological assessment of sinus or perinephric fat; 5 upstaged from T2a/b to T3a, 2 downgraded from T3a to T2a and T2b. Two cases were upstaged from T1b and T2a to T3a due to histological invasion of renal vein, although the latter was microinvasion. Two cases were downsized from T1b to T1a and T2a to T1b. Two cases demonstrated concerning lymph nodes on CT; staged as N1, however cleared on lymph node dissection. At 5-year follow-up 11 patients died; 7 due to RCC (14% mortality; average death at 2 years). Only 2 RCC deaths occurred in radiology/histology mismatch patients, which were histologically down staged.

**Conclusion:** Histological upstaging of cases by early fat/vascular invasion is a well-recognised issue that all radiologists should be aware of; however, it does not appear to significantly alter management or outcome.

1. Cancer Research UK, https://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/kidney-cancer/mortality, Accessed [Dececmber] [2021]. 2. Tsili, A. C., & Argyropoulou, M. I. (2015). Advances of multidetector computed tomography in the characterization and staging of renal cell carcinoma. World journal of radiology, 7(6), 110-127. https://doi.org/10.4329/wjr.v7.i6.110

### L7.5 What proportion of patients receiving radical treatment for muscle invasive bladder cancer would be suitable for trimodality therapy including HDR-brachytherapy - retrospective study from a single UK tertiary referral centre

*Liam Mannion[1]; Vinod Mullassery[2]; Deborah Enting[2]; Rajesh Nair[2]; Mieke Van Hemelrijck[1]; Samuel Withey[3]; Thomas Charlton[2]; Muhammad Shamim Khan[2]; Ramesh Thurairaja[2]; Simon Hughes[2]*

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**Background:** Trimodality therapy including HDR-Brachytherapy (TMT-HDR) is a management option used in select European Centres for muscle invasive bladder cancer (MIBC). Suitable patients have good bladder function, solitary tumours 5cm, no CIS, no pelvic lymphadenopathy, and are located away from the bladder trigone.

**Methods:** We conducted a retrospective cohort study of patients who received radical treatment: radical cystectomy and lymph node dissection (RC-LND), or radical Radiotherapy +/- chemotherapy (C-RT) at a London teaching hospital between 2010 and 2019. The aim was to determine what proportion of patients would have been suitable for TMT-HDR. To assess the accuracy of clinical tumour diameter assessment we compared the following diameter measurements in 10 patients who had undergone RC-LND without neoadjuvant chemotherapy: diagnostic CT / MRI, diagnostic TURBT, cystectomy histology.

**Results:** 703 patients received radical treatment over the time frame studied: 562 RC-LND, 141 C-RT. From these, 96 would have been suitable for TMT-HDR: 54 RC-LND, 42 C-RT. Diagnostic imaging and TURBT estimates of tumour diameter were all found to fall within 0.5cm of the RC-LND histology measurements.

**Conclusions:** Overall 13.6% of patients seen at our centre were suitable for TMT-HDR (7.7% RC-LND, 6% C-RT). Diagnostic imaging and TURBT diameter measurements are clinically appropriate for guiding patient selection.

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## MSK POSTER PRESENTATIONS

### P001 The gooey bits of MSK: Periarticular cystic lesions

*Sian Davies*

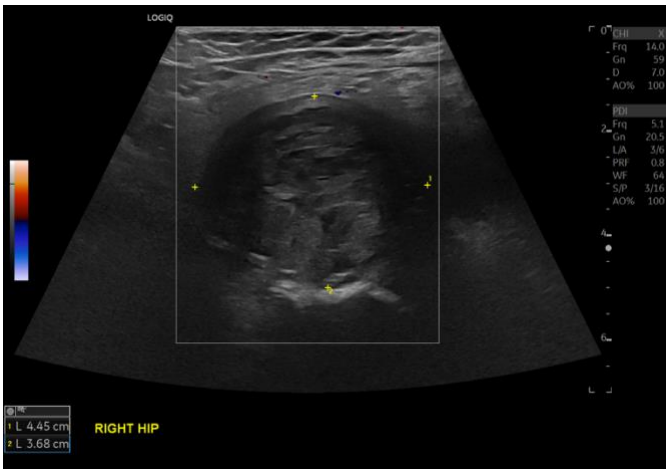
Musgrove Park Hospital

**Aim:** Both general radiologists and those with a special interest in musculoskeletal imaging may encounter cystic lesions around joints on a wide variety of imaging modalities. This educational presentation seeks to highlight some of the frequently encountered and more unusual pathologies in the differential for peri-articular fluid-containing lesions.

**Cases:** Common lesions such as ganglia and Baker's cysts are widely known of, but a host of other pathologies can cause periarticular cystic lesions. Some of these may be secondary to underlying disease within the joint and should prompt further evaluation for a causative arthropathy. A pictorial review will be presented showcasing classic examples of cases ranging from: paralabral cysts in a variety of joints, metal on metal pseudotumour, infective collections, arteriovenous malformations, an array of different bursae, post operative complications and more. Ways to differentiate these lesions and important aspects to describe in the radiology report will also be covered.

**Conclusion:** It is important for radiologists to appreciate the full scope of differentials when assessing the imaging characteristics of periarticular cystic lesions to enable accurate diagnoses and appropriate recommendations for further studies.






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### P002 The knee: An overview of anatomy and approach to knee MRI

*Israah Amin*

Hull University Teaching Hospitals

**Background:** MRI examinations of the knee are amongst the most commonly performed musculoskeletal MRI studies, probably second only to the spine. This means that of all MSK MRI this is one of the most commonly encountered - be it by the General Radiologist in a District General Hospital, by Radiology trainees, or increasingly, by reporting radiographers. It is therefore an important study for these reporters to feel comfortable with. The unfamiliarity with the modality and with the soft tissue structures well depicted by it, structures poorly outlined on other imaging, can make reporting a little daunting initially.

**Purpose:** This pictorial review aims to provide an overview of an approach to reviewing an MRI Knee and a guide to imaging signs of common soft tissue pathology. The aim is to provide a useful aid to those new to the study or act as a revision tool for those with prior experience.

**Summary:** A poster aiming to provide an overview of knee anatomy, common soft tissue pathology and an approach to reviewing an MRI of the knee.

## P003 Best practice: Service evaluation of a one-stop lumbar spine pathway, from referral to nerve root block via MRI

*Katie Corin[1]; Christine Heales[2]; Alex Jack[1]*

[1]University Hospitals Plymouth NHS Trust; [2]University of Exeter

**Background:** Patients with radicular leg symptoms who have MRI showing neural compromise may be treated with a nerve root block (NRB) under CT guidance. The typical pathway for such patients involves multiple hospital visits with waits between appointments. This is inconvenient for the patient and adds delays in terms of their progress to treatment when indicated.

**Purpose:** The aim of this abstract is to describe the introduction of a one-stop clinic for these patients in terms of impact upon time from referral to treatment. The implementation of this clinic is intended to improve patient management by providing same day referral and rapid diagnosis for patients with acute spine problems. Same day scanning also enables further on-the-day discussion with the patient regarding available treatment options including conservative treatment.

**Summary:** The poster will provide timelines for the multi-stop (established) pathway i.e. specialist physiotherapist assessment, referral to MRI where indicated, discussion of results with neurosurgery, referral to radiology for CT-guided NRB. The one-stop pathway which utilises the skills and knowledge of an interprofessional team (specialist physiotherapist and reporting radiographer) to provide on-the-day results and onward referral to the relevant treatment pathway will be described. Challenges encountered will be identified. The key metric - timeline from referral to treatment - for this pathway will be compared with the multi-stop pathway. This is particularly important as the sooner a patient receives a NRB the more likely it is to be effective. Finally, consideration will be given to patient experience which is also key.

## P004 Glucocorticoid-induced osteoporosis - a need for early intervention

*Margot McBride*

Society of Radiographers

**Background:** Glucocorticoid-induced Osteoporosis (GIOP), in Cushing syndrome (CS), remains the most common form of drug-induced osteoporosis.1 This health condition creates weaknesses in bones, causing fractures. In a 2020 Health-related Quality of Life (HRQoL) study of 86 CS patients, 38% of them were diagnosed with GIOP. Method As part of this HRQoL survey, patients were asked if they had been diagnosed with osteoporosis, the methods of diagnosing and treatments, and the impact it had on their HRQoL.

**Results:** Patient ages were between 35-68 years old. All patients recorded very poor QoL scores. 91% of the women reported mobility disabilities and regularly attend a fracture clinic. Identified within the thematic analysis was that their mobility disabilities had, reduced their ability to socialise and work and if osteoporosis had been diagnosed earlier, then this would have improved their HRQoL. Of the 38% diagnosed with osteoporosis, 26% had a DEXA scan, the rest were referred for other forms of imaging, including MRI, and skeletal imaging which confirmed their diagnosis. All patients were prescribed medical therapy (bisphosphonates), and 23.8% of them reported that this had improved their HRQoL Conclusion This study highlighted the prevalence of osteoporosis in CS patients. Health Professionals' awareness and early diagnosis would reduce the sustained burden of hypercortisolism, which is a major cause of GIOP. Referral for a DEXA scan following biochemical testing would help in risk stratifying to identify early signs of osteoporosis. New technology such as artificial intelligence to identify early changes in bone density and early intervention would also reduce the financial burden of healthcare.

1Saag K et al, (2021). Marcus and Feldman's Osteoporosis, Chapter 45, Ed. T. Glucocorticoid-induced osteoporosis in Cushing syndrome: Vol. 2, Pp. 1103-1138.

### P005 Retrospective audit of acute inpatient whole spine MRI for MSCC

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Leeds Teaching Hospitals NHS Trust

**Introduction:** Up to 5% of cancer patients will be affected by metastatic cord compression (MSCC) , although the true incidence is unknown. NICE recommends imaging assessment in a timely fashion depending on the suspected clinical diagnosis. MRI within 1 week is recommended for symptoms suggestive of spinal metastases and more urgent MRI within 24 hours if symptoms suggest an oncological emergency of MSCC - the hallmark of which is positive neurology on examination.

**Method:** All inpatient MRI studies performed for suspected MSCC between January 2019 and December 2019 at our tertiary cancer center were reviewed with data collected regarding imaging findings, referring history and patient demographics including details on any known cancer. A positive study was taken as that demonstrating MSCC.

**Results:** There were a total of 311 scans performed over 12 months for suspected MSCC - 19% of which were positive for compression. 134(43%) of the MRI scans had clinical details fitting the NICE criteria for urgent MRI - that is known malignant disease with neurology. Of these, 46(34%) were positive. Interestingly of these 46 positive cases, 41 had known bony metastatic disease.

**Conclusion:** Despite the number of urgent MRI we perform for suspected MSCC, less than 20% of cases were positive. Our audit demonstrated that known bony metastatic disease alongside neurology was the greatest indicator for a positive MSCC MRI. Pain alone was found to be a poor indication for scanning acutely accounting for only 10% of positive scans.

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### P006 Bone infection: From infectious osteitis to osteomyelitis- the many faces of serious osseous involvement

*Stavroula Theodorou[1]; Daphne Theodorou[2]; Evangelos Papanastasiou[1]; Miltiadis Kostas[2]; Marios Vekris[1]; Anastasios Korompilias[1]*

[1]University Hospital of Ioannina, Greece; [2]General Hospital of Ioannina, Greece

**Background:** Differentiating among diagnosis of bone and soft tissue infection is crucial to clinicians in selecting certain treatment options, such as operative intervention, percutaneous drainage, or noninvasive medical treatment. Furthermore, the early diagnosis of infection is important in prompting treatment that will prevent serious complications.

**Purpose:** We focus on diagnosis of osseous infection according to the osseous compartment involved- that is, infection either limited to cortical bone (infectious osteitis) or affecting bone marrow (osteomyelitis). Regardless of the mechanism of contamination, we consider specific situations including recurrent multifocal osteomyelitis, pedal infections in diabetic patients, and bone infections in immunocompromised patients. Although radiography remains the initial imaging examination of choice for suspected skeletal infection, CT provides exceptional detail of cortical bone in a cross-sectional display. With CT, abnormalities in cortical bone including erosions, subtle osteolysis, foci of gas, and intracortical bone abscesses can be optimally detected. Changes in medullary bone including increased intraosseous density, sequestra, involucra, and cloacae also can be delineated by CT. With MRI, diagnosis can be achieved before destructive changes are identified by radiography/CT, owing to the contrast MRI typically provides between abnormal and normal bone marrow. Furthermore, MRI is the most appropriate method to detect involvement of the cartilaginous epiphyses in children that is impossible with other methods.

**Summary:** CT can be useful to detect early spread of infection to periosteum or cortex (osteitis), whereas MRI is superior in delineating the presence of abscesses and sequestra in medullary bone (osteomyelitis), and regional extent of infection.

1. Mandell JC, Khurana B, Smith JT, et al (2018). Osteomyelitis of the lower extremity: pathophysiology, imaging, and classification, with an emphasis on diabetic foot infection. Emerg Radiol 25(2):175-188 2. Anwer U, Yablon CM (2017). Imaging of osteomyelitis of the extremities. Semin Roentgenol 2017; 52(1):49-54 3. Schmitt SK (2017). Osteomyelitis. Infect Dis Clin North Am 31(2):325-338

### P007 Audit of the use of collimation during orthopaedic theatre fluoroscopy

*Laura Groves; Caitlin Young*

NHS Greater Glasgow and Clyde

**Background:** Fluoroscopy provides intra-operative imaging to guide surgical equipment. Fluoroscopy improves the surgeons' proficiency and reduces morbidity (Ojodu et al., 2018). It has the potential to be high dose and pose a radiation risk (Narain et al., 2017), therefore parameters known to reduce dose such as collimation to help keep the dose as low as reasonably achievable (ALARA) should be utilised.

**Purpose:** This audit aimed to determine to what extent collimation is being used during orthopaedic theatre cases using fluoroscopy in a Major Trauma Centre and to consider the effectiveness of quality improvement tool Optimal Orthopaedics (Silverton and Forbes, 2019). Between data collections the number of images with evidence of and adequate collimation improved by 20.43% and 19.45% respectively, demonstrating the effectiveness of Optimal Orthopaedics (Silverton and Forbes, 2019). Identification of theatre training champions may have contributed as this is an effective way to facilitate change (Gesme and Wiseman, 2010). Discussions between modality leads and theatre staff about shared expectations strengthened working relationships. Effective leadership ensured ways of working aligned with what was discussed. Barriers to implementation such as workload, lack of time, staff working across multiple areas (Geerligs et al., 2018) may be why, despite an improvement, the second data collection did not meet the standard. The interrelationship between the four pillars of advanced practice is demonstrated: modality lead -- leadership, theatre champions -- education, collimation as an indicator of clinical practice and audit as research.

1. Geerligs, L., Rankin, N.M., Shepherd, H.L. and Butow, P. (2018) 'Hospital-based interventions: a systematic review of staff-reported barriers and facilitators to implementation processes', Implementation science, 13(1), pp. 36. doi: 10.1186/s13012-018-0726-9. (Accessed June 2021). 2. Gesme, D. and Wiseman, M. (2010) 'How to Implement Change in Practice', Journal of oncology practice, 6(5), pp. 257-259. doi: 10.1200/JOP.000089. (Accessed June 2021). 3. Narain, A.S., Hijji, F.Y., Yom, K.H., Kudaravalli, K.T., Haws, B.E. and Singh, K. (2017) 'Radiation exposure and reduction in the operating room: Perspectives and future directions in spine surgery', World journal of orthopedics, 8(7), pp. 524-530. doi: 10.5312/wjo.v8.i7.524. (Accessed July 2021). 4. Ojodu, I., Ogunsemoyin, A., Hopp, S., Pohlemann, T., Ige, O. and Akinola, O. (2018) 'C-arm fluoroscopy in orthopaedic surgical practice', European journal of orthopaedic surgery & traumatology, 28(8), pp. 1563-1568. doi: 10.1007/s00590-018-2234-7. (Accessed July 2021). 5. Silverton, J. and Forbes, R. (2019) 'Optimal Orthopaedics: an evaluation and improvement strategy for adults intraoperative radiographic imaging service'. NHS GGC.

### P008 Correlation of the quantitative methods for the measurement of bone uptake and plasma clearance of 18F-NaF using positron emission tomography. Systematic review and meta-analysis

*Rajeh Assiri; Karen Knapp; Jon Fulford; Junning Chen*

University of Exeter

**Background:** 18F-NaF PET is valuable for detecting bone metabolism through osteoblastic activity in the assessment of bone disease. Hawkins, Patlak, and standardised uptake value (SUV) are the most common quantitative measurements used to evaluate bone metabolism. This systematic review evaluates the correlation between quantitative positron emission tomography (PET) methods and to compare their precision.

**Methods:** A systematic search in Medline, PubMed, SCOPUS, and Web of Science was undertaken to find relevant papers published from 2000. All studies with human adults undergoing 18F-NaF PET, PET/CT, or PET/MRI were included except for subjects diagnosed with non-diffuse metabolic bone disease or malignancy. Quality Assessment Tool for Studies of Diverse Designs (QATSDD) was used to assess risk of bias. A qualitative review and meta-analysis using Hedges random-effect model was used producing summary size effects of the correlation between methods in healthy and unhealthy bone sites and assessing study heterogeneity.

**Results:** 228 healthy and unhealthy participants were included across 12 studies resulted from the systematic search. One-third of studies had a moderate quality percentage while the rest had relatively high quality. The pooled correlation coefficient in meta-analysis showed a high correlation of more than 0.88 (0.71--1.05. 95 %CI) between SUV and Hawkins and more than 0.96 (0.88--1.03. 95 %CI) between Patlak and Hawkins within all subgroups, suggesting all

methods yield similar results in healthy and unhealthy bone sites. SUV has the lowest precision error followed by Patlak while Hawkins method showed the highest precision error.

**Conclusion:** Patlak is the best within research and SUV is better within clinical practice.

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## P009 Short-term precision errors of radiofrequency echographic multi-spectrometry (REMS) bone density measurements at the lumbar spine and neck of the femur using an Echolight scanner

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University of Exeter

**Background and aim:** Osteoporosis is a silent disease that keeps progressing without clear symptoms until a fracture suddenly happens. Globally, approximately 200 million cases are affected by osteoporosis with nearly 9 million fractures occur annually. Accessing dual X-ray absorptiometry (DXA) scanning can be limited and this encouraged searching for alternatives. REMS is a new diagnostic technology for osteoporosis that solves some limitations of DXA. As a new technology, this study aimed to assess the short-term precision errors for REMS using an (Echolight) scanner, to determine the potential for future clinical use compared to the currently adopted gold standard DXA.

**Methods:** Fifteen participants (10male, 5female), mean age 36.26 (sd ±12.8) years, underwent 3 scans of their lumbar spine and femoral neck, on the same day with repositioning between scans using the Echolight scanner. The root mean square (RMS) standard deviation (SD) and RMS coefficient of variation (CV%) were calculated.

**Results:** The RMSSD was 0.015g/cm², 0.010 g/cm², and 0.019 g/ cm² for the Lumbar spine, femoral neck, and proximal femur respectively. CV% was 1.24% for the lumbar spine, 1.14% for the femoral neck, and 1.88% for the proximal femur.

**Conclusion:** The precision error rates in both targeted anatomical sites in this study are less than that of DXA. Further studies are required to investigate the medium and/or long-term precision errors of REMS to better understand the impact of time progression on REMS measurements as well as to assess operator dependency. Ethics committee approval University of Exeter - internal REC approval granted (19/11/233) Funding Sponsorship from the Royal Embassy of KSA.

### P010 Exploring the agreement between the GE Lunar knee software and historical methods for the measurement of bone mineral density in the knee

*Rhianna Beck[1]; Ellie Steer[1]; Elicia Wreford[1]; Karen Knapp[1]; Michael Gundry[1]; Patrick Hourigan[2]; Andrew Toms[2]*

[1]University of Exeter; [2]Royal Devon and Exeter NHS Foundation Trust

**Background:** Knee dual energy x-ray absorptiometry (DXA) is a relatively new measurement technique, but a potentially important one for research into peri-prosthetic changes. Historically, adjusted lumbar spine settings were used for knee scans; GE Lunar have now released knee software. The purpose of this study was to explore the agreement between historical methods and the knee software.

**Method:** 24 participants with prosthesis and 25 without (25 male to 24 female, mean age 70.9y ± 8.18, BMI 29.18kg/m2 ± 4.15) were scanned using the historical method, which utilises a long lumbar spine DXA setting with thin mode selected and rice bags to provide bolstering medially and laterally to the knee on a GE Lunar Prodigy (Bedford, UK). An eight region of interest template was used to analyse the scans and point typing used to ensure bone and soft tissue were correctly characterised. The scans were then converted and reanalysed using the knee software. Differences were tested using a Wilcoxon Signed Rank test and a p-value of <0.05 considered significant using SPSS V26 (IBM).

**Results:** Mean differences (SD) between the two techniques across the eight regions of interest ranged from -0.05 (±0.22) to 0.05 (±0.22) in knees with prostheses and -0.13 (±0.19) to -0.06 (±0.09) in knees without (p<0.05).

**Conclusion:** These results demonstrate significant, but small differences between the two techniques, which are close to the precision errors for Knee DXA [1,2]. The knee software required less post-processing, and thus was beneficial in terms of analysis time.

1. Soininvaara T, Kröger H, et al. Measurement of bone density around total knee arthroplasty using fan-beam dual energy X-ray absorptiometry. Calcified Tissue International. 2000;67(3):267-272 2. Jensen CL, Petersen MM, et al. Bone mineral density changes of the proximal tibia after revision total knee arthroplasty. A randomised study with the use of porous tantalum metaphyseal cones. International Orthopaedics. 2012;36(9):1857-1863

### P011 Short-term intra- and inter-operator precision errors of radiofrequency echographic multispectrometry bone density measurements at the proximal femur using the Echolight scanner

*Chelsie Das; Jacqueline Hilley; Gemma Hooper; Mohammed Asiri; Karen Knapp*

University of Exeter

**Background:** The Echolight uses 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 proximal femur with this new scanner.

**Method:** 29 participants were recruited and underwent REMS measurements at the proximal femur using the Echolight (Lecce, Italy). Three operators were trained and undertook practice sessions prior to conducting the study. Duplicate measurements were made by a minimum of two operators with repositioning between measurements. The root mean square standard deviation (RMDSD) and root mean square coefficient of variation (RMSCV%) were calculated for the intra- and inter-operator results.

**Results:** Participants' mean age was 24.4y (± 8.0) and their mean body mass index was 24.6kg/m2 (±4.2). Intra-operator and inter-operator precision errors ranged from RMSCV% (RMDSD) 1.24% (0.012) to 2.13% (0.021) for the total hip and 0.71 (0.005) to 1.18% (0.009) for the femoral neck. Degrees of freedom ranged from 9 to 13 for the intra-operator precision and was 12 for inter-operator precision because measurements were not achieved on 7 of the 29 participants, while only one operator achieved measurements in some of the participants.

**Conclusion:** These results demonstrate good precision errors, which are comparable to those reported for dual energy x-ray absorptiometry. However, further work is required to reduce the number of participants where measurements could not be successfully achieved. Greater experience on the scanner may reduce this number.

## P012 Short-term precision errors of density index measurements at the distal radius and proximal plus distal tibia using the Bindex scanner

*Abdulkareem Algahtani; Karen Knapp; Robert Meertrns; Jonathan Fulford; David Strain*

University of Exeter

**Introduction:** The Bindex system utilises a novel ultrasound method that calculates a bone density index by measuring the thickness of cortical bone at peripheral skeletal sites with a handheld device. This study aimed to assess the short-term intra-operator precision of the Bindex on combined measurements from the distal radius, proximal and distal tibia.

**Methods:** Fifteen participants (13 male & 2 female), mean age 35.86 (SD ±7.61) years, were included in this study. All participants underwent three scans with the Bindex® device in the same session with repositioning between each scan. In all scans, the thickness of cortical bone at the distal radius as well at the distal and proximal tibia was measured in order to analyze intra-operator precision. The measurements were performed according to manufacturer's instructions and by the same investigator. The data were analysed using the root mean square standard deviation (RMSSD) and the room mean square coefficient of variation (RMSCV%), as is recommended by international society for clinical densitometry (ISCD) [1].

**Results:** For the bone density index score, based on scans at all anatomical sites, RMSSD was 0.035g/cm² and RMSCV% was 3.14%.

**Conclusion:** The precision error rates in this study were higher but in line with the Behrens et al, 2016 study [2]. Further studies are required to investigate the medium and long-term precision errors of Bindex, as well as inter-operator precision results.

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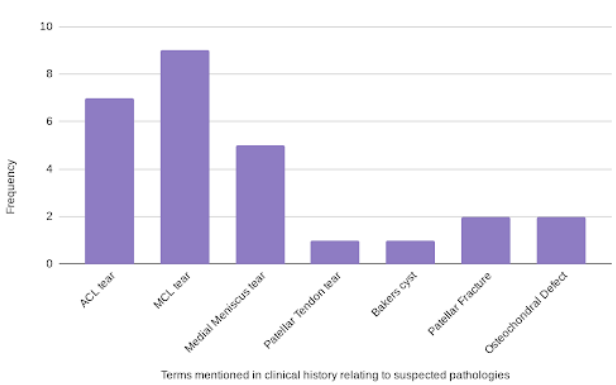
## P013 Unexpected features of transient patellar dislocation on MRI knee examinations

*Sian Elisabeth Davies; Edward Walton*

North Bristol NHS Trust

**Objectives:** To investigate the incidence of clinically occult/ unsuspected recent patella dislocation on MRI knee examinations performed in a large teaching hospital. To establish the mechanisms of injury commonly associated with occult/ unexpected transient patella dislocation specifically.

**Methods:** A retrospective review of MRI knee studies performed from January 2019 to November 2019 with CRIS reports containing the phrase " patella dislocation" was performed. Those MRI reports stating features of patella dislocation were present were assessed for mention of patella dislocation/ patellofemoral instability in the radiological request. Of those without mention of this in the request, an analysis of the mechanism of injury, suspected pathologies and previous imaging was performed.




**Results:** Of 51 MRI knee studies showing features of recent patella dislocation, 17 (33%) did not mention patella dislocation or patellofemoral joint instability as a suspected pathology in the radiological request. The most common mechanisms of injury were "twisting" or "valgus" injuries where MCL/ ACL/ medial meniscus injuries were suspected.

**Conclusions:** This study demonstrates that a significant proportion of MRI-confirmed patella dislocations are clinically unsuspected. Prompt use of MRI early in the clinical pathway in those with a typical mechanism of

injury can help prevent delayed diagnosis in these patients, which can have a significant deleterious effect on long term functional outcome.

### P014 Pictorial review: Common non-degenerative causes of hip pain

*Claire Giles[1]; Scott Harrison[2]; Carol Phillips[1]; Gary Cross[2]; Ynyr Hughes-Roberts[2]*

[1]University Hospitals Bristol and Weston NHS Foundation Trust; [2]Royal United Hospitals Bath NHS Foundation Trust

**Background:** The authors of this poster issued a survey to reporting radiographers throughout Southwest England. Of the 30 respondents, 70% (n=21) stated they would benefit from additional support and knowledge in the accurate identification of non- degenerative MSK disorders requiring an orthopaedic referral, particularly in the pelvis.

**Learning objectives:** To correctly identify different causes of femoral acetabular impingement.
To recognise and qualify acetabular dysplasia.
To identify early signs of avascular necrosis.
To understand and recognise the subtle signs of insufficiency fractures.

**Application to practice:** To confidently identify subtle changes to pelvic morphology whilst reporting radiographs.
To identify subtle pathologies which are recognised to be causes of early onset degenerative changes.

**Summary:** The poster acts as a quick reference guide for reporters by providing a pictorial review of common causes of non-traumatic hip pain in the adult pelvis. A series of radiographic images paired with illustrations summarise causes of femoral acetabular impingement, avascular necrosis and insufficiency fractures. The identification and quantification of acetabular dysplasia is also included. The poster is designed to improve recognition of commonly overlooked causes of hip pain in the hope of expediting patient pathways.

### P015 Pictorial review of the radiographic image in patients with hip arthroplasty

*Scott Harrison[1]; Claire Giles[2]; Ynyr Hughes-Roberts[1]; Gary Cross[1]*

[1]Royal United Hospitals Bath NHS Foundation Trust; [2]University Hospitals Bristol and Weston NHS Foundation Trust

**Background:** The authors of this poster issued a survey to reporting radiographers practicing in radiology departments throughout Southwest England. Of the 30 survey respondents, 83% (n=25) stated that they would benefit from additional support and knowledge in the accurate identification of atraumatic radiographic pathologies associated with orthopaedic implants such as hip arthroplasty.

**Learning outcome:** Correctly recognise the various methods of hip arthroplasty
Identify the physical components of the total hip arthroplasty and recognise their relationships
Explore common atraumatic radiographic pathologies relating to total hip arthroplasty

**Application to practice:** Confidence to correctly name different hip arthroplasty procedures whilst reporting radiographs.
Apply improved recognition of atraumatic abnormalities to reduce errors when reporting on radiographs of patients with hip arthroplasty.

**Summary:** The poster gives a pictorial review of total hip arthroplasty intended for utilisation as an *aide-mmoire* for reporters reviewing radiographs of patients who have undergone this procedure. A series of radiographic images summarise the differences between various hip arthroplasty procedures. An additional set of images outline the radiographic features of common atraumatic pathology relevant to hip arthroplasty, for example aseptic loosening, polyethylene wear, and osteolysis. The poster intends to improve the ability of reporters to accurately identify atraumatic radiographic pathology pertaining to total hip arthroplasty, providing prompt diagnosis and improved outcomes for this group of patients.

### P016 Fluoroscopically guided joint injections - a pictorial review

*James Ross; Simon Rupret; Chris Pawley, Isacc Uri*

Gloucestershire Hospitals NHS Foundation Trust

**Background:** Fluoroscopic guided injections are used widely in radiology departments for the purpose of both diagnosis and treatment of a range of musculoskeletal pathology. The new RCR curriculum states that all radiology trainees should be proficient in image guided injection in musculoskeletal radiology, which is defined as being able to practice independently at the level of a day 1 consultant (1). A recent survey by the British Society of Skeletal Radiologists of UK radiology trainees found that 57% believed training in fluoroscopy could be improved (2).

**Purpose:** The purpose of this poster is to act as education and practical aid for radiology trainees, displaying a stepwise approach to fluoroscopic guided joint injections commonly performed in a standard outpatient radiology setting including shoulder, wrist, hip and ankle.

**Summary:** The poster will use both diagrams and fluoroscopic images obtained from our practice to explain the anatomy, equipment, set up, needle placement and distribution of contrast post injection that indicates successful infiltration of the desired joint space.

1. Clinical Radiology Speciality Training Curriculum Curriculum. Implementation 01/08/2021. Royal College of Radiologists. 2. Dalili, D et al; British Society of Skeletal Radiologists. Musculoskeletal radiology training in the UK: a national survey by the British Society of Skeletal Radiologists. Clin Radiol. 2021 Sep;76(9):650-658.

### P017 Is a lateral hip radiograph useful in detecting complications post hip arthroplasty?

*Rowaa Ahmed; Richard Fawcett; Rebecca Macklam; Kane Moreton*

Leeds Teaching Hospitals NHS Trust; [2]

**Background:** Hip fractures remain one of the most common serious injuries in elderly patients across the UK. According to the national hip data base, 670 hip fracture patients were admitted to one major trauma center alone in 2020 (1). A significant number of these patients are intra-capsular neck of femur (NOF) fractures, who are commonly treated with hip arthroplasty (2). Historically, the standard practice for these cases was to obtain both post operative AP pelvis and lateral hip check radiographs to detect immediate post operative complications. A change in practice was implemented at the end of June 2021 by eliminating lateral hip radiographs from the standard post-operative checks, as it was felt that it was of no added benefit. This audit was conducted to provide evidence whether this change should be maintained.

**Method:** This audit was done by conducting a retrospective search for post NOF fracture patients that underwent a hemiarthroplasty or a total hip replacement (THR) who had both AP and lateral radiographs obtained between the 1st January 2021 and 17th June 2021 until 100 cases were met. All the cases were reviewed for complications, and whether they were visible on the AP or lateral alone.

**Results:** In all cases with complications, there was no additional diagnostic information given by the lateral hip view.

**Conclusion:** By obtaining only an AP pelvis radiograph, there is a significant reduction in radiation exposure, the cost of an additional x-ray view is saved, and patient dignity and comfort are maintained (3)(4).

1. National hip fracture data base. 2. Nice guidelines in treating hip fractures. 3. Farman-Alanie,O.M, Ingram,R. and Stark,A.D. (2018). A retrospective study of patients' experience of the post-operative check radiograph following a total hip replacement using the turned lateral view and horizontal beam lateral view radiographs. Orthopaedic Proceedings. vol 94. 4. National institute of health research, Interactive costing tool, Investigation and intervention tariff 2020/2.

### P018 Flexion and extension weight bearing spinal CT

*Naomi Winn*

The Robert Jones and Agnes Hunt Orthopaedic Hospital NHS Foundation Trust

**Purpose:** To assess spinal stability in different physiological positions whilst weight-bearing. Methods. A cone beam CT scanner (CBCT) was used to identify any abnormal motion in the spine in different physiological positions whilst weight-bearing. The lumbar spine was assessed in 6 different patients with a comfortable neutral standing position and standing flexion and extension images in selected patients. Seated, weight-bearing flexion and extension images

of the cervical spine were obtained in a further patient. Clinical indications included stability assessment post-trauma, post-surgical fusion and back pain. The projection images were reconstructed using bone and soft tissue algorithms to give isotropic CT images which could be viewed as per conventional multi-detector CT images. The flexion and extension CBCT data were fused to give a representation of any spinal movement between the extremes of motion.

**Results:** The flexion and extension weight-bearing images gave anatomical detail of the spine. Detail of the surgical constructs was possible. Dynamic structural information about spinal alignment, facet joints, exit foramina and paraspinal musculature was possible. The effective dose from the neutral position was equal to that of supine, multi-detector CT.

**Conclusion:** CBCT can be used to image the lumbar and cervical spine in physiological weight-bearing positions and at different extremes of spinal motion. This novel application of an existing technology can be used to aid surgical decision making to assess spinal stability and to investigate occult back and leg pain. Its use should be limited to specific clinical indications, given the relatively high radiation dose.

1. Falkowski AL, Kovacs BK, Benz RM, et al (2021) In vivo 3D tomography of the lumbar spine using a twin robotic X-ray system: quantitative and qualitative evaluation of the lumbar neural foramina in supine and upright position. European Radiology 31:3478–3490. https://doi.org/10.1007/s00330-020-07355-x/Published 2. Harder D, Amsler F, et al (2018) Initial Assessment of a Prototype 3D Cone-Beam Computed Tomography System for Imaging of the Lumbar Spine, Evaluating Human Cadaveric Specimens in the Upright Position. Investigative Radiology 53:714–719. https://doi.org/10.1097/RLI.0000000000000495 3. Jinkins JR, Dworkin JS, Damadian R v (2005) Upright, weight-bearing, dynamic-kinetic MRI of the spine: initial results. European radiology 15:1815–1825. https://doi.org/10.1007/s00330-005-2666-4

## P019 Radiographer led MRI MSK reporting

*Fiona Nelson; Sharad Daniel*

Practice Plus Group

Ever increasing reporting workloads combined with the need to develop and retain radiographers within the workforce has led Practice Plus Group to start to develop a radiographer led MSK MRI reporting service. The diagnostic radiography workforce census published by the College of Radiographers in April 2021, which showed an average current UK vacancy rate of 10.5% in diagnostic radiographers so retaining trained staff has to be a key service objective for all employers. An important way to retain staff is to encourage role extension as this has the two-fold impact of a quality improvement in the service but also increased job satisfaction for the staff involved. This objective taken in combination with the April 2021 RCR census showing that the NHS radiologist workforce is short-staffed by 33% will allow reporting capacity to be increased and reduce the potential clinical impact of the ongoing radiologist numbers shortfall. Our first fully trained MRI reporting radiographer qualified in March 2022 in MSK reporting and is now beginning his internal preceptorship programme. We are now in the process of extending our existing governance framework for plain x-ray reporting radiographers to embrace this development. This will include a comprehensive job plan with peer review process, MDT and REALM style meetings and CPD opportunities to support further staff development. We are also looking for our next candidate to train so that we can continue to grow this fledgling service.

## P023 Siemens VTIQ gives better quantitative estimates of elastic moduli than the older VTI software

*Richard Rendle*

University of Exeter

**Background:** Ultrasound shear wave elastography has been validated as a reliable method for differentiating the elastic moduli of soft tissue lesions (Saavedra et al., 2018). This study is designed to test the upper limit of elastic moduli that can be reliably measured using the Siemens S3000 elastography software Virtual touch Quantification (VTQ) and the new Virtual touch Image Quantification (VTIQ).

**Method:** A series of aqueous gels were made with concentrations of gelatine ranging from 6% to 18%. These gels were mechanically tested using an Instron to obtain a reference elastic modulus for each gel. The results were then compared with the mean elastic moduli measured using both the VTQ and VTIQ software on the Siemens S3000 machine. The standard error of each set of readings was calculated.

**Results:** We found that both the VTQ and VTIQ elastography settings were reliable at measuring gels with an elastic modulus of up to 49kPa (12% gel) and VTIQ could measure the elastic moduli of gels up to 62kPa (14% gel). Higher concentration gels were not reliably estimated using either VTQ or VTIQ. In gels with an elastic moduli over 62kPa, VTIQ was slightly more accurate and had a smaller standard error.

**Conclusion:** The range of elastic moduli that can be measured using Siemens VTIQ is greater than VTQ. The measurement error of VTIQ is less than VTQ particularly at higher elastic moduli.

References 1. Saavedra, A. C. et al. (2018) Breast elastography: Identification of benign and malignant cancer based on absolute elastic modulus measurement using vibro-elastography, in Nishikawa, R. M. and Samuelson, F. W. (eds) Medical Imaging 2018: Image Perception, Observer Performance, and Technology Assessment. SPIE, p. 48. doi: 10.1117/12.2293664.

## P024 The Linear Hallux Valgus Index - a novel way to measure Hallux Valgus

*Rajesh Botchu[1]; Karthikeyan Iyengar[2]; Ahmed Saad[3]; John Firtzpatrick[4]; Christine Azzopardi[4]; Hiten Panchal[5]*

[1]Royal Orthopaedic Hospital, Solihull; [2]Southport and Ormskirk; [3]Royal Orthopaedic Hospital, Birmingham; [4]Royal Orthopaedic Hospital; [5]Sanyapixel Diagnostics

**Introduction:**

Hallux Valgus is a complex deformity of the first ray of the forefoot and several radiological measurements.

**Purpose:**

To describe a new radiological linear hallux valgus index (LHVI) of measuring Hallux Valgus (HV) deformity.

**Patient and methods:**

Antero-posterior weight bearing radiographs of 100 consecutive patients were reviewed. HVA (hallux valgus angle) and LHVI were measured, and data was analysed using student 't' test.

**Results:** T

here was statistically significant difference of LHVI between normal and hallux valgus cohorts with a p- value of 0.0001.

**Conclusion:**

LHVI can be an additional measure of assessing hallux valgus.

1. Hecht PJ, L(2014) Med Clin North Am. 98(2):227-32. doi: 10.1016/j.mcna.2013.10.007. Epub 2013 Dec 8. 2. Coughlin MJ. (1997) Hallux valgus. Instr Course Lect. 46:357-91. PMID: 9143980. 3. Karasick D (1990) Hallux valgus deformity: preoperative radiologic assessment. AJR Am J Roentgenol. ;155(1):119-23. doi: 10.2214/ajr.155.1.2112832.

## P025 Iyengar Botchu Panchal (IBP) Calcaneal Offset Index to measure hindfoot alignment in pes planus

*Rajesh Botchu[1]; Karthikeyan Iyengar[2]; John Fitzpatrick[3]; Christine Azzopardi[3]; Hiten Panchal[4]; Eindere Zawpe[2]*

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**Introduction:** Pes planus is a common three-dimensional deformity characterised by forefoot abduction, collapse of medial longitudinal arch and hindfoot valgus. Several radiological measurements exist to calculate the degree of hindfoot alignment in these patients with variable intra- and inter-observer reliability.

**Purpose:** To describe a new radiological ancillary method of measuring hindfoot alignment, the Iyengar Botchu Panchal (IBP) Calcaneal Offset Index.

**Material and methods:** Antero-posterior (Mortise) and lateral view weight bearing ankle radiographs of 100 consecutive patients referred for ankle pain were reviewed. Calcaneal Offset Index calculation was undertaken on the mortise view along with the measurement of 'Calcaneal pitch angle'. A one-way analysis of variance (ANOVA) was performed. Intraclass Correlation Coefficient (ICC) analysis was undertaken to assess the intra-class reliability between observers.

**Results:** There was a female preponderance in the study population with a mean age of 51.21 years (13-86 years). The calcaneal offset was increased in pes planus (hindfoot valgus). The p -value was 0.017 on ANOVA. The 'Calcaneal

Offset Index' (COI index) gave moderate intra-observer reliability on Intraclass Correlation Coefficient (ICC) analysis of 0.55.

**Conclusion:** The Calcaneal Offset Index (COI) can be an additional index of measuring hindfoot alignment in patients with pes planus. In contrary to the traditional angular measurements, this linear measure is easier to calculate and reproducible. COI measurement has shown a moderate inter-observer reliability in the study to complement clinical evaluation of hindfoot valgus alignment.

1. Michaudet C (2018). Foot and Ankle Conditions: Pes Planus. FP Essent. 465:18-23. 2. Deland JT. (2008) Adult-acquired flatfoot deformity. J Am Acad Orthop Surg. 16(7):399-406. doi: 10.5435/00124635-200807000-00005. 3. Smyth NA (2017) Adult-acquired flatfoot deformity. Eur J Orthop Surg Traumatol. 27(4):433-439. doi: 10.1007/s00590-017-1945-5. Epub 2017 Mar 21.

## P026 Lateral femoral condyle CRATER sign of Iyengar - Botchu an ancillary sign of lateral patellar dislocation

*Rajesh Botchu[1]; Karthikeyan Iyengar[2]; Bhamidipaty BKDP[3]*

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**Introduction:** Acute lateral patellar dislocation is a common knee injury pattern seen in the young athletes and tall, young adolescent females. Such injuries may be associated with bone contusion or an osteochondral fracture of the articular and peri-articular structures around the knee joint. However, co-incidental osseous defect may be present in normal knees.

**Purpose:** Evaluate the characteristics of osseous bone defect and describe a new ancillary sign associated with lateral patellar dislocation.

**Material and methods:** Magnetic Resonance Imaging (MRI) of 50 consecutive patients referred following a traumatic lateral patellar dislocation of the knee joint and 50 patients with knee pain without MR features of patellar dislocation were obtained for evaluation over a 7-year period. They were analysed for location of bony defects in the periarticular region.

**Results:** Of the 50 patients (25 male: 25 female) aged with a mean age of 23 years (12-57 years), who underwent MRI following a reduced traumatic lateral patellar dislocation, three patients had an osseous 'Crater' of more than 2 mm in depth on the non-articular surface of the lateral femoral condyle. None of control group of patients had an osseous defect measuring more than 2mm in depth.

**Conclusion:** This associated finding of an osseous 'Crater' of more than 2 mm on the non-articular surface of the lateral femoral condyle following traumatic lateral patellar dislocation is a rare occurrence. It signifies patellar dislocation has occurred with a severe enough force with impaction to create a bony defect.

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## P027 To analyse the effects of joint injections and its outcome

*Warda Shafiq*

University Hospitals Bristol and Weston NHS Foundation Trust

Block selection sampling Metrics used for analysis are: 1. Gender 2. Scan type 3. Outcome (pain diary)

Total patients were 258, out of which 49 were excluded as the procedure got cancelled at the time of appointment due to various reasons. 209 Patients underwent the procedure. 141 females and 68 males. 166 were ultrasound guided and 43 were fluoroscopic guided. Pain diary was submitted by 40% ,84 patients only. 52 patients had a good response to the treatment and 32 had a poor response.

**Conclusion:** Analysis showed that joint injections do have a great benefit with positive outcome.

**Action plan:** To make the feedback / pain diary return convenient and easy. To introduce an electronic submission of feedback rather than obsolete paper feedback.

# CARDIAC / CHEST & LUNG POSTER PRESENTATIONS

## P029 A survey investigating postero-anterior chest X-ray clinical technique amongst radiographers and assistant practitioners in the UK

*Constance Dudfield; Anthony Manning-Stanley; Colette Bennion*

University of Liverpool

**Background:** Whilst many factors considered 'gold standard' technique for the posteroanterior chest projection are well-researched and standardised, anecdotal evidence suggests a discrepancy regarding optimum positioning of the X-ray tube, with some radiographers using a horizontal tube, and others applying a caudal angle. No published evidence supports the benefits of either technique.

**Method:** Following University ethical approval, an invitation e-mail with a link to a short questionnaire and participant information sheet was emailed to radiographers and assistant practitioners in Merseyside. Questions related to basic demographics; length and level of experience; positioning preference in CR and DR rooms (horizontal v angled tube) and reasoning behind tube positioning preference. The survey was open for 9 weeks in total, with reminders at 5 and 8 weeks.

**Results:** From 63 responses a horizontal tube was marginally preferred in both DR rooms (59%) and CR rooms (51%). Many participants indicated 'undergraduate teaching' influenced the approach used (24% in DR, 37% in CR). 25% of participants who use caudal angulation stated reduction in dose to the thyroid as the rationale for their technique in both CR and DR rooms.

**Conclusion:** Both techniques are taught in the Diagnostic Radiography curriculum; evidently there is variation in practice demonstrated. Further empirical research is required to standardise practice and give evidence-based reasoning to technique choice, ensuring an optimised radiation dose. A limitation of this study is the small sample size of 63 participants, from only 7 NHS Trusts in Merseyside.

## P031 A comparison of bolus track and test bolus CT pulmonary angiography protocols and the implications on pulmonary and aortic vessel enhancement, effective dose and suboptimal scan rate

*Aoife Murphy*

Sandwell and West Birmingham Hospitals NHS Trust

**Background:** Multiple CT protocols exist to time contrast enhancement for CTPA acquisition. However, there is no clear consensus on which protocol results in optimal enhancement. The purpose of this research is to compare test bolus and bolus track CTPA protocols in terms of enhancement of pulmonary vessels and aorta, radiation dose and suboptimal scan rate for the determination of the optimal protocol.

**Methods:** A total of 200 CTPA examinations performed between January and February 2021 were assessed retrospectively. All scans were performed on a 2x128 Dual Source Siemens Drive Scanner. CT attenuation was measured in Hounsfield Units (HU), with measurements taken from the main pulmonary trunk, right pulmonary artery, left pulmonary artery, ascending and descending aorta. Mean effective dose was calculated from the dose-length product (DLP). Suboptimal scan rate (error rate) was calculated as the percentage of examinations below 210HU.

**Results:** The average HU of the pulmonary arteries was 358 HU in the test bolus group and increased to 394 HU in the bolus track group with a P value of $< 0.05$. The average HU of the aorta was 235 HU in the test bolus group and increased to 319 HU in the bolus track group with a P value of $< 0.001$. Mean effective dose reduced by 4.2% in the Bolus Track protocol group (2.4Sv vs 2.5Sv, $P > 0.05$). 80% less suboptimal scans were performed with the bolus track protocol (5 scans <210HU vs 9 scans <210HU).

**Conclusion:** The bolus track protocol results in better enhancement of the pulmonary arteries and aorta, with the added benefits of a lower suboptimal scan rate and lower effective dose.

### P032 Chest X-ray and CT-scan radiography image analysis for diagnosis Covid-19 and the impact on lungs

*Nisheeth Jaiswal*

Aston University

**Background:** This project diagnoses Covid-19 cases using chest X-rays and computerized tomography (CT) radiographs. This study is helpful along with existing diagnosis techniques and provides an alternative such as RT-PCRs which have high accuracy but are expensive and sophisticated and require skilled professionals for collecting samples and screening. This provides an alternative AI-driven automated diagnosis using radiography images is much sought after.

**Method:** A transfer learning-based deep learning approach to identify the presence of Covid-19 from chest X-rays and its progression stages from CT-scans using pre-trained AI models trained on images to identify and provide a diagnosis for the presence of Covid-19 and detect its progressive stages. In this project, we use radiographs of the lungs to provide diagnosis using state-of-the-art artificial intelligence techniques like vision transformers (ViT) and deep transfer learning using InceptionResNet-v2 a pre-trained CNN architecture on chest X-rays for computer vision tasks for detection of Covid-19.

**Results:** The predictions made for the presence of Covid-19 in chest X-rays are supported by explaining the outcomes shown in the form of saliency heatmaps of the affected regions within the chest X-rays and the damage caused to the lungs. Further for a better diagnosis, the CT-scan images provide much better accuracy in finding the progression pattern of the Covid-19 and the damage caused to the lungs the progression stages of Covid-19 affect the lungs from 4 days to 14 days period.

**Conclusion:** This project comes in as an assistive technology for radiologists, clinicians, and practitioners and would also help in triaging from.

### P033 Gastroduodenal artery aneurysm: a rare cause of abdominal pain and a great peril of gastrointestinal haemorrhage

*Stavroula Theodorou[1]; Daphne Theodorou[2]; Vasilios Gogos[1]; Georgios Loridas[2]; Konstantinos Katsanos[1]; Dimitrios Christodoulou[1]*

[1]University Hospital of Ioannina, Greece; [2]General Hospital of Ioannina, Greece

**Background:** Abdominal visceral artery aneurysms (VAAs) are important to diagnose and treat early to prevent life-threatening complications, including haemorrhage from rupture. Most VAAs arise from the celiac axis and are classified as true aneurysms, or pseudoaneurysms. Gastroduodenal artery (GDA) aneurysms are rare comprising 1.5% of the VAAs and are usually related to atherosclerosis and pancreatitis. The release of proteolytic enzymes in pancreatic inflammation may result in vascular wall destruction and rupture of the aneurysm, with a mortality rate of 40%. Additional conditions associated with development of GDA aneurysms include trauma, ethanol abuse, and congenital vascular anomalies.

**Purpose:** A 56-year-old hypertensive woman presented with acute onset of severe epigastric pain and a pulsatile abdominal mass. Serum amylase and lipase were elevated. Chest radiography showed left-sided pleural effusion. Abdominal sonography displayed decreased echogenicity of the pancreatic parenchyma and the collection of fluid around the head of pancreas. CT images disclosed changes in density of the parenchyma, and a peripancreatic fluid collection. A densely calcified semi-circular structure measuring 1.6 cm was visualized in the vicinity of the celiac axis. On the contrast-enhanced MIP reformatted CT images, a large saccular aneurysm corresponding to the calcified lesion was seen arising from the celiac artery. CT angiography confirmed the visceral aneurysm involving the GDA, just proximal to the origin of the anterior pancreaticoduodenal artery. Because the patient was at high risk for gastrointestinal bleeding, endovascular stent grafting was performed.

**Summary:** CT angiography may efficiently delineate VAAs, facilitating complex diagnosis of a perilous visceral emergency.

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### P035 Hot or cold? You decide! GP Chest X-ray hot reporting with same-day access to CT - the Welsh experience

*Stuart Baines; Joanne Evans; Ruth Albert; Geraint Rees; Tim Pearce; Grant Griffiths*

Cwm Taf Morgannwg University Health Board

Following the Welsh Governments introduction of the Single Cancer Pathway (SCP, 2019) our Radiology Directorate in CTMUHB was unable to offer scanning and reporting of CT examinations for patients with suspected lung cancer on CXR within the specified timeframe using conventional practice. This prompted a need for innovation. Welsh Cancer Network funding enabled four Radiographers to undertake a 1-year MSc in CXR interpretation. With multidisciplinary input appropriate patient information and pathways were devised. This allowed GP patients attending for CXRs to have their examination immediately reported and coded remotely, enabling the performing Radiographer to give appropriate feedback to the patient. Where there was a suspicion of cancer or other pathology Radiographers organised a same-day CT scan or follow-up CXR with onward referral to the lung cancer multidisciplinary meeting where appropriate. We present our findings and Welsh experience of initiating a same-day hot reporting service for GP referred CXR's. We demonstrate the significant time savings that are possible with regard to report turnaround times for CXR/CT and the positive effect this innovation has had on the patients Lung Cancer pathway.

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### P036 Radiography image analysis of Chest X-rays for diagnosis of pathological conditions in the lungs

*Nisheeth Jaiswal*

Aston University

**Background:** Chest X-ray radiography image analysis for diagnosis of pathological conditions of the lungs. It provides an alternative to existing diagnostics methodology which needs a lot of direct human intervention to an AI-driven automated diagnosis using radiography images is much sought after.

**Method**: A transfer learning-based deep learning approach to identify pathological conditions from chest X-rays from pre-trained AI models trained on images to identify and provide a diagnosis for the presence of possible pathological conditions out of 14 different pathological conditions. In this project, we use radiographs of the lungs to provide diagnosis using state-of-the-art artificial intelligence techniques like deep transfer learning using DenseNet-121 pre-trained CNN architectures on chest X-rays for computer vision tasks for detection of pathological conditions of the lungs. The diagnosis is interpreted explaining the overall results with explainability and interpretability of the AI algorithms using saliency heatmap the Gradient-weighted Class Activation Mapping (Grad-CAM) algorithm to get a perspective behind how the algorithm makes a prediction and how it classifies images giving probability scores of a possible medical condition.

**Results**: The predictions made for the presence of the pathological condition in chest X-rays are supported by explaining the outcomes shown in the form of saliency heatmaps of the affected regions within the chest X-rays and the damage caused to the lungs. This is also supported along with a probability score of how likely is the pathological condition affecting the lungs.

**Conclusion**: This project comes in as an assistive technology for radiologists, clinicians, and practitioners and would also help

### P037 EVALI - E-cigarette or vaping product use-associated lung injury

*Stuart Baines; Khattab Alkhedairy; Emma Kirby; Geraint Rees; Ruth Albert; Joanne Evans; Tim Pearce; Grant Griffiths*

Cwm Taf Morgannwg University Health Board

The incidence of respiratory illness resulting from E-cigarette or vaping product use-associated lung injury (EVALI) is increasingly recognised with associated hospital admissions and reported EVALI related deaths. We describe the

background, pathogenesis, radiological pattern and distribution of EVALI in an acutely presenting patient utilising chest x-ray and CT imaging. We aim to assist the reporter in considering EVALI, in the right clinical context, as a cause of acute centrilobular nodular opacification, which histopathologically is thought to represent micronodular organising pneumonia but on imaging may resemble hypersensitivity pneumonitis (HP).

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### P038 Exercise-induced pulmonary edema: A potentially fatal condition in healthy individuals

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**Background:** Pulmonary edema (PE) after intense exercise is a rare, yet potentially fatal condition that occurs in previously healthy individuals. Although numerous cases of high-altitude PE have been described in the literature, PE developing in individuals exercising at sea level is only sporadically reported and, in some cases, has been associated with subclinical cardiac abnormalities. From a pathophysiology standpoint, it has been postulated that mitral valve dysfunction during intense physical exercise can cause increased pulmonary vascular pressure, which may disrupt the capillary barrier leading in turn, to stress-induced alveolar haemorrhage, hypoxaemia and PE.

**Findings:** A 38-year-old man presented with haemoptysis that had developed during intense land exercise. He was afebrile and had cough with production of frothy pink sputum. Patient had dyspnoea at rest with arterial oxygen saturation 82% and tachypnoea. ECG, echocardiography, and chest radiography were quite unremarkable. Chest CT revealed bilateral, patchy alveolar areas of airspace consolidation, with some peribronchial cuffing predominantly involving the central lung parenchyma. Diffuse ground glass attenuation was present. Repeat chest radiograph 24 hours after admission demonstrated diffuse alveolar areas of increased opacity that predominated at the lung bases. Patient was treated with oxygen and pulmonary vasodilators. On day 3, the radiologic findings of PE appeared confined to the upper lung lobes and disappeared within 2 days.

**Conclusion:** Although rare, PE may develop during intense physical exercise in individuals with no prior history of cardiac disease. Knowledge of this emergency is important to avoid delay in diagnosis and eliminate possibility of a fatal event.

1. Bates M, Farrell E, Eldridge M (2011). The curious question of exercise-induced pulmonary edema. Pulm Med 361931, 7pg 2. Piérard LA, Lancellotti P (2004). The role of ischemic mitral regurgitation in the pathogenesis of acute pulmonary edema. N Engl J Med 14;351(16):1627-1634 3. Gluecker T , Capasso P, Schnyder P, et al (1999). Clinical and radiologic features of pulmonary edema. Radiographics 19(6):1507-1531

### P039 Leptospira lung infection in the COVID-19 pandemic - great mimicker of coronavirus pneumonia

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**Background:** Leptospirosis (LS) or Weil disease is a zoonotic disease caused by spirochaete Leptospira spp. Harboured in rodents, spiral bacteria are excreted in the urine of infected animals and offend humans by direct contact or through contaminated water, soil, or vegetation. Typical point of entry is abraded skin around the feet. Incidental exposure to the infective organisms may occur via swimming in contaminated water. LS is a serious, generalized and rapidly evolving infectious disease that may cause multiorgan failure with a high mortality rate.

**Findings:** A 63-year-old man, recreational swimmer presented with fever, dyspnoea, and myalgia. He had bilateral abnormal chest auscultation. Blood parameters showed elevated bilirubin and urea/creatinine, anaemia, and thrombocytopenia. D-dimers and CRP were increased. Chest radiography showed multiple nodular densities, with ill-defined ground glass appearance. CT demonstrated a combination of bilateral ground-glass and small nodular opacities with small patchy areas of consolidation due to alveolar haemorrhage, and superimposed septal and bronchial wall thickening (crazy paving pattern). Patient was suspected for COVID-19 pneumonia. The RT-PCR test results turned negative for SARS-CoV-2 but positive for Leptospira. ELISA testing detected early rise in IgM. Antibiotic treatment was then administered, and the patient recovered quickly.

**Conclusion:** Because lung abnormalities are nonspecific for COVID-19 pneumonia, imaging findings should not be used as an independent diagnostic tool to confirm or exclude coronavirus infection. LS may as well mimic COVID-19 and as such, radiologists and clinicians need to assess the patient history, clinical symptoms and course, imaging findings, and molecular testing results for diagnosis.

1. Kwee TC, Kwee RM (2020). Chest CT in COVID-19: What the radiologist needs to know. Radiographics 40(7):1848-1865 2. Yu M, Xu D, Lan L, et al (2020). Thin-section chest CT imaging of COVID-19 pneumonia: A comparison between patients with mild and severe disease. Radiol Cardiothorac Imaging Apr 23;2(2):e200126 3. Dolhnikoff M, Mauad T, Bethlem EP, et al (2007). Leptospiral pneumonias. Curr Opin Pulm Med 13(3):230-235 4. Marchiori E, Lourenco S, Setubal S, et al (2011). Clinical and imaging manifestations of hemorrhagic pulmonary leptospirosis: a state-of-the-art review. Lung 189:1-9

## P040 CT-guided lung biopsy: An audit of diagnostic adequacy and safety

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**Background:** Computerised tomography (CT)-guided percutaneous lung biopsy (PTLB) is a well-established approach for obtaining histopathology of thoracic lesions. As the indications and demand for PTLB rises, it is important to recognise and mitigate its associated complications. The most common post-procedural complications are pneumothoraces, with the potential need for subsequent chest tube insertion, and pulmonary haemorrhage.

**Method:** A complete 2-cycle retrospective audit was completed. It compared diagnostic adequacy of tissue samples and complication rates against standards set by the British Thoracic Society (BTS). The first cycle was completed between January 2020 - February 2021. It revealed that diagnostic adequacy met the target standards, but the complications rates did not. As a result of this, a saline track sealing technique was introduced. The measures were re-audited between February - December 2021.

**Results:** 69 patients were included in the second cycle. The overall diagnostic adequacy rate was 99%. 33% of patients developed a clinically insignificant pneumothorax; none required chest drain insertion. 6% of patients developed haemoptysis. The mortality rate associated with the procedure was nil.

**Conclusion:** The diagnostic adequacy rate met the BTS standard, similar to the previous audit. Target complication rates were met for clinically significant complications (pneumothoraces requiring chest drainage and mortality rates). However, complication rates are higher than the BTS standards for clinically insignificant complications. This shows that the implementation of the saline track technique minimally improved complications. Further suggestions for improvement include the adoption of approaches described in the PEARL protocol, with re-auditing planned in 12 months.

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Manhire, A., Charig, M., Clelland, C., Gleeson, F., Miller, R., Moss, H., Pointon, K., Richardson, C. and Sawicka, E. (2003) Guidelines for radiologically guided lung biopsy. Thorax, 58(11), pp.920-936.

## P041 An audit of the outcomes of percutaneous cholecystostomy

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Norfolk and Norwich University Hospital

**Background:** Percutaneous cholecystostomy is a minimally invasive image-guided placement of a drainage catheter in the gallbladder. This procedure is a temporary measure in high-risk patients diagnosed with acute cholecystitis, who are unfit for definitive laparoscopic cholecystectomy. Research has shown that percutaneous cholecystostomy is effective in treating up to 90% of patients with acute cholecystitis, and up to 54% do not proceed to have cholecystectomy (1).

**Method:** A retrospective study was conducted to determine the outcomes and to compare the findings with benchmarks in the review on percutaneous cholecystostomy by Little et al (2) and a systematic review by Winbladh et al. (3) for patients with percutaneous cholecystostomy for acute cholecystitis at a tertiary university hospital. The target sample size was 100 cases.

**Results:** 35% of the cholecystostomy was done as a definitive treatment. The readmission rate was 42% in 6 months. Cholecystitis-related readmissions accounted for 41% while cholecystostomy-related admissions accounted for 24%. 15% underwent subsequent laparoscopic cholecystectomy with a mean waiting time of 194 days. 30-day mortality was 8% with 7% died as inpatient. 90-day mortality was 3% with 2% died as inpatient.

**Conclusion:** Percutaneous cholecystotomy is a means of treatment for unwell and unfit patients with acute cholecystitis. The audit showed satisfactory technical and clinical success, and zero post-procedure mortality post percutaneous cholecystostomy at our hospital. Procedure-related complication rate such as tube dislodgement was higher than the benchmark. Action plan included improving technique to minimise tube dislodgement such as anchoring the drain with a suture and reinforce the slack tubing with dressings.

1. Gulaya, K., Desai, S. S., & Sato, K. (2016). Percutaneous Cholecystostomy: Evidence-Based Current Clinical Practice. Seminars in interventional radiology, 33(4), 291-296. https://doi.org/10.1055/s-0036-1592326.

2. Little, M. W., Briggs, J. H., Tapping, C. R., Bratby, M. J., Anthony, S., Phillips-Hughes, J., & Uberoi, R. (2013). Percutaneous cholecystostomy: the radiologist's role in treating acute cholecystitis. Clinical radiology, 68(7), 654-660. https://doi.org/10.1016/j.crad.2013.01.017.

3. Winbladh, A., Gullstrand, P., Svanvik, J., & Sandström, P. (2009). Systematic review of cholecystostomy as a treatment option in acute cholecystitis. HPB : the official journal of the International Hepato Pancreato Biliary Association, 11(3), 183-193. https://doi.org/10.1111/j.1477-2574.2009.00052.x

## P042 Patient compliance with preparation instructions for stress cardiac MR - annual re-audit

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University Southampton NHS Trust

**Background:** Cardiac magnetic resonance imaging (CMR) and its perfusion modality provides invaluable diagnostic information for the presence of myocardial ischemia (sens 80-90%, spec 70-80%) and its diagnostic performance is at least equivalent to that of nuclear perfusion imaging. The preparation entails 24h refraining from nitrates, caffeine and nicotine, with a reminder SMS being sent 1 week before scan date. Last year the service operated suboptimally, whereby this year it worked in full capacity.

**Method:** 60 consecutive individuals were scanned in March 2021 in Southampton General (UHS) and their electronic notes were reviewed for their compliance. This practice was compared against the standard Local policy and UHS guidelines in concordance with the Euro-CMR registry (Klinke et al., 2013) and the SCMR-standardised protocol (Kramer et al, 2020). The standard for each section would be 100%. The results were compared with the prior compliance audit.

**Results:** The sample percentage that did not adhere to preparation instructions were 11% for caffeine, 0% for nitrates and other anti-anginal drugs and 7% for nicotine (N=60). The previous audit found adherence issue in 10% for caffeine, 2% for nitrates and 25% for nicotine (N=60).

**Conclusion:** This audit highlights the need for appropriate preparation to stress CMR reflecting the importance of accurate reports. Additionally, appointment cancellation results in loss of resources (CMR and staffing). Here both audits showed a satisfactory degree of compliance (>= 89%) for both parameters. As a result, we are planning to: 1) adjust SMS service to specific advice for stress patients, 2) review the information leaflets with the patients representatives.

Klinke, V. et al. (2013) 'Quality assessment of cardiovascular magnetic resonance in the setting of the European CMR registry: Description and validation of standardized criteria', Journal of Cardiovascular Magnetic Resonance, 15(1), pp. 1–13. doi: 10.1186/1532-429X-15-55. Kramer, C. M. et al. (2020) 'Standardized cardiovascular magnetic resonance imaging (CMR) protocols: 2020 update', Journal of Cardiovascular Magnetic Resonance. Journal of Cardiovascular Magnetic Resonance, 22(1), pp. 1–18. doi: 10.1186/s12968-020-00607-1.

## UROradiolgy GI and Heptobiliary Poster Presentations

### P044 Audit on CT KUB done for Acute renal colic

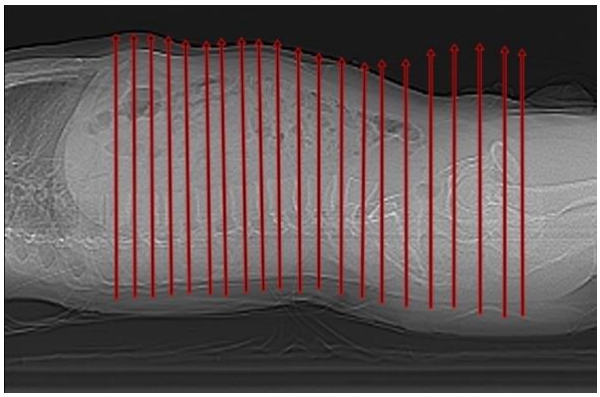
*Devi Jansirani Dhanabalan; Shiva deep Sukumar*

Calderdale and Huddersfield NHS Foundation Trust

**Background:** CT-KUB is the gold standard for the investigation of Acute renal colic. Standardisation is needed to ensure quality and safety.

**Method:** A retrospective analysis of 50 CT KUB scans referred from A&E department was done. Parameters of details in request forms, time interveal between presentation and scan, result outcome, acquisition area of scan images, scan quality and dose involved were analysed.





**Results:** Inadequate clinical details seen in 38% cases. 100% of scans were completed within 24 hours of presentation which is within national guidelines. Detection rate for calculi was 52% and alternative acute conditions was in 10%; which again was within national standards. In 88% scans, kidneys were fully imaged when starting scan at T11 level; 100% imaged when starting at T10-11. All the scans had slices below the pubic symphysis unnecessarily. 20% of radiation can be reduced if scan field is optimised by imaging between T10 vertebra and pubic symphysis. 12% scans did not have scanogram. A scanogram gives a chance to see if a stone is visible on it. If visible, follow up can be done by radiographs instead of CTs. 22% scans had no MPR reformatted sagittal images and hence incidental bone lesions may be missed.

**Recommendations and conclusion:** Radiographers were asked to ensure the requests has side of pain and haematuria history. To scan from T10 level to pubic symphysis and to send scanogram and reformatted sagittal images as well on PACS. Referrers asked to give adequate clinical details of side of pain and haematuria.

1. Al-Bakir I, tse D, D'Costa H. Radiological investigation of renal colic following teh introduction of CT KUB. RCR Audit-Live. 2010. 2. Tsiotras, A R Daron Smith, Ian Pearce, Kieran O'Flynn and Oliver Wiseman. British Association of Urological Surgeons standards for management of acute ureteric colic. Journal of Clinical Urology 2018, Vol. 11(1) 58 -61.Sagepub.co.uk/journals DOI: 10.1177/2051415817740492 journals.sagepub.com/home/uro 3. Webb WR, Brant WE, Fundamentals of Body CT. Third edition. Major NM. Elsevier - Health Sciences Division. November 2005. Page 276. 4. British Association of Urological Surgeons (BSUS) guidelines for acute management of first presentation of renal / ureteric lithiasis, December 2008. 5. iRefer. Making best use of a Department of Clinical Radiology, Guidelines for Doctors, 8th Edition 2017, The Royal College of Radiologists, London.

### P045 Delayed diagnosis of renal cancer does it cause harm?

*Sarath Vennam; Alison Bradley; Sherafghan Ghauri; Giles Maskell; John McGrane*

Royal Cornwall Hospital, Truro, Cornwall

**Background:** In a previous study we found that in 16% of patients (50 of 327) diagnosed with renal cancer, the lesion was visible in retrospect on an earlier imaging investigation. (1) It is known that many renal cancers are relatively indolent. The purpose of the present study was to determine as far as possible whether patients came to harm as a result of delay.

**Methods:** Patients from this cohort were included if they survived 5 years from treatment or died in the interim. Imaging and case note review was performed. Patients were deemed not to have come to harm if they survived 5 years from the date of treatment without evidence of metastatic disease or died of an unrelated cause with no sign of recurrence.

**Results:** 40 patients were identified fitting the inclusion criteria. Median delay was 37.7 months (0.7-79.7). 32/40 were found not to have come to harm as a result of delay. Harm may have resulted in the remaining 8/40. Example cases will be presented.

**Conclusion:** The determination of harm following delayed diagnosis is not straightforward. Indeed, patients with low volume asymptomatic metastases are often observed for a while before starting treatment. It was possible to show that in most patients the delay did not result in harm, in keeping with what is known of the natural history of this disease.

1. Bradley, A.J., Maskell, G.F., Mannava, A., Pollard, A., et al. (2021) Routes to diagnosis and missed opportunities in the detection of renal cancer. *Clinical Radiology.*76 (2), 129134.

### P046 Real world single centre comparison of upgrading and upstaging in prostate cancer: Looking at the impact of multi-parametric MRI and transperineal biopsies

*Myles Sheehan[1]; Alison Bradley[1]; Richard Morse[2]; Nicholas Munro[2]; Mathialagan Murugesan[2]; Catherine O'Dwyer[2]; Helen Texeira[2]; Sebastian Sheehan[3]; John McGrane[2]*

[1]The Royal Cornwall Hospital; [2]The Royal Cornwall Hospital Trust; [3]Aneurin Bevan University Health Board

**Introduction:** This studies primary aim was to assess whether the introduction of multi-parametric MRI (mpMRI) and transperineal template (TP) biopsy has improved the accuracy of prostate cancer staging and grading compared to standard high resolution T1/T2-weighted MRI and transrectal ultrasound (TRUS) biopsies. The secondary aim was to assess whether the re-classifying of T2 disease with broad contact of tumour with the prostate capsule as T2/T3a disease was predictive for diagnosing T3 disease.

**Method:** Retrospective analysis of 156 patients who underwent preoperative mpMRI and TP biopsy between 2017-2019 was compared with a group of 114 patients preoperatively staged with standard MRI and graded with TRUS biopsy between 2013-2016. The international cancer imaging societies reporters' course states that any lesion with capsular contact length >15mm is highly likely to have capsular invasion. Where this was seen on mpMRI the imaging was staged as T2c/T3a. The T2c/T3a group was classified as T3 when analysing for change in stage and also analysed as a separate subgroup.

**Results:** Compared to the pre-intervention date 37.80% fewer patients were upstaged, 10.60% more patients were downstage and 26.22% more where unchanged. Regarding Gleason group, 18.06% fewer patients were upgraded, 0.50% fewer were down graded and 18.56% where unchanged. 19 mpMRI reports used the T2c/3a stage. At final pathological diagnosis of these 19 patient 47.37% had organ confined disease whilst 52.63% had T3 spread.

**Conclusion:** We found that the introduction of mpMRI, TP biopsy and the reclassifying of T2 disease with broad capsular contact improved the accuracy of prostate cancer diagnosis.

### P047 The development of the 'advanced adaptor' role for urology patients receiving online adaptive radiotherapy treatment

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**Background:** Adaptive Radiotherapy uses online CBCT to adapt each treatment session to daily changes in patient position and anatomy. Treatment plans are generated within minutes with the patient on the treatment couch, with the full adaptive process completing from start to finish in a normal appointment time frame. The adaptive process initially began as clinician led treatment, but the role of advanced adaptor has been created as a delegation. The advanced adaptor role takes aspects of different professions such as clinicians, dosimetrist, physicist and radiographer to create one multi-disciplinary role.

**Purpose:** To delineate organs at risk based on CT quality imaging. Analysis of CBCT and target generation. Assessment of dose to targets and surrounding structures leading to the selection of treatment plans. All completed in an online real time environment. Outcome for patients Increased accuracy of treatment plan. Potential for reduced toxicity. Better patient experience due to reduction in pre-treatment preparations.

**Summary:** Outline of the adaptive radiotherapy workflow within the department Requirements to become an advanced adaptor Training and competency matrix Graphics (image of treatment machine, example of image quality, skill matrix diagram).

### P049 Giant sigmoid diverticulum

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[1]Wigan, Wrightington & Leigh; [2]St Helen's & Knowsley Teaching Hospitals NHS Trust

This is a case report of a patient presenting with a giant sigmoid diverticulum; hence I will discuss the risk factors, presentation, imaging findings, differentials, management and complication of patients with giant sigmoid diverticulum. Giant diverticula in the colon is rare worldwide and the first case to be described radiologically was in 1946. There are under 200 cases reported worldwide, most of which are through case studies[1]. The commonest location for giant diverticula to arise is the sigmoid colon[2]. Giant colonic diverticula can be seen as a rare presentation of diverticulosis which is very common and well described[3]. Giant colonic diverticulum most commonly presents with abdominal pain and on examination most commonly an abdominal mass is felt. It is important to be able to recognise giant diverticula as the gold standard for diagnosis is computed tomography (CT) as opposed to colonoscopies where giant colonic diverticulum can be if the pedicle of the diverticula is particularly narrow[4,5]. There are three subtypes of giant colonic diverticula which are: giant pseudo-diverticula, inflammatory giant colonic diverticula and true giant colonic diverticula. The most common subtype is the inflammatory type. It is important to recognise a giant colonic diverticula because if it goes untreated it can form an abscess or perforate and turn into a surgical emergency[2]. Other differentials to consider would include but are not limited to volvulus, diverticula of the duodenum, Meckel's diverticulum, emphysematous cystitis, emphysematous cholecystitis, colonic fistula or a pancreatic pseudocyst.

1.SteenvoordeP, Vogelaar FJ, Oskam J, Tollenaar RA. (2004)Giant colonic diverticula: review of diagnostic and therapeutic options. Dig Surg 21(1): 1–6. 2. Stephen Thomas, Robert L. Peel, Leonard E. Evans, Kelly A. Haarer. (2006). Giant Colonic Diverticulum. RSNA, Radiographics 3. RogerT, Rommens J, Bailly JM, Vollont GH, Belva P, Delcour C. (1996) Giant colonic diverticulum: presentation of one case and review of the literature. Abdominal Imaging; 21(6): 530–533 4. Giuseppe Nigri, Niccolò Petrucciani, Giulia Giannini, Paolo Aurello, Paolo Magistri, Marcello Gasparrini, and Giovanni Ramacciato. (2015) Giant colonic diverticulum: Clinical presentation, diagnosis and treatment: Systematic review of 166 cases. World J Gastroenterol. 21(1): 360–368.

### P050 RARE case of simple appendiceal mucocele

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Wigan, Wrightington & Leigh NHS Foundation Trust

An appendiceal mucocele is described as a dilated and abnormal accumulation of mucin in the appendix, most commonly as a result of epithelial proliferation. However, it can also be caused by an obstruction or inflammation of the appendix. It is a rare disease and sometimes it can present like an acute appendicitis. Computed tomography should be used vastly to prevent serious complications such as pseudomyxoma peritonei, if underlying pathology is

neoplasm, or ileocolic intussusception We present here a case study on patient with an appendiceal mucocele, together with its radiological, endoscopic as well as histological features. A 74-year-old gentlemen was referred for a colonoscopy due to symptom of anaemia. He had an incidental finding of abnormal appendix orifice bulging into the lumen for about 15mm with an appearance of submucosal cystic lesion. He subsequently had a CT thorax, abdomen and pelvis which showed a 7-8cm appendiceal mucocele with 1.8cm diameter. An urgent Laparoscopic Appendicectomy was performed, which revealed an intact but large distended appendix with 9cm in length. The appendiceal lumen was filled with mucus material. No polyps or tumour identified. Histological examination revealed that this was a simple appendiceal mucocele with no evidence of malignancy. The patient was well post-operatively with no complication noted.

1. Demetrashvili, Z., Chkhaidze, M., Khutsishvili, K., Topchishvili, G., Javakhishvili, T., Pipia, I., & Qerqadze, V. (2012). Mucocele of the appendix: case report and review of literature. International surgery, 97(3), 266–269. https://doi.org/10.9738/CC139.1 2. Louis TH, Felter DF. Mucocele of the appendix. Proc (Bayl Univ Med Cent). 2014;27(1):33-34. doi:10.1080/08998280.2014.11929046 3. Radswiki, T., Sharma, R. Appendiceal mucocele. Reference article, Radiopaedia.org. (accessed on 14 Dec 2021) https://doi.org/10.53347/rID-12273

## P051 An audit to evaluate the success rates and complication rates of percutaneous image guided liver biopsy

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Lancashire Teaching Hospitals NHS Foundation Trust

Percutaneous image-guided biopsy is performed widely at most centres in the UK for focal liver lesions, with a move towards the use of image guidance (ultrasound or CT) for non-focal liver biopsy to enhance diagnostic yield and reduce complications. We report an audit assessing the biopsy success and complication rates at a major department over one year. Guidelines have set recommended parameters for various stages of the biopsy process, and these were the focus of our audit (1). All patients who underwent percutaneous liver biopsy between January 2021 to January 2022 were assessed against the audit standard table (Table 1). Procedure documentation and PACS reports were used to gather information on complications, needle size and number of passes. Tissue histopathology reports were reviewed to assess adequacy. The findings were presented at the departmental audit meeting and disseminated among interventionalists, radiographers and support staff. Overall, the results are within the accepted standards which is reassuring for our department. A future re-audit is recommended to ensure quality is maintained. Minor complications included abdominal/ shoulder tip pain with two patients having vasovagal symptoms. No link was found between the needle gauge, number of passes, complication and success rates. However, this was not statistically tested. This audit will prove useful when consenting patients as department statistics can be presented. It can also be a reference for future audits. In future audits, it may be interesting to assess success and complication rates in targeted versus non-targeted liver biopsies

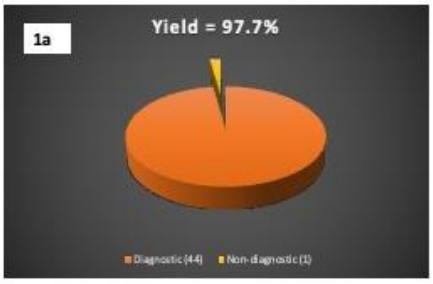



*Figure 1a shows the success rate.*

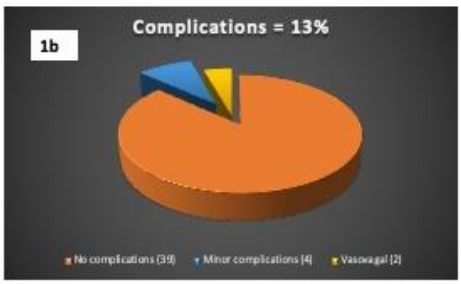



*Figure 1b shows the complication rate.*

(2).

**Table 1. Audit standard [1]**

| | |
|---|---|
| Success rate | >98% |
| Complication Rate | <30% |

1. Day C, Grant A, Neuberger J, Saxseena S. (2004) Guidelines for the use of Liver Biopsy in Clinical Practice. British Society of Gastroenterology Guidelines; 1-15. 2. Harguem S, Maheux A, Purcell Y, Ronot M, Vilgrain V. (2019) Targeted and non-targeted liver biopsies carry the same risk of complication. European Radiology. 29(11), pp.5772–5783.

### P052 Finding the Baseline in PETCT: accuracy of different liver reference sample SUV measurements compared to a gold standard whole liver measurement

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Northampton General Hospital NHS Trust

**Purpose or learning objectives:** PETCT is now well-established as the modality of choice in the assessment of various cancers. A number of scales have been devised such as the Deauville score which use liver uptake as an internal reference. SUVmax values for the liver may vary, however, between readers and the technique used to sample and measure the liver. Consequently, this may result in an inaccurate final score which may affect patient management. This study assesses the accuracy of background reference liver SUVmax measurements between readers and measurement techniques compared to a gold standard whole liver measurement.

**Methods or background:** We assessed a series of PETCT scans performed at our institution between 2017-2019. Two independent readers performed blinded 2D and 3D region-of-interest measurements of liver SUVmax on a subset of 30 patients to assess inter-observer reliability. 104 scans were then assessed by three readers. 2D and 3D region-of-interest liver SUVmax measurements were made followed by a whole liver SUVmax 'gold standard' measurement for each case.

**Results or findings:** The two independent readers' initial measurements showed high interobserver reliability. We present a comparison between the 2D and 3D liver SUVmax values with the whole liver 'gold standard', including relevant statistical analyses.

**Conclusion:** Our data provides evidence for whether a 2D or 3D region-of-interest measurement is more accurate in assessing background liver uptake. Limitations: A larger study series would have more accurate results. Three different readers assessments may have led to some measurement error. Whole liver 'gold standard' measurement was difficult to obtain.

### P053 The role of water-soluble contrast enemas in assessing anastomoses prior to ileostomy reversal, and their influence on patient outcomes

*Alice Giucca; Huw Roach; Sarah Biggs*

University Hospitals Bristol NHS Trust

**Background:** Water-soluble contrast enemas (WSCE) are routinely performed to check anastomotic integrity and patency in patients who have undergone a low anterior resection and loop ileostomy formation, in preparation for subsequent ileostomy reversal. The use of WSCE remains controversial1 and no specific guideline exists in this regard. Our aim was to evaluate whether WSCE influence management and postoperative outcomes.

**Method:** WSCE examinations performed between January 2019 to March 2021 were retrieved. Radiology reports, discharge summaries, and clinic letters were retrospectively collected from prospectively maintained data to determine outcomes.

**Results:** Over the 24-month period, we identified 63 patients who underwent a WSCE following an anterior resection. Seven had positive radiological leaks (11%), and six of these seven underwent further investigations, then either proceeded to a successful reversal (3) or are awaiting surgery (3). Additionally, WSCE identified 10 strictures (16%). Again, due to these findings, they underwent additional investigations before proceeding to interventions (ileostomy reversal, endoscopic dilatation, or resection of stenosed anastomosis). Only one (2%) ileostomy reversal was not successful due to a small bowel leak, not related to the low anastomosis.

**Conclusion:** This study demonstrates a positive WSCE result impacts subsequent investigations or interventions required. A positive result (leak or stricture) was never a contra-indication for reversal, and none of the positive results had significant postoperative complications. The only unsuccessful reversal was not related to the low anastomosis.

1. Habib, K., Gupta, A., White, D., Mazari, F.A.K. and Wilson, T.R. (2015). Utility of contrast enema to assess anastomotic integrity and the natural history of radiological leaks after low rectal surgery: systematic review and meta-analysis. International Journal of Colorectal Disease, 30(8), pp 1007-1014.

### P054 An audit to assess the availability of eGFR results in patients for CT IV contrast examination

*Edozie Iweka; Louise Haine; Federica Palma*

University Hospitals of Derby and Burton NHS Foundation Trust

**Background:** Iodinated contrast agents can cause contrast-induced acute kidney injury (CI-AKI) especially in patients with certain risk factors including diabetes and known kidney problems. Estimated Glomerular filtration rate (eGFR) is recommended as the preferred parameter for assessing renal function prior to CT contrast examination1,3. Guidelines from ESUR 2018 recommend the provision of eGFR results at the point of referral1 while guidelines from ESUR 2018, NICE 2019 and RANZCR 2018 identify previous kidney problems and known diabetes as common risk factors to CI-AKI1,2,3.

**Method:** All outpatient CT IV contrast examinations were included retrospectively from January -- February 2021. eGFR results and history of previous kidney disease and diabetes were obtained both from referral notes and patients' responses to contrast safety questions as entered on CRIS (Computerised Radiology Information System).

**Results:** 1,943 outpatient CT IV contrast examinations were performed between January-February 2021. 949 (49%) patients did not have recent eGFR results (≤3 months) available before their CT appointment. 23% of these patients had risk factors for CI-AKI as agreed by the referred guidelines, with a total of 7%, 14% and 2% having a history of known kidney problems, diabetes and both respectively. In addition, 119 out of 153 patients with diabetes were on metformin medication, an added risk to CI-AKI3.

**Conclusion:** The audit does not meet the current available guidelines and hence there is a need to develop a robust local policy on CT IV contrast examinations. This should emphasize the referrer's responsibility to provide renal function results for patients especially those with risk factors to CI-AKI.

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## PAEDIATRICS POSTER PRESENTATIONS

### P055 Optimising image quality and radiation dose for neonatal incubator imaging

*Jenna Tugwell-Allsup[1]; Rhys Morris[1]; Andrew England[2]*

[1]Betsi Cadwaladr University Health Board; [2]Keele University

**Introduction:** Neonates often require imaging within incubators however limited evidence exists as to the optimal method and acquisition parameters to achieve these examinations. This study aims to standardise and optimise neonatal chest radiography within incubators.

**Methods:** A neonatal anthropomorphic phantom was imaged on two different incubators under controlled conditions using a DR system. Exposure factors, SID and placement of image receptor (direct v tray) were explored whilst keeping all other parameters consistent. Image quality was evaluated using absolute visual grading analysis (VGA) with contrast-to-noise ratio (CNR) also calculated for comparison. Effective dose was established using Monte Carlo simulation using entrance surface dose within its calculations.

**Results:** VGA and CNR reduced significantly ($p < 0.05$) whilst effective dose increased significantly ($p < 0.05$) for images acquired using the incubator tray. The optimal combinations of parameters for incubator imaging were: image receptor directly behind neonate, 0.5mAs, 60kV at 100cm SID, however, if tray needs to be used then these need to be adapted to: 1mAs at maximum achievable SID. Effective dose was highest for images acquired using both incubator tray and 100cm SID owing to a decrease in focus to skin distance. There is significant increase ($p<0.01$) in VGA between using 0.5mAs and 1mAs but an apparent lack of increase between 1 to 1.5mAs.

**Conclusion:** Using the incubator tray has an adverse affect on both image quality and radiation dose for incubator imaging. Direct exposure is optimal for this type of examination but if tray needs to be used, both mAs and SID

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## P056 Neonatal digital chest radiography - should we be using additional copper filtration?

*Jenna Tugwell-Allsup[1]; Rhys Morris[2]; Andrew England[3]; Kate Thomas[1]*

[1]Betsi Cadwaladr University Health Board; [2]Bangor University; [3]Keele University

**Introduction:** Copper filtration removes lower energy X-ray photons, which do not enhance image quality but would otherwise contribute to patient dose. This study explores the use of additional copper filtration for neonatal mobile chest imaging.

**Methods:** A controlled factorial-designed experiment was used to determine the effect of independent variables on image quality and radiation dose. These variables included: copper filtration (0Cu, 0.1Cu and 0.2Cu), exposure factors, SID and image receptor position (direct+tray). Image quality was evaluated using absolute visual grading analysis (VGA) and contrast-to-noise ratio (CNR) and entrance surface dose (ESD) was derived using an ionising chamber within the central x-ray beam.

**Results:** VGA, CNR and ESD significantly reduced ($p<0.01$) when using added copper filtration. For 0.1Cu, the percentage reduction was much greater for ESD (60%) than for VGA (14%) and CNR (20%), respectively. When compared to the optimal combinations of parameters for incubator imaging using no copper filtration, an increase in kV and mAs when using 0.1mmCu resulted in better image quality at the same radiation dose (direct) or, equal image quality at reduced dose (in-tray). The use of 0.1mmCu for neonatal chest imaging with a corresponding increase in kV and mAs is therefore recommended.

**Conclusions:** Using additional copper filtration significantly reduces radiation dose (at increased mAs) without a detrimental effect on image quality. This is the first study, using an anthropomorphic phantom, to explore the use of additional Cu for DR neonatal chest imaging and therefore helps inform practice to standardise and optimise this imaging examination.

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## P057 Reliability of sonographic testicular volume assessment

*Merike Mikkov[1]; Michael Jackson[2]; Samantha Choi[2]; Andrew Kirby[2]; Alan Quigley[2]; Kaseem Ajilogba[2]*

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**Background:** In paediatric ultrasound, reliable testicular volume assessment is crucial, particularly in varicocoele patients, where volume discrepancy (VD) of 20% may determine intervention. This study assessed reliability of sonographic testicular volume measurement.

**Method:** Retrospective analysis of scrotal ultrasounds over a two-year period was conducted alongside a prospective phantom study. Seven ovoid phantoms of predetermined volumes (between 1ml and 15 mls) were created and

scanned within non-transparent water-filled rubber gloves by five blinded operators (all consultant paediatric radiologists) using two ultrasound probes. Three orthogonal dimensions, automated and calculated volumes were recorded.

**Results:** Of 204 examinations performed 2019-20, 106 had testicular volumes documented. VD of 20% was found in 45 of 80 non-varicocoele patients and in 9 of 26 varicocoele patients (in one case the smaller testis was on the asymptomatic side). All 7 phantoms were under-measured by all 5 operators, by a mean of between 10% - 29%. Mean VD of 20% found in 5 of 7 phantoms. VD between operators ranged from 14% to 59%, with a VD of 20% in 3 of 7 phantoms. Inconsistencies were found in the ultrasound machine generated volume measurements -- these were discarded from analysis, prompting modification to our clinical practice until resolved. Technical properties of phantoms made reliable measurement of the vertical dimension challenging, likely contributing to variation. Superior phantoms are being produced to allow repeat measurements.

**Conclusion:** Reliability of sonographic testicular volume assessment is uncertain. In decision-critical situations, multiple measurements are recommended, and vigilance with regard to computer-based calculation glitches is advised.

### P059 A qualitative analysis of the role of diagnostic radiographers in child safeguarding

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University of Bradford

**Background:** Diagnostic radiography is an established method of investigating child safeguarding concerns (Hogg et al, 1999. Antwi et al, 2021a). The role of the radiographer in identifying signs that represent safeguarding concerns and acting as a conduit between the patient and other professionals is less well understood (Davis and Reeves, 2009).

**Methods:** Twelve semi-structured interviews were conducted online over Microsoft teams (TM) using an established interview guide. These were transcribed using Otter AI (TM) and reviewed for accuracy. Using framework analysis, three distinct themes were created that facilitated discussion around the role of the diagnostic radiography in child safeguarding.

**Results:** The interview results demonstrated a fundamental desire on the part of diagnostic radiographers to contribute to child safeguarding and an awareness of escalating procedures was shown. The underpinning knowledge of concerning signs and symptoms was inconsistent and the semantics of language was shown to be particularly significant in understanding those signs and symptoms. The evolving nature of the radiographic examination, influenced by technology and role development has had an impact on the assessment of some appearances of child safeguarding concerns.

**Conclusion:** For diagnostic radiographer to contribute to the recognition of child safeguarding concerns most effectively, a knowledge base commensurate with the imaging modality worked in needs to be created at pre and post registration level. This should include pathognomonic injuries and understanding of aetiology. Identification of physical and social signs and symptoms of child safeguarding concerns by diagnostic radiographers whilst not impossible, is regarded as improbable within contemporary and future practice.

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## OBS & GYNAE POSTER PRESENTATIONS

### P060 The efficacy of ultrasound as a pelvimetric tool

*Ogechukwu Anike*

Association of Radiographers Practitioners of Nigeria

**Background:** Pelvimetry is the assessment of the female pelvis in relation to the birth of a baby. In other words, pelvimetry is the assessment of the pelvic size with a view of arriving to the mode of delivery. Pelvimetry also helps in determining the mode of delivery of an expectant mother. It decides if natural delivery or caesarean section would be applied. Normal morphological features of the maternal pelvis are an important prerequisite to vaginal delivery. Longitudinal ultrasound scanning by transabdominal 3.5mhz curve linear probe was performed for measurement of obstetrics conjugate from a site most adjacent to pubic symphysis to the sacral promontory. Although clinical evaluation and radio-pelvimetry are the accepted methods of evaluation of maternal pelvis, but they are associated with radiation hazard to the fetus Barton Garbaciacic and Ryan 1982-Havery, Boice and Honeyman -- 1985 MRI (Magnetic Resonance Imaging) carries no radiation exposure but it is quite expensive, time consuming, technically demanding and not suitable during labour. Ultrasound of the conjugate is stated to be simple, cost effective and clinically useful in women with suspected inlet contraction. Based on 531 (Five Hundred and Thirty-One) of the obstetrics conjugate women that were attended to, they were divided into three groups namely those with obstetrics conjugate < 10crn, 10.1 -- 12crn and > 12crn mode of delivery was noted and maternal height and neonatal weight were correlated with ultrasound obstetrics conjugate. Ordinary least square method and logistics regression analysis were used for statistical analysis. The caesarean delivery rate was 10.9% (7/55) while the forceps delivery rate was 5.4% (4/55). Results from regression analysis

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### P062 MRI features of perifibrinous deposits in the placenta

*Hiba Alessa[1]; Cesar Peres[2]; Emma Ferriman[3]; Elspeth Whitby[1]*

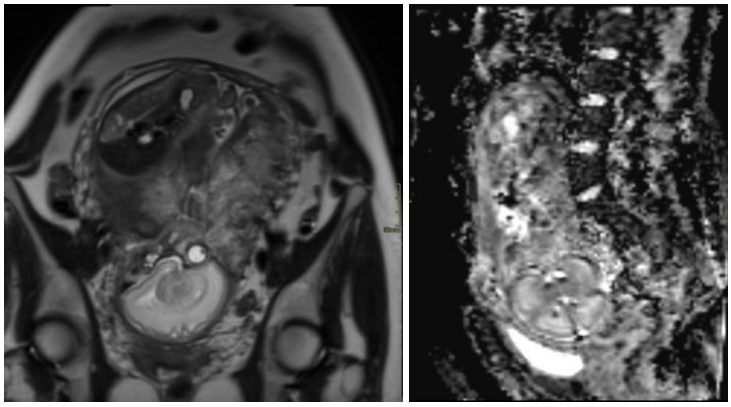
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COVID-19 has been linked to pregnancy complications and loss (1, 2). Infection during pregnancy is usually mild (3). The risk is highest in the third trimester with increased hospital admission rates and maternal and fetal compromise (3-6). Post-Covid placentitis is uncommon but the effect on the placenta and the fetus is extensive (7). We present a case report correlating clinical, imaging, and pathological findings.

**Case report:** A 29-year-old para 2 gravida 1, with a normal fetal anomaly scan at 22 weeks GA. Contracted COVID at 24 weeks GA. Fully recovered but reported reduced fetal movements at 27 weeks and 1 day.

**Imaging:** US scan showed bright echoes within the brain, small lungs and oligohydramnios. MRI showed abnormal brain signals, small lungs and oligohydramnios but also a very abnormal placenta. Reduced and heterogeneous T2 signal and a marked reduction in the DWI signal intensity. The placental size was markedly reduced (volume 785.6 cm3 expected for GA is 5604.8-5952.4 cm3. The surface area of attachment was 3220 mm2, expected 22180.4-29293.2 mm2).

**Pathology:** The placenta was small (5th centile) with massive perivillous fibrin deposition and multifocal chronic deciduitis. Histology revealed placental chorionic villi showing diffuse sclerotic changes surrounded by perivillous fibrin deposition in the intervillous space. The basal plate revealed multifocal chronic deciduitis. Possible causes of perivillous fibrin deposits include immunologic, developmental and genetic. The placenta is a forgotten organ when imaging the fetus and should be routinely included and assessed to allow detection of important abnormalities.



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## BREAST POSTER PRESENTATIONS

### P063 Management of clinically indeterminate (P3) breast lesions at a tertiary centre

*Saraswati Samyukta Aryasomayajula; Trupti Kulkarni; Shruthi Patel*

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**Background:** P3 (clinically indeterminate) lesions are investigated with ultrasound (<40 years, pregnant or lactating) or ultrasound and mammography (>40 years). Image guided biopsy is performed following uncertain or suspicious radiological findings (M3-5 / U3-5), freehand core biopsy is indicated in P3 lesions with normal imaging. Fine needle aspiration cytology (FNAC) is not recommended.

**Method:** Retrospective assessment of 149 electronic patient records for patients with P3 lesions between 25/4/2019-25/9/2019.

**Results:** 26% (38/149) had normal imaging (U1/M1). 3% (1/38) had FNAC and 3% (1/38) had ultrasound core biopsy. 63% (24/38) had freehand biopsy with 13% (3/24) showing indeterminate or suspicious histology (B3-5). 32% (12/38) were discharged without biopsy.

43% (64/149) had benign imaging (U2/M2). 23% (15/64) were discharged including a 68-year-old patient with solid lesion but benign imaging characteristics. 58% (37/64) had ultrasound guided cyst aspiration. 2% (1/64) had FNAC, 2% (1/64) had ultrasound core biopsy and 16% (10/64) had freehand biopsy, with normal pathology.

32% (47/149) had indeterminate or suspicious radiological findings (M3/U3-M5/U5). All of these were appropriately managed and 70% (33/47) were B3-5.

8% (12/149) with discordant clinical and radiological findings did not have biopsy. 2 patients with normal/benign imaging had ultrasound core biopsy and FNAC. These were evaluated on a case per case basis and patient safety was ensured.

**Conclusion:** The pathway for management of indeterminate breast lesions was appropriately followed for the most part. In case of deviation from the pathway, careful consideration was paid to patient safety with justification for the change applied.

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### P064 A pictorial review of metastatic breast cancer to the urinary bladder

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[1]Maidstone and Tunbridge Wells Trust; [2]Nottingham University Hospitals

**Background:** We report a case of an 80-year-old female with a known history of breast cancer on adjuvant aromatase inhibiter treatment who presented with urinary incontinence. Upon investigation, she had microscopic haematuria and impaired renal function. CT imaging of the kidney, bladder and urinary tract revealed thickening of the posterior bladder wall and right sided hydronephrosis (shown in Fig. 1 and 2).

**Discussion:** Breast cancer with urinary bladder metastasis is a rare disease presentation, accounting for 2% of solid bladder tumour metastases [1]. Urinary bladder metastasis is rare, with a recent systemic review in March 2020 showing 65 cases reported in the literature [1]. Breast cancer metastasis is linked to the histological type of cancer. Lobular carcinoma tends to metastasize to serosal surfaces [1]. The patient, in this case, had the infiltrating lobular carcinoma subtype, which is in keeping with the literature. Urinary symptoms at presentation can range from gross haematuria, polyuria, nocturia, microscopic haematuria and incontinence, the latter two of which our patient had [2]. These symptoms highlight the need for an urgent investigation into patients with urinary symptoms with a history of breast cancer. Further investigations should include CT images of the whole body to determine any metastatic disease.

**Conclusion:** This case highlights the need for a prompt investigation into patients presenting with urinary symptoms and a history of breast cancer. With advancements in imaging and therapies for cancer patients, the life expectancy of patients is increasing. The standard workup for surveillance and metastatic disease may require a change in the future.

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### P065 Breast cancer: Invasive Lobular Carcinoma

*Tamanna Begum*

London South Bank University

**Objective**: To examine the strengths and weaknesses of imaging modalities involved in the management of Invasive Lobular Carcinoma.

**Conclusions**: Both U/S and MRI have their separate benefits but both are needed to obtain the most information for the patient. U/S is the foundation necessary before MRI is even considered and MRI is there to supplement initial findings

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### P066 Planning technique evaluation for breast patients: Forward and inverse Intensity Modulated Radiotherapy and Volumetric Modulated Arc Therapy

*Clara Navarro Ibarra; Chris South; Sandra Dymond; Caroline Balcombe; Junman To; Donna Rickard; Elizabeth Adams*

Royal Surrey County Hospital

**Background:** Currently small and medium breast patients are planned 6/10MV Field in Field (FiF) and larger patients with Intensity Modulated Radiotherapy (IMRT). The aim was to introduce/evaluate 6MV IMRT on small/medium patients and Volumetric Modulated Arc Therapy (VMAT) on larger patients; and to ensure the techniques were comparable and robust. Previous studies (1,2) looked at planning technique but not in terms of breast size and plan robustness.

**Methods:** Twenty-seven patients were included in the study. Plans were compared using relevant PTV and organ-at-risk dose statistics, and total monitor units (MU). IMRT and VMAT plans were re-calculated with shifts of +/-1cm along each axis to assess robustness. Gamma analysis was performed using portal dosimetry.

**Results:** On the small/medium cohorts (FiF vs IMRT): lung and PTV doses were within 1-3%. IMRT plans had better coverage on the sup/post border and some plans showed better anterior tumour coverage. IMRT plans have higher MU and more complex fluences but portal dosimetry was within departmental tolerances. On the large cohort (VMAT vs IMRT): The plan uncertainty evaluation showed PTV D90% & D2% were within 1-2Gy. On VMAT plans the ipsilateral lung doses V17Gy (%Vol) was 7% lower and the mean heart doses and contralateral breast/lung is higher by approximately 0.5-2Gy.

**Conclusion:** Our results suggest FiF and IMRT plans had comparable lung and PTV doses; VMAT and IMRT plans demonstrate similar levels of robustness. After this study, the most complex breast patients can be planned using both VMAT and IMRT. We are introducing IMRT for some smaller/medium breast patients.

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## DENTAL / HEAD & NECK / NEURO POSTER PRESENTATIONS

### P069 Enhanced 3D anatomical information - application to 3rd molars

*Carly Comia; Andrew Dawood; Veronique Sauret-Jackson*

Cavendish Imaging Ltd

**Background:** Third molar also known as the wisdom tooth sometimes can be impacted. It is because they don't have enough room to emerge and to develop normally. Those impacted third molars can lead to gum disease, tooth decay, inflammation and pain if left untreated. To determine the precise location of the wisdom tooth when intra-oral or panoramic images are not conclusively showing a safe margin with the dental nerve, advanced Cone Beam CT (CBCT) is used prior to any treatments or extraction to avoid injury.

**Method:** Radiographers associated to dental imaging aim to investigate the position of lower third molar to the relationship of the inferior alveolar nerve (IDC), the roots of mandibular wisdom teeth and neighbouring teeth. The CBCT scan will provide a clear 3D visualisation for the clinician with a field of view as small as 40 x 40 from 85-micron thickness slices and interval.

**Conclusion:** Initial panoramic and periapical x-ray can view an impacted tooth, however in cases of intimate 3D relationship of the wisdom tooth with the nerve, adjacent structures and pathology, CBCT will then be the best examination we can offer to the patients. CBCT has become sufficient, and it is rare to use conventional CT-scan for further investigation to demonstrate the structures further. Aside from the major disadvantage of the conventional CT-scan which produce higher radiation that patient can receive compared to the CBCT and 2D radiography.

### P070 Head and neck cancer patients' experience of MRI radiotherapy planning scan with an immobilisation mask

*Louise Jordan*

The Newcastle upon Tyne Hospitals NHS Foundation Trust

**Background:** Modern radiation therapies of head and neck cancer require precisely delineated target areas in order to deliver high tumour doses whilst sparing surrounding healthy tissue and functional anatomy. The advantages of MRI in the radiotherapy treatment pathway of head and neck patients are axiomatic. An immobilisation device is utilised to allow replication of patient position at subsequent treatment sessions. This study investigates the experience of head and neck cancer patients undergoing an MRI scan whilst immobilised in a thermoplastic mask.

**Methods:** A purposively selected sample of eight head and neck cancer patients took part in semi-structured interviews. Reflexive thematic analysis based on a process described by Braun and Clark (2019) was used to allow themes to emerge from the data.

**Results:** Participants described their experience of the MRI in their mask. Pre-scan preparation was discussed, alongside feelings of confusion and mistrust of online media. Participants' loss of control during the scan was highlighted, and coping strategies employed in order to complete the scan were shared. Feelings of restriction, powerlessness and removal of choice were identified leading to resignation and acceptance of discomfort. Significant trust in medical professionals was displayed with confidence in the treatment pathway prescribed.

**Conclusion:** This study proposes strategies to minimise patient refusal in the known claustrophobic environment of MRI plus the restrictive thermoplastic mask. All participants in this study were able to tolerate the MRI due to confidence in skilled staff and endured any discomfort as a means to achieving the goal of becoming cancer free.

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. Qualitative Research in Sport, Exercise and Health, 11(4), 589-597.

### P071 Local audit of u-scoring on ultrasound thyroid reports and the appropriateness of subsequent fine needle aspiration

*George Pears; Gajraj Sharma*

Aintree University Hospital

**Background:** Thyroid nodules are extremely common, but only a small percentage (3-7%) are found to be malignant (1). Accurate assessment to identify benign and malignant features is vital to guide management. British Thyroid Association (BTA) produced guidelines in 2014 advising all ultrasound thyroid reports should provide a U-score (which states whether the nodule is considered benign, indeterminate, suspicious or malignant) (2). This provides clarity of the operator's nodule assessment and allows decisions to be made on the appropriateness of subsequent fine needle aspiration (FNA): U1-2 do not require FNA unless there are clinically worrying features; U3-5 require FNA unless adequate clinical reasoning is given (2).
**Purpose:** Retrospective audit assessing whether U-scores were provided on 100 ultrasound thyroid reports (between 03/03/21 - 30/07/21) and if FNA was either performed or not performed appropriately as per BTA guidelines. This allowed specific areas of weakness to be identified and appropriate recommendations made.
**Summary:** The poster will display the audit background (including educational images on U-scoring), aims, method, standards, results and discussion. Briefly, the appropriateness of FNA was 100% however the provision of U-score was 76%. Therefore, specific actions were identified to improve the latter including educating sonographers and

radiologists, providing handouts of the U-scoring system in ultrasound rooms and introducing report templates with a specific section for the U-score. Re-audit in 6 months to assess for subsequent improvement was recommended. The poster will also display data on FNA results and their correlation to U-scores.

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2. Perros, P., Boelaert, K., Colley, S., Evans, C., Evans, R.M., Gerrard BA, G., Gilbert, J., Harrison, B., Johnson, S.J., Giles, T.E., Moss, L., Lewington, V., Newbold, K., Taylor, J.., Thakker, R.V.., Watkinson, J. and Williams, G.R. (2014), Guidelines for the management of thyroid cancer. Clin Endocrinol, 81: 1-122. https://doi.org/10.1111/cen.12515

## P072 Imaging Horner's syndrome - pearls and pitfalls for the general radiologist

*Alan Eccles[1]; Richard Chaytor[1]; Benjamin Rock[2]; Nick Hollings[2]*

[1]Peninsula Radiology Academy; [2]Royal Cornwall Hospitals NHS Trust

**Background:** Horner's syndrome encompasses a clinical syndrome of ipsilateral enopthalmos, ptosis, pupillary miosis and facial anihydrosis due to a lesion of the oculosympathetic pathway. It represents challenges to the radiologist due to the variety of underlying causes spread over several anatomical regions including central, preganglionic and post ganglionic segments. The central segment involves the first order neurones from the level of the hypothalamus travelling through the brainstem to the cervical spinal cord. The preganglionic segment involves the 2nd order neurones from the brainstem which synapse in the superior cervical ganglion within the neck. The post ganglionic segment involves the 3rd order neurones which travel alongside the carotid artery, with fibres accompanying the internal carotid artery entering the cavernous sinus with the Ophthalmic division of the Trigeminal nerve. (Lee et al., 2007) Imaging is guided by clinical history and examination. An acute onset of symptoms should prompt consideration of a vascular aetiology such as carotid dissection. Presentation with brain stem signs, spinal signs or Pancoast syndrome will also help guide the modality and region to be imaged.

**Purpose:** To review the relevant anatomy of the oculosympathetic pathway and provide a pictorial review of some of the major pathologies in the central, preganglionic and post ganglionic regions through a variety of imaging modalities.

**Summary:** Following a pictorial review of the relevant anatomy, cases of the major causes of Horner's syndrome will be presented, with a view to providing a template for imaging Horner's syndrome and improving confidence of the general radiologist in assessing this.

1. Lee JH, Lee HK, Lee DH, Choi CG, Kim SJ and Suh DC. (2007) Neuroimaging strategies for three types of Horner syndrome with emphasis on anatomic location. AJR Am J Roentgenol;188 (1): W74-81.

## P073 Characterisation of bone lesions on CT head scans

*Amy Vosper*

University Hospitals Plymouth NHS Trust

**Background:** To assess the potential need for additional training within the CT head reporting cohort, the author of this poster issued a survey to CT head reporting radiographers in the Southwest. The aim of the survey was to establish if there were any areas within their practice where they would benefit from additional training in the form of a study day. Of the 16 respondents, 94% stated that a study session focused on bone lesions would assist them to identify specific bone lesions more accurately on a CT head scan.

**Purpose:** The purpose of the poster is to deliver a pictorial guide to aid reporting radiographers to recognise different bone lesions within CT head imaging and to assist them in being able to accurately describe and report on these lesions.

**Summary:** The poster gives a pictorial review of common bone lesions seen on CT head imaging as a quick references guide for reporting radiographers who are reviewing CT head scans. The aim is to enable the reporting radiographer to accurately describe and diagnose these lesions with confidence. The poster will demonstrate a variety of common bone lesion, both benign and malignant, as well as describing the imaging features of each lesion. The review will also discuss whether any further imaging or referral is advised or required.

### P074 The added value of MRI brain for patients presenting with headache who have a normal unenhanced CT, a single centre experience

*George Pears; Hülya Wieshmann*

Aintree University Hospital

**Background:** Headache is a common presenting complaint. Normal neurological examination indicates a decreased likelihood of a significant cerebral lesion (1). Despite normal CT and clinical examination, MRI brain is often performed. The aim of our project was to assess the added value of MRI in patients presenting with headache who have no significant findings on neurological examination and on unenhanced CT.
**Method:** All patients attending our accident and emergency department over a 12-month period because of headache and investigated with an unenhanced CT followed by MRI brain for the same clinical indication were included. MRI brain was requested as no radiological cause was identified on CT. Reports and clinical documentation were analysed to establish whether MRI provided additional clinically relevant information and changed management. Patients who presented with focal neurological deficit, reduced GCS or seizure were excluded.
**Results:** 64 patients met the above described criteria. 4/64 MRIs revealed acute pathology; in 2/4 it changed immediate management. One of these patients had acute subarachnoid haemorrhage and the second patient had an acute pontine ischaemic stroke. The other 2/4 patients MRI showed an incidental left petrous apex lesion and changes secondary to possible migraine for which the patient was already being treated for.
**Conclusion:** The added diagnostic value of MRI in our cohort presenting with headache and normal CT was ~7%. Triaging patients to the correct imaging pathway is a challenge. Diligent clinical examination and communication with the radiologist may help to choose the correct modality or avoid unnecessary scans.

1. Holle, D., & Obermann, M. (2013). The role of neuroimaging in the diagnosis of headache disorders. Therapeutic advances in neurological disorders, 6(6), 369–374. https://doi.org/10.1177/1756285613489765.

### P075 A pictorial review of the EXODEVA approach to CT head interpretation of suspected acute ischaemic stroke for non-radiologist physicians

*Joshua Wong*

Nottingham University Hospitals NHS Trust

In patients with a suspected stroke, a non-contrast computed tomographic (CT) head scan is the first-line radiological investigation in order to establish an infarct and exclude an intracranial haemorrhage and other stroke mimics (e.g. a space-occupying lesion). Most stroke presentations are first brought to emergency departments and decisions on treatment of ischaemic stroke including thrombolysis and mechanical thrombectomy are based on the requesting physician's clinical acumen and interpretation of the scan, without waiting for a formal report provided by radiologists. Thus, time-critical treatment can be initiated without delay, avoiding irreversible damage to the brain. This pictorial review describes a systemic approach to interpreting early and important signs of an acute infarct on CT scans for acute care physicians who may not have received formal radiology training. The EXODEVA approach consists of 6 key aspects of CT interpretation in suspected strokes, which begins with 1) EXcluding a haemorrhage, followed by identifying early signs of infarct including 2) focal parenchymal HypOdensity (including the insular ribbon sign and obscuration of lentiform nucleus in MCA infarcts), 3) hyperDense artery sign, and 4) cerebral oEdema with ventricular and sulcal effacement and loss of cortical grey-white matter differentiation. This is followed by establishing 5) pre-existent Vascular burden (e.g. small vessel disease and old infarcts), and lastly calculating the Alberta stroke programme early CT score in patients with middle cerebral artery and posterior circulation stroke to predict functional and treatment outcomes. The EXODEVA approach provides a user-friendly, mnemonic-driven, stepwise approach to identifying cerebrovascular infarcts in CT head scans.

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## P076 RCVS - A common cause of thunderclap headache!

*Stuart Baines; Saptarshi Mukherjee; Rhian Rhys; Shawn Halpin*

Cwm Taf Morgannwg University Health Board

Reversible Cerebral Vasoconstriction Syndrome (RCVS) is a common but often overlooked cause of thunderclap headache and stroke in younger patients. RCVS can cause acute cerebral haemorrhage and brain infarction and is associated with characteristic vascular imaging findings. We describe the clinical presentation, pathophysiology and range of findings in RCVS. We emphasise the utility of 3D volume rendered CT Angiography to enable reporter to consider the diagnosis of RCVS in the right clinical context.

Miller,T. R., Shivashankar, R., Mossa-Basha, M. and Gandhi, D. (2015) Reversible Cerebral Vasoconstriction Syndrome, Part 1: Epidemiology, Pathogenesis, and Clinical Course. American Journal of Neuroradiology. 36 (8), pp1392-1399. Singhal, A. B., Topcuoglu, M. A., Fok, J. W., Kursan, O., Nogueira, R. G., Frosch, M. P. and Caviness, V. S. (2016) Reversible cerebral vasoconstriction syndromes and primary angiitis of the central nervous system: clinical, imaging, and angiographic comparison. Annals of Neurology. 79(6), pp 882-894.

## P077 Neuroimaging of Parkinson's disease

*Denise Bishop*

London South Bank University

Parkinson’s Disease (PD) is a neurological disorder that can be difficult to diagnose on clinical examination without specialist imaging. To explore the efficacy of diagnostic imaging, it is helpful to acknowledge: the pathophysiology of PD, the imaging modalities involved, and the latest research on advanced imaging techniques.

1 Magrinelli F, Picelli A, Tocco P, Federico A, Roncari L, Smania N, Zanette G, Tamburin S. Pathophysiology of Motor Dysfunction in Parkinson's Disease as the Rationale for Drug Treatment and Rehabilitation. Parkinsons Disease. 2016 Jun 6; 2016:9832839. Available from: https://doi.org/10.1155/2016/9832839 [Accessed 15th December 2021]. 2 National Institute for Health and Care Excellence. Parkinson’s Disease: Background Information. Available from: https://cks.nice.org.uk/topics/parkinsons-disease/background-information [Accessed 15th December 2021]. 3 Reeve A, Simcox E, Turnbull D. Ageing and Parkinson’s disease: Why is Advancing Age the Biggest Risk Factor? Ageing Research Reviews 2014 Mar; 14(100) 19-30. Available from: https://doi.org/10.1016/j.arr.2014.01.004 [Accessed 15th December 2021]. 4 National Institute for Health and Care Excellence. NICE Guideline NG71. Parkinson’s Disease in Adults: Diagnosis and Management. Full Guideline. London: NICE; 2017. Available from: https://www.nice.org.uk/guidance/ng71/evidence/full-guideline-pdf-4538466253 [Accessed 15th December 2021]. 5 Parkinson’s UK. Poll Finds a Quarter of People with Parkinson’s are Wrongly Diagnosed. 2020. Available from: https://www.parkinsons.org.uk/news/poll-finds-quarter-people-parkinsons-are-wrongly-diagnosed [Accessed 16th December 2021]. 6 Tran J, Anastacio H, Bardy C. Genetic predispositions of Parkinson’s Disease Revealed in Patient-Derived Brain Cells. Nature Partner Journals Parkinsons Disease 2020 Apr 24; 6(8). Available from: https://doi.org/10.1038/s41531-020-0110-8 [Accessed 16th December 2021]. 7 Sweeney P, Park H, Baumann M, Dunlop J, Frydman J, Kopito R, McCampbell A, Leblanc G, Venkateswaran A, Nurmi A, Hodgson R. Protein Misfolding in Neurodegenerative Diseases: Implications and Strategies. Translational Neurodegeneration 2017 Mar 13; 6(1) 6. Available from: https://doi.org/10.1186/s40035-017-0077-5 [Accessed 15th December 2021]. 8 Bernal-Conde LD, Ramos-Acevedo R, Reyes-Hernández MA, Balbuena-Olvera AJ, Morales-Moreno ID, Argüero-Sánche R, Schüle B, Guerra-Crespo M. Alpha-Synuclein Physiology and Pathology: A Perspective on Cellular Structures and Organelles. Frontiers In Neuroscience 2020 Jan 23; 13:1399. Available from: https://doi.org/10.3389/fnins.2019.01399 [Accessed 16th December 2021]. 9 Harris JP, Burrell JC, Struzyna L, Chen HI, Serruya MD, Wolf JA, Duda JE and Kullen DA. Emerging Regenerative Medicine and Tissue Engineering Strategies for Parkinson’s Disease. Nature Partner Journals Parkinsons Disease 2020 Jan 8; 6(4). https://doi.org/10.1038/s41531-019-0105-5 [Accessed 11th January 2022]. 10 Rees RN, Acharya AP, Schrag A, Noyce AJ. An Early Diagnosis is Not the Same as a Timely Diagnosis of Parkinson's Disease [version 1; peer review: 2 approved]. F1000Research 2018 Jul 18; 7(F1000 Faculty Rev) 1106. Available from: https://doi.org/10.12688/f1000research.14528.1 [Accessed 15th December 2021]. 11 Wang L, Zhang Q, Li H, Zhang H. SPECT Molecular Imaging in Parkinson's Disease. Biomed Research International. 2012 Mar 24. Available from: https://doi.org/10.1155/2012/412486 [Accessed 7th January 2022]. 12 Varrone A, Halldin C. Molecular Imaging of the Dopamine Transporter. Journal of Nuclear Medicine. 2010 Sept1; 51(9) 1331-1334. Available from: https://doi.org/10.2967/jnumed.109.065656 [Accessed 11th January 2022]. 13 Deng XY, Wang L, Yang TT, Li R, Yu G. A Meta-Analysis of Diffusion Tensor Imaging of Substantia Nigra in Patients with Parkinson’s Disease. Scientific Reports. 2018 Feb 13; 8: 2941. Available from: https://doi.org/10.1038/s41598-018-20076-y [Accessed 7th January 2022]. 14 Mitchell T, Lehéricy S, Chiu SY, Strafella AP, Stoessl AJ, Vaillancourt DE. Emerging Neuroimaging Biomarkers Across Disease Stage in Parkinson Disease: A Review. JAMA Neurology. 2021 Oct 1; 78(10)1262-1272. Available from: https://doi.org/10.1001/jamaneurol.2021.1312 [Accessed 7th January 2022]. 15 Lorio S, Sambataro F, Bertolino A, Draganski B, Dukart J. The Combination of DAT-SPECT, Structural and Diffusion MRI Predicts Clinical Progression in Parkinson's Disease. Frontiers in Aging Neuroscience. 2019 Mar 15; 11:57. Available from: https://doi.org/10.3389/fnagi.2019.00057 [Accessed 11th January 2022]. 16 National Institute for Health and Care Excellence. Levodopa with Carbidopa and Entacapone. British National Formulary. 2022. Available from: https://bnf.nice.org.uk/drug/levodopa-with-carbidopa-and-entacapone.html#indicationsAndDoses [Accessed 11th January 2022]. 17 Lee PS, Richardson RM. Interventional MRI-Guided Deep Brain Stimulation Lead Implantation. Neurosurgery Clinics. 2017 Oct 4; 28(4) 535-544. Available from: https://doi.org/10.1016/j.nec.2017.05.007 [Accessed 11th January 2022].

## P078 Neurological imaging of acute ischaemic stroke

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**Objective**: A review of the strengths and weaknesses of different imaging modalities in the detection of acute ischaemic stroke

**Conclusion**: In conclusion CT is an essential imaging modality for the detection of acute ischaemic stroke and useful for differentiating between haemorrhagic and ischaemic. MRI diffusion weighted image could offer more information if CT appears normal, and in some trusts where MRI is more accessible MRI might be used more but the delay in using MRI compared to CT could affect the patients success rates in treatment and eligibility for endovascular thrombectomy. Therefore non-enhanced CT followed by a CTA and / or perfusion CT is more widely used.

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## P079 The clinical factors most likely to result in an abnormal CT head - a UK trauma centre experience

*Abul Haque; Kevin Kow; Kai Tsang*

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**Background:** Demand for medical imaging has significantly increased in the UK with Computed Tomography (CT) becoming the main modality used in the assessment of suspected head injuries. We looked at all such CT Heads performed in our Trust over the course of one month and analysed those that were abnormal to assess for specific links with the clinical factors provided in the history.

**Method:** A retrospective audit was performed looking at all inpatient CT Heads performed over the course of one month between 15th October -- 15th November 2021. We then analysed the reports for the presence of intracranial and/or extracranial injuries and tried to identify commonly related clinical findings.

**Results:** 535 CT Heads were analysed of which 13.3% (n=71) were abnormal. Almost half of patients (45% n=242) were on some form of anticoagulation and this was found to be the most common indication for requesting a CT Head. Of the abnormal scans, bruising around the ears/eyes and retrograde amnesia were the two most common clinical factors in the history provided -- demonstrated in almost 30% of patients. 25% of patients found to have an abnormal CT were on some form of anticoagulation.

**Conclusion:** Within our Trust, being on anticoagulation is by far the most common indication for a CT Head overall. However, facial bruising and retrograde amnesia were found to be the most common clinical factors resulting in an abnormal CT Head.

### P080 Compliance with NICE guidelines 2014 for traumatic head injury in regard to CT (Re-audit)

*Karen Man Yan Chan; Tariq Ali*

Norfolk and Norwich University Hospital

**Background:** Traumatic head injury is one of the most common causes of mortality and morbidity in the UK for the adult and paediatric population with a 1.4 million emergency attendance annually and 200,000 admissions (1). CT head is the key primary imaging modality for prompt detection. An audit is performed based on the revised 2014 NICE guidelines for traumatic head injury to assess local practice.

**Method:** Retrospective analysis of the data of the same month in two consecutive years (Sep 2019 and Sep 2020) of all A&E patients with CT head and traumatic head injury was performed at 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 from PACS and RIS.

**Results:** Data of 353 cases and 330 cases of trauma CT head scans in Sep 2019 and 2020 were collected respectively. 81% (2019) and 76% (2020) of patients had CT head scans within 1 hour or 8 hours of risk factors identified. 66% (2019) and 68% (2020) of CT head reports were authorised within 1 hour of the scan being performed.

**Conclusion:** The results highlighted longer request-to-scan time which could be due to staffing and Covid-19-related factors. This audit also showed that more CT heads were reported in a shorter timeframe which could be due to the implementation of registrar-to-registrar referral during out-of-hours resulting in less disruptions during reporting.

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

2. irefer. The Royal College of Radiologists. (2017) Making the best use of clinical radiology services 8th edition. https://www.rcr.ac.uk/sso/irefer/v8.

## DOSE / RADIATION PROTECTION / IMAGING TECHNOLOGIES POSTER PRESENTATIONS

### P082 Paediatric unenhanced CT head dose audit: Comparing our single-photon emission computed tomography (SPECT) scanner in the 16 slice standard CT acquisition mode against our standard 64 slice CT scanner

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Sheffield Children's Hospital NHS Foundation Trust

**Background:** At our tertiary referral paediatric specialist trust we use a single General Electric (GE) 64 slice scanner, the Lightspeed VCT 64, for our CT scanning. The most frequently performed CT study in our trust is an unenhanced CT head. There are occasions where due to routine maintenance, quality assurance testing or unexpected faults that the CT scanner is not available for use. On these occasions, where clinical need dictates that imaging cannot be delayed, we use the CT scanning capabilities of our single-photon emission computed tomography (SPECT) scanner in the standard CT acquisition mode - installed in 2019. Whilst standard quality assurance processes are undertaken on both the CT and SPECT scanner in accordance with the Ionising Radiation Regulations 20171, a comparison of the doses from our SPECT scanner in CT mode and our standard CT scanner has not previously been made.

**Purpose:** To audit the dose from the SPECT scanner against our reference standard, the doses from our standard CT scanner

**Methods:** A retrospective, single centre audit evaluated 94 unenhanced CT heads between May 2019 and June 2021. Only studies acquired in a single acquisition were included.

**Results:** A one-way analysis of covariance (ANCOVA) test showed no significant difference ($p>0.05$) in the mean dose for an unenhanced CT head on the CT scanner vs the SPECT scanner when adjusted for age at event. Subjectively there was no difference I image quality. We will continue to use the SPECT scanner as a backup to perform standard CT acquisitions when adjusted for age at event.

1. Ionising Radiations Regulations 2017. Available at https://www.legislation.gov.uk/uksi/2017/1075/pdfs/uksi_20171075_en.pdf (accessed 15/12/2021)

### P084 Virtual grid software for scatter correction to improve image quality and reduce radiation dose, assessed using a TOR CDR image quality phantom

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[1]Diagnostic Radiology, Najran University; Medical Imaging, University of Exeter; [2]Medical Imaging, University of Exeter; [3]Diagnostic Radiology, Najran University; [4]Diagnostic Imaging, Musgrove Park Hospital

**Background:** Currently, the use of virtual grid (VG) technology in diagnostic radiology is limited and has a low evidence-base. VGs are a new post-imaging processing technology, which can be implemented to reduce the effects of scatter radiation on an image. Traditionally, scatter issues have been minimised via the use of physical grid devices (PG), however, they do lead to increased radiation dose and grid cut-off. This study aims to assess the image quality of VG corrected images compared to PG.

**Method:** A TOR-CDR image quality phantom with a 10mm thick piece of Perspex placed upon it was imaged, both with a PG and without a grid, from which VG images were generated. Exposure factors were identical for all techniques: 70 kVp, mAs: 5, 10, 16, 20, 25, 32, 36, and 40, Source-to-Object distance 110cm. Mean and standard deviations of selected ROIs were measured and (CNR, SNR) calculated with paired samples T-Test undertaken to compare differences between VG and PG across all mAs values.

**Results:** VG improved the image quality of non-grid with a significant difference ($p < 0.001$) in terms of CNR, from 3.804.23 to 10.284.61 and SNR from 40.1433.8 to 77.3413.47, and provided a nearly comparable level of image quality compared to PG ($p > 0.05$). However, VG achieved optimal SNR/CNR at lower exposer factors (<16 mAs) whereas PG needed (> 25 mAs).

**Conclusion:** Image quality was not adversely impacted by the use of the VG versus the PG; VG can be performed at a lower radiation exposure.

### P085 X-ray scatter correction software studies for diagnostic X-ray imaging: Scoping review

*Mohammad Sayed[1]; Karen Knapp[2]; Jon Fulford[2]; CJ Heales[2]; Saeed J. M. Alqahtan[3]*

[1]Diagnostic Radiology, Najran University; Medical Imaging, University of Exeter; [2]Medical Imaging Department, University of Exeter; [3]Diagnostic Radiology Department, Najran University

**Background:** The anti-scatter grid has been used in X-ray radiography to reduce the scattered X-rays generated by the patient. However, the presence of a grid means the patient dose subsequently increases as more X-ray photons are required to compensate for those primary X-rays absorbed by the grid. Recently, several manufacturers have developed software that can correct the scattered X-ray and enhance the image contrast. This scoping review aims to systematically map the research carried out in the field and to identify any existing knowledge gaps.

**Methods:** This scoping review was conducted through a systematic search using different electronic databases to reveal studies that are relevant to the research questions. Published articles about X-ray scatter correction software for X-ray imaging from 1.1.2000-31.12.2021 were included. A part of the PRISMA model and the PICO framework were utilised to establish eligibility criteria.

**Results:** A total of 12 articles were included in the data synthesis. The study population of the included studies was varied: patients, image quality phantoms, and anatomical phantoms. The clinical application that used X-ray scatter correction was found to be limited in some body parts, including the cervical spine, chest, shoulder, lumbar spine, hip, and pelvis. The scatter correction software seems to be effective in terms of image quality and radiation dose. However, the conventional grid still provides higher image quality, but with a high radiation dose.

**Conclusions:** X-ray scatter correction software could be effective, and it seems that there are potential benefits of this software for some circumstances or clinical.

### P086 Verification experience of SRS and SABR using the Suncheck Dosecheck and Per Fraction systems

*Colin Jennings; Syed Hassan; Simon Rennison*

Rosemere Cancer Centre, Lancashire Teaching Hospitals NHS Trust

**Method:** The Dosecheck and Per Fraction systems were installed and commissioned in 2021 as an additional verification method alongside our current Patient Specific QA measurements and software. The system calibration and training was straightforward with easy to follow process taking less than 3hrs. A 6MV FFF model was produced by Sun Nuclear that is used for both systems. At our centre all lung SABR is delivered using 6MV FFF and SRS will be in the near future. Single isocentre SRS plans are generally more difficult to verify as they involve small field sizes and off axis dose points. Standard phantom geometry and a set of past single Isocentre SRS cases were used to test the implementation of the Dosecheck system. The Per fraction system was intended to look at anatomical changes to lung SABR treatments eg breathing rate, amplitude and baseline shift. The system was evaluated using a Quasar respiratory phantom, allowing dose measurements including breathing motion. The results were quantified by looking at the gamma passing rate for different treatment planning strategies for lung SABR (Average Intensity projection and Mid Ventilation Projection).

**Results:** The initial beam model provided showed poor verification results for small MLC fields with dose point agreement over 5% for fields less than 2x2cm in simple phantom geometry. However, for larger fields the agreement was within 1%. A subsequent model was then obtained which resulted in agreement within 2% for the smallest fields and acceptable verification for a set of small fields, single isocentre SRS cases. This provided confidence in the use of the system. The per fraction system proved to be a sensitive and reliable tool for verifying lung SABR cases and could distinguish between different planning strategies, with increased gamma passing rates for the mid ventilation planning approach.

### P087 Effect of simulating body habitus on image quality metrics when using low-dose CT parameters

*Maryam Jessop[1]; Peter Hogg[2]; Robert Higgins[2]; John D. Thompson[2]*

[1]University Hospitals Sussex NHSFT; [2]University of Salford

**Background:** Image quality affects decision making and confidence when reporting. The importance of simulating body habitus when measuring image quality is often underestimated. A range of image quality metrics (IQMs) were investigated for low-dose CT acquisition parameters and a larger body habitus in a phantom model.

**Method:** An anthropomorphic chest phantom, fitted with and without attenuation jackets, had simulated lesions ranging in density (-800HU, -630HU, 100HU) and size (5mm, 8mm, 10mm) that were placed in the upper, middle and lower regions of the lung. CT image series were acquired using incremental amperage settings (10mA to 100mA) at 120kV. A variety of IQMs were then applied to the image data, including mean squared error (MSE), peak signal-to-noise ratio (PSNR), structural similarity index (SSIM), non-shift-edge ratio (NSER) and texture analysis IQMs looking at Energy, Homogeneity and Entropy.

**Results:** The effect of using attenuation jackets was seen in graphed data with changes in gradient averaging 34% (range 7%-80%), and y-intercept averaging 38% (range 4%--77%), when looking at the IQMs as a whole. Within the IQMs, T-tests compared averaged datasets of image series obtained both with and without attenuation jackets, proving statistical significance ($p<0.01$) in most instances.

**Conclusion:** These findings are specific to the inherent high-contrast region of the thorax, but have wider implications for image quality measurement. Results of most IQMs demonstrated a significant difference when attenuation jackets were used, highlighting the importance of considering body habitus when performing image quality assessment.

### P088 Optimising CT dose in Radiotherapy

*Anne-Marie John; Jancis Kinsman; Harley Stephens*

University Hospitals Bristol

**Background:** National guidance (IR(ME)R 2017) recommends that CT imaging in Radiotherapy is optimised. The first UK survey of dose indices from radiotherapy planning CT scans was conducted by the Institute of Physics and

Engineering in Medicine (IPEM) in 2018. Breast, brain, head and neck, 3D and 4D lung, prostate and gynae scans were audited. Local imaging doses were found to be higher than national standards for prostate, gynae and 4D lung. With the reduction of scan lengths where appropriate and the introduction of a reconstruction algorithm such as iDose, which allows image quality to be personalised by preventing artifacts and increasing spatial resolution at low dose, it should be possible to reduce local imaging doses to within recommended levels.

**Method:** Scan lengths for 59 prostate patients were audited. We measured the vertical distances between mid SI joint level and (i) extrema of marked planning volumes (ii)L3 (iii) superior border of scan.

**Results:** Superior scan border for prostate scans approx. 13cm (median) too high relative to required anatomy for planning radiotherapy. Identified mismatch between Doctor's protocol and Radiographers work instruction for prostates -- aligned documentation and gave guidance to staff. Started to weigh all patients at CT, to enable best use of iDose in future.

**Conclusion:** We have now implemented a departmental change to shorten the scanning parameters for prostate only patients. We met our aim to bring prostate imaging doses to within national recommended levels, further work is being done for gynae and 4D lung.

1. Wood, T.J., Davis, A.T., Earley, J., Edyvean, S., Findlay, U., Lindsay, R., Nisbet, A., Palmer, A.L., Plaistow, R. and Williams, M., 2018. IPEM topical report: the first UK survey of dose indices from radiotherapy treatment planning computed tomography scans for adult patients. Physics in Medicine & Biology, 63(18), p.185008. 2. IPEM, SCoR, RCR, 2020. IR(ME)R: Implications for clinical practice in radiotherapy; Guidance from the Radiotherapy Board. The Royal College of Radiologists (Clinical Oncology) 3. Ionising Radiation (Medical Exposure) Regulations 2017 UK Statutory Instruments

## P089 The dosimetric evaluation of the consequences of CTV displacement for patients enrolled in the SBRT arm of the PACE trial

*Kevin Young*

University Hospitals Coventry and Warwickshire NHS Trust

**Background:** In radiotherapy the magnitude of PTV margins is calculated from geometrical considerations (1) so any information on CTV dose as a result of displacement during treatment would be valuable in verifying that used margins are appropriate. The PACE trial (2) including prostate radiotherapy requires acquisition of post treatment CBCT images which can be used to estimate the displacement of the CTV from the reference scan position during treatment. The displacement can be introduced in a treatment planning system and the planned dose recalculated to verify that prescribed clinical goals are maintained.

**Method:** For each of the 5 fractions for 10 patients enrolled on the PACE trial displacements of patients from a reference CT scan position were taken from post treatment CBCT images and the plan dose recalculated in the TPS (RayStation v9.2) with these displacements. The resultant CTV dose volume statistics were then analyzed.

**Results:** The mean CTV volume receiving 36.25Gy was greater than 95% for 9 out of 10 patients with one particularly low value for 1 fraction (75.85%) for a patient bringing the average below 95%. A relatively large displacement was associated with this fraction. In general, the CTV clinical goal was maintained despite displacement from the plan reference position.

**Conclusion:** The study gives some confidence that clinical goals for the CTV are maintained with PTV margins in use for these patients. The study has the limitation of assuming there is a translation of the CTV and intrafractional motion isn't fully taken into account.

1. On target: ensuring geometric accuracy in radiotherapy RCR, IPEM, SCR 2. The PACE Trial (Prostate Advances in Comparative Evidence) International randomised study of prostatectomy vs stereotactic body radiotherapy (SBRT) and conventional radiotherapy vs SBRT for early stage organ-confined prostate cancer

## P090 Radiation protection for student nurses in IR

*Jack Grant*

Liverpool University Hospitals NHS Foundation Trust

Within our busy IR department, we have a number of student nurses at varying stages of their training. They often spend between a week and 6-week blocks playing an integral role within our team. It is, however, apparent that they

have very little training in regard to radiation safety which poses a particular problem when working in the IR theatre. This poster was aimed at those students and other new members of staff to give them a basic understanding of radiation protection and how to protect themselves when working within this environment.

1. Ball, J., Moore, A.D. and Turner, S. (2008) Ball and Moore's Essential Physics for Radiographers. 4th edn. United Kingdom: Blackwell Science. 2. British Medical Association. (2007) The British Medical Association Illustrated Medical Dictionary. 2nd Edn. London. A penguin Company. 3. Carter, C. (2006) Imaging Science. Oxford: Blackwell Science 4. Hiles, P., Hughes, H., Arthur, D. and Martin, C. (2016) Personal Protective Equipment for Diagnostic X-ray use. United Kingdom. The British Institute of Radiology. 5. International Commission on Radiological Protection (ICRP). (2000) "Avoidance of Radiation Injuries from Medical Interventional Procedures" Annals of the IRCP. 30, No 2 2000. [Online] Available at: https://www.researchgate.net/publication/11881638_Avoidance_of_radiation_injuries_from_medical_interventional_procedures_ICRP_Publication_85 Accessed: 30.10.2021). 6.Santos, J., Simola, J., Kaasalainen, T., Aho, P and Venermo, M. (2020) "Radiation Doses to Staff in a Hybrid Operating Room: An Anthropomorphic Phantom Study with Active Electronic Dosimeters" European Journal of Vascular and Endovascular Surgery. 59, 4, April [Online]. Available at: https://www.sciencedirect.com/science/article/pii/S1078588420300642 (Accessed: 01.11.2021) 7. Sloane, C., Holmes, K., Anderson, C. and Whitley, A,S. (2010) Pocket Handbook for Radiographers. Great Britain: Hodder Arnold 8. The Department of Health and Social Care (2018) Guidance to the Ionisng Radiation (Medical Exposure) Regulations 2017 [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/720282/guidance-to-the-ionising-radiation-medical-exposure-regulations-2017.pdf (Accessed: 02.11.2021) 9. United States Environmental Protection Agency (2021). Protecting yourself from Radiation. Available at: https://www.epa.gov/radiation/protecting-yourself-radiation (Accessed: 30.10.2021)

## AI / IMAGING TECHNOLOGIES POSTER PRESENTATIONS

### P091 An efficient way of collaborating on multicenter reader studies with your peers

*Daniel Alamidi; Mathias Engström; Subhashis Ghosh*

Collective Minds Radiology

**Background:** Collaboration in healthcare is crucial to improve patient outcomes and keep up with the continuous rapid technical developments that lean towards larger datasets and multiple imaging modalities. There is a need for a common infrastructure to collaborate between centers, institutions, countries and to conduct streamlined multicenter reader studies. This also has to be carried out in a regulatory sound way. The purpose of this study is to develop a cloud-based medical imaging platform to facilitate collaborative multicenter studies.

**Method:** A cloud-based medical imaging collaboration platform was developed to conduct streamlined multicenter reader studies. It facilitates collaboration options for multiple centers and enables reproducible imaging studies. Healthcare professionals can manage and invite collaborators to build local, national and international expert groups. The imaging platform was developed with a multi-modal data repository, embedded zero-footprint DICOM viewer, pseudonymization support, customisable case report forms (CRF) and annotation/segmentation tools.

**Results:** We have developed a scalable and secure cloud-based infrastructure that follows GCP and data handling according to GDPR. The platform includes work distribution of data management, structured reporting (*Figure1*) and result delivery together with image analysis.

**Conclusion:** A multi-site reader study collaboration platform for multi-modal medical images, has been developed following a privacy and compliance by design concept. The platform allows for easy collaboration following GCP and GDPR. We believe that this infrastructure will facilitate both academic single- and multi-institution reader studies as well as large clinical trials, especially where interdisciplinary work is required.

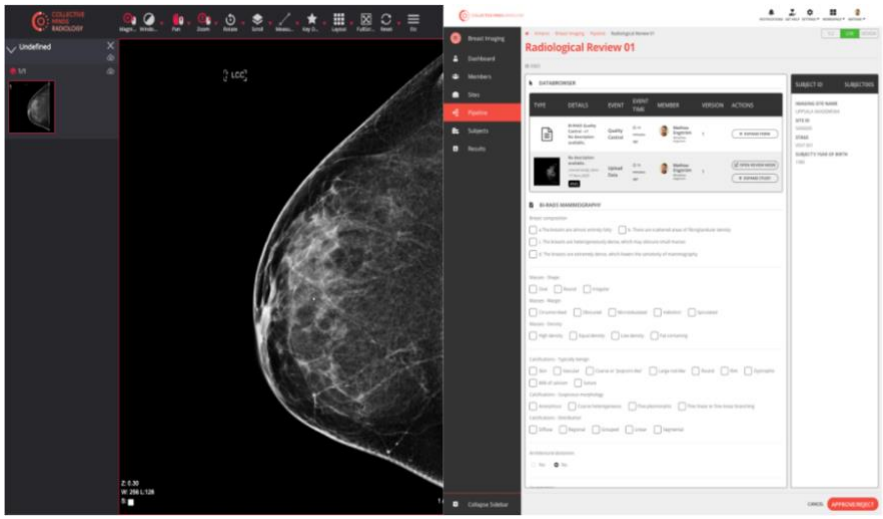



*Figure1. Screenshot from the platform showing a reader study with the DICOM viewer and structured report.*

### P092 Diagnosing Covid-19 from images of chest X-rays communicated via WhatsApp

*Sabyasachi Sahoo[1]; Mariamma Antony[1]; Rachit Shah[1]; Siva Teja Kakileti[2]; Geetha Manjunath[2]; Pratik Katte[2]; Dinesh Sethi[3]; Chiranjib Bhattacharyya[1]*

[1]Indian Institute of Science; [2]Niramai Health Analytix; [3]ARTPARK

**Background:** Scarcity of skilled radiologists for interpretation of Chest X-rays (CXR) resulted in several deaths due to later presentation of COVID-19 patients particularly in some rural areas.

**Methods:** We developed a machine learning (ML)-based solution that enables radiographers to get an automated interpretation of CXR over WhatsApp Medium. Our novel ML model worked on low-resolution WhatsApp images and addressed the issue of lack of large training dataset by using a multi-task deep learning (MTL) model trained with a small COVID-Net dataset and two large CXR datasets meant for other diseases to co-learn best data features for CXR. This MTL architecture was validated on the COVID-Net test dataset of 373 images after WhatsApp compression. The WhatsApp service was also used in real-life to predict COVID-19 labels in a prospective study of 262 images which was later validated by RT-PCR results.

**Results:** Our MTL model resulted in a sensitivity and accuracy of 89% and 79%, respectively on native high-resolution COVID-Net testdata, when compared to 89% sensitivity and 76% accuracy on corresponding WhatsApp-API converted COVID-Net testdata. On the other hand, the traditional deep learning architectures such as Densenet and ResNext resulted in an approximate 20-25% drop in sensitivity and accuracy with WhatsApp compression. The key benefit of our technique was best seen on real-life WhatsApp images, which were taken using a mobile-phone camera with bad lighting, where our ML model had 98% sensitivity when ground truth was obtained using corresponding RT-PCR results.

**Conclusion:** The use of MTL in our AI service resulted in a reliable performance that is minimally affected with WhatsApp compression.

| Model | COVID-Net Native Test Data | | COVID-Net Whatsapp Test Data | | Prospective Whatsapp Test Data | |
|---|---|---|---|---|---|---|
| | Accuracy | Sensitivity | Accuracy | Sensitivity | Accuracy | Sensitivity |
| DenseNet | 0.72 | 0.64 | 0.54 | 0.38 | 0.58 | 0.85 |
| ResNeXt | 0.75 | 0.66 | 0.55 | 0.40 | 0.65 | 0.96 |
| MTL | 0.79 | 0.89 | 0.76 | 0.89 | 0.65 | 0.98 |

**Table 1.** Performance Comparison of DenseNet, ResNeXt and MTL on COVID-Net Native Test Data, COVID-Net Whatsapp Test Data and Prospoective Whatsapp Test Data

### P093 Evaluating screening performance of Artificial Intelligence-based Thermalytix by comparing breast lesion sizes detected by Thermalytix with Mammography

*Siva Teja Kakileti[1]; Lakshmi Krishnan[1]; Sudhakar Sampangi[2]; Ramprakash HV[3]; Venkat Ramana Sudigali[4]; Geetha Manjunath[1]*

[1]NIRAMAI Health Analytix; [2]Healthcare Global; [3]Central Diagnostic Research Foundation; [4]Royal College of Radiologists

**Background**: Thermalytix is a portable, radiation-free, contactless technique for detecting early-stage breast cancer using AI over thermal images. Prospective clinical studies have earlier shown Thermalytix to be non-inferior to mammography [1,2,3].Unlike Mammography which has low sensitivity in dense breasts, performance of Thermalytix is breast-density-agnostic [1]. Since Thermalytix uses affordable equipment and can be conducted by less-skilled health-workers, it is also suitable for community screenings in resource-constrained settings. In this post hoc analysis, we evaluate the ability of Thermalytix to detect malignant lesions of different sizes.

**Method**: We evaluated 470 women who underwent Thermalytix followed by standard imaging investigations in a multisite observational study. The sizes of malignant lesions were extracted from the mammography and breast ultrasonography reports. The largest dimension was used to categorise the lesions in subgroups of 0.5 intervals. In each subgroup, the number of cases detected by AI-based Thermalytix was correlated with those identified by radiologist-interpreted mammography reports.

**Results**: Of the 470 women, 78 women (16.6%) were considered disease positive based on standard imaging and histopathology results. Out of these 78 women with breast malignancies, lesion size information was available for 60women of which mammography results were not available for eight women and hence, were excluded. In total, we correlated the number of cases detected in different sizes for the remaining 52 women who underwent both Thermalytix and mammography tests. 31 women had a lesion with maximum size greater than 2cm, of which 29 women were detected by Thermalytix and 28 women by Mammography. Out of 5 sub-centimetre lesions, Thermalytix detected two and Mammography also detected two. The bar chart in figure (**see remarks**).

1. Bansal R, Aggarwal B, and Krishnan L. (2021) A prospective study of an AI-based breast cancer screening solution for resource-constrained settings. Journal of Clinical Oncology 2021, 39:15_suppl, e13586-e13586
2. Kakileti ST, Madhu HJ, Krishnan L, Manjunath G, Sampangi S, Ramprakash HV. (2020) Observational Study to Evaluate the Clinical Efficacy of Thermalytix for Detecting Breast Cancer in Symptomatic and Asymptomatic Women. JCO Glob Oncol. 2020;6:1472-1480. doi:10.1200/GO.20.00168
3. Singh, A., Bhat, V., Sudhakar, S., Namachivayam, A., Gangadharan, C., Pulchan, C., & Sigamani, A. (2021). Multicentric study to evaluate the effectiveness of Thermalytix as compared with standard screening modalities in subjects who show possible symptoms of suspected breast cancer. BMJ open, 11(10), e052098.

### P095 The effect of AI-assisted imaging in a supraregional mechanical thrombectomy referral network

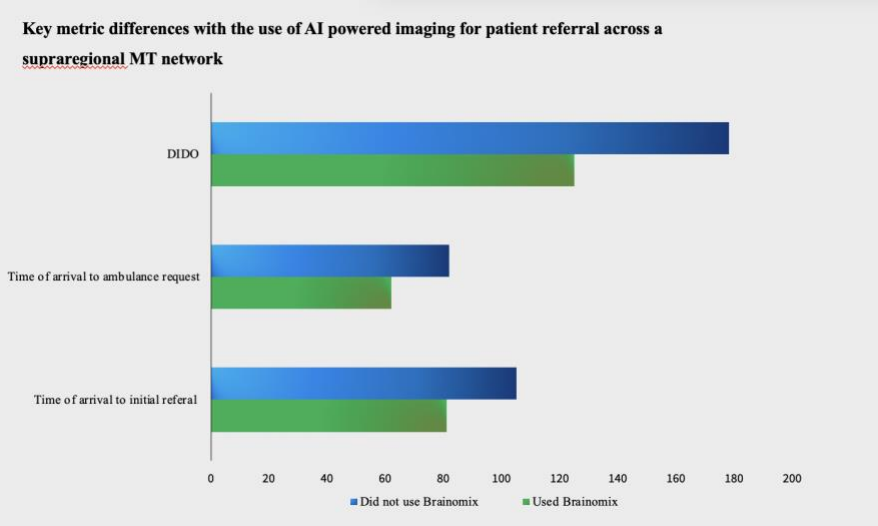
*Christos Nikola; Oliver Spooner; Alexandra Andrews; Levansri Makalanda; Pervinder Bhogal*

Barts Health NHS Trust

**Introduction:** Fast detection of large vessel occlusion (LVO) and timely image transfer to comprehensive stroke centre is crucial to reducing decision-making and reperfusion times. The Brainomix AI platform has been widely implemented in the Royal London Hospital mechanical thrombectomy catchment area.

**Material and methods:** We performed a retrospective analysis of patients that underwent MT between 01/07/2021 and 14/12/2021.We included patients that were referred from external sites that used AI and the sites that did not use. Data was sourced from a local database and SSNAP audit. Time was analysed as minutes for initial referral, ambulance request and departure with subsequent calculation of Door-In-Door-Out (DIDO).

**Results:** A total of 112 patients were referred for MT. Out of the 112 patients 26 presented locally and 86 were external referrals. 59 were males with median age 70 (29 to 90). 109 patients progressed to MT. One third of the external network hospitals use Brainomix. From the external network referrals,59 patients were included for statistical analysis. Time of first arrival to ambulance request for transfer appeared lower from sites using AI (Md=81.0, n=19) compared to the sites that did not (Md=105.3, n=40) U= 299, z=-1.314, p=0.189. Time differences between DIDO for patients referred from a site implementing AI was significantly faster to the ones who did not (Md=125.0, n=19) vs (Md=183.0, n=40) U=240, z=-2.271, p=0.023.




**Conclusion:** AI-assisted imaging for stroke can be effectively implemented across a supraregional MT network and used to enable and improve decision-making for MT. Reducing DIDO times are crucial to timely reperfusion.

## P096 Insights from implementation of an artificial intelligence assist device across a national radiology network

*Catherine Jones[1]; Ronald Shnier[2]; Mark Wilson[3]; Michael Vasimalla[3]; Sajith Karunasena[2]; Michael Milne[3]*

[1]I-MED Radiology & Annalise.ai; [2]I-MED Radiology; [3]Annalise.ai

**Background:** Many Artificial Intelligence (AI) assist devices are proven to augment radiologist diagnostic performance and are already approved for clinical use. Implementation into clinical practice, however, is a complex task with many challenges. There is currently very little in the literature regarding the intricacies of successful AI device implementation.

**Purpose:** This presentation highlights the challenges of large-scale implementation of a comprehensive AI assist device for chest radiograph interpretation throughout a national radiology network comprised of over 250 clinics and hospitals and describes how these challenges were overcome.

**Summary:** For successful implementation, a device must integrate seamlessly into existing workflows, maintain performance across diverse clinical settings, and be deployable into various technical infrastructures. Early stakeholder engagement, and ultimately, collaboration between device manufacturer and radiology service provider is pivotal.

Change management strategies around user engagement and adoption are also important as perceptions of AI may hinder implementation. Radiologists' attitudes towards AI in clinical practice have been shown to correlate highly with AI-specific knowledge (Huisman et al, 2021), therefore user training and education is key to widespread adoption.

Pre-determined implementation success metrics are also discussed. In our case study (Jones et al, 2021), 90% of radiologists reported subjective improved accuracy. Post-implementation feedback also showed high user satisfaction - most importantly, 93% maintained device usage after 3 months and 75% indicated they would be disappointed if device access was ceased.

The complexities of implementation across a large radiology network, with a diverse range of sites and users, were therefore shown to be overcome through careful planning and pre-determined success metrics.

1. Huisman, M., Ranschaert, E., Parker, W., Mastrodicasa, D., Koci, M., Pinto de Santos, D., Coppola, F., Morozov, S., Zins, M., Bohyn, C. and Koc, U., 2021. An international survey on AI in radiology in 1041 radiologists and radiology residents part 2: expectations, hurdles to implementation, and education. European Radiology, 31(11), pp.8797-8806.

2. Jones, C.M., Danaher, L., Milne, M.R., Tang, C., Seah, J., Oakden-Rayner, L., Johnson, A., Buchlak, Q.D. and Esmaili, N., 2021. Assessment of the effect of a comprehensive chest radiograph deep learning model on radiologist reports and patient outcomes: a real-world observational study. BMJ Open, 11(12), p.e052902.

### P097 Early experiences of the use of a Virtual Reality Environment to prepare adult patients for MR imaging

*Christine Heales; Kelly Sargent*

University Hospitals Plymouth NHS Trust

**Background:** MRI can be a challenging examination to undergo due to a combination of factors including the length of the imaging procedure, scanner noise, the use of coils and the size of the scanner bore. This can be exacerbated for individuals who experience claustrophobia. MRI radiographers typically utilise a patient centred approach to identify a strategy to best support patients who find undergoing MRI challenging.

**Purpose:** The use of Virtual Reality is increasingly being explored as part of the MRI radiographer's toolkit. The purpose of this communication is to describe early experiences (from a small-scale service evaluation) of the use of a bespoke MRI Virtual Reality Environment (VRE) tool within a busy MRI department in terms of impact upon patient experience and scan outcome.

**Summary:** A pictorial overview of the MRI VRE tool will be provided together with service evaluation data outlining early experiences of its use in practice. These data will include practical information about implementation such as the radiographer's perception of ease of use and amount of time taken. Limited data (within the scope of a service evaluation) about patient experience will also be provided together with outcomes in terms of whether patients subsequently underwent an MRI scan of diagnostic quality. Limitations to the data set will be discussed and suggestions for future research made.

## EDUCATION AND RADIOTHERPY POSTER PRESENTATIONS

### P099 Clinical research placement for radiotherapy students - a pilot study

*Elaine Smith; Gillian Bestwick; Emma Delaney; Emma Charman*

Gloucestershire NHS Foundation Trust

**Background:** The College of Radiographers released their new 5-year research strategy (CoR 2021) which aims to embed research, improve patient care and service delivery and expand UK radiography research capacity. The Council for Allied Health Professions in Research have also published a Practitioner Research Framework (CAHPR 2019) which sets out the knowledge and skills required by an AHP to perform and apply research in different health care settings. To ensure newly qualified radiographers were equipped with research knowledge and skills our Radiotherapy department developed a placement opportunity for students.

**Method:** Third year students undertook a week placement alongside the Radiotherapy research radiographers. This gave them an insight into the role of a research radiographer and gain experience of clinical trials, local service evaluations and research. To assess the efficacy of the placement the students were asked to complete a pre and post placement questionnaire and to take part in a focus group to expand on any themes raised from the questionnaires.

**Results:**

Results

Table 1 Comparison of Pre and Post Placement Responses.

| | Pre Placement Mean | Post Placement Mean |
|---|---|---|
| Current Knowledge of research | 3.8 | 5.8 |
| Current confidence level of undertaking research | 3.6 | 5.4 |
| Current knowledge of Radiotherapy Trials | 3.8 | 6.8 |

**Conclusion:** The increase in the mean response shows that there has been an increase in knowledge and confidence in research. The main themes raised were regarding the impact it would have on their clinical time and that there were no set objectives for the placement, however, they were pleased that they had a valuable insight into how to undertake their dissertation. As this was a pilot study the results are to be shared with the academic institutions to see if a research placement could be incorporated into the curriculum.

The College of Radiographers. (2021). Research Strategy 2021-2026. Available from: https://www.collegeofradiographers.ac.uk/getattachment/Research-grants-and-funding/cor-research-strategy/cor-research-strategy-2021-26.pdf?lang=en-GB [Accessed 27th November 2021].

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## P100 Therapeutic radiographers - Image and Images

*Elizabeth Joyce[1]; Marcus T Jackson[1]; Jennifer Skok[1]; Bianca Peet[2]; Helen A McNair[2]*

[1]St George's University of London; [2]Royal Marsden Hospital

**Background:** Advanced practice, 'a level of practice characterised by a high degree of autonomy and complex decision making' (HEE, 2017) is very relevant to therapeutic radiographer (TR) roles and implementation of on-line adaptive MRI-guided radiotherapy (MRIgRT) will require role development. In preparation, we have established the current TR role description and involvement in off-line ART.

**Methodology:** A training needs analysis was created and TR's were invited to participate via departmental emails and social media. Descriptive statistics were used to describe and define current roles and responsibilities.

**Results:** 261 responses were received from 77 UK NHS centres. The UK protected title of 'therapeutic radiographer' was the most common reported title but was only used to describe 26% of participants roles. The majority of TR's were involved radiotherapy setup and/or delivery (85%) with pre-treatment pathway the second most common (53%). Although 90% were involved in image verification and 95% of those referred images for plan assessment, only 25% could undertake the assessment. Only 23% of TR's could authorise a subsequent decision. A minority (32%) had the option to rotate through planning and dosimetry. Experience in planning and checking was reported by less than half of TR's (42%). A traffic light decision tool was used by 32%.

**Conclusion:** There is a lack of clarity in the description of the TR role by TR's. Although TR's are the professional expert in image verification acquisition, the responsibilities for decision making lies elsewhere. In order to undertake on-line ART and MRIgRT the TR's role must evolve.

1. HEE. (2017). Multi-professional framework for advanced clinical practice in England. Available: https://www.hee.nhs.uk/sites/default/files/documents/multi-professionalframeworkforadvancedclinicalpracticeinengland.pdf. Last accessed 15th December 2021.

## P101 Training and developing radiographers' knowledge, skills and competency to work on an MR Linac

*Lisa McDaid; Abigael Clough; Wesley Doherty; Rebecca Benson; Cynthia Eccles*

The Christie NHS Foundation Trust

**Background:** Hybrid technologies combining linear accelerators (linacs) and MRI scanners (MR Linacs) have recently become available commercially and are being implemented worldwide. The introduction of an MR Linac at our site warranted review of existing radiographer competencies, and development of new ones, to ensure safe working practice and fully exploit the potential benefits of the MR Linac.

**Purpose:** It was decided that a hub and spoke model would provide an appropriate framework on which to build an education and training curriculum. A central, or "hub", competency was developed initially, to be attained by all staff. From this, emanates multiple spoke competencies that are independently attained by radiographers. Within each competency lies an interactive learner guide to be completed "on the job". These include directed and self-directed elements. Activities designed to test understanding and application of knowledge and skills were included. These activities were based on Bloom's taxonomy and were developed to deepen understanding of the material as well as developing critical thinking skills. Trainer and assessor guides were developed to ensure parity for learners when both introducing the learner to the material and assessing their learned knowledge and application to practice. Formal

assessor guides also allow us to measure learning outcomes. Prior to implementation, the competencies were piloted on 4 new staff members and feedback gained.

**Summary:** The poster will pictorially display the framework in its entirety with supporting text outlining competency content, along with benefits and challenges experienced.

### P102 Evaluating therapeutic radiographers' role in instigating prehabilitation and rehabilitation advice

*Jo McNamara[1]; Yuchen Wang[2]; Daniel Hutton[2]; Hazel Pennington[3]*

[1]Sheffield Hallam University; [2]The Christie NHS Foundation Trust; [3]Lancashire and South Cumbria NHS Foundation Trust

**Background:** Investigating therapeutic radiographers' (TR) perception of their role in delivering prehabilitation and rehabilitation advice before and after completing an e-learning resource. Role of e-learning resource to provide knowledge and professional skills to enable TRs' inclusion of prehabilitation and rehabilitation into cancer pathways.

**Purpose:** Knowledge gap and lack of skills for TRs in providing prehabilitation and rehabilitation advice. The e-learning resource improved TRs' knowledge and increased awareness of prehabilitation and rehabilitation. The e-learning resource equipped TRs with the necessary tools to initiate a conversation about prehabilitation and rehabilitation and refer patients to other cancer services. Remaining challenges for TRs to incorporate a comprehensive prehabilitation and rehabilitation service. It is also vital to eliminate barriers and support TRs in providing prehabilitation and rehabilitation to patients through the radiotherapy treatment pathway. Promoting the role TR's can play in prehabilitation and rehabilitation is important within the MDT.

**Summary:** In total, 62 TRs were recruited from three radiotherapy departments in the northwest of England. 36 TRs responded to the pre-questionnaire (58% response rate) and 18 participants submitted the post questionnaire (response rate 29%) after completing the e-learning resource. Findings showed the level of confidence to deliver prehabilitation and rehabilitation advice was low, with less than 25% of participants having high confidence levels. Lack of knowledge, training, confidence, time and concern about upsetting patients were identified as barriers. Surveys also identified 24% of participants have considered prehabilitation and rehabilitation as part of a TR's role.

### P103 The value of a clinical therapeutic radiography simulation role within practice

*Leah Untisz-Sly; Joanna McNamara; Alex Robinson*

Sheffield Hallam University

**Background:** Therapeutic radiographers are a small profession, with approximately 3000 posts in 2019 (SOR, 2020). In cancer services approximately 50% of all patients will receive radiotherapy and that figure is set to rise to 60% by 2025 (All party parliamentary group, 2019). Workforce expansion and development to support the growth of demand for cancer services is required. It is predicted that a 45% increase in therapeutic radiographers is needed by 2029 (Cancer Research UK, 2020). The challenges documented surrounding recruitment and retention (Health Education England, 2018) has resulted in clinical placement expansion becoming a priority to increase student numbers.

**Purpose:** Simulation has been identified as an opportunity to facilitate student education in a risk-free environment, allowing students opportunity to take time in their practice, have instant debrief and opportunities to pause and reflect (Chamunyonga et al., 2020). Radiotherapy departments are fast paced with staff juggling their commitments in patient care, staff wellbeing and student education. Simulation allows bridging of the academic and clinical environment. The purpose of this role is to investigate how a blended learning approaches can potentially increase placement capacity without impacting student experience.

**Summary:** The simulated placement will utilise a range of effective strategies - The use of HEI treatment suites, virtual environment of radiotherapy treatment room, eclipse planning, role play, service user involvement and peer learning. With successful implementation of simulated placements, the equivalent 112.5 hours of placement would be created for one student over the academic year, resulting in placement capacity increase.

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### P104 Creating a culture: Benchmarking research activity, capability and ambition of Allied Health Professionals

*Gillian Bestwick; Elaine Willmore; Sarah Williams; Leanne Raybould; Paul Donachie*

Gloucestershire Hospitals NHS Foundation Trust

**Background:** Driving research has been identified by our Hospital Trust as a strategic priority. The aim of this project was to benchmark the current level of research awareness, capability and activity of Allied Health Professionals (AHPs) across the Trust.

**Method:** A cross-sectional self-administered questionnaire was developed based on the CAHPR framework (1) and distributed to AHPs across the trust. Results from Diagnostic and Therapeutic Radiographers were compared to results from all AHPs.

**Results:** 265 AHPs responded (50.3% response rate) including 35 Diagnostic Radiographers and 33 Therapeutic Radiographers. Most AHPs (>70%) do not have job plans that facilitate research activity. Fewer than 30% have personal objectives that relate to research and research career development was discussed in less than half of recent appraisals (all AHPS 33%, Therapy Radiographers 43%, Diagnostic Radiographers 10%). Over the last 12 months, 131(49.4%) of responding staff had engaged with some form of research activity and 71.1% of responders regarded themselves as being research aware and able to look for relevant research. The majority lacked confidence with critical appraisal skills. Research activity is not equally spread across professional groups. 60% of Diagnostic Radiographers could not see themselves becoming involved in research in the next 5 years compared to 12% of Therapy Radiographers and 23% of all AHPs.

**Conclusion:** The SCoR and HCPC require AHPs to engage with research and whilst pockets of research activity and capability exist across AHPs in the Trust, there is not an embedded research culture across the organisation. Work is being done to develop this.

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## RADIOTHERAPY AND CLINICAL ONCOLOGY POSTER PRESENTATIONS

### P105 Enhancing the safety of paperless radiotherapy

*Paul Roxby; Jonathan Hughes; Matthew Walsh; Stephen Tozer-Loft, Emma Prince*

Sheffield Teaching Hospitals NHS Foundation Trust

**Background:** Patient set-up instructions for radiotherapy treatment are increasingly moving from paper to computer systems with displays inside the treatment room. A different patient could be selected on these systems than on the linear accelerator. If so, a patient could be set up for incorrectly for treatment. Two CQC IRMER reports (2018/19 and 2020/21) have highlighted this danger, which we addressed.

**Method:** A computer program was written to display a coloured box on the monitors of computers displaying set-up information (Aria) and breathing management information (Varian RPM). The box is green when the patient selected

matches the linac and red if not. The Aria database is used to identify which patient is selected on the linac, and the titles of windows on the secondary computer system are read to check the patient matches. Feedback was collected from radiographers.

**Results:** The system was found to be effective.

For Varian RPM, a combination of the patient's name plus the date of the planning CT scan had to be used instead of name plus patient ID.

A database problem meant that it was not possible to identify the patient being treated if they had been originally booked on a different linac. A successful work around extended the software by reading the HIPAA log file on the Aria server.

For the new set-up instructions, font size needed increasing and medical-grade mice with excessive lag needed replacement.

**Conclusion:** Safe and effective display of paperless (electronic) patient set-up information for radiotherapy is achievable.

### P106 "Getting started with radiotherapy" - a collaborative approach between the radiotherapy department and the Maggie's Centre at the Royal Free Hospital to deliver essential information and support to new radiotherapy patients

*Evriklia Melabianaki; Robyn Volkers; Sarah Needleman; Mark Prentice; Matthew Chiu; Amy Clifford; James Barber*

Royal Free London Foundation Trust

Prior to COVID19, patient education sessions had been held in the Radiotherapy department. In order to conform to COVID19 restrictions, these sessions were suspended, and information was instead delivered via individual telephone calls. Collaboration with the new Maggie's Centre offered a chance to re-invigorate these sessions in an online setting for prostate patients, enhancing the way in which we delivered information and supported patients and their families. As restrictions eased these sessions were introduced for breast patients in a face-to-face format. The success of these sessions prompted the department to extend this format to the prostate radiotherapy sessions.

Since the information sessions have been set up, 74 prostate (13 months) and 29 breast (3 months) patients have attended. Of the feedback received, 100% of patients rated their overall experience as "Good" or "Very Good", 92% rated their welcome as "Very Good" and 100% said they felt questions were answered in a way they could understand. Comments included "The staff are welcoming, kind and knowledgeable;" "The care and dedication that you give is a big help to any patients;" and "Nothing could have made it better." The roll out of the "Getting Started with Radiotherapy" sessions has led to a significant improvement in the quality of information and holistic support given to patients, as well as making the radiotherapy department workflow more efficient.

Going forwards, we aim to integrate radiotherapy staff into other sessions existing in the Maggie's Centre and investigate offering information sessions to additional patient cohorts.

### P107 Building a Radiographer-led RECIST measurement service

*Georgina Hopkinson; Sharon Vit; Robby Emsle[2]; Ed Johnston; Anglea Riddell; Angela Little; Christina Messiou*

The Royal Marsden NHS Foundation Trust

**Background:** The assessment of the number and size of tumours as per RECIST 1.1 criteria (and similar) is integral to the evaluation of cancer therapies, contributing significantly to end points in clinical trials (1). In response to the national and local shortage of Radiologists (2), a Radiographer-led RECIST measurement service has been developed.

**Purpose:** Currently over 70 RECIST type assessments are performed by Radiographers on our site each month. The service is supported by a weekly meeting, co-chaired by Radiographers, which also brings together radiologists and the clinical trials team (oncologists, nurses, and trial coordinators). Whilst the primary motivation was to fulfil an area of unmet need, the role has been well received by all stakeholders with a number of positive effects. Inter-disciplinary communication, documentation and radiographer morale has improved. Ambitions to expand the service include Radiographer target lesion selection and training in the use of other response criteria.

**Summary:** This poster will provide a brief overview of a traditional RECIST measurement service and will describe how this workflow has been adapted to enable a radiographer led service. It will provide a summary of radiographer training and ongoing governance in addition to ambitions to future plans.

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2. The Royal College of Radiologists, 'Clinical Radiology UK workforce census 2020 report', London, The RCR, 2021, Clinical radiology UK workforce census 2020 report (rcr.ac.uk)

## P108 The introduction and implementation of a formal process and electronic workflow template for missed radiotherapy treatments

*Nathan Wilson; Angela Halpin; Alexander Hughes; Daniel Blair*

Clatterbridge Cancer Centre

**Background:** When delivering radiotherapy, overall treatment time (OTT) is a vital factor to take into consideration as prolongation may have a detrimental effect on treatment outcomes. Research indicates that accelerated repopulation has a significant role in local failure, especially in rapidly proliferating tumours, whereas research shows that a gap in treatment may have no consequence dependent on tumour type.

**Method:** An electronic workflow template was created for use within the institutional record and verify system to ensure formal processes have been adhered to. The workflow template was added to any patient in the authors department that missed a fraction of radiotherapy for any reason other than a machine breakdown. The workflow template prevents further fractions being delivered without the appropriate tasks being performed, encouraging communication of information and the formal process is followed before patients return to treatment.

**Results:** In the first month of use there was an uptake of 63.3% correct uses of the workflow template out of 30 patients, with 72.2% of those returning to finish their course of treatment. The workflow template was used most for patients who had a gap in treatment of more than 1 fraction.

**Conclusions:** The addition of the workflow template and formal process is feasible as part of normal radiotherapy working practices. Further follow-up required at 3- and 6-months post introduction, the process allows for further study into the effect of unplanned gaps and the impact on overall survival.

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## P109 Adequacy of sexual care information given to prostate cancer patients receiving radical external beam radiotherapy

*Samuel Greenwood-Wilson; Pete Bridge*

University of Liverpool

**Background:** Despite the acknowledged value of providing prostate radiotherapy patients with sexual dysfunction information, there is little evidence related to patient perceptions of this or the extent to which information is provided to them. This study aimed to critically evaluate the quality and format of sexual dysfunction information given to patients before, during, and after radical EBRT to treat prostate cancer.

**Method:** Members of UK prostate cancer support groups were asked to complete an anonymous online survey tool seeking opinions of the sexual dysfunction information they were given before, during, and after external beam radiotherapy.

**Results:** There were 56 complete responses to the survey with over 42% of respondents reporting that they had not received any sexual dysfunction information. Of those who did, 78.1 % (25/32) received information before the start of external beam radiotherapy treatment. Physicians were the most involved in the provision of sexual dysfunction

information, with nurses and therapeutic radiographers being underutilised. Responses were mostly negative, or neutral regarding the quality of sexual dysfunction information and the information received about impact on relationships, psychological and emotional health. Many participants wanted more information and support.

**Conclusion:** This study demonstrates that prostate cancer patients who have undergone radical external beam radiotherapy have not received adequate information relating to potential sexual function side effects and the psychological and emotional effects of sexual dysfunction. This information should be included in verbal and written information provided at all stages of the radiotherapy pathway.

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## P110 Audit on the radiology review of cancer coded patients resulting in cancer diagnosis

*Samar Abdelhameed; Umairah Kalim; Sarah Yusuf; John Morlese*

Sandwell and West Birmingham Hospitals NHS Trust

**Background:** Radiology cancer flagging system has been introduced to our trust aiming at creating a critical alert of new cancer diagnosis and referring the patients efficiently to the corresponding MDT teams.

**Method:** This is a retrospective analysis of all patients marked with radiology cancer flags from January 2019 to December 2019 in our trust, obtained from radiology information system (CRIS); following approval by the trust clinical effectiveness team. These were subdivided by the flagging codes used into 6 groups: Cancer chest, Upper GIT, Lower GIT, Urology, Haematology, Gynaecology. A thorough analysis of the clinical outcome of the patients with reference to their MDT discussion +- pathological outcome has been performed.

**Results:** The clinical outcomes of the patients have been eventually divided into four categories; new cancer diagnosis, cancer follow up/ recurrence, benign and unknown/ drop out. We concluded that the flagging true positive rate was 60 % of the whole flagged cases, while we had 40% of false positively alerted cases.

**Conclusion:** Radiology cancer flagging accuracy has varying percentage from one flagging code to another. Modified coding system needs to be introduced with adding a flag for the cancer follow up/ recurrent cases. This would help saving the manpower and resources used on MDT sessions and improve the quality of patient care.

## P111 Re-establishing radiotherapy research during a pandemic - a demonstration of research radiographers adaptability to meet evolving clinical priorities

*Anne Mckenna; Gillian Bestwick*

Gloucestershire Hospitals NHS Foundation Trust

**Background:** Evidence demonstrates that clinically research active hospitals have better patient outcomes (1). (Name of department) Radiotherapy department has a strong research focus, with a Research Lead Radiographer and Senior Radiographer embedded in the department. The lead post (0.6WTE) is funded by the Trust Research & Development, with the Senior post (0.6WTE) being funded for two years by the local cancer charity, FOCUS. The presentation aims to explore the impact of the SARS COVID-19 pandemic on these roles.

**Purpose:** At the outset of the pandemic, the research radiographers were redeployed to work clinically in the radiotherapy department. Radiotherapy attendances soon reduced (due to hypofractionation/deferring of treatment). The Research radiographers were then redeployed to assist with urgent national research studies and then COVID radiotherapy studies. By the summer of 2020 the research radiographers were able to safely re-open the majority of radiotherapy trials by working with the trials units and radiotherapy department to adapt our ways of working and offer more remote trial consultations and follow ups. Prioritising re-opening order based on potential patient benefit and safety. The profile of research nationally has increased as result of the pandemic and feedback from patients taking part in trials throughout it has been very positive.

**Summary:** Research radiographers have been highly adaptable throughout the pandemic, being deployed to clinical work, working on COVID research studies, safely re-opening radiotherapy trials and carrying out local research and development projects to benefit patients and continue to embed a culture of research within the department.

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### P112 A survey exploring the views of radiographers and radiologists on non-medical consultancy in radiology

*Emma Fellows; Anthony Manning-Stanley*

University of Liverpool

**Background:** Consultant radiographers are expert radiographers performing roles traditionally designated to radiologists. Most research into consultant radiographers is limited to only the views of consultant radiographers. This study explored the views of diagnostic radiographers and radiologists in the UK on consultant radiographer practice in radiology.

**Method:** Following University ethical approval, an invitation e-mail with a link to a questionnaire and participant information sheet was disseminated via e-mail and Twitter to diagnostic radiographers and radiologists across the UK. Questions concerned opinions on consultant radiographer's impact on workload, patient care and report quality as well as opinions on consultant radiographer pay. The survey was open for 8 weeks in total, with a reminder in week 7.

**Results:** Across the 84 respondents (70 diagnostic radiographers and 14 radiologists), 57% of radiographers believed consultant radiographers and radiologist cross-sectional reports were equal in quality, compared to 7% of radiologists. Most radiographers believed consultant radiographers had sufficient training to provide a quality report, and should receive Band 8a pay. Some radiologists believed that medical training is needed to answer the clinical question; most believed consultant radiographers should be paid at Band 7.

**Conclusion:** Whilst both diagnostic radiographers and radiologists agree training more consultant radiologists will help meet reporting requirements, radiologists were of the opinion consultant radiographers do not provide the same quality in reporting as radiologists. A slight discrepancy was seen in the opinions relating to the remuneration consultant radiographers should receive. The small number of radiologist responses is a limitation to the study.

## EDUCATION AND WORKFORCE POSTER PRESENTATIONS

### P114 Cone Beam CT awareness and training needs for radiographers

*Carly Comia; Daria Cupurdija; Veronique Sauret-Jackson*

Cavendish Imaging Ltd; [2]

**Background:** The Cone-Beam CT (CBCT) imaging has boomed over the last 20 years in the dental world and made tremendous progress in maxillofacial, ENT and orthopaedic applications. It focuses on small volumes and is a technique of choice to visualise detailed 3D bony anatomy quickly and effectively. Beyond its diagnostic capabilities, CBCT is also a key element to the "digital surgical workflow", together with 3D printing, because of its ease of access and low radiation dose. Yet, it is not generally taught in radiography degrees and recruitment of radiographers with the relevant skills is difficult.

**Method:** Analysing past radiography staff training records, a review of the gaps in knowledge before and after a) CBCT equipment-specific training, and b) application-specific training, was performed.

**Results:** The gap-analysis showed the lack of anatomical knowledge as the largest factor creating difficulties with CBCT for the radiographers. Dexterity in 3D image manipulation was crucial to self-appraise the scan quality. When the end-use (diagnostics vs computer-aided surgery) of the CBCT scan by the referrer was clearly understood, radiographers were better equipped to perform the correct scans.

**Conclusion:** As a projected growth area in the NHS and the private sector, CBCT as a learning topic in academia and workforce will raise awareness of the technology. The key-skills for CBCT currently lacking at degree-level include detailed 3D anatomy identification, image manipulation dexterity and a wide understanding of the different roles of the scan in the patient's journey. Radiographers will benefit from developing these further in continuing professional education.

### P115 Exploring peer assisted learning from the peer tutor's perspective

*Sarah Naylor[1]; Denise Foulkes[2]*

Sheffield Hallam University

**Introduction:** Changing working practices, student numbers, workforce demands, and deficits, have created a need to consider new ways of radiography student training. One suggestion could be to implement Peer Assisted Learning (PAL) during clinical placements. PAL utilises social constructivist theories, where peer tutors teach lower or same level tutees, reinforcing and practicing material formally taught. The aim of this study was to trial an intervention of PAL, co-designed between the university and students and evaluated to identify opportunities and challenges.

**Methods:** Using participatory action research 8 final year student volunteers trialled a 3-week intervention, where they delivered PAL to first years, tutoring on first year radiographic clinical practice. Focus groups were held pre and post intervention to gather qualitative data.

**Results:** Focus group discussions were transcribed and collectively thematically analysed. Two students and the primary researcher took part in the analysis.

**Conclusion:** Students identified benefits and challenges to PAL. Issues around preparing for and being a peer tutor are also discussed. Further study involving experiences of first year students and clinical colleagues is required. Implications for Practice Peer-tutoring has potential benefits to students to facilitate the development of skills related to image analysis and critique as well as radiographic anatomy and patient positioning.

### P117 Advanced practice and radiographers

*Martin Nelson[1]; Paul O'Riordan[1]; Ryan Carr[2]; Bev Snaith[3]*

[1]HEE Midlands Faculty of Advancing practice; [2]HEE South East Faculty of Advancing practice; [3]University of Bradford

A short presentation giving an overview of Advanced Practice, what some of the misconceptions are, problems with implementing this on a practical level based on my experience of engaging with HEIs, stake holders, department leads and other sections of the advanced practice community, but also referencing the literature. Summarized by indicating how radiographers need to think about advanced practice, the funding and professional development opportunity in order to bring about meaningful change to improve the patient pathway.

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### P118 Interprofessional working during the covid-19 pandemic - the reflections of an advanced practice radiographer

*Sarah Booth[1]; Sarah Naylor[2]; Will Verrier[3]*

[1]University of Salford; [2]University of Derby; [3]East Suffolk and North Essex NHS Foundation Trust

**Background:** Interprofessional collaboration in healthcare is fundamental to the delivery of a safe, efficient, and patient -- centred health service. The impact of the Covid-19 pandemic on the health service workforce, has influenced the nature of interprofessional practice as we know it, with many staff being redeployed into clinical areas outside of their normal scope of practice. The experiences of staff who were redeployed into frontline clinical roles during the pandemic, are well-documented (Forrester et al 2020; Lim et al, 2020; Veerapen and McKeown, 2021). However, there are limited documented accounts of the experiences of Diagnostic Radiographers working outside of their normal scope of practice.

**Method:** An overarching phenomenological methodology was used in data collection and analysis. An interview was conducted via Microsoft Teams with the advanced practitioner by two researchers. The interview was transcribed verbatim and thematically analysed.

**Results:** The emerging themes included: interprofessional working, patient care, and moving forward.

**Conclusion:** Diagnostic Radiographers are no stranger to the Intensive Treatment Unit (ITU) environment, frequently undertaking imaging for critically ill patients (Tavere et al, 2020). This study critically reflects on the experience of one Advanced Practice Radiographer who volunteered to work as part of the multi-disciplinary team in the ITU at the height of the pandemic. The study found the experience of non-hierarchical interprofessional practice and delivery of patient care and how this experience has impacted their current practice as an Advanced Practice Radiographer. This experience can inform the education and continuing professional development (CPD) of all Diagnostic Radiographers.

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## SERVICE DELIVERY AND INNVOATION POSTER PRESENTATIONS

### P120 Implementation of a workflow management tool in a radiology setting: Implications for turn around times

*Amy Davis; Sam Dumonteil; Tim Baker; Louise Goodwright; Sue McKiernan; Jaymin Patel*

Hexarad

**Introduction:** The UK is facing unprecedented levels of diagnostic demand. Supply/demand mismatch of radiology examinations to reporting capacity is getting worse. Workforce planning and matching supply/demand are becoming ever more complex owing to subspecialist reporting, flexible job-plans, working across sites and myriad other complexities. This mismatch leads to two undesirable outcomes: first, the examination report is delayed or second, the examination is sent to a reporter who may not be a specialist in that area. Workflow management tools in the radiology setting are still in their infancy. No existing tools in the market (to the knowledge of the authors) are able to provide a full compliment of functions to enable rota management, an allocations engine and supply/demand forecasting. We aim to compare turnaround time (TAT) before and after implementation of our workflow management tool.

**Method:** All examinations reported in the months of May, July, September and December before implementation (2019) and the same months in the year after implementation (2021) were retrospectively included. Statistical

comparison made with an unpaired student t-test. Initial data analysis was performed using Microsoft Excel and statistical analysis performed using GraphPad.

**Results:** Total number of examinations: 2637, 3230, 2975, 3545 for the respective months of May, July, September and December pre-implementation, and 9672, 7977, 8017, 10193 post-implementation. TAT hours (mean and SD) before and after implementation: Pre-May (69,102) Post-May (24,13). Pre-July (112,125) Post-July (23,13). Pre-Sept (132,172) Post-Sept (23,14). Pre-Dec (117,63) Post-Dec (23,17). $p<0.0001$ for each month comparison.

**Conclusion:** The implementation of a workflow management tool yields significant and reliable improvements in TAT.

### P121 Developing inclusive patient support resources for diagnostic imaging

*Helen Francis*

Practice Plus Group Diagnostics, Buckinghamshire

**Background:** A patient with profound hearing impairment attended for MRI imaging but no sign language interpreter had been arranged. The patient was amenable to communicating via pen and paper so the examination went ahead. This experience prompted a search for suitable existing resources and in their absence, the creation of a set of cue cards to assist in checking patient safety and patient preparation prior to MRI. This model is currently being extrapolated to other modalities and other health conditions such as dementia.

**Purpose:** Improving patient experience by enabling staff to communicate more effectively with profoundly hearing-impaired patients and other groups who may benefit from more targeted patient information material. Improving image quality through better patient compliance. Facilitating smooth workflow by reducing delays caused when sign language translators are unavailable.

**Summary:** The poster will show how a resource was created to assist MRI staff in completing the patient safety questionnaire with patients with profound hearing loss (and other conditions such as dementia) to prepare such patients for their MRI scan. To illustrate how decisions were made regarding resource design, content and usage. eg The open question style of an MRI safety questionnaire was swapped for closed questions to facilitate use where pts are non-verbal, simple explanations were included of equipment, noise and vibrations. Font choice, colour scheme. Opportunity to write questions. This resource has been successfully used with patients who gave positive feedback. To outline plans to use this model to create similar resources for other modalities and patient groups.

1. Royal National Institute for the Deaf. (2021) Communicating with People Who are Deaf or Have Hearing Loss. RNID_communication-tips2021.pdf

### P122 Experiences of diagnostic radiographers through the Covid 19 pandemic

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**Introduction:** Diagnostic Radiography plays a major role in the diagnosis and management of patients with Covid-19. This has seen an increase in the demand for imaging services, putting pressure on the workforce. Diagnostic radiographers, as with many other healthcare professions, have been on the frontline, dealing with an unprecedented situation. This research aimed to explore the experience of diagnostic radiographers working clinically during the Covid-19 pandemic.

**Method:** Influenced by interpretative phenomenology, this study explored the experiences of diagnostic radiographers using virtual focus group interviews as a method of data collection.

**Results:** Data were analysed independently by four researchers and five themes emerged from the data. Adapting to new ways of working, feelings and emotions, support mechanisms, self-protection and resilience, and professional recognition.

**Conclusion:** The adaptability of radiographers came across strongly in this study. Anxieties attributed to the provision of personal protective equipment (PPE), fear of contracting the virus and spreading it to family members were evident. The resilience of radiographers working throughout this pandemic came across strongly throughout this study. A significant factor for coping has been peer support from colleagues within the workplace. The study

highlighted the lack of understanding of the role of the radiographer and how the profession is perceived by other health care professionals.

### P123 Audit of appropriateness of ovarian/adnexal cyst/mass referral for MRI characterisation

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**Background:** Many referrals are made for MRI characterisation of ovarian/adnexal cysts and masses. Ultrasound is a cost-effective, readily available, non-ionising technique, and is the preferred primary investigation 1,2. Our aim was to assess whether patients referred for MRI characterisation of ovarian/adnexal masses had prior ultrasound (ideally transvaginal); whether masses were classified according to IOTA/RMI score; whether MRI provided additional information; and whether MRI scans were correctly protocolled.

**Method:** Retrospective audit of 150 consecutive patients aged 13-91 (mean 45) referred for MRI characterisation of ovarian/adnexal lesions between 2018 and 2021.

**Results:** In the three months preceding MRI, 20% (n=30) had no relevant imaging; 41% (n=62) had previous ultrasound only; 17% (n=26) underwent ultrasound and CT; 19% (n=28) had CT only; and 3% (n=4) had MRI +/- ultrasound/CT. Average interval to MRI was 20 (range 0-83) days. Of 91 patients who underwent ultrasound, 76% had a transvaginal scan. Where ultrasound (transabdominal or transvaginal) identified an ovarian lesion (n=75), 23% had IOTA/RMI score reported. 83% MRI scans added value in lesion characterisation, including confirmation (n=52) or refutal (n=18) of previous imaging findings, and identification of previously undiagnosed torsion (n=5). 46% showed additional findings, including fibroids (n=16), ascites (n=5), cervical lesions (n=4) and hydronephrosis (n=2). Correct gynaecological MRI sequence was performed in all studies.

**Conclusion:** Ultrasound is frequently not performed prior to MRI in cases of suspected adnexal lesions, despite being the recommended first-line imaging modality. Where ultrasound is performed, IOTA/RMI score is infrequently reported. Whilst MRI adds value in lesion evaluation, ultrasound should remain the first-line imaging option.

1. RCOG Green-top guideline No.62. Management of Suspected Ovarian Masses in Premenopausal Women. Published date November 2011. Available from URL: https://www.rcog.org.uk/globalassets/documents/guidelines/gtg_62.pdf
2. RCOG Green-top guideline No.34. The Management of Ovarian Cysts in Postmenopausal Women. Published date July 2016. Available from URL: https://www.rcog.org.uk/globalassets/documents/guidelines/green-top-guidelines/gtg_34.pdf

### P124 MR conditions and conditional devices - what does it all mean?

*Hitesh Patel*

University Hospitals of Birmingham NHS Foundation Trust

**Background:** Whilst MRI is considered a safe imaging modality due to the absence of ionising radiation, the electromagnetic fields (EMFs) generated can cause significant harm (1)). Medical devices are particularly vulnerable to these EMFs and may malfunction or cause the patient harm if mismanaged (2). Difficulties in screening medical devices were highlighted by a recent UK review of MR safety incidents (3). These could be attributed to MR operators misunderstanding the MR safety information, due to a lack of standardisation in the terminology used for MR conditions (2). A current international standard by the American Society for Testing Materials (ASTM) categorises medical equipment and devices as either: (1) MR safe, (2) MR conditional or (3) MR unsafe (4). As medical devices are more frequently gaining MR conditional status due to technological developments, MR operators' will need to develop their knowledge of MR safety information and conditions to improve clinical decision making (1, 5).

**Purpose:** To introduce MR conditions and how this relates to the safe scanning of MR conditional devices for MR operators.

**Summary:** MR conditions will be defined to demonstrate whether the operator can control them and the associated effects when mismanaged. Recommendations will include evaluating MR conditions against an MR system; obtaining accurate device information; dealing with contraindicated and 'MR unlabelled' devices; and technological developments.

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2. Kanal, E., Froelich, J., Barkovich, A. J., Borgstede, J., Bradley, W., Gimbel, J. R., Gosbee, J., Greenberg, T., Jackson, E., Larson, P., Lester, J., Sebek, E., Shellock, F. G., Weinreb, J., Wilkoff, B. L., & Hernandez, D. (2015). Standardized MR Terminology and Reporting of Implants and Devices as Recommended by the American College of Radiology Subcommittee on MR Safety. Radiology, 274(3), 866–870.
3. Hudson, D., & Jones, A. P. (2019). A 3-year review of MRI safety incidents within a UK independent sector provider of diagnostic services. British Journal of Radiology Open, 1(1).
4. MHRA. (2021). Safety Guidelines for Magnetic Resonance Imaging Equipment in Clinical Use.
5. Lowe, M. D., Plummer, C. J., Manisty, C. H., & Linker, N. J. (2015). Safe use of MRI in people with cardiac implantable electronic devices. Heart, (101), 1950–1953.

## P125 An audit on the adequacy of information provided on ultrasound requests for deep vein thrombosis

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**Background:** Deep vein thrombosis (DVT) presents with symptoms in approximately 1-2 people per 1,000 with an increasing annual incidence due to an ageing population and higher prevalence of cancer and obesity (1,2). Diagnosis of DVT based on clinical signs/symptoms alone is unreliable due to their poor specificity (3). NICE guidelines (NG158) recommend a cost-effective algorithm, utilising a 2-level Wells score and D-dimer to assess pre-test probability of DVT to direct which patients should have a venous ultrasound (US) scan (4). Adequacy of information in the referral is key for prioritisation of resources.
**Methods:** SCoR and SVT-GBI guidelines recommend 100% of US requests for suspected DVT to have a specific clinical question, sufficient supporting information and a Wells score D-dimer status (5,6). We audited a 1-month period at our hospital to evaluate local compliance with national guidelines.
**Results:** In this 1-month period, 169 US scans were performed for suspected DVT of which 161 were non-obstetric. 65% of scans were negative for any pathology. Overall, 50% of referrals had suboptimal information provided at referral. Only 10% of referrals explicitly recorded the Wells score, all of which were high risk (2 or more). Whilst 75% of scans had a D-dimer level done prior to the scan, 47% of these did not record the result in the referral.
**Conclusion:** Implementing standardised information on clinical requests for suspected DVTs will help with prioritisation of resources and patient management. We aim to address these improvements and re-audit in 6 months.

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## P126 VACTERL association for the General Radiologist and Allied Healthcare Professionals

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**Background:** VACTERL is an acronym for the constellation of non-random co-occurrences of congenital malformations. These include (V) vertebral anomalies, (A) anal atresia, (C) cardiac defects, (TE) trachea-oesophageal fistula, (R) radial/renal dysplasia, and (L) limb defects. At least 3 defects are required for diagnosis 1,2. Children have multiple problems at birth and a range of imaging modalities are used to diagnose and exclude the wide range of

malformations 2. The identification of all co-existing malformations (antenatally and complete neonatal evaluation) allows for appropriate surgical and medical management in specialist centres 3. Early radiological diagnosis and planning is essential to establish a good clinical outcome for the patient.

**Purpose:** * As per the RCR curriculum all radiology trainees should be able to recognise a range of paediatric congenital conditions 4. VACTERL association has an incidence of one in 10,000 to one in 40, 000 live born infants 2. Although uncommon it is a condition healthcare professionals will come across during their clinical practice. * This presentation aims to provide an overview of common and atypical imaging findings of VACTERL association for the general radiologist and allied health professionals.

**Summary:** This presentation will review the different congenital malformations of VACTERL association across a range of imaging modalities using a case-based series. For each case a brief clinical history, imaging findings and management will be discussed. Typical and atypical imaging appearances will be reviewed alongside more complex cases for paediatric sub-specialists.

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## P127 Efficacy and safety of gadopiclenol for central nervous system (CNS) magnetic resonance imaging (MRI): The PICTURE trial

*Jochen Fiebach[1]; Anna Pichiecchio[2]; Gábor Hutóczki[3]; Katarzyna Dziadziusz[4]*

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**Background:** Gadopiclenol (Guerbet) is a high relaxivity GBCA, currently under review by regulatory authorities. This study was designed to demonstrate the non-inferiority of gadopiclenol at 0.05 mmol/kg to gadobutrol at 0.1 mmol/kg for contrast-enhanced CNS MRI.

**Method:** This international, randomized, double-blind, controlled, cross-over study included 256 patients with CNS lesions who were randomized to undergo two MRIs with gadopiclenol then gadobutrol or vice versa (interval of 2 to 14 days). The primary criterion was lesion visualization, based on 3 parameters (border delineation, internal morphology and contrast enhancement), assessed by 3 independent off-site blinded readers. Overall diagnostic preference was assessed in a global matched-pairs fashion by 3 additional blinded readers. Adverse events (AEs) were collected up to one day post-second MRI.

**Results:** For all readers, and all visualization co-criteria, the difference in mean of scores showed the non-inferiority of gadopiclenol to gadobutrol (lower limit of 95% CI -0.06, above the non-inferiority margin [ 0.35], p<0.0001). Readers preferred images with gadopiclenol in 44.8% to 57.3% of evaluations, reported no preference for 21.6% to 40.7% of evaluations, and preferred images with gadobutrol in 14.5% to 24.1% of evaluations (p<0.001). AEs were reported similarly after MRI with gadopiclenol (14.6%) and gadobutrol (17.6%). AEs considered related to gadopiclenol (4.9%) and to gadobutrol (6.9%), were mainly injection site reactions, and none serious.

**Conclusion:** MRI with gadopiclenol at 0.05 mmol/kg is non-inferior to gadobutrol at 0.1 mmol/kg for CNS lesion visualization. Gadopiclenol showed a good safety profile.

## P128 A survey of ultrasound QA implementation in the UK

*Nicholas Dudley; Darren Woolley; Maryla Stevenson; Daniel Wyatt*

Multi-Medix Ltd

**Background:** In England QA is a requirement of The Health and Social Care Act 2008 (Regulated Activities) Regulations 2014, which states that "Equipment must be suitable for purpose and properly maintained" [1]. Regular inspection

and testing of equipment is therefore essential. There is limited evidence implying that ultrasound QA is not widely performed in the UK. The aim of this study was to gather more information on QA practices in the UK.

**Method:** A questionnaire was developed and sent to 170 NHS Chief Executives to establish the level of QA in place.

**Results:** The survey response rate was 35%, with 4 respondents (7%) indicating that no QA was performed in their organisation. A sample of 60 respondents provides a margin of error of approximately ±10% at a confidence level of 95%. It is unlikely that the missing data from non-respondents was random, so that non-response bias is present in our results. In the context of the limited responses, it seems likely that there is a lower implementation of QA amongst non-respondents. In the worst case, if no non-respondents had a QA programme, only 33% of NHS Trusts in the UK have a QA programme.

**Conclusions:** Whilst there is a legal requirement for ultrasound QA to be performed. This survey has shown that user QA is not widely implemented, partially due to time pressures and lack of knowledge. User QA can be straightforward and accessible for users and guidance is available to overcome a perceived lack of knowledge.

1. National Health Service, England, Social Care, England, Public Health, England. The Health and Social Care Act 2008 (Regulated Activities) Regulations 2014. UK Statutory Instruments 2014 No. 2936.

### P129 Student experiences and opinions on blended learning across programmes and academic levels

*Sue McAnulla; Sara Venner; Chaima Mennai; Karen Knapp*

University of Exeter

**Background:** Facilitating effective learning for a range of learners in higher education is challenging. Mature students with caring or other commitments have frequently been impacted by timetables which result in challenges managing their time. Higher education needs to be inclusive and available to students who have followed a different path in life to traditional school leavers. The purpose of this study was to explore student experiences of blended learning across undergraduate diagnostic radiography and postgraduate education students; both of which have recognised high attrition rates.

**Method:** Ethical approval was granted internally. 11 mature students were recruited from diagnostic radiography and education programmes. Data were gathered in two phases: preliminary semi-structured interviews with screen recording of online engagement following a face-to-face lecture and focus groups to evaluate a blended learning activity covering the same learning outcomes which was developed to incorporate feedback from preliminary interviews. The data were analysed using thematic analysis in NVivo.

**Results:** The following themes emerged: flexibility, clear expectations, interactive learning, variety, good communication with staff, self-directed learning, use of e-learning platform, group / peer work and logistical challenges. Students found the blended version to be more manageable and enabled learning at their own pace.

**Conclusion:** Blended learning was well received by students in this study. Interactive activities were valued. As higher education moves into new ways of working post Covid-19, it is important to consider accessible learning for students from all backgrounds in future plans to provide the best chance of retention and success for all.

### P130 The development of a leadership placement for undergraduate radiography students

*Ellie Monaghan; Emma Edwards; Rebecca Scott*

University of Keele

**Background:** A national shortage of radiographers has increased pressures on radiography education providers to provide places for students and increased the difficulty for NHS trusts to provide these essential placements. There is also a change in work pressures for future graduates. Due to this there is a need for creatively designed placements that maximise placement capacity, introduce core transferable skills and begin to meet the national need for more graduate radiographers and strengthening the future workforce. This placement would build essential leadership skills and resilience in third year student radiographers, thus aiding in future-proofing the workforce to meet the changing demands and priorities of the current workforce following the Covid-19 pandemic.

**Purpose:** We aim to design a pilot placement that can successfully aid third year radiography students with skills that are both essential to their clinical development, enlisting personal strengths and desirable characteristics to make them future leaders in radiography. This educational leadership placement included training following the NHS leadership model, shadowing of academic staff, student mentorship and an individually designed leadership project. We then surveyed the students involved with a questionnaire, to further the development and improvement of the leadership placement experience.

**Summary:** This poster outlines the background to the development of an educational leadership placement, the experience of the students involved, and proposed future changes to this placement experience.

## P131 The development of hybrid placements for undergraduate 1st year Radiography students to support their health and well-being

*Ellie Monaghan; Emma Edwards; Rebecca Scott*

University of Keele

**Background:** Enriched education and clinical assessment are the foundation for evolving health professionals capable of delivering high quality care. Allied Health Professional (AHP) degree programmes blend academic knowledge and clinical assessment to ensure an informed vocational education; bridging theory into practice cannot occur without this amalgamation (SCoR, 2007) Blended teaching is essential due to the diversity of learners in the average cohort, an inclusive environment will offer all learners a chance to succeed and reinforces the need for the clinical placement training to be conducted in a supportive environment (Rowe et al 2012). This highlights the need for creatively designed placements that maximise health and wellbeing support, placement capacity and build a more collaborative learning environment.

**Purpose:** The aim of the project is to evaluate a hybrid placement using a questionnaire and assess the requirement for this innovation moving forwards, this purpose of this is to make a collaborative learning experience to support students' health and well-being as clinical placements can be a time of heightened anxieties (Astirbadi and Lockwood; 2021).

**Summary:** This poster focuses on the development of a hybrid placement, student experiences and proposed changes for successful collaboration between academics, Practice Educators and students with hybrid placements resulting in inclusive 3-D learning experience thus benefitting the learner's mental health and wellbeing.

Astirbadi, D. and Lockwood, P. (2021) COVID-19: A literature review of the impact on diagnostic radiography students, Radiography (London, England 1995). Rowe, M., Frantz, J. & Bozalek, V. (2012). The role of blended learning in the clinical education of healthcare students A systematic review. Medical teacher. 34 (4): e216-e221. The Society and College of Radiographers (SCoR) (2007). CLINICAL IMAGING AND ONCOLOGY Learning and Development Framework for Clinical Imaging and Oncology. London: The College of Radiographers. p5-10.

## P132 Research as a practical skill for undergraduate radiography students

*K Louise McKnight*

Birmingham City University

**Background:** A recent staff research project led to changes in the way undergraduate students approach their final year research module. Students can now choose to undertake research projects, rather than just writing proposals. The original research found that both staff and students felt this would add to students' learning experience as they take a practical approach to research, reflecting the practical learning experienced on placement. Students who followed the module during the year 2020-21 were asked for their feedback.

**Method:** To comply with General Data Protection Regulation guidelines, students used anonymous on-line surveys to collect data. This staff led research replicated their method to further test the tool, and to enable demonstrations of how it works and its ease of use to future cohorts. A range of quantitative questions were asked, with some open-ended questions to gather quantitative data.

**Results:** Of 119 students on the module, 14 (12%) did a project and 105 (88%) chose to do a proposal. Of these a total of 28 (24%) responded to the questionnaire, of whom 9 (32%) did a project and 19 (68%) a proposal. Many students reported enjoying the chance to do some real independent research, appreciating the freedom to choose a topic and gather 'real' data for analysis.

**Conclusion:** More work needs to be done to normalise research for students, by encouraging them to do research projects. Other providers may benefit from this assessment of a new and exciting way of including students in the radiography research family.

### P133 Clinical placement provision in pre-registration radiography training - the role of ultrasound simulation

*Donna Holdcroft*

Canon Medical Research Europe Ltd

**Introduction:** A radical reform of diagnostic services has been recognised in both the NHS Long Term Plan (2019) and the Richards report (2020). Subsequently, a recommendation was made to train an additional 4,000 radiographers above those training posts already facilitated. Radiography training requires minimum Clinical Placement hours (1300) to meet the criteria for Health Care Professions Council registration to facilitate employment the NHS. With a limited number of Clinical Placements available and demand for Radiographers increasing, educational establishments need innovative practical training to meet these requirements. Simulation can assist with this challenge. The advent of reasonably priced handheld transducers makes ultrasound a suitable area for simulation, freeing up placement time in the hospital environment and potentially increasing student capacity. This study examines student perceptions of ultrasound simulation.

**Methods:** This was a quantitative and qualitative study using Likert scales and open-ended questions to demonstrate the impressions of second and third year radiography students at Keele University, examining the role of ultrasound simulation to compliment or potentially replace ultrasound training in the hospital environment.

**Results:** Following simulation training, 100% of students considered simulation training met expectations, increased knowledge and would recommend to their peers. 80% of students responded with training complimenting placements with 50% of students considering University ultrasound training could replace this provision in hospital environments.

**Conclusion:** Ultrasound simulation training within the University has the potential to partially replace current Clinical training in the hospital environment. With increased demand for Clinical Placements this could be an option to increase capacity.

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### P134 Graduate radiographers' experience of learning MRI practice: A pilot study using constructivist grounded theory methodology

*Sophie Gallagher*

University of Derby

**Background:** Traditionally radiographers, specialising in MRI practice, would have first worked in a general imaging department, however due to the shortage of MRI radiographers within the UK, opportunities have now arisen for graduate radiographers to enter MRI practice directly. There are no requirements to undertake formal MRI qualifications or competency frameworks for UK MRI practitioners. Consequently, training is often conducted in house by other MRI practitioners and is not regulated or audited. The aim of this pilot study was to explore the learning experience of graduate radiographers' commencing MRI practice.

**Method:** A constructivist grounded theory methodology was implemented. Data were collected through semi-structured interviews. Participants (n3) had all entered MRI practice directly from graduation within the last 5 years and were currently working in the UK.

**Results:** All of the participants had a positive experience of learning MRI practice. Their undergraduate placements in an MRI department were highly influential in their choice of attaining a graduate job in MRI. Upon entering a graduate job in MRI all of the participants were provided with a structure to their learning which consisted largely of practical 'on the job' training. Demonstration of their competence was required in the form of assessments. All participants felt that they were able to practice competently and safely as a result of their training. All participants did however identify the need for further learning.

**Conclusion:** The research to date indicates for a national standardised competency framework is required to ensure consistency of training.

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