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

PAEDIATRICS

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

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

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

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

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

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

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

P119 Change of practice-fluoroscopy of the paediatric abdomen

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

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

P120 Imaging for ingested FB in children

Haram Zia; Amanda Martin
Royal Bolton Hospital

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

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

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

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

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

Method:

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

Results:

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

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

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4. Smits M, Visch-Brink E, Schraa-Tam CK, Koudstaal PJ, van der Lugt A. Functional MR imaging of language processing: An overview of easy-to-implement paradigms for patient care and clinical research. Radiographics. 2006;26 Suppl 1:S145-58

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

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

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

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

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

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

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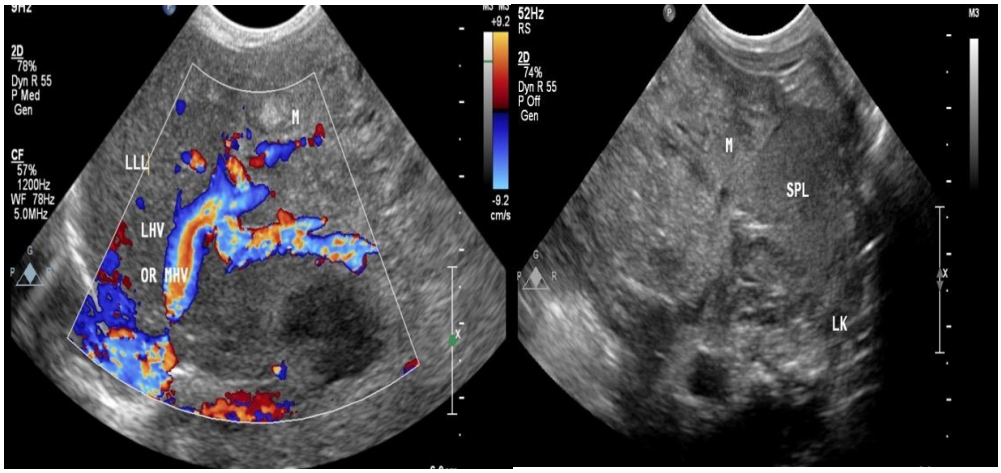
Background: Evaluation of abdominal masses in neonates is challenging. Here, we report a case of a neonate who presented with abdominal distension.

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



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

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

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

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

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

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

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

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

P125 Paediatric IGRT hitting the target

Sarah Stead
Clatterbridge Cancer Centre

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

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

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

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

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

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

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

DOSE / RAD PROT / IMAGING TECHNOLOGIES

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

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

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

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

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

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

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