Title of Study

Early Laser for Burn Scars (ELABS) - A randomized, controlled trial to study the treatment of hypertrophic burn scars with Pulsed Dye Laser and standard care compared to standard care alone.

Dr. Mark Brewin, Consultant Clinical Scientist (HCPC Registration Nº CS18654)
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Background.

The need to improve outcomes for burn injury survivors with hypertrophic scarring is described as "the greatest unmet challenge after burn injury". It is hypothesized that if hypertrophic burn scars are treated with pulsed dye laser (PDL) early in the scarring process, the scar outcome and quality of life is improved.

Methods.

A national multicentre randomised, controlled trial to compare treatment of hypertrophic burn scars (HBS) with PDL and standard care (SC) against SC alone. Patients with burn injuries were eligible if they had hypertrophic scarring within 3 months of wound healing. Patients with keloid scarring or below 16 years old were not eligible. 153 participants were randomised in a 1:1 ratio, stratified by study centre. The primary endpoint was 6 months and primary outcome was the patient-rated Patient and Observer Scar Assessment Scale (POSAS).

Results.

Early PDL treatment showed an improvement with a statistically significant difference for the primary outcome of patient-rated POSAS scar quality (p=0.041) and in the binary scar quality (p=0.01). There were no statistically significant differences between the groups for quality-of-life, observer-rated POSAS and colour measurement. Total, mean treatment and out of pocket costs paid by participants costs were higher in the treatment arm at 6 months, which was driven by additional laser visits.

Discussion & Conclusion.

The use of early PDL treatment for the treatment of HBS shows improvement for patient rated POSAS but not quality of life at 6 months. PDL is not cost-effective in terms of Quality Adjusted life years. Longer term follow-up of upwards of 2 years is required to understand the lasting impact of PDL treatment of HBS.

Key references.

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Brewin MP, Homer S. The lived experience and quality of life with burn scarring-The results from a large-scale online survey. Burns. 2018;44(7):1801-1810. doi:10.1016/j.burns.2018.04.007

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Title of Study

NHSE-NIHR Pre-Doctoral Research Fellowship – My Journey

Submitters details:

Emily Rowe
Clinical Scientist – Clinical Engineering
NHSE/NIHR Pre-Doctoral Research Fellow

Invited talks - an abstract summarising you presentation is welcome including any images or tables.

Through my role as a Clinical Scientist in Clinical Engineering, I aspire to improve evaluation and translation of innovative technology to clinical practice. I am particularly interested in technology for neurorehabilitation, both for the purposes of rehabilitation directly and instrumentation of outcome measures. However, my work remit has necessarily been much broader than that because Clinical Scientists in rehabilitation are uncommon in the South West.

Successfully applying for an NHSE-NIHR Pre-Doctoral Research Fellowship is allowing me to make some headway towards achieving this ambitious, sometimes bewildering, aspiration. I am about a quarter of the way into this fellowship, which I am undertaking part-time over 24 months.

In this presentation, I would like to share the triumphs and tribulations of my journey thus far, alongside becoming a mother of two. I have no doubt that there are many parallels to the experience of others on similar journeys in, or towards, research within the fields of medical physics and clinical engineering, as well as across many other professions.

Sharing this journey could hopefully help others understand what needs to be in place to apply for a fellowship. This requires a lot of time upfront – a challenge itself. My experience also provides an insight into how fellowship plans intrinsically centre around progressing and broadening careers; from funding a carefully tailored training and development plan to opening doors for networking and collaboration – amazing opportunities… but another challenge to plan before knowing what you don't know!

Learning from two Complex I-131 Treatments

Christian Sheer, Nuclear Medicine Clinical Scientist, Royal Devon and Exeter Hospital

Invited talks – The Royal Devon and Exeter Hospital recently encountered two complex cases during I-131 ablation therapy, providing valuable opportunities for reflection and improvement. One patient was diagnosed with tuberculosis (TB) shortly after receiving treatment, while another elderly patient was found to be incontinent just before their scheduled therapy, leading to unavoidable delays. Although both situations presented challenges, they have offered important lessons that will help refine processes and enhance patient care in the future.

In the case of the TB patient, a scan prior to treatment raised concerns that the observed lesions might be TB rather than metastases. As a precaution, the clinician requested a TB test; however, the results confirming a positive TB status were only available after the I-131 had already been administered. Since the test result alone could not confirm an active infection, further testing was required, which posed difficulties from a radiation protection perspective. Additionally, the standard cleaning procedures for a TB-positive room involve chlorine-based products, which are hazardous when used on I-131 contamination. Following extensive collaboration between departments, it was ultimately confirmed that the patient did not have active TB, and they were safely discharged.

The second case involved a patient who, throughout the referral process, had reported no issues with incontinence. However, on the weekend before treatment, they informed the medical physics team that they did experience incontinence and were not aware of incidents until afterwards. Given the short timeframe before treatment, a thorough radiation risk assessment and contingency planning were necessary, leading to a postponement. When the patient returned for their rescheduled treatment, they stayed overnight in a nearby ward to gain confidence using a catheter, ensuring that both medical physics and nursing staff were comfortable proceeding safely. Unfortunately, a patient in the same ward subsequently tested positive for COVID-19, resulting in further postponement. Understandably, this was distressing for the patient given the metastatic nature of their cancer, particularly as their primary clinician had recently retired, and their secondary clinician was on leave. Thanks to close collaboration across multiple departments, a new treatment plan has now been arranged.

These cases illustrate the complexities that can arise in I-131 therapy and serve as a reminder of the importance of multidisciplinary coordination. By viewing these experiences through the lens of the Swiss cheese model, the hospital aims to refine processes in a positive, supportive manner—ensuring future treatments are as smooth and stress-free as possible for patients, their families, and staff.

Radiotherapy Summer Internship in the SEND Network

James Gibson (Clinical Scientist, Royal Devon University Healthcare NHS Foundation Trust)

Radiotherapy Summer Internship in the SEND Network

James Gibson (Clinical Scientist, Royal Devon University Healthcare NHS Foundation Trust)

Summer internships offer an opportunity to on-ramp promising graduates and prepare them for the STP application process, but it also offers the opportunity to allocate projects to self-motivated individuals which can be achieved with suitable oversight from physicists but a reduced workload. This presentation discusses the funding, framework and beneficial outcomes of an 8-week summer internship programme offered as a joint venture between the Royal Devon & Exeter and Torbay Radiotherapy departments since 2022. It includes testimony from prior interns who are now STP Trainees on the importance of the programme to the start of their career. It also includes advice for other departments to replicate the success of the programme.

Equivalence routes through Nuclear Medicine – personal experiences

Anne-Marie Stapleton, Royal Surrey NHS Foundation Trust

Within Clinical Science in the UK there is an accepted issue regarding the existing workforce. This appears at all levels of HCPC registered staff, and is a great challenge to the provision of services that are becoming ever more complex and requiring highly specialised staff. In part this is a result of natural attrition of those qualified to other careers and personal life choices. One way of improving the situation may lie in making entering the field more accessible via suitable equivalence routes to the normal STP and HSST routes.

In this talk I present a case study of my personal experience starting in the field of Nuclear Medicine and working through the training routes from the perspective of equivalence. I had already acquired a physics PhD and started a successful career in a different scientific industry before consider training as a Clinical Scientist. My Nuclear Medicine training included HCPC registration following Route 2. Following that, I achieved MPE via the existing portfolio scheme, and have joined the Higher Scientific Specialist (HSS) register through its Equivalence Route. This work will focus on how bringing a broad range of experience prior to training as a Clinical Scientist proved beneficial in applying for HSS. The HSS equivalence scheme may be valuable for many experienced Clinical Scientists for their career progression. It will also discuss ways that the required proficiencies can be met both within and outside the field.

Improvements to Radiation Incident Investigations, implementing PSIRF and National Coding Taxonomy

Sophie Wiltshire

Background.

NHS England introduced the Patient Safety Incident Response Framework (PSIRF) to enhance how the NHS addresses patient safety incidents (NHS England, 2025). A key element of this framework is the introduction of a post-incident "huddle" - a structured, team-based discussion following patient safety-related events. To adopt this approach within our trust, we explored how the huddle process could be tailored specifically for radiation incidents.

Alongside this, we sought to improve the internal processes within our Diagnostic Radiology Physics team, with a particular focus on reducing turnaround times for incident response. In addition, we wanted to incorporate the Clinical Imaging Board (CIB) Taxonomy (UKHSA, 2024) coding into our process to allow for national reporting. As part of my HSST training, I conducted a comprehensive review of our procedures for managing radiation incidents. This led to the implementation of several changes to how incidents are reported and investigated. The project required close interdisciplinary collaboration and a systematic, strategic approach.

Methods.

To support the introduction of the post-incident huddle, I collaborated with our trust's divisional lead and adapted the draft template to include an appendix specifically tailored for radiation incidents. This modified version was trialled and reviewed by both the clinical teams and the medical physics department. Based on their feedback, the template was refined and subsequently adopted for routine use.

As part of a broader review of our radiation incident investigation process, I conducted a detailed evaluation of existing practices. Using a process map, I identified areas that could be streamlined or enhanced, with particular focus on steps contributing to delays. I was then able to create a new workflow and template for our investigation which included coding according to the CIB taxonomy.

Results.

The new PSIRF template and revised investigation workflow have been developed and recently implemented following team training. Initial feedback from trial use has been positive, particularly in relation to the simplified process and improved clarity. By the upcoming meeting in June, I aim to report measurable improvements in our incident reporting, investigation processes, and overall turnaround times.

Conclusion.

Enhancements have been made to our local systems for managing radiation incidents, aligning them with several recent national initiatives. This project also provided valuable opportunities to collaborate with a range of stakeholders, while deepening my understanding of broader trust systems and requirements.

Key references. In alphabetical order, numbered.

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2. UKHSA, 2024, 'User guidance and application of the national taxonomy for incident learning in clinical imaging, magnetic resonance imaging and nuclear medicine', Available at: https://assets.publishing.service.gov.uk/media/66421c494f29e1d07fadc61a/User_guidance_national_taxonomy_for_incident_learning_in_clinical_imaging_MRI_and_nuclear_medicine.pdf (Accessed 11 April 2025)

The effects of lead-time and length-time biases in estimating mortality rate in high-risk uveal melanoma (UM)

Azzam Taktak, Rumana Hussain, Gabriella Czanner, Bertil Damato, Anna Praidou, Sarah Coupland, Heinrich Heimann

Background. Many UM patients present with advanced ocular disease, with approximately 23% reporting that their tumour was initially missed when they presented with symptoms[1]. There are indications that earlier detection and treatment of smaller UM are not only associated with better local outcomes but may also be associated with improved survival rates[5]. The aim of this study is to determine whether earlier treatment of UM would result in a reduction in mortality from metastatic UM. Our hypothesis is that earlier detection and treatment of high-risk UM may improve the patients' chances of survival.

Methods. Retrospective case–control study analysis was performed on a cohort of UM patients diagnosed over the period of 2007–2014, to enable a minimum of 5 years of follow-up. Tumours were classified as 'small' (≤2.5 mm in thickness) and 'large' (>2.5 mm in thickness). This size cut-off is based on the clinical risk factors previously described for small melanocytic lesions of 2 mm[4]. Lead time and length time biases were estimated according to the method described by Duffy et al[2].

Results. During the 7-year study period, data were available for 940 patients whose UM underwent genetic testing. Of these, 403 (43%) were classified as high-risk. The median age at diagnosis was 61 years (mean 60; range 24–94 years) with a male: female ratio of 525:415 (1.26:1). The relative risk (RR) of death over 5 years was 0.45 (95% CI 0.26–0.8) in the smaller high-risk group compared to the larger high-risk group, and the hazard ratio (HR) was 0.44 (95% CI 0.30–0.58). Assuming a 'sojourn time' of 1 year for detectability to symptomatology to correct for lead time bias, the modified RR of death was 0.69 (95% CI 0.45–1.05) and the modified HR was 0.67 (95% CI 0.53–0.81) (Table 1). The rates did not change significantly after 5-year correction for length time bias.

Risk Ratio and Hazard Rates	RR (95% CI)	HR (95% CI)
Uncorrected	0.45 (0.26 – 0.8)	0.44 (0.3 – 0.58)
After lead time bias correction	0.69 (0.45 – 1.05)	0.67 (0.53 – 0.81)
After length time bias correction	0.78 (0.69 – 1.01)	0.64 (0.5 – 1.03)

Table 1. Risk ratio and hazard rates for small compared to large high-risk tumours with lead and length time bias correction

Discussion. This study shows that over one quarter (27%) of small lesions have a high metastatic risk. Previous studies have shown genetic heterogeneity within larger UM which suggests that there is an evolutionary process from low to high genetic risk. In addition, we have previously demonstrated that asymptomatic patients with UM identified via the annual UK national diabetic retinopathy screening program have lower mortality than those detected via alternative routes[3].

Conclusion. Our study has shown that treatment of small high-risk UM is potentially lifesaving in its early stages. It is, therefore, necessary to identify and treat malignancy in these small, potentially lethal lesions without delay, if necessary, after performing intraocular tumour biopsies.

Key references.

1. Damato, E.M.; Damato, B.E. Detection and time to treatment of uveal melanoma in the United Kingdom: An evaluation of 2384 patients. Ophthalmology 2012, 119, 1582–1589.
2. Duffy, S.W. et al. Correcting for lead time and length bias in estimating the effect of screen detection on cancer survival. Am. J. Epidemiol. 2008, 168, 98–104.
3. Hussain, R. et al. Mortality of Patients with Uveal Melanoma Detected by Diabetic Retinopathy Screening. Retina 2020, 40, 2198–2206.
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From Liverpool to Passo Fundo: International collaboration to assess the risk of microshock in operating theatres

Azzam Taktak, Marcello Trindade Rebonatto, Felipe Rattore Andreis, Luiz Eduardo Spalding

Background

The lowest threshold of perception of the human body to an electric shock is around 0.5 mA at mains frequencies. Such events are called macroshocks. By contrast, a microshock is a term used when tiny electrical currents (around 50 uA) cause cardiac fibrillation when applied directly to the heart muscle but would otherwise go unnoticed in the human body. In the operating room, the patient is particularly vulnerable to both macro and microshocks due to the fact that they have their skin resistance deliberately lowered, they come into contact with a large number of devices simultaneously and they are often under anaesthesia thus unable to pull free from sources of electrocution. Electrical contact with the heart muscle is very likely through pacing leads and intracardiac temperature/pressure lines (Fig. 1).

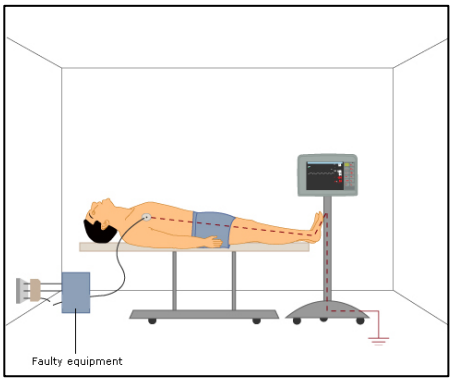

Fig. 1 Example of a microshock scenario

A team in Passo Fundo (south Brazil) developed a novel device for detecting leakage currents inside the operating room called Protegemed. The device works by inserting small toroids in the electrical supply to measure phase and differential currents in each socket. If the differential current exceeds a pre-determined threshold, an event is triggered which sends information via a microprocessor to the hospital information system. The Clinical Biomedical Engineering team monitor these events remotely via the hospital network. Supported by a grant from the Brazilian Ministry of Education under the Science without Borders programme, I was able to collaborate with the University and Hospital teams in Brazil to conduct research into the Protegemed device.

Method

Computer simulation was carried out using PSPICE as well as bench top experiments simulating situations which may lead to an electrical hazard inside the operating room. The situations include breakdown of insulation in one or more piece of equipment, loss of protective earth and accidental patient contact with earth via the operator. These were repeated for TNS and IT power supply systems.

Results

Results showed that when a patient is connected to more than one piece of equipment, moderate failure of the applied part insulation can cause leakage current to exceed the threshold for microshock. Severe failure in the applied part can cause the leakage current to exceed the threshold for macroshock.

Conclusions

Single or multiple faults can be hazardous when a patient is connected to more than one device even in an isolated environment. This can be life threatening in cardiac theatres where there is a direct electrical contact with the patient's heart. Regular field testing of insulation and earth continuity is crucial to maintain safety. The Protegemed device can help detect fault currents inside the operating room in real time.

Bridging the gap between RT Physics and RT Engineering, a personal experience

William Credé, Torsten Liebig
Clinical Scientist – Radiotherapy Physics,
Royal Devon University Healthcare NHS Foundation Trust
Will.crede@nhs.net

The interface between radiotherapy physics and radiotherapy engineering is critical to the safe and effective delivery of modern cancer treatments. However, differences in training, perspective, and departmental responsibilities can sometimes hinder collaboration. As linacs continue to become more software driven, increased collaboration between RT Engineering and RT Physics offers more potential than ever to add value to both staff groups. In this talk we intend to present our experience of unlocking this potential through a split role, with a physicist having dedicated time spent in the RT engineering team.

The benefits which we have managed to elicit include:

- Increased collaboration and closer working relationships between RT Physics and RT Engineer teams.
- Development of new tools to aid analysis of machine events and long-term trending, pairing engineer's technical knowledge with physicist's data manipulation and analysis skills.
- Greater ability to understand and translate the impact of routine maintenance and emergency intervention on machines and therefore better advise on the follow-up QA required to ensure safe operation.
- Increased flexibility of scope for both teams, providing resilience in times of short-term resource shortage.

The presentation will discuss these areas, as well as including detail on a couple of machine log analysis tools we have developed through this collaboration and the subsequent impact of these. Our hope is to inspire others to look at this method of broadening careers and engender greater collaboration between physicists and engineers across the profession.

2D vs 3D Ultrasound of the Neonatal Brain

Rachel M Roberts[1], João Alves Rosa[2], Siân Curtis[3], Adam P.R. Smith-Collins[3,4], Martin Kidd[5], Savvas Andronikou[6]

[1] Department of Neuroradiology, John Radcliffe Hospital, UK, [2] Neuroradiology Department, North Bristol NHS, Trust UK, [3] University Hospitals Bristol and Weston NHS FT,[4]Neonatal Neuroscience, University of Bristol Medical School, UK, [5]Centre for Statistical Consultation, University of Stellenbosch, South Africa,[6]Department of Radiology, Children's Hospital of Philadelphia, United States.

Background: Advances in perinatal care have helped to reduce the morbidity and mortality of severe neurological conditions in the neonatal population. Ultrasound remains the primary method used to screen and evaluate intracranial abnormalities, but acquisition and interpretation of images remains highly operator dependent.

The aim of this pilot study was to compare the diagnostic quality of semi-automated 3-D and 2-D ultrasound in demonstrating specific predetermined intracranial anatomical landmarks.

Methods: This was a prospective study of 20 neonates, who had both routine 2-D and 3-D research cranial ultrasounds. For each patient, a 3-D (coronal and sagittal reconstructions) followed by a 2-D ultrasound were sequentially acquired by a single operator, a consultant neonatologist (>10 years' experience) (Figures 1a,1b).

Standard coronal and sagittal views were extracted from the 3-D volume to match the 2D ultrasound and were evaluated by three radiologists blinded to the acquisition method. Anatomical structures were classified as present or absent as relevant for each view. The quality of each view was graded as 0 (absent view), 1 (poor), 2 (adequate) or 3 (good).

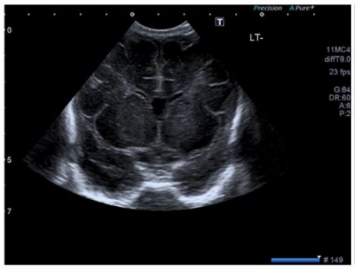

Figure 1a 2-D coronal image of the 3rd ventricle

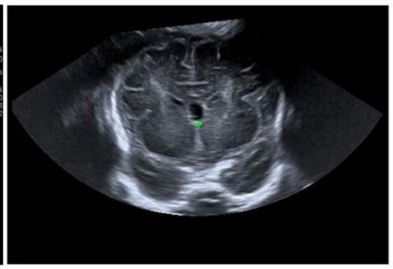

Figure 1b 3-D coronal image of the 3rd ventricle

Results: More anatomical structures were identified in the 3-D studies (P<0.01). There was similar image quality across 2-D and 3-D views for most participants. There was a trend that 3-D ultrasound performed better for image quality in the coronal plane, and 2-D in the sagittal plane, only reaching statistical significance for two of the coronal views and two of the sagittal views (Table 1).

Table 1|Merged results for all readers presenting the proportion of views that were of adequate quality by mode of acquisition and mean view quality score

		Standard view obtained (%)		Mean view quality score (SD)		
		2-D	3-D	2-D	3-D	*P*-value
Coronal views	Frontal lobe	73	83	1.37 (0.99)	1.50 (0.87)	0.23
	Frontal horns	93	97	1.63 (0.74)	1.90 (0.66)	**0.04**
	Third ventricle and Sylvian	97	100	1.82 (0.68)	2.13 (0.65)	**0.03**
	Temporal uncus and Sylvian	98	98	2.00 (0.61)	2.03 (0.71)	1.00
	Tentorium	83	88	1.87 (1.05)	1.88 (0.94)	0.94
	Choroid plexus	98	100	2.12 (0.76)	2.26 (0.72)	0.12
Sagittal views	Midline	98	100	1.97 (0.74)	1.78 (0.72)	0.30
	Caudothalamic groove	100	100	2.13 (0.63)	1.93 (0.54)	**0.02**
	Temporal	97	100	1.73 (0.63)	1.85 (0.69)	0.84

Conclusion: Semi-automated 3-D acquired neonatal cranial US performs similarly to 2-D US performed by an experienced operator, both at detecting anatomical structures and in producing good quality images. This could enable clinicians to acquire quality cranial US at remote sites when experienced operators are unavailable. Images could then be interpreted remotely by expert radiologists, avoiding long transfers of these frequently unwell patients.

Key References: Stoll et al (2015) Trends in Care Practices, Morbidity, and Mortality of Extremely Preterm Neonates JAMA 314:1039; Dudink et al (2020) State-of-the-art neonatal cerebral ultrasound: technique and reporting. Pediatr Res 87:3–12.

IR CTV dose analysis in HDR Cervix -A Retrospective Study

AIM

This study aims to analyse the dose coverage of IR CTV (D98) achieved as part of the department's current protocol and the impact on DVH when editing the IR CTV, i.e., Cropping from the applicator and OARs. Along with that, the question about the difference in the combined EQD2 of IRCTV if not cropped on the second day of insertion is also addressed.

Method

A total of 12 patients' CTs, treated at the institution, were selected for this study. The CT structures were anonymised and were exported to the Oncentra Masterplan Treatment planning system, including the pre-existing structure sets. Three IRCTVs were contoured on CT sets of each fraction and named as follows;

- IRCTV 1- CTV with margins from HR CTV according to the department protocol.
- IRCTV 2- CTV with margins according to the department protocol and cropped from the organs at Risk.
- IRCTV 3- CTV with margins according to the department protocol and cropped from the organs at Risk and from the applicator.

The whole treatment plan for each fraction was regenerated again by ensuring the TRAK, dwell times and activity matched the original treatment plan. The DVH was then analysed for all the IR CTVs contoured, and the plans were reoptimized where possible to obtain the desired goal for the IRCTVs. From the data procured, deviation in dose received by 98% of the volume of the IRCTV1, IRCTV2, and IRCTV3 was obtained and, estimated the deviation in EQD2 if the IRCTV was not cropped on the second day of insertion.

Results and Discussion

IR CTV dose coverage Audit

Among the 12 cases, two were omitted since the IR CTV was the same as the HR CTV due to complete remission. From the rest of the 10 cases, the desired IR CTV coverage, which is an equivalent dose of 60 Gy in combination with the external beam was achieved for only one case (see

Figure 2). However, the minimum coverage achieved was not less than 54 Gy.

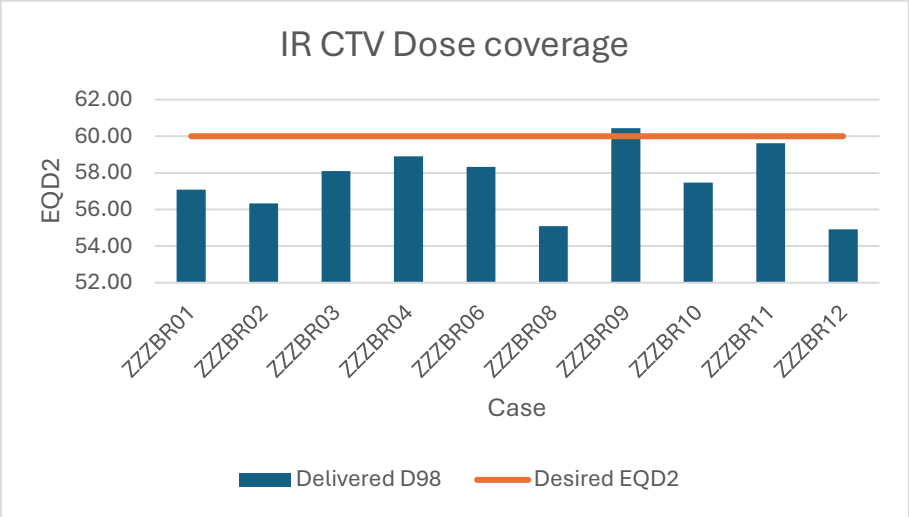

Figure 2. IRCTV Dose coverage

In 60% of the cases, the IR CTV dose coverage was limited due to the patient's anatomy, where organs at risk, especially the bladder /rectum being very close. In 20% of the cases, the IR CTV coverage was achievable but optimising the plan based on IRCTV alone could result in an EQD2 dose greater than 90Gy to the HR CTV which is not ideal. It was also noted that in 2 cases, reducing the applicator's size for the second insertion lowered the coverage. Along with that discrepancies in the volume of IR CTV among different insertions for the same case were seen (see **Error! Reference source not found.**). This could lead to an inaccurate estimation of the DVH. It is also possible that cropping the IRCTVs from OARs throughout the fractions may lead to changes in IRCTV volume when organs at risk move around or the size varies (e.g., the Rectum/small bowel usually appears gassy for the second fraction after the first insertion). It was also observed that the superior end of IRCTV is less often covered due to the difference in contouring on the Patient plane (see Figure 3).

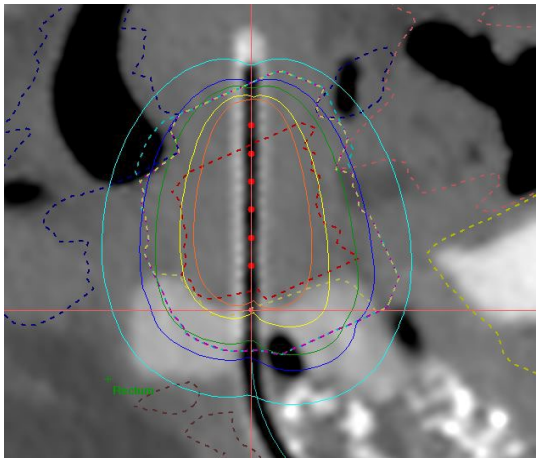

Figure 3 IRCTV Contour on applicator plane.

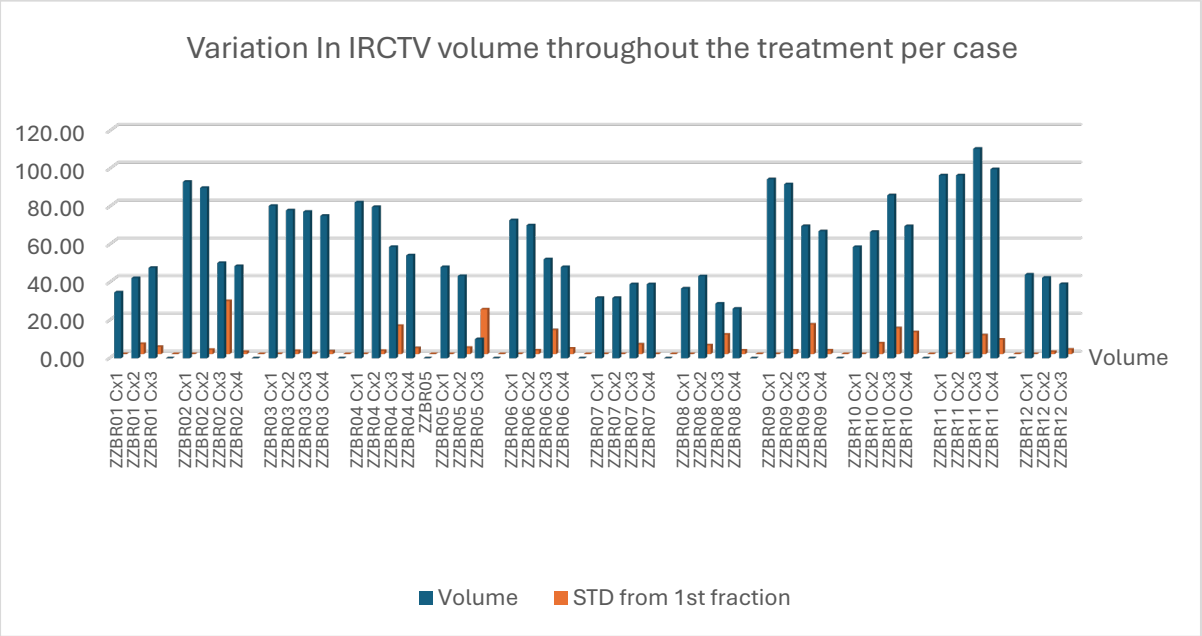

Figure 4 Variation in IRCTV volume throughout the treatment per patient.

Case	Fraction	IRCTV Volume (cc)	STD DEV in IR CTV volume between insertions
ZZBR01	1	34.82	**9.192**
	3	47.82	
ZZBR02	1	93.31	**30.328**
	3	50.42	
ZZBR03	1	80.58	**2.199**
	3	77.47	
ZZBR04	1	82.42	**16.645**
	3	58.88	
ZZBR05	1	48.24	**26.955**
	3	10.12	
ZZBR06	1	73.00	**14.588**
	3	52.37	
ZZBR07	1	31.91	**5.119**
	3	39.15	
ZZBR08	1	36.9	**5.657**
	3	28.9	
ZZBR09	1	94.66	**17.508**
	3	69.9	
ZZBR10	1	58.86	**19.318**
	3	86.18	
ZZBR11	1	96.71	**9.949**
	3	110.78	
ZZBR12	1	44.28	**3.557**
	3	39.25	

Table 1 STD DEV in IRCTV Volume between insertions

Impact on DVH when IRCTV is cropped from organs at risk and the applicator.

The dose obtained per fraction for each of the IRCTVs of each case was tabulated and the standard deviation between IRCTV1, 2 and 3 was calculated. The maximum standard deviation between IRCTV 1 and 2 was calculated as 0.32 in which case the treatment fraction was delivered with needles. Omitting this, resulted in a standard deviation of less than 0.09. In the cases, where the SD was higher than 0.05, the organs at risk were close to the IRCTV. There was no trend found in the variation of dose between the IRCTVs, though IRCTV 2 was higher in most of the cases (see **Error! Reference source not found.**.). Significant changes in volume were observed when the IRCTV was cropped from organs at risk and the applicator which did not affect the coverage much (See **Error! Reference source not found.**).

Along with that, no trend in dose coverage was observed with different IRCTVs, meaning the end effect depends entirely on the patient's anatomy and optimisation. Logically, IRCTV 1 is supposed to get less dose coverage compared to IRCTV2, due to the increase in volume which is prominent in cases where the Organs at risk are very close to the uterus for example, case ZZZBR04 and ZZZBR08. The deviation is much more visible in the first two fractions of the case ZZZBR04, especially in the second fraction, due to the presence of needles and organs being too close to the target. Though it is noticeable, the standard deviation was found to be less than 0.9. For the other cases where no needles and caps were used, the standard deviation varied from 0 to 0.32.

However, the analysis shows that there is no significant difference in overall EQD2 (D98) per case, between IRCTV 1 (not cropped from OARs), IRCTV2 (cropped from the applicator) and IRCTV3 (cropped from the applicator (not the IU tube) and OARs) if no needles are used (see Figure 7). But only one case with 2 fractions treated with needles was analysed so it is required to get more data to analyse it properly.

The percentage deviation in dose coverage of IRCTV2 to IRCTV 1 was also analysed for all the fractions and the maximum deviation found was -5.02 % (see **Error! Reference source not found.**Table 1)omitting the fraction with needles while the one fraction with needles showed a -15.51 % deviation. Nevertheless, looking at the overall percentage deviation in EQD2 D90 of IRCTV2 to IRCTV1, the maximum deviation found was only -0.78 % and in the case of the needle, it was -2.01% only. In the case of IRCTV3, the analysis per fraction showed a maximum percentage deviation of -5.05% excluding the case with needles (See **Error! Reference source not found.**). For the case with the needle, the deviation was 6.4% more. but when it comes to the D98 (EQD2), combining all the fractions, the maximum deviation was found to be 1.35% and the minimum was -0.12%. In the case of the needle, the deviation was -0.62%. The standard deviation varied from 0.01 to 0.54 in all the cases.

The table below (see **Error! Reference source not found.**) depicts the standard deviation of EQD2 (D98) between IRCTV 1 from 2 and 3 per case.

Case	IRCTV1 EQD2	IRCTV2 EQD2	IRCTV3 EQD2	STD Dev IRCTV2	STD Dev IRCTV3	percentage deviation IRCTV2	percentage deviation IRCTV3
ZZZBR01	56.84	57.02	56.77	**0.12**	**0.05**	**-0.31%**	**0.13%**
ZZZBR02	56.63	56.71	56.25	**0.05**	**0.27**	**-0.14%**	**0.68%**
ZZZBR03	58.07	58.09	57.87	**0.01**	**0.14**	**-0.03%**	**0.34%**
ZZZBR04	58.14	59.31	58.50	**0.83**	**0.25**	**-2.01%**	**-0.62%**
ZZZBR05	57.72	57.71	57.35	**0.01**	**0.26**	**0.02%**	**0.64%**
ZZZBR06	58.61	58.53	58.23	**0.06**	**0.27**	**0.14%**	**0.64%**
ZZZBR07	61.56	61.59	61.45	**0.02**	**0.08**	**-0.04%**	**0.18%**
ZZZBR08	54.85	55.28	54.92	**0.30**	**0.05**	**-0.78%**	**-0.12%**
ZZZBR09	60.29	60.50	60.31	**0.15**	**0.01**	**-0.35%**	**-0.03%**
ZZZBR10	57.63	57.56	57.45	**0.05**	**0.13**	**0.13%**	**0.32%**
ZZZBR11	59.63	59.72	59.66	**0.07**	**0.02**	**-0.16%**	**-0.05%**
ZZZBR12	54.92	54.85	54.93	**0.04**	**0.01**	**0.11%**	**-0.02%**

Table 2 The standard deviation and percentage deviation of IRCTV1 from 2 and 3.

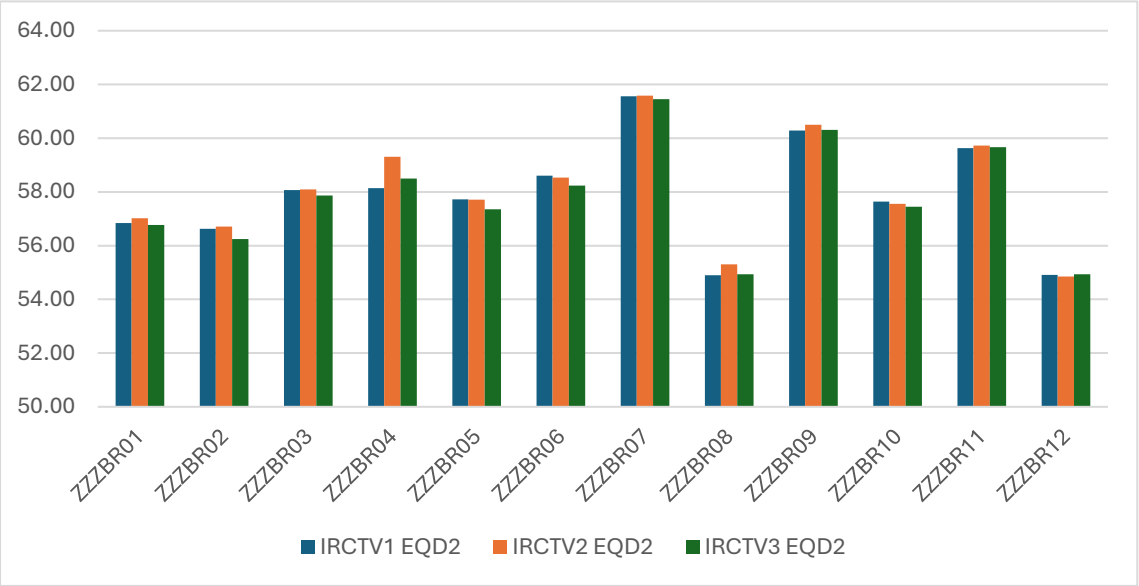

Figure 7 Comparison of D98 between IRCTV1,2 and 3 per case.

Impact on combined EQD2 of IRCTV when IRCTV is not cropped on the second day of insertion.

The table below shows the estimated deviation in D98 of IRCTV when it is not cropped from the OARs on the second day, for all the cases used in the study.

Patient	2nd and 4th fraction not cropped					EDQ2 with all # cropped (Gy)	STD	Percentage deviation
	# 1 cropped Dose/# (Gy)	# 2 not cropped Dose/# (Gy)	# 3 cropped Dose/# (Gy)	# 4 not cropped Dose/# (Gy)	Total EQD2 (Gy)			
ZZZBR01	3.72	3.787	3.5597		56.924	57.017	**0.066**	**0.16%**
ZZZBR02	2.095	2.21	3.50	3.53	52.597	56.705	**2.905**	**7.24%**
ZZZBR03	3.17	3.17	3.17	3.09	54.752	58.086	**2.358**	**5.74%**
ZZZBR04	3.20	2.88	3.67	3.15	55.098	59.309	**2.978**	**7.10%**
ZZZBR05	3.70	3.68	4.21		57.710	57.713	**0.002**	**0.00%**
ZZZBR06	3.11	3.13	3.51	3.18	55.075	58.529	**2.442**	**5.90%**
ZZZBR07	3.59	3.68	3.86	3.90	57.024	61.585	**3.225**	**7.41%**
ZZZBR08	2.72	2.58	2.46	2.59	52.449	55.280	**2.002**	**5.12%**
ZZZBR09	3.61	3.71	3.42	3.47	56.468	60.499	**2.850**	**6.66%**
ZZZBR10	3.41	3.42	2.46	2.91	54.489	57.559	**2.171**	**5.33%**
ZZZBR11	3.41	3.52	3.36	3.45	55.810	59.659	**2.722**	**6.45%**
ZZZBR12	3.21	3.33	3.10		54.910	54.930	**0.014**	**0.04%**

Table 5 Estimation of difference in EQD2 when IRCTV is not cropped on the second day of insertion.

The standard deviation in dose with the second day of insertion not cropped Vs cropped was found to be between 0.002 to 3.225, and the percentage deviation was from 0 % to 7.41%. However, among the 12 cases, 3 were treated with only 3 fractions rather than 4, which evidently reduced the deviation.

Omitting the 3 cases, the standard deviation varies from 2.002 to 3.225 and the percentage deviation from 5.12 % to 7.41%.

Conclusion

It can be concluded that, in most cases, the required coverage for IRCTV is less often achieved due to various reasons such as proximity of organs at risk, variation throughout the fractions in contouring, contouring on the patient plane, changes in application selection between the insertions and the necessity to optimize the HR CTV beyond the current clinical goal (i.e. to give more than 9 Gy/fraction).

The analysis showed that cropping the IRCTV from organs at risk and the applicator has no significant impact (SD:0.01to 0.3 (IRCTV cropped from OARs) and 0.01 to 0.27(IRCTV cropped from OARs and applicator) on the D98(EQD2) even if the organs are close to the CTVs, though in most cases, IRCTV cropped from the organs only showed a bit higher coverage as expected. Only one case with 2 fractions treated with needles was analysed in this study, which showed a higher deviation than the rest of the cases. Further data analysis on the cases with needles is required to support the evidence.

From the data analysed, it is clear that not cropping the IRCTV on the second day of insertion can significantly underestimate the dose coverage, especially if there are 4 fractions to be treated. Still, the effect is less significant in cases treated with only 3 fractions.

Interventional radiology radiographer routine QA fail

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Background: The DR Physics team were informed of a significant QA fail for dose-rate reproducibility QA performed by radiographers for two Siemens Artis Icono systems in interventional radiology. The QA test was performed by adding Cu filtration to the x-ray tube, screening for one minute, and recording the accumulated DAP over that minute.

The two systems were commissioned at the end of 2024 and this was the first time that radiographer QA had been performed. Baseline dose-rate values for radiographer QA had been set up in conjunction with Medical Physics. The tests were repeated by two radiographers independently so we were confident that it was not due to set-up/user error.

Methods: Posts on the medical-physics-engineering mailbase regarding the Siemens Artis Icono systems were reviewed alongside presentations from the Siemens physics user group meeting (Nottingham, Nov 2024). Both systems came with a 'torso phantom' that contained some anatomical structures, so we tested radiographer QA protocols using this instead of Cu in the beam.

Results: Communications on the mailbase and with other physics colleagues found that other Trusts had experienced similar issues in not being able to directly apply previous QA methods and have had to be creative in the solutions. We have changed how routine radiographer QA is performed for this particular test to better accommodate the way in which the system modulates but further investigation on how to test the systems is required.

In reviewing the QA results with the radiographer, we also found that the two clinical protocols were not set up identically between machines. The radiographer also reported that one of the systems had also undergone a software update a few weeks earlier.

Discussion: The Optiq modulation software has been modelled using patient simulations, so the use of Cu was no longer appropriate for this test being of uniform density, unlike a patient. This highlights the importance of understanding how specific equipment works and that, particularly with advancements in technology and techniques, current testing protocols may not be suitable.

At commissioning it was requested that both systems were set up identically, however the systems were delivered from the factory with different software versions and it was not possible to have the software versions updated / altered to match both systems. There are different names for protocols/settings as default for each software version, a finding also shared by another Trust at the Siemens user group meeting. Siemens currently do not have a method to easily review scanning protocols across multiple Icono systems.

Applications had also attended to update pulse-rate settings to optimise performance of one of the machines, but physics had not been notified of this update. Other details in the protocol settings (e.g. target IQ) may have been altered during this update.

Conclusion: QA tests should be reviewed to ensure they are suitable for new equipment, and tests should be adapted to suit equipment where possible. Transparency with Physics regarding applications visits and to ensure appropriate review/tests can be performed following a visit. Information on software versions to be kept current and accurate, particularly in light of the recent IR(ME)R 2024 amendment.

Key words: Software, Artis Icono, QA, protocol, radiographer, Cu

Optimisation of paediatric CT non-contrast head scanning protocols.

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Background.

CT head scanning is the most common scan type performed for paediatric patients [1] and optimisation of paediatric scanning protocols is of particular importance given that children are more susceptible to the effects of radiation exposure [2].

A local patient dose audit found that the median patient dose for all paediatric age categories exceeded the National Diagnostic Reference Levels (NDRLs), prompting an evaluation of current practice and how scanning protocols can be optimised. This identified that the use of automated tube-current modulation (ATCM) may be an effective tool in reducing patient dose, but would also impact image quality, so further work was required to assess this option. The investigation was performed on a Canon Aquillion Genesis scanner which is set up with both volume and helical paediatric head scanning protocols. The Canon ATCM software, Sure Exposure 3D, modulates based on a pre-defined Target Standard Deviation.

Methods.

A series of anthropomorphic phantom scans were performed to benchmark the current scanning protocols: 0yrs-1yrs, 13mths-2yrs, 3yrs-5yrs, and 6yrs-12yrs. Both helical and volume acquisitions were evaluated for each age category, first altering the fixed mA to reduce $CTDI_{vol}$ below the relevant NDRL, and then using ATCM.

$CTDI_{vol}$ was the dose parameter evaluated, and was obtained from the scanner displayed dose information. Standard deviation and SNR were measured and calculated to evaluate image quality.

Results.

The use of ATCM significantly reduced the patient dose for both the helical and volume scanning protocols, with the largest reduction being approx. 77%. Initial image quality evaluation indicates that SNR decreases with decreasing $CTDI_{vol}$ as expected, and further analysis is currently being performed to determine whether there is a significant difference between the default protocol SNR and those calculated for the mA adjusted and ATCM images.

Discussion.

The results of the anthropomorphic phantom scanning suggest that ATCM should reduce patient dose without a large compromise on image quality. However, this may not directly translate to clinical patient imaging as patient anatomy differs from the phantom and the phantom not displaying pathologies and structures that may need to be identified in clinical images. Additional factors, such as accurate patient positioning and patient movement, will also impact the effectiveness of ATCM.

Conclusion.

The use of ATCM is effective in reducing patient dose for paediatric head imaging based on anthropomorphic phantom scanning, but further investigation into the optimal Target Standard Deviation for each scanning protocol should be done if implementing ATCM clinically.

Key references.

[1] - NHS England Diagnostic Imaging Dataset Annual Statistical Release 2023/24. Version 1. November 2024.

[2] - Worrall, M., Holubinka, M., Havariyoun, G., Hodgson, K., Edyvean, S., Holroyd, J., Davis, A., Dunn, M. and Gardiner, A. (2021) 'Analysis and results from a UK national dose audit of paediatric CT examinations', The British Journal of Radiology, 95(1129) Available at: 10.1259/bjr.20210796.

Key Words. Optimisation, ATCM, SNR, $CTDI_{vol}$, helical, volume, phantom

Title of Study

Immersive technology in healthcare: Clinical Scientist intrapreneurship opportunities and benefits

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Background

The author will describe research and innovation work force development programmes that have substantially assisted when seeking to establish an immersive technology in healthcare group. Opportunities and benefits of NHS Clinical Scientist intrapreneurship will also be discussed.

Methods

In 2021 a National School of Healthcare Science (NSHCS) Innovation Fellowship [1] provided tuition, mentoring, funding and opportunity to initiate an end-of-life care immersive technology service development project. Working in collaboration with a local hospice, the project sought to benefit patient wellbeing through generic and personalised outdoor environments experienced through virtual reality and real world 360° video recordings [2]. The fellowship also introduced the concept of 'intrapreneurship' and provided motivation and confidence to then successfully apply to cohort 6 of the NHS Clinical Entrepreneur Programme (CEP) [3] in 2022.

Results

Learning, experience and networks formed through the NSHCS fellowship and NHS CEP have been utilised when gaining multiple subsequent external funding awards totalling over £100k. In addition to the initial virtual reality and end-of-life care work, other immersive technology projects exploring staff training [4] and well-being resources have been instigated. These have been multidisciplinary; working across specialities and developing new external collaborations.

Funding has supported staffing capacity and grown immersive technology infrastructure. Three matched funded paid internships have strengthened links with university partners whilst benefitting students and enabling projects to utilise Unity software development expertise. The Trust's positive role within the community has also been further supported through participation in local events such as TedXBath, Bath Digital Festival, Trust AGMs and STEM initiatives.

The resulting projects have been a substantial source of continuous professional development for project team staff. This has included proffered and invited talks at national meetings, individual and team awards and prizes, positive media releases, expansion of professional networks and a six-month part time secondment to the NHS CEP team by the author. Project team colleagues have also successfully initiated and pursued other innovative funding and training opportunities.

Discussion

Successful innovation often does not need to be complex or groundbreaking; the difference between it happening or not can simply be taking a first practical step. Programmes such as those experienced by the author, or support offered by IPEM, can act as enablers, providing space, legitimacy and opportunities to initiate research and innovation activities. These can have parallels with the 'lean startup' approach of building the simplest thing that first tests core assumptions. Beyond individual project deliverables, there can be broader benefits to a culture of research and innovation where staff feel valued and engaged with opportunities to create future services. Such benefits are also mirrored by insights gained by the NHS CEP since its launch in 2016 [5].

Conclusion

There are opportunities for Clinical Scientists to pursue intrapreneurship activities that benefit a culture of research and innovation. These benefits can often extend beyond individuals supported by workforce development programmes and immediate deliverables of associated projects.

Key references

[1] The National School of Healthcare Science Innovation Fellowship
[2] Dorothy House Hospice Forestry UK press release
[3] The NHS Clinical Entrepreneurs Programme
[4] RUH Back to Basics
[5] Insights from the NHS England Clinical Entrepreneur Programme

- ***Aims and/or Background***:

Anxiety can be problem for 60% or more of patients that are having tomographic imaging scans such as Positron Emission Tomography-Computed Tomography (PET-CT). A serious consequence of this anxiety is that some patients do not attend their appointment or subsequent appointments, and some are unable to tolerate the scanning procedure. This could lead to poor quality images due to patient motion. The patient therefore does not receive the benefit of the procedure they were referred for; their clinicians lack information to guide treatment, and healthcare resources are wasted.

We introduce a novel use of a Virtual Tour (VT) in a pilot study to test its acceptability for patients referred for their first PET-CT scan. Patients who view the VT may feel less anxious and more prepared, making the overall experience less stressful and improve patient satisfaction. Patients may be more willing to attend subsequent scans and ensure continued care.

- ***Methods***:

The design of the single centre pilot study focusses on three measures: an in-house anxiety questionnaire, taken before and after the intervention; heart rate during the virtual tour and PET-CT; and finally comments to improve the tour and Likert scale acceptability measures of the participants experience on the VT by interview. Participants were recruited over 5 months. The intervention comprises of 360-degree video and images of the PET-CT patient pathway.

- ***Results*:**

Results show a positive experience and potential benefit to patients with a mean experience score of 4.30 (+/- 0.80) out of 5 and mean benefit score of 3.05 (+/- 0.76) out of 5. Heart rate (HR) data indicates a statistically significant reduction from HR during the VT to HR during the PET-CT (p = 0.01). Through interview, 95% of participants had positive comments about the VT, 90% and 80% found that the VT was an appropriate length and had appropriate locations respectively.

- ***Conclusion*:**

These early findings indicate that the VT is not only feasible and well-received but also has the potential to reduce anxiety—a finding aligned with broader research in this area. This initial study has led to a grant application to conduct a multicentre randomised controlled trial to test the acceptability and efficacy of an improved VT based on participants comments.

- ***Key Words:*** For example: *Biomedical engineering, implantable devices, imaging, MRI Safet*

Title: Investigating the effect of biomarkers on Absorbed Dose in I-131 therapy for Thyroid Cancer

Presenting Speaker: Sushmitha Turton (previously Dachepalli)

Aims: The aim of this study is to apply a novel dosimetry technique to investigate the impact of physiological biomarkers on thyroid absorbed dose in I-131 therapy for thyroid cancer. Current dosimetry protocols often rely on single time-point imaging and assume standard biokinetics, which can lead to suboptimal treatment due to interpatient variability in iodine clearance and retention. [1, 2] Patient-specific physiological factors such as renal function and calcium levels can significantly influence the absorbed dose.[3] This project proposes a novel method using whole-body radiation clearance data and a single thyroid time-point to estimate thyroid absorbed dose [5]. The influence of renal function and calcium level on the thyroid dose will be investigated.

Methods: Whole-body count-rate measurements are collected from 12 hours post-administration onward, avoiding the early uptake phase where biokinetics are non-linear. A clearance slope derived from these later time points is used as a surrogate for thyroid clearance. A single thyroid count-rate measurement is integrated with this slope to estimate TIAC (time integrated activity coefficient) using the area-under-the-curve. Dosimetric calibrations are included for accurate quantification. Dose conversion is performed using Hermes Dosimetry Software. The method is validated against data from published multi-time-point studies & compared through paired AUC analysis & statistical correlation testing.[6]

Results: At the time of abstract submission, data collection & calibration are ongoing. They will include analysis of the agreement between the novel single-time-point method & traditional multi-time-point dosimetry, along with correlations between thyroid absorbed dose & serum creatinine & serum calcium levels.

Discussion: This approach may provide a clinically feasible & resource-efficient alternative to traditional dosimetry, for settings with limited resources. It may also support personalised dosing for patients at risk of over- or under-dosing due to physiological variations.

Conclusion: This project aims to validate a resource-efficient method for estimating thyroid absorbed dose & to explore how key biomarkers influence iodine clearance.

Key Words: I-131 Therapy, Thyroid Cancer, Dosimetry, Time Integrated Activity, Biomarkers

References:

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Title of Study
Service evaluation of paradigm repetition in fMRI scans in pre-surgical risk management of paediatric epilepsy patients

Background and Aims

Language laterality is often used in preoperative risk assessment and planning to safeguard against post operative cognitive deficits. fMRI is an established and validated method of assessing language laterality. In paediatric patients, it is assumed that unlike adults they might benefit from the runs being repeated to encourage task engagement — a key factor in successful fMRI acquisition. However, task repetition extends the total scan time, which will make it more challenging for children to remain still — an essential requirement for acquiring reliable MRI data. It also robs the clinicians of valuable time that can be used to run other useful scans. This retrospective service evaluation study explored whether repeating language fMRI scans improves the reliability and validity of language laterality results for paediatric epilepsy neurosurgery candidates.

Methods

Two fMRI tasks, ADDT and VG, were each run twice in the same scanning session as part of the clinical pathway for presurgical risk assessment. 22 patients who had undergone fMRI language scans as part of this pathway between 2022-2024 were selected for this study. Following data processing and analysis using SPM12, task-related ROI language laterality indices were calculated using data from each repeated run from 18 patients' datasets.

Discussion and Results

We found agreement between results in 9 out of 18 patients for the ADDT task and 11 out of 15 patients for the VG task. In 5 of the ADDT and 3 of the VG non-agreement results, the disagreement was found to be between a bilateral and a unilateral result. Close inspection of activation maps and motion parameters showed that in cases of disagreement, at least one of the runs (often the first) had not worked. In all but one case, a reliable result could be inferred from the collective information that included the two runs, showing that repeating the task added value to the assessment of language laterality.

Conclusion

The findings of this study suggest that scan repetition is valuable in reducing variability and enhancing diagnostic confidence in this cohort of patients. However, considering the difference in age, aetiology, and cognitive ability present in the cohort, further research is required to predict who may or may not need a repeat scan.

Key words and abbreviations
Language laterality, neurosurgery, epilepsy, functional MRI, laterality index, fMRI paradigm

fMRI : Functional Magnetic Resonance Imaging
ADDT: Auditory Description Decision Task
VG: Verb Generation
ROI: Region Of Interest
SPM: Statistical Parametric Mapping