CHRISTIE MEDICAL PHYSICS & ENGINEERING NEWSLETTER AND EDUCATIONAL RESOURCE

Introduction

The aim of the newsletter is to both raise awareness of radiation protection activities and provide educational material across:

- Imaging with X-rays
- Magnetic Resonance Imaging
- Ultrasound Imaging
- Radiation Protection advice on X-ray, Nuclear Medicine and Radiotherapy

There is valuable **Continued Professional Development** content and we encourage reading by employers and those working with radiation. We hope that you enjoy the content and would love to receive any feedback to *the-christie.cmpe.info@nhs.net*

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Training Opportunities

CMPE Radiation Protection Supervisor Training

CMPE currently offer an RPS basic training course which runs 3-4 times per year. This allows users to gain information about the role of the RPS under IRR17 and a basic knowledge of theory and tasks through talks, discussions, and group exercises. This course is also accredited by the Society of Radiographers with 5 hours of content equivalent to 5 CPD points. CMPE will be running two more training courses for Radiation Protection Supervisors in 2024.

The course is open to staff from organisations who receive services from CMPE and who have been recently appointed RPS or who will soon be involved in RPS work. This includes: diagnostic radiology staff (X-ray), members of oral surgery departments, community clinics, general dental practices, radiotherapy staff, nuclear medicine staff, PET staff and other users of radioactive materials.

Contact us if you or your colleagues would like to attend one of the next courses this year. The dates of the courses are as follows:

- 7th February 2024
- 11th June 2024
- 10th October 2024

Mammography QC Training Day

The CMPE mammography physics team recently delivered an in-person theory and practical based mammography quality control course (QC) in October 2023 at The Nightingale Centre, Wythenshawe Hospital. This was well attended by mammographers working across the region. The course covered a range of topics with particular focus on understanding and carrying out the required QC for compliance with the NHS Breast Screening Programme.

The content delivered on the day and the physics background pre-reading is now available to download here: Mammography QC Google Drive. This is a useful introduction to those new to mammography QC, a good refresher for those who may be familiar already, and suitable evidence of CPD.

Mini C-Arm Training

The Pulvertaft C-arm training course is newly available for online training. This is aweb based course for all clinical staff who use a Mini C Arm Image Intensifier within their role in compliance with the Ionising Radiation (Medical Exposure) Regulation and it can be accessed here: Radiation Protection Mini C Arm Course

Ultrasound Imaging

CMPE are pleased to welcome a new Ultrasound Imaging Lead, David Rowland, to the group.

David Rowland (BSc, MSc, PGDip IPEM, MIPEM, CSci) is the principal clinical scientist for ultrasound physics in Christie Medical Physics and Engineering (CMPE) leading a team that provides technical and scientific ultrasound support across the northwest of England. After gaining a MSc in medical physics at Aberdeen University David undertook the Institute of Physics and Engineering in Medicine (IPEM) Grade A (now known as Part 1) training scheme at Newcastle. David achieved HCPC registration as a Clinical Scientist via Route 2 training while working at St Georges Hospital NHS Trust (Now Foundation Trust) in London and at Leeds Teaching Hospitals NHS Trust.

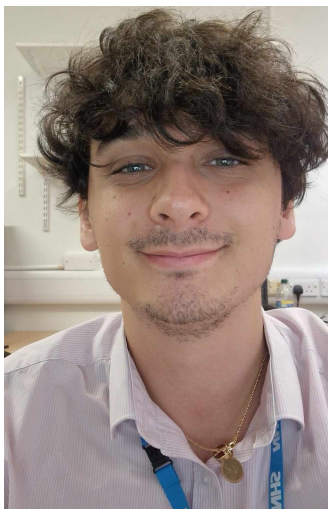
David is a member of the BMUS Physics and Safety committee and has peer reviewed articles for the UMB and Physica Medica scientific journals. Professional interests include type testing and classification of diagnostic ultrasound equipment, novel methods, test devices and metrics of ultrasound performance, improvements in medical ultrasound QA testing and the automation of QA measurements.

David is working to expand and promote the ultrasound physics representation across the northwest and nationally with the goal of ensuring adequate physics support for an ever-expanding fleet of ultrasound scanners.

Diagnostic Radiology

We've had quite a few new faces recently. Here are some introductions.

Liam Djedidi – Registered Clinical Scientist. Liam was with us for work experience and a junior physicist post some years back and left to undertake the Scientist Training Scheme at the East and North Hertfordshire NHS Trust. We're pleased to have him back with us in the north.



Eadie Weston – Newly registered, Clinical Scientist. Eadie is looking forwards to being able to concentrate on customer support work now her training scheme is completed.

Rachael Seymour – Registered, Senior Healthcare Science Practitioner recently joined us from Cambridge University Hospitals NHS Foundation Trust. Rachael will be out in the region testing x-ray equipment.

Connor McDermott - Healthcare Science Practitioner, working towards registration through the Register of Clinical Technologists equivalence route. Connor also join us from East and North Hertfordshire NHS Trust.

Alice Howarth – Healthcare Science Practitioner, working towards registration through the IPEM Technologist Training Scheme. Alice did a summer work experience placement with us some time ago and we are pleased she has joined the profession.

We are also pleased to see the return of Lorna Sweetman as a Principal Clinical Scientist (part time) and look forwards to the arrival of Tom Tang and Primrose Ruhukwa as Healthcare Science Practitioners, all in November 2023.

CMPE Staff Praise

A number of the team have been nominated for or gained awards/qualifications recently and below is a brief summary of these.

Diagnostic Radiology & Radiation Protection

Colin Swift (Optical Principal Clinical Scientist) won the British Medical Ultrasound conference 'Best Clinical Poster Presentation' titled 'High frequency ultrasound: Use in the Photo Dynamic Therapy Clinic'.

Colin Swift 'High Frequency Ultrasound – Its use in informing the suitability and effectiveness of PDT at the Christie Hospital, Manchester' presented at Euro PDT. Barcelona 2023

Craig Munnings (Chief Healthcare Science Practitioner – job share, and Trainee Clinical Scientist) was nominated for 'Inspiring Leader of the Year' at The Christie colleague awards and made it to the top 3.

Eadie Weston (Clinical Scientist) gained registration through the Scientific Training Scheme.

Cynthia Ojeaburu (Healthcare Science Practitioner) gained registration through the apprenticeship in Healthcare Science route.

Nuclear Medicine

Vicky Flanagan (Trainee Clinical Scientist) won the 'Young Investigator' Prize for her presentation at the ASNC Annual Congress.

Mike Gornall (Principal Clinical Scientist) has achieved Medical Physics Expert certification.

Steve Jeans (Principal Clinical Scientist) and *Chris McLoughlin* (Chief Radiopharmacy Technician) have each celebrated 40 years of service at The Christie.

Magnetic Resonance

The Magnetic Resonance Imaging team were nominated for The Christie 'Innovation & Improvement' award for their work across the North West on 'advanced accelerated technology'. This software can be used to increase patient throughput on MR scanners but requires optimisation by medical physics staff to ensure satisfactory image quality, patient safety and experience.

Michael Dubec (Principal Clinical Scientist) won 'Best Technical Abstract' at the MR Linac Consortium meeting for his talk on oxygen-enhanced MRI for the assessment of radiotherapy-induced treatment effects. Michael was also featured on physics world for his work in oxygen-enhanced MRI (https://physicsworld.com/a/towards-combined-hypoxia-imaging-and-adaptive-radiotherapy/)

Mike Hutton (Consultant Clinical Scientist) was featured as part of NHS England's Healthcare Science week. The 'A day in the life' profile was featured on NHS England's social media channels and aimed to highlight the key role that healthcare scientists have in ensuring safe, high quality patient care.

CMPE Professional Activities

Numerous members of our team have been developing the literature or are members of working parties of interest to the imaging and radiation protection profession. The following is a summary.

Diagnostic Radiology & Radiation Protection

Will Mairs, Alice Gutowski and Jaddy Czajka. Invited speaker. 'Mobile CT Shielding' talk presented at the IPEM RPA Update. Birmingham. 2023

Jaddy Czajka. Round table discussion lead ‘Critical Examinations – considering X-ray tube leakage’ at the IPEM RPA Update. Birmingham 2023

Alice Gutowski, Christie Theodorakou. ‘A study on skin doses in interventional cardiology’. Presented at the IPEM Science Technology Engineering Forum. Glasgow. 2023

Colin Swift. Membership of BSI EPL-76 committee, developing standards in the field of optical radiation and associated equipment

Will Mairs (and Mike Hutton of the CMPE MR group) co-chair the NHSE NW Imaging Medical Physics Advisory Group. A ‘diagnostic and interventional radiology workforce’ document has been published. Also, an ‘added value of medical physics’ document.

Ultrasound

David Rowland. Invited speaker. ‘Caring for Your Scanner is Caring for Your Patient’ - safety and maintenance of ultrasound scanners. BMUS annual scientific meeting due December 2023

Nuclear Medicine

Emma Birch. ‘Pass/fail criteria for leak tests’. Presented at the IPEM RPA Update. Birmingham. 2023

Tony Hughes. ‘Revised IRAT Methodology – Implications for Medical University Users’. Presented at the IPEM RWA Update. Birmingham. 2023

Heather Williams and Jan Walukiewicz presented research at the BNMS Annual Meeting 2023

Raquel Massa and Jose Anton-Rodriguez presented teaching materials and research at the EANM Annual Congress 2023

Kimberley Saint represented CMPE at the IPEM Strategy Day

Heather Williams is deputy chair of the NIHR MRT Research working party

Jose Calero is a member of the UK Radiopharmacy Group

Peter Julyan is a member of ARSAC

Magnetic Resonance

Mike Hutton is secretary for the IPEM MR special interest group Mike Hutton and Steve Jackson co-chair an IPEM TF group on the implementation of advanced acceleration techniques in MRI, which is providing resources to support the implementation of these techniques into routine clinical practice

Mike Hutton. Member of IPEM TF group looking at the workforce challenges in the MR physics profession. The group has recently published an interim workforce report (MRI services in desperate need of scientific support staff, says new report - IPEM). A full report will be published in early 2024.

Dubec MJ, Buckley DL, Berks M, Clough A, Gaffney J, Datta A, et al. ‘First-in-human tech-

nique translation of oxygen-enhanced MRI to an MR Linac system in patients with head and neck cancer'. Radiother Oncol. 2023;183:109592.

Zhong J, Kobus M, Maitre P, Datta A, Eccles C, Dubec M, McHugh D, Buckley D, Scarsbrook A, Hoskin P, Henry A, Choudhury A. 'MRI-guided Pelvic Radiation Therapy: A Primer for Radiologists'. Radiographics. 2023 Nov;43(11):e230052. doi: 10.1148/rg.230052. PMID: 37796729.

Jackson S, 'Physicist Perspective: Rapid multi-vendor AAT implementation to increase imaging capacity in the NHS', IPEM MRI Protocol Development: Clinical Optimisation and Standardisation, May 2023 (invited speaker)

Dubec MJ, 'Oxygen-Enhanced MRI Assessment of Radiotherapy-Induced Treatment Effects in Patients with Head and Neck Cancer'. ISMRM. Toronto. June 2023. (oral presentation) and MR Linac Consortium. Amsterdam. June 2023. (oral presentation / best technical abstract award)

Moore C, Clough A, Nelder C, Eccles CL, Hoskin P, Chuter R, Choudhury A, Zhong J, McHugh D, Dubec M. 'Visual and Quantitative Comparison between the Consortium Prostate DWI Sequence and a Modified DWI Sequence', MR Linac Consortium. Amsterdam. June 2023 (oral presentation)

Jackson S, IPEM webinar series: Advanced Acceleration Technology in MRI – An Overview, June 2023

Hutton M, IPEM webinar series: Advanced Acceleration Technology in MRI – Philips, June 2023

Hutton M, Accelerating MRI for Clinical Benefit – Novel Acceleration Methods, UKIO Congress, July 2023 (invited speaker)

Moore C, MR functional imaging techniques: basic principles. UKIO. Liverpool July 2023 (invited speaker)

Hutton M, Deep Resolve – A View from the North West, Siemens MR Symposium 2023, August 2023 (invited speaker)

Dubec MJ, Oxygen-Enhanced MRI for Imaging Tumour Hypoxia. National Head and Neck Oncology Meeting. York. September 2023 (Invited presentation) and Institute of Cancer Research. October 2023. (Invited Presentation)

Dubec MJ, Optimising MR for Radiotherapy. North West Society of Radiographers Meeting. Preston. October 2023. (Invited presentation)

Hutton M, Jackson S, Harkin J, Woodhouse N, Phenna S, Effectively-MR Conditional cardiac implantable electronic devices, IPEM MR Safety Update, November 2023 (presentation)

Hutton M, Jackson S, McHugh D, Brindle S, Holden R, Mehan R, Soni B, Off-label scan of a NeuroControl FREEHAND® peripheral nerve neurostimulator in a tetraplegic patient, IPEM MR Safety Update, November 2023 (presentation)

Ezekiel A, Drabble G, Jackson S, Hutton M, An audit of patient-specific MR safety queries for a large MR Safety Expert service, MPEC, February 2023 (poster)

Kilgallon J, Jackson S, Hutton M, Audit of MR Unlabelled Off-Label Risk Assessments, IPEM MR Safety Update, November 2023 (poster)

Harkin J, Curley S, Jackson S, Phenna S, Hutton M, Using 3D CT Reconstructions to Widen Access to MR for Patients with Aneurysm Clips, November 2023 (poster)

McHugh DJ, Datta A, Dubec MJ, Buckley DL, Little RA, Berks M, Cheung S, West C, Choudhury A, Hoskin P, O'Connor JPB. Evaluating radiotherapy response in uterine cervical tumours using intra-voxel incoherent motion MRI. ESTRO 2023, PO-2069.

Moore C, Clough A, Nelder C, Eccles C, Hoskin P, Chuter R, Zhong J, McHugh D, Choudhury A, Dubec M. Optimising the MRL Consortium Biomarkers Group Prostate DWI Sequence Image Quality ADC Comparison. ESTRO 2023, PO-2075.

Datta A, McHugh DJ, Dubec MJ, Buckley DL, Little R, Berks M, Cheung S, West C, Choudhury A, Hoskin P, O'Connor JPB. Evaluating intra-voxel incoherent motion in the uterine cervix: healthy volunteer repeatability and therapy-induced changes in tumours, ISMRM 2023, 0732.

BIR Radiation Safety Advice Sheets

The BIR have issued a series of new radiation safety advice sheets (Mar 2023) covering patient skin dose management, lead apron screening, non-medical referrers to imaging and classification of nuclear medicine staff. They can be accessed here: BIR Advice Sheets

Radiation Protection Update

CHRIS WOOD

CMPE recently held the biennial RP Update course in Nov 2022. As a reminder you can still access all the content from our recent RP Update course. The course content, videos and slides have been made available to all customers and can be found here: RP Update Presentations

We would encourage those that did not get chance to attend to look through the content. It may also be useful to revisit this as a good refresher if you already attended too. As proof of CPD, it is still possible to obtain a certificate once you have read or watched the content by completing the following quiz:

Radiation Protection Update Quiz - Diagnostic Radiology Specialism

If you need any further information regarding the RP Update, RPS basic training or other courses we offer please contact: the-christie.cmpe.courses@nhs.net

The CQC IRMER Annual Report (Nov 2022)

The annual report from the CQC has been published, which details their findings from inspections and notifications between April 2021 and March 2022. Overall, across all modalities, there has been an increase in the number of notifications of 22% compared to last year. For diagnostic imaging, the key points are summarised below, but the full report should be read to ensure all recommended actions and findings are taken on board.

The main themes highlighted in the report are:

- To ensure procedures, protocols and guidance for staff are up-to-date and effective,

- To improve the quality and availability of training records for staff,

- To make the best use of valuable input from medical physics experts.

The modality with the highest proportion of notifications was CT, which accounted for 63% of diagnostic imaging notifications, which is consistent with previous years.

The most common type of error is where a patient received an examination meant for another patient, as found in last year's report. However, operator errors now account for the highest origin of incidents (40%), where it previously was referrers. This has resulted in an increased number of incidents attributed to pre-exposure safety checks. One Trust has combatted this by re-energising the PAUSED poster and launching a new campaign to refocus staff on the principles of checking.

The most common recommendations following inspections in diagnostic imaging are related to insufficient employer's procedures. Other findings have included improving processes for investigating incidents, monitoring incident themes and including information on quality assurance records, faults and associated actions in audit trails, and management of training records

Risks have been identified surrounding a shortage of medical physics experts, and employers have been recommended to monitor this risk.

Themed inspection programmes have been carried out for neurointerventional departments, where the key risks highlighted, and associated recommended actions are listed below.

- Risks from ageing equipment: ensure a

proactive replacement programme is established and consider if more frequent QA is appropriate,

• Employer's procedures too generic: ensure these are reviewed so that they are useful for staff and consider adapting specific procedures,

• Referral guidelines not implemented,

• Patient doses: be familiar with the COMARE report, encourage sharing information on patient doses between networks and participating in studies to increase the amount of international data available, and investigate dose outliers.

Themed inspections programmes are ongoing for Mobile CT services. These will continue for the next 3 years, with a focus on co-operation between employers and establishing an IR(ME)R framework. The key risks highlighted are:

• Compliance with written procedures,

• Standardization of exposure protocols,

• Co-operation between host sites in relation to employer's procedures and duty holders entitlement managing incidents

• Limited clinical audits.

Findings from dental inspections have included employer's procedures not always being localised, minimal records of training, and quality assurance tests not being carried out in line with professional guidance (only visual checks performed).

A full review of the IR(ME)R regulations is due to be released in the next year.

Regional Lone Working

Occasionally CMPE staff attend customer sites to test equipment, for example, and they are not met by a responsible person who can hand the equipment over to us and receive it back when the work has finished. This can lead to two potential issues. The first is that our staff may be working alone in an empty department/van. The second is that no one can vouch for the condition the equipment is in when we take responsibility for it nor it's condition when we leave it. If something happens to the equipment, or the facility itself, between us leaving and the equipment owner's staff taking back responsibility for it, it may lead to accountability disagreements. We do not want to be in that situation therefore we feel you should always have a representative handover equipment and secure the premises when we leave. We would like to put forwards our conditions for working at your location and will also add this to our service description.

The regional service has a lone working, risk mitigation approach where those working alone keep in contact with our duty manager in

Manchester until all staff are accounted for at the end of the day. We need a certain level of oversight by our customers when we are visitors to your premises. We need to be able to call the facility and have the local staff check our employee is OK if we can't get hold of them.

1. For CMPE staff working in a busy radiology department or where appropriate customer staff are working in the department:

• Equipment handover: Handover equipment and receive it back again

• Lone working: Please be aware of our team and alert them when customer staff wish to lock up and leave, so we can also leave site safety.

2. For CMPE staff working in a closed department/location e.g. satellite department or remote area of hospital or a mobile van (often in the community, including non-secure locations).

• Equipment handover: Allocate a contact to handover equipment and receive it back again. Ensure the equipment is shut down correctly and secured after the visit.

• Lone working: A buddy system can be set up for that visit so the customer contact, CMPE worker and CMPE manager in Manchester all know who can be contacted that day until the worker leaves site. Our team will in turn make sure your isolated staff leave and lock up safety before coming back to base. Lone working on units where the customer is unable to provide staff for this purpose should not be undertaken.

HSE Notification, Registration and Consent for Work with Ionising Radiation

WILL MAIRS

Before carrying out most work with ionising radiation, or working in an atmosphere containing radon above a certain level, Employers must notify or apply to the HSE. For work that is:

• low risk – you must notify

• medium risk – you must apply for a registration

• high risk – you must apply for consent

HSE have released updated guidance to their processes for this: Notify, registration or consent for work with ionising radiation.

Employers with registrations and consents in place before 1st Oct 23 will be contacted by HSE who will request further information. This is particularly significant for those gaining consent where, in addition to submitting your current local rules and contingency plans, a safety assessment will be required (Safety assessment - Ionising radiation notifications -

HSE) and the HSE will inspect the facility. The average cost associated with this will be £26 for registration and a massive £6,000 for consent.

Let CMPE know when your Employer is contacted about this. The CMPE RPA Body is working through the support we can offer for these processes and we encourage you to work with your RPA in advance of completing the online application(s). It is best to work through the safety assessment(s) offline in advance of your online submission.

Don't forget that HSE need to be informed of material changes to information submitted during notification or when gaining registration/consent. For example, a change of Employer name or changes in the categories of work undertaken. See the link above for more detail.

Employer responsibilities with respect to Radon

EMMA BIRCH

IRR17 applies to any work carried out in an atmosphere with an annual average concentration of radon (Rn-222) greater than 300 Bq/m3 (IRR17 Regulation 3(1)(b)). Employers have a legal duty to assess the radon risk to staff undertaking work for them. For workplaces either below ground level or in a "radon affected" area this assessment must include radon monitoring. This requirement also applies to employees who are working from home, not just those working on the employer's premises.

The HSE have and will take enforcement action against employers who fall short of their expectations with regard to radon.

CMPE Advice Sheet 44 outlines the employers' responsibilities. Further information, including the indicative radon map (which was updated on 1st December 2022), can be found on the UK Radon website (www.ukradon.org). The results of any radon monitoring undertaken should be copied to the RPA.

HSE action against employer

As described above, there are legal limits for radiation exposure in the workplace as defined in IRR(17). Radiation exposure must be kept as low as reasonably practicable. HSE has found that a private boarding school has breached this, resulting in the school being fined £50,000 after exposing two employees, five pupils, and two other children to high levels of radioactive radon gas. The five pupils were exposed to levels 8 times the legal limits, two other children (not pupils) to 14 times the legal limit and the employees to $\frac{3}{4}$ the legal limit.

The investigation found that the school were aware of the radon levels following radiation monitoring in 2007, but from 2010 to 2018

no subsequent radiation monitoring had taken place. The HSE deemed that sufficient systems of work were not in place to ensure adequate radiation control measures.

The HSE released a statement following the investigation: *"We will not hesitate to take action against companies, including schools, who do not do all that they should to keep people safe. Every workplace needs to consider radon as a risk to its employees and others."*

Workforce Requirements: Diagnostic and Interventional Radiology (x-ray)

WILL MAIRS

The North West Imaging Medical Physics Advisory Group have undertaken a workforce survey across the NW Imaging Networks to help inform the strategy to achieve sustainable physics services now and in the coming decade. The NW Networks are the three Integrated Care Systems (ICS) of Cheshire and Merseyside, Greater Manchester and Lancashire and South Cumbria. Looking specifically at the workforce in the Diagnostic and Interventional Radiology (D&IR) specialism, the employees typically undertake both imaging physics and radiation protection physics for modalities using x-rays e.g. planar x-ray, CT, fluoroscopy, mammography and dental imaging etc.

Imaging and radiation protection physicists sit within the healthcare science NHS Employer profiles. The profiles are split into healthcare science practitioner roles (often called clinical technologists) and healthcare scientist roles (associated with the protected title of registered 'clinical scientist' – regulated by the Health and Care Professions Council). They are a bridge between science and the clinical environment, fulfilling roles that facilitate and optimise medical imaging to improve patient outcomes while ensuring the radiation safety of patients, staff and members of the public. They hold defined roles required by key regulations such as Radiation Protection Adviser under The Ionising Radiations Regulations 2017 (IRR17) and Medical Physics Expert under The Ionising Radiation (Medical Exposure) Regulations 2017 (IRMER17).

The NHS long term plan sets out expectations of improved care in areas including cancer, cardiovascular disease, stroke and respiratory disease with the aim to have faster diagnosis and expanded coverage/throughput, while acknowledging the challenging time scales required for expanding and training the workforce. Imaging and radiation protection physicists are essential to meet these goals as they are fundamental in optimising the technical aspects of the diagnostic imaging chain. If this first step is not optimised this will impact on patients by affecting diagnostic accuracy, the clinical decision and outcome e.g. how many abnormalities you can identify and the number of false/true diagnosis.

The Richards report recommends major ex-

pansion of imaging services e.g. a doubling of CT scanner numbers but also significant growth in other x-ray imaging by 2025.

Clinical scientists have general and specific competence that enables safe, timely, high quality, state of the art imaging activities. A recent review (cited within NHSEI Science in Healthcare Strategy) on clinical academic careers highlighted the achievements of the healthcare science workforce in combining patient-centred innovation with clinical practice. It describes a highly motivated, scientifically trained, research literate clinical community that frequently embeds and creates innovation as part of their core practice. The healthcare science workforce is well-placed to support and lead the integration of future intelligence and technology adoption and provide insight in terms of how research fits into a clinical context, looking ahead to which technologies will be relevant in the future and considering the impact of these technologies on service providers and the health system as a whole.

There is a drive to ensure sustainable, sufficient physics resource to adequately support services in line with legal requirements as a minimum and then beyond this to support all aspects of the quality assurance of services, active research and development and uptake of suitable technologies in the clinical setting.

Historically, physics support to D&IR imaging departments would typically consist of attendance at the facility when required for commissioning of equipment or for meetings etc, with remote (email or phone) support the rest of the time. However, with the growth of imaging services and more advanced role of the MPE there is a shift in focus to more integrated physics support within the clinical teams, especially for larger and more complex services. A Department of Health and Social Care response to the COMARE 16 report (recommendation 7) requires collaboration between professional groups and formal appointment of a team of 'radiation protection champions' (consisting of at least a radiologist, radiographer and medical physicist) with the purpose of consistently optimising all examinations (but in particular CT examinations) for dose and imaging quality. This multidisciplinary working highlights the need for close involvement of medical physics with the clinical team.

Benchmarking

A workforce benchmarking exercise was undertaken to understand current staffing in the NW Networks. This was simultaneously undertaken nationally by IPEM to get a UK wide picture. Staffing levels were calculated using guidance from the European Commission (report RP174) and the European Federation of Medical Physics (policy 7.1). Given the current staffing levels in the UK fall far below expectations, the medical physics profession have decided to aim for just 70% of the staffing recommended by the models initially.

Another relevant staffing model is that taken from the NHSBSP medical physics service specification. This produces similar results in terms of staff needed vs those available and

is a significant concern for the profession.

The Care Quality Commission (CQC) are likely to ask for evidence of an organisation's benchmarking at inspection and have issued strong wording towards appropriately resourcing MPE services in their Oct 2020 annual report. They are aware of the workforce challenge in the UK. Medical physics can collaborate with imaging services to add appropriate wording to their risk register where support is below expectations and this action with realistic plans to improve support should demonstrate to the CQC that the risk is being addressed.

Current shortfall

This represents the workforce in the NW Networks in 2021 (numbers haven't changed much by 2023). Note that the total medical physics service WTE includes the Medical Physics Expert WTE.

	EC report RP174 model		EFOMP 7.1 model
	'Medical Physics Experts' WTE	**Total medical physicist service WTE**	**Minimum staff at band 7 WTE and above to be 'safe'**
Posts available in 2021 for the NW Networks NHS imaging services	13	33	15
Benchmarked staffing need	38	96	48
70% of benchmarked need (realistic professional opinion in UK)	27	67	34
Shortfall against 70% of need (WTE)	14	34	19
2021 staff against realistic current need:	**48%**	**49%**	**44%**

Table 1: Current staffing against need in the NW Networks

The Northwest of England has by far the lowest staffing levels within the D&IR specialism in the UK and requires major investment to expand capacity and quality (see table 2). This is impacting on the timely, safe, optimal exposure of patients to radiation and will impact on the ability to implement new Community Diagnostic Centres to grow imaging capacity. In particular there is a shortage of MPEs with the skills to specify, procure and commission imaging equipment and ensure ongoing patient safety through support to radiation safety frameworks and provision of comprehensive quality assurance programmes.

	Establishment (WTE)	**Recommended workforce WTE (average of Report 174 and EFOMP 7.1)**	**Difference (WTE)**	**Establishment as a % of recommendations**
England	360	804	444	45%
North West	40	152	112	26%
North East	53	117	64	45%
Midlands	64	125	61	51%
South West	42	61	19	69%
East	27	61	34	45%
South East	66	116	50	57%
London	67	171	104	39%
Scotland	46	80	34	58%
Wales	19	52	33	36%
N. Ireland	17	29	12	59%

Table 2: UK medical physicist establishment as a percentage of recommendations (taken directly from the IPEM report)

5-year Shortfall

	EC report RP174 model		EFOMP 7.1 model
	'Medical Physics Experts' WTE	Total medical physicist service WTE	Minimum staff at band 7 WTE and above to be 'safe'
Total staff needed in 5 years	50	124	65
70% of benchmarked need (realistic professional opinion in UK)	35	87	45
Shortfall against 70% of need (WTE)	22	54	30
2021 staffing against realistic 5-year need:	36%	38%	34%

Table 3: Total shortfall of staff against 5-year need as based on the Richards report and benchmarking tools.

This article and the 'Medical Physics Roles' piece in the CMPE newsletter from May 22, sets out what medical physics staff can deliver within their skillset and how they fit into the NHS Long Term Plan. The current workforce is benchmarked against current need at 49% and against 5-year need at 38%. A national survey by IPEM points to the particular challenge faced by the NW Networks in regard to workforce growth, showing the region with by far the lowest staffing levels in the UK. The shortfall must be addressed to ensure timely, safe, effective imaging for the benefit of patients. New ways of scaling up training will be explored and imaging services must fund the growth of established posts at the rate medical physics training programmes (delivered by the medical physics) can output suitable candidates in order to grow the workforce. Business cases for new imaging equipment or staffing should include medical physics resources for set up and ongoing support. This is particularly important for the establishment of new CDCs which have no physics support currently and will be an additional drain on available resources. The NHS Long Term Workforce Plan proposes that education and training places for healthcare scientists need to increase by up to 34% (1039) by 2033. A focus will be in apprenticeship pathways.

UK National Diagnostic Reference Levels Update

The UK Health Security Agency (UKHSA) have published several updates to the National Diagnostic Reference Levels in the UK.

The updates include the following:

- The adult CT examinations have had new NDRLs adopted as of October 2022

- Paediatric CT examinations have had NDRLs adopted as of October 2022

- A new NDRL for screening mammography has been adopted. This value was proposed to the UKHSA NDRL working group by the Breast Screening Physics Clinical Professional Group (formerly National Breast Screening QA Co-ordinating Group for Physics), and the National Co-ordinating Centre for the Physics of Mammography (NCCPM).

All NDRLs are available online at: NDRLs

The Use of CBCT in Theatres

ABDUZ RYLANCE

Summary: CBCT is increasingly available on mobile C-arm systems used in theatres. Clinical applications for CBCT are increasing. There are addition radiation protection requirements when using CBCT, such as lead shielding in walls. Installing lead shielding in walls is more cost effective when building or renovating theatres. Please discuss all new or refurbished theatres with your CMPE RPA to fully evaluate future radiation protection needs. Please discuss all new/loan CBCT equipment with your CMPE RPA/MPE prior to bringing them into use

Cone beam computed tomography (CBCT) is a well-established technology on interventional radiology (IR) systems. CBCT is becoming more widespread in IR, increasing in both workload and clinical applications, as clinical users realise the benefits to patient care and patient pathways which it can provide.

Historically, CBCT has only been available on fixed C-arm systems used within IR rooms or Hybrid theatres due to the tube mobility requirements of the c-arm, image reconstruction computing requirements and the ability to display the information to the operator. However, with improving technology and clinical needs, CBCT capable mobile c-arm systems are becoming readily available.

CBCT uses large form detectors, typically 30x40 cm in IR, and hundreds of high dose projections around the patient to produce 'CT-like' reconstructed images. As a result, using CBCT significantly increase the workload of a system, and therefore scatter dose rates, with significant doses delivered in short periods of time. These higher dose rates have added radiation protection requirements over conventional interventional procedures, such as larger controlled areas, lead shielding in the walls of the facility, in-room protective equipment or specific systems of work.

Future workloads and clinical applications of CBCT are unpredictable but are extremely likely to increase over the operational lifetime of a theatre. Installing lead shielding to a working theatre is cost prohibitive due both the modification costs and clinical downtime of the theatre. Therefore, the use of CBCT in a theatre should be considered as a probable future workload by the project team at the design stage of a new or refurbished theatre. You should discuss the radiation protection implication and requirements with your CMPE RPA.

Please discuss all new or refurbished theatres with your CMPE RPA to fully evaluate future radiation protection needs. Please inform your CMPE RPA/MPE of any new CBCT systems or systems being upgraded to enable CBCT prior to bringing them into use, whether this is a loan system or purchased system.

Is all your equipment under regulatory control?

To ensure that CMPE provide appropriate advice regarding the safe use of any source of ionising radiation, we are asking all employers to confirm whether any of the following practices are carried out in their organisations:

- Irradiation of blood or blood products
- Use of x-ray specimen cabinets e.g. in morgues or pathology labs
- X-ray diffractometry
- Electron microscopy
- Staining of electron microscopy specimens using uranium salts

Please confirm in writing to your RPA contact if you have items that need regulatory support with CMPE

Guidance on Screening of Lead Aprons

EADIE WESTON

According to UK law (the Ionising Radiations Regulations 2017), all personal protective equipment provided should be thoroughly examined at suitable intervals and properly maintained. A program should be in action in your department to ensure this regulation is complied with.

In order to create a suitable program, the details of the lead aprons should be noted and recorded. This includes the thickness of the lead (0.25mmPb or 0.35mmPb), the type of PPE (e.g. thyroid shield, lead skirt) and the type of lead (single or double layer).

Visual inspections are important to look for obvious damage. The British Institute of Radiology reccomends the following procedure:

- Lay the PPE out on a flat surface
- Visually inspect seams for obvious damage

• Check belts and fastening devices are working

• Feel over the surface of the PPE for any lumps, cracks or sagging

X-ray inspections allow for any defects that are not visible to the naked eye are found. There are numerous methods that can be adopted. Using fluoroscopic systems, BIR recommends that a bespoke screening protocol is created as the pre-programmed protocols are unlikely to be optimal. When using CT systems, manually set the exposures and avoid using any automatic exposure control system.

Identifying the rejection criteria for x-ray aprons should be decided at each location with the consultation with your Radiation Protection Adviser. There are different considerations for the rejection of PPE depending on the location of the defect and the requirements of the PPE.

CMPE have seen several purpose built apron screening systems that are being purchased by Trusts, or loaned. CMPE attended to measure x-ray scatter and in beam dose measurements and will issue a risk assessment in due course.

Please contact CMPE if you are aware of plans to purchase or loan a lead screening system.

Medical physics in procurement of imaging equipment

EADIE WESTON

Summary is written based on report published by Institute of Physics and Engineering in Medicine (IPEM) experts in medical imaging physics on behalf of the Clinical Imaging Board (IPEM, RCR and College of Radiographers).

IPEM recommends splitting the phases of imaging equipment procurement into:

• Pre-procurement

• Procurement

• Initiation

• Design

• Construction and Installation

• Commissioning and acceptance

Pre-procurement phase involves establishing a project team that includes relevant persons to advise on the radiation protection requirements, and persons to identify the technical and clinical need for the equipment. The project team should feature relevant clinical managers, radiographers, medical physicists, technology officers and estates. Where the room is not already in existence, the potential rooms and spaces will be evaluated according to access requirements and electrical compatibilities. If relevant, modality specific issues

such as storage of radioactive substances and necessary electric generators should also be discussed. If the room has not previously been used for ionising radiation equipment, the absence or existence of lead shielding should be discussed to find whether lead shielding is sufficient for the suggested use of the room.

Procuring equipment will involve sourcing specifications and quotations for equipment and comparing this with respect to the necessary requirements from the equipment. It may be useful to involve the RPA at this time. Once the quotations have been received the RPA together with the estates and facilities manager will go through the vendor pre-installation manuals and installation plans and provide reports to the project manager on the suitability of each quote with respect to decisions made about location in the pre-procurement phase.

During initiation, liaising with contractors and estates is necessary to produce a project timeline featuring all necessary milestones. Medical physics will need to be involved at this time to ensure that the correct checks have been included in installation plans. Typically, it is important to give Physics as much notice as possible to allow for commissioning/critical exam dates to be built into timelines. This should be assumed to take two days unless otherwise stated. In this situation, it should be agreed whether the installer will provide the critical exam, and the installer should agree the engineering support necessary for commissioning, for example an engineer to be on site on the first day of commissioning.

The project team should provide the RPA with the room blueprints. The RPA can comment on equipment layout in relation to distance from walls and to staff control areas. Furthermore, the rooms surrounding should be disclosed to allow the RPA to consider the occupancy of the adjacent rooms (i.e. staff office or public waiting area). Room design calculations must be completed by the RPA to ensure appropriate shielding is in the walls. To complete this fully, the site must inform the RPA of workload, room usage and expected protocols to be used (i.e. beam directions). The RPA must sign off room plans before work begins.

Before and after the installation of the imaging equipment, shielding checks should be performed to check the integrity of the lead shielding.

Before final sign off, a critical exam must be performed to satisfy to the radiation experts that the designed safety features and warning devices are operating correctly, there is sufficient protection for persons from exposure to ionising radiation and that the equipment is safe to use under normal conditions. Acceptance testing can then be performed to compare the equipment with vendor specifications.

Reference: The Royal College of Radiologists. Imaging equipment from procurement to installation and commissioning: the role of the medical physicist. London: The Royal College of Radiologists, 2023.

Wearing your radiation dose badge

JADDY CZAJKA

The HSE have provided comments on the wearing of body dose badges:

• They shouldn't be attached to ID lanyards which may flap about while being worn.

• They shouldn't be under multiple layers of lead PPE, e.g. at the waist under both skirt and top.

The best position is pinned or clipped to the chest area so that they always face the right way, not in the pocket of the lead and not where the badge is covered by multiple layers of lead e.g. at the waist band where a skirt and top could unrealistically lower the dose to the monitor while your trunk actually gets a higher level of dose.

CMPE are aware of an instance where an ID lanyard and the attached dose badge had been removed from under the lead apron due to it being too bulky. It was placed on top of the image intensifier cart during a session and hence accumulated a reading. The subsequent reading exceeded the investigation level and required following up by interrogating the radiographer on their workload and practice. The formal report concluded that the dose had not been received by the radiographer in person. Since the radiographer is not classified, UKHSA will not amend the recorded dose and it will remain on the dose history. Therefore, it is important to keep the report alongside the routine UKHSA dose reports.

Please remind all staff of their obligation to wear their dosimetry badges appropriately.

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All the Christie 4-digit extensions dialled direct by putting (0161) 446 before extension beginning 3xxx, 918 before 7xxx or 956 before 1xxx.

For email add @nhs.net to get the complete address.

MR Physicists can be contacted on mobile numbers that are shared directly with customers.

Diagnostic Radiology & Radiation Protection Hotline

We routinely work at healthcare facilities across the North West, in The Christie offices and from home. As such, email is the best method of contact for non-urgent advice.

We do have a group HOTLINE (8am to 5pm Mon-Fri) for urgent advice or equipment testing needs/changes:

0161 446 3551

the-christie.cmpe.info@nhs.net

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