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BAMRR news

THE NEWSLETTER OF
THE BRITISH ASSOCIATION OF MR RADIOGRAPHERS

ANNUAL CONFERENCE BOURNEMOUTH

PAGE 11


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welcome

from your BAMRR PRESIDENT

Welcome to the Autumn 2019 edition of the BAMRR newsletter. I hope you have all had a great summer.

My presidential year has flown by, so I will be handing the reins over to Aileen Wilson in October at our annual conference. It promises to be an exciting year ahead, as BAMRR celebrates its 30th birthday in 2020..

I would also like take this opportunity again to thank everyone on the BAMRR Policy Board, who work tirelessly to promote safety and education in MRI on a voluntarily basis, receiving no remuneration except expenses.

We had a good attendance at our BAMRR educational session at UKIO conference on Tues 11th June. Thank you to Jill and our speakers for a fantastic afternoon. Thanks also to Cath and Nimah, who kept us all 'puzzling' with their quiz activities for MR Safety week 22nd-28th July.

Dave and Matthew are busy making the final arrangements for our 36th annual conference in Bournemouth. I hope you will be able to join us on Sat 5th Oct for what promises to be a great educational day out. Prizes of £300 and £150 are on offer for the best oral proffered paper and poster for all the budding MRI radiographers who wish to present on the day. All conference details are on the BAMRR website

Our upcoming BAMRR Introductory MRI course in November is selling out fast, so please register early.

I cannot say it enough but a big thank you once again to all of the policy board members involved in arranging these events and our loyal sponsors for their financial support- without them we would not be able to keep our introductory course fee and conference registration price so low, which has been unchanged for the last few years.

Also, thank you to Guerbet for their continual support of the newsletter.

BAMRR is currently involved in several national MRI projects including:

- An update of the Health Building Note Supplement (HBNS-06) for MRI site planning and design
- Devising a magnet specification document in association with the MR Clinical Advisory group (MR-CAG) for the NHS Supply chain
- A working party developing E-learning modules for MRI safety

BAMRR has representation on both MRAG and the British Institute of Radiology (BIR) MR safety group- these partnerships ensure BAMRR members are kept abreast of all the latest in MRI safety and education. It is vital to establish and maintain relationships with these leading UK institutes.

Our membership continues to thrive, which is great news. Please encourage any student radiographers to take advantage of the free membership option.

We are working on our new website to make membership renewal and event registration more automated - so watch this space...

Finally, the BAMRR educational grant is still available - please see the website for the proforma and if anyone has any articles for our e-newsletter, please let Matthew know.

Wishing you all a lovely autumn and look forward to seeing you in Bournemouth

Rachel Watt
BAMRR President

from your EDITOR

Welcome to the autumn 2019 BAMRR News.

With a fair wind this one should be ready for this year's annual conference on my home patch – Bournemouth. I hope many of you have registered and that we have a full house for the event. We have some great lecturers lined up for the Saturday - the policy board are planning a Friday evening dip in the sea, so hopefully none of us will have caught a cold overnight.

In this edition of BAMRR News I have included a few recent posters from members as well as the usual scattering of articles that I hope you find interesting. Hopefully see you at the Queens Hotel on the 5th.

Happy page clicking……

Matthew Benbow
BAMRR Editor

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WELCOME from our sponsor GUERBET

Guerbet wishes you a warm welcome to the Autumn edition of BAMRR News.

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In November 2015 we completed the acquisition of the "contrast media and delivery systems" (CMDS) business of Mallinckrodt. The new entity brings together 2,500 employees creating a global leader specializing in contrast media and imaging solutions and services (ISS).

We continue our committment to supporting continuous professional development for MR Radiographers. Throughout the year, in partnership with Radiologists/Radiographers who are passionate about sharing their knowledge, we organise and support teaching courses which are informative and relevant. Please visit our website www.guerbet.co.uk to find out more about the events we hold or sponsor.

Do not hesitate to get in touch on 0121 733 8542 or uk.info@guerbet-group.com if there is something you would like to tell us. As always, we welcome your comments and suggestions as we are here because of you.

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INTRODUCTION TO MRI COURSE

Friday 22nd and Saturday 23rd November 2019

Course to be held at the National Centre for Sports and Exercise Medicine (NCSEM) at Loughborough University

Topics include:

- **Hands on scanning**
- **Contrast Agents**
- **Physics – how it works and pulse sequences**
- **Artefacts**
- **Safety**
- **Fat sat imaging**
- **MSK**
- **Neuro**
- **Knee and Lumbar spine**

Registration is via www.bamrr.org

BAMRR Members: £135 Non Members: £185
Cours and membership only £165!

BAMRR Policy Board Members, Autumn 2019

The co-ordination of the Associations activities is overseen and undertaken by an elected Policy Board. BAMRR consists of up to 15 individuals who are full members of BAMRR and are working in different regions of the UK.

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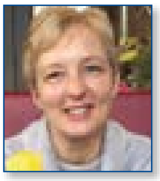

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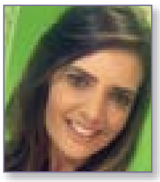

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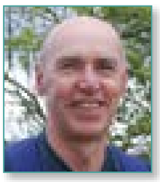

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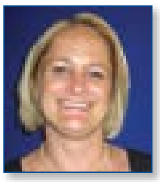

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BAMRR session UKIO report 2019

The first BAMRR session at the United Kingdom Imaging and Oncology Congress (UKIO) was a great success. The UKIO is the permanent amalgamation of two well-known conferences; the UK Radiological Congress (UKRC) and the UK Radiation Oncology Conference (UKRO). It was held at the ACC, King's Dock, Liverpool on 10-12 June.

This event was organised by the Radiology Oncology Congress (ROC) which is a charitable partnership of the British Institute of Radiology (BIR) the Institute of Physics and Engineering Medicine (IPEM) and the College of Radiographers (CoR). The annual event consisted of a three-day multidisciplinary scientific congress and technical exhibition which all runs simultaneously at one location. It is aimed at all those involved in the field of radiological science and radiation oncology and this year attracted over 2000 attendees.

The theme for 2019 was Personalise and Humanise with a varied programme that covered a wide range of topics. This theme was reflected in the BAMRR session, held on Tuesday 11th June. It was chaired by BAMRR President Rachel Watt and co-chaired by Safety Co-ordinator Cath Mills.

Bill Bailey from Radiology Management Solutions gave the first presentation called 'M.R. Sequences to try when you die' and spoke on the subject of postmortem scanning. Bill outlined his own experiences in researching and performing MRI and CT postmortem scans, showing a collection of images that demonstrated how the appearances in tissue differed when compared to a living patient. He spoke about the appearances on T1 and inversion recovery sequences, and his vision for how postmortem scanning should develop in the UK.

In his talk entitled 'MR-Linac: What's under the bonnet', Mike Hutton, Consultant Clinical Scientist at The Christie NHS Foundation Trust, gave an insight into the inner workings of a MR Linac system and how it is installed within the hospital. He explained the value of the MR Linac system to the patient; how the MRI part of the system allows tracking of tumour position in real time, therefore allowing the MR Linac part of the system to more accurately target tumour cells.

Staying on the subject of MR Linac our final speaker was Cynthia Eccles from The Christie NHS Foundation Trust who gave a presentation entitled 'MR-Linac and its implementation to clinical practice'. She spoke about her own personal experiences working with MR Linac systems and some of the successes and challenges faced when setting up a service and using this hybrid technology.

Thank you to those who attended the session, your interest and support is appreciated.

Thanks
Cath
BAMRR Safety Co-ordinator

The potential role of high resolution MRI in guiding the treatment of early rectal cancer:

What a Radiologist Needs to Know

B.Fox, G.Edwards

Background

Screening for early rectal tumours (ERC) has significantly increased the detection rate of non-invasive T1 colorectal cancers. The current gold standard of endoscopic ultrasound (EUS) is failing to adequately deliver on the staging of these cancers and, in turn, has led to a considerable number of patients being subjected to unnecessary radical treatment . Encouraging results from recent preliminary studies[1] suggest high-resolution MRI is able to successfully delineate the degree of invasion in mucosal and muscular layers within the rectum and significantly improve the accuracy of ERC staging; specifically reducing the under/over-staging produced by other diagnostic techniques. This potentially would improve identification of tumours amenable to organ preserving treatment such as endoscopic mucosal resection (EMR) or transanal microsurgery (TEMS). The principal aim of the poster is to educate the reader on the potential of high-resolution MRI in ERC staging with a view to shielding patients from unnecessary radical treatments. This pictorial review will detail the current concerns of ERC staging and will then proceed to explore high resolution MRI's prospective role in addressing these concerns.

Current Practice

The rise in patients presenting with ERC's (T1-T2-N0) has driven the demand for more precise disease staging to guide pre-operative planning. Earlier T1 node negative tumours (see figure 1 for tumour staging) can potentially be treated with minimally invasive EMR/TEMs procedures, instead of the more invasive total mesorectal excision (TME) or anterior resection, reducing patient co-morbidity, mortality and improving outcome.

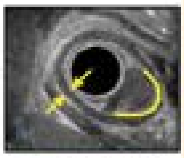
Axial cross sectional imaging provides the majority of the required TNM information. Potentially, the gold standard of EUS (see examples (a) and (b)) can accurately delineate the rectal structures in ERC's[2] but in reality this does not translate to clinical practice. Review of TEM specimens showed approximately 30% and 12-45%[3] were under- and over-staged respectively. It is a technician dependent procedure providing highly variable results and the limited field of view cannot complete staging e.g complete nodal assessment. Hence, it is largely obsolete in most centres.

Kikuchi's classification (figure 1) further delineates submucosal invasion in T1 tumours and has been linked with nodal invasion[4] (see nodal assessment section). Sm1 tumours are more amenable to EMR/TEMs and Sm2/3 tumours are potentially treatable depending on other factors such as nodal disease. ERC patients require this degree of detail to assist with appropriate staging and pre-operative planning. EUS has proven unreliable but current studies suggest high resolution MRI may be the way forward.

Rectal Tumour Staging   T1 Kikuchi Classification

Figure 1

GI Tract Tumour on EUS[2]



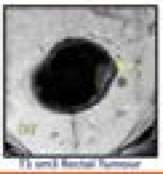
Muscularis Propria Intact[2]

Potential Role of MRI for Guiding Early Rectal Cancer Treatment

High resolution MRI is the gold standard for staging advanced rectal cancer but until recently had been disregarded for staging ERC's. Previously, there was a paucity of good data evaluating the performance of HR MRI for ERC's. Generally, these studies did not differentiate between T1-T2 tumours[2]. The rejection of MRI's capabilities on such data is questionable. However, promising large cohort multi-centre studies that differentiate between early tumour stages are underway (MINSTREL)[1]. This will legitimately evaluate HR MRI's potential for pre-operative staging.

MRI excels at providing soft tissue contrast (see (a) and (b)) which is imperative for the challenging interpretation of submucosal invasion in ERC's. Potentially, it would be able to identify safe surgical resection planes, high risk extramural vascular invasion and assess remote disease in the mesorectum or pelvic sidewalls[5]. The HR technique developed in the 1990's for advanced cancer would require optimisation for ERC's; the following section explores potential strategies to implement this.

T1 sm1 Rectal Tumour



T1 sm3 Rectal Tumour

Optimising the MRI Technique for Staging

1. **Improve delineation of the rectal layers**

- **Endorectal Coil**

The endorectal coil (a) is designed to improve the signal to noise ratio (SNR). Consequently, this allows for better delineation of the rectal layers which assists with the staging of ERC's. However, the coil is expensive and not widely used; and patient compliance is an issue.

Endorectal Coil[7]

- **Rectal Distension**

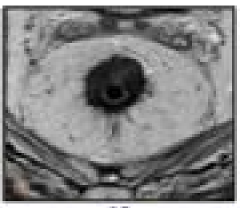
Rectal distension with liquid (c) or gas has been deemed beneficial in detecting small tumours. However, the practice is contentious as the resultant compression of mesorectal fat reduces the distance between the tumour and mesorectal fascia which may lead to overstaging[8].

Liquid Contrast Distension

- **3T MRI**

The increased SNR of the 3T field compared to 1.5T provides higher resolution and distinction between the rectal layers (c) & (d)) with multiple studies reporting an overall increase in accuracy of T-staging[2,7]. Additionally, the advent of dedicated external coils is predicted to further enhance staging capabilities. However, the higher resolution image can lend itself to interpretation difficulties[2] which emphasises the need for reporting optimisation.

1.5 T



3 T

Optimising the MRI Technique (continued)

- **Buscopan**

Motion artefact can significantly degrade rectal imaging (as demonstrated in (e) & (f)). The general consensus at the ESGAR 2012 meeting concluded that use of routine spasmolytic's was advised for rectal imaging unless contraindicated[6]. They were found especially useful in limiting motion artefact more proximally in the higher rectal tumours as this region is more susceptible.

Without Buscopan

With Buscopan

2. **Nodal Assessment**

Despite optimisation, rectal layers may not be adequately visualised for tumour staging in every study but HR MRI can assist with other aspects of staging e.g. nodal assessment. Size criteria alone is insufficient for distinguishing between positive and negative nodes but when used in combination with morphological criteria (figure 2) it can yield clinically relevant conclusions. Moreover, Kikuchi et al[4] confirmed a relationship between the degree of submucosal invasion and lymphovascular invasion (SM:nodal mets% likelihood; sm1: 2%; sm2:8%, sm3:23%) to further evaluate lymph node involvement. This highlights the importance of optimising anatomical resolution with HR MRI.

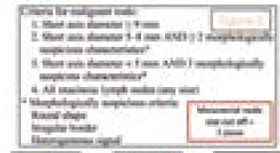


Figure 2

Heterogenous   Irregular Border   Round

3. **Extra-Mural Vascular Invasion**

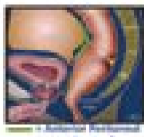
Extramural vascular/venous invasion (EMVI) had previously not been included in the risk stratification of rectal cancer. Recent research has confirmed its importance as a poor prognostic indicator[1,2]. Consequently, it has now been advocated at the ESGAR meeting in 2016 for inclusion in standard rectal cancer reports[6]. The next challenge is to ensure consistent interpretation of such findings.

EMVI

EMVI

4. **Position of the Tumour and Peritoneal Reflection**

The mesorectal fascia at the mid-high portion of the rectum is replaced by the anterior peritoneal reflection (APR) anteriorly. It is important to delineate the position of the APR when pre-planning treatment as it raises the surgical risk of small bowel injury, pre-empts tumour spread pathways and guides radiotherapy management[6]. HR T2W images are optimum to identify the APR (j).



= Anterior Peritoneal reflection[6]

T1 sm3 Tumour

Optimising the Radiologists Reporting Technique

With the advent of improved imaging techniques comes the task of correct interpretation of tumour characteristics. The importance of various tumour characteristics e.g. EMVI are gradually being elucidated by research but in order to be of value to the patient's management the reporting radiologist must be aware of them and able to interpret the imaging. Inconsistent reporting has been an issue in recent years. This has been fuelled by the number of cases individual radiologists have been reporting, the difference in report style and what specific characteristics are included[2].

This can principally be tackled in two ways; dedicated training and a standardised reporting proforma. It is not sufficient to learn on the job, targeted training is required in the form of up to date courses to educate the radiologist. Additionally, agreeing upon a standardised reporting proforma (figure 3) that reflects the most recent research is imperative to uniformalise reports[6]. This will ensure evaluation of all the important tumour characteristics which would optimise the patients management plan and outcome.

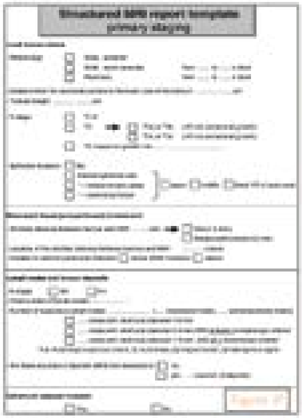


Figure 3

Conclusions

- Layers can be seen in HR MRI which may help identify ERC's suitable for organ preserving surgery.
- Even if layers are not seen, other tumour characteristics can be evaluated.
- Improving the Radiologists reporting technique is as important as improving the imaging.

References

Contrast to Noise Ratio (CNR)

Melany Palmer *and* ***Matthew Benbow****, Royal Bournemouth Hospital*

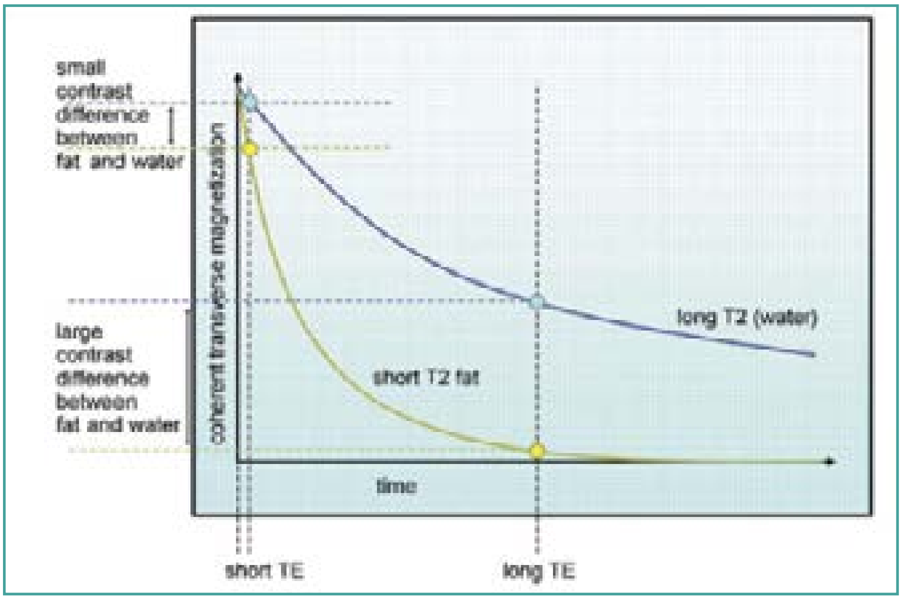
Signal to Noise Ratio (SNR) is a concept familiar to most MRI radiographers. It reflects image quality, based on the relative brightness seen in our images as a consequence of actual detected signal (true patient anatomy) versus randomly superimposed (unwanted) signals. Better image quality comes as a result of a larger difference between these two, i.e. a higher SNR. As such, sequences are usually built and saved within our scanners to provide acceptable SNR for the clinical questions to be answered. If on occasion an image is produced that is lacking in SNR, radiographers should be able to readily and instinctively spot this and decide on how to best repeat the sequence to make an improvement – usually by either compromising the image resolution and/or the scan time in some way.

Contrast to Noise Ratio (CNR) however is understood less well. Whilst it also gives us a measure of image quality, it seeks to describe the ability to perceive neighbouring structures of differing tissue type, i.e. their difference in their SNRs.

In this way, the level of CNR to achieve diagnosis may be higher in some body areas where lesions are subtle, perhaps liver MRI, yet lower where inherent contrast is strong, for example angiography. So in short, images may be high or low in SNR and CNR independently of each other, and depending on what you are looking at, this may be just fine.

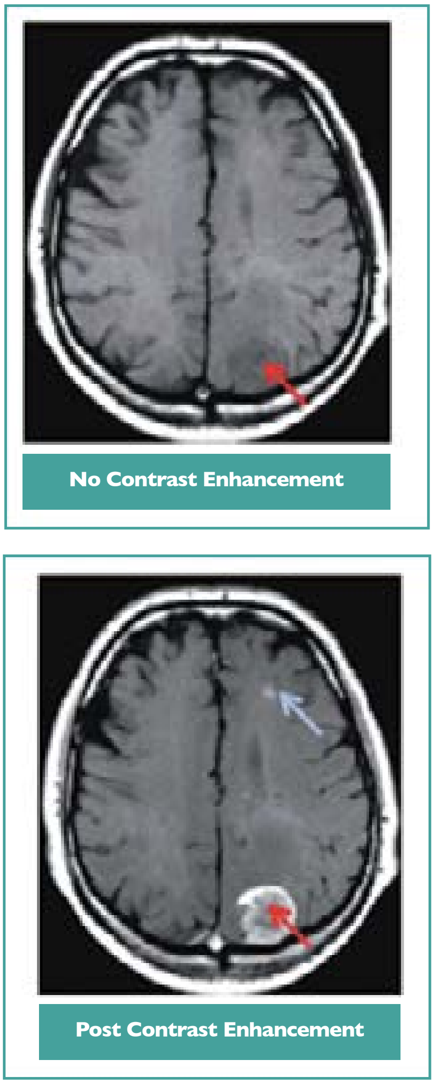
To help understand the concepts of CNR further, Melany Palmer, Senior MRI radiographer at the Royal Bournemouth Hospital, has investigated how to improve CNR, whilst at the same time recognising the inevitable and consequential trade-offs.

To improve the contrast to noise ratio (CNR), the difference in signal intensity between adjacent structures needs to be enhanced. This is achieved by exploiting the intrinsic and extrinsic contrast parameters to either enhance signal from the relevant tissues, or decrease the signal from the normal tissues. (Westbrook, Kaut Roth and Talbot, 2011).



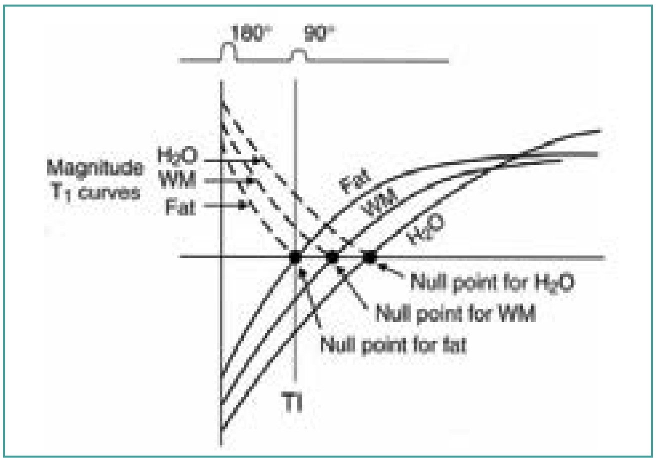
◆ **Figure 6.1. The T2 decay ciurves in fat and water (Westbrook, 2016, p.18)**

Pathological tissues are typically associated with oedema or a high capillary density (McRobbie, et al., 2017). The use of T2-weighted images, which display water as hyperintense to the adjacent tissues, will therefore improve the CNR between pathology and the surrounding normal tissue. Figure 6.1 (Westbrook, 2016, p.18) displays the T2 decay curves of fat and water, demonstrating the large contrast difference achieved with the long TE values utilised in T2-weighted images. Due to water molecules being spaced further apart than fat molecules (Westbrook, Kaut Roth and Talbot, 2011), water has a longer T2 decay time than fat, as their spin-spin interactions are more infrequent than in tightly packed fat molecules. Their T2 time is therefore relatively long compared to fatty tissues, resulting in a larger contribution to the signal, thus appearing relatively hyperintense to the adjacent structures. If T2-weighted images are produced with conventional spin echo sequences, long TR and TE values are required which results in a long scan time (McRobbie, et al., 2017). FSE sequences are typically used to achieve T2-weighting as they significantly reduce scan times. The image contrast is however, compromised by the multiple RF pulses which reduce the effects of the spin-spin interactions in fatty tissue, thereby lengthening their T2 times. Fat is displayed as hyperintense relative to the surrounding tissue, which may obscure any fluid content within the tissue.



◆ **Figure 6.2. Axial T1-weighted image of the brain pre- and post-contrast enhancement, in a patient with metastatic disease (Westbrook, Kaut Roth and Talbot, 2011, p.377).**

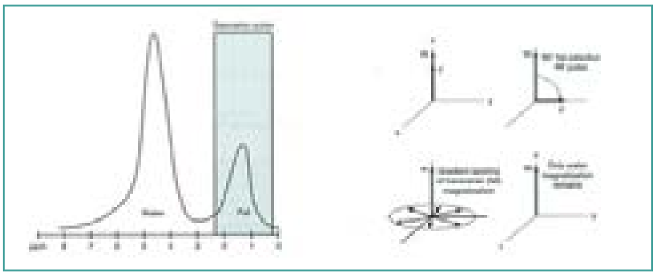
Some disease processes do not have a high-water content and will have a low CNR relative to the surrounding tissue (Westbrook, 2014). T1-weighted images produce a higher SNR than T2-weighted images; however, they generally display pathology and water as isointense. This is demonstrated in figure 6.2 (Westbrook, Kaut Roth and Talbot, 2011, p.377) where a brain metastasis is hypointense to the brain tissue (red arrow) prior to gadolinium contrast enhancement. Xiao, et al. (2016) ascertain a method to improve differentiation of these tissues, is to introduce a contrast agent. The majority of MRI contrast agents contain gadolinium as it possesses a high magnetic moment and is the most stable ion with unpaired electrons. This renders them strongly paramagnetic, thereby having positive magnetic susceptibilities which shortens the T1 relaxation time of the neighbouring water molecules, resulting in an increased signal intensity on T1-weighted images. The same metastasis is demonstrated post gadolinium contrast enhancement (red arrow), showing improved CNR. A small metastasis (blue arrow) that was inconspicuous without contrast enhancement, is now visible on the post-contrast image. Dorazio, et al. (2014) note that pre- and post-contrast enhanced images are usually required for diagnosis, which adds to both scan time and cost.



◆ **Figure 6.3. The different null points of fat, water (H$_2$0) and white matter (WM). In the STIR sequence, the TI is set so that the T1 recovery curve of fat crosses zero at the time of the 90˚ excitation pulse (Hashemo, Lisanti and Bradley, 2017, p.84)**

Tissue suppression techniques are used to selectively suppress either fat or water signals (Hashemi, Lisanti and Bradley, 2017), which enhances the tissues of greater interest, such as pathology, thus improving the CNR. Figure 6.3 (Hashemi, Lisanti and Bradley, 2017, p.84) illustrates the inversion recovery (IR) pulse sequence which utilises a 180o inversion pulse at the beginning of the sequence to fully saturate the spins. The excitation pulse is applied at a time TI (time to inversion), which is set at the null point of fat in the diagram, so that only these spins will be fully saturated, and will therefore not contribute to the signal. The TI can be set to the null point of individual tissues depending on their T1 recovery times, thus determining the weighting of the image.

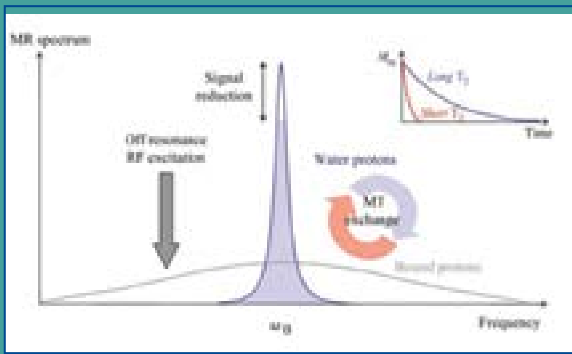
Short TI inversion recovery (STIR) sequences are used to supress fat signals and fluid attenuated inversion recovery sequences (FLAIR) are used to null fluid signals. IR sequences do however, require long TR values to allow for full T1 recovery, which increases the acquisition time. All tissues with a similar T1 time will be supressed at the same TI value and can therefore not be differentiated. For this reason, STIR sequences cannot be used post-gadolinium enhancement due to its T1 shortening effects which renders the pathologies T1 time equivalent to that of fat.



◆ **Figure 6.4. The fat peak is selectively saturated by a narrow bandwidth RF pulse (Questions and Answers in MRI, 2017c).**

The different precessional frequencies of fat and water can also be exploited to improve the CNR (Del Grande, 2014). At 1.5 T the precessional frequency of fat protons is 220 Hertz (Hz) lower than water protons. This allows for chemical shift selective suppression (CHESS) of either fat or water protons. CHESS is proportional to the main magnetic field; higher field strengths experience a wider shift between the fat and water peaks, allowing for more selective saturation, while lower fields may have heterogenous fat suppression, as the distance between the peaks is shortened, and overlap may occur. Figure 6.4 (Questions and Answers in MRI, 2017c) demonstrates fat suppression which utilises a 90o pre-saturation pulse with a narrow bandwidth centered on the resonant frequency of fat. The diagram further illustrates how the fat spins are flipped into the transverse plane and dephased with the use of a spoiler gradient, so that only magnetisation from water protons contribute to the signal.

Compared to IR sequences, CHESS techniques are relatively fast with a high SNR (Del Grande, 2014). They are however, sensitive to field inhomogeneities and are therefore less suited to large FOVs, off-centre imaging, and imaging of metallic implants, which increase susceptibility artefacts. STIR imaging in contrast, is insensitive to field heterogeneity and is therefore widely used in these instances.



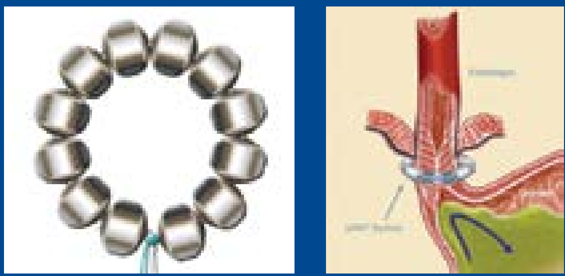
◆ **Figure 6.5. MT exchange between free water protons and bound water protons (McRobbie, et al., 2017, p.140).**

Magnetisation transfer contrast (MTC) is a technique used to supress background tissues, thereby improving CNR by enhancing visualisation of smaller vessels and certain disease processes (Westbrook, 2014). Hydrogen protons within the tissues are typically classified into two groups; the "free pool" of mobile water molecules, and the "bound pool" of tightly bound macromolecules (Gambarota, 2012). The MR signal is usually generated from the free pool of molecules, as those in the bound pool have very short T2-relaxation times, thus contributing very little to the signal intensity. As demonstrated in figure 6.5 (McRobbie, et al., 2017, p.140), MTC is achieved by utilising an off-resonant RF pulse applied prior to the excitation pulse. This saturates the bound protons which causes them to exchange some of their saturated magnetisation to the free protons (Westbrook, 2014), resulting in reduced signal intensity from the protons in the free pool.

Safety Update LINX Implant

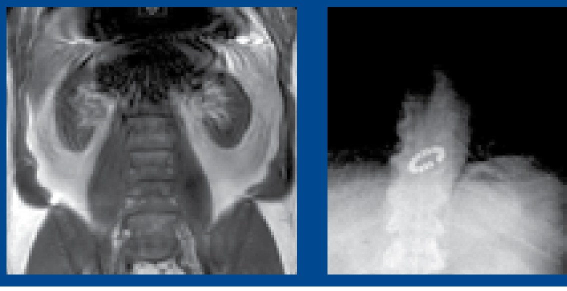
Pauline Hall Barrientos, *Greater Glasgow and Clyde NHS*

◆ **Figure 1. a) Schematic of the LINX implant closed b) LINX around the LES**



◆ **Figure 2. Implant card given to the patients**

◆ **Figure 3. a) MRI of device b) X-ray of LINX implant**



The LINX Reflux Management system is used for patients with Gastroesophageal Reflux Disease who continue to have chronic symptoms despite of medical therapy. The implant consists of titanium beads with magnetic cores (yes magnets) connected by a titanium wire, as shown in figure 1a. The beads surround the lower oesophageal sphincter (LES) and magnetic force between the beads compresses the LES (figure 1b). This additional support prevents gastric pressure pushing open the muscle, stopping reflux into the oesophagus. If you have ever played with magnetic bracelets you will also know that with enough force one can expand the bracelet. Therefore, this property allows the beads to expand when food is passing through into the stomach.

Although there are magnets present the implant is MR conditional. However, it is important to know which LINX device the patient has. Patients who have had the device implanted prior to 22nd May 2015 they should not be exposed to an MRI greater than 0.7 T. After this time the patient should not be exposed to a MRI greater than 1.5 T. Patients will typically be given an implant card to identify which implant they have (figure 2). Figure 3 shows an example of a LINX implant imaged by MRI and x-ray. It can be seen that there is large artefact around the implant in the MRI image.

British Association of MR Radiographers

Annual Conference

Saturday 5 October 2019

Queens Hotel, Bournemouth

Provisional topics:

Non-conditional pacemakers

Experiences from an extremity scanner

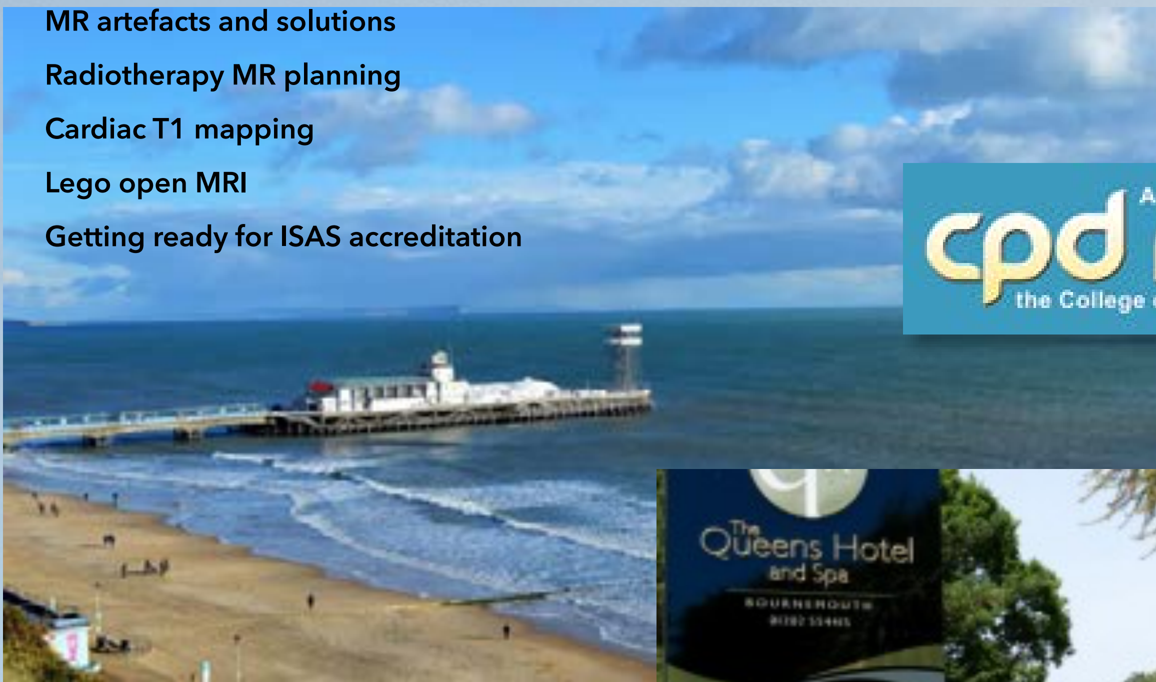
MR artefacts and solutions

Radiotherapy MR planning

Cardiac T1 mapping

Lego open MRI

Getting ready for ISAS accreditation



Accreditation by cpd now the College of Radiographers

Members £55

Non-members inc. one year membership £85

Non-members £100

Registration opens in June at www.bamrr.org

We have negotiated a very competitive accommodation rate of £64 pppn B&B, and £74 pppn Dinner, B&B. Limited number of rooms available and you must book direct by emailing: dale@queenshotelbournemouth.com

There will be a live band at the hotel on Saturday evening!

AN AlwaysEvent® IN MRI

Darren Hudson BSc(hons) MHSc PgCert (Mgmt) PgCert (ClinEd) – MRI Clinical Lead
Carrie Monteith BSc(hons) – Senior MRI Radiographer
Danielle Blake – MRI Clinical Assistant
Dale Gardiner – MRI Clinical Assistant

INHEALTH

Background

AlwaysEvents® were developed in the United States by the Picker Institute and is a quality improvement tool focused on patient experience (IHI, 2016). The methodology has been adopted by NHS England (NHSE) as part of the governments objective to ensure that patients, their families and carers are involved, through co-production, in defining what matters most in the quality of experience of services and assessing and improving the quality of NHS services (Marshall, et al, 2016).

In contrast to a 'Never Event' commonly referred to in incident management terms, the concept of an AlwaysEvent® is based around something that should always happen in relation to patient experience. At the heart of this approach are patients and the concepts of co-design and co-production to ensure their involvement throughout (Marshall, et al, 2016). As part of our endeavour to continually improve the experience of having an MRI scan for our patients, the organisation signed up to developing an AlwaysEvent® and piloted this at a hospital based site.

Area Identified	Outcome
1. Clearer direction to department	Improved signage along the corridor from the building entrance with pop up banners
2. Information on notice boards	Purchased and displayed in the waiting area containing information on having a scan and useful resources
3. Information on delays and appointment times	Notices designed and on display showing who is on shift that day and whether there are delays to scan times
4. Ambience of waiting room	A local photographer provided a choice of local photos on which patients voted for their preference and the final 3 were printed and displayed
5. Free WiFi	Under discussion with IT
6. Hot drinks in reception	Discussed with patient representative and decided not to pursue

1. Set up and Oversight

Executive sign off for support was given to the project. Members of the local team were identified to form the **'point of care team'** to lead the event locally, and an **'oversight team'** consisted of the departments registered manager and the organisations MRI Clinical Lead to help keep the project on track.

2. What Matters to Patients Locally

The first step was to identify areas for improvement. Reviewing local feedback from Friends and Family tests (FFT) provided limited insight into areas for improvement with the department averaging 98.2%. The complaints rate was also low and so a survey was used to engage with local users of the MRI service to better understand what mattered to them when attending the department for a scan. The initial survey again proved limited in value and so a further survey was conducted asking them to rate their emotional journey as they attend and go through the process of having their scan.

The results of this showed that emotionally their journey started off particularly low when arriving and waiting, improving as they proceeded through their journey with us – see progress chart below. Along with comments, this therefore demonstrated the need to improve the **'Warm Welcome'** for patients attending for scan. This was further supported by conducting a 15-step challenge (NHS England, 2017) with our Director of Clinical Quality and an observational report by the Patient Experience Network (PEN) – both of which further reinforced this as being an area for clear improvement and of benefit to our patients.

15 Steps Challenge
Quality from a patient's perspective

3. Vision and Aim Statements

Based on the feedback and identified areas for focusing the AlwaysEvent® on, the team developed an overarching Vision statement and supporting Aim statements in the voice of the patient. These were then reviewed by patients as part of the next round of surveying to see whether these made sense and fitted with what they had told us.

Vision Statement:

"I will always feel welcomed on arrival, fully informed and at ease whilst waiting for my scan.

Aims Statements:

- Average of **80% positive emotional journey responses** for arrival and waiting (warm welcome) reported by April 2019
- **80% of patient will agree or strongly agree** to being informed of next steps whilst waiting for their scan by April 2019

4. Measures

Three sets of measures were used throughout the project.

Process Measures – to check any actual interventions are working
15-step challenge and regular observation (beginning, throughout and in April)

Balanced Measures – to check no adverse effects as a result of the changes
Staff engagement survey (beginning, Feb and April). Conversation with staff (throughout)

Outcome Measures – to check the changes are actually providing improvement
Patient survey (beginning, Jan, Mar and Apr, continued 3 monthly for maintenance)

5. Interventions

To decide which areas of the 'Warm Welcome' to focus efforts on, patients were asked to vote whilst waiting for their scan. The outcomes were those around making for a more

informed and thoughtful wait.

6. Progress so far...

The final measure to meet the aims for April 2019 had to be delayed due to issues with implementing some of the waiting room changes. However, the interim measure in Feb 2019 showed progress was being made in terms of the warm welcome when attending and waiting for their scans. The responses on agreement on being an informed wait showed some decline, although the sample size was smaller and not all waiting room interventions had been completed at that time. Interestingly the dip in emotional state experienced at scanning was more evident...

	Sept 2018	Feb 2019
"Whilst waiting, I felt at ease and informed of what to expect next"	86.60% (N=33)	80% (N=12)

Patient Involvement

One of the challenges faced was the brief time that is spent with our patients making it more difficult to build rapport and engage with them in a meaningful way.

We therefore had to rely on surveys and voting polls to maximise engagement which potentially has limited the level of co-production possible. We managed to engage one member of the hospital patient group to attend the department and provide some invaluable feedback on the work that was being conducted. So far almost 100 patients and service users have been surveyed as to what matters to them when coming to Eastbourne for an MRI, and their emotional journey has been recorded.

Conclusion

The ongoing AlwaysEvent® shows the potential for improvement based on what is important to patients locally. There are challenges with obtaining patient engagement within this environment where contact time is short, but this was achieved through differing approaches for capturing input.

Whilst initially the feedback confirmed much of what we knew and supported the good FFT scores and feedback normally given to us, still some great areas for real positive improvement have been developed and implemented with support from patients.

Next steps

...to perform the final measure to evidence desired improvement and attainment of the aims statements, sustain the changes implemented within the department, and share the learnings across the organisation.

PATIENT EXPERIENCE AT INHEALTH MEANS...

Providing **great care** to **all service users**, from **referral to results**, that is **timely, informed** and **personal... always!**

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NHS England (2017) The 15 Step Challenge: Quality from a Patient's Perspective. A Toolkit for Clinics and Outpatient settings. NHS England

PEN

Acknowledgements

Wendy Wilkinson – Director of Clinical Quality
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Eastbourne MRI Team
Ruth Evans MBE – Patient Experience Network

INHEALTH | MAKING HEALTHCARE BETTER

Royal Mail celebrates British engineering with set of special stamps

02 May 2019

Royal Mail is celebrating some of the marvels of British engineering from the last 50 years with a new set of ten stamps available from today. They feature three past winners of the Royal Academy of Engineering MacRobert Award, which marks its 50th anniversary this year.

From the smallest of computers, the Raspberry Pi, to the three-way catalytic converter developed by Johnson Matthey, and Oxford Instruments' superconducting magnets that enable MRI scanning, the UK has a long and proud history of engineering. All three innovations are former MacRobert Award winners

Superconducting magnet for MRI

Today, magnetic resonance imaging (MRI) is used routinely in hospitals around the world to generate pictures of the insides of our bodies to help diagnose maladies such as cancer, internal bleeding or infections. This revolutionary, non-invasive technique would not be possible without powerful superconducting magnets, which were first developed in the 1960s and in the 1970s applied to body scanning by Sir Martin Wood of Oxford Instruments. The first electromagnet was invented by British scientist William Sturgeon in 1824, and today's superconducting magnets are based on the same principles.

A superconducting magnet is made up of a large coil of wire that, when electricity is passed through it, produces a strong magnetic field thanks to the laws of electromagnetism. The coil itself is made from very thin filaments of a niobium-titanium alloy, which are embedded in a copper matrix. This material becomes superconductive if it is cooled to below ten kelvins (–263°C). In this state, it has nearly zero electrical resistance and, once created, the magnetic field is self-sustaining – it does not require external power during operation. To achieve these cryogenic temperatures, the superconducting coil is cooled using liquid helium and is insulated from the warmth of its surroundings by a vacuum. In this way, the coils in MRI machines can produce magnetic fields that are around 50,000 times that of the Earth's magnetic field. The Royal Academy of Engineering awarded Oxford Instruments the MacRobert Award in 1986 for their work on superconducting magnets

SMUG 2019 report

This years Southern Magnets User Group meeting was hosted by the MRI Department at Derriford Hospital in Plymouth.

The day began with a talk on Paediatric MR Imaging by Ellie Lloyd Lead MR Paediatric Radiographer at University Hospitals Plymouth. She discussed processes put in place within the Trust, following audit, to try and reduce the number of GA sessions performed as well as on-going projects specifically related to the paediatric service.

Next up was Vicki La Roche who discussed her research into Prone Lumbar Spine Imaging performed at UHPT performed as part of her University Masters program.

Principal Radiographer Christine Heales followed on with a talk titled Business Planning a Growing Department. It gave oversight into how the MR department at Derriford has expanded greatly over recent years and the strategies Christine has used to source funding, restructure staffing and strategically plan ahead to get the department to where it is today.

Peter Wright, Director of Healthcare Sciences and Technology at UHPT discussed the role of the Physics Department within MRI both at Plymouth and other large centres he has previously wotked. It provoked a good number of questions and discussion amongst the audience

Guest speaker Cheryl Richardson, Superintendent MR Radiographer travelled from The Royal Marsdon Hospital, London to speak on Radiotherapy planning. She gave insight into the vast number of planning scans, use of fiducials and cyberknife treatment performed at the centre.

Evelyn Perkins GI Advanced Practice Radiographer at UHPT gave a comprehensive talk on Small Bowel Imaging. It included patient preparation, scanning technique and sequences, anatomy, pathology, image interpretation and treatments for certain conditions.

Consultant Neuro-Radiologist Lucy McGavin covered functional MR imaging. Why it is performed and how it is best achieved, the difficulties and how the results may affect neurosurgical treatment options.

Georgina Kirby, MR Radiographer gave a talk about Human Factors and retold a couple of scenarios where human factors had come into play, lessons learnt and steps taken at UHPT to reduce errors caused because we're human!

Tim Relf, Advanced MSK Practice Radiographer talked about a Knee one-stop-shop set up at UHPT where patients can be sent for an MRI scan which is Radiographer reported all at the time of their outpatient appointment. He discussed the pros and cons of setting up such a service.

The day was rounded up by Sophie Sweeting, Quality and Governance Lead MR Radiographer who held a quiz, testing and teaching Mri quality issues

Following this really busy and informative day a Treasure Hunt was held at Plymouth's Historic Barbican. A good time was had by all with only a limited number of attendees managing to complete the 6 tavern challenge!

USE OF SIMULATION TECHNIQUES IN MRI TRAINING

INHEALTH

Darren Hudson BSc(hons) MHSc PgCert (Mgmt) PgCert (ClinEd) – MRI Clinical Lead
Jenny Corden-Jolly BSc(hons) – Senior MRI Radiographer & Training Co-ordinator

Background

What is simulation?

Simulation can be described as 'the technique of imitating the behaviour of some situation or process by means of a suitably analogous situation or apparatus, especially for the purpose of study or personnel training' (Oxford English Dictionary, 2019). Zorn, et al (2018) also cite it as 'an active teaching method involving active participation of students in their learning'.

The use of simulation techniques in education and healthcare has become more prevalent over the past 50 years and translates into multiple learning objectives being taught in realistic clinical environments, without any harm to patients (Willard & Doyle, 2005; and Gibbs, 2015). Various studies have found that students report simulation exercises to have benefit to clinical practice as they have the time to practice and repeat tasks without time pressures of a busy clinical environment (Gibbs, 2015).

Simulation models and techniques align with all four learning opportunities for adults identified in Kolb's Learning Cycle (Bruce, 2015), and also with the 4 tiers of Miller's pyramid resulting in consolidation back in to clinical practice (Willard & Doyle 2005).

Simulation based learning has been shown to promote patient safety, communication and teamwork amongst healthcare professionals (Aura, et al, 2016). This leads to better operational treatments and expedites competencies for learners, resulting in increased confidence. Simulation better prepares students for the clinical environment through **'Active Participation'** which enables students to progress along a spectrum from passive observation through to performance (practice) (Dornan, et al, 2007). Practice through simulation ultimately benefits patients as learners can practice skills required to do their job through trial and error in a safe, non threatening environment closely representing reality (Lindel & Pollepet, 2005).

Context

Due to a national shortage of diagnostic radiographers within the UK, there is a lack of experienced MRI staff available to fill vacant posts and support service delivery of increasing clinical complexity. In response, an internal demand for development of less experienced staff within MRI at InHealth was identified.

This has led to the redesigned Emerging Talent Preceptorship programme which aims to provide structured training and support to both graduate and band 5 radiographers wishing to specialise in MRI.

Through the redesign of the programme, simulation was considered an important aspect to incorporate in order to help expedite development of competence, and in turn operational usefulness to fill the vacancy demand. Based on research, literature and personal experiences of training it was felt that this would be a useful way to induct trainees in to their new roles. **Three different methods of simulation were introduced**. As debriefing is a central step of the simulation process (Zorn, et al 2018), feedback was gathered both on trainees and from trainees throughout.

Simulated Safety Screening Scenarios

The concept behind these sessions was to provide trainees with the opportunity to practice and build confidence in preparing patients for MRI. Actors were briefed and used to portrait a mixture of patient presentations with trainees tasked at screening and preparing them for scan. This was conducted in small groups of 4-6 with a facilitator. The group then observed and fed back on each other based on the principles of ALOBA (Agenda Led Outcome Based Analysis) with constructive feedback driven by each participant as to what they felt they may struggle with or wanted specific feedback on (Silverman, et al, 1997).

In particular it was around **communication skills to support rapid rapport, ask appropriate questioning and manage potentially challenging behaviours** which could inhibit eliciting valuable histories to ensure safety. **Engaging and effective screening to be able to obtain a reliable and sufficient medical history is essential** (Hudson & Jones, 2018). The challenge is often the short period of time in which to do this (5-10mins) and is therefore something that improves with experience. In addition, trainees will be used to using "medical language" which may or may not be meaningful to the patient.

Feedback from the group was mixed, with the expected fear of role play and 'performing' in front of others they have just met. This has been acknowledged in previous studies concerning role play (Zorn, et al, 2018). Together with the findings of their study, we also found that giving trainees a clear understanding of what was expected of them helped. Despite feedback from our groups being mixed, **69% felt the session content, relevance and usefulness was either good or excellent.**

> Really enjoyed the screening sim. Gave me positive reassurance about how to deal with an array of patient types.

Coils and Positioning

To familiarise trainees with the scanning environment which may be new to many, a mobile MRI scanner trailer was brought into the hotel car park. This was in part used for equipment orientation and to show trainees where certain key pieces of equipment were, but also an opportunity to **interact with the scanner, handle coils and position each other** for various routine examinations in preparation for the clinical environment.

In small groups with a facilitator, trainees were shown coils and the gantry controls and then each given an examination to talk through set up and position for.

98% rated the session contents and relevance as either good or excellent, with 93% rating it useful.

> Positioning sim was covered well – experience of how it feels for a patient

> Chance to see actually what we'll be doing

Online MRI Scan Simulator

Access to an online virtual scanning interface was purchased which allows learners to practice scanning techniques such as slice placement and parameter changes. The tool came preloaded with cases and there were some issues with being able to upload further bespoke cases and so the quality and usefulness was limited.

Trainees worked in pairs, working through worksheets which guided them through the process of performing a scan, getting them to critically appraise parameters and resultant images whilst also practicing slice and sat band placement etc.

The intention of the simulator, which is also accessible from home, was to encourage trainees to practice the simple steps of **hand-eye co-ordination** around a generic scanner platform to **support muscle memory and to gain confidence** in this part of their role.

> More consequence from adjusting parameters/ positioning to enable us to learn from mistakes

However, the level to which the simulator reflects real life scanning is significantly limited and this resulted in feedback from trainees being extremely mixed.

Only 69% of responses agreed or strongly agreed use of the simulator helped support their understanding and application of clinical knowledge (mean score 3.8 on a 5-point Likert scale, n=35) which reflects their indifference to the use of this piece of technology.

> Not great when I've been scanning. Very restrictive compared to real life. Maybe nice to see how the different sequences affect the image.

> Sims were not very useful to me.

Some of the minor issues with the software have now been resolved and the approach next time is to be more prescriptive in its use and guide learners through the task of a scan step by step. It was felt that the sessions were too self-directed which meant learners did not fully engage and therefore didn't get as much as was expected out of the sessions.

Interestingly, feedback from session facilitators was all extremely positive and how such a tool would have been great when they underwent training.

> A fantastic opportunity for trainees to be able to get to grips with the technique of scanning, having the time and chance to ask questions each step of the way.

Conclusion

The aim of introducing more simulation based teaching into the preceptorship programme was to help **expedite required clinical skills** to support gaining competence sooner through **building confidence to more actively participate back in the clinical environment**.

Dornan, et al (2005) suggested that the clinical environment is much more threatening than the seminar room and that uncertainty is more of a demotivator than a motivator. By trainees acquiring skills in a simulated clinical environment it was hoped that it would equip them better to perform back in the clinical environment, feeling more confident, motivated and prepared.

After each teaching block (30 days in total) trainees were asked how much they agreed with the following statement – *'I feel more confident and prepared to more actively participate in the clinical environment'* – an average 84.2% agreed or strongly agreed (mean score 4.3 on a 5-point Likert scale, n=[illegible]). This positive feedback has ensured that we will continue to include and develop this particular component of the training programme.

References

[illegible]

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THE BRITISH ASSOCIATION OF MR RADIOGRAPHERS

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why?

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