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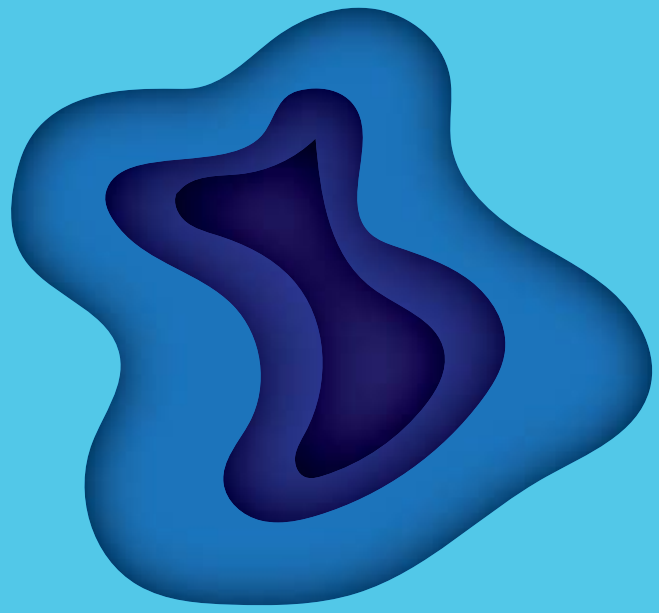

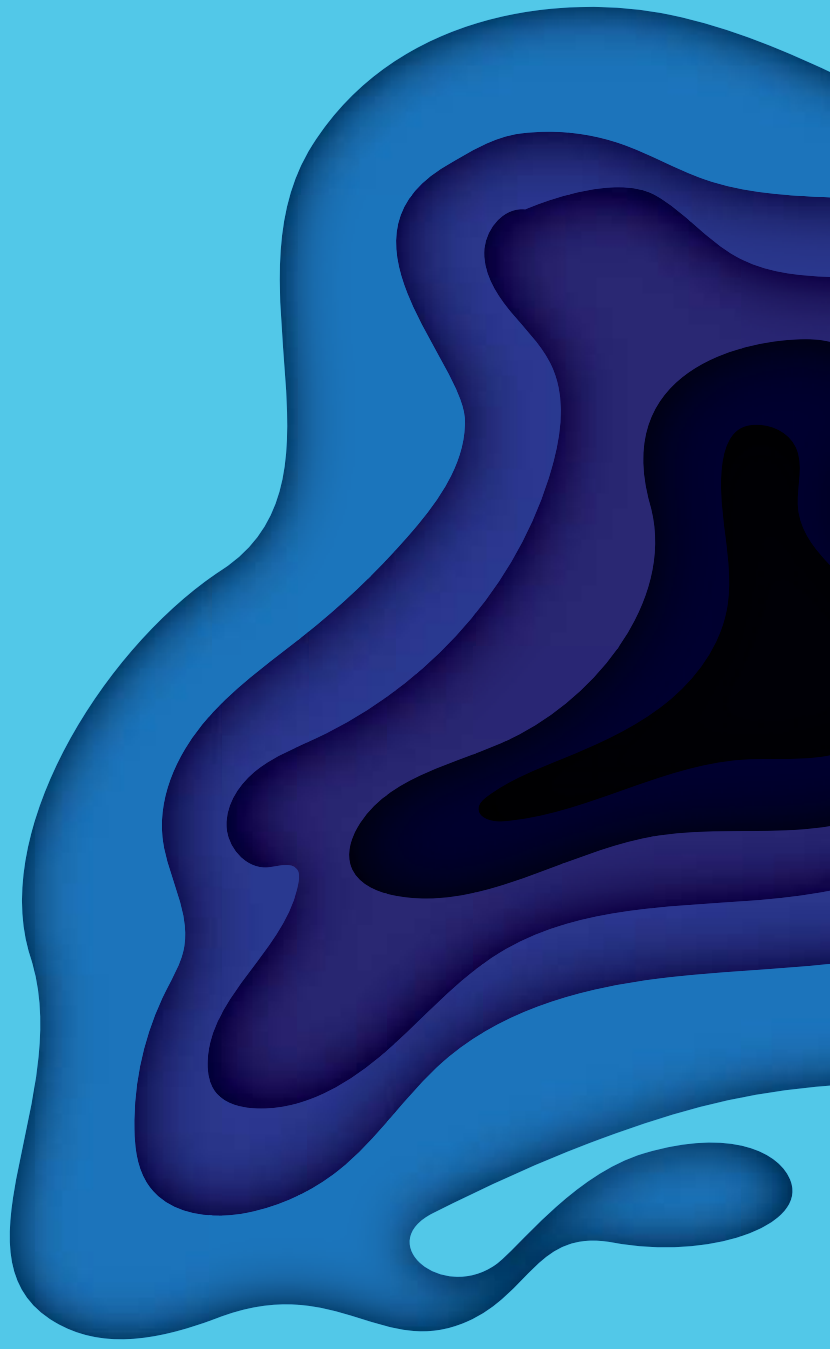

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Editorial

Another year has passed and I am still here as Editor, so I am guessing that I did not do too bad a job last time round.

Once again, I need to say a huge thank you to Charlotte Beardmore and Mel Armstrong for their support, advice and guidance. Thank you to all of the authors for their contributions to this, my second issue as Editor of *Imaging and Oncology*.

I hope that this edition provides something that will be of interest to all professionals working in diagnostic imaging and radiotherapy and oncology.

Our publication begins with two articles from teams of radiography educators working in different Higher Education Institutions (HEIs). Each article provides an overview of how simulation is being in used in both diagnostic and therapeutic radiography education to enhance the student experience and to prepare students for the busy clinical environment. The theme of education continues with an article about improving retention in therapeutic radiography written by John Clarke, Mary Lovegrove and Jan Zietara, which comes from the RePAIR project. As you may be aware, there are currently two direct entry ultrasound programmes running in the UK; staff from the two HEIs delivering these programmes provide their perspectives on these programmes to date. The subject of developing resilience in newly qualified radiographers is explored by Jane Harvey-Lloyd. Beverley Harden, the Allied Health Professions Lead at Health Education England, encourages us to lead on workforce transformation and not to shy away from 'wicked problems'. We have an overview of magnetic resonance image guided radiotherapy from Helen McNair and a reflection on selection protocols for whole body computed tomography in trauma authored by Charlotte Wright and Chris Cobb. Bev Snaith presents the conundrum of reporting standards and outlines where we are to date with radiographer reporting in the UK.

Our patients should always be at the centre of all that we do, and Chris Woodgate encourages us to look at the Quality Standard from the perspective of the patient, to provide a good experience for those using our services. Tracy O'Regan broaches the subject of social prescribing as an alternative to more traditional prescribing and how this can be of benefit to service users. Leslie Robinson and Sandra Mathers challenge us all to reflect on what we can learn from patient stories, something for us all to consider.

I hope that you will enjoy reading the work.

Best wishes
Dr Ruth Strudwick, Editor
IOEditor@sor.org

RM Strudwick

Foreword

It is one of the privileges of being President of the Society and College of Radiographers to be involved with writing and contributing to various publications across our profession. I am particularly pleased to be asked to write this foreward for the *Imaging and Oncology* journal which brings together diverse pieces of research and guidance from a wide range of modalities, all delivering healthcare and training in these difficult times across the NHS and private sectors.

There is a great drive for earlier diagnosis and therefore an increase in demand for the imaging and therapy services of the radiology departments, which is putting pressure on everyone to deliver efficiency and cost-cutting, and by sharing research in publications such as this, and presenting at study days and conferences that we can share best practice. Radiology in the UK is seen as innovative and ground-breaking in Europe and across the world, as I have discovered on my travels during my time on the presidential team, and by publishing in this journal, ideas will reach practitioners worldwide, helping them to develop best practice.

Ongoing challenges are faced across the UK to train and develop radiographers and sonographers. Changes in funding and cuts in universities are making it harder to recruit and retain staff, so new ways to encourage people into the profession must be explored. There is now, as written about in this edition, direct entry into ultrasound and ideas to retain staff once qualified. Simulation is being used in universities to train students before they move on to clinical practice, which is a confidence enhancing tool, harnessing the power of technology and preparing students for day-to-day work.

Advanced practice, role development and research advise our behaviour and practice in dealing with patients but we must remember that at the centre of our world are the patients. We must encourage interaction with patients, listen to them and understand their perspective on our world. We must engage with them and move our practice forward in a way that is patient centred.

This edition is full of inspiring articles which I hope will cause you to think about the way we are developing and changing practice in the world of healthcare that demands cost cutting, efficiency and earlier diagnosis from highly trained and skilful professionals. Please do not read just the articles that pertain to your own field of practice, in other pieces you may find ideas which might inspire you to change or enhance your practice.

Sue Webb
President, Society & College of Radiographers

An Overview of the Types and Applications of Simulation-based Education within Diagnostic Radiography and Ultrasound at Two Higher Education Institutions

Simulation-based education (SBE) is well established within the healthcare professions. An integral part of radiography education is the transfer of theory to practice, and a recent literature review indicates SBE can support students through the challenges of transitioning into clinical practice[1].

Simulation offers a safe learning environment for students to explore learning objectives, learn through experience, gain confidence and competence to consolidate skills. A key aspect to achieving these outcomes is familiarisation with the hospital environment. SBE can be used as an additional 'gateway', providing Higher Education Institutionss (HEIs) with opportunities to assess students for safe practice prior to entering the pressures of the hospital environment[2].

The application of simulated practice is extensively varied across professions. Educators may utilise low to high fidelity, simulated or in-situ environments, the use of manikins or actors, scenarios and software[1,2]. Cost, availability of resources and facilitator training are recognised as challenges for implementing SBE[1,2].

HEIs deliver validated radiography programmes with inherently similar goals, to produce graduates who are eligible to register and practice as radiographer practitioners. Despite this, differences in pedagogical approaches are intrinsic.

The aim of this research was to explore the use of SBE across two HEIs delivering diagnostic radiography and ultrasound programmes; to inform, inspire and encourage educators across HEIs and in clinical practice to implement the use of SBE to support students in their learning.

Background

With clinical placement at a premium due to high demand for undergraduate radiography programmes, creative ways are required to ensure students can gain valuable experience. For SBE to be effective, its design needs to reproduce real-world situations[3,4,5]. SBE is a potential solution to ensuring quality, relevant experiences to complement and enhance clinical practice. A key feature of simulation is the development and demonstration of safe practice[3,4]. SBE allows the transition from the 'see one do one' ethos[5], providing the opportunity for repetition through the utilisation of simulation. This enables skills to be honed and understanding to be developed across the diversity of radiography education[4].

The application of simulated practice is extensively varied across professions.

SBE is a potential solution to ensuring quality, relevant experiences to complement and enhance clinical practice. A key feature of simulation is the development and demonstration of safe practice.

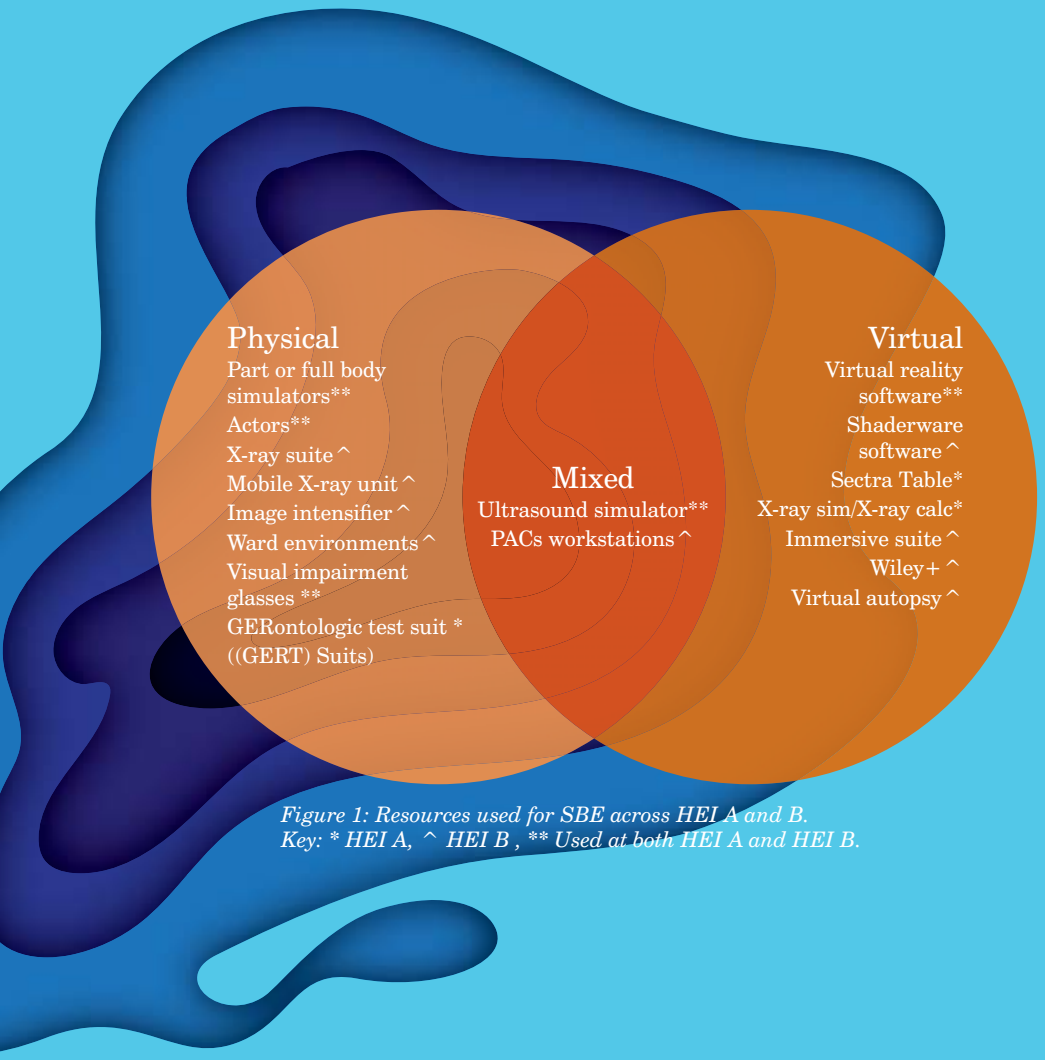

Figure 1: Resources used for SBE across HEI A and B.
*Key: * HEI A, ^ HEI B , ** Used at both HEI A and HEI B.*

Simulated patients enable the development of confidence in communication. Students found the realistic simulated learning experiences relevant to their future as a healthcare practitioner.

Phase	Description of the process
1. Familiarising yourself with your data:	Transcribing data (if necessary), reading and re.reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes:	Checking on the themes of work in relation to the coded extracts (level 1) and the entire data set (level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells; generating clear definitions and names for each theme.
6. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back the analysis to the research question and literature, producing a scholarly report of the analysis.

Table 1: Phases of coding[7].

In radiography education it is essential that the soft skills as well as hard science are developed. SBE has been identified as being able to address both paradigms, through the improvement in attitudes to the understanding of radiation safety[4,6]. To determine the integration of simulation in the radiography curriculum, two HEIs have undertaken a review of its application.

Methodology

Data collection

Purposive sampling was used. Each HEI requested data from all module leads delivering material to diagnostic radiography or ultrasound students. Module leads were asked to provide a short paragraph outlining any form of SBE they utilise, together with the learning objectives. No ethical approval was required.

Data analysis

The data were independently analysed by two researchers using a six-phase coding process to identify themes (see Table 1)[7]. A concordance check was completed between the two researchers once the themes had been determined.

Results

A total of 13 different module leaders responded across both sites (it should be noted that some individuals lead on more than one module). HEI A delivers SBE in 17

modules and HEI B in 14 modules across both undergraduate and post-graduate provision.

Data analysis identified three themes related to the resources: physical, virtual and mixed (Figure 1). Secondary analysis of the data identified the underlying purpose for using SBE. This resulted in two additional themes for discussion: predictability and unpredictability.

Purpose for using SBE

Developing understanding and perspective

Physical simulators were utilised in a number of modules in both HEIs (Figure 1). An example of a recently introduced resource was the Ready-or-Not Tot® into a paediatric module. The aim of this resource was to enhance student understanding of paediatric radiography and working with babies in particular. The resource allowed students to experience the emotional and psychological aspects of dealing with distressed children, and develop understanding and empathy with the parents of the distressed children. This aspect is encapsulated by the students who developed their own aims, one of which is identified as:

> ***'Understanding the emotional pressures on care givers with young infants and transferring these skills to practice.'***

GERontologic Tests suit (GERT)[8] (Figure 2) and visual impairment glasses provide students with the ability to experience patient conditions. This develops empathy and understanding with respect to the issues they may face when dealing with patients, developing safer practice to provide a better service. This level of understanding would be difficult with other learning tools [6].

Developing skills

ScanTrainer is used to develop the students' basic ultrasound scanning skills in transabdominal and transvaginal ultrasound. The use of a 'traffic light' display provides positive reinforcement, as well as immediate feedback. A key aspect for sonographers is the development of hand-eye co-ordination skills, which ScanTrainer promotes (Figure 3).

Developing communication

Simulated patients enable the development of confidence in communication. Students found the realistic simulated learning experiences relevant to their future as healthcare practitioners. Using simulated patients also offers feedback, which students may not always receive in practice[6].

Figure 2: Age simulation suit GERT[8].

Figure 3: ScanTrainer.

Figure 4: FujiFilm FDR Visionary Suite (HEI B).

Orientation

The use of physical or virtual facilities such as X-ray facilities (Figure 4) or virtual reality software, allows first year students to familiarise themselves with an X-ray room, orientating them to the clinical environment. These resources are embedded throughout the curriculum, developing further understanding beyond basic imaging skills, to encompass room design and adaptive techniques.

Understanding the hard science

To aid students with understanding the physical principles of X-ray, virtual software was employed across both HEIs. Shaderware and two simulators, EX-RayCalc and EX-RayImage (Figure 5). These tools have been designed to replicate practice whilst demonstrating changes in physical properties of the X-ray beam, to provide students with an understanding through application.

Using SBE as an adjunct to formal teaching

Packages such as Wiley +, Sectra table and Picture Archiving and Communication System (PACS) workstations are used as an adjunct to teaching, providing visualisation of the location of normal and abnormal anatomical structures and appearances. Three dimensional reconstructed images allow students to understand image appearances in more depth, building their understanding of the patient pathway.

Discussion

Results indicate both HEIs are heavily invested in the use of SBE across both undergraduate and post-graduate programmes, with variation in the resources available (Figure 1). The themes identified will be discussed further.

Physical resources

Simulation can be defined as 'the process whereby knowledge is created through transformational experience'[9]. The results evidence that this is the case with the use of the Ready-or-Not Tot, actors and GERT suits. It must be acknowledged that some SBEs are well established[6] and others are still in their infancy.

The physical resources enable a more immersive experience, developing empathy, hand-eye co-ordination, deeper understanding, coping mechanisms and problem-solving skills[1]. Realism provides familiarisation to the clinical environment and skills developed may be considered easier to transfer[10]. Booth et al.[6] identified an increase in positive attitudes towards elderly patients with age simulation suits (Figure 2), however this was not sustained in practice. This highlights the need for collaboration between HEIs and clinical partners, to encourage students to reflect and transfer learning between the two environments.

The use of these physical resources is not without cost. Initial installation and maintenance costs of physical resources such as X-ray facilities, simulated manikins or suits can be high; acting as a barrier to expansion of SBE[11]. Results indicated duplication of resources across both HEIs (Figure 1), reflective of other radiography education programmes[2]. The questions raised are how much duplication of resources is there nationally? And is there potential for regional/national SBE centres?

Virtual resources

The use of virtual resources has the advantage of involving all students. This ensures that there is the opportunity for parity of experience. The interactive nature and the use of visualisation can help students who struggle with the subject. There is greater control over the direction of the learning activities and in many cases this allows the students to work at their own pace, having access to the SBE resource outside the scheduled sessions. Despite differences in the type of software used by HEIs A and B, it is unlikely student experience is negatively impacted. Shiner[1] found variation in use and type of software within conventional radiography, with all users reporting positive outcomes. However, like physical resources there are costs and accessibility issues involved which can restrict availability, such as licensing costs (Shaderware), access (Sectra table) and staff training availability[1,12].

Predictability

Authentic learning requires real-world problems; open-ended inquiry and thinking skills; discourse amongst a community of learners; and self-directed learning[13]. Similar to Diamond et al.[14], students (HEI A) developed their own aims, evidencing SBE links to open-ended enquiry, thinking skills and self-directed learning. The academic environment lends itself to rich discourse amongst learners, enhanced by feedback from simulated patients; this can suffer in clinical practice due to the increased demands on the service[15]. Replicating 'real-worldness' is more challenging[14]. This does not prevent the creation of real-life experiences through SBE, which has the potential to provide students with quality memorable experiences through employing authenticity and realism[10]. However, more work is required to establish the impact of SBE on student radiographers' development. The nature of clinical placement means that the students' clinical experience is unpredictable and can lead to a potential lack of parity of learning. To some extent, SBE can be used to address this issue through exposing students to structured

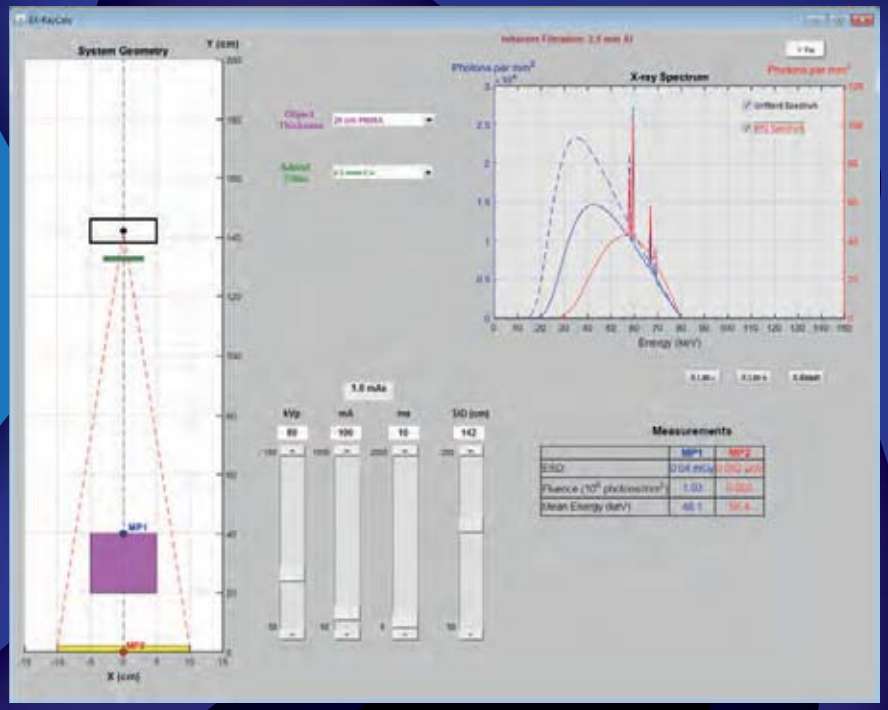

Figure 5: EX-RayCalc (HEI A).

The use of physical or virtual facilities such as X-ray facilities or virtual reality software, allows first year students to familiarise themselves with an X-ray room.

activities [4], supporting the theme of predictive training which can be achieved through virtual resources.

Predictability allows for the assessment of safety and understanding through repetition. However, 'mixed' resources such as ultrasound ScanTrainers use positive reinforcement and develop hand-eye co-ordination through repetition, a key feature of some simulated learning[5]. Computer software offers additional feedback, which is prominent in achieving learning outcomes[1]. This encourages students to explore issues; that may not be achievable in the real world.

Unpredictability

Robinson et al.[16] utilise the voice of service users to highlight the requirement for patient centred care (PCC) to be embedded within education. Developing understanding, skills, communication and perspective, are key to successful imaging procedures and providing PCC. Physical and virtual resources enable students to develop initial skills and become orientated to their new working environment. Building on this throughout the programmes both HEIs use 'simulated patients' and variation in scenarios, offering a new level of complexity to the students, which can be considered as 'scaffolding'[17]. The facilitator, simulated patient or the students themselves, cannot predict how they might respond within the simulation. Unpredictability or lack of homogeneity in scenarios may be considered as reducing student parity. However, students undertaking observational roles facilitated by observational tools have been found to have equal student satisfaction and may have a clearer understanding of the learning objective[18]. This unpredictability offers students an opportunity to use their initiative, develop problem-solving skills and personalise care provided.

Developments

Once SBE is integrated into a programme, the portfolio can be expanded as staff and students become more confident with this pedagogical approach. This was evidenced in both HEIs, with a number of planned future developments.

Radiography is often overshadowed in the media by nursing and medical professions. However, investment in staffing and resources within radiography has recently been highlighted by the media[15]. Increasing the profile of radiography careers is required to attract students who have the values and behaviours to work within this profession. In addition to SBE being used in modules, simulation at both HEIs has been used in several events which include outreach events (Summer Schools Pathway Scheme and taster days) and open days.

Expansion of student numbers within HEIs is limited by placement capacity.

A future development at HEI B is to replace a week of first year placement with SBE to relieve the pressure on clinical placements. This move is encouraged by recent developments in other disciplines; the Nursing and Midwifery Council no longer place a cap on the number of clinical hours that can be met through SBE[19]. Significant changes to any programme should be formally evaluated to ensure the needs of the students and Health and Care Professions Council (HCPC) are being met.

Both HEIs are investing in computed tomography (CT) simulation to enhance understanding and safety, as well as enabling the students to maximise their clinical experience. CT is now an integral part of clinical practice, yet due to the number of students, it is questionable as to whether a quality experience can be obtained to prepare the students with the expectations of practice. SBE may provide students with the foundations prior to entering clinical practice.

Limitations and recommendations

This research was undertaken across two HEIs within the United Kingdom (UK) and therefore represents a small sample of the radiography programmes delivered nationally. Comparatively, Thoirs, Giles and Barber[2] reported on the resources and use of SBE across Australia to further understand how SBE can be expanded. This funded report included professional bodies and associations, educators and clinicians (n=207)[2]. A similar report would enhance our understanding of SBE in the UK. Anderson et al.[11] established that management and sharing of resources remains poor in many areas of the UK, indicating improved SBE communities are required. This is supported by a recent Health Education England (HEE) SBE framework[12] (Figure 6) that recognises variation in SBE practice, allocation of resources and considers strong regional and local networks as key to ensuring a return on investment. This may help to address cost, reduce duplication of resources across HEIs and trusts, foster a community approach to learn from each other and enhance the evidence base for using SBE in radiography education.

Conclusion

The evidence presented indicates a growing application in the use and variety of SBE at the two HEIs. With the endorsement of the use of SBE by the HCPC and Health Education England, it is essential that SBE is thoroughly evaluated[12,20]. Studies recognise limitations of research of the impact of SBE[1,3], a view supported by Patel and Dennick[5] who consider simulation to be a useful addition to existing education but recognise the need for more research into the area, to determine predictive validity and effect on patient experience. There is evidence that SBE is

Figure 6: Strategic vision for the delivery of SBE[12].

The physical resources enable a more immersive experience, developing empathy, hand-eye co-ordination, deeper understanding, coping mechanisms and problem-solving skills.

structured and progressively complex across the levels of education, which has been highlighted as being important by Buckley et al.[3] and Kable et al.[17] This piece of work has identified the diversity of SBE at two HEIs and its use in both predictive and unpredictive learning that support the progressive complexity, and focuses on improving patient safety and experience. For SBE to be accepted, it is essential that it reflects real life situations and is valued; aspects of this is evidenced by the use of SBE across the two HEIs.

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Naomi Shiner, Senior Lecturer, University of Derby.
Voyin Pantic, Lecturer, University of Leeds.

Building a lung health screening programme

Providing effective, efficient screening for all patients

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SIEMENS Healthineers

The Role of Simulation within an Undergraduate Radiotherapy Programme: The Experiences of One Higher Education Institution

Simulation is widely used in healthcare education to allow students a supportive environment and to build confidence and ability in clinical tasks, thus improving patient safety and patient care[1,2].

Simulation can be classified according to the processes and technology used, two examples being the Virtual Reality Radiotherapy Training (VERT) system[3] and role play, which can be considered simulation because carefully-planned and well-constructed clinical scenarios produce authentic situations that mimic practice[4]. This article focuses on how simulation methods can be integrated within undergraduate radiotherapy education, drawing on examples from one higher education institution (HEI).

Simulation – background and pedagogical theory

Imaging and treatment technology within radiotherapy has been evolving rapidly and the introduction of diagnostic imaging modalities into radiotherapy procedures now enables radiation to be delivered with millimetre precision to the anatomical target. Delivering such accuracy within a high-pressure, time-restricted working environment can present challenges to learners and their clinical supervisors. Therefore, providing alternative opportunities to acquire cognitive and motor skills in a supported and controlled setting is desirable. In university-delivered radiotherapy education, two technology-based simulation systems predominate: VERT and radiotherapy planning systems. Both systems employ deliberate practice in that they involve purposeful simulations of a set of skills relevant to specific radiotherapy procedures, namely radiotherapy equipment operation and planning of target volumes. Such authentic learning activity lends itself to the development of new skills and is appropriate for novice learners[5]. Repeated use of these simulation systems facilitates iterative, active learning engagement whilst negating the risks that are associated with mistakes. It also encourages contact between students and allows relationships to develop between students and staff; activities that embody core principles of teaching and learning[6]. Important to the cycle of learning is intervention by means of constructive feedback given on individual performance so that new knowledge and understanding is promoted, and confidence is gained in the use of the systems.

Additionally, the use of simulation in radiotherapy exploits collaborative learning opportunities, which increase involvement in learning, allowing students to sharpen their thinking and deepen their understanding of radiotherapy set-up procedures and planning techniques. An international audit of the use of VERT noted that 90% of the respondents (n=47) used simulation as a means of conveying information related to radiotherapy techniques[7]. Yet the study also noted that there was a discrepancy between how VERT was employed and its functionality, suggesting that it had not been fully explored or exploited by radiotherapy communities.

These technological aspects are not the only skills in which simulation can be beneficial to learning. Simulation has been described as any technique that evokes or replicates substantial aspects of the real world in a fully interactive manner[8] and links

to experiential learning by allowing students to learn by doing [9]. This is particularly relevant for therapeutic radiography students who need to refine their technical expertise, while developing skills enabling them to deliver high levels of personalised care for their patients. Communication and empathy are noted as being prime topics for which simulation is useful to help students develop these softer skills[10].

Overall, therefore, being able to replicate some aspects of the discipline in a controlled, safe environment, either prior to their first clinical placement or in conjunction with time in busy clinical departments may allow students to develop higher levels of self-confidence in their abilities[11, 12]. This is where role-play involving simulated scenarios is invaluable, allowing students to address a variety of communication and patient care skills in a fully supportive and controlled environment.

Simulation use in one HEI

The growth of role-play and VERT simulation at the University of Hertfordshire has been helped significantly by the support and enthusiasm of practice-based learning facilitators from partner clinical sites, who as part of the university academic-clinical liaison group, have been instrumental in developing simulation use. One of the successes of this partnership has been to produce learning materials, such as workbooks and scenario-based, simulation packages, that have subsequently been adapted for use in admissions group interviews, curricula delivery and viva/objective structured clinical examination (OSCE)-style assessments. The developments have been overseen by the programme leader and have been reported at regular programme committee meetings and programme review meetings to ensure that developments meet the requirements of the programme learning outcomes and the Health and Care Professions Council (HCPC) Standards of Proficiency[13] and Standards of Conduct, Performance and Ethics[14]. During the developments, students were consulted and have had the opportunity to feed back to the team to ensure there is clarity in simulation purpose and instruction, as well as appealing to student curiosity. Service users have also been involved in the development of scenario-based resources to confirm relevance and currency, and to ensure that patients are considered holistically. Resource development is an iterative process, but reviews occur at least annually so that any developments related to changes in practice can be incorporated, and the link between theory and practice enhanced.

On the undergraduate radiotherapy programme, the three main areas in which simulation is used are the admissions cycle, purposeful learning sessions and assessment.

Engaging with simulation through the admissions cycle gives us the opportunity to interact with potential learners and provides orientation to higher education learning through simulation methods.

Simulation in admissions

Applicants and their families attending open days may not yet have visited a radiotherapy department, so it is invaluable for them to experience an accurate representation of the radiotherapy environment and equipment. We ensure that part of the open day takes place in the VERT and planning laboratories, with a visit to the computed tomography (CT) scanner included, so that applicants are given a sense of a typical 'patient journey'. Applicants are encouraged to handle the VERT handsets to adjust and move the equipment in real time, according to a set of instructions based on a level four practical workshop. This allows lecturers to give applicants a taste of a higher education simulation session, with visual displays making the radiographer role 'come to life'. In the planning laboratory, lecturers and radiotherapy students demonstrate a range of anatomical and pathological resources, then move on to a display of 'typical' isodose distributions, talking through the concepts associated with planning principles and holistic patient care, in order to show the applicants this different aspect of the radiographer's role. Engaging with simulation through the admissions cycle not only gives us the opportunity to interact with potential learners but also provides orientation to higher education learning through simulation methods.

Another part of the selection process is a group interview, during which applicants are asked to 'role play' as a student radiographer and consider a range of quite challenging clinical scenarios, again allowing them to simulate the potential roles and responsibilities of a radiographer. This is facilitated by a lecturer, a service user and a student, who not only facilitate the scenarios but also are able to make judgements on an applicant's suitability for the profession. Examples have ranged from whether obese patients or people who smoke deserve to be given expensive anticancer drugs, to how someone would react to a verbally abusive patient. The group interview is useful as applicants from a diverse population are invited to relay their values, judgements and behaviour in accordance with the NHS values-based recruitment framework[15]. It also provides opportunities for the lecturer, student and service user to review an applicant's communication skills and ability to work within a collaborative group environment.

Simulation in learning

Students in their first year participate in a number of VERT small group interactive sessions, during which they learn the components of the treatment machine, the underpinning principles of operation and application to the clinical setting, all within a safe and controlled environment. VERT sessions permit the development of technology-related skills and increase the speed with which a student may 'set-up' a patient.

Using VERT specifically to practise setting up a patient creates the risk that the patient becomes neglected in this process, as the focus is on the technology.

However, Benner's novice to expert theory[16] suggests that such learning is aligned to the particular situation and therefore is limited to those features, i.e. learning and subsequent behavioural response is governed by a set of rules that the novice applies to that situation. Using VERT specifically to practice setting up a patient creates the risk that the patient becomes neglected in this process, as the focus is on the technology. To promote a more authentic simulation educational approach, we have installed a motorised couch into the VERT room and students take turns in role play where they rotate through playing the 'patient' lying on the couch and then the radiographers who move and interact with the patient. Having a diverse group of learners rotating through different roles enables a variety of experiences to occur; yet the culture of the clinical environment and the team-working interaction with clinical staff remains absent from the process, and this is an area that we are currently exploring.

There are many non-technological simulation scenarios also embedded within the curriculum. These include the use of pigskin to practise tattooing, which is conducted in a dietetics laboratory, and manual handling practicals where students learn the theory of how to safely interact with and handle patients, and then engage in simulated scenarios. The development of basic life support skills is undertaken using Resusci-Annie (Laerdal™) and the theory of cross-infection is delivered prior to simulation using ultraviolet handwash detectors. Role-play is used to help students develop their communication skills, in particular enabling them to learn how to interpret both verbal and non-verbal clues to a patient's health and wellbeing status, and learning the correct questions to ask to assess treatment-related side effects. Role-play frequently involves service users to add authenticity, as sometimes peer-to-peer role-play can lack realism as individuals may hold back in their type and level of responses[17].

Planning-system based simulation is an established teaching and learning method within the programme. Formerly, one module incorporated learning outcomes related to successful operation of the planning system and application of planning principles, with learning facilitated by students completing isodose distributions for a range of tumours commonly treated by external beam radiotherapy. Students' skills, capability and understanding of planning principles were assessed by Viva Voce exam and a written evaluation of a treatment plan produced under examination conditions. The advantages afforded by this simulation included parity of student experience, facilitation of personal growth and the opportunities to interact with peers and staff, all of which promoted deeper learning. However, the teaching and learning were isolated from the patient journey and it was recognised that this could be enhanced.

Theory and practice links are enhanced and as the simulated placement week replaces a clinical week and counts as 'clinical' hours, it also helps to reduce the burden on clinical placements.

Consequently, it was decided that planning simulation would form part of modules spanning all three years of the programme and would also be an essential part of a university-based, simulated 'clinical practice' week which has been targeted at second and third year students. Implemented in 2016, the university-based clinical practice weeks incorporate a range of simulation and virtual environments, which mimic the patient journey. Each week is repeated three times so that students rotate in and out of clinical placements to attend. A typical week begins with students undertaking simulation processes in the university's CT scanner. Here, small groups of students are given a range of case scenarios of different diagnoses incorporating different patient identities, psychologies, social standings and backgrounds. The students must research aspects of each case scenario, so time for case study preparation and use of the university's learning resource centre is scheduled into the week. Students are required to share specialised knowledge gained from their research with lecturers so that their knowledge and understanding can be confirmed and applied to pre-treatment simulation activity.

Following scanning of the 'patient', students move on to use the planning system where isodose plans for each case study are created. Each student produces a plan which when complete is critiqued by the wider student group who act as assessors as well as providing critical commentary and support, thus learning from and with each other[18]. VERT is a useful tool in displaying isodose distributions and allows visual confirmation of the fields in relation to the surrounding anatomy. To enhance the patient journey the week finishes by focusing again on the patient, with students detailing and presenting aspects of treatment delivery and side effects within the context of their patient case study.

Although university clinical weeks are staff resource intensive, they permit students to work together collaboratively and provide time for them to research specific aspects of the cases in depth. Theory and practice links are enhanced, and as the simulated placement week replaces a clinical week and counts as 'clinical' hours, it also helps to reduce the burden on clinical placements.

Simulation in assessment

Learning outcome assessments have been aligned to real-world radiotherapy scenarios to again mirror students' future professional roles. In addition to formal assessment of planning and dosimetry, understanding and capability through plan creation, evaluation and viva, other simulated assessment includes role-play related to first day chats. Here, a student picks at random one unmarked envelope from a number (usually up to six) which contains brief details of a hypothetical case scenario relating to a specific diagnosis and stage, and includes information on the patient's social, mental and physical health

background. The student reads through the scenario and is then required to undertake a professional discussion with the patient (role-played by either a service user or someone not previously known to them) in which they have to demonstrate knowledge and understanding related to both the diagnosis and the context set out in the 'patient' background.

VERT has been incorporated into first year assessments as an OSCE workstation, so that the students can be assessed on their ability to manipulate machine parameters and carry out simple set up. OSCEs have also incorporated 'handwashing' stations, a simulated cardiac arrest, moving a patient from a chair to a bed in a manual handing role play, as well as other tasks designed to test a student's ability to carry out radiotherapy calculations, view and interpret images and problem solve specific scenarios.

In each of these assessment-based simulations, the rationale has been to use assessment methods that are authentic to the clinical practice knowledge and tasks expected of our students, whilst minimising the reliance on assessments carried out in clinical departments. These can be difficult to schedule and assess and, depending on the range of patients on any given day, may not allow students to participate in all the expected practice skills.

Conclusions

In this article we have described the use of simulation at one HEI, providing an overview of some of the advantages and disadvantages that simulation affords and demonstrating that simulation does not need to be dependent on technology. We have found that replicating some aspects of the radiotherapy discipline in a controlled, safe environment allows students to develop higher levels of self-confidence in their abilities. With diverse student cohorts being given challenging clinical scenarios, students begin to develop the key skills which will also be required for their professional careers when engaging with colleagues from their own and other disciplines. By integrating simulation throughout our students' journey from admissions to final year assessment, we have developed a learning environment which provides excellent preparation for life as a qualified therapeutic radiographer.

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Quality and the Patient Experience

As professionals, we need to be aware of our responsibilities to our patients both under legislation found in The Health and Social Care (H&SC) Act 2008 (Regulated Activities) Regulations[1], within our own professional standards found within the Society and College of Radiographers[2], the Health and Care Professions Council[3] and the Imaging standard[4]. The H&SC Act Regulation 12[1] states that:

1	**Care and treatment must be provided in a safe way for service users**
2	**Without limiting paragraph (1), the things which a registered person must do to comply with that paragraph include –**
a	assessing the risks to the health and safety of service users of receiving the care or treatment;
b	doing all that is reasonably practicable to mitigate any such risks;
c	ensuring that persons providing care or treatment to service users have the qualifications, competence, skills and experience to do so safely;
d	ensuring that the premises used by the service provider are safe to use for their intended purpose and are used in a safe way;
e	ensuring that the equipment used by the service provider for providing care or treatment to a service user is safe for such use and is used in a safe way;
f	where equipment or medicines are supplied by the service provider, ensuring that there are sufficient quantities of these to ensure the safety of service users and to meet their needs;
g	the proper and safe management of medicines;
h	assessing the risk of, and preventing, detecting and controlling the spread of, infections, including those that are health care associated;
i	where responsibility for the care and treatment of service users is shared with, or transferred to, other persons, working with such other persons, service users and other appropriate persons to ensure that timely care planning takes place to ensure the health, safety and welfare of the service users.

Table 1.

The Imaging Standard's key message to all services is that it is patient centred.

'The Standard is designed to: be patient-focused; cover the functions and systems of a whole diagnostic imaging and interventional radiology service (asymptomatic breast screening services are currently excluded from consideration); and address quality in delivery and support quality improvement'[4].

How can radiographers ensure that they are up-to-date with the expectations placed upon them in a regulatory environment, the various codes of conduct and any other professional recommendations? If professionally, radiographers are to be mindful of all the above, will that lead to increased quality of care for their patients and how do radiographers ensure that they have evidence to demonstrate that quality of care for patients is addressed? One way in which this can be achieved is by working with the Imaging Standard to implement the not only the Patient Experience domain but all the other portions of the Standard relevant to patient care.

How can radiographers ensure that they are up to date with the expectations placed upon them in a regulatory environment, the various codes of conduct and any other professional recommendations?

The Imaging Standard

Within the Imaging Standard a whole domain is focused upon the Patient Experience the key points are shown in Table 2.

Although thorough in the expectations of the experience the patient can expect when visiting or preparing to visit an imaging service, the patient experience domain does not meet all the requirements of the H&SC Act Regulation 12[1].

The purpose of the patient experience domain is to ensure that service delivery is patient focused and respectful of the individual patient and their specific requirements. This is achieved through provision of appropriate information and support for patients and carers with due regard to differences in culture, religion, age and other factors. Effective feedback systems for patients and carers are necessary.	
PE1	The service implements and monitors systems to ensure that patients are able to access patient-friendly information about what happens before, during and after specific examinations/procedures.
PE2	The service implements and monitors systems to ensure that the privacy, dignity and security of patients are respected throughout contact with the service.
PE3	The service implements and monitors systems to ensure informed patient consent.
PE4	The service implements and monitors systems to ensure that service delivery is patient focused.
PE5	The service implements and monitors systems to ensure that patients are able to give feedback on their experience of the service.

Table 2.

For example, radiographer competency is not covered nor is the safe use of equipment as outlined in section c and f as shown in regulation 12[1]. It is therefore important that the whole Standard be considered when looking at the patient's experience.

What then does the Imaging Standard have to offer apart from the Patient Experience domain? A very brief overview reveals there are areas in every domain which impact the quality of care to patients.

Leadership & Management domain section 1; the Standard asks that the expected tasks of staff are clear and processes are in place, assurance that there are sufficient staff to deliver their tasks and that staff have an opportunity to have a development plan. In section 2 of Leadership & Management domain, it expects that all processes are subject to audit, all discrepancies are managed and that quality and continual improvement is demonstrated.

The Clinical domain states that it is there to promote the service's role in rapid and accurate diagnosis and treatment; ensuring administrative and clinical practices appropriate to the patient population, as well as effective management of risk and emergencies. Perhaps key for the future of the profession is the review of existing and new clinical practice to develop and improve the service. This takes into account the work our professional colleagues undertake in research in ensuring our profession develops ensuring a quality service for patients into the future.

Within the Facilities, Resources and Workforce domain, the facilities and environment for patients as well as staff is covered.

It can be seen that the domains within the Imaging Standard cannot be viewed in isolation, even if they appear to demonstrate the evidenced need for excellence in patient experience.

This includes the procurement of equipment, equipment maintenance, competency of staff to meet the needs of patients and workforce planning to ensure the continuity of service for patients.

As can be expected the Safety domain covers radiation safety alongside the safety of ultrasound, magnetic resonance imaging and ablation services. It also asks that all areas around infection control, hazard substances, moving and handling, and the difficult area of aggression and violence are considered and acted upon to ensure a safe consistent service.

It can be seen that the domains within the Imaging Standard cannot be viewed in isolation, even if they appear to demonstrate the evidenced need for excellence in patient experience, as the Patient Experience domain does. To truly accomplish a quality patient experience consideration of the Standard as a whole must be taken.

Perhaps the overall quality message about the service offered to patients could be summed up by the following four points.

a. Safe – everything you do needs to be safe for the patient and the staff performing any task.
b. Consistent – it should be the same for every patient – no matter what their circumstance, equality and diversity must allow for patient choice, shared decision-making and values-based practice.
c. Accurate – does the service offer the 'right test, with the right equipment, at the right time, for the right patient?
d. Fit for purpose – is the service acting from an evidence base, can it demonstrate that it offers best practice, that it is efficient and effective, using the best 'tools' to obtain the required result?

An alternative view of this could be described as the radiographer, as a professional, acting as the patient advocate. Where the radiographer actively ensures that the patient experience matches the four points above within the context of the H&SC Act Regulation 12[1] and the Imaging Standard[4].

Patient advocacy is described in the SCoR *Patient Advocacy* document [5] as 'primarily concerned with both promoting and protecting the interests of patients and service users.' The document also states that there is no 'single consistent definition of patient advocacy being put forward... despite nursing literature having this as a topic of discussion and academic papers for over 30 years'. The SCoR provides a guide to radiographers within the Patient Advocacy document which are:

1. Guarding patients' rights and conserving the patients' best interests.

Where is the radiographic professional supposed to look to ensure they are providing a quality patient experience, ensuring the patient's safety and advocacy?

2. Protecting/maintaining patients' autonomy.
3. Protecting patients against any type of malpractice: suspected or blatant.
4. Championing ethical and social justice in the provision of healthcare.
5. Referring patients to the most appropriate service.

The Society & College of Radiographers (SCoR) has published several guidance documents on best practice in patient centred care such as the *Consent: Guidance of mental capacity decisions in diagnostic imaging and radiotherapy*[6], *Values-based Practice in Diagnostic and Therapeutic Radiography: A Training Template*[7] and *Practitioner Partnerships within Imaging and Radiotherapy: Guiding Principles*[8], as well as other references for healthcare workers such as *Adult Safeguarding: Roles and Competencies for Health care Staff*[9].

Where then, is the radiographic professional supposed to look to ensure they are providing a quality patient experience, ensuring the patient's safety and advocacy? The Imaging Standard part two contains a commentary for each Standard statement which points services to the relevant evidence base, including current professional guidance and legislation[4]. This section provides valuable guidance on the provision of evidence that professionals can use to ensure they operate a patient centred service with a quality patient experience.

Amidst the number of documents available, the Imaging Standard is sufficient to meet the points raised, as long as the Standard as a whole is taken into consideration and the audit programmes required to meet accreditation to the Standard are followed.

Conclusion

The body of evidence that can be garnered through the use of the Imaging Standard can give the radiographic professional a strong basis on which to listen to and advocate for their patients, in order to highlight where perceived deficiencies in a quality patient experience are found within their service. Perhaps this is a stance that radiographers as professionals can take, even within a busy working environment; it will give them the ability to challenge and innovate using the evidence from the Imaging Standard. The challenge to us professionally may be to increase the awareness of the radiographer's role in advocating for patient care within an imaging department. The Imaging Standard is a well-rounded tool that can be used to educate, support and encourage (through audit evidence) the radiographer to become a motivated advocate for excellence in patient care and the patient experience within an imaging service.

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Whole Body Computed Tomography – A Reflection on Selection Protocols in Trauma

It has been estimated that there are 20,000 cases of major trauma occurring in England every year, resulting in around 5400 deaths[1]. For patients surviving major trauma there is also the after effect of debilitating long-term injuries. It is because of this that trauma is considered a large socio-economic burden, with the cost of trauma now believed to be close to £3.3 to £3.7 billion[2].

Research has highlighted that rapid patient triage followed by transportation to a designated trauma centre is associated with a significant reduction in mortality when compared to patients transferred to a non-trauma centre. This reduction is due to a timely initial evaluation, with part of this being attributed to computed tomography (CT) as it is more sensitive for the detection of head, spine and torso injuries. However, recent literature has begun to highlight a number of concerns surrounding the appropriate patient selection, potential excessive radiation exposure, the management of incidental findings and the possible increased healthcare costs and it has also been noted that there is no validated clinical prediction rule defining clear criteria for whole body computed tomography (WBCT) or a consensus[3].

One of the biggest benefits noted by many papers is that, in a situation where time to diagnosis is critical, WBCT can be beneficial as it allows more time for treatment planning and recruitment of theatres and theatre staff[4]. Furthermore, Harvey and West note in their study from 2013 the reduced time spent in the emergency department (ED) will result in a consequential reduction in intensive treatment unit (ITU) stays[4]. However, with recent work suggesting that 2% of cancers may be attributed to radiation from CT scans[5] there needs to be a balance struck between radiation risk and the potential cost savings associated with a liberal approach to scanning trauma patients[4].

WBCT has proven its potential to change the face of trauma imaging and clearly it has many merits. There is an argument that WBCT decreases mortality rates. Whilst some authors support this theory[6] others argue that the mortality rate was unaffected[7]. However, with requests for WBCT in major trauma rising from 5% in 2002 to 46% in 2010[4] clinicians must be mindful that IR(ME)R 2017, whilst allowing flexibility and professional judgement to be used, also maintains that the reasoning behind this decision must be clearly defined[8] and that risks must be balanced against the potential benefit to the patient.

Rapid patient triage followed by transportation to a designated trauma centre is associated with a significant reduction in mortality.

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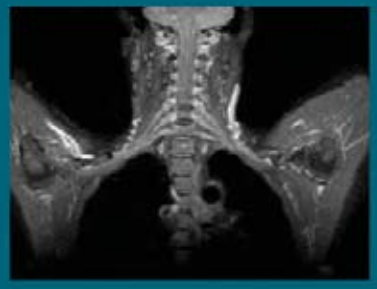

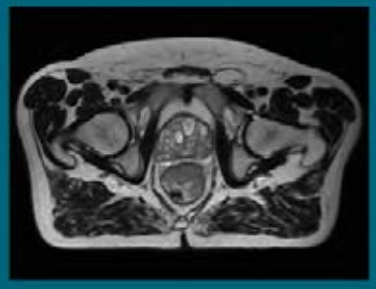

Captured on Elekta Unity during 2018 imaging studies

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Investigations have also highlighted the benefit of incidental findings when WBCT scans are performed. Some argue that this allows clinicians to treat the whole patient, instead of reacting only to the episode that brought them to the hospital. Furthermore, they propose that by undergoing a WBCT the patient is also reducing their overall radiation dose during their hospital stay. The claim being that as a comprehensive scan has been undertaken at the start of diagnosis, the need for subsequent imaging is limited[4]. However, few authors support this assertion[9]. Gupta et al.[9] mention that the discovery of occult injuries can increase the intensity of diagnostic activities without improving patient outcomes, and it has been stated that with each successive CT scan there is a 16% increase in cancer risk[5]. If incidental findings are increasing the intensity of diagnostic activities without improving patient outcomes, then the justification process may well be a weak one. This reasoning could be one factor responsible for the large rise in WBCT requests since 2002 and possibly for scans having low positive findings. In fact, research from one UK hospital found that there was a negative scan rate for WBCT of 42%[10]. Evidence does point towards a need for standardisation of the use of WBCT in trauma.

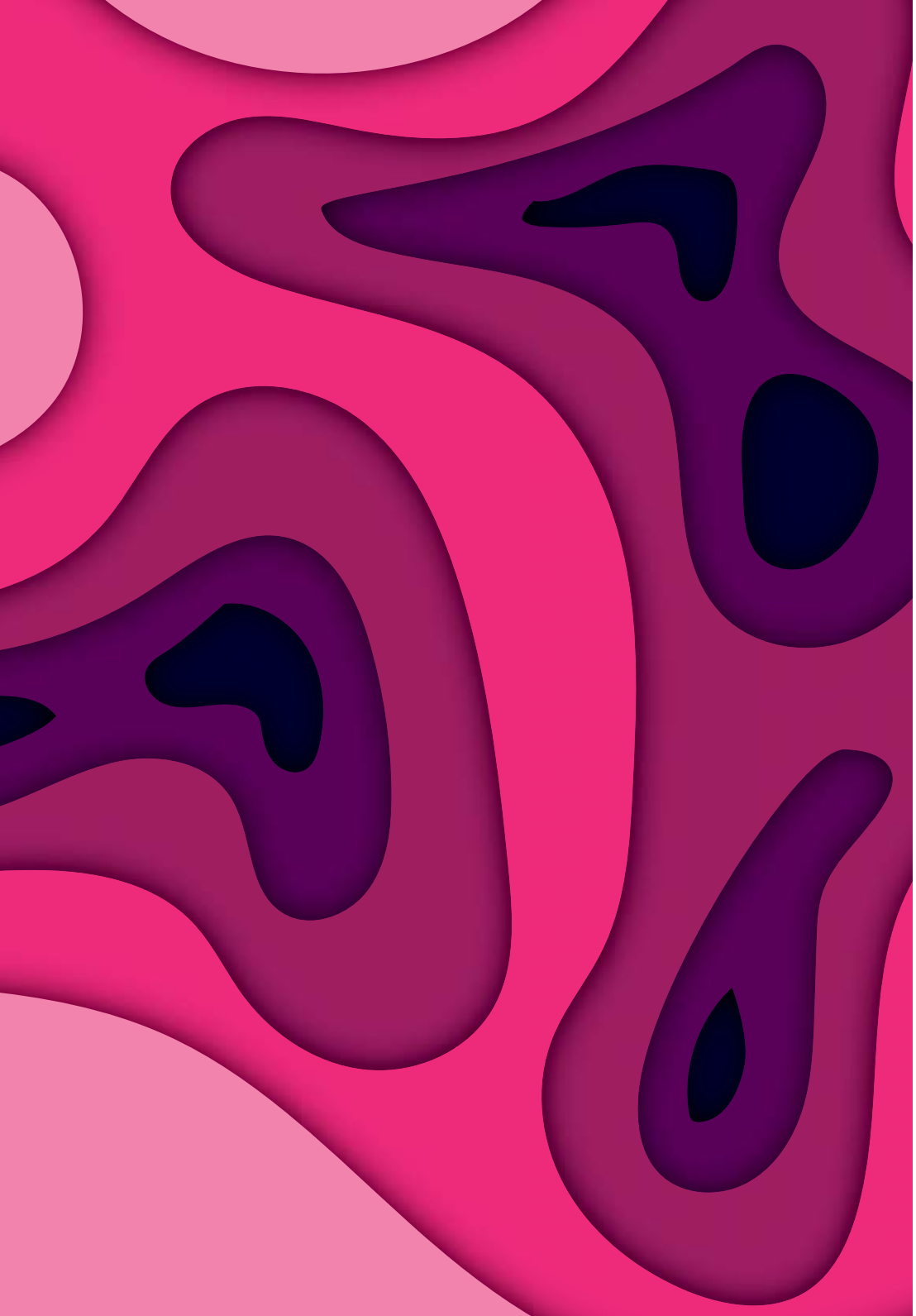
Some authors argue that one approach to these issues is to consider using selective CT instead of WBCT in trauma. The effective dose of a WBCT is considered to be 10 to 20mSv compared to the effective dose of a selective CT protocol which is around 5 to 16mSv[6]. However, research into dose optimisation in WBCT is expansive and there are many reduction strategies that have been considered[11].

Realistically, WBCT has too many recognised benefits and is so widely accepted as an imaging strategy that is unlikely for selective protocols to return.

Investigation in to the standardisation of practice for WBCT practice in England has revealed variation. An extensive study of more than 115,000 participants found that WBCT was performed five times more frequently in major trauma centres (MTCs) (31%) than in trauma units (TUs) (6.6%)[12].

Currently, there are 22 adult major trauma networks (MTN) in the UK, with 27 designated MTCs that deal with the most severe forms of trauma in adults and paediatrics[13]. Each region has developed its own network based on the available facilities and the transfer times, leading to a three-tier system for trauma care, namely major trauma centres, trauma units and local emergency hospitals which are in line with the requirements of the National Institute for Health and Care Excellence (NICE) Guidelines[14]. MTCs represent hospitals with the facilities to provide resuscitation, massive transfusion protocols, consultant-led trauma teams 24/7 within the ED, and immediate access to diagnostic imaging, interventional radiology and to operating theatres[1].

WBCT can be beneficial as it allows more time for treatment planning and recruitment of theatres and theatre staff.



A MTC is designed to have all the facilities and specialties required to be able to treat patients with any type of injury in any combination, from traumatic amputations to polytrauma involving abdominal, chest and/or head injuries. MTCs also take responsibility for the care of all patients referred with major trauma in the area covered by the network and set the local protocols for the local TUs.

Many networks appear to be following the guidelines created by The Royal College of Radiologists (RCR)[15] and all hospitals within a MTN should be adhering to the same WBCT protocols highlighted in NICE guidelines[14]. However, a lack of countrywide guidelines on the indications for WBCT means that some networks do not use specified criteria and a possible reason for the variation in protocols between MTCs and TUs.

The RCR guidelines suggest six indications that are appropriate to request a WBCT in trauma. These cover road traffic accidents (RTAs), falls, assault, reduced Glasgow coma score (GCS) with unknown mechanism, haemodynamic stability and a section for other indications that are chosen by the trauma leader. In a recent survey, many MTNs show that they are following the RCR guidelines closely, with similar indications for WBCT being included in their protocols. However, some also highlight a degree of variation, showing that despite the guidelines there is a disparity between the networks when it comes to injuries that require a WBCT in a trauma situation. This difference suggests that there is still variance in the level of care provided around the UK, as differing protocols could imply differing standards of care.

The presence of extra indications in the protocols by some of the MTNs highlighted differences between hospital protocols and the RCR guidelines. The breakdown of these indications into subcategories such as mechanical and clinical indications also emphasised the importance of understanding the patient within the situation and suggested that a wider understanding of the whole trauma situation was beneficial. RTAs, falls and assault are important mechanisms of injury that should remain the focus of the mechanical indications, as the level and patterns of injury associated with these warrant the request of WBCT.

Most of the extra indications noted in the MTN protocols relate to mechanism of injury.

Clinical indications seen in the MTN protocols are commonly found to consider the same aspects which include GCS and systolic blood pressure and would suggest that the networks are all in agreement considering the clinical indications, but not the mechanism of injury. This is perhaps because the mechanism of injury will vary dependent on each patient case, geography, economy and in some situations may be unknown.

Many individuals who are ejected from a vehicle present with head, chest and abdominal injuries.

None of the guidelines simply state that being involved in a RTA is reason enough for a WBCT. However, the RCR guidelines suggest that if a patient has been in a RTA in which there has been a high speed impact, or there has been a fatality at the scene, or the patient has an injury to more than one body region, a WBCT should be requested. Entrapment and extrication time from the vehicle should also be a consideration for WBCT requests and are frequently apparent in some protocols. A factor also worthy of consideration when establishing protocols for WBCT is whether or not the patient has been ejected from the vehicle involved in a RTA. Many individuals who are ejected from a vehicle present with head, chest and abdominal injuries[15]. It is possible that because of the level of trauma caused by this type of accident this may well have been considered under clinical indications as a patient who has been ejected from a vehicle may have a reduced GCS and suffer from haemodynamic instability. However, there is a reasonable argument that this indication should also be considered by MTNs in their protocols as it closely links to improved outcomes. A similar argument can be made for cyclists or pedestrians who sustain injury as a result of a RTA and are not afforded the extra protection a vehicle offers.

The RCR guidelines have a section regarding assault which uses the subcategory of injury to more than one body region. It does not indicate the mechanism of injury or the instrument used to harm the patient. However, interpretation of this in some MTN protocols use assault as an indicator for WBCT and tend to be more specific, including gunshot wounds, blast injuries and stabbing as reasons for undertaking WBCT. The importance of assault as an indication is somewhat self-explanatory as it is closely linked to penetrating trauma.

Analysis of the extra information considered by MTNs in WBCT protocols does suggest that many of the extra indications could benefit patient care and improve outcomes.

The RCR guidelines provide a sample form for WBCT scanning but provide no written explanation for its use. This tends to leave the process open to interpretation, leading to a concern regarding the specifics of WBCT trauma protocols and whether they should be open to interpretation. The argument could be made either way, as a more specific set of protocols does not allow for interpretation and therefore limits the creeping use of WBCT, which reduces the number of unnecessary scans performed. However, by creating a specific protocol which leaves no room for interpretation hinders a clinician's ability to make judgements and suggests that anyone could request a WBCT, removing the level of expertise from the equation.

It is hard to argue either point, but it is evident from the variation seen by the

MTNs that there is room for some enhancement of the guidelines produced by the RCR in order to benefit the patient's care and outcome.

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Improving Retention in Therapeutic Radiography

Student attrition from pre-registration therapeutic radiography education and training programmes is a long standing challenge. It is well understood that the factors that contribute to student attrition are complex and are influenced by institutional, political, professional and societal issues, as well as individual student factors[1].

In 2015, Health Education England (HEE) commenced the RePAIR (Reducing Pre-registration Attrition and Improving Retention) project in response to the Department of Health's refreshed mandate 2015-2016, paragraph 6.19[2]: *'Unnecessary attrition from training programmes can result in significant cost and impact on the health and wellbeing of students. Health Education England's objective is to reduce avoidable attrition from training programmes by 50% by 2017'*. HEE selected therapeutic radiography, midwifery and nursing (all four fields – adult, child health, mental health and learning disability) as the professions to be the focus of RePAIR. At the outset, HEE decided to extend the scope of the project to include approaches to improving retention during the first two years of employment, as newly qualified practitioner turnover rates tend to be high during this period.

At the same time, the government announced the funding reform for healthcare students. The capped numbers of student places were abolished and the student grant system was replaced by student loans[3].

In 2017, phase 1 of the Cancer Workforce Plan was published, setting out an immediate course of action to expand the supply of therapeutic radiographers by 23.5% by 2021[4]. However, the current data shows that there has been a 37% reduction in the number of applications to pre-registration BSc (Hons) therapeutic radiography programmes since 2013.

Approach to RePAIR

RePAIR set out to:

a) provide a standard definition of attrition and establish a baseline;
b) establish a detailed understanding of the multi-factorial aspects of attrition and retention in pre-registration education and training;
c) identify best practice and isolate the factors that are in place for retention to be optimised.

RePAIR was delivered over three distinct but overlapping phases:

i) establishing the project and developing the theoretical framework;
ii) gaining an in-depth understanding of stakeholders' experience in relation to attrition and retention;
iii) identifying, developing and testing current and new interventions to improve retention.

For the purpose of RePAIR, the student to newly qualified practitioner journey was described in four 'Steps' (Figure 1): pre-enrolment, duration of the course, the flaky bridge and early clinical career.

RePAIR theoretical framework

Initially, a tripartite (student, higher education institution (HEI) and healthcare provider (HCP)) model of commitment was developed (Figure 2), based on Tinto's model of student retention[5], to enable a clearer understanding of factors that affect retention across the four Steps.

Factors that affect a student's commitment to their chosen course of study include personal circumstances: prior academic qualifications, the individual's attributes, family attributes (mother's education), debt and personal problems.

Figure 1: The RePAIR four Step journey.

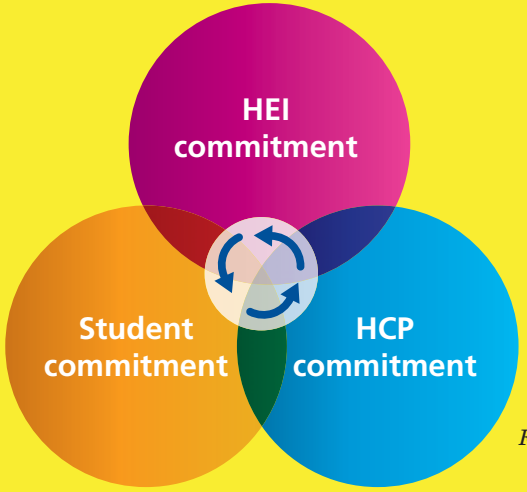


Figure 2: RePAIR commitment framework.

Figure 3: Data collection sources.

Programme, Completing Year	Starters (number)	Non-completers (number)	RePAIR Attrition % (Non-completers / Starters)
2013/14	202	63	31.19
2014/15	193	66	34.2
Aggregate	395	129	**32.66**

Table 1: HEE national average pure attrition for therapeutic radiography for years 2013/14 and 2014/15.

2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	Trend	Average attrition	% change in expected attrition 2009-10 to 2014-15
35.1%	28.3%	21.5%	19.7%	17.0%	15.1%		22.8%	-57%

Table 2: Observed expected attrition for therapeutic radiography for 2009/10 to 2014/15 cohorts.

Factors that affect an HEI's commitment to a course is the importance of the programme to that institution: financial reward and status. The approach that any HCP takes to supporting students is influenced by student loyalty and the capacity to support student learning. The financial rewards, the partnership with the local HEI and support for the clinical service are also important to the HCP.

Collecting the evidence

The mixed-methods approach to collecting the data was pragmatic and based on the premise that the findings would add to the existing knowledge base. Three separate data sets were collected (Figure 3):

- An understanding of the indicators of attrition.
- An insight into stakeholder experiences.
- An in-depth enquiry into improving retention based on a case study site model[a].

Main findings

Understanding indicators of attrition

Defining attrition is a complex matter with a number of different approaches in existence. In the absence of a consistently applied definition of attrition, HEE established a new and separate definition of pure attrition solely for the purpose of RePAIR:

> *'Pure attrition was counted as the percentage of students who did not complete within the standard pathway for that programme.'*

Student data for all therapeutic radiography programmes, for cohorts completing in academic years 2013/15 and 2014/15, was collected (Table 1). An aggregate of 32.66% of these two cohorts did not complete on time. When analysed by region over the two years, there was an increase in attrition in London and the South East and a decrease in the North. The attrition in the Midlands and East, and the South, changed very little over same period (Figure 4). Further analysis was undertaken using a separate metric: observed expected attrition[b] for the period 2009/10 to 2016/17 (Table 2). The overall observed expected attrition for therapeutic radiography fell by 57 percentage points, from 35.1% to 15.1%. Figure 5 shows Higher Education Statistics Agency (HESA) attrition trends, by year of programme, between 2009/10 and 2016/17. There is evidence of improvement in attrition from therapeutic radiography programmes over this period. Most students who experienced an interruption in their course of study went on to complete within a further 24 months of the standard pathway.

The reasons students left the course were categorised into avoidable and unavoidable.

The reported unavoidable reasons why students left their course were:

- Student sickness
- Maternity leave
- Inappropriate professional behaviour
- Personal reasons

The reported avoidable reasons why students left their course were:

- Failure at assessment
- Wrong career choice
- Financial hardship

The employment data for therapeutic radiography that was collected as part of RePAIR, showed a decrease in the percentage of students who gain employment where they trained from 58% in 2013/14 to 36% in 2015/16, and that 15% of the newly qualified therapeutic radiographers left their first job during the preceptorship period.

An insight into stakeholder experiences

One hundred and three therapeutic radiography students completed a national RePAIR survey designed to capture the student experience. Overall, the students were very positive about their course of study; the majority reported that it met their expectations, was appropriate for their learning needs and would recommend it to their friends and family.

However, more than 60%, all of whom were in receipt of a bursary stated that they would not have applied for the course if they had been required to pay course fees.

There were a number of student comments about the workload and for some it was a trigger to consider leaving the course.

[a] *For the purpose of RePAIR, case study sites were defined as local partner organisations that agreed to work together to advise and inform the project.*

[b] *HEE, using HESA student records, developed observed expected attrition as a high level measure for measuring attrition during training.*

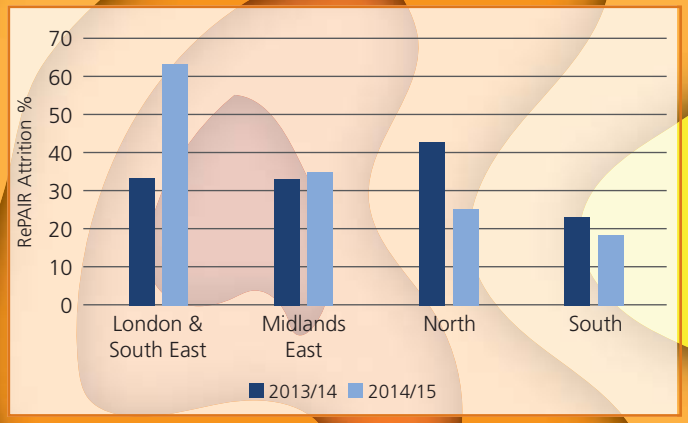


Figure 4: Therapeutic radiography pure attrition by region.

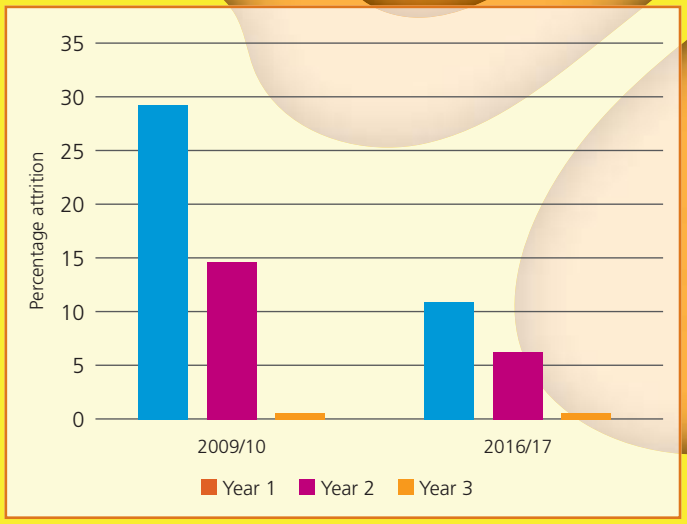


Figure 5: Percentage attrition by year of programme (HESA student data intelligence).

One first year therapeutic radiography student explained: *'I nearly quit after the first week at 'uni' because of the workload. I could have really done with either less of an overload in that first week of learning or more reassurance that it was very doable'.* Third year students also commented on the workload as illustrated by this year three student based in the Midlands and East: *'I cannot fault the lecturers, they have been brilliantly supportive and informative across the three years. However, the academic workload is overwhelming, and all the placement hours that we have to take part in makes it extremely difficult to stay on top of the work, this is exceptionally problematic as I have to do a 100 mile round trip to my clinical site, which adds an extra three hours to my day.'*

The importance to the student, of the clinical learning experience was evident from the qualitative comments. Students recognised the clinical pressure and the impact that it has on their learning. A year two student based in the North explained that *'staff most definitely do not have enough time for students due to their large workload'*.

The top three reasons why students considered leaving their course were: financial challenges, academic concerns and a negative experience while on placement. The top three reasons that students gave for not considering leaving the course were: the end goal, the ambition to be a therapeutic radiographer and support they were given throughout the course either from friends, family members or staff.

Other key findings from the insight into the stakeholder experience were:

- It is important for the HEIs to understand and manage students' expectations about the course, from initial enquiry to successful completion.
- It is important that students are afforded an opportunity to visit clinical services prior to the start of the course to help inform their career choice.
- Second year students receive relatively less support than either first or third year students.

Recommendations from RePAIR

This large scale national project has reminded HCPs and HEIs that it is the responsibility of all stakeholders to seek ways to reduce attrition and improve retention. RePAIR consistently captured evidence of how important the clinical component of the course is to students. The student experience, their desire to stay on the course, or indeed to consider applying to work in a service, is heavily influenced by the practice educator and the culture in that clinical setting.

Fourteen of the 15 recommendations from RePAIR apply to therapeutic radiography.

Recommendation 1: Standardisation of indicators of attrition
National bodies should work together to review the current range of definitions of attrition, and model(s) for measuring this metric, to ensure that the output data is meaningful to all parts of the sector, in particular HCPs.

Recommendation 2: Costs of intervention to improve retention
HEIs and HCPs should work in partnership to acquire a better understanding of the cost effectiveness of interventions that are designed to improve retention.

Step 1 – Pre-enrolment

Recommendation 3: Financial pressures
HEE should seek ways to make hardship funds available to encourage more prospective students, particularly mature students, to embark on a career in therapeutic radiography.

Recommendation 4: Wrong career choice
HEIs should ensure clinical staff are actively involved in recruitment and that prospective students really do understand the career they have chosen to enter and the demands of the course.

Step 2 – Duration of the Course

Recommendation 5: Buddy schemes
HEIs should review, in partnership with their students, the institution's approach to buddy schemes for healthcare.

Recommendation 6: Year two students
HEIs and HCPs should work together to develop specific programmes of support for second year students.

Recommendation 7: Placement allocation and associated costs
HEIs should work more closely with their HCP partners and map out detailed placement allocations for all the students throughout the duration of their course. They should also review processes relating to placement costs and ensure students are reimbursed in an efficient and timely way.

Therapeutic radiography students and staff.

Recommendation 8: National model of support for students in the clinical department
HEE should work with HCPs and HEIs to ensure that its national strategy, to support students in clinical practice and their supervisors/mentors is implemented.

Recommendation 9: Students' role in the clinical department
HCPs and HEIs should work together to resolve the dissonance that exists concerning some students' understanding of their role in the service and the interpretation of students' supernumerary status, particularly for third year students.

Recommendation 10: Standardised approach to clinical assessment
HEIs should work together to agree a national standardised approach to assessing students' clinical competence, including a simple process of recording students' prior clinical experience.

Step 3 – Flaky bridge

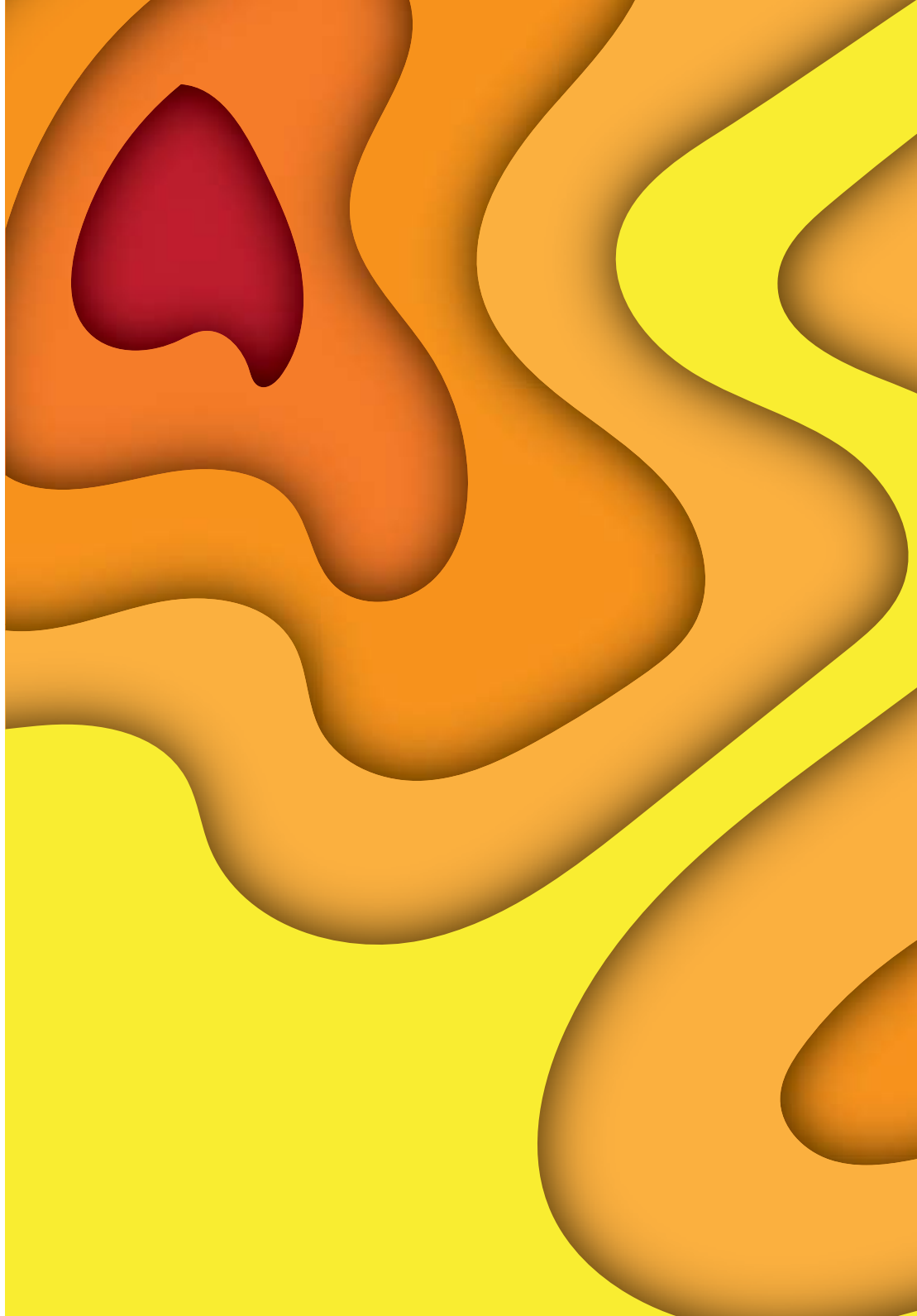
Recommendation 11: Levels of student confidence
HEIs should develop a clearer understanding of factors that affect student confidence levels, particularly at the point of progressing from student to newly qualified practitioner.

Step 4 – Early clinical career

Recommendation 12: Preceptorship model as an aid to recruitment and retention
HCPs should review their preceptorship programmes, ideally in partnership with HEIs, to improve recruitment and retention of their newly qualified staff and ensure the preceptors are appropriately trained.

Recommendation 13: Recruitment of newly qualified practitioners
Neighbouring HCPs should work together, and with their local education providers, agree a shared model of recruiting newly qualified practitioners.

Recommendation 14: Impact of culture of care and early career choices
HCPs should gather data about the culture of care in the clinical environments in which the students are training, to understand the impact of that culture on the students and their early career choices.



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A therapeutic radiography student practising the positioning of a patient ready for treatment.

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Patient Engagement in Radiography: What Can We Learn from Patient Stories?

Over the last 30 years, the National Health Service (NHS) has placed an increasing significance in patient involvement. Primarily, this was to increase the patient's participation with their own health and care but has evolved to provide insight into the quality of care and services. More recently this has changed, with the recognition of a lived patient experience[1] providing an exclusive and unique insight into the provision of services, thus enabling clinicians towards a more patient centred model of care.

Diagnostic imaging and radiotherapy departments within the United Kingdom (UK) are experiencing ever increasing workloads. Policies and procedures have been developed to provide a high quality of services for our patients. But is the service we provide what our patients want? Do we provide the service we think we do? As professionals, do we take time to talk and listen to our patients and their carers?

Patients and their carers have experience of using our services and they have the ability to identify where things work for them, where they do not work, and if asked will probably supply solutions to where improvements can be made. Patients have a lived experience to tell; we as professionals need to listen and be informed by them as to how we can improve the service we provide. Professionals within the NHS should see this as a benefit and should stop seeing involvement as a task that is required to be done[2].

The UK Society and College of Radiographers (SCoR), has long acknowledged the contribution patient engagement makes to our services. We have a long standing Patient and Public Liaison Group which was established in 2007, and it recently changed its name to the Patient Advisory Group to reflect its increased influence. This is seen in the priorities of the SCoR Strategic Plan 2018-2020 which will 'ensure the patient voice is integral' (Society) and 'be informed by the voice of the patient' (College)[3].

The SCoR was determined that achieving these priorities was not seen as a tick box exercise and resolved to embed them throughout the whole organisation and across the profession. In order to do this, the College Board of Trustees first organised a research workshop in May 2017 entitled 'how best to engage/involve patients as stakeholders', inviting a wide range of participants, including patients.

One of the recommendations from the workshop was to commission a piece of work to devise a strategy which would ensure that the SCoR priorities relating to the centrality of patient voice would become embedded throughout the organisation. In March 2018, a small task and finish group of 13 people was convened to carry out the work. This comprised patients, practitioners, researchers, educationalists and SCoR officers. In response to the remit, the group co-created a set of Guiding Principles for Patient, Public and Practitioner Partnerships (PPPP), intended for use by all those with a stake in the quality of radiography practice[4].

The resulting document was published in the Autumn of 2018.

Patients have a lived experience to tell; we as professionals need to listen and be informed by them as to how we can improve the service we provide.

The purpose of this paper is to highlight the value radiographers and their teams can gain from listening to and learning from patient stories.

Story 1

Recently, I attended [hospital x] A&E, after a bicycle accident. I had broken my elbow. The nurse practitioner that handled my case was lovely and caring.

However, when I had to go and get an X-ray, I did not have same experience with the radiographer. I was asked to place my elbow on the table while sitting, however I was in a lot of pain and did not feel I had the movement to do so. So I stood up to do it. I was then snapped at by the radiographer (not the student who was present, who was lovely) and told to sit down and do it. I then said: "I can't" and they replied by snapping again and said: "YES you can!". I was then asked to rotate my arm for a different angle. They said they would support my elbow as I would rotate. They did not. The radiologist simply just placed their hand underneath but not giving support. Then proceeded to drop my elbow on the table, causing a lot of pain. They said I could rotate my arm the best I could, and when I stopped at my threshold, they continued to turn it causing further pain. Please bear in mind, my accident had only happened a couple hours prior to this.

I understand that they do need specific angles to get the best image, however I would have liked more empathy and consideration towards my situation and not have been snapped at and wrongly treated.

I am involved in the medical professions and do have a great understanding of what is expected from health professionals. I understand people have off days, however, a hospital is a place of care and nurture and you are supposed to feel cared for. I am deeply saddened that I did not receive this care.

https://www.careopinion.org.uk/opinions/596609

Story 2

After a routine breast screening mammogram, my Mum received a letter two weeks later, to say that she needed to attend... for further tests, with an appointment for three days later. This was obviously a very worrying time for us as a family.

... Mum's eyesight isn't the best, however; mine is fine, and even I could not read the map that was included...The original map had been photocopied that many times, that none of the writing was legible. The leaflet had been printed on one side only, meaning what should have been two sides of A4,...seems like an absolute waste, considering how many of these must be sent out.

A big problem was the language in the leaflet, which stated that patients are not allowed to have anybody with them in the clinical areas, and anyone other than the patient must wait outside in the main waiting room, leaving the patient to sit on their own, waiting to be tested for cancer. My mum is very disabled, and could not be left on her own in a waiting room, as she couldn't carry a bag, get herself changed, go to the toilet, open a bottle of water or even recall the information she is told. Therefore; I called the unit to explain this, and ask that an exception be made due to Mum's needs. When I called, the person who answered seemed bewildered and a little peeved by the fact that I'd called, despite the fact that the leaflet gave their number for any questions. I explained I had some questions, and was told they were too busy (10am) and someone would call me back later.

A short time later, I was called back by a radiographer, who was very helpful. ...she was surprised that we were so worried, and said that this wasn't a problem at all, they just 'don't want men sitting in the clinical areas, as women would be in hospital gowns and it was to protect their dignity'. I do wonder what would happen if it was a man needing further tests here, as obviously, men can still get breast cancer? While I am thankful for them prioritisting patient dignity, the wording of the leaflet made Mum believe she would have to be alone with no help, and this caused such massive upset and anxiety, that she was considering not going for these further tests. I strongly believe the wording (and general quality) of this leaflet needs to be reconsidered – perhaps just to say, 'to discuss individual needs and circumstances, please call the department' – the wording in the leaflet made this seem very final and not up for discussion. It nearly caused my Mum to cancel this very important appointment, when actually, this was without reason, as me attending with her was not an issue. A lot of anxiety, upset and worry could have been avoided, by a slight adjustment of the leaflet's wording.

https://www.careopinion.org.uk/opinions/446224

It contains core values as described by patients or carers, illustrated with real patient stories and followed by guidance as to how each core value can be achieved. It concludes with facilitative resources. The patient voice is very strong in this document and it makes essential reading for all radiographers who want to listen and learn from their patients.

Patient stories of radiography

The purpose of this paper is to highlight the value radiographers and their teams can gain from listening to and learning from patient stories. It will do this by presenting the experiences of five patients or their close family members, as they themselves described their attendance at imaging and therapy departments. They have been taken from the Care Opinions website[5]. These will be analysed separately and evaluated against the PPPP document and its guidance. This will give a unique insight to the patient experience, their perceptions of what is good and bad, what opportunities were missed and what could have been done differently to enhance that experience.

At face value, story 1 (page 41) appears to centre on the importance of physical care and manual handling from the patient perspective. From the radiographer's perspective, it reinforces the difficulty we have on a daily basis balancing patient comfort against the achievement of an imaging goal. However, considered through a more patient-centred lens, the focus is arguably one of communication, and highlights the possibilities radiographers have for supporting the 'joint decision-making' agenda. Core Values numbers '9' and '10' in the PPPP Guiding Principles document state: *'Be aware of my limitations but please do not make assumptions about me'* and *'build in time for genuine discussion'*. The radiographer in the story has made assumptions, not only about the patient's range of movement and pain (they don't appear to have explored this with the patient) but also about the amount of information the patient needs, taking a paternalistic approach to 'directing' this examination. If the patient understands the imaging goals they may be more inclined to explore the limits of their reach. By providing them with the answers to their questions, *'why am I here?'*, and *'what are you looking for?'*, a joint solution can be found and the radiographer can then determine the degree of technique adaptation required. The PPPP guidance section for value '10' refers the reader to the principles of shared decision-making on the NHS and Health Foundation websites. Clearly, as this example shows, the concept of shared decision making can and should extend beyond the therapeutic setting[6].

One further observation worthy of discussion is the incorrect use of the term radiologist to refer to the radiographer. There has been much debate about how we

can raise awareness of the radiography profession. Of course, a simple solution is to include this, along with our name, in every patient encounter. However, this does not always happen;

"My niece attended an appointment in the X-ray department at the... Hospital, we were seen by three members of staff and not one of them took the time to introduce themselves by name or explain their role"[7].

There are a number of striking issues in story number 2. The most obvious is the quality of written information. Although photocopying may be the responsibility of one of the administrators, the radiographer must quality-check these. How many of us read our leaflets from the perspectives of the patient? Have you attempted to follow the map you send as if you were a stranger to your department? Have you really walked the journey of the patient? Core Value 4 in section 1 of the PPPP document asks to *'provide me with high quality patient information…'* and the guidance directs practitioners to useful tools to help them develop and evaluate their patient information materials.

However, if we delve deeper this story tells us more. It outlines not only the frustration of poor quality or, worse still misinformation, it highlights the potentially catastrophic implications of this for the patient. Here is a patient who almost failed to attend a crucial examination because of the anxiety caused by the leaflet. Things that appear inconsequential to us really matter to patients. Furthermore, the knock-on effect on the family is evident as is the additional resource burden on the service through having to respond to unnecessary queries (only unnecessary because of the confusion caused by the leaflet).

It also questions the rationale behind 'banning' relatives from clinical areas. We make exceptions for children, why not for frightened adults? We argue that this population is even more vulnerable and in need of carer support. This is because there is an expectation that, being adults, they have the cognitive skills to understand and remember instructions. With an increasingly aging population, this is no longer guaranteed. Furthermore, the carer can offer important support to the radiographer, having a much greater awareness of the patient's abilities, limitations and coping strategies.

The rationale for banning relatives in this story should also be questioned at a time when we are attempting to embrace an understanding of gender which extends beyond male and female identities[8,9]. We suggest maintaining patient dignity can be achieved through many other approaches.

The relative who has written story 3 calls this a "small gap in communication".

Story 3

"My husband received chemotherapy and radiotherapy treatment for Head and Neck cancer ...The care and attention he received as a patient was nothing short of amazing and nothing was too much trouble.

Due to the nature of his cancer, he could no longer eat and became extremely ill eventually requiring a nasogastric tube and in-patient care towards the end of his treatment.

He was discharged a few days before the end of the radiotherapy sessions with a huge amount of medication and needed round the clock help. At each of the following radiotherapy session, we had the comfort of him being checked over by the staff and if he needed any additional help it was arranged.

On the final day of treatment we said our goodbyes and that was that.

At home as expected my husband became increasingly worse with his skin on his neck breaking down and becoming very sore and requiring dressed.

Given that I was a) new to being a carer and 2) worried sick about my husband it was at this point I felt totally lost. We no longer were under the care of [Hospital B] and I really didn't know where to turn. On looking at all the handouts I had received I was not really any further forward.

It wasn't until I was very upset at work that things changed when a friend of a friend who was a district nurse came to our aid. Apparently I should have been referred back to our GP to arrange for nursing directly from them. No-one told me of this at any time. Once the GP were informed, things settled and I was re-assured on a daily basis by the wonderful nurses there.

The small gap in communication was thankfully filled. Thankfully this didn't affect my husband, which was important but it did leave me feeling quite isolated and panicked.

A small piece of information would have made a big difference to me"

https://www.careopinion.org.uk/opinions/297282

In this way it is very similar to story 2 where small details missing from patient information can make a huge difference to the patient and their relatives. However, this story also highlights that radiographers have a role in the patient pathway which extends beyond the episode of care in radiotherapy. This is also true for diagnostic imaging and there are many stories on the Care Opinion site which show that what we tell patients about results is a stock reply rather than a reflection of reality, for example:

"My actual complaint is we were told we would receive the results of the X-ray in seven to ten days and over three weeks later we still haven't heard when they will be reported on[10]".

As radiographers we have a duty of candour and so must always be truthful with our information regardless of the pressure the service is under. Not only is this morally appropriate, but honesty plays an important role in managing the patient's expectations and directing them in terms of the next stages. This is captured in Core Value 12 of the PPPP guidance which says: *'Let me know what happens next, timescales and people to contact if needed'*. It is easy when we are busy to have a standard 'script' but these scripts need to be adapted and constantly updated to reflect reporting times, new patient management pathways and services. How many of us truly engage with the world outside of imaging and therapy to make sure we are up to date with the policies and practices of the services to which we 'discharge' our patients?

Story 4 also highlights problems related to the patient pathway but may also provide an insight into the exciting possibilities that lay ahead for radiographers.

This story-teller suggests the problem is one of 'communication and clarity', identifying that the pathway protocol has not been correctly articulated or followed. However perhaps the referral protocol itself is outdated. Taking a more holistic view, and seeing the service from the patient perspective, could enable the team to explore a more patient-centred approach to the protocol. Equipping the radiographers with clinical assessment skills, for example, could mean that patients do not need to see a general practitioner, radiographers would be able to refer for plain imaging, improving the service to the patient, saving NHS resources and increasing role satisfaction. Adding a reporting radiographer with prescribing and discharge roles would be even more effective and efficient. Core Value 15 asks radiographers to *'consider patient-centred approaches to booking and appointment systems'*. Although extremely important, innovative and holistic thinking redefines an effective appointment system as one which goes beyond providing the patient with a convenient date and time.

Story 4

I phoned our GP practice last Tuesday morning for my husband, who is seventy-three as he has a hand injury that seemed to be getting more swollen and more painful. When I was told there were no appointments that day, I was told to take him to the minor injuries unit at 'W' to have it X-rayed. We were screened by a staff member who said an X-ray wouldn't be possible unless he was seen by his GP. We phoned the surgery and the GP then agreed to see him and we had to go back to the surgery and rush back to 'W' again for him to have the X-ray (which showed a severe wrist injury). All of this took three hours!

There seems to be a lack of communication and clarity between GP surgeries and the minor injuries unit. It is not good that patients – especially the elderly – are suffering because of this.

https://www.careopinion.org.uk/opinions/289941

Story 5

"My autistic teenage son suffers from extreme anxiety and had fallen off his bike at speed. He is unable to travel by car but managed after a few days to cycle to A&E for an X-ray.

Upon arrival his anxiety peaked and he was unable to enter the hospital. My husband went in and explained the situation and he was triaged outside where he felt more comfortable. The radiographer even came outside to talk to him and reassure him that the X-ray would be quick and that he could return outside as soon as possible if that was easier for him.

He began to panic when walking to the X-ray department but the radiographer chatted to him about computers, his favourite topic, and he was able to relax enough to be X-rayed.

We feel that the care received was excellent and that the staff went above and beyond for our son. Autism and anxiety are very challenging but the staff were so understanding and patient and it made all the difference. Please thank the staff for how wonderful they are.

Fortunately the chipped radius did not require a cast so my son was able to cycle home again".

https://www.careopinion.org.uk/opinions/589003

As radiographers we have a duty of candour and so must always be truthful with our information regardless of the pressure the service is under.

Despite the negative perceptions these stories portray, they also illustrate the positive value that can be gleaned from giving the patient a 'voice' to feedback their experiences. In story 2, for example, the carer offers an alternative to the wording of the leaflet. Section 2 of the PPPP document encourages the involvement of patients and the public in the development of the service, in a way that goes far beyond the Friends and Family Test. Core Value 1 in this section asks: *'Include me in the team which discusses and develops diagnostic imaging and radiotherapy services…'* and the guidance section refers the reader to the Always Events[11], a patient and practitioner collaboration initiative, as an example of good practice.

It is also interesting to note that stories 2, 3 and 4 have been written by relatives and carers, highlighting that the extent of our actions is impacted beyond our immediate patients. Carers and relatives can often get overlooked in a busy department yet play a huge role in supporting our patients. Ethically, our duty of care therefore extends beyond the person we are imaging or treating. This notion is captured in the PPPP document in Core Value 11 which also refers the reader to a number of useful NHS documents and websites about supporting carers.

Conclusion

This paper highlights that much can be gained from listening to and engaging patients, not only in their own care but in service development and improvement. The PPPP document also highlights the vital role patients play in radiography education and research. We urge radiographers to access the document, learn from the stories and be guided by the resources.

Finally, although we have used negative stories to identify issues and opportunities, there are many positive stories which show that radiographers can strike the right balance in providing patient-centred individualised care. We would therefore like to finish on a positive note by presenting an example of such a story (Story 5).

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Appreciating Complexity and the Art of Managing Polarities – Leading Workforce Transformation at Scale

As the National Health Service (NHS) turned 70, Simon Stevens[1] recalled Aneurin Bevan's prediction that the NHS would need to be continuously changing, growing and evolving. He added his own corollary that to continue to succeed in the future the NHS must always be impatient with the present, and that the future lay largely in our hands.

The NHS has published its strategy[2] for the next ten years, it is clear that the pace of change will continue to increase. Within imaging and oncology services the momentum for change to support increasing demand, hastened diagnostic targets and growing workforce pressures, is a powerful combination which places change centre stage and ensures that the leaders of NHS commissioned services will continue to operate within rapidly changing, complex contexts.

This paper will consider some of the issues of leadership in today's system facing NHS, and will focus in to examine the potentially paralysing issues of complexity and polarity, which although recognised, often remain unnamed and unaddressed as they can be challenging to manage. The challenge is that the changes needed now are often significant, perhaps previously avoided and involve a human system. In general, we have made the easy changes. People struggle with how to genuinely enable sustainable change, when there is so much at stake. Will the fact that there is so much at stake drive new behaviours and attitudes that could support the change required?

Context

The Cancer Research UK[3] report on the UK Non-Surgical Cancer Treatment Workforce, clearly outlines the workforce challenges faced by imaging and oncology services. This report highlights the need to transform the skills mix of teams, develop roles and improve services to realise the potential of all aspects of the workforce and service. In the face of overwhelming service demand, professional silos, networked services, a fast changing external context and a human system this challenge has become increasingly complex.

There is much written about the leadership skills, attitudes and behaviours required by today's 'system leaders' in order to drive 'transformational change'.

NHS Improvement published *Developing People-Improving care*[4] to support the system and develop the strategy to promote the critical leadership capabilities required by the NHS. These include:

- Systems leadership skills to build trust and relationships across systems.
- Improvement skills.
- Compassionate inclusive leadership skills.
- Talent management.

System leadership skills are further broken down into skills that span the ability to build readiness, create direction and lead transformation[5].

Tweed et al.[6] state that 'an effective leader focuses on creating the conditions for transformational change and its sustainability. A primary role is that of a relationship builder, but systems leaders have additional core capabilities: a wider perspective, the ability to foster reflection and generative conversations and the ability to shift from problem solving the present to co-creating a new future.' They continue, 'at the heart

of system leadership lie the personal qualities of the leader: reflexivity, the ability to cope with ambiguity and ways of thinking to translate the difficult and complex as a means of galvanising others.'

Putting it into practice

What is interesting when trying to put leadership thinking into practice, is that leadership development at all levels focuses upon the centrality of building effective relationships and building and maintaining trust, to create effective, sustainable change. In the pursuit of effective sustainable change, however, I would argue that this relational and dialogic aspect of leadership needs further depth and development. At face value, it risks over simplifying the root cause issues that complicate and prevent change.

A key part of building relationships and trust involves appreciating the world through the lens of each constituency and the individuals within, appreciating their hopes, fears and lived realities (past and present). This is not for one to be influenced by, or paralysed by, rather it is to understand the human aspects of change and to support genuine appreciation of the real complexity. To work at a lesser level of understanding results in being tripped up by the unseen, unknown and unsaid. The art of complexity and polarity management is increasingly seen in modern leadership curricula, yet it appears to remain peripheral, and hard to understand until one begins to notice the symptoms. Workforce transformation is deep rooted in complexity and polarity (a pair of interdependent opposites, eg strong individual professions and an aptly skill mixed functional team).

To consider both in further depth will help illustrate the issues and need for greater attention.

Complexity

We operate within a challenged human system in which demand continually outstrips resources, change is a constant and not all change is a positive experience. As a result we underestimate the breadth and depth of human emotion and experience which drives further complexity. The ambiguity and diversity of stakeholders of workforce change projects builds complexity and the work of Grint[7] is helpful in understanding the nature of these 'wicked' problems. Grint outlines three types of issues faced by leaders and managers:

1. Tame problems – a clear issue, uncomplex environment, known stakeholders and issues, a solution can be implemented.

We operate within a challenged human system in which demand continually outstrips resources.

2. Time critical or crisis problems – clear issue, needing urgent attention, new solution needed but time critical nature offers permission for action and innovation, directive leadership is needed/allowed.
3. Wicked problems unclear problem definition, requires multiple agencies, requires adaptive leadership.

Much of NHS-facing large-scale change work presents as wicked problems. Grint continues to argue that wicked problems often only become clearer as wicked problems as you start to try and solve them as:

- They do not respond to normal solutions;
- often it is not possible to gain consensus on the nature of the problem let alone the solution;
- there are multiple stakeholders, some known and some unknown;
- there are complex interdependencies which appear and may create new problems.

Grint adds an interesting and often seen, yet rarely discussed, complicating factor in that there is often a gap between the expressed values, beliefs and attitudes of a community/organisation and their behaviours in practice[7].

Seeing change through this lens highlights the need for flexibility and adaptability in leadership style, and the need for varied and multiple approaches. There needs to be an ability to move from individual to collective leadership, engaging multiple representative stakeholders and a very adaptive leadership style, as the group works together to understand and work through aspects of solutions, referred to by Grint as 'clumsy solutions'. The leader's role when facing a wicked problem is to ask and support the right questions, eg 'how could we?'. The leader should accept where people are and, whilst avoiding alienating constituencies, accept that full consensus is unlikely, however, looking for a starting point where all (or the majority) can agree. Once at this point, then working together to craft albeit clumsy solutions. Thereby embracing the complexity, working with it and those involved in it.

Polarities

A polarity is a pair of interdependent opposites[8]. For example, as we transform the workforce, we need to enable strong professional identities, unique skills and pride, whilst being able to significantly skill mix the activities and expertise of a team to create the most effective services, where more staff are skilled to share work safely and effectively and increase access. To focus on one polarity without attention to the other will potentially create threat to some parties, will not provide a sustainable

solution, and may lead to negative unintended consequences. Ignoring polarities leads to an 'either/or' mentality which creates sides and therefore winners and losers.

To work with polarity, one must first recognise it as a polarity, understand the detail of the polarities and then learn how to work with it to balance the polarity where possible, and work towards a shared vision that all can subscribe to, feeling heard, respected, understood and valued. This honest brokerage is fundamental to managing a polarity.

If a polarity is ignored, the human reaction is significant but not always understood as a symptom of a poorly managed polarity. The psychological and physiological reactions to threat are fight, flight or freeze; these reactions are commonly seen in work we do on workforce change, the root cause being fear of threat. In workforce change this is very apparent. A fear of loss, a fear of giving something away when others don't, a fear of criticism for not defending or protecting one's department, profession, organisation; the list goes on. Aside from the very human response to one's own experience and group thinking, so many of our leaders are leaders of constituencies, often in the professions, organisations or systems for short terms of office. For them the fear of making a move detrimental to the profession, department or organisations, that they will then need to return to, potentially having given away something important on their watch as their legacy, is too much of a threat for change to be easy.

By reframing an issue as a polarity, thinking can move from the 'either/or' of problem solving to how we can achieve 'both/and', moving from 'can we have both?' to 'how can we have both needs met?' Discovering the difference between problems, wicked problems and polarities to manage is a vital leadership skill. Rather than solving a polarity one has to manage a polarity, balancing attention to the needs of both components. By working together to map out both sides of the polarity and understanding what positive outcomes for both sides looks like, supports a shared understanding of the polarity and helps vision a shared future outcome[9].

This requires skilful brokerage, an understanding that this is often an uncomfortable and new way of thinking for many. This in itself generates perceived threat and potential reaction, due to the human emotional response. However, in practice, it is perhaps the most powerful component of change conversation, building trust, relationships and shared foundations for change – understating where we can agree and therefore where we start. With a workforce polarity, we may only find agreement in 'our patients must have timely access to high quality care'. The aim is to aggregate to a level of agreement and start there.

By mapping the sides of the debate we are able to start to highlight where we can achieve 'both/and' rather than 'either/or' and start to take action together to the benefit of our patients. At its very basic level, polarity management is about the value of all and honest, adult brokerage when polarity management is not possible.

Leadership thinking often pays attention to 'what's in it for me?', using this as a core understanding to support people through change. This is perhaps an oversimplified approach and reinforces the wrong mindset, this is not, and should not be a 'win/lose' situation. Rather, working with the wicked issues and managing the polarities, it is, far more fundamental, perhaps less about 'what's in it for me?' and rather 'what do I see I could lose or gain?'

In summary

The one certainty is that change will be ever present throughout our careers, with increasing pressure, complexity and ever present polarity. If the future of the NHS is largely in our hands, the responsibility to deliver this change lies with us and our ability to lead sensitively and effectively through complexity. We need to lead and be led with our eyes to the greater system gain of sustainable, meaningful change for populations. We ignore polarities and complexity at our peril. The basic human reaction to threat often sits with us as the unseen, unspoken spectre in our meetings, conversations and emails, and this silently dictates our outcomes, drives our behaviours and perhaps limits the potential of change. A drive for collective leadership to wrap around complex, wicked problems and respectful, value driven attention to the management of polarities, are perhaps the most vital additions to our leadership skills, behaviours and attitudes for 21st century change.

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Magnetic Resonance Image Guided Radiotherapy (MRiGRT)

Advances in image guided radiotherapy (IGRT) technology have revolutionised radiotherapy in the last ten years. The introduction of cone beam computed tomography imaging (CBCT) allowed three dimensional images to be acquired prior to treatment delivery, providing information regarding not only the patient and their skeletal position, but also the position of the internal anatomy[1]. Hence, allowing any changes in the position of the target and organs at risk to be compensated for prior to treatment delivery by enabling online image guided radiotherapy (IGRT) to be delivered effectively and thus improving accuracy of treatment delivery[2,3].

The main challenge in the MR Linac systems is to minimise the impact of the magnetic and RF interferences between the MRI and the accelerator.

In parallel with the implementation of CBCT in treatment verification, the advantages of magnetic resonance imaging (MRI) over CT has been explored and exploited in the radiotherapy pre-treatment pathway[4]. This has driven the concept and subsequent development of radiotherapy linear accelerators (Linacs) combined with magnetic resonance imaging (MR Linacs) and thus enabling online MR image guided radiotherapy (MRiGRT) and subsequently adaptive radiotherapy.

This paper will describe the MR Linac systems available, the impact of MRiGRT in radiotherapy departments and initial clinical experience.

MR Linac systems

At the time of writing there are four systems at varying stages of implementation (Table 1). The first clinical treatment was 15 January 2014 with the MRIdian system (ViewRay)[5], consisting of a 0.35 T magnetic resonance imaging (MRI) scanner combined with a three head Cobalt 60 radiation source (Figure 1a). This system has since combined the magnet with a 6MV Linac which was European Conformity (CE) marked in 2016 and had both Food and Drug Administration (FDA) approval and first treatment in 2017. A total of 17 centres are treating patients on 19 systems with nearly 4000 patients treated. The first patient was treated (spinal metastases) with the Unity system (Elekta) in June 2018[6] (Figure 1b), and more than 40 patients have been treated since. The Unity system uses a 7MV Linac with a 1.5 T magnet with treatment delivery between magnet poles and images are of quality shown in Figures 2a-c.

The other two systems have acquired patient images but not treated patients as yet. The Aurora-RT consists of a cryogen free bi-planar magnet with the Linac oriented parallel to the magnetic field and acquired the first patient images from an inline system in 2014[7] (Figure 1c). The radiation beam is directed through the centre of the coils along their common axis and the entire system rotates together. The Australian system is a 1 T split-bore magnet research system[8] with the Linac outside the Radio Frequency (RF) cage (not visible) (Figure 1d).

System (manufacturer)	Radiation strength (MV)	Field strength (Tesla)
MRIdian (Viewray)	Cobalt or 6 MV FFF	0.35 T
Unity (Elekta)	7 MV	1.5 T
Aurora-RT (MagnetTx)	6 MV	0.5 T
Australian	4 & 6 MV	1 T

Table 1: Current MR radiotherapy systems.

Figure 1a: Meridian® system (courtesy of Viewray).

Figure 1b: Elekta Unity (courtesy of Elekta).

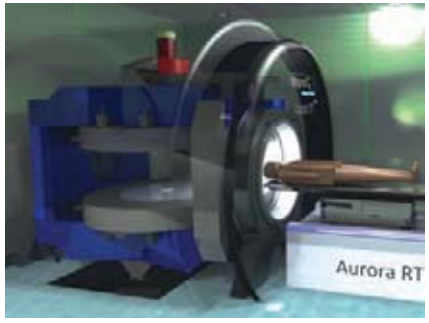

Figure 1c: Aurora RT™ (Courtesy of MagnetTx).

Figure 1d: Australian (courtesy of Paul Keall).

Figures 1a-d: MR Linac systems.

Images were acquired in humans in 2017 in horizontal and upright positions. Animal experiments are planned for 2019 and an ethics application for human treatments is being processed.

The main challenge in the MR Linac systems is to minimise the impact of the magnetic and RF interferences between the MRI and the accelerator. The MRIdian system achieves the decoupling of the MRI from the accelerator as well as RF minimization via compact passive shielding. The Elekta MRL incorporates a redesigned Faraday cage which positions the accelerator outside of the cage to manage RF interferences between the accelerator and the MRI. The Aurora-RT employs simple active shielding to magnetically decouple the Linac.

Impact of MR Linacs in radiotherapy departments; safety considerations

The safety considerations of introducing MR in the radiotherapy department must be considered when installing a MR Linac. Radiotherapy staff will need to be aware of the MR environment and understand the safety considerations thereof. Local rules combining radiation and MR rules are required and best created by considering any existing MR policies of the hospital and the Medicines and Healthcare products Regulatory Agency[9]. This requires collaboration between both diagnostic and therapeutic radiographers and the radiotherapy and MR physicists to designate defined areas, authorisation and roles. All staff in radiotherapy departments should be trained according to their level of access and authorisation. The implications of an untrained workforce may be catastrophic if the hazards of the MRI environment are not fully understood and mitigated. This is best achieved via collaboration with experienced MR diagnostic colleagues, which is professionally valuable and rewarding.

Impact of MR Linacs in radiotherapy departments; radiotherapy pathway and workflow

The MR Linac systems aim to provide a platform for online adaptive radiotherapy (ART). ART was first described as 'a closed-loop radiation treatment process where the treatment plan can be modified using a systematic feedback of measurement'[10]. Until the introduction of the MR Linac systems which have provided the software to create the 'closed loop' online system, adaptive radiotherapy was delivered either offline, by creating a new treatment plan, after a CBCT image triggered the event or scheduled after a set number of treatments; or online by prospectively creating a number of plans either prior to, or within, the first few treatments ('plan of the day')[11].

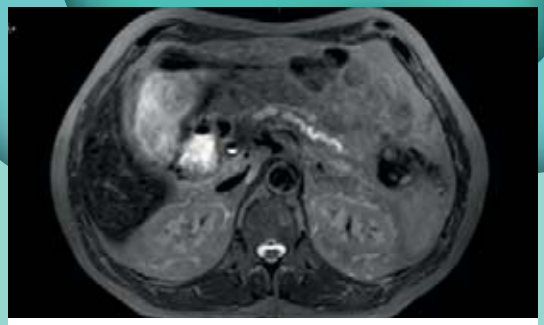

Figure 2a: Navigated Abdominal image.

Figure 2b: T2 pelvis (six minute).

Figure 2c T2 pelvis (two minute).

Figures 2a-c: Images from Unity MR Linac.

MRI offers additional advantages compared to X-ray imaging in providing functional information which may be used to assess treatment response and further personalise treatment in terms of daily geometry and dose

Whereas the online adaptive workflow consists of making a judgement either prior to treating or at the time of imaging regarding whether to adapt and if adapting, then recontouring and replanning, checking the plan, considering whether to reimage and delivering the treatment.

Early experiences described the workflow as comprising of nine stages and was heavily staff intensive, requiring the physician and/or physicist to participate in seven stages and resulted in a median treatment time of 54 minutes (range 34-99 mins) [12]. Waiting for staff and the unfamiliarity of staff with the patient and system were main factors contributing to the increase of treatment time[12].

With the first 20 patients the median time for adapting the plan, defined as the time required for re-contouring, re-optimization, and quality assurance (QA), was 26 minutes[13]. This approach requires clinicians to only review and adjust organs at risk (OARs) located within 3cm from the planned target volume (PTV). Another approach would be to utilise the radiographers, the key staff members on the Linac, to re-contour and make the decisions required to adapt. Therapeutic radiographer skills and roles have evolved alongside the advances in imaging technologies, from evaluating treatment portal images[14], evaluation of verification images for hypofractionated treatments[15], and more recently, to choosing prospective adaptive (plan of the day) treatments[16]. To evaluate plans and images online for adaptive radiotherapy is not only a logical progression but also a necessary step to enable an efficient workflow and unlock the potential of adaptive radiotherapy.

Clinical experience

The first 20 patients treated with MRIdian system reported that of 170 fractions available for consideration of online ART, 52 underwent re-optimisation (30.6%)

Dosimetric benefits and patient outcomes are required to define thresholds regarding the need for ART.

and 92 were given using an online-adapted or previously adapted plan (54.1%)[13]. Only one patient could not tolerate the treatment and this was because of claustrophobia.

Patients who have commenced treatment on the MR Linac within the Elekta consortium, have ranged from spinal metastases and prostate (Utrecht, Holland), and prostate (Royal Marsden and Institute of Cancer Research, UK, and Netherlands Cancer Institute, Holland). Approaches have differed from each centre, whether adapt to position (dose shift similar to standard image guided radiotherapy) or adapt to shape (recontouring and replanning). Reports on patient experience have been acceptable[17].

Dosimetric benefits and patient outcomes are required to define thresholds regarding the need for ART. The dosimetric benefits include either reducing the dose to organs at risk or increasing the dose to the target, or a combination of both and the potential benefits have been indicated in many planning studies[18-21]. Although improved outcome has been demonstrated in early clinical studies[22] further clinical trials are required to determine the benefit of radiotherapy delivery on improved patient outcomes.

Future

Adaptive radiotherapy delivered with MR Linacs has further possibilities. MRI offers additional advantages compared to X-ray imaging in providing functional information which may be used to assess treatment response and further personalise treatment in terms of daily geometry and dose[23]. Intra fraction dose adaption has been proposed and demonstrated, however more advances in software development is required before it is clinically available [24].

Radiotherapy delivered on MR Linacs will provide a wealth of data, images and information. This can inform both MR Linac and conventional radiotherapy treatments. Whilst fast planning and possibly improved image quality will be required for online adaptive radiotherapy to be delivered on conventional Linacs, the information gained from treating patients on the MR Linacs may provide thresholds to trigger offline ART. These options must be explored within the multi-professional team to ensure adaptive radiotherapy is available to all radiotherapy patients.

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Direct Entry Ultrasound: Undergraduate and Post-graduate Routes. The unique Perspectives of Two HEIs

This article explores the unique perspectives of two of the higher education institutions (HEIs) who have developed 'direct entry' programmes in medical ultrasound in response to current national demand. The University of Cumbria developed a 'direct graduate entry' MSc Medical Ultrasound programme, which began in January 2016 and Birmingham City University developed a BSc (Hons) Medical Ultrasound, which started in September 2016.

According to the Society & College of Radiographers (SCoR) in 2014, 18.1% of sonographer posts in the United Kingdom (UK) were unfilled[1]. In response to the growing sonographer shortages, and the negative impact this is having on ultrasound departments[2,3] new educational solutions are being considered and developed within the UK ultrasound community[4]. The Consortium for the Accreditation of Sonographic Education (CASE) has recently acknowledged the need for a long-term solution to enable sufficient sonographers to join the workforce, which includes direct entry ultrasound education[5].

The University of Cumbria Experience (Direct Graduate Entry MSc Medical Ultrasound)

In 2014, following extensive in-depth discussions and meetings with local clinical ultrasound departments, the University of Cumbria made the decision to develop a dedicated direct graduate entry MSc Medical Ultrasound programme.

There was understandable trepidation within the region's clinical ultrasound community that ultrasound services could potentially become devalued if the current post-graduate level educational standards were not maintained[6]. This report supported the University of Cumbria's decision to develop a post-graduate 'direct entry' programme.

Two-year pre-registration Masters level degrees have been available in the UK, in nursing, occupational therapy and physiotherapy, since the 1990s and they were introduced to facilitate widening participation in a climate of shortages in the relevant workforces[7]. Much of the literature suggests that these programmes attract older, motivated candidates with a wider academic base who work hard and perform well, ultimately producing high quality clinical practitioners[8].

This programme offers a balance between maintaining the educational level 7, producing a competent sonographer in only two years, whilst widening participation in recruiting non-traditional students.

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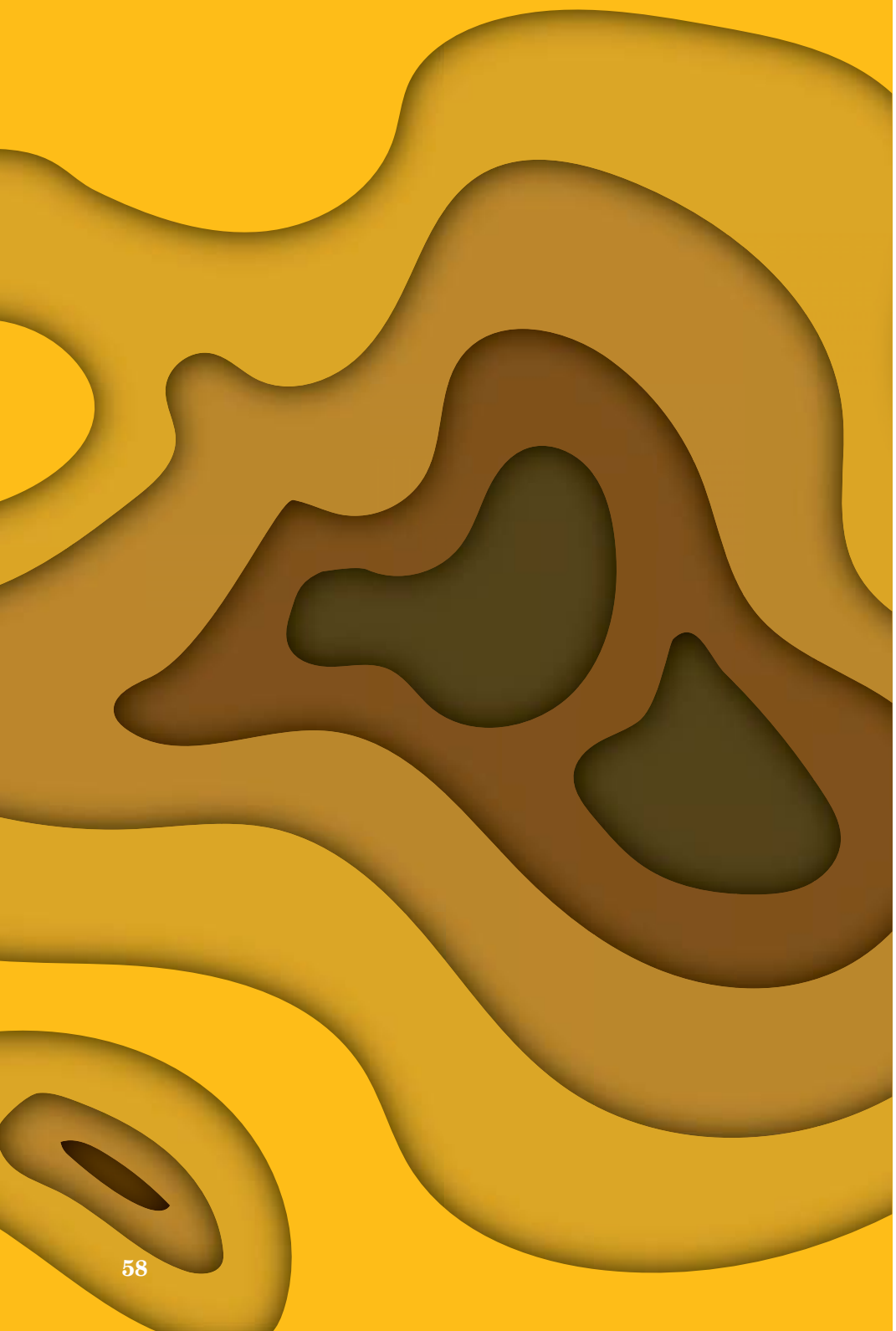

The new programme was evaluated through a report funded by Health Education England, involving a series of interviews with placement clinical lead sonographers and students from the first cohort[9].

At a 12 month interim review all students were happy with how well the course was going and felt accepted in their clinical environment, however some students did recognise the high workload and felt a little unprepared for this initially, particularly those from a non-clinical background.

> 'I don't think I could have been more prepared.'

> 'The people I have worked with have been quite open-minded.'

> 'I expected it to be a little bit easier than the course actually was, it's been hard work but definitely worth it.'

> 'I don't think I was as prepared as I would have liked to have been [for clinical placement] I think there was so much to take in and I felt that I was under a lot of pressure. It was all new to me; I haven't been in clinical practice before.'

The lead sonographers felt their students adapted well to their role and were happy overall with their progress.

> 'We've actually had some positive compliments from colleagues, radiologists and other support staff around the direct entry student.'

> 'She is often praised to me by the team, and compared to some of the other radiography students that are training she's progressing quicker.'

> 'Compared to other students at this stage in training she is probably further ahead and more confident, more able.'

Some constructive points were made in terms of developing communication skills, particularly for non-traditional students with no previous healthcare experience.

> '[The student] hadn't been in a patient facing role before so we did quite a lot of work regarding how to deal with patients, how to communicate rather than just scanning. I think the communication thing was a challenge.'

'There is a little more input required with our direct entry student with regards to hospital systems so the team had to adapt a little bit in that respect.'

However, the clinical lead sonographers still reported a high degree of satisfaction with their students in terms of the ability and attitude. The high standard of the 'direct graduate entry' student seemed to ease some of the initial concerns and quash some opposition to this new programme.

'I think the opposition that was there has faded as we've got to know our student and know how capable she is.'

'As our student has progressed [peoples'], opinion has started to change and they're now very supportive of direct entry.'

The lead sonographers recognised that the academic teaching and the clinical skills hub at the university had a part to play in preparing students for placement.

'[The student] was well prepared; she came in knowing what to do with the machines and her anatomy …. and a good basis of how to scan.'

'[The student] had a very good foundation knowledge and it became very apparent that [they had gained] experience by scanning on the simulators.'

This programme offers a balance between maintaining the educational level 7, producing a competent sonographer in only two years, whilst widening participation in recruiting non-traditional students. Opening ultrasound education to non-healthcare professionals is seen as a positive step, enriching the profession by introducing applicants with a variety of experiences and skills. Consequently, in recruiting from a new and 'un-tapped' pool of graduates, there is potentially less impact on other professional groups such as radiographers, who are also recognised a 'shortage' profession.

'I feel [ultrasound education] needs to go in this direction only because there is such a big shortage.'

'It has taken a group of non-radiographers and equipped them with skills to become competent sonographers.'

The high standard of the 'direct graduate entry' student seemed to ease some of the initial concerns and quash some opposition to this new programme.

University of Cumbria

‘The course has delivered us a clinically competent practitioner.’

‘Direct entry is a very positive way of increasing the sonography workforce.’

‘Recruiting students that are from areas of the healthcare spectrum and beyond introduces people into the workplace with a whole new, different set of skills and life experiences.’

The issue of Health and Care Professions Council (HCPC) registration remains contentious with many still disagreeing on its current validity and value. Lack of HCPC registration was not deemed significant and many of the clinical lead sonographers already employ non-HCPC registered sonographers.

‘Our view at this trust is that HCPC registration is largely irrelevant. The students will qualify with eligibility to register with the Society of Radiographers voluntary register which, in my opinion, is of greater value than HCPC registration anyway.’

‘I’ve got other members of staff who aren’t HCPC registered and it doesn’t stop me from dealing with them from a managerial point of view.’

Overall the ‘direct graduate entry programme at the University of Cumbria continues to be a success and the programme team continue to work with clinical colleagues to enhance and improve the course. One of our placement clinical lead sonographers summed up the whole two-year experience perfectly.

‘It’s been an interesting learning curve for the academic and clinical teams, I think we have learnt a lot but it’s been good.’

The Birmingham City University Experience (Direct Entry BSc (Hons) Medical

The response to the ultrasound shortage workforce position[1] from the West Midlands region has been for Birmingham City University to write the first direct entry BSc (Hons) Medical Ultrasound three year, full-time course, with a formalised preceptorship period (in the form of a PGC qualification) to follow in year four.

Two years of discussions between 14 employers, Health Education (West Midlands) and education teams led to this being the identified way forward.

A core thought process behind our course design was the acknowledgment that these students come to university with no expected prior healthcare knowledge or experience.

Birmingham City University

It is well known that sonographers are traditionally predominantly diagnostic radiographers (46.9%) or midwives, both of which are shortage professions[10]. This development intends to enable those with a desire to be sonographers as their first profession, and through their first degree, to be able to do so.

Direct entry to ultrasound at undergraduate level being an entirely new approach to the education of sonographers, course design followed that already in place for the therapeutic radiography and diagnostic radiography pre-registration programmes, with 50% of weeks across the three years being identified to be spent on clinical placement. Students thus far have attended placement in blocks, spending time with obstetric, gynaecological and abdominal sonographers in year one through to year three. Time within other imaging modalities and hospital departments, as well as time with midwives and antenatal services all being core within their clinical education.

Due to comparison with traditional post-graduate sonography students in employment, clinical staff highlighted placement pattern with concern initially

> '… the block placement would mean that the students would lose the skills they have built up whilst on academic placement but this so far has not been an issue.'

Within the clinical environment, hands-on scanning supported by qualified sonographers has been greatly valued by the students, with scanning skills being consolidated on return to the university though time spent practising in simulated scenarios. From year one, students develop their report writing skills alongside their scanning ability in case-based workshops. The University is fortunate to have two General Electric scanners, as well as transvaginal (TV) and transabdominal (TA) Medaphor Scantrainers. These simulation and skills facilities have evaluated well in developing competence but particularly confidence in scanning and anatomical knowledge. Students highlighted the positives:

> '...discussing pathologies seen on placements and applying that to workshops' (third year student).

> '...workshops where we scan each other have been really helpful to practice' (obviously with appropriate referral processes in place) (second year student).

> 'The Medaphor simulator we use at the university has helped us learn ultrasound anatomy and scanning techniques before going out on clinical placements. Great for practising, especially if you are new to ultrasound' (second year student).

Identifying the full range of clinical placements for all students has been problematic as although many clinical departments initially signed up to the support of these students and the course, at the point where placement was required, only a small number of departments had capacity to deliver this. As commented by a clinical partner

> '...the burden fell on to few departments. This was not good for the departments or students, as gaining sufficient scanning time without impacting on the efficiency of the department became a bit of a juggling act.'

Whilst clinical teams also commented

> 'I do not feel that the time spent with the student developing [scanning] skills has increased any differently from post-graduate students.'

Discussion around capacity of departments for supporting all types of learner is ongoing.

The positivity with which students received the simulation time in the university, plus comments from clinical teams, highlighted the need for students to be front loaded with scanning skills and anatomical knowledge. Increasing the simulation time as a part of clinical development better supports clinical departments by taking some of the burden of getting the student 'off the ground' in their scanning ability and thereby alleviating the pressure on clinical training places. It also enables the student to be better able to make the most of their time training in the clinical department.

A core thought process behind our course design was the acknowledgment that these students come to university with no expected prior healthcare knowledge or experience. Some concerns relating to this were highlighted as part of Parker and Harrison's 2015 British Medical Ultrasound Society (BMUS) membership survey[4]. Acknowledged and accommodated within the design of both the BSc Hons Medical Ultrasound course and the PGC Medical Ultrasound (Preceptorship) course design includes building the awareness of becoming a healthcare professional (and what this means), the '6 Cs'[11], as well as concepts of evidence-based practice and research. Clinically, the importance of this has been highlighted, with one consultant sonographer stating:

> ...'it takes a year for them to understand what they have signed up for and understand the dynamics of a hospital.'

and in comparison with traditional post-graduate students increased development being needed...

> '...from communicating with the general public in an appropriate manner and other basic skills you would expect them to already be equipped with.'

The students themselves also come with differing experience however (some holding previous healthcare qualifications, or other degrees), some being mature students and a minority being school/college leavers. Consequently, individuals respond in differing ways, with some already holding some of this skill set.

The educational model of delivery is continuously being evaluated, with course design being reviewed, the pattern of placement and role of simulation within the course being assessed. As one consultant sonographer (who is a core member of the group who designed the course and supports students in clinical practice) stated:

> 'The bottom line is [direct entry] undergrads are different from [traditional] post-grads and the way we train them must change to account for this.'

As we move forwards our first intake are due to graduate in summer 2019, and students are being offered their first post jobs and support for their preceptorship year. This in itself shows that clinical teams are sure of the quality of the student, their knowledge and their skills – not surprisingly given the amount of input, education and clinical support each of the sonographers involved has provided. This partnership with our clinical teams has been, and will remain, invaluable in shaping the current and future direction of the course.

National discussions surrounding the career framework for sonographers plus the ongoing review of sonography as a profession including submission of evidence to the Professional Standards Authority, mean that both HEIs will continue to review their course design in line with the changing professional landscape.

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The University of Cumbria Experience (Direct Graduate Entry MSc Medical Ultrasound).

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The Birmingham City University Experience (Direct Entry BSc (Hons) Medical Ultrasound).

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Social Prescribing: The Cultivation of Community Referral in Clinical Imaging and Radiotherapy

There are a wide range of definitions and models of social prescribing. The United Kingdom (UK) Social Prescribing Network found 56 different approaches in a 2016 survey[1]. Despite diverse styles and approaches, a single common thread is an aim to help patients to counteract the social and economic factors that affect their health.

Current social prescribing models are dependent on the provision of services by an assortment of voluntary, community and not-for-profit services (commonly referred to as the third-sector)[2]. For that reason it has been suggested that social referral is a more accurate way to describe social prescribing[3].

Beyond helping individual patients, social prescribing also has the potential to address the health and social needs of communities[4]. For example, social group activities can increase connections between places and people[5].

At first glance, it seems that the development of social prescribing has the potential to help achieve the 'triple aims' of healthcare[6]; it could improve care, improve population health, and reduce costs per capita[2]. There are many areas and ideas to probe in relation to the topic of social prescribing. This article will provide a broad introductory synopsis.

Background

There is increasing argument for the use of social prescribing. The success of the National Health Service (NHS) means that the population of the UK is living longer than ever before. With longevity comes an increase in the possibility of long-term physical and mental health problems, also adverse factors that affect quality of life, for example, isolation and loneliness. It has been argued that long-term health conditions are currently the greatest challenge for the NHS[1]. Risk factors for long-term conditions across age groups include lifestyle behaviours such as poor diet, obesity and physical inactivity. The public health agenda accordingly encourages healthcare professionals to hold healthy conversations with patients[7].

However, lifestyle behaviours are overshadowed by wider health determinants. Across all generations, a range of social and economic factors influence health and wellbeing, reduce quality of life, and impact life expectancy. For example, we live in times of austerity in which people from lower socioeconomic groups have poor health and mortality[2]. Collectively, all factors can be categorised as biological, psychological or social – the bio-psycho-social triad[8]. In the UK healthcare system, historically, health and social care have been effectively estranged. The triad has been fragmented – social determinants are largely disregarded[8]. Social wellbeing is not just allied to but also a basis of physical health. To enable people to flourish physically, mentally and socially, the healthcare system needs to change the ways that health is understood, decisions are made and resources are prioritised[9].

It has been posited that social prescribing is an innovative approach that may provide such a change[10]. However it is not new; pioneers used exercise and arts on prescription with patients in the mid-1990s[11]. Albeit more recently, the movement has blossomed to encompass a wider range of activities[12]. Social referral now includes a range of cultural, arts and educational activities to address individual health conditions[12]. In a climate where the NHS is unable to keep pace with demand[13], it has also been claimed that social prescribing will ultimately decrease health system costs[3]. This appears to be a key theme across a plethora of papers and articles about social prescribing but the claim is contested. There is a need for research to provide a stronger evidence base[10].

Current social prescribing models are dependent on the provision of services by an assortment of voluntary, community and not-for-profit services.

The rationale for social prescribing is therefore predicated on a need to address the psychosocial issues that affect either physical or/and mental health, while reducing healthcare costs. Models of social prescribing have been criticised for being a mere 'bolt-on' to predominately clinical services[10] and championing a system of practitioner-led prescription rather than patient-led self-referral[5]. Hence there is critique that, ironically, current models of social prescribing act to maintain the dominant biomedical model of healthcare. Social prescribing models must equalise not subordinate the psychosocial elements of health.

Who benefits from social prescribing

Social prescribing schemes have been focused toward alleviating the effects of conditions, experiences and lifestyles which include, amongst others, depression, low self-esteem, lack of confidence, anxiety, alcohol and drug dependency[14]. A hot topic currently, is that of social isolation, which increases the risk of both physical and mental health problems[15]. Social prescribing services potentially reduce social isolation because they often involve people attending group and community activities[16]. Much of the existing work on loneliness and its impact on health have been conducted with older adults but loneliness also affects others, for example, adolescents. This point is a reminder that the whole population of patients who attend clinical imaging and radiotherapy departments may benefit from social prescribing in some way – not just individuals at specific points of the life course. Social isolation, low mood, anxiety and depression, were commonly experienced by participants in a study of working age people with long-term conditions[2]. Of particular note, people with mild to moderate depression appear to benefit from social prescribing – one of the three most common reasons for general practice consultations in the UK[5,9]. It may also benefit high intensity users of accident and emergency services[17].

Social prescribing activities

Once referred, people can join groups that aim to improve physical and mental health or tackle the effects of economic and social issues. For example, people may attend community gyms, walking groups, gardening or dance clubs; weight management and healthy cooking clubs; services may address and provide practical information and advice about welfare, smoking cessation, debt, legal, parenting, housing, social cohesion, education and employment issues[18]. Groups may be focused toward living well with specific conditions, for example, for people living with dementia or cancer[2]. One service lists luncheon clubs, befriending groups, social services volunteering organisations, getting back into work groups, literacy classes, debt advice, an access bus, bereavement groups, reminiscing, arts and crafts and music groups[10]. These growing lists reflect an observation that patients have mainly been prescribed hobbies, volunteering opportunities or befriending services[19].

The language of social prescribing often labels these activities 'interventions' directed at

neighbourhood, family and/or individual level. It is surmised that accessing a range of activities engenders an individual sense of independence and purpose[4]. Despite the scarcity of an evidence base around interventions, the practice continues to grow[11]. Much evidence of the effectiveness of social prescribing is inconclusive and importantly, this causes commissioning challenges for some localities[4]. If services are not equally available across the UK then there is a risk to parity of opportunity for disadvantaged groups (commonly known as the postcode lottery).

Strategic support

In favour of social prescribing, in 1999 a UK government white paper set out policy that advocated that the NHS should work with community and voluntary organisations[20]. A further paper in 2006 advocated the introduction of social prescriptions for those with long-term conditions[18,21]. *The General Practice Forward View*[22] lists social prescribing as one of ten high impact actions for primary care[11]. Finally, the current Secretary Of State for Health and Social Care in England has spoken about the importance of a holistic view to the prevention of ill health, with the publication of a green paper due in 2019.

Set against this background of growing strategic support, it must be remembered that social prescribing cannot be a panacea to cure all ills. Individuals are not solely to blame for worsening UK health outcomes. Life expectancy and infant mortality rates have been linked to a range of factors not least being political strategy. Many social determinants of mental ill health, such as poverty and inequality, are also political[8]. Communities affected by austerity have seen their health outcomes worsen in the UK[23]. There is concern that social prescribing could inadvertently be a reductionist diversion of attention from the need for wider societal change[8]. It is therefore posited that a prevention plan which targets individual lifestyle choices will not confront the deepening health crisis in the UK[23]. Nevertheless, NHS England has appointed a national clinical champion for social prescribing in England with around half of clinical commissioning groups now reporting that they have social prescribing schemes[24]. Assessment from policy think tanks The Kings Fund, Health Foundation, Nuffield Trust and Nesta echo uneasiness about the research evidence on social prescribing[18]. The research evidence base has 'not kept pace with policy direction and momentum'[4].

Models of referral and programmes

The vast majority of literature emanates from and focuses upon primary care (general practice) based social referral. A range of social referral projects preceded this appropriation of prescribing schemes by primary care. Projects originally started in an 'organic manner' across the UK[11].

Figure 1: Proposed community referral process.

Figure 2: Example conversations.

Looking more widely, on an international level, schemes in secondary care (hospitals) have also been implemented but tend to be labelled 'emergency case management[3].

Notwithstanding variable nomenclature, schemes must adapt and evolve according to local population needs. The manner in which a social prescribing scheme is delivered is important, for example, the use of digital, group, or individual activities influences possible effectiveness[25] and the routes through which people are referred, influence the uptake of these services and their success[5]. Services include national organisations, providing information and support, but also local self-help groups or community activities.

Referral can be via health and social care professionals or patient self-referral (see Figure one for example referral pathway). Patients tend to be called clients in the social referral literature. Using one scheme as an example here[10], a link worker would typically contact a client within seven days to arrange an appointment. Link workers may offer three appointments of around 40 minutes to discuss needs and identify suitable actions.

The presence of a link worker provides reassurance that a referral will be dealt with by a suitably experienced and trained member of staff[10]. There have been concerns that clients will become reliant upon link workers, consequently, individuals are encouraged to withdraw from services after a locally specified number of sessions[4]. The result is that social prescribing schemes are short-term intermediary services that facilitate patients with emotional, social or psychological needs that detrimentally affect their health. In these terms, social prescribing differs from social work because it is an intermediary to facilitate the patient to access support rather than providing support[19]. Parallels can be drawn with aspects of the work of occupational therapy.

Outcome and impact

There is mixed evidence about the ability of social prescribing services to reduce the financial costs of healthcare[16]. Similarly, evidence that social prescribing can reduce the number of primary and secondary healthcare attendances is conflicting. An early study found that social prescribing increased GP visits and prescribed medications[26]. In contrast, GP visits were reduced in another study[14]. A third study found that compared to a control group, social prescribing resulted in GP and mental health appointment increases while secondary-care referrals decreased[16]. At odds with all three, a fourth study reported that the majority of participants used GP services about the same[4]. Status as the 'golden child' of cost savings[3] is therefore disputed. Evidence that social prescribing could meet an aim of the NHS long-term plan to 'moderate growth in demand for healthcare'[27] is equivocal. Nonetheless, paradoxically, for reasons of 'fairness and overall outcomes improvement'[27] schemes cannot simply be discounted. Arguably, healthcare professionals have moral and ethical responsibilities to attempt to prevent or alleviate the negative determinants of health. It has been pointed out, however, that when it comes to funding provision, prevention is better than cure except when it comes to paying for it[28]. There is a threat that moral and ethical obligations may be superseded by finance.

Beyond budgetary concerns, scheme participants have reported benefits including social inclusion, meeting new people and increased confidence[10]. Feelings of control and self-confidence reduce social isolation and have a positive impact on health-related behaviours including weight loss, healthier eating and increased physical activity[2]. It is also argued that clients benefit from increased time allocation with staff in comparison with primary and secondary care[5].

Translation to clinical imaging and radiotherapy

When implementing services, general practitioners initially perceived time constraints and their own limited knowledge as barriers to social prescribing[19]. It is likely that clinical imaging and radiotherapy professionals may conceive the same barriers. This supports the statement that healthcare professionals can feel overwhelmed and powerless to help patients with psycho-social issues[10]. Another barrier to the adoption of social prescribing for some members of our imaging and radiotherapy teams is the use of the word 'prescribing'. For staff who are precluded from prescribing medicines the term prescribing does not fit well. For this reason, it is posited here that social prescribing in this context is better described using the term community referral: a more suitable description which realistically describes what could be achieved (see Figure two for example conversations).

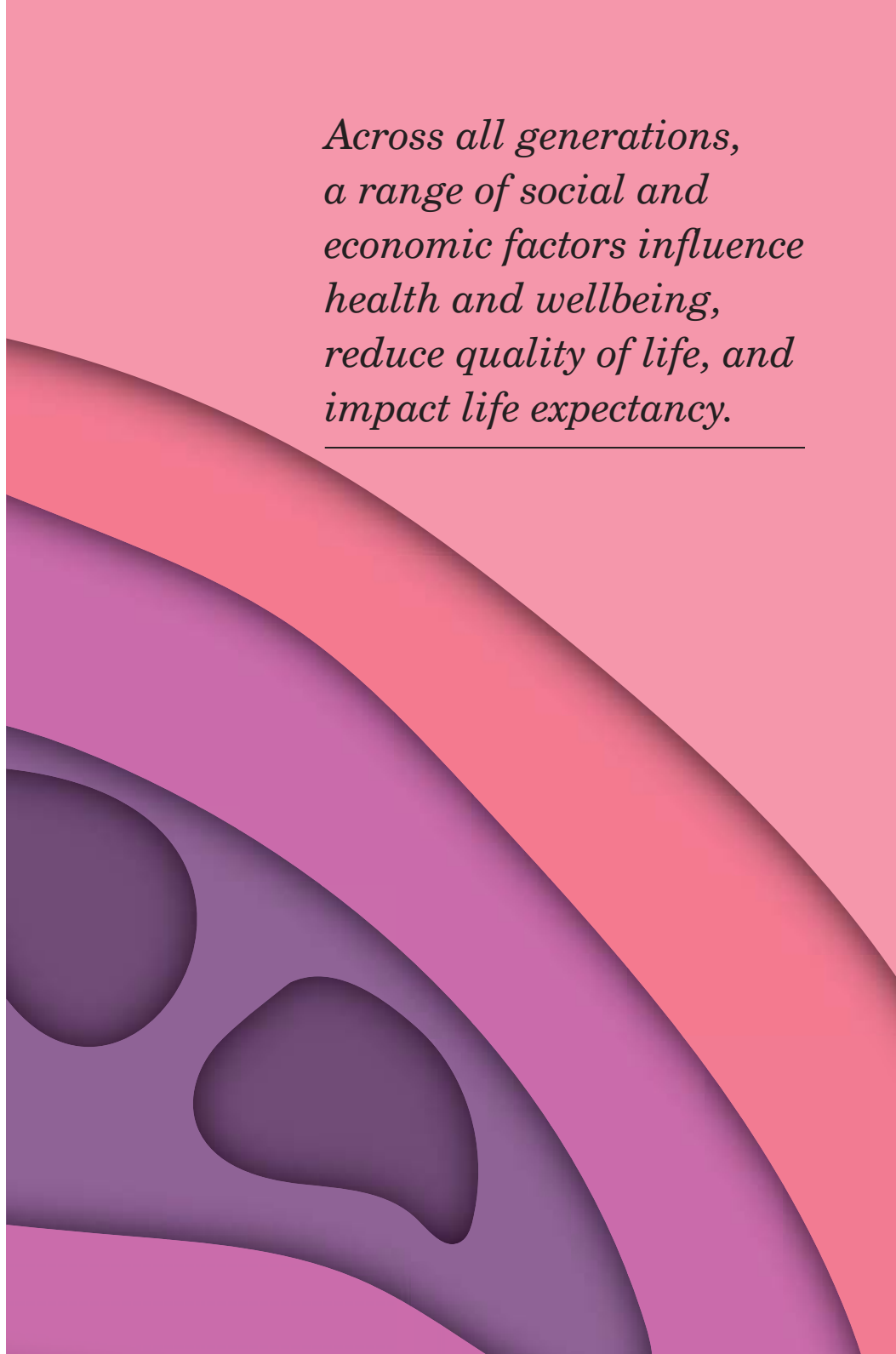
The notion of community referral complements the professional values and day-to-day work of clinical imaging and radiotherapy. Patient education, advocacy and support are familiar and regularly flexed competencies albeit in specific areas, commonly around the role of radiation protection. Community referral is simply directing the patient toward the education, advocacy and support of a person who specialises in their community, a link worker. To understand the basics of who, when and how to make a referral to a link worker, rally the troops in local departments and approach your nearest social prescribing service. An online search will reveal their whereabouts.

The Royal Society for Public Health, Public Health England and NHS Improvement, have invited the College of Radiographers and fellow allied health profession (AHP) professional bodies to work together to explore social prescribing. It is intended to develop a framework to support increased use of social prescribing by AHPs (or alternatively, community referral by radiographers) as part of a holistic approach to healthcare and health improvement. Documents due for publication in 2019 include an AHP public health strategic framework and an AHP prevention focused service toolkit.

Conclusion

Adequate local provision of (social prescribing) services that are safe and easily accessed by staff and patients, is essential if community referral is to become a normal part of everyday practice. Everyone in a clinical imaging and radiotherapy department should be aware of how schemes operate in their area.

Across all generations, a range of social and economic factors influence health and wellbeing, reduce quality of life, and impact life expectancy.



If there are no formal local schemes then we must lobby for them together. Sometimes, contribution to address the social determinants of health must take the form of advocacy and activism to directly target the roots of ill health[8].

The biomedical model of healthcare provision traditionally envelops the work of clinical imaging and radiotherapy departments. Alternatives include the social model of health[12] and the bio-psycho-social triad[8]. Services have changed little in terms of core business since the inception of the NHS. Departments continue to screen, diagnose, treat, monitor and alleviate the progression of injury, disease, healing or death. The addition of community referral offers an approach that does not simply complement but also joins together bio-psycho-social elements in practice. Community referral enacts patient care. It will be a choice of professional maturity to allow and encourage all staff to take the time to refer everyone who needs help on to a community referral service. This is what holistic, patient-centred, values-based, heartfelt and kind care can look like in clinical imaging and radiotherapy departments; the humanistic care that we all aspired to when we became healthcare professionals.

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Developing Resilience in Newly Qualified Radiographers

The role of the radiographer is constantly changing in order to keep abreast of advancing technology and the rising demand for imaging services[1].

Ever increasing targets add to the pressure that health service providers face whilst they strive to find more effective and efficient ways of working. This is exacerbated by an ageing population, an increase in patients with long-term conditions and a health service struggling to cope with a vast range of complex co-morbidities. It has been suggested that this has exerted undue pressure on the radiography profession and has directly affected the working environment into which newly qualified radiographers enter[2]. As such, the challenges that healthcare professions now face requires them to be both committed and resilient[3]. This paper will discuss the need for resilience and share the findings of a recent PhD study in which newly qualified radiographers shared their experience of transition[4]. Nine participants were interviewed at three, six and twelve months post-qualification, the final interview using a theme board to represent their feelings and experiences. This interpretive phenomenological study identified 'surviving' as a sub-theme and this will be used to illustrate the need for resilience in graduate radiographers. The identity of all participants has been protected by the use of pseudonyms.

What is resilience?

There are numerous definitions of resilience in the literature, many of which refer to the ability of an individual to recover from a period of stress or an adverse event[5]. This implies that there must have been a significant event from which a recovery is needed, whereas in fact the development of resilience will allow an individual to cope more effectively with sustained levels of stress and allow them to move forward. Gillespie et al., offer a more measured definition of resilience as 'an ongoing process of struggling with hardship and not giving up'[6]. However, the following definition 'the capacity of individuals to navigate their way to ….. resources….. and …. individually and collectively to negotiate them ….' not only highlights the individual's ability to cope but also focuses on their capacity to seek out and use the available resources[7]. This is particularly relevant to newly qualified practitioners during early transition.

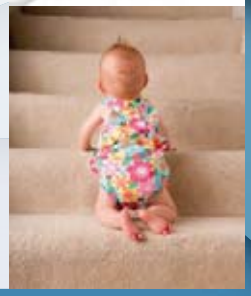
The need for resilience and surviving

The nature of work related stress (WRS) was investigated in a single diagnostic imaging department, utilising a questionnaire based on the Health and Safety Executive (HSE) Indicator Tool for WRS containing 35 statements relating to seven standards; demands, control, managers' support, peer support, relationships, role and change[8]. The results demonstrated that the standards were not achieved in any of the seven areas and the specific problem areas were managers' support, relationships, role and change. Work pressures were associated with staff shortages, heavy workloads and volume of patients, thus offering not only some insight into the working environment of a diagnostic radiographer but also highlighted the day-to-day pressures.

There are numerous definitions of resilience in the literature, many of which refer to the ability of an individual to recover from a period of stress or an adverse event.

It can be seen that there is a growing body of evidence to suggest that resilience is an important facet of professional practice.

‘I think these two are more just demonstrating determination you know like I will fly I and I will go up those stairs…. I have needed a lot of it because I think I have been in the situation where I’ve never turned round to myself and I’m going to give up, I’m going go back to ZZZZ, I’m going to get another job. I’ve never, I’ve never had that as a consideration you know. I could never do it […] but to get to get through it I think I have needed quite a lot of determination […] you know there’s a lot of times when you ask for help and you just don’t get it and you’ve got to be determined…’ **(Ruby, 12 months)**



These will remain the same for the newly qualified radiographers who may not be so well equipped to deal with the challenges early on in their career, thus underpinning the need for resilient practitioners at the point of graduation.

McAllister and McKinnon also highlight the pressures placed upon health professions such as fast-paced work, interactions with a diverse range of people at different levels, the constant change and also the underpinning desire to care for others[9]. It is this last pressure that separates health and social care professions from any other type of career in that the majority of people enter these professions ‘because they sincerely want to care for others’[10]. In doing so, the emotional effort this can take may sometimes lead to stress-related issues and evidence suggests that health professions suffer more from this type of issue in the workplace in comparison with other professions[11].

During the 12-month interview with Ruby as part of the aforementioned PhD study, she spoke about the sheer determination she needed to get through at times by referring to two images on her theme board, a baby chick trying to fly and a baby climbing up the stairs.

Here, Ruby discusses the determination she felt she needed to in order to survive those first 12 months as a novice practitioner. The work pressures that Ruby has had to deal with during this time were also highlighted by the work of Verrier and Harvey[8] who explored the nature of work related stress in one diagnostic imaging department. Reflecting on her year, Ruby has had to cope with a lack of support, staff shortages, heavy workloads, building and developing new relationships, volume of patients and dealing with emotional situations. Developing resilience has helped Ruby not only to cope with these challenges but also to have the capacity to navigate and identify appropriate resources to help[7].

Ruby also spoke about the need to survive challenging situations with patients, where the outcome is not always a positive one. The need to develop coping strategies to deal with difficult and emotive situations is often overlooked:

> ‘…think the connection you get obviously when things just don’t go so well […] it’s not nice, you know we do see a lot of horrendous things you know like in the last month we’ve had two kids come in who have been drowned.’ **(Ruby, 12 months)**

What Ruby is referring to here is a concept known as emotional labour often required by health professionals when dealing with patients and their relatives.

Ruby was the only participant to mention the emotional aspect of her role and this may well be due to the hospital in which she works and the nature of the

patients that she deals with. The emotional effort that is required by Ruby is largely unexplored in diagnostic radiography but recognised in the work by McAllister and McKinnon[9] as an isolated pressure of health and social care professionals. It has however, been explored across the professions in nursing and midwifery[12,13].

Part of the challenge of surviving for some participants was how to deal with the monotony and pressure of the role. This feeling was also shared by Jane and Adam and are illustrated by the following quotations:

> '…like when it's busy and you've got stacks of other patients to do you don't want to have to repeat an image because it's going to take you however many minutes to do that and put you even further back and you stand there and you just pray it's like please let it be on or you know lateral or whatever so I can get the patient out and do the next one which is awful because it does become like kind of a conveyor belt' **(Jane, 12 months)**

> 'I do love my job I wouldn't do anything else but there are times when you do feel a little bit bored like you feel like you do the same thing over and over and over again… I think it's just monotony and pressure are the two overriding things just the same things over and over and over and over' **(Adam, 12 months)**

The use of the phrase 'conveyor belt' by Jane and Ben is also interesting, as it is one that has been used widely in recent years by the media when focusing on the NHS. From Jane's perspective the endless stream of patients puts her under increased pressure and de-humanises the experience of imaging patients. The pressures placed on the new graduates due to the workload has led them to feel despondent as their main focus is on patient throughput rather than on the quality of care given to individual patients. For those that have entered radiography because they wanted to care for others and make a difference, the restriction of being able to do this because of the nature of the workplace could result in a stressful and uninspiring environment[9]. The emotional labour required to work and cope in this environment requires the new graduates to be resilient practitioners. In medical education this has been recognised and recent initiatives have introduced resilience into the curriculum, in order to prepare graduates to deal with stressors in the workplace. These may be large or most likely small stressors experienced over long periods of time which if not well managed will result in distress or burnout[14].

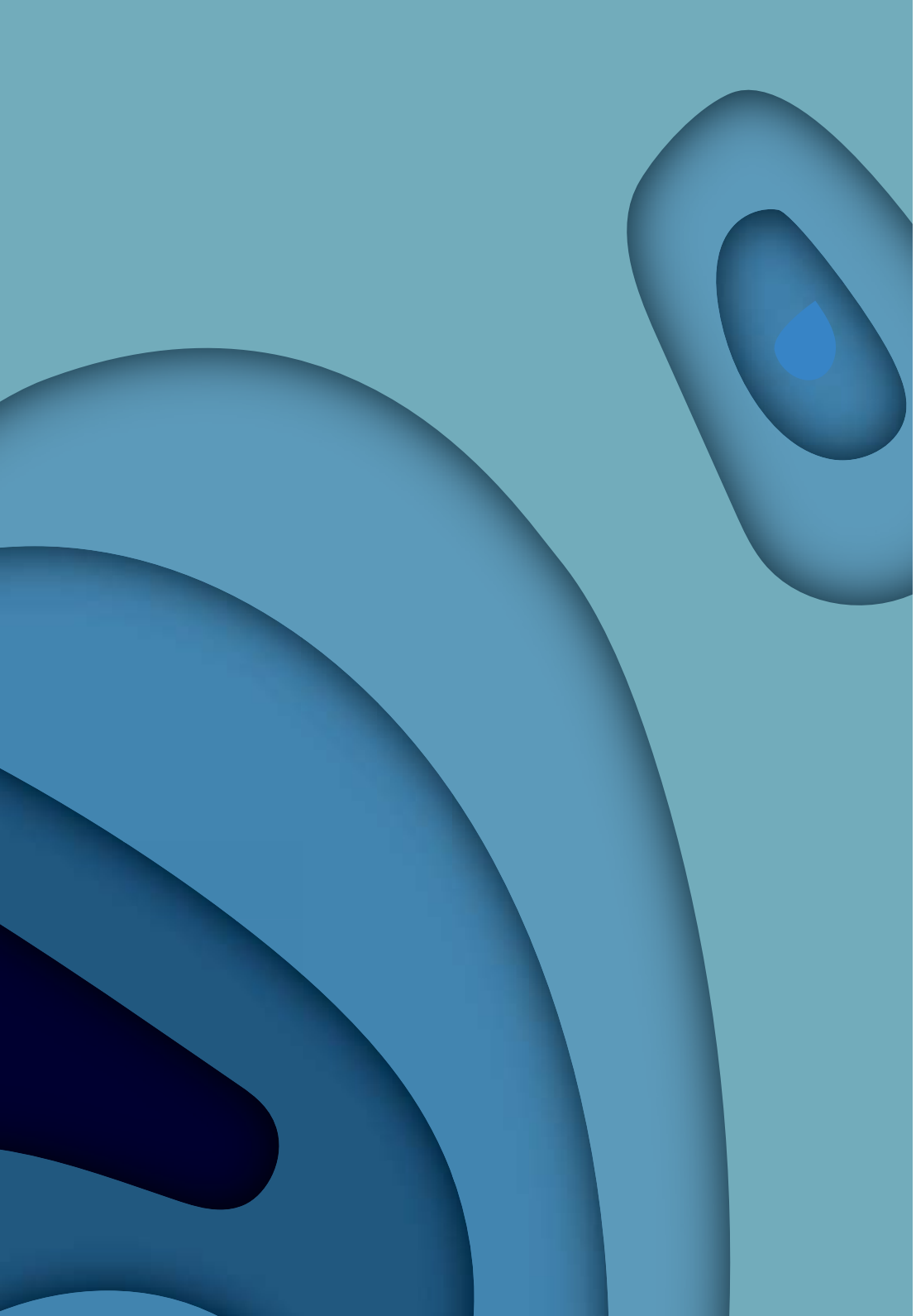
'…I think that's just kind of how my work is sometimes; I feel it's like a conveyor belt one car through one car through one car through and I don't like that…' **(Ben, 12 months)**

Conclusion

It can be seen that there is a growing body of evidence to suggest that resilience is an important facet of professional practice. It is not only something which current practitioners need to adopt for their own health and wellbeing but also to ensure effective and patient-centred services which can respond quickly to change. A resilient workforce will reduce attrition of the workforce but also make it a more appealing career option thus enhancing recruitment. The pressures and stressors that are not discriminate affect all health professions, including students and new graduates. It is evident from the findings of this PhD that participants have been required to dig deep to utilise the available resources to enable them to cope in the early days of transition. The capacity to develop resilience in the workplace would certainly help the newly qualified radiographers cope with the harsh and busy environments they now face[9]. The pressured and constantly changing conditions challenge even the most experienced practitioners and ensuring a supportive work environment where resilience is valued, encouraged and developed, could well reduce staff attrition in the National Health Service (NHS).

Higher education institutions should look at ways in which they can help students build the capacity to be resilient. As previously discussed, resilience is an important aspect of professional practice and it is something that needs to be cultivated within the profession. Having the adaptability to respond quickly to change whilst maintaining health and wellbeing is essential to all healthcare practitioners in the current climate. As a consequence, resilience workshops have been introduced into level four of diagnostic undergraduate programmes at the author's university and it is the intention that this is expanded into levels five and six, and becomes an integral strand throughout the curriculum. The challenge in delivering resilience is that undergraduates do not always understand the importance of these type of topics. However, helping students to build up the capacity to develop a resilient outlook will ultimately prepare them for working in an environment of constant change and challenge. The use of alumni who are willing to come and talk to the students and share their experiences of working in the NHS, dealing with change and coping with the work pressures, offers an excellent opportunity to add value to the curriculum, as well as become an original and meaningful way to develop resilient practitioners.

Higher education institutions should look at ways in which they can help students build the capacity to be resilient.



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Reporting Standards: A Conundrum

Behind the scenes in the imaging community in the United Kingdom (UK), a whole debate is ongoing around expectations for the interpretation of images and delivery of reporting services. Professional, regulatory, commissioning and arm's length bodies are discussing reporting standards, whilst at a local level service leads continue to consider how to continue to deliver services with diminishing resources and increasing demands. Indeed, 2019 may be a watershed moment in terms of the expectations on imaging departments to provide timely and quality assured accurate reports (at least in England).

What do we mean by standards?

If standard is considered an adjective then the dictionary[1] defines it as a

- basis of weight, measure, value, comparison, or judgment;
- of recognized excellence or established authority;
- usual, common, or customary;
- authorised or approved.

So in the context of diagnostic image reporting, what are our standards? How do our reports influence clinical pathways and outcomes, and does our inconsistency in, or inability to deliver against, expected standards, negatively affect patients?

Many would suggest there are already standards for reporting, with many published by the Royal College of Radiologists[2,3] and aspirational turnaround times for reporting[4]. But standards is a broad term, indeed it may relate to the accuracy and quality of report content or the service delivery model. Further, how do we measure these in a consistent and effective manner, particularly in the context of multiple critical reviews of radiology services?[5] In this era of multi-professional team working, the challenge is not only to establish the standards but also to consider how these standards are embodied within practice and achieved in the context of increasing demand and workforce shortages.

If we consider that there are three components to reporting standards:

- Accuracy – whether a report is correct
- Quality – how a report conveys the message
- Delivery – when and how a report is communicated to the referrer and/or patient

Each of these is influenced by different factors (Figure 1); accuracy is underpinned by the level and scope of clinical and academic education, whereas report quality may depend on education, personal supervisor or mentor, departmental style and local protocols and finally, the delivery by workplace factors such as staffing, rotas, priorities and referrer expectations.

Accuracy

Diagnostic accuracy is probably one of the most studied aspects of reporting, with an aspiration of correct outcome every time. However, with all human endeavours errors are inevitable and these should be an opportunity for learning rather than self-flagellation. The ability to accurately make decisions on image appearances is directly related to experience and education. The two main professions involved in the reporting of radiological images in the UK, radiologists and radiographers, have very different undergraduate and post-graduate training routes. Yet, post-graduate education prepares them to undertake the same task, albeit with a very different scope. Whilst radiology specialist training and fellowship examination covers the breadth of imaging, with subspecialty components, radiographers remain more focused in their development, usually limited to one modality or body part.

So, when we report, it is not the professional background that matters, but

Diagnostic accuracy is probably one of the most studied aspects of reporting, with an aspiration of correct outcome every time.

whether we can make a decision which is accurate and identifies correctly the normality, or abnormality of an examination.

Quality

Although accuracy is critical, the content of a report may vary between individuals, professions and in response to different referrer groups. This has been the subject of much debate around radiographer reporting and whether the knowledge base of a non-medical professional enables the production of an actionable report[2]. However, the style and content of reports is probably driven more by education, mentorship and personal preference rather than initial qualification, as we see variation even between radiographers[6]. This is not the experience everywhere and there will be examples of 'house style' with expectations set by the workplace and by the professional body[2].

But is every report actionable and is that our goal? Does it really reflect all the appearances on an image, or does it just answer the clinical question? When reporting a trauma knee radiograph from the emergency department, does the reporter just confirm the presence (or absence) of bony injury and/or effusion. Do underlying pathologies, such as degenerative change, or incidental appearances, for example vascular calcification, also get a mention? Some are more likely to be inclusive, with many cross-sectional and ultrasound reports being more structured, although not all authors comply with such a standard approach. In fact the language, style and content may also vary dependent on the reader; do we change our emphasis when we know the referrer, or if it is likely to be shared with the patient?

Delivery

Beyond reporting accuracy and quality the mode of delivery is critical. Although the best practice guidance[4] places the onus on reporters and management to produce an interpretation in a timely manner, the reality is very different. With workforce shortages, increasing demands and competing priorities offering 24 hour turnaround for all, imaging is at best aspirational and probably for most departments impossible. Traditionally, reporting turnaround time has received less focus than the interval between referral and examination, and in England waiting time has been a key national measure for over a decade. However, with a greater focus on the whole patient pathway this is changing; hidden waits are being exposed and high profile snapshot audits have demonstrated the scale of the challenge facing imaging departments[7].

The 2018 Care Quality Commission (CQC) review also confirmed the wide-scale problem of auto-reporting[5], with clinicians held responsible for the interpretation of images. Such practices were introduced decades ago when images were static, visible only to the holder and clinical care was medically driven with perhaps greater consultant oversight of decisions.

Figure 1: influences on reporting standards.

Or something like...

Diagnostic accuracy
– Outcome
– Measurable

Quality
– Content
– Actionable

Delivery
– Consensus
– Changes

Influenced by education

Influenced by workplace

The much heralded artificial intelligence, either as a companion, first read or independent reporter, is much debated but also feared.

In this century, skill mix has changed the face of healthcare and many clinics and wards are staffed by a multi-professional team with less experience of image interpretation. Yet imaging departments have retained the historic practice of auto-reporting, presuming that all orthopaedic or in-patient cases will have the relevant expert to make decisions.

However, one fact highlighted by the CQC report in 2018[5] was that many departments do have key performance indicators (KPIs), although the variation in measures and local escalation processes restricts the ability to compare outcomes.

Challenges and opportunities for education

Recognising the influence that education has on both interpretation accuracy and report quality, there is a responsibility on both formal and informal providers. Whether an individual is on a radiology training programme in an academy or hospital-based scheme, the delivery of formal learning opportunities will vary from one region and organisation, to another[8]. But the impact of supervision and teaching in the clinical environment is key, as is exposure to an appropriate case mix. This is also critical for radiographers, as the academic post-graduate programmes are discrete from the hospital environment without access to clinical resources. But radiographer programmes also often have a more structured approach to learning and all have a rigorous assessment schedule expecting a significant portfolio of reporting experience.

The 2018 Cancer Workforce Plan[9] announced plans for 300 more reporting radiographers to alleviate the capacity gaps and to release radiologist time. It was hoped that these additional trainees would be supported, not through the traditional university/clinical training schemes but via new multi-professional academy-style hubs. This was designed to build on the positive experience of the radiology academies and exploit opportunities for collaborative training and shared learning. Although there are plans in some regions to develop stand-alone or collaborative academy models, integration with current education provision will take longer and requires the development of new relationships and potentially revised academic programmes.

However, there is progress in terms of multi-professional collaboration and alongside increased numbers of trainee radiologists and reporting radiographers, Health Education England (HEE) set out to work with the professional bodies to develop national standards. The first of these, musculoskeletal radiographs, is in advanced development and it is hoped this will provide a platform for future development and provide assurance on the abilities of all professions in this area. A standard assessment would not only deliver confidence in clinical skills to external bodies but also imaging departments. There is no expectation that a single qualification will be developed across radiology and radiography, but a standardised assessment which could evidence the level of knowledge and accuracy would go a long way to providing assurance.

In the meantime, we continue to have inter-professional differences in report content, but also within profession variation, driven either by education provider, clinical placement site or individual supervisor/mentor. This has implications for confidence in scope of practice, transferability of skills and patient outcomes. The potential for greater inter-professional collaboration can only be a good thing, but does provide a significant challenge for providers

(academic and clinical) in relation to workforce to deliver more development opportunities.

As we continue to exploit skill mix and greater numbers of radiographers undertaking reporting of images, the challenge will be to integrate these individuals into the wider team to provide appropriate support for their development and learning. But beyond this, is the changing health landscape and the expectation that reporting radiographers are working as advanced (or consultant) practitioners, autonomous in their practice within the clinical team. It is therefore important to be aware of the developments in non-medical roles and expectations of advanced clinical practice (ACP) in terms of standards and competencies. It is expected that in the future, more universities will align their reporting programmes to the new national framework for ACP, providing greater transferability and assurance of outcomes.

For education, there is the opportunity to collaborate between professional groups but this will be tempered by ongoing challenges in the workforce and funding.

Challenges and opportunities for the workplace

To stand still is a challenge for many imaging departments, delivering quality assured services in an era of increasing demand places difficult decisions on clinical leaders. Traditional working practices and personal preferences, particularly in report generation are a difficult balance in capacity generation, standardisation of outcomes and resource constraint. But the changing political environment with the move to networks and regional collaboration, provides a new challenge and opportunity. Resource sharing across organisations and the ability to load balance during peaks and troughs are the new buzz words, with aspirational, and in some cases real life plans to deliver image reporting across a whole region. But this itself raises new challenges for providers who require assurance the individual A at site X has the same skill set as individual B at site Y. Co-operation will be required with negotiation of scope, report style, structure and standards for urgent communication and escalation. Moving from a single hospital process to a regional system not only requires a new way of thinking but standards for delivery.

Such collaboration and indeed trust, is nothing new. Independent sector providers have been contributing reporting capacity to the National Health Service (NHS) for many years, with processes in place for working to standards established by individual hospitals. They have established technological processes for peer review[3], delivering this as part of a contract of care, something which the NHS can often only dream of having the capacity to deliver. We need to learn from this experience and build on the knowledge base to provide similar models within the NHS, whilst still maintaining relationships with other providers to support demand peaks. But we will also see new models of delivery with in-sourcing across networks providing additional capacity within the NHS, a new challenge, but one that many regions are already developing or managing.

However, help may also be on the horizon; the much heralded artificial intelligence (AI), either as a companion, first read or independent reporter, is much debated but also feared. Who holds responsibilities for the standards, and what happens when things go wrong?

Probably the main opportunity and challenge for imaging departments in delivering against any new standards, will be our workforce. Investment in new posts, new roles and new service delivery models needs us to look critically at our current workforce structures and consider who is best placed to provide the care for patients This will include expanding the assistant practitioner tier to release radiographers and it will also mean greater reliance on radiographers undertaking focused reporting. Doing so must mean that we need to collaborate, trust and support each other to deliver the future standards to which we aspire and will be measured against.

The next year will see new standards for reporting; what will be the impact in your department, on your practice and for your patients?

Acknowledgement

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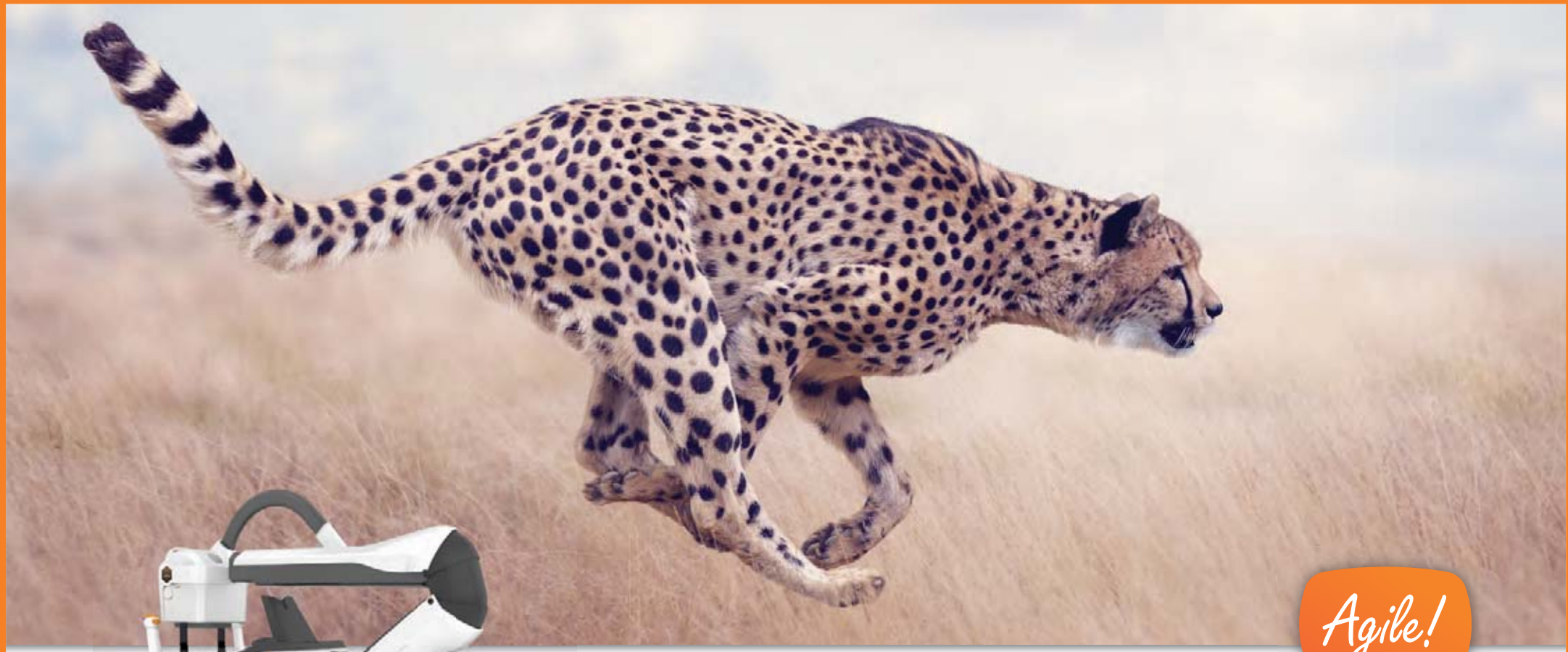

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