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## Editorial

# Challenges and Changes



*I would like to start by saying thank you to Hazel Edwards for the past eight editions of *Imaging and Oncology* and for her encouragement and detailed handover. Hers are indeed 'big boots to fill'.*

After much support, advice and guidance from Charlotte Beardmore and Mel Armstrong, here it is; my first issue as the new Editor of *Imaging and Oncology*. Thank you also should go to all of the authors for their patience with me as a 'newbie'.

I hope that I have continued to provide something that will be of interest to all professionals working in diagnostic imaging and radiotherapy and oncology.

We are all aware I am sure, of the updated Ionising Radiation (Medical Exposure) Regulations; Stephen Green has provided an overview of the changes, challenges and some of the yet unanswered questions. There are three articles focusing on the workforce; the non-surgical cancer workforce written by Camilla Pallesen, a Policy Adviser for Cancer Research UK; the challenging landscape of the imaging and oncology workforce from the perspective of an imaging services manager; and an overview of workforce transformation from Kevin Moore who is Head of Workforce Transformation at Health Education North. The quality of the service we provide is constantly under scrutiny and Chris Woodgate discusses quality and the Imaging Standard, whilst Gail Woodhouse encourages us to be open to learning from errors. Dr Amanda Martin's article about shoulder imaging sets out the importance of good radiographic technique and high quality diagnostic images. John Buscombe and colleagues, who outline the clinical utility of SPECT-CT, consider new and emerging imaging techniques. Our patients or service users need to be at the centre of all that we do; Fulford et al. provide an introduction to values-based radiography practice and Robinson et al. give an example of the use of social media in conversing with service users. The radiographer's responsibilities with regard to public health are discussed by Linda Hindle in her article entitled 'Do we have a role in public health?'. I will leave you to consider this.

I hope that you will enjoy my 'first attempt'.

*R M Strudwick*

**Dr Ruth Strudwick, Editor**  
IOEditor@sor.org

## Foreword

# Striving for Excellence



*As President of the Society and College of Radiographers, it is a real privilege to be asked to contribute to various publications, whether it is a professional guidance document or a blog, or an article in Synergy News. Writing for Imaging & Oncology is no exception.*

Since the first issue in 2005, the professions and the health service provision, whether within the NHS or in the growing private sector, have seen many changes, including increases in demand and huge advances in technology. The development of research in this country is outstanding and makes us the leading light to which others across Europe look, to allow their own practice to flourish and grow.

Over the last 13 years in which this publication has been produced, under the expert guidance of the editors, initially Professor Audrey Paterson, then Hazel Edwards and currently Dr Ruth Strudwick, I am sure it has encouraged many or at least some of the developments in practice that we have seen. So, I must thank Audrey, Hazel and Ruth for their unstinting work in producing an inspirational publication. As I have been writing this column, I have had a chance to review forewords by Presidents in previous editions of *Imaging and Oncology* and they have mentioned very importantly, those changes in healthcare that we face, and the various government initiatives and documents which set out goals for the health service. It's essential that we should have a clear focus and that our patients should be at the centre of what we do; that the care we give should be both compassionate and timely, as well as evidence- and values-based. We should allow timely diagnosis using the resources in imaging and the reporting of those images, whether by radiologist or radiographer, to facilitate the planning and treatment of patients to give the best of outcomes. On my travels across the country over the recent months, and I am sure those months which follow, I have seen this in practice. I have been amazed at the depth and breadth of practice across all levels and areas of practice in both imaging and therapy, and the radiographers out there should be congratulated.

Our professions are acutely aware of the need for efficiency and for cost-cutting, but we still need to move forward and it is quite clear from the pieces of work included in this year's publication, that we are moving forward. Despite some differences of opinion of late around professional roles, as a group we must pull together so we do our best for the patients we serve.

So, as I close this foreword, I recommend this edition with enthusiasm and I am sure we will continue to work together developing and sharing our knowledge, and pushing forward the professions involved in imaging and oncology.

A handwritten signature in black ink, appearing to read 'Gareth Thomas'.

**Gareth Thomas, President  
Society & College of Radiographers**

# Quality and the Imaging Standard

**The Imaging Standard<sup>1</sup> has been developed by the Royal College of Radiologists and the Society and College of Radiographers (RCR/ SCoR) and includes input from special interest groups, peer review, patient groups and the relevant regulatory and government bodies.**

## **The Standard**

The Standard articulates the expectations of good imaging, interventional radiology and teleradiology services, and is freely available to any diagnostic imaging service. It was first developed in 2009 and is reviewed every four years to ensure that the evidence base and standards meet the expectations of a developing imaging service across all four nations within the United Kingdom.

‘The Imaging Standard is primarily designed to be a benchmark against which service delivery can be evaluated to drive quality improvement’<sup>1</sup>. Therefore to use the Standard effectively, an imaging service will need to measure itself against the contents of the Standard. To make this achievable the Standard has been divided into five ‘domains’; leadership and management; clinical; facilities, resources and workforce; patient experience; and safety.

**Leadership and management:** The purpose of this domain is to ensure appropriate leadership and managerial controls, to support the staff to deliver the service. This is achieved through an effective leadership and management structure (senior, service and clinical) under the direction of a person or persons with the

competence to define and delegate responsibilities for the activities provided, and by working within an appropriately designed quality management system.

**Clinical:** The purpose of this domain is to promote the service’s role in rapid and accurate diagnosis and treatment. This is achieved through administrative and clinical practices appropriate to the patient population, including children; effective management of risk and emergencies; and the review of existing and new clinical practice to develop and improve the service.

**Facilities, resources and workforce:** The purpose of this domain is to ensure that resources are used effectively to provide a safe, efficient, comfortable and accessible service. This is achieved through appropriate and adequate facilities (rooms and equipment); motivated and competent staff; and the integration of sound business planning principles within the service.

**Patient experience:** The purpose of this 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.

*“A benchmark against which service delivery can be evaluated to drive quality improvement.”*

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*“Why would aligning an imaging service to the Imaging Standard make a difference to the quality of service offered to all users of the service?”*

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**Safety:** The purpose of the safety domain is to ensure that services provide the highest level of safety for patients, staff and others who come into contact with the service. This is achieved through assessment and management of the risks associated with delivery of the service.

Within each of these 'domains' there are a number of standard statements which ensure a depth of information and compliance to the standard; overall there are 29 statements and within these there are a number of criteria which indicate the level a service should be meeting. All of the standard statements and criteria are backed up by commentaries and peer reviewed evidence, all of which are made freely available by the RCR and SCoR.

## Quality

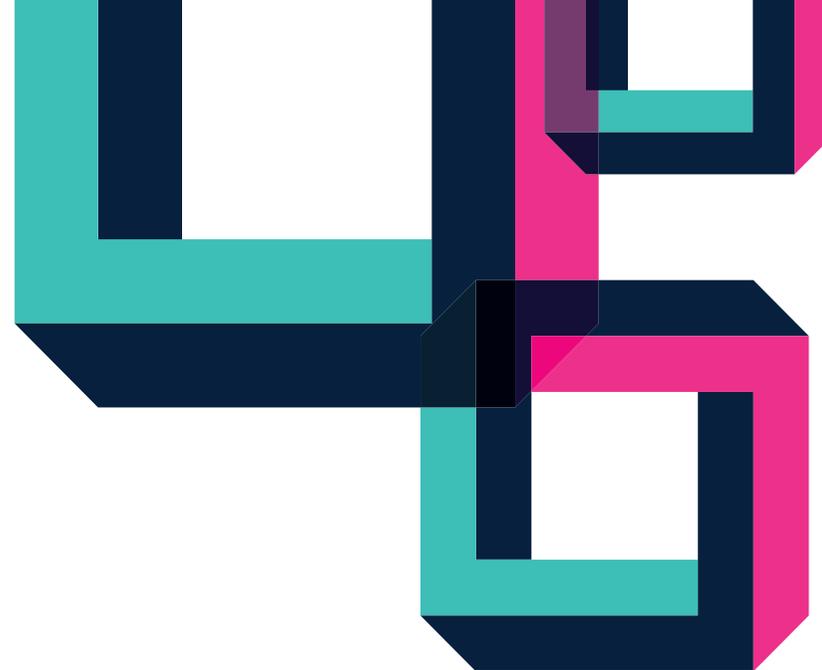
What then does this have to do with quality? Why would aligning an imaging service to the Imaging Standard make a difference to the quality of service offered to all users of the service? Sir Robert Francis QC articulated this in *The Francis Report 2013*<sup>2</sup>: 'There should be a clear fundamental set of standards, driven by the interests of patients, and devised by clinicians; a 'bottom up' as opposed to a 'top down' system'. The recommendations state:

- 'Develop a set of fundamental standards, easily understood and accepted by patients, the public and healthcare staff, the breach of which should not be tolerated;
- provide professionally endorsed and evidence-based means of compliance with these fundamental standards, which can be understood and adopted by the staff who have to provide the service.'

The *Oxford Living Dictionary*<sup>3</sup> definition of Standard is a level of quality or attainment, a required or agreed level of quality or attainment, or something used as a measure, norm, or model in comparative evaluations. Therefore, using a standard should ensure an agreed 'level of quality', which is where the Imaging Standard meets the quality agenda within imaging services.

## Quality assurance

One of the key areas that the Imaging Standard supports is that of quality assurance, where services are assured, ie they have evidence to prove they are safe, consistent, accurate and fit for purpose. As individual professionals, we also are required by our professional/regulatory bodies to show we meet those criteria.



Therefore, as individuals can we assure (give evidence to show):

- Our practice is safe for patients and other staff/service users who work alongside us.
- Our practice is consistent no matter what ethnic, or religious background, gender orientation or disability our service users have.
- Our practice is accurate, that the right test is performed on the right patient with the right equipment/modality and at the right time.
- Our practice is fit for purpose, that it is evidence-based, best practice, efficient and effective and the best 'tools' are used.

## Quality management

All of the above will enhance the quality of service you offer a patient and service, but how is this evidence base maintained? Quality management is a systematic recording of all quality and safety assurance within a service. In other words, a repository where all the evidence, audit, policy/protocol/procedures are kept to demonstrate you have quality assurance. Any quality management system should be able to be accessed by all staff but regulated or changed by a minimum number of staff to ensure consistency and accuracy. The Imaging Standard has a whole section dedicated to quality management to ensure governance of the evidence base of any service. Use of a service's quality management system will provide some of the evidence for re-accreditation or demonstration of compliance with regulatory bodies for those staff required to provide such evidence.

## *“The Imaging Standard has a whole section dedicated to quality management to ensure governance of the evidence base of any service.”*

### **Quality improvement**

As professionals, there is an awareness that practice changes and develops as research is completed, new equipment comes to the market, and as the skill mix and staff demographics change. It would be foolish to think that practice that was in place ten or 20 years ago, should not change or at least be open to scrutiny, to ensure that it is within the confines of quality assurance. Quality improvement supports the changes that occur in imaging services by ensuring there is an evidence base, and by analysing performance against previously document measures. The Health Foundation<sup>4</sup> offers some simple advice on quality improvement (as follows,) which will enable services to look at an improvement agenda.

Is the practice;

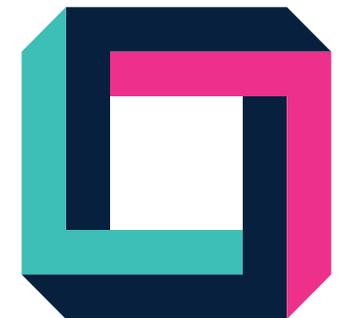
1. Safe – avoiding harm to patients, eg dose is ‘as low as reasonably achievable’ (ALARA), contrast media prescribed appropriately, is the correct examination requested?
2. Timely – is the booking system working efficiently, are there any inbuilt delays, are waiting times within prescribed limits?
3. Effective – are there any data on outcome measures, is there a clear evidence base for practice?
4. Person-centred – is there evidence of good team working across interdisciplinary groups, are patient/carer needs taken into account?
5. Equitable – are patients, service users and staff treated with dignity and respect?

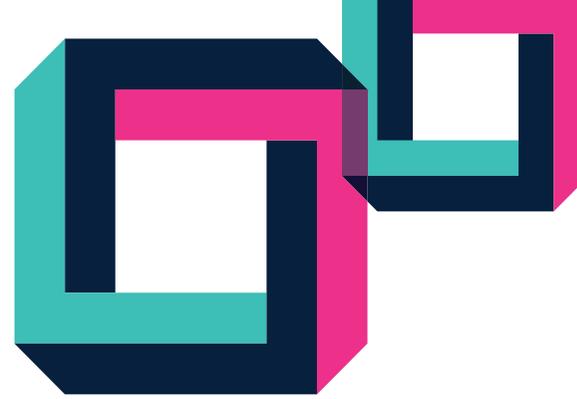
The checks and balances applied to imaging services can also be applied to individual professionals, to enable them to reflect upon their practice, enable them to continue along a path of ‘lifelong learning’ and to ensure they have a relevant up-to-date evidence base, perhaps even investing in audit and research to ensure the required evidence is available to themselves and their fellow professionals.

### **The quality challenge**

The quality challenge is where individual professionals and/or services endeavour to put into practice, a patient-centred quality agenda with supporting evidence so that a Sir Robert Francis<sup>2</sup> type report will never have to be written about an imaging service. Why is this a challenge? Any questions around quality and quality improvement inevitably lead to challenges of existing practice, take time from the working day when imaging departments are hard pressed to meet the demands of the service, and can cause conflicts of understanding between professionals, other professions (eg other allied health professionals, nurses, non-radiology doctors) and any agenda that the organisations management team may have in place. How then is the challenge met without causing a disruption to a service that reduces the quality of patient care instead of enhancing it?

It would be foolish to think there is an easy formulaic answer, which is why it is called the quality challenge rather than quality ‘made easy’. For those already involved in quality, there is an awareness of the challenge of change and the change management skills needed to embed quality and quality improvement, so that it becomes a natural process within a service rather than a ‘mountain to climb’.





Many of you through study and/or experience, will have been part of or undergone a change management process and are well aware of the effects change can have, from excitement to despair. But as professionals, the majority of us entered our profession to make a difference to patients, to make that difference count for the better; ensuring our patients have the 'right examination at the right time with the right imaging modality'. There are many scholarly articles on change management, how it works, how to make it happen, how to influence. The list could go on but how does a radiographer or anyone else in an imaging service make a difference for the better, without having to attend a change management course or training? There are some simple ground rules which can apply to any professional who is looking to take up the quality challenge in their service. These are outlined here as the five Cs (not to be confused with the six Cs our nursing colleagues aspire to) as outlined by the Health Foundation<sup>4</sup>.

**1. Candour** – be candid with yourself; without really acknowledging that improvement is needed, finding the facts and sharing them, quality cannot change. As a professional, are you able to challenge the existing beliefs and assumptions that you and others hold, do you work with a system of 'custom and practice' or is there an evidence base to the systems you use? Without candour and challenge, are you limiting the possibilities for you and your colleagues without even realising it?

**2. Comparison** – how can you challenge if you don't know what standard you are working towards? This may mean as a professional you investigate the latest evidence base, comparing your practice against latest techniques, peer reviewed research, your professional body's standard and the standards of your registrant body. Nothing convinces others about change more, than having the evidence that the change is clearly researched and that it benefits patient care and service delivery.

**3. Consequences** – there are consequences to change; when your colleagues are challenged, some will embrace the change others may not, and as a consequence morale may be affected adversely. There are also consequences to not changing;



morale may not be affected and time not wasted through argument and debate around the change. The patients who use the service will, by default, experience the consequences of whichever process prevails. Our service users and patients deserve to have the best care achievable; if by changing to improve quality, then hopefully the consequence is positive for users and patients. In any quality improvement, it is important to remember the positive consequences and how they enable us to provide a safe, timely, effective, patient-centred and equitable service.

**4. Courage** – this is often needed in the face of the consequences described above and to have the candour that is needed within a change process. Maintaining focus on being the best you can be professionally as well as inspiring others can take effort, having the courage to follow through what has begun can take its toll. It takes courage to ask for help or support, to identify those likeminded colleagues and then to take some responsibility for seeing the process through to the goal you have set.

**5. Cooperation** – as professionals we are not alone in driving a quality agenda; there are numerous other allied health professions who also strive to maintain quality and work within the quality challenge in organisations where, at times, it can feel that quality is not a priority. Working with fellow professionals in different disciplines may mean you have a stronger voice, that the patient journey through diagnostic professions is highlighted in a way you could not do as a lone voice. Professions working together can find a ‘win-win’, with the biggest win being a better service to our patients and users.

The evidence base provided within the Imaging Standard, will provide imaging services with an evidence base that is peer reviewed and regularly updated, and is tailored to meet the needs of an imaging service in terms of its systems and quality requirements. But it is only as good as those who use it in practice, who critically examine their systems and ways of working in order to provide patients with the best care achievable.

## Conclusion

The quality challenge is as it ‘says on the tin’ a challenge, but as professionals, our training has taught us that questioning an evidence base is a good thing, that professionally we have the right to challenge to ensure our duty to protect our patients and offer them the best care. By maintaining quality, it is possible to consistently give patients the best care within imaging services, with the certainty that services have acknowledged negative consequences, mitigated against them and focused on positive consequences in regard to patient care outcomes.

## References

1. *Imaging Services Accreditation Scheme Standard* [https://www.rcr.ac.uk/sites/default/files/isas\\_standard\\_v3.0\\_2017.pdf](https://www.rcr.ac.uk/sites/default/files/isas_standard_v3.0_2017.pdf) (last accessed September 2017).
2. *Francis Report 2013 – The Mid Staffordshire NHS Foundation Trust Public Inquiry*, ISBN: 9780102981476 Printed in the UK for The Stationery Office Limited on behalf of the Controller of Her Majesty’s Stationery Office.
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4. *Quality Improvement made simple*. Health Foundation, 90 Long Acre, London WC2E 9RA ISBN 978-1-906461-47-8 2013 The Health Foundation.



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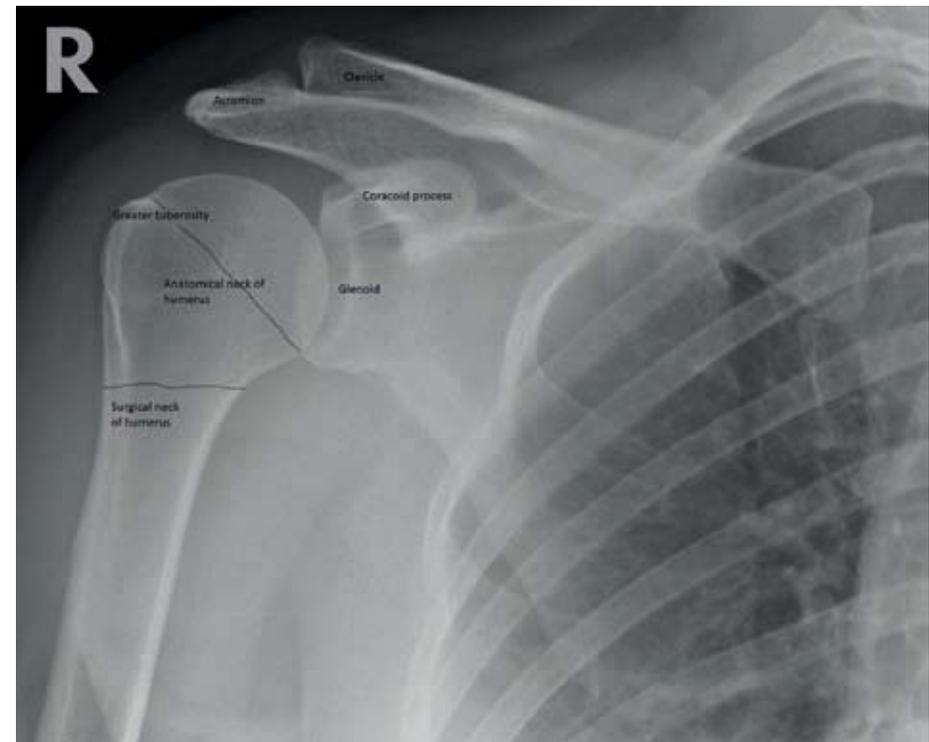
# The Importance of Good Technique – Shoulder Imaging

**Imaging in the emergency department following injury, can be relatively straightforward. However, if the clinical request information is limited, it is imperative to employ the correct technique in order to facilitate an accurate diagnosis.**

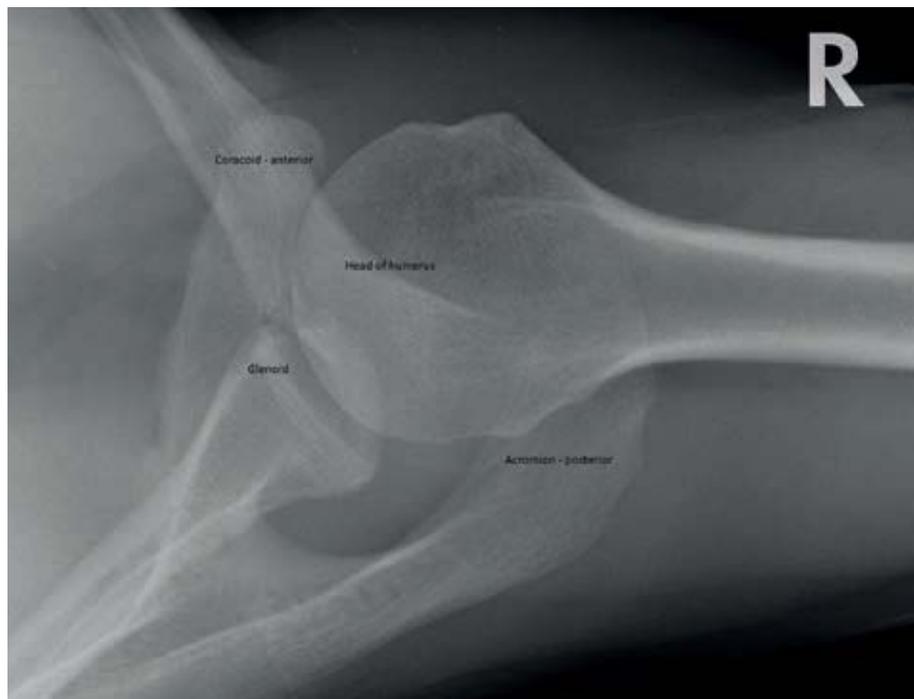
The shoulder is a complex joint comprising the humerus articulating with the scapula at the glenohumeral joint (GHJ), and the clavicle articulating with the scapula at the acromioclavicular joint (ACJ) (Figures 1a and b). The shallow glenoid fossa is deepened by a cartilaginous labrum and the rotator cuff offers some support to what is a relatively weak joint. This weakness, and its high range of mobility<sup>1</sup>, makes for an unstable joint.

Many patients present through the emergency department (ED) following injury and the selection of imaging technique is relatively simple. However, just as many patients present through their general practitioner (GP) with atraumatic shoulder pain, the third most common cause of musculoskeletal visits to a GP<sup>2</sup>. The impact of shoulder pain can be far reaching, with difficulty performing everyday tasks preventing a patient from working, socialising or caring adequately for themselves<sup>3</sup>. This can have a negative impact on quality of life and lead to mental health problems, as well as job loss, resulting in an economic and a socio-economic burden on society. Careful selection of the correct imaging technique may assist in earlier diagnosis and treatment.

This article will review different techniques for shoulder imaging, with the aim being to recommend the best techniques for known trauma/pathology, as well as those for atraumatic shoulder pain.



▲ Figure 1a.



▲ *Figure 1b.*

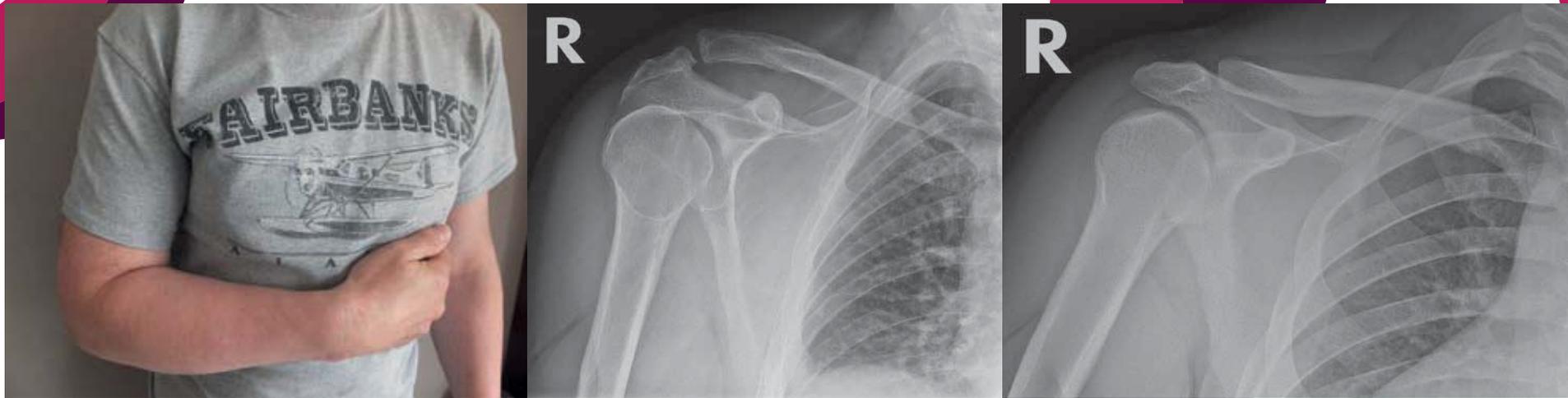
### **Shoulder technique**

Radiographers position patients using standard techniques, with the aim being to reach a diagnosis with minimal radiation dose<sup>4</sup>. In most cases, only two projections are needed, generally anteroposterior (AP) and lateral. However, there are a number of positions for shoulder imaging, based on the suspected pathology. Lack of understanding of clinical presentation of pathologies, as well as inadequately completed request cards<sup>5</sup>, leaves radiographers producing a generic AP with a second projection, dependent on departmental protocols. This may result in a misdiagnosis if inappropriate projections are presented for reporting.

Twelve techniques for AP shoulder are described<sup>4</sup>, with slight changes to the x-ray tube/body position dependent on suspected pathology. Some techniques can be useful yet dangerous. AP with internal rotation of the arm demonstrates the lesser tubercle and Hills Sachs lesion, however, it can also simulate a posterior dislocation (Figures 2a-c page 16).

*“Posterior dislocations are quite rare and can be clinically difficult to identify.”*

---



▲ Figure 2: a) internal rotation of arm; b) resultant image demonstrating light bulb appearance to humeral head; 2c) posterior dislocation.

The lesser tubercle and Hills Sachs lesion can be seen on a well positioned axial, suggesting that the AP with internal rotation is not really needed. Table 1 demonstrates the three most useful AP variations.

The Survey AP is a compromise between the Grashey and the AP, and is useful when the patient has atraumatic pain, along with the correct secondary and/or supplementary projection. Tables 2 and 3 demonstrate the more useful secondary and supplementary techniques.

Supplementary techniques are underused and carried out purely at the behest of orthopaedic surgeons. Using these techniques earlier in the pathway may lead to faster diagnosis and improved outcome, whilst eliminating those unnecessary, and often undiagnostic, projections performed at initial presentation. For example, the Zanca projection best demonstrates the ACJ<sup>6</sup> and should be standard for ACJ injury/pathology. Moreover, some projections that are described in the literature<sup>7,8</sup> do not necessarily add anything to well positioned standard projections, such as the Stryker Notch projection which demonstrates the coracoid process or Hill Sachs lesion, both of which can be seen on a well positioned axial.

Choosing technique based on clinical presentation and suspected diagnosis, not only relies on a good knowledge of radiographic anatomy, but requires an understanding of how injuries/pathologies appear on images.

***“Employing some of the less used techniques earlier in the pathway may lead to faster diagnosis and improved outcome.”***

View	Patient position			Advantages	Disadvantages
Grashey	Turn 35-45° towards the affected side and externally rotate arm			Demonstrates: <ul style="list-style-type: none"> <li>- scapula</li> <li>- proximal humerus</li> <li>- greater tuberosity</li> <li>- glenohumeral joint</li> <li>- subacromial space</li> <li>- glenoid</li> <li>- supraspinatus region</li> </ul>	Poor demonstration of: <ul style="list-style-type: none"> <li>- clavicle</li> <li>- acromioclavicular joint</li> </ul>
AP	Coronal plane parallel to detector and arm externally rotated			Demonstrates: <ul style="list-style-type: none"> <li>- clavicle</li> <li>- acromioclavicular joint</li> </ul>	Poor demonstration of: <ul style="list-style-type: none"> <li>- glenohumeral joint as GHJ has 30-40° anterior angle</li> <li>- subacromial space</li> <li>- glenoid integrity</li> </ul>
Survey AP	Turn 15° towards the affected side and externally rotate the arm			Demonstrates <ul style="list-style-type: none"> <li>- glenoid</li> <li>- humeral head</li> <li>- glenohumeral joint</li> <li>- acromioclavicular joint</li> <li>- subacromion space</li> <li>- clavicle</li> <li>- supraspinatus region</li> <li>- greater tuberosity</li> </ul> Good for patients with non-specific pain and unclear history of trauma	

▲ Table 1: Variations of AP shoulder.

View	Patient position			Advantages	Disadvantages
Axial	Extend arm across detector at right angles to body and flex elbow 90° with hand prone whilst leaning the patient forward slightly; angle central ray 15° towards elbow			Demonstrates: <ul style="list-style-type: none"> <li>- glenohumeral joint</li> <li>- acromioclavicular joint</li> <li>- Hill Sachs lesions</li> <li>- glenoid</li> <li>- acromion</li> <li>- coracoid</li> <li>- greater tuberosity</li> <li>- tendon calcification</li> </ul>	Poor demonstration of: <ul style="list-style-type: none"> <li>- scapula body</li> <li>- proximal humerus</li> </ul>
Modified axial	Rotate body 45° to affected side and internally rotate arm; angle central ray 45° caudally			When positioned well, demonstrates: <ul style="list-style-type: none"> <li>- glenohumeral joint</li> <li>- acromioclavicular joint</li> <li>- Hill Sachs lesions</li> <li>- glenoid</li> <li>- acromion</li> <li>- coracoid</li> <li>- greater tuberosity</li> <li>- tendon calcification</li> </ul> Can be done with patient on trolley	Poor demonstration of: <ul style="list-style-type: none"> <li>- scapula body</li> <li>- proximal humerus</li> </ul> Difficult to achieve a good projection if not enough angle applied to x-ray tube and body not rotated
Y projection	Stand patient PA with 60° rotation and affected side against detector with elbow flexed and dorsum of hand on back			Demonstrates: <ul style="list-style-type: none"> <li>- scapula body</li> <li>- acromion</li> <li>- coracoid</li> <li>- proximal humerus</li> <li>- glenohumeral joint</li> </ul>	Poor demonstration of <ul style="list-style-type: none"> <li>- glenoid</li> <li>- acromioclavicular joint</li> <li>- tendon calcification</li> </ul>

▲ Table 2: Secondary techniques.

View	Patient position			Used for:
Supraspinatus outlet	Stand patient as for 'Y' projection and angle tube 10° caudally			Impingement syndrome Demonstrates: <ul style="list-style-type: none"> <li>- subacromial space</li> <li>- osteophytes impinging on rotator cuff</li> <li>- shape of acromion process</li> </ul>
Zanca	Stand patient with coronal plane parallel to detector and angle 10° cranially			Clearer demonstration of acromioclavicular joint

▲ Table 3: Supplementary techniques.



Fractures and dislocations are generally simple to see and are associated with a history of trauma. Atraumatic pain presents a few more challenges. However, the most common presentations are rotator cuff injury, referred neck pain, GHJ and ACJ abnormalities<sup>2</sup>. Use of a systematic method of evaluating the images will assist in their identification<sup>9</sup>.

### **Evaluation and identification of pathologies on shoulder views**

Nicholson and Driscoll (1995) first introduced the ABC method of image evaluation<sup>10</sup>. This systematic method ensures that all aspects of the image are evaluated, thus minimising the risk of an abnormality being missed. This method will be used to demonstrate common shoulder abnormalities, which may be present on images following trauma or referral for shoulder pain.

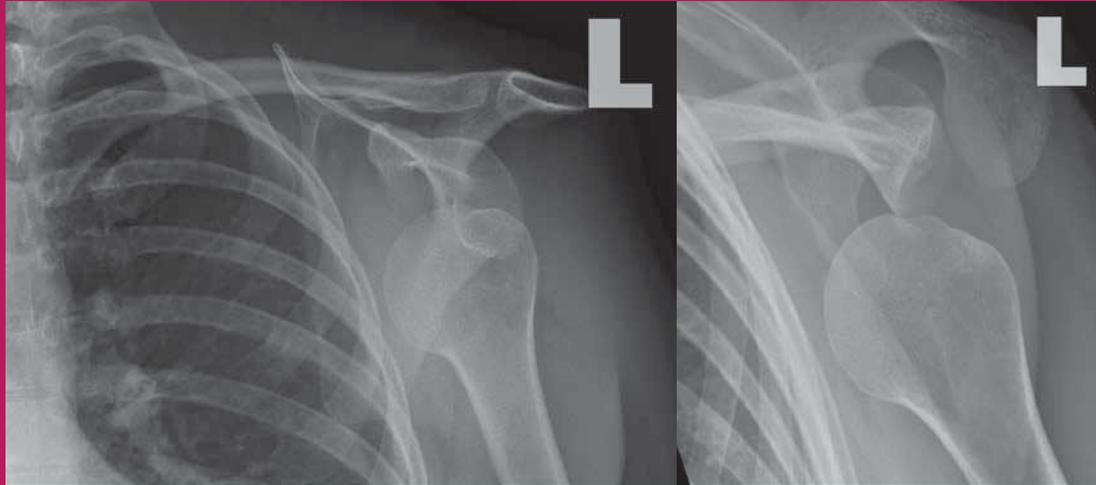
### **Alignment**

The humeral head articulates with the glenoid cavity and, on the AP, it should take on the appearance of a walking stick when correctly aligned (Figure 1a). Anterior shoulder dislocation contributes to 90% of all shoulder dislocations<sup>11</sup>, and the patient presents with loss of the shoulder contour and external rotation of the arm, making these clinically easy to diagnose. On the Grashey projection, the humeral head sits under the coracoid process, whilst on the secondary projection it will sit anterior to the glenoid (Figures 3a and b).

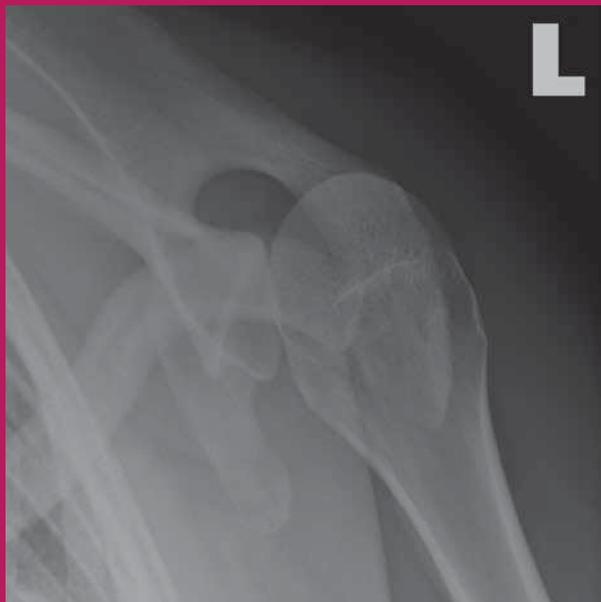
Posterior dislocations, often caused by electric shock or seizure<sup>12</sup>, are quite rare and can be clinically difficult to identify. On the AP, the humeral head will take on the appearance of a light bulb as seen in Figure 2c. However, as previously stated, it looks similar when the arm is internally rotated. A second projection is essential in differentiating a posterior dislocation from a positioning error. The humeral head sits behind the glenoid, near the acromion process, in a posterior dislocation (Figure 4).

Occasionally, the humeral head maintains some contact with the glenoid. Subluxations can be anterior or posterior and traumatic, or caused by an effusion or lipohaemarthrosis pushing the humeral head down. Clinical appearances, and possibly radiological appearances, will be subtle and there is reliance on good technique for this diagnosis. Figure 5a demonstrates the humeral head not articulating fully with the glenoid cavity. On the modified axial (Figure 5b), the humeral head is seen sitting anterior to the glenoid, under the coracoid process, meaning that this is an anterior subluxation.

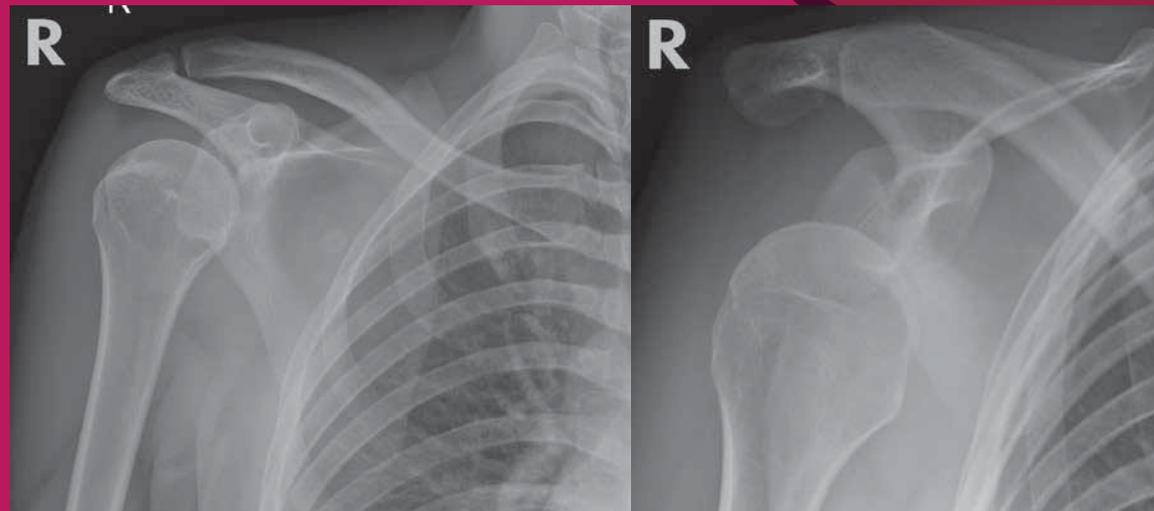
When assessing for acromioclavicular injury/pathology, alignment is determined by looking at the underside of the acromion process and aligning it with the underside of the clavicle. Disruption suggests subluxation or dislocation.



▲ *Figure 3: Anterior shoulder dislocation seen on a) AP and b) modified axial.*



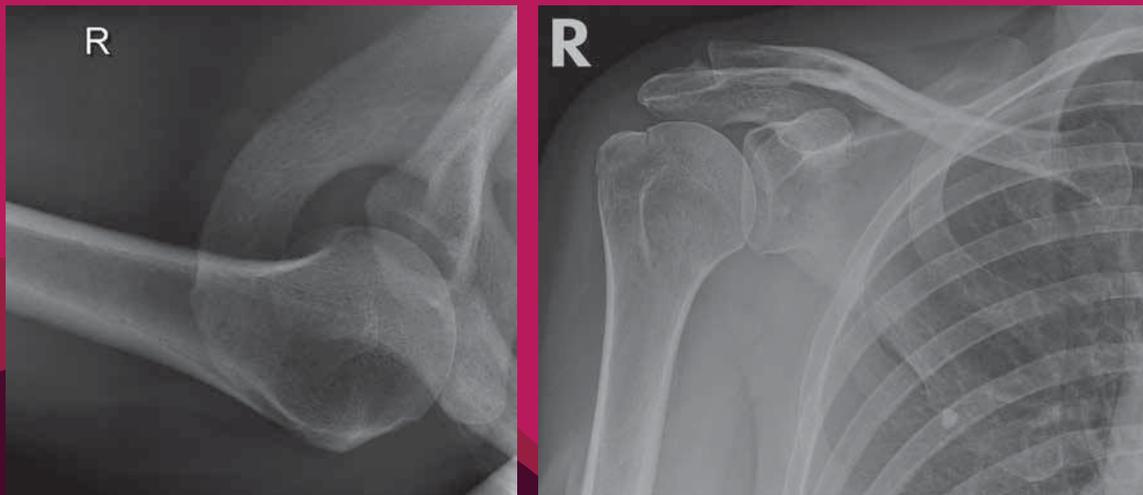
▲ *Figure 4: Posterior shoulder dislocation seen on axial.*



▲ *Figure 5: Subluxation on a) AP and b) modified axial.*



▲ Figure 6: a) subluxation and b) dislocation of the acromioclavicular joint seen on AP projection.



▲ Figure 7: Grade 4 ACJ injury on axial.

▲ Figure 8: Survey AP with greater tuberosity cortical breach.

Normal acromioclavicular distance is up to 7mm in men and 6mm in women<sup>13</sup> with coracoclavicular distance being 11-13mm. It is essential to be able to measure these and this is difficult on the Grashey projection. Figure 6a demonstrates subluxation of the ACJ, with the coracoclavicular distance being maintained, whilst figure 6b demonstrates dislocation, with clavicle elevation beyond the articular surface of the acromion process, and increased coracoclavicular distance.

ACJ injuries are graded from 1 to 6<sup>14</sup>. Grade 4 is a posterior subluxation/dislocation of the clavicle and is best visualised on the axial projection (Figure 7). It is extremely difficult to see this on any other projection.

### Bones

Checking the cortex of each bone will enable subtle abnormalities to be identified. Steps, breaks or buckles should raise suspicion of a fracture, in particular in the region of the greater tuberosity which is prone to undisplaced fracture following direct trauma (Figure 8). This area cannot be clearly seen on the Grashey projection.

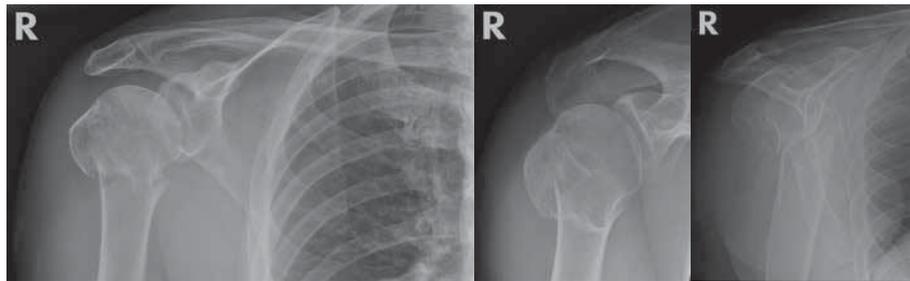
External rotation at the shoulder joint is needed to see the greater tuberosity on the AP projection (Figure 9a). A common mistake is to externally rotate the hand, without rotation of the shoulder, as in Figure 9b.

Humeral neck fractures are often seen in elderly female patients with osteoporosis<sup>15</sup>. These are easily seen using any AP technique (Figure 10a), but require a further two projections to identify associated fractures/displacement and inform treatment. An axial, or modified axial projection, demonstrates lesser or greater tuberosity involvement (Figure 10b), whilst the 'Y' projection demonstrates anteroposterior displacement at the fracture site (Figure 10c).

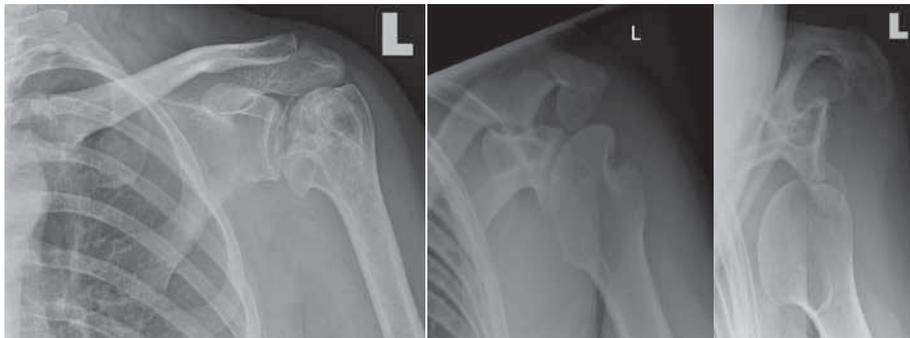
Figure 10: a) AP demonstrating humeral neck fracture; b) modified axial demonstrating no tuberosity



▲ Figure 9: a) correct external rotation; b) incorrect external rotation



▲ Figure 10: Humeral neck fracture a) AP projection; b) axial projection; c) Y projection.



▲ Figure 11: Avascular necrosis.

▲ Figure 12: a) Hill-Sachs; b) Bankart.

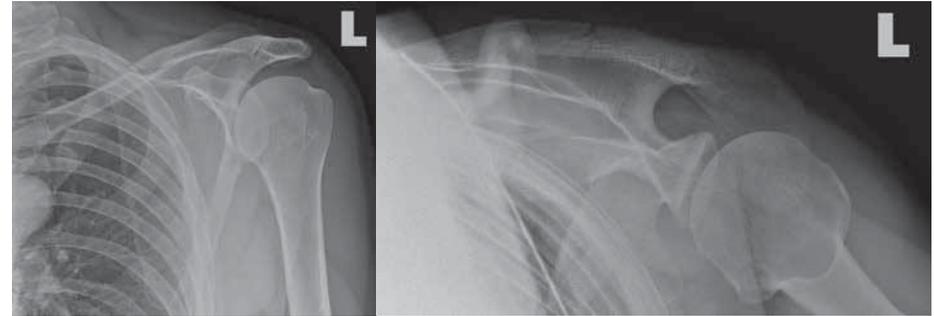


involvement; c) 'Y' projection demonstrating anterior shift at fracture site.

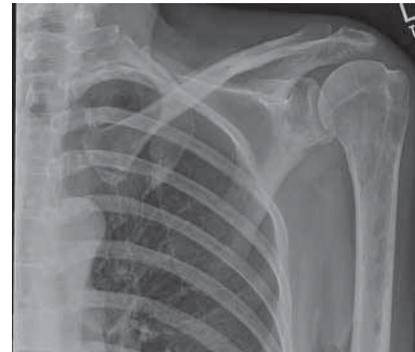
Fractures of the anatomical humeral neck may go on to develop avascular necrosis due to interruption in the blood supply, so the articular surface of the humeral head needs to be seen on follow-up images. This will demonstrate the subtle subchondral lucency in initial stages, with subchondral sclerosis and fragmentation being seen later (Figures 11).

Associated with dislocations are the Hill Sachs lesion, seen in the posterior aspect of the humeral head and caused by impaction of the glenoid in an anterior dislocation (Figure 12a), and the Bankart lesion, an avulsion fracture of the anteroinferior aspect of the glenoid generally, but sometimes seen in the posteroinferior aspect (Figure 12b). The Bankart lesion is caused by the capsule detaching from the glenoid labrum and pulling a small fragment of bone with it<sup>16</sup>. Good Grashey and axial projections are required to see it clearly.

Other fractures to look for are rib and scapula fractures. Scapula fractures can



▲ *Figure 13: Scapula fracture a) AP demonstrates fracture through the superior border; b) axial demonstrates fracture is through the scapula spine.*



▲ *Figure 14: Lucencies within the proximal humerus associated with myeloma.*



▲ *Figure 15: Trabecular irregularities.*

be seen on any of the AP projections (Figure 13a) and, depending on location, will either need a 'Y' projection to see fractures through the body or an axial projection to see fractures through the superior border (Figure 13b). In complex fractures, all three projections may be necessary.

There is a high incidence of metastatic disease and myeloma in the humerus, so it is important to look for any lesions which may be associated with a pathological condition (Figure 14).

When minor trauma has resulted in a fracture, the surrounding trabecular pattern and the fracture edges should be assessed carefully, looking for irregularity within the trabecula and loss of sharpness to the fracture fragments (Figure 15), which might suggest pathological fracture.



▲ Figure 16: Grashey projection showing early onset of degenerative changes.



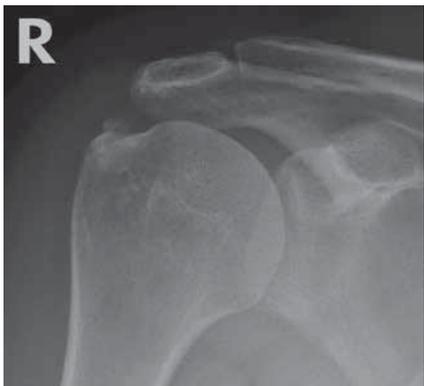
▲ Figure 17: Reduced subacromial space.



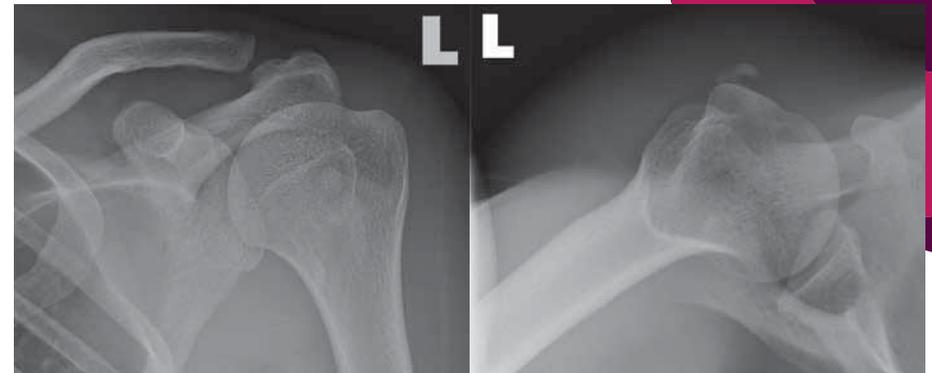
▲ Figure 18: Hook on underside of acromion, impinging into subacromial space.



▲ Figure 19: Sites of calcification within a) supraspinatus adjacent to superior facet of greater tuberosity; b) subscapularis adjacent to lesser tuberosity; c) infraspinatus adjacent to middle facet of greater tuberosity; d) teres minor adjacent to inferior facet of greater tuberosity.



▲ Figure 20: Calcific tendonitis within the supraspinatus tendon.



▲ Figure 21: Subscapularis tendon calcification a) area of sclerosis overlying lesser tuberosity; b) seen external to the bone and adjacent to lesser tuberosity on the axial.

### Cartilage

Good technique is essential when assessing the cartilaginous areas within the shoulder. Irregularities within the joint spaces may suggest ligamentous injuries, indicated by a widened joint, or degeneration indicated by a reduction in joint space. Imaging of the ACJ has already been discussed. The GHJ measures 3-6mm, and the Grashey view best demonstrates this. Figure 16 shows subchondral sclerosis, cystic lesions and osteophytes associated with osteoarthritis'.

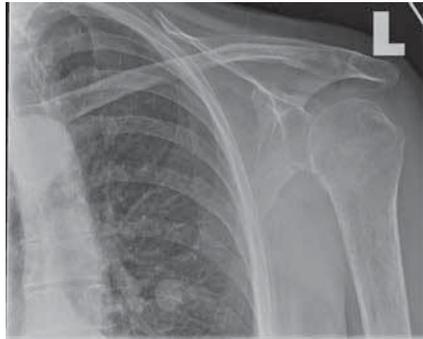
Often overlooked is the subacromial space, the distance between the humeral head and the underside of the acromion process, and measuring between 7-11mm<sup>17</sup> (Figure 1). Reduction may indicate chronic rotator cuff tear (Figure 17).

Acromion osteophytes impinging on this space may lead to impingement syndrome, pain when raising the arm overhead and weakness in the shoulder. Other signs to look for are increased sclerosis adjacent to the greater tuberosity or hooked acromion process (Figure 18). Supraspinatus outlet projection can offer further information on the shape of the acromion process.

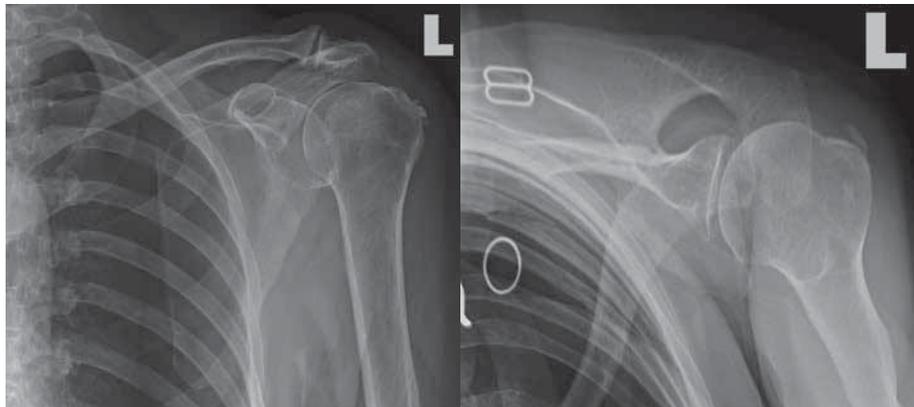
### Soft tissues

Finally, soft tissues should be assessed, looking for areas of increased density around the GHJ, which may indicate calcific tendonitis. There are four tendons which need to be evaluated and knowledge of their location in relation to the humeral head is essential (Figure 19).

More commonly, calcific tendonitis is seen in the supraspinatus tendon (80%) and this can generally be seen on using any AP technique (Figure 20).

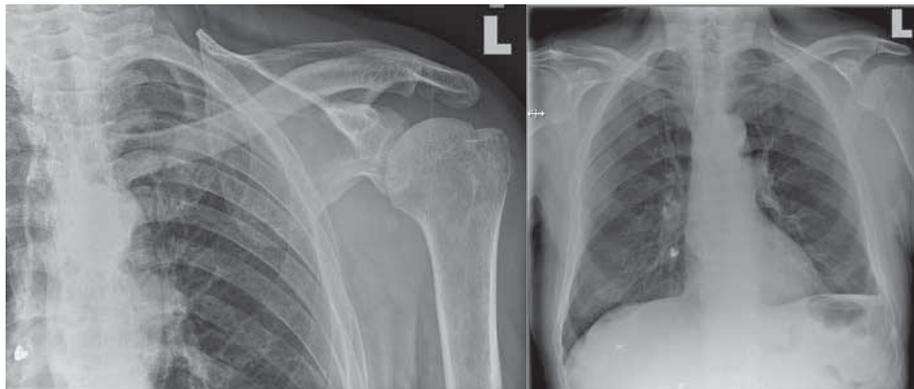


◀ Figure 22: Lesion seen in the left lung.



▲ Figure 23a.

▲ Figure 23b.



▲ Figure 24: a) opacity seen on shoulder image; b) multiple opacities on chest x-ray.

However, tendonitis in any of the other tendons may require an axial view to confirm that a sclerotic lesion seen on the AP is actually within a tendon and is not a bone lesion (Figure 21).

Lung fields should also be assessed for lesions, foreign bodies or pneumothorax. Lesions, in particular a Pancoast tumour, can present with shoulder pain<sup>18</sup>, so it is essential to raise concerns for any lesion seen within the lung field.

Large pneumothorax should be easily seen (Figure 23a), however, a small apical pneumothorax may be a little more difficult to see. Always check for rib fractures if a pneumothorax is seen (Figure 23b).

If any foreign body is identified, always try to account for it external to the patient. If it cannot be seen external to the patient, further imaging may be required to fully demonstrate this. Figure 24a shows a small radiopaque density in the region of the right hilum. When a full chest x-ray was performed, further radiopacities were seen (Figure 24b) and, on questioning the patient, these were identified as retained shrapnel from World War II.

### Conclusion

Understanding pathologies that affect the shoulder allows the radiographer to provide the best images possible, so that a definitive diagnosis can be made. When the patient has sustained trauma, imaging is generally straightforward. However, when the request card is lacking in clinical information, and the patient just has 'shoulder pain', the choice of techniques can be confusing. Table 4 outlines the best projections for the given pathology.

Presenting condition	Recommended technique	Justification
Injury – with non-specific signs	Compromise AP Axial or modified	The two projections show most traumatic conditions. Posterior dislocation and subluxation are clinically difficult to identify so may present with non-specific signs following trauma and are easily seen on these projections.
Fracture humeral neck	Compromise AP Axial or modified axial Y projection	Compromise AP demonstrates most of the shoulder clearly, whilst the axial will show greater tuberosity involvement and the Y projection will demonstrate displacement at the fracture.
Anatomical humeral neck fracture follow-up	Grashey Axial	Need to see the articular surface of the humeral head for subchondral lucency
Anterior glenohumeral dislocation	Grashey Axial or modified axial	Need to see humeral head and glenoid rim for Bankart lesion
Acromio-clavicular joint injury	Compromise AP Axial Zanca	The compromise AP will help to exclude other causes of pain, like clavicle fracture. The Zanca will clearly demonstrate the ACJ, whilst the axial will identify posterior displacement of the clavicle.
OA glenohumeral joint	Grashey	Grashey clearly shows the articulation of the humeral head and glenoid.
Non-specific pain	Compromise AP Axial	These projections will show possible calcification and the subacromial space, whilst allowing a reasonable view of the glenohumeral joint for degenerative disease.
Impingement	Grashey Supraspinatus outlet	A clear view of the subacromial space and the underside of the acromion process is needed.

▲ Table 4: Recommended projections for given presentations.

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# Values-based Practice for Imaging and Radiotherapy Professionals: An Introduction

Professionals working in imaging and radiotherapy can be rightly proud of their record in developing the evidence base of their subject. Patient care however, in contemporary person-centred clinical care, depends on values as well as evidence.

*The importance of values alongside evidence in clinical care is evident at many levels. It is emphasised in professional codes of practice; for example, the General Medical Council's guidance on shared clinical decision-making<sup>1</sup>. It is also spelled out in the best of evidence-based practice: the preface to all NICE guidelines for example requires professionals using the guideline to take account of '... the individual needs, preferences and values of their patients or service users<sup>2</sup>.' Furthermore, a recent ruling of the UK Supreme Court, the Montgomery judgement<sup>3</sup>, puts shared decision-making based on evidence and values, at the very heart of consent to treatment in all areas of clinical practice<sup>4,5</sup>.*

This article introduces a new approach to working with values in clinical contexts called values-based practice. The article describes the key elements of values-based practice and illustrates through two clinical examples, how these elements support imaging and radiotherapy professionals in delivering best practice in person-centred clinical care. But first, just what are values?

## What are values?

The role of values in healthcare is best appreciated by 'doing not saying'. So rather than just reading straight on, you may like to try the brief 'forced choice' exercise described in Box 1 for yourself.

### Box 1: The forced choice exercise

Imagine that you have developed the warning signs of a fatal illness and are being asked to decide between two treatments, A and B. Recent evidence-based guidelines from NICE (National Institute for Health and Care Excellence) tell you that both treatments offer benefits but also snags.

- **Treatment A** will give you a guaranteed **period of full remission** but at the end of that time you will inevitably die.
- **Treatment B** offers a **kill-or-cure** option: it gives you a 50:50 chance of being completely cured and living your normal life span or of dying immediately on taking it.

In all other respects (side effects, etc) the two treatments are equal; and you have no way of predicting into which group you will fall. Also, and just to be clear, you can only have one go at treatment: you can't choose Treatment A and then move on to Treatment B when your minimum period of remission is running out!

*What would be the minimum period of remission you would want from Treatment A to choose that treatment over the 50:50 kill-or-cure option offered by Treatment B?*

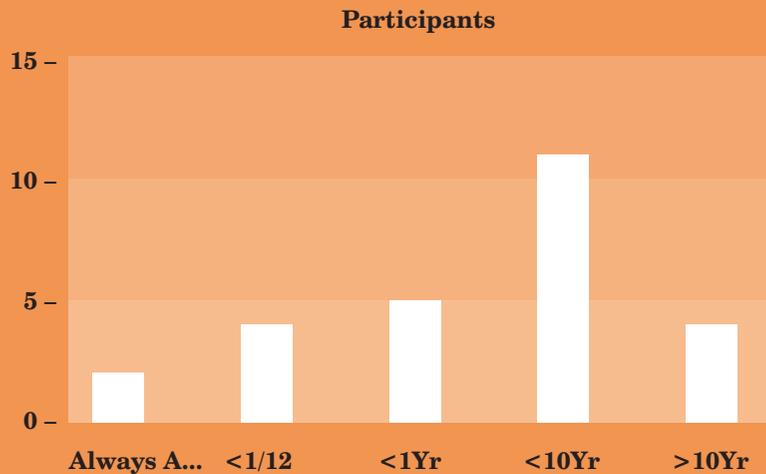


Note that this exercise is about you. It is not about what most people would choose or what the ‘right’ answer is. The forced choice is about what you would choose as you are now at your current age and in your current personal circumstances.

This is not always easy to think about. But try writing down your own minimum period and turn to Figure 1 on the next page, to compare your answer with others.

*“The role of values in healthcare is best appreciated by ‘doing not saying’.”*

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▲ Figure 1: Minimum time periods chosen in the forced choice exercise in a surgical care seminar.

As Figure 1 indicates, the forced choice exercise produces a wide range of responses. At first sight this is surprising. But if you think about your reasons for choosing the period you did, it will be clear that the diversity of responses reflects the diversity of what matters or is important to each of us individually – in a word, the diversity of our individual values. Someone with a young family for example, is likely to opt for a minimum of around 20 years because the most important thing in their lives is to see their children safely grown up. Others may choose much shorter periods if what matters most to them, is to finish a key life project, such as a PhD.

Notice finally, that everyone doing this exercise starts from the same facts – they have the same evidence base for their choice. So the bottom line is

### Same evidence + different values = different choices

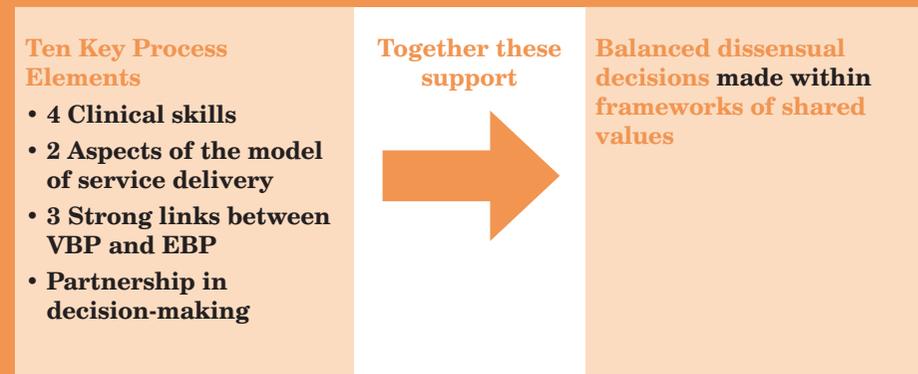
It is this bottom line that makes it important to add values-based practice to evidence-based practice in clinical care.

### Values-based practice

Values-based practice complements and is a partner to evidence-based practice<sup>6</sup>. There are other resources in the values ‘tool kit’ of healthcare: ethics, health economics and decision aids for example. Values-based practice adds to these, a particular focus on the diversity of individual values.

The main elements of values-based practice are shown diagrammatically in Figure 2 and summary definitions are given in Box 2. Briefly, the four skills areas

### Premise of Mutual Respect for Differences of Values



▲ Figure 2: A flow diagram of values-based practice.

Values-based Practice	Brief definition
Premise of mutual respect	Mutual respect for differences of values
Skills – awareness	Awareness of values and of differences of values
Skills – knowledge	Knowledge retrieval and its limitations
Skills – reasoning	Used to explore the values in play rather than to ‘solve’ dilemmas
Skills – communication	Especially for eliciting values and for conflict resolution
Person-values-centred care	Care centred on the actual rather than assumed values of the patient
Extended MDT	MDT role extended to include a range of value perspectives as well as of knowledge and skills
Two feet principle	All decisions are based on the two feet of values and evidence
Squeaky wheel principle	We notice values when they cause difficulties (like the squeaky wheel) but (like the wheel that doesn’t squeak) they are always there and operative
Science-driven principle	Advances in medical science drive the need for VBP (as well as EBP) because they open up choices and with choices go values
Partnership	Decisions in VBP (although informed by clinical guidelines and other sources) are made by those directly concerned working together in partnership
Frameworks of shared values	Values shared by those in a given decision-making context (eg a GP practice) and within which balanced decisions can be made on individual cases
Balanced dissensual decision	Decisions in which the values in question remain in play to be balanced sometimes one way and sometimes in other ways according to the circumstances of a given case

▲ Box 2: Brief definitions of the process elements of values-based practice.



(elements 1-4) are the foundation; these skills play out through teamwork as the basis of person-centred care (elements 5 and 6); working hand-in-glove with evidence-based practice (elements 7-9); and coming together in partnership as the basis of balanced decisions within frameworks of mutually shared values (element 10).

Awareness of values (element 1) is the starting point for values-based practice. Raising awareness is the aim of the forced choice exercise. In training, this exercise produces the ‘ah hah!’ light bulb moment about the diversity of individual values, from which values-based practice takes off.

If awareness is the starting point, communication skills (element 4) are key to how values-based practice plays out practically. The importance of communication skills in values-based radiography practice is illustrated by ‘Jane’s story’ given in Box 3. Again, you may want to think about Jane’s story before reading on. Ask yourself ‘what worked, and why?’ Think about this question first from Jane’s point of view, what mattered to her (Jane’s values) and then from the point of view of the radiography team, what mattered to them (the team’s values).

### Jane’s story and values-based communication skills

#### Box 3: Jane’s story

Jane has found a lump in her breast and has been referred to the one stop clinic. Mark her husband, cannot go with her and as she does not want to worry her friends and family she goes to the appointment alone. Jane is more than a little anxious about the visit to clinic and what her lump might be. At clinic she is the first patient of the day. A friendly staff member, called Anne, introduces herself and explains that she will be doing the mammogram. She asks Jane to change into a gown and takes her to a sub-waiting area. Jane sits in the sub-waiting area for quite some time in her gown. Jane is cold and anxious. She can hear the discussions of the staff who are sitting in a room just along the corridor from her. Jane does not want to hear about the radiographer’s difficulties in getting a matching toilet for her bathroom suite. She wants somebody to offer to keep her warm and to get on with her examination. Jane also wants to go to the toilet but there are no clear signs and there is nobody visible to ask. Jane does not want to interrupt the staff. She hates ‘making a fuss’ but she is starting to shiver now as she is so cold. Eventually (about 20 minutes and many more varied conversations later) a different member of staff calls Jane into the examination room and briefly mentions that the equipment takes quite a while to warm up on cold days. Jane smiles politely.

Jane's story starts well but ends less happily. Communication skills (respectively good and poor) are key to both phases of her story.

### ***Opening phase: good communications***

The story starts with a friendly member of staff (Anne) who introduces herself and takes Jane to the waiting area. Three elements of Anne's approach in this part of the story are important in conveying both kindness and competence as key aspects of values-based communications: a friendly approach, giving your name, and taking the patient to where they need to be.

Patients regularly rank kindness and related qualities (such as empathy and compassion) equally with competence, in what they value in health professionals – see for example the results of polls and surveys carried out by the General Medical Council<sup>7</sup>. Kindness and competence are both very likely to have been important to Jane as she arrived for her mammogram. Kindness was communicated by Anne's friendly approach, by introducing herself<sup>8</sup>, and by her taking Jane to where she needed to be rather than just directing her to the waiting area. This in turn, conveyed a sense of a well-run department with competent people in charge.

### ***Closing phase: poor communications***

But then things start to go downhill. Jane is left sitting in the waiting area with no idea how long she will be there and with no way of finding out what is happening or of asking for anything she needs. As the story describes, the things that were important to Jane (her values at this stage) were to know when they would get on with the examination and meantime to be kept warm, and to go to the toilet.

We can't know what any particular patient may need. But needs of this kind are readily met by explaining 'the what, the when, and the who': what will happen next, when it will happen, and who to ask if it does not happen or if you need anything.

In Jane's story, the staff were clearly caring and efficient. Where things went wrong was in their failure to engage with Jane not just as their first 'case' of the day but rather as an individual with concerns and expectations of her own. For the staff dealing with much the same clinic everyday, they were well aware it would be some 20 minutes or so before they could carry out the required mammogram. Had the person who greeted Jane explained this, she would have been less inclined to become anxious as time went by. This is where the what, the when, and the who comes in. This can be done in a few seconds even in a busy outpatient clinic: 'we'll be about 20 minutes while the machine warms up – we are in the office on the right there – if you need anything, please just let us know'.



***“Effective communication about values depends on more than just what is said.”***

Effective communication about values, it is worth emphasising, depends on more than just what is said. Listening is even more important! Body language too is powerful. And the physical environment may help or hinder. In Jane's story, why were the toilets not clearly signed? Why was the waiting area cold? Many hospital areas are unfriendly and impersonal, so it is worth looking for anything you can do to remedy this: a cared-for environment is a caring environment.

### ***Gareth's story and teamwork in values-based practice***

Gareth's story (given in Box 4) illustrates the importance of a different area of values-based practice, the multidisciplinary team. Once again, you may want to think about this before reading on. In what ways did the radiographer involved in Gareth's story contribute to providing clinical care that was values- as well as evidence-based? In what ways (and for whom) was this important?

As in Jane's story, both awareness of values and communication skills are important in Gareth's story. The radiographer, Jeanette, played a lead role in

#### Box 4: Gareth's story

Gareth is a 35 year old man who was being treated for metastases which had spread to his spine from an unknown primary. On day one of treatment he was an outpatient and was able to walk by himself for treatment. By day three he could no longer walk, had been admitted as an inpatient and a further two areas had been identified for treatment. He was in a lot of pain, despite being medicated with painkillers prior to coming down for treatment from the ward. On day four, he came down for treatment as normal. He was however, unable to tolerate the treatment due to the pain. When Jeanette, the radiographer, went into the room Gareth told her that he did not wish to have any further treatment and that he wanted to have his pain managed by medication and to spend the remainder of his time with his family. Jeanette clarified with Gareth that he no longer wished to continue with his treatment to ensure that she had understood him correctly. Gareth re-confirmed that was his wish. Jeanette and her colleagues transferred Gareth back to the ward, documented events in his treatment card and then called the registrar on the team to tell him what had happened. He took the view that it was 'the pain talking' and that it was in Gareth's best interests to get him down again for treatment the next day. The consultant however, took a different line when he came to the department later that day. Having talked with Gareth on the ward and reviewed the latest scan (confirming that there was another metastasis present) he agreed that there should be no further treatment.

recognising and responding appropriately to what was important to Gareth (that he stop treatment). The decision to stop however, was not made by Jeanette and her radiotherapy colleagues alone. It was a team decision initiated by Jeanette and continued through the medical staff, including the consultant. Neither was the decision made by Gareth alone. It was a shared decision, based on an understanding of the relevant evidence (the likelihood of further disabling side effects with little prospect of amelioration still less cure) and taken in dialogue with Gareth.

Teamwork is important also in diagnostic radiography. In a team seminar in values-based surgical care in Oxford, one of the radiographers described how patients often talked about their concerns and fears for the first time when they were undergoing imaging<sup>9</sup>. In this instance, the context was making decisions about reconstructive options after surgery for breast cancer. Here, patients are



*“Understanding what is important from the perspective of the particular individual concerned is key to person-centred care.”*

naturally feeling frightened and confused, and hence unable to open up about their real concerns. Working as a team provides a range of opportunities for issues to be identified naturally at different points in an individual's journey through assessment and treatment<sup>6</sup>.

Gareth's story illustrates the importance of teamwork first and foremost for

Gareth himself. Understanding what is important from the perspective of the particular individual concerned is key to person-centred care. Teamwork around values is however, also important for staff. Contributing to shared decision-making extends the role of team members from the technical aspects of treatment (vital as these remain) to engagement also with the humanistic aspects of care.

Teamwork on values is important, finally, for the legal aspects of care. Following the Montgomery judgment<sup>3</sup>, as noted in the introduction to this paper, consent to treatment requires shared decision-making based on evidence and values. Continuing treatment without Gareth's consent would of course have been illegal. Jeanette and her colleagues played a key role in ensuring Gareth's values were properly in play in the decision that treatment should be discontinued.

### **Other aspects of values-based practice and radiography**

Jane's and Gareth's stories illustrate many other aspects of values-based practice. You may want to think further about this – how many of the elements of values-based practice listed in Box 2 are exemplified in one way or another by one or other or both of them. They all are, is the short answer. The need for more effective person-values-centred care for example, is clearly at the heart of both.

### **Two further points about values-based practice are worth making**

#### ***Values and routine care***

Much discussion of values in healthcare focuses on ethical dilemmas. These are important but represent only a tiny fraction of the roles of values in clinical practice. Just like evidence, values are important everywhere in healthcare and in everything we do. There is indeed a sense in which the more routine the occasion, the more important it is to be aware of what matters to the individual concerned.

Jane's story illustrates the importance of being alert to values, to what matters, particularly in routine situations. In the second (downhill) phase of Jane's story, far from being alert to what mattered to her, the imaging staff left her sitting alone in a chilly waiting area while their equipment was warming up. It was the routine nature of this situation – a routine the staff went through everyday – that led

this otherwise caring and competent team to forget about their patient and what mattered to her.

#### ***Values, efficiency and effectiveness***

As practitioners, we are under pressure to achieve 'throughput'; everyone wants 'their' image or 'their' treatment now, and they want a good image and good treatment too. So, one natural reaction to the idea of 'adding values' is that it is yet another pressure. Yet as Jane's story shows, done in the right way, adding values is time efficient. A few extra moments spent explaining 'the what, the when and the who' pays huge time dividends downstream through improved engagement. This in turn, adds to your effectiveness in obtaining a good image or treatment session; an anxious, shivering Jane will not be an easy subject for the demanding technical task of obtaining a clear mammogram.

The mobile mammography service provides a helpful example of how good communication skills support the technical aspects of care. Here, the imaging professional has just a few minutes to establish a relationship with each client and is working under huge pressure to achieve a high throughput, while maintaining the highest technical standards in the images they produce. Yet notwithstanding the often-painful nature of the breast compression required for the procedure, patients report high levels of satisfaction with the way they are treated<sup>10</sup>. Staff communication and caring skills are known to play a key role in client satisfaction<sup>11</sup> and there is ongoing work on professional as well as client perspectives, on how to still further improve mammography care<sup>12</sup>.

#### **Conclusion**

We have introduced a new approach to working with values in healthcare called values-based practice. The initial forced choice exercise pointed to the importance of the diversity of individual values – of what matters or is important to us individually – in clinical care; add to the same evidence base, different values and you get different decisions. Values-based practice offers a way of working with the diversity of values that supports and complements the role of evidence-based practice in delivering best clinical care. We have given case examples illustrating two aspects of values-based practice (communication skills and teamwork) and indicated how these support the technical demands of radiographic practice.

Responding fully to the diversity of individual values in healthcare requires all ten elements of the model of values-based practice shown in the flow diagram in Figure 2 and the accompanying table of summary definitions in Box 2. Each of these elements, however, used separately, can have important impacts on practice.

The two phases of Jane's story showed how effective using just the first two elements of values-based practice (awareness of values and values communication) can be in delivering care that is both patient-centred and technically efficient, and effective. Gareth's story showed the importance of teamwork in person-centred care and in the shared decision-making that since the Montgomery judgement, is the basis of consent to treatment.

The Montgomery judgement has given a new urgency to the development of values-based practice in all areas of healthcare. Imaging and radiotherapy professionals are well placed to play a key role in this. We hope that this introduction will stimulate your interest to learn more about values-based practice and, if you will, to contribute to its development in all areas of radiographic clinical care.

### Further information and how to get involved

The website for The Collaborating Centre for Values-based Practice in Oxford includes a detailed reading guide for values-based practice and many downloadable resources for training – go to [valuesbasedpractice.org](http://valuesbasedpractice.org) and follow the drop-down menu to the section 'More about VBP'.

The Association of Radiography Educators is working with The Collaborating Centre on the development of training materials to support values-based radiographic care. If you are interested to learn more or to contribute to these developments, please use the 'contact us' facility available on any page of the website.

### Acknowledgements

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# The Clinical Utility of SPECT-CT

Single photon emission computed tomography-computed tomography (SPECT-CT) has been available for nearly two decades but was always seen as the poorer cousin of positron emission tomography-computed tomography (PET-CT). However, the equipment is less expensive and a range of radiopharmaceuticals can be used which are not available with PET-CT, which means studies can be performed for a range of malignant and benign diseases. The coming of quantitative SPECT-CT will aid post-radionuclide therapy dosimetry but also become a useful tool for research. SPECT-CT should not be thought of as PET-CT's poorer cousin but an essential tool for scintigraphic imaging in the 21st century.

*Conventional planar gamma imaging produces a two dimensional projection of a three dimensional distribution of a radiopharmaceutical. The images of the organs are superimposed, depth information is lost and contrast is reduced. SPECT imaging overcomes the above issues. SPECT has been in clinical use in the UK for 50 years<sup>1,2</sup>. SPECT involves collecting conventional planar views of the patients from different directions. These sets of data are processed into a set of transverse images by methods similar to those used in CT<sup>3</sup>.*

However, SPECT images alone often lack sufficient anatomical detail due to poor spatial resolution. In the year 1999, the first commercial SPECT-CT scanner was introduced for clinical use<sup>4</sup>. SPECT was initially combined with low dose single slice CT. Progressively, SPECT has operated with a CT equivalent to standard quality scanners, though at present limited to 16 slice CT. The SPECT data are acquired sequentially with the CT data, with an elongated table that could be positioned for either CT or SPECT imaging without moving the patient from the scanner. The reconstructed and post-processing steps produce three different displays: radionuclide emission data reconstructed with attenuation correction from the CT data, CT data from the CT scanner, fused images in which the radionuclide data displayed over a co-registered CT image<sup>5</sup>. Thus, CT anatomical images fused with SPECT functional images, provide anatomical localisation of regions of abnormal tracer uptake. The CT may also provide information to help with the attenuation correction of the SPECT data.

## **Oncological preparations**

### **Iodine131 post-therapy imaging**

One area where SPECT-CT was quickly adopted was the scan performed two to three days after I-131 therapy of thyroid cancer. Due to the long half-life of



***“SPECT-CT facilitates the study of a broad range of malignant and benign diseases.”***

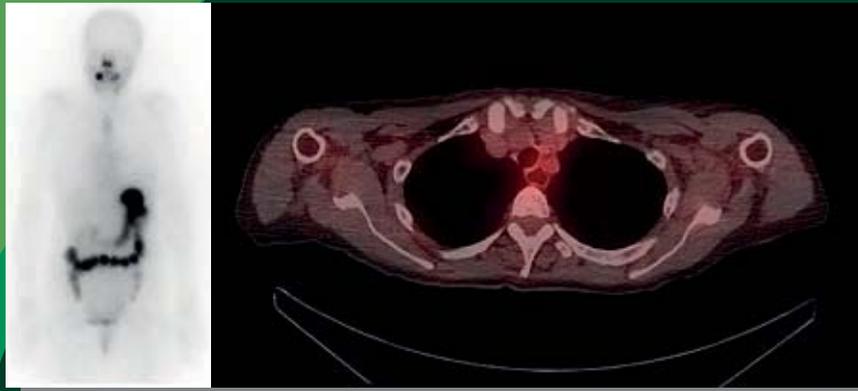
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I-131 and that in therapy high activities of 2-6 GBq are given, there is often a good count rate. Whole body imaging may show uptake outside the thyroid bed but this may be physiological or pathological. In a study of 147 areas of focal activity of I-131 in 54 patients scanned post-I-131 therapy, the radiologists' correct reading of the scan was increased by 71%. In particular, it was possible to differentiate central uptake as oesophageal and mediastinal metastases<sup>6</sup>. In a further study of 147 patients' images with SPECT-CT after I-131, there was not only the expected improvement in specificity (Figure 1) but an improvement in sensitivity<sup>7</sup>.

### **Somatostatin analogue imaging in neuroendocrine tumours**

The first somatostatin receptor imaging was tested in vivo in 1989. The eight amino acid analogue of somatostatin, octreotide, has a longer plasma half-life (two hours) than somatostatin (plasma half-life two to four minutes) and is used for imaging. It is labelled with <sup>111</sup>In which decays by electron capture, with half-life of 68 hours and approximately 171 and 245 Kev gamma emissions<sup>8</sup>. With these modifications in initial radiochemistry, in 1993a new radiotracer <sup>111</sup>In DTPA-D-Phe -1-octreotide (octreoscan) was developed and is still being widely used<sup>9</sup>. Another radiopharmaceutical occasionally used is <sup>99m</sup>Tc-HYNIC-Tyr3-octreotide. Initially, planar imaging was performed with octreoscan and subsequently with SPECT followed by SPECT-CT, improving the anatomical localisation, specificity and possible sensitivity.

These agents are particularly useful in imaging neuroendocrine tumours (NETs) which over express the sub type 2 somatostatin receptor<sup>9</sup>. NETs are classified as G1-G3 based on the mitotic count and Ki-67 index, which reflect the proliferative activity. G1 and G2 are well differentiated tumours exhibiting higher expression of somatostatin receptors and low glucose metabolism. These are ideally localised with SPECT-CT (Figure 2). In a study from 2005, <sup>111</sup>In-octreotide SPECT-CT has a sensitivity of 95–98% and a specificity of 100%<sup>10</sup>. SPECT-CT added an increased diagnostic confidence and reduced the number of equivocal findings, and altered the original diagnosis for 12% of the lesions. Overall, fused SPECT-CT had a clinical impact in 40% of the patients<sup>10</sup>. New PET techniques, such as <sup>68</sup>Ga labelled octreotide derivatives, show an increased accuracy compared with octreotide imaging. <sup>68</sup>Ga-DOTATATE PET estimated sensitivity 90.9% and specificity 90.6% in a recent study in 2016<sup>11</sup>. Therefore, this technique may take over from <sup>111</sup>In octreotide SPECT-CT.



▲ Figure 1a: Whole body image two days after 3.7GBq I-131. There is low grade uptake in the centre of the chest.

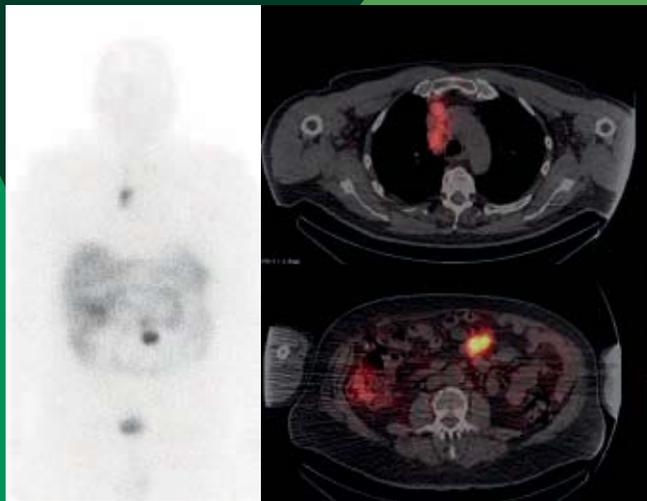
▲ Figure 1b: A SPECT-CT shows the uptake is physiological only and within the oesophagus.



▲ Figure 4a: A plain radiograph of the left lower leg showing surgical repair of a complex ankle fracture.

▲ Figure 4b: A two phase bone scan performed six weeks after the fixation devices seen in Figure 4a were removed. The upper image is the blood pool image, the lower the static image. This study was performed as there was persistent pain in the left ankle.

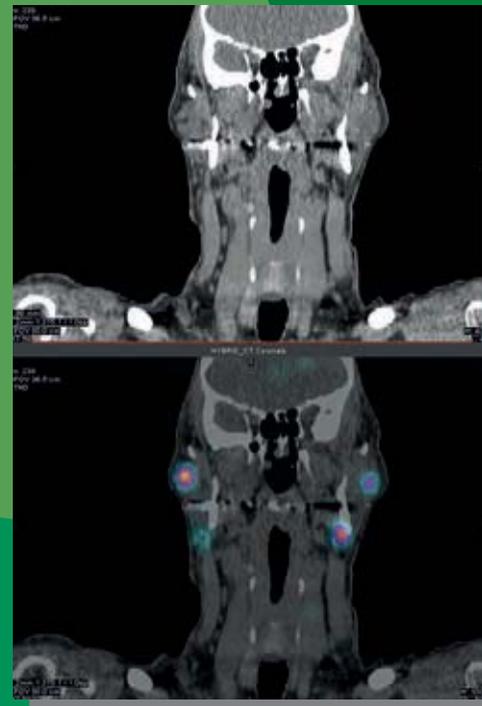
▲ Figure 4c: A SPECT-CT coronal slice shows intense uptake of 99mTc-MDP in the lateral aspect of the distal left tibia, the accompanying CT shows a persistent depressed fracture in the lateral distal tibia.



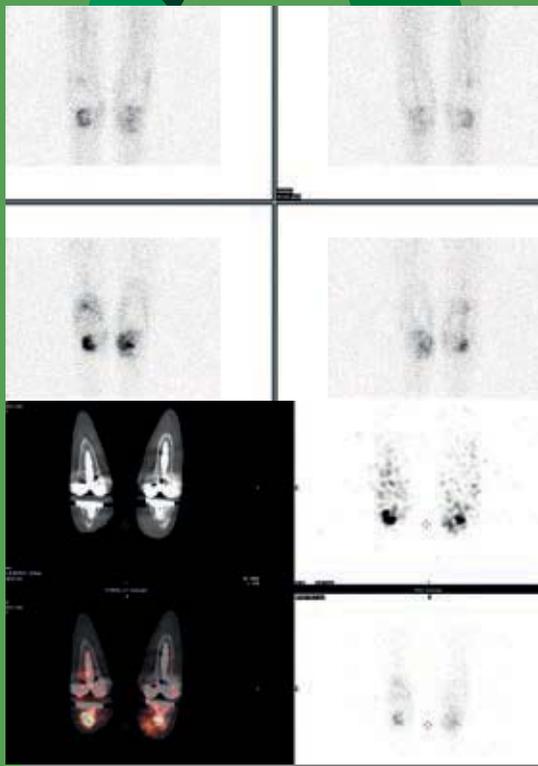
▲ Figure 2a: Whole body <sup>111</sup>In octreotide image with pathological uptake in the chest and the abdomen.

▲ Figure 2b: A SPECT-CT of the chest shows uptake in pre-tracheal nodes due to involvement with a neuroendocrine tumour (NET).

▲ Figure 2c: A SPECT-CT of the abdomen reveals a mesenteric node, positive for NET metastases.



◀ Figure 3: A coronal slice of a SPECT-CT of a the head patient with a melanoma on the tip of their nose, imaged 30 minutes after injection of 99mTc-Tilmanocept, showing four cervical bilateral sentinel nodes.



◀ *Figure 5a: A two phase bone anterior and poster views of <sup>111</sup>In leucocyte scintigram of a patient with painful total knee replacements (TKR), the upper image is the four hour image and the lower images were performed at 24 hours.*

◀ *Figure 5b: A coronal slice of the SPECT-CT confirms that infection involves the tibial component of both TKRs.*



▲ *Figure 6: Planar <sup>99m</sup>Tc MIBI image of the neck at two hours, showing no clear evidence for a parathyroid adenoma.*

▲ *Figure 6b: A SPECT-CT at two hours shows focal retention of the <sup>99m</sup>Tc MIBI in an 8mm, right-sided, retro-tracheal parathyroid adenoma*

### Sentinel nodes

The sentinel node principle of the first logical draining node from a cancer has been present for 60 years, and 20 years ago, the accuracy of this approach was enhanced by the use of radioactive tracers, along with the more commonly used blue dye, resulting in high accuracies in both breast cancer and melanoma<sup>12,13</sup>. In most cases, planar imaging is sufficient but in cases where localisation of the site of a sentinel node can be difficult, such as truncal melanoma or melanoma of the head and neck, SPECT-CT can be invaluable<sup>14</sup> (Figure 3).

### Musculoskeletal disease

For many nuclear medicine centres, bone scintigraphy is limited to whole body bone scintigraphy for the assessment of possible bone metastases from a bone seeking primary, such as breast and prostate. SPECT-CT can help in those areas difficult to see on planar imaging, such as the base of the skull. In a comparison of 30 patients with suspected skull base metastases, MRI found 17 lesions and <sup>99m</sup>Tc-MDP SPECT-CT found 19 metastases<sup>15</sup>.

Formally however, before the advent of MRI, more benign musculoskeletal disease would also be investigated by bone scintigraphy. The advent of SPECT-CT has meant a revival in many centres of the use of bone scintigraphy in a variety of different bone conditions.

### Spinal SPECT-CT

The spine presents significant issues in terms of planar imaging. Chronic low back pain is common and if related to bone disease, can be caused by degenerative changes in the vertebral bodies. However, a wider range of pathologies can affect the posterior elements, some of which can cause chronic low back pain in the young adult. Planar bone scintigraphy is poor at localising abnormal uptake, especially in determining if increased tracer uptake is in the posterior elements. SPECT-CT has the advantage of localisation and has been seen as the area of most intense uptake being the pain generator which when directing treatment can be 50% more effective than other imaging modalities<sup>16</sup>. A further problem area where SPECT-CT seems to have an advantage over techniques such as MRI, is in assessing post-operative pain, especially if there are metal rods or implants<sup>17</sup>.

### Prosthetic joints

The use of SPECT-CT has similar limitation to CT in terms of the artefacts from the CT component, however this can be offset by the functional aspect of the imaging, which is less affected by the presence of metal.



In addition, the bladder activity of the  $^{99m}\text{Tc}$ -MDP can distort the SPECT reconstruction, meaning that around hip prostheses SPECT-CT may have limited value. The situation in the knee is different.

Patients with total knee replacements (TKRs) can have post-operative pain for a number of reasons. Though infection or loosening is the most feared, the most common problems are mechanical or impingement problems. In a series of 60 patients who had a TKR and persistent pain,  $^{99m}\text{Tc}$ -MDP SPECT-CT correctly identified two patients as having a peri-prosthetic infection and nine patients as having loosening. Forty three had changes consistent with impingement or mechanical issues most involving the posterior part of the patella<sup>18</sup>.

### Feet

Painful feet are common and the causes can be anything from fractures, which can occur with minimal trauma or due to exercise, congenital abnormalities such as additional sesmoid bones and impingement. That is before the issue of the post-surgical foot or diabetic feet is considered. In a recent review of 60 patients who presented with foot pain but in whom planar x-ray and MR was unhelpful, 59 had an abnormal  $^{99m}\text{Tc}$ -MDP SPECT-CT and in 29 of these cases, the SPECT-CT had a positive effect on management<sup>19</sup> (Figure 4). The most common causes are commonly unsuspected stress fractures or degenerative changes.

### Infection imaging

The role of SPECT-CT was first determined in a review of 50 patients' images, with both  $^{67}\text{Ga}$ -citrate and labelled leukocytes. It was noted that in eight patients there was a minor change in the final report using SPECT-CT, with a major change seen in a further five patients<sup>20</sup> It was noted that this was primarily due to an improvement in localisation of the radionuclide tracer, improving specificity. This paper showed that the improvements found with SPECT-CT were not determined by the radiopharmaceutical tracer but the improved diagnostic accuracy provided by the ability to localise uptake as physiological or pathological.  $^{67}\text{Ga}$  citrate has limited use in imaging infection but may have a role in vertebral osteomyelitis where labelled leukocytes have proved ineffective.

Most subsequent evidence looks at the use of SPECT-CT with labelled leukocytes. SPECT-CT was used in a mixed group of 82 patients with suspected infection imaged with  $^{67}\text{Ga}$  citrate or  $^{99m}\text{Tc}$ -HMPAO WBCs. It was noted SPECT-CT improved accuracy by 48% compared to planar imaging<sup>21</sup>. There are particular indications where the use of SPECT-CT with leukocytes has proved to be superior to other methods. Reporting an Italian multi-centre trial in 55 patients with suspected



vascular grafts, the accuracy of  $^{99m}\text{Tc}$ - HMPAO labelled WBCs was 100%, compared to a specificity of 63% for SPECT alone<sup>22</sup> (Figure 5). This improved accuracy of SPECT-CT and labelled leucocytes, has meant the technique can be used in areas it would not have been previously considered such as those patients with infective endocarditis and cardiac implants where in 33 such patients,  $^{99m}\text{Tc}$  HMPAO WBC SPECT-CT has a sensitivity of 93% and a 100% specificity<sup>23</sup>.

### SPECT-CT in parathyroid imaging

The role of SPECT-CT in diagnosing the cause for hyperparathyroidism is vital. Primary hyperparathyroidism is diagnosed with elevated parathyroid hormone (PTH) and hypercalcaemia. The aetiology is a single parathyroid adenoma in 85-90% of cases, chief cell hyperplasia in 10%, parathyroid carcinoma in less than 1-4% of cases and multiple parathyroid adenomas 2-5% of cases<sup>24</sup>. The definitive treatment for patients with symptomatic primary hyperparathyroidism is the excision of the parathyroid adenoma or the hyperplastic glands. The primary role of parathyroid scintigraphy is in the detection and localisation of the hyperfunctioning parathyroid gland(s) which can facilitate minimally invasive surgery.

There are normally four parathyroid glands (superior and inferior on either side of the thyroid gland). Embryologically, inferior glands arise from the third branchial arch and the superior glands arise from the fourth arch. The inferior glands migrate caudally during development to their actual anatomical position which can result in ectopic positions of inferior parathyroid glands anywhere from the mediastinum at the level of the arch of the aorta to the chin. In ectopic glands, scintigraphy is the optimal method for localisation.

Reflecting modern practice, combined ultrasound and  $^{99m}\text{Tc}$ -MIBI scintigraphy are reported to have increased sensitivity for the preoperative localisation of parathyroid adenoma<sup>25</sup>. With  $^{99m}\text{Tc}$ -MIBI washout using dual phase planar and SPECT imaging replacing  $^{201}\text{Tl}/^{99m}\text{Tc}$  pertechnetate subtraction imaging<sup>26</sup>. Such dual phase  $\text{Tc}$ - $^{99m}$  MIBI scintigraphy is reported to have sensitivity of 88% versus 78% for single adenomas, 44% versus 35% for parathyroid hyperplasia<sup>27</sup>.

However, the main advantage of SPECT-CT is not just the ability to see that there is a parathyroid adenoma but to provide more precise localisation. This can be important because ectopic parathyroid adenoma can lie behind the thyroid bed, for example in the post-tracheal space (Figure 6) but also outside the thyroid in the upper mediastinum or around the aortic arch, where ultrasound will be of limited use<sup>28</sup>.

The advantages of SPECT-CT in the localisation of parathyroid adenoma has been conformed in a meta-analysis of 1276 patients, where the combined sensitivity

was 86% for SPECT-CT, 74% for SPECT and 70% for planar imaging. The studies that were negative tended to involve adenomas which were eventually found and were less than 7mm, and where the parathormone level was less than double the upper limit of normal<sup>24</sup>. Therefore at present,  $^{99m}\text{Tc}$ -MIBI SPECT/CT remains the method of choice in the scintigraphic localisation of parathyroid adenomas.

### Quantitative SPECT-CT and the SPECT SUV

Quantitative emission tomography is a valuable tool for the reliable diagnosis and staging of disease, and for assessing therapeutic response. Whilst previously being seen as a non-quantitative imaging modality, an increasing number of quantitative SPECT applications are being developed for both diagnostic – such as Q.Lung and Q.Brain<sup>29</sup> – and therapeutic applications, indicating the merit of quantitative information in the reporting of images. Although PET (formerly perceived to be the only quantitative radionuclide imaging modality) has both a sensitivity and spatial resolution advantage over SPECT, SPECT arguably has some advantages of its own. Not least, the physical half-lives for many SPECT radionuclides are generally longer and more aligned with the biologic half-lives of physiologic processes of interest, and the imaging systems are of lower cost and are much more widely used worldwide<sup>30</sup>.

For accurate quantification, it is imperative that corrections are applied to account for the heterogeneous nature of most anatomic regions of the body, and the subsequent non-uniform attenuation and scattering of photons. The introduction of combined SPECT-CT scanners provided a leap forward in SPECT quantification. In a matter of seconds, the CT data can provide information about the density of the body's tissues in the form of a photon attenuation map; a voxel-by-voxel representation of the linear attenuation coefficients at the SPECT photon energy appropriate to the administered radionuclide. Attenuation correction can be directly included in the iterative reconstruction algorithm, as in Siemens xSPECT Quant<sup>31</sup>. Although CT data is not absolutely essential for producing quantitative SPECT images, the ready availability of co-registered SPECT/ CT images has certainly improved the accuracy of uptake values obtained from SPECT.

The quantitative accuracy of reconstructed data is affected by decreased apparent activity concentration in objects less than approximately three times the spatial resolution of the system – the partial-volume effect. Additionally, counting rate losses due to dead time within the imaging system and accuracy of corrections maps applied for spatial and temporal variations in the detector's response, all impact upon the reliability of data. The most widely favoured reconstruction algorithm is based upon iterative methods, as opposed to filtered back-projection,

with many applications using the ordered-subset maximum-likelihood expectation maximisation algorithm (OSEM)<sup>32,33</sup>. Most reconstruction software now includes good scatter and attenuation correction and, increasingly, resolution recovery. Both GE and Siemens favour the use of a lower energy scatter window for scatter correction, with GE using a dual energy window method and Siemens a triple energy window<sup>34</sup>. Consideration must be made as to the number of iterations performed during reconstruction, as this impacts upon the quality of reconstructed images<sup>35</sup>. Previous studies have found the error in quantitative accuracy of SPECT/CT images to be within 6.8%, 31%, 12% and 11% for phantom spheres of varying radii filled with <sup>99m</sup>Tc, <sup>131</sup>I, <sup>111</sup>In and <sup>90Y</sup> respectively.

SUV-based evaluation of tracer uptake adds weight to the conclusions drawn in diagnostic imaging, dosimetry and the monitoring of effectiveness of therapies using a range of radionuclides, including <sup>131</sup>I and <sup>177</sup>Lu<sup>31</sup>. Quantitative SPECT of therapeutic radionuclides can be more difficult than quantitative SPECT of diagnostic radionuclides, such as <sup>99m</sup>Tc, because of the higher energy and often low gamma abundance of emissions, as well as the multiple emission energies commonly associated with therapeutic nuclides<sup>36</sup>. Consequently, image quality may suffer. However, correct calibration of the imaging system, knowledge of administration information and application of corrections, allow SUVs to be measured with reasonable accuracy in many scenarios and be a beneficial resource for SPECT image reporting.

## Conclusion

SPECT-CT has become an essential tool in a wide range of clinical scenarios and the authors consider that for many patients it should be the standard of care. New work may also mean that it will compete with PET-CT for quantification, producing similar results but at a lower cost.

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# Sharing Learning from Errors in Diagnostic Imaging, Interventional Radiology and Nuclear Medicine – the First Steps

**Every day in the NHS, tens of thousands of patients are treated and investigated safely by dedicated healthcare professionals, who are motivated to provide high quality and safe clinical care. A proportion of the treatment and investigations provided to inform clinical care, will involve the use of ionising radiation.**

## **Background**

Over 29 million diagnostic, interventional and nuclear medicine examinations were delivered by, or for, the NHS in England in 2016<sup>1</sup>. In the delivery of these large numbers of medical exposures, inevitably things can, and do, go wrong, no matter how dedicated and professional the staff. It is imperative we monitor diagnostic imaging errors to mitigate and reduce the magnitude of these events. Interventional radiology and nuclear medicine are implicitly included when the term ‘diagnostic imaging’ is used throughout this article.

There are well recognised risks (deterministic and stochastic) associated with

the use of ionising radiation across diagnostic imaging and radiotherapy. Although relatively rare, tissue reactions secondary to diagnostic imaging do occasionally occur. Instances of patients suffering radiation induced skin injuries following complex interventional procedures have been reported since the early 1990s<sup>2</sup>. In addition, while uncommon, a number of errors involving computed tomography (CT) examinations have resulted in tissue reactions such as skin reddening and hair loss<sup>3</sup>.

A national reporting and learning system for the diagnostic imaging community would offer the opportunity for analysis of a broad range of diagnostic errors and near misses. The data analysis would support the identification of national error trends and lead to the dissemination of learning, with a view to minimising the risk of these errors happening again.

## **Safety culture**

Healthcare organisations experience complex challenges and can sometimes struggle to combine reporting, investigation and learning from errors.

Senior management commitment is central to leading and developing a positive ‘safety culture’. In an organisation with a good ‘safety culture’, errors are still to be expected, however when an error occurs, the important issue is not who made the mistake but why the safeguards and defences, that should be in place, failed.

Some industries with known safety risks, such as nuclear power and aviation have developed good ‘safety cultures’ and robust safety systems.



*“A national reporting and learning system for the diagnostic imaging community would offer the opportunity for analysis of a broad range of diagnostic errors and near misses.”*

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The aviation industry shares learning from serious accidents by international dissemination of accident investigation reports. In the UK, the Civil Aviation Authority requires mandatory reporting of aviation safety events to a national data base for trend analysis and feedback to the industry. An independent body manages confidential human factor error reporting and provides anonymised feedback. A number of airlines have ‘company safety information systems’ to which staff report all levels of safety related events, in a culture where no individual is pursued for an honest mistake. Finally, there are systems for proactive flight data monitoring of crew. The focus of these safety systems is on detecting and learning from not only accidents and serious incidents, but also lower level near misses, some of which might have the potential to lead to a more serious event<sup>4</sup>.

Healthcare organisations can learn valuable lessons from these sectors, which have spent decades establishing a culture of safety and implementing improvements based on systematic learning from accidents and incidents.

### **Human factors**

There are a variety of human, environmental and procedural factors which can contribute to any error, including those involving ionising radiation. For each error, there will be a chain of events and circumstances which will play a part. Human error may sometimes be the factor that triggers a safety event but there is frequently an underlying failure of a process or system of work which, if addressed, would have prevented the error or acted as a safety net to lessen the consequences.

### **Opportunities for learning**

#### **Mandatory error reporting**

In 2000, the Ionising Radiation (Medical Exposure) Regulations (IR(ME)R)<sup>5</sup> came into force in England, Wales and Scotland, with separate but equivalent legislation in Northern Ireland.

IR(ME)R 2000 requires healthcare organisations to report incidents to the appropriate authority, where a person has, or might have, been exposed to a level of radiation defined as ‘much greater than intended’.

*“There are a variety of human, environmental and procedural factors which can contribute to any error, including those involving ionising radiation.”*

**Table 1: The appropriate authority for each country within the UK**

Country	Authority
England	Care Quality Commission (CQC)
Northern Ireland	The Regulation and Quality Improvement Authority (RQIA)
Scotland	Healthcare Improvement Scotland (HIS)
Wales	Healthcare Inspectorate Wales (HIW)

It is likely that updated IR(ME)R legislation, which at the time of writing, is due to come into force in February 2018, will require the enforcing authorities to share the learning relevant to radiation protection, from the significant events that have been reported to them.

A number of the appropriate authorities already publish an annual report to update and share findings from their IR(ME)R inspections and notifications of ‘much greater than intended’ exposures<sup>6,7,8</sup>.

These notifications make up an important but small proportion of all the errors and near miss events involving patients undergoing medical exposures, thus offering only limited opportunities for learning.

### Near miss error reporting

Herbert Heinrich, a pioneer of industrial safety in the 1930s, claimed that for every fatal accident in the workplace, there were 30 minor events and some 300 near misses<sup>9</sup>.

The reporting and analysis of near miss events offers the potential to learn from an error before it causes harm. It also provides a rich data set covering a broad range of errors, and as such, enhances the more limited data available from mandatory reporting systems.

In the absence of an ideal metric to measure patient safety, a reporting and learning system (RLS) might be considered a suitable substitute<sup>10</sup>.

### Voluntary error reporting

NHS organisations in England and Wales voluntarily report ‘patient safety incidents’ and near misses to the National Reporting and Learning System (NRLS). These ‘patient safety incidents’ include a broad range of errors, some of which may involve ionising radiation. All are reported via healthcare organisations’ risk management systems such as Datix, Ulysses and so on.

### Learning from radiotherapy errors

The UK has established an international reputation for its safety initiatives in radiotherapy. One of these initiatives is the voluntary reporting and learning from radiotherapy errors and near misses.

In 2006, the Chief Medical Officer (CMO) for England launched and funded a range of initiatives relating to patient safety in radiotherapy. This included resources to allow the Health Protection Agency (now Public Health England (PHE)) to establish a dedicated means to support the radiotherapy community in improving safety in radiotherapy.

A further initiative by the CMO resulted in a document (*Towards Safer Radiotherapy* (TSRT))<sup>11</sup> with a view to finding practical solutions for reducing errors in radiotherapy caused by human error or failure of systems of work. TSRT delivered a number of key recommendations, established a reporting, analysis and learning system, and clarified that all radiotherapy centres should participate in this system to enable national learning from radiotherapy radiation errors and near misses. The Patient Safety in Radiotherapy Steering Group (PSRT) was tasked with taking these recommendations forward.

100% of radiotherapy departments across the UK have voluntarily reported errors and near misses using the classification terminology and pathway coding from TSRT, thus enabling these errors to be compared locally and nationally. Radiotherapy staff at PHE receive the anonymised data, provide the analysis and disseminate the learning through regular publication of the newsletter *Safer Radiotherapy*<sup>12</sup> and other reports, in association with the PSRT. *Safer Radiotherapy* highlights key messages and trends, identified from radiotherapy error report analysis, and provides guidance on how these errors might be mitigated.

### Learning from diagnostic errors

To date, there is no national reporting and learning system specifically for diagnostic imaging errors, that provides the level of detail required to identify all radiation related events.

The Clinical Imaging Board (CIB) recognised the need for such a system<sup>13</sup>. A working party, commissioned to take this forward for the diagnostic imaging community, produced a document which, at the time of writing this article, is still in draft form. The document includes a classification and pathway coding framework intended to enable organisations to code, analyse and learn from local errors. A reporting template has also been developed to be used in conjunction with the coding framework.



The CIB document proposes a number of recommendations which include:

- The formation of a multidisciplinary steering group to evaluate and progress the coding taxonomy and guidance;
- for the diagnostic coding taxonomy to be adopted locally as a mechanism for categorising diagnostic errors;
- for diagnostic error reporting and learning to take a multidisciplinary approach;
- the provision of national workshops for representatives from clinical imaging services to understand and implement the coding system;
- the development of a national implementation phase for the diagnostic imaging reporting and learning system.

### **The coding framework (taxonomy)**

The coding taxonomy, developed by the working party, captures the severity of an error and includes those reportable to the appropriate authority, a non-reportable error, or a near miss. It also records the exposure type, for example medical, research or health screening, and the imaging modality, for example general radiography, computed tomography, nuclear medicine and so on.

The pathway taxonomy identifies each step of the patient pathway, from referral through to clinical evaluation. The taxonomy identifies the point in the pathway when the error occurred and provides further classification to identify what went wrong, ie the detail of the error.

Subsequent analysis of an error will often expose a series of events or departures from safe practice; these are the contributory factors, ie the why. The contributory factor taxonomy enhances the trend analysis and captures not only what happened, but why it happened.

Also included in the document is a reporting template to enable recording of the final alphanumeric code, used as part of the coding framework, in a format to support analysis.

Seventeen clinical imaging centres from across the UK, were invited to participate in a pilot study of the coding taxonomy and reporting template. Twelve centres responded and using the framework provided, the centres were asked to code six 'control' errors. The 'control' errors were coded and consistency checked prior to inclusion in the pilot study by members of the working party. The centres were also asked to code ten errors from their own diagnostic imaging departments. This local error coding was independently reviewed by working party members and discrepancies evaluated collectively. All details of the pilot study are included in the CIB document.

The pilot study highlighted a number of changes required to the pathway

taxonomy, the contributory factor taxonomy and the reporting template. These are being reviewed for incorporation into the final document.

### Next steps

While it is accepted that there are a number of healthcare organisations who record, analyse and share learning from local imaging errors, there is scope to build on this limited, but commendable, local reporting and learning.

It could be argued that a dedicated national reporting and learning system for the diagnostic imaging community will support and improve patient safety, as it clearly does for the radiotherapy community.

Radiotherapy departments have had, for some time, embedded in their workforce, governance and quality radiographers. These radiographers have a proportion, if not all, of their role dedicated to tasks which support the radiotherapy service, to provide a safe efficient and effective treatment programme. These tasks include the collection, analysis, error coding, and interpretation of information on radiotherapy errors, which in turn support quality improvement and inform change in practice, both locally and nationally.

The dedicated diagnostic quality assurance radiographer role is seen, and valued, in a number of large healthcare organisations. However, there is scope for this role to become more widely established to support all diagnostic imaging departments. Providing a dedicated ‘champion’ in each organisation to lead the adoption of diagnostic imaging error coding locally, is important for the success of this safety initiative. This role would support and progress the recommendations set out in the CIB document and would work towards delivering national submissions of error coding.

### Conclusion

A national reporting and learning system for diagnostic imaging errors is an ambitious but much needed project. The field of diagnostic imaging is complex and evolving, requiring trends and cycles of change to be monitored. Healthcare professionals need to be supported in their role to protect patients from harm and as such, we need an effective system to reduce the probability and magnitude of diagnostic imaging errors. We can only accomplish this through working together as a community to achieve this goal of learning from errors, influencing change and informing practice to better protect our patients.

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# Using Social Media in Imaging and Oncology: An Illustrative Example

**The use of social media has and is escalating across all ages and socio-economic groups in the UK. The WoMMeN hub has taken advantage of this growth to create a dedicated patient-practitioner resource about breast screening.**

## Introduction

Ofcom, the communications regulator in the UK, produces information on adults' media use and attitudes. They report<sup>1</sup> that in 2016, 86% of UK adults used the internet, varying slightly by age and less so by socio-economic group (see Table 1). Furthermore, the report shows that the average length of time spent on the internet has increased considerably from 9.9 hours in 2005 to 22.9 hours in 2016. The most significant increase in use has been in the home environment, ie for personal purposes, where an average of 14.8 hours per week is spent on the internet.

So, what are people doing online? Ofcom's 2017 report<sup>2</sup> suggests we are mainly online communicating with each other, through social networks such as email and dedicated platforms such as Facebook, Twitter, LinkedIn and SnapChat; collectively known as social media (SoMe). Coupled with the ubiquitous use of mobile digital devices, SoMe allows instantaneous sharing of knowledge through social interaction, and has led to an increasingly interconnected and informed world.

Conversations about health have not escaped this digital transformation. SoMe has dramatically changed how health information and support are accessed, shared and acted upon<sup>3</sup>. It is difficult to know the number of online health communities which exist. However, the Symplur Healthcare Hashtag project<sup>4</sup> which has been

listing all global Twitter chats about health since 2010, claims there have been more than 1.5 billion tweets on 15,375 health-related topics. These figures reflect activity on Twitter only; a SoMe platform which Ofcom reports is used by just 25% of the UK population<sup>1</sup>. This gives some indication of the appetite society has for health information and Ranschaert<sup>5</sup> suggests we are now practising within a digital society, where many patients are able to share their own health information with almost whomever they want using SoMe.

A number of systematic reviews<sup>6,7</sup> have identified innovative uses of SoMe by health professionals, which have been shown to produce benefits, including online support and better tailoring of information to the specific needs of patients, relatives and carers. However, as Hawkins et al.<sup>8</sup> claim, the debate about SoMe's potential has now been had and must be replaced with discussions about best practice and illustrative cases.

This article will, therefore, provide an authentic illustration of how SoMe tools have been used to create a dedicated patient-practitioner information resource about breast screening; the Word of Mouth Mammogram e Network (WoMMeN). Although primarily set up as an informational resource, WoMMeN incorporates links to accounts on popular SoMe platforms, to facilitate conversations about breast screening.

SEG/gender	All adults	AB	C1	C2	DE	Male	Female	
Goes online	86%	93%	93%	84%	73%	85%	86%	
Age	All adults	16-24	25-34	35-44	45-54	55-64	65-74	75+
Goes online	86%	98%	97%	93%	94%	82%	65%	44%

▲ Table 1: Table of internet use, adapted from Ofcom/section 5 (2017).



*“Social media has dramatically changed how health information and support are accessed, shared and acted upon.”*

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The discussion following the case study will highlight benefits, problems and solutions for the use of SoMe within the imaging and oncology setting.

### **The WoMMeN case study**

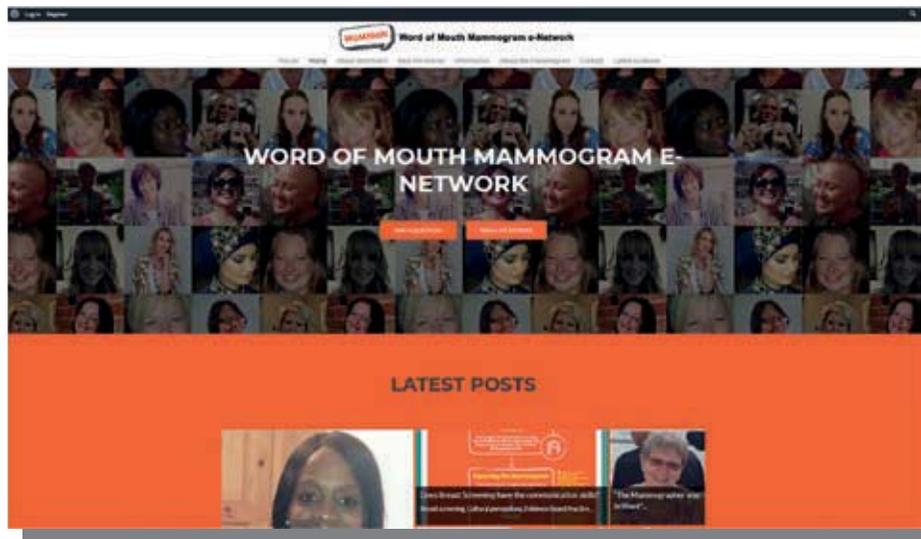
The WoMMeN online hub ([www.wommen.org.uk](http://www.wommen.org.uk)) was created to provide information about breast screening. The aim for the hub was to address limitations with the information currently sent to women invited for breast screening in the United Kingdom (UK)<sup>9</sup>.

From the offset, WoMMeN was to be created using a user centred design (UCD) approach to ensure potential users could inform the concept and end product. 'Users' refers to both practitioners and patients – strictly speaking 'service users' since this is an asymptomatic population, but for ease of reference will be referred to as patients henceforth. However, it proved difficult to convene face-to-face focus group meetings, since our 'users' were generally busy with work/life commitments. To address this, we took the project online, recruiting more than 100 women (patients and practitioners) to a private Facebook User Design Group (UDG). The role of the UDG would be to discuss breast screening and in so doing, identify features and requirements for an information hub. We spent almost a year developing this online research community, sharing information and experiences, and continually evaluating the hub as it developed<sup>10</sup>.

The WoMMeN hub uses a Wordpress.org (<https://wordpress.org/>) template and contains the following:

- i) Information identified as important by the UDG, such as the principles behind screening in general, as well as specific detail about breast screening and the mammogram procedure;
- ii) a latest evidence section for those who want access current research;
- iii) a conversation space to recount real life stories through blogs – the UDG expressed a belief that experiential information is as important for making decisions as empirically-derived 'evidence'. This positive value of experiential knowledge has also been highlighted by others<sup>11</sup>;
- iv) a patient-practitioners forum to gain clarification on general issues related to mammography (not personal advice). This facility to talk with a professional online is also advocated in the 2012 UK NHS communication strategy<sup>12</sup>;
- v) a practitioner-only forum to provide an opportunity to test out responses to patients and share CPD resources.





▲ Figure 1: Landing page of the WoMMeN Hub.



The intention was for the hub to be a self-sustaining ‘community’, where patients and practitioners would engage in discussions and share resources about breast screening. We also linked the WoMMeN hub to an open Facebook page ([www.facebook.com/BreastScreeningMammography/](http://www.facebook.com/BreastScreeningMammography/)) and Twitter account ([twitter.com/wommen](https://twitter.com/wommen))<sup>3</sup> to appeal to users across multiple platforms, relevant to the screening population, and therefore provide a wider range of opportunities to connect.

SoMe was therefore incorporated and is an important element of the hub, because it allows patient-patient, patient-practitioner and practitioner-practitioner communication. The hub was launched to coincide with National Women’s Day on 8 March 2016 (Figure 1).

### Implementation

To ensure the hub would be accessed by patients and practitioners, we had to consider potential barriers and solutions to implementation.

### Practitioners

Engaging practitioners online with patients has been reported as problematic by others<sup>7,13</sup>, who showed that proposals to use SoMe as a professional communication tool was associated with widespread confusion and fear by health practitioners. These fears were related primarily to professional issues, such as confidentiality, patient privacy and breaching professional, employer and ethical codes of conduct, as well as the impact on time management.

In order to test out and address these concerns, we secured the College of Radiographers Industrial Partnership Scheme (CoRIPS) funding to run four workshops with breast screening practitioners across England. We also explored the readiness of nine UK Hospital Trust communication policies for enabling the use of SoMe as a professional tool for practitioners. The findings of both studies have been reported elsewhere<sup>14,15</sup> but generally reflected the anxieties detailed in the literature.

However, the workshops also served to raise awareness of WoMMeN and provide some training opportunities in the professional use of SoMe. Consequently, around 30 breast practitioners signed up to the hub to engage in online conversations with patients. The hub ‘practitioner only’ forum also allows practitioners to receive peer feedback on their responses to patients before posting.

Additionally, the employer communication policies we reviewed, generally discouraged the use of SoMe by staff to communicate with patients. Only one of the nine policies we reviewed actively encouraged the use of SoMe<sup>14</sup>. To realise the promise of online communication acknowledged in the NHS communication strategy<sup>12</sup>, we argue that this needs to change.

*“There are specific issues in reaching out to a ‘screening’ population as opposed to one with a long-term condition.”*

Suggestions are that (i) managers are encouraged to see the potential for improving service quality; (ii) firewalls need to permit accessibility to SoMe channels; and (iii) staff need training in the technical aspects of the relevant platforms, as well as guidance on the professional and ethical use of online communication in a public space. Whilst it is understandable that issues of risk-management are prioritised, high quality professional guidance now exists to support staff wanting to engage with the public online<sup>16,17</sup>.

### **Patients**

Engaging patients online has been less problematic. Hawkins et al.<sup>8</sup> suggest the patient population has enthusiastically integrated SoMe into their lives, calling for an increased use by their physicians. As Hodgkin and Metz<sup>18</sup> point out, patients are becoming better equipped (in terms of technology and skills) and less afraid of risks than practitioners, and are intrinsically motivated.

Nevertheless, there are specific issues in reaching out to a ‘screening’ population as opposed to one with, say, a long-term condition. Their motivation to access information may be less clear and certainly more transient than someone seeking peer support for a chronic life-changing ailment. Breast screening clients do therefore, need to be made aware of the WoMMeN hub as a useful resource.

Consequently, it has been important to understand how best to market the hub to an audience who may not be ‘looking’ and this has brought about collaboration with a number of digital marketing experts. A SoMe marketing campaign was devised and a small amount of funding was used to pay for Google and Facebook targeted advertisements, and although ads boosted traffic to the hub, the majority of visitors have come about through ‘organic’ means. This included using free Wordpress tools, search engine optimisation of blogs, sharing through our own networks and the use of Buffer, a SoMe management tool ([www.buffer.com](http://www.buffer.com)) to time-release posts via our Twitter and Facebook pages. Facebook and Twitter contributed significantly to the growth of the community.

Traffic now appears to be growing steadily through this ‘organic’ approach, which relies on the connected nature of SoMe networks. The ultimate aim is for the hub to be a self-sustaining community where members create and share their own content, and where, through discussion, multiple perspectives are embraced but factual misinformation can be corrected. If this can be achieved, there will be minimal resource implication for sustaining the hub, offering exceptional value for the initial resource invested in development.

The NHS Breast Screening Programme (BSP) could also support dissemination of WoMMeN, for example by linking the WoMMeN hub to screening invitations and



the NHS BSP and NHS Choices website. However, in what Hodgkin and Metz<sup>18</sup> term 'Eco-Evo-Devo' – a re-conceptualisation of the patient-practitioner relationship – knowledge and communication boundaries that have been requisite for a more traditional, paternalistic clinical approach may now stand in the way of promoting and valuing the use of SoMe in health.

### Evaluation

The aim of the hub was to increase the quality of information to support women's decision-making with regard to breast screening. With this in mind, the most appropriate way to evaluate WoMMeN was to measure traffic to the hub and associated SoMe platform accounts, as well as reviewing the quality of discussion and experiences shared.

According to Google Analytics (analytics.google.com/) in the 12 months between Dec 2016-2017 WoMMeN.org.uk attracted approximately 6000 visitors and 17,000 page views. This included 30% returning visitors, suggesting the hub holds more than transient value. The WoMMeN Facebook page and Twitter accounts have 2356 and 681 followers respectively (checked 17/12/17). #WoMMeN3 has been placed second on the Symplur HealthCare Hashtags project list for mammogram mentions worldwide.

SoMe works when there is 'engagement' since this is what leads to the development of communities and networks, thus extending the 'reach' of the message. Engagement can be measured quantitatively via the number of likes, comments and shares. There were 1243 post-engagements on the Facebook page in the month 18/11/17-15/12/17. This degree of engagement has meant that 5629 people were 'reached' with the posts about breast screening during the same period. It is therefore, easy to see the massive potential SoMe offers within the Public Health arena<sup>19</sup>. It is also clear that organic development of a health community is possible without a large investment in advertisements.

Qualitative observations can also be made from the posts. Although we have yet to undertake a thorough analysis of this, there are many instances of women advising others to attend screening based on their own experiences. The following verbatim comments<sup>20</sup> are typical examples.

*"Everyone please go it saved my life 18 months ago. I had a routine mammogram and it was picked up very early and now clear and well. Nothing to be afraid of."*

And

*"My mammogram picked up my cancer in the early stages if I'd left it another three years who knows what the outcome would have been so glad I went."*

Some of these women have been encouraged to provide more detailed accounts of their stories for the WoMMeN hub<sup>21</sup>.

A secondary outcome of WoMMeN must be to increase the uptake of breast screening since, despite ongoing international controversy, the NHS in the UK still advocates screening. We have therefore undertaken a hub visitor survey. This pilot evaluation (57 respondents) over a two month period (November-December 2016) has shown that 37.5% of respondents were influenced to attend for breast screening as a result of visiting the hub, and a further 28.6% probably would be. The remainder had already made their mind up. All respondents said the hub provided useful additional information, with more than 50% of people strongly agreeing with a statement to this effect.

'Targeted' digital marketing of the hub offers promise in terms of reaching out to low uptake groups. A pilot project has shown that it may be possible to direct specific groups to the hub through clever targeting of online ads, and through messages on local community Facebook groups, which coincide with scheduled screening rounds for those communities. This is proving really effective, with early figures suggesting up to 25% of visitors are coming to the hub as a result of these ads. This work is ongoing and will require funding and longitudinal data to determine impact.

### Discussion

Although it has been acknowledged that the adoption of SoMe has been slow in radiology<sup>8,22</sup>, there are many potential applications. The WoMMeN case study has illustrated how public health and screening contexts can clearly benefit from its use. Whilst the focus of WoMMeN is breast screening, what we have learned during the project may be transferred to other screening contexts. This includes preparing practitioners for professional engagement online; engaging patients in information development; the importance of real-life stories; strategic use of a range of SoMe platforms; writing effective blogs; and ensuring the site is search engine optimised for the population in question. Similar hubs can therefore be developed for other screening populations, adapting design and marketing for the specific group, eg targeted to the most appropriate SoMe platforms for young women for cervical cancer, and older males for abdominal aortic aneurysm and colorectal screening.

However, non-screening radiology contexts may also be improved through the application of SoMe, for example, curating and interpreting patient information about radiological investigations and radiation therapy. Patients have access to an unprecedented amount of information about health and struggle to distinguish between valid sources or make sense of contradictory reports. Hawkins et al.<sup>8</sup> suggest there is a role for radiology professionals to help interpret the facts.



Examples, they suggest, are explaining radiation risks or outlining the relative advantages of a range of minimally invasive interventions.

Although a small number of radiology services have exploited the value of SoMe to promote their services<sup>23</sup>, SoMe provides an excellent opportunity to promote the professions more generally, raising awareness of what radiologists and radiographers do, and making us more visible to the public<sup>8,23</sup>. Engaging in online patient communities also offers health professionals a new insight into how patients experience their illnesses, treatment and care.

Radiology service managers might also consider the value of engaging with patient feedback sites such as Care Opinion ([www.careopinion.org.uk](http://www.careopinion.org.uk)) devised to facilitate open and authentic dialogue between providers and users in order to improve service quality<sup>24</sup>. Being able to demonstrate in an open online forum that a complaint or comment has been responded to, provides excellent data for quality assurance purposes too.

## Conclusion

Hawkins et al.<sup>8</sup> claim that SoMe is not merely about technology, rather it is redefining the way people communicate and we have demonstrated that patients have certainly embraced SoMe to communicate about health. In common with other authors, we have also found that health professionals may be somewhat more reticent.

However, this article has attempted to show that there are a number of clear benefits to practitioners participating in online health conversations with patients. These include improvements in service quality, leading to a better patient experience; a more educated patient population which is empowered to make decisions about their health; and a raised public awareness of the professions related to imaging and oncology. Despite local variations in policy, overall the UK NHS strategy advocates the use of SoMe in order to realise these benefits<sup>25</sup>.

Nevertheless, traditional health discourses are, quite rightly, concerned with data protection and privacy, and this stands in opposition to the sharing and open philosophy of SoMe. Practitioners are understandably concerned about becoming visible online and breaking down the traditional boundaries which have defined their conversations with patients in the past. Yet professional SoMe guidelines exist and the good practices which underpin professional face-to-face communication with patients are easily adapted to the online space. These concerns are therefore not insurmountable.



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# Framing Workforce Transformation in Today's NHS

This year is the 70th anniversary of the founding of the NHS, and ever since its creation, successive governments have introduced key reforms and yet another round of reorganisation, all promulgated on the need to equip the NHS with the best structure and processes to meet the challenges of the day. Such changes have promoted hospital mergers, the introduction of a market approach to the commissioning and provision of healthcare services, abolition of Health Authorities and in recent times, the creation of arm's length bodies, including NHS England, NHS Improvement, Public Health England, National Institute for Health and Care Excellence (NICE), The Care Quality Commission (CQC) and Health Education England (HEE).

*Government policy is not the only reason for changes in the NHS; science and the very latest technology have also driven many service changes as we have seen. These include the use of ever advancing technology to undertake more sophisticated sonography, CT and MRI scanning in our imaging and oncology services, along with new oncology treatments arising from leading edge science. The utilisation of artificial intelligence will no doubt be a major driver of change over the next few years. Other drivers, including the ever increasing demand for health and care services from an aging population and shifting patient and public expectations of the NHS, also contribute to the change agenda, along with patient use of the internet, as websites offer a wealth of health-related information to the general public. These in turn, enable patients to play a much more active role in their own consultations with health professionals. All of the aforementioned drivers illustrate the very different world the NHS finds itself in today. And the changes roll on.*

## Next Steps on the Five Year Forward View

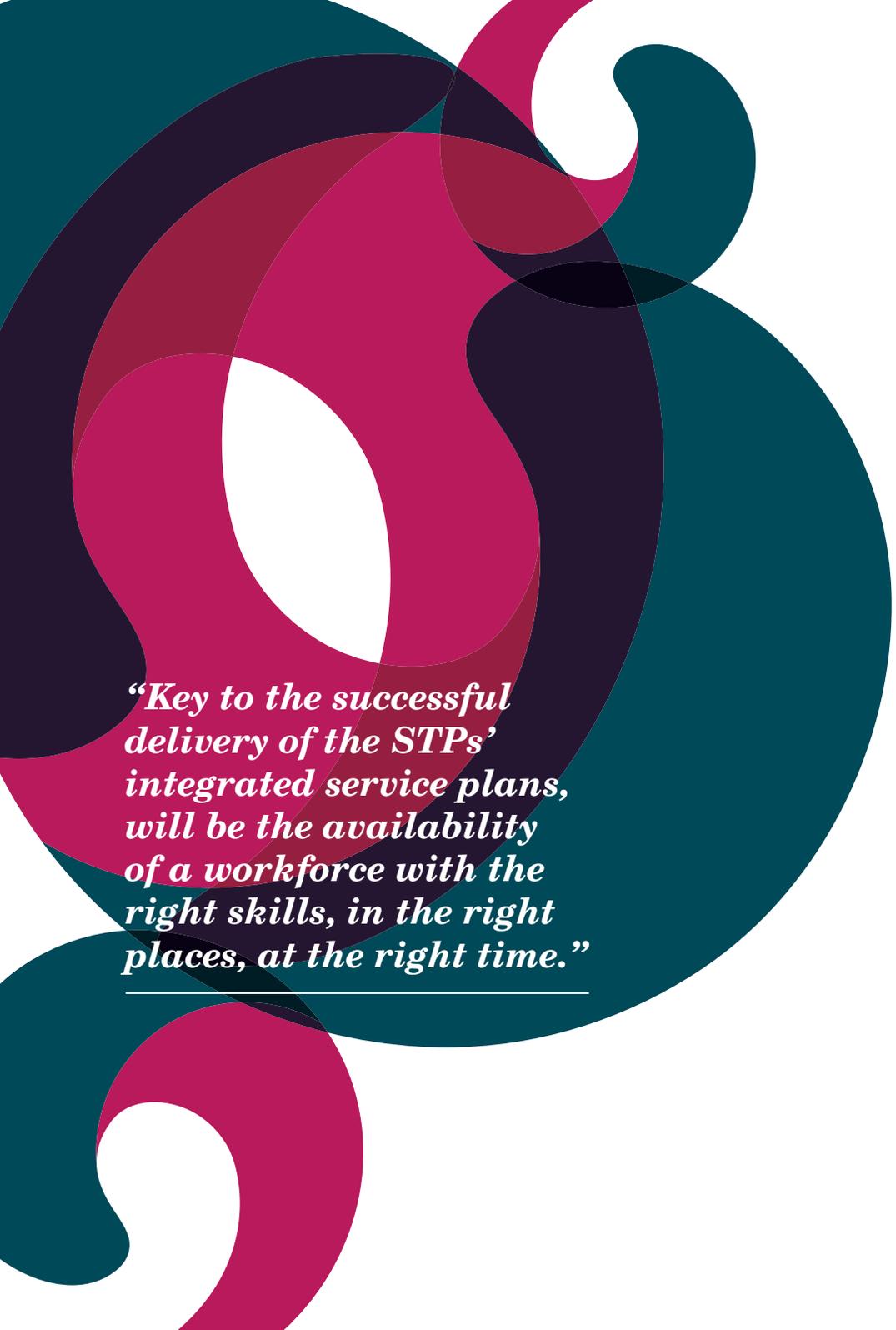
Publication of the *NHS Five Year Forward View*<sup>1</sup> in 2014, set out the challenges facing today's NHS and outlined an ambitious programme to encourage the development of new service solutions to meet these challenges, with the pump-priming of 50 vanguard initiatives across the country. In March 2017, the NHS published *Next Steps on the NHS Five Year Forward View*<sup>2</sup> which detailed the immediate service priorities for the NHS, one of which is the need to develop locally integrated care services.

The 2014 *NHS Five Year Forward View* noted: 'The traditional divide between primary care, community services and hospitals – largely unaltered since the birth of the NHS – is increasingly a barrier to the personalised and coordinated health services patients need.'

The background is a solid teal color. It features several abstract, overlapping shapes in dark teal and maroon. These shapes are curved and organic, resembling stylized swirls or droplets. Some shapes are larger and more prominent, while others are smaller and more subtle. The overall composition is dynamic and modern.

*“The traditional divide between primary care, community services and hospitals – largely unaltered since the birth of the NHS – is increasingly a barrier to the personalised and coordinated health services patients need.”*

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***“Key to the successful delivery of the STPs’ integrated service plans, will be the availability of a workforce with the right skills, in the right places, at the right time.”***

Long-term conditions are now a central task of the NHS; caring for these needs requires a partnership with patients over the long-term rather than providing single, unconnected ‘episodes’ of care. Increasingly we need to manage systems – networks of care – not just organisations. Out-of-hospital care needs to become a much larger part of what the NHS does. And services need to be integrated around the patient.’

### **Partnerships and action boards**

This requirement is to be addressed by the local development of Sustainability and Transformation Partnerships (STP) and ultimately for some parts of the country, the development of accountable care systems (ACS) which are the next stage in the evolution of STPs. Some 44 STPs have been established and these partnerships bring together GPs, hospitals, mental health services and social care, to develop sustainable and where required, transformational plans to keep local people healthier for longer, improving care, reducing health inequalities and managing the money collectively. The golden thread running through these arrangements is better integration between professions, services and sectors. Headline service delivery areas for the STPs to focus are:

1. Urgent and emergency care.
2. Primary care.
3. Cancer.
4. Maternity and children’s services.
5. Mental health.

For each of the five, the STP will be required to develop a cross-system integrated service implementation plan. Key to the successful delivery of the STP’s integrated service plans, will be the availability of a workforce with the right skills, in the right places, at the right time. In response to this workforce challenge, Health Education England (HEE) has established for each STP, a Local Workforce Action Board (LWAB) which is co-chaired by a local NHS senior executive and the local director from HEE, and whose membership is drawn from local stakeholders. The LWABs will make a vital contribution in four key areas, as part of the sustainability and transformation planning process. They will develop:

- A comprehensive baseline of the NHS and care workforce within the STP footprint and an overarching assessment of the key issues that the local labour markets face.

- A high level workforce strategy that sets out the workforce implications of the STP's ambitions in terms of workforce including type, numbers and skills, along with system leadership development requirements.
- A workforce transformation plan focused on the key priorities that need to be addressed to deliver the service ambitions set out in the STP.
- An action plan that proposes the necessary workforce investment required to support STP delivery, identifying sources of funds and key actions to be taken by stakeholders to enable its implementation

### Workforce transformation

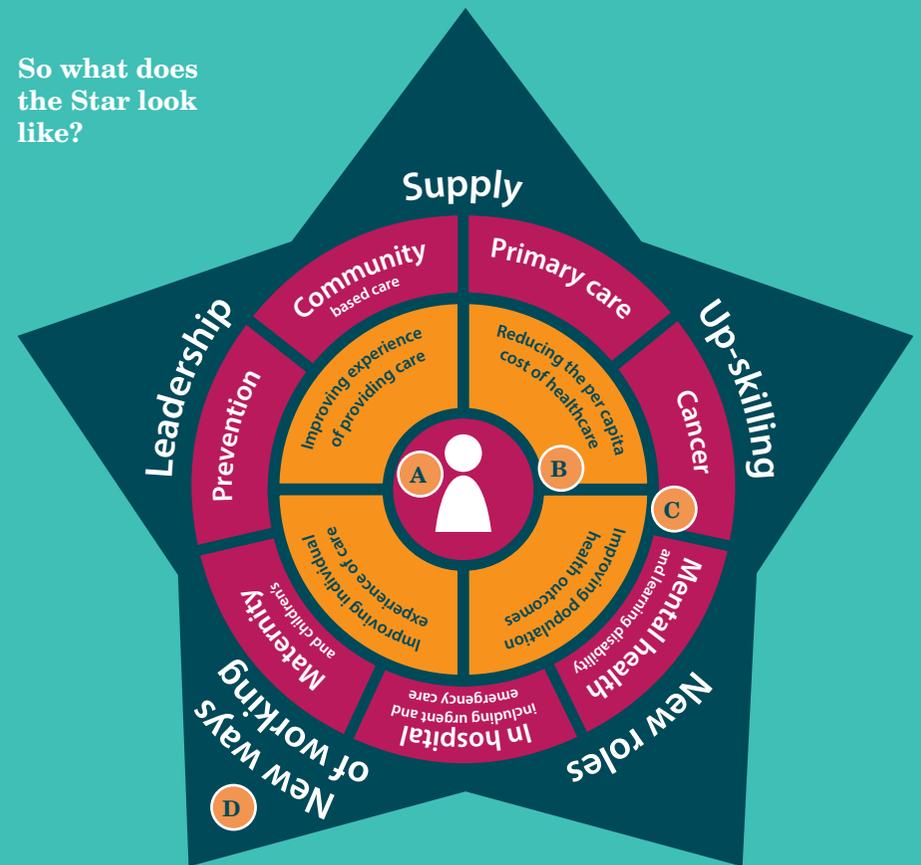
Discussions regarding the workforce implications arising from the implementation of the new STP/ACS service/care models, needs to be considered within a workforce transformation context. Workforce transformation is an activity that results in changes to the shape of the workforce, and its key drivers are financial pressures, increased demand/activity and/or a lack of supply of a key staff group.

One of the weaknesses of the NHS in recent years, has been the failure of the system to adopt successful service delivery models developed elsewhere. This slow spread of best practice has hindered the service, and HEE are keen to address this challenge. To aid local workforce transformational discussions, HEE has under development, the HEE Star (see image) that is being designed to be used on a phone, tablet and laptop, and which will address two key aspects of the workforce transformation challenge:

1. To provide a **simple, coherent framework** to facilitate and guide local conversations with provider systems, to aid better understanding of service and workforce need, which will aid the development of local workforce requirements. By focusing on the key themes contained within the five points of the Star, users will be able to identify key requirements and focus on their priorities.
2. To create a **single 'go to' directory** for providers and systems to access and explore the range of workforce transformation solutions available. Rather than start with a blank sheet of paper about what is achievable, the interactive element of the Star will enable users to access a wealth of information about schemes elsewhere in the country including tools, training materials, case studies and other interventions, realising the potential of workforce transformation investments.

In formulating their ideas and thoughts around the workforce implications of current and new service models, service managers need to consider the five key enablers of

So what does the Star look like?



- A** At the centre is the overarching goal to deliver patient-centred care, ie care that depends on the needs, circumstances and preferences of the individual receiving care.
- B** The orange segments symbolise the quadruple aim of the *NHS Five Year Forward View*. Every entry included in the tool contributes towards meeting one of four aims:
  - Improving the individual experience of care.
  - Improving the health of populations.
  - Reducing the per capita cost of healthcare.
  - Improving the experience of providing care.
- C** Content can be viewed by **clinical area**: primary care, cancer, mental health and learning disability, in hospital (including urgent and emergency care), maternity and children's, prevention, and community-based care.
- D** Content is framed around the **five key enablers of workforce transformation**, or the **domains**: supply, upskilling, new roles, new ways of working and leadership.

workforce transformation as presented on the five points of the Star, namely:

Service managers and STP leaders need to start by answering the key headline questions: what are my supply issues (and solutions); what upskilling needs do my staff have to take on such a role; what new roles could we introduce into the service delivery model; what new ways of working do we need to embrace; and what clinical/system leadership requirements must we address, so we can lead and sustain such a change? By answering these questions, the service can start to formulate plans and define their workforce requirements to meet the integrated service delivery plans requirements. By formulating such plans, they will be able to articulate their service needs in terms of workforce, and seek the support of local stakeholders within the LWAB to turn these plans into reality, so that staff can develop new skills, move into new roles and start the process of delivering services very differently from existing models.

### Successes to date

From a workforce transformational perspective, we are already seeing some of these changes up and down the country. Consider the introduction of physician associates and medical assistants, both of which are new roles in the service. Investment in advanced clinical practitioners (ACP) is climbing, and more and more are being introduced into many services, including emergency medicine, neonate services and primary care. In imaging services, we are seeing the formalisation of the ACP role with the further development of reporting radiographer posts, all of which are examples of upskilling. Assistant practitioner developments, including the introduction of 5000 nursing associate roles, are further examples of upskilling responses. Supply challenges are being met by an increased focus on retention strategies by NHS Improvement and alternative routes to professional awards, with the introduction of apprenticeship routes to qualification, following the introduction by government of the apprenticeship levy. Additionally, in the case of sonography services, direct entry routes to qualification are under active consideration.

### Current work in Yorkshire & Humber

Addressing workforce supply challenges is not always about supporting more trainees in ever increasing numbers. We also need to focus on the current workforce already working within the NHS. In Yorkshire, this need is recognised and the three Yorkshire & Humber LWABs, have identified ten key principles to shape their emerging approaches to workforce.

These principles will enable the LWAB to determine who is responsible for what



## The Five Key Enablers of Workforce Transformation

### SUPPLY

Identifying current and future workforce availability in terms of skills, capabilities and numbers, in order to identify the appropriate workforce interventions.

### UPSKILLING

To improve the aptitude for work of (a person) by additional training\* the aim of which is to create:

- A competent workforce working to its maximum potential.
- An agile workforce that may be flexibly deployed.
- A capable workforce with future-facing knowledge and skills.

\*Collins English Dictionary, 2014

### NEW ROLES

Health and care roles designed to meet a defined workforce requirement, warranting a new job title; the likely ingredients including additionality to the workforce, a formal education and training requirement (whether that be vocational or academic), an agreed scope within the established Career Framework, and national recognition (although not necessarily regulatory) by clinical governing bodies.

### NEW WAYS OF WORKING

Emphasis on developing an integrated workforce culture that empowers it to break through system barriers to deliver a practical response, resonating with STP needs, to person-centred care.

### LEADERSHIP

The support of individuals, organisations and systems in their leadership development – ranging from individual behaviours and skills, to organisational development of systems through partnerships.

### Develop the Current STP Workforce – Retention

Summary of Recommendation	STP/ACS Actions	Place-Based Actions	Organisation	Proposed Lead Group(s)
1.1 Given the challenges of workforce supply, greater attention to retaining (Retention) existing staff is critical. Recruiting new staff is difficult but is also costly and leaves gaps in service. Staff turnover results in lost experience, skills and organisationally effective staff.	Develop an overarching recruitment and retention strategy which promotes the STP area as a ‘great place to work’ and, which supports employers and ‘places’ to recruit and retain staff.	Support planned career moves between organisations and sectors to develop careers, skills and knowledge, and encourage cross-sector working. Promote good employment practice.	Good employment practice to aid retention, promote benefits such as flexible working, staff engagement, career advancement, training and health and wellbeing initiatives to ‘look after’ staff.	HRD Management Group (Provider Trusts)/Primary Care Workforce Group.

in terms of meeting the workforce requirements within the STP; after all not everything can be laid at the door of the LWAB. The ten principles which are still under development are:

1. Develop the current STP workforce – retention.
2. Develop the current STP workforce – skills.
3. Increase future supply to STP – including new roles.
4. Increase future supply to STP – increasing HEI places.
5. Develop the STP workplace – flexible employment models.
6. Develop the STP workplace – good employment practice.
7. Develop the STP workplace – efficiency and productivity.
8. Build workforce infrastructure and investment decision making for STP – system leadership and governance.
9. Build workforce infrastructure and investment decision making for STP – workforce planning and management intelligence.
10. Build workforce infrastructure and investment decision making for STP – investment decision making.

For each of these headline principles, local discussions are being held to consider the key actions which need to be addressed from the following three perspectives:

- a) STP/ACS actions;
- b) place-based actions; and
- c) organisation actions.

And who will lead and be responsible for taking key work forward? For example, with regard to principle one – retention.

In considering these service changes and workforce implications, it is important that consideration is given to what it means for:

- a) The organisation – to deliver on the new service models and ways of working.
- b) The place – this could be the city or town within which the service provider is located; so how will we work with other providers within the immediate area?
- c) The system and by this we mean the ACS. What needs to be developed and delivered across the geography at a system wide level to enable the integrated service model to happen? This could be for example, collaboration on pay rates

and the sharing of work based educational resources. By completing the same assessment for all ten principles at STP place and organisational levels, a complete programme of action can be developed, which will underpin the workforce requirements of the STP and, more importantly, the connectivity between each set of actions can be determined and monitored by the LWAB.

So what does all this mean for NHS staff? Firstly, I believe they need to be aware of the intended changes in the local healthcare system that are being led by the STP, seek out information on the emerging new service delivery models and find out how these are to be progressed. Secondly, they need to embrace and recognise the need for these changes, which will be developed with the patient very much at the centre of all plans, and actively seek out opportunities to be part of the STP clinical workstreams where appropriate. Thirdly, support constructive involvement in the STP, ensuring that they or their service representatives are actively engaged in shaping new service delivery models, share new ideas and research new opportunities for service integration within each of the STP clinical workstreams. The STP/ACS plans require direct clinical involvement if they are to succeed. Finding the time to engage in such discussions with all the day-to-day service challenges will not be easy, but a way forward must be found to enable local health professionals to seize the workforce transformation opportunities ahead, and for them to co-design with other health professionals the redesign of local health services around the needs of patients.

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# The Changing Landscape of the Imaging & Oncology Workforce

## An employer's perspective on the advent of apprenticeships in radiography.

### The current service landscape

The imaging and oncology service landscape is increasingly complex and diverse. We face challenging waiting-time targets, service delivery protocols have become extremely sophisticated, and there is a trend of increasing demand. Workforce planning both nationally and locally is problematic, with a severe shortage of trainees and an unsustainable workforce model. Current training strategies are not coping.

Striving for a high-quality service, we should combine compassionate delivery with procedural correctness ('ensuring that the right people, with the right skills are in the right place at the right time with the right equipment, and knowing what is expected of them'). Often, we are hampered by spiralling service needs and the inability of the system to provide sufficient trained staff (particularly at entry- and junior-level).

Operationally, the imperative in a shortfall environment is to maintain service delivery. It is natural to concentrate on performance metrics, but this is often at the expense of service improvement, research and sharing of best practice. Heads of service constantly battle to balance delivery demands against quality requirements.

Most patient pathways interact with diagnostic imaging at some point and because we have a single workforce for both cancer and non-cancer services, the impact of any shortfall is system-wide in diagnostics. There is increasing reliability on outsourcing, waiting-list initiatives and agency locums.

The recent Cancer Research UK *Full Team Ahead* publication noted the adverse effects on the oncological workforce as 'a barrier to providing efficient cancer treatments and excellent patient experience'<sup>1</sup> in a postal survey of the wider cancer workforce.

There is now recognition within the Department of Health (DoH) and Health Education England (HEE) that the system is in need of significant recalibration, evidenced by the recent publication of the first phase of the *Cancer Workforce Plan*<sup>2</sup> with a second phase anticipated later this year. Phase one describes a portfolio of measures to increase numbers of the cancer workforce, including diagnostic and therapeutic radiographers, as well as sonographers, and to further enhance the skill-mix, with the introduction of additional advanced practice radiographers. The ultimate aim is to achieve a workforce sufficient to deliver a sustainable high-quality imaging and oncology service.

### Factors driving the workforce shortfall

There are many diverse drivers for change in the workforce-planning domain, and each one demands greater activity, higher staff numbers and more complex training. To name but a few:

- Technological innovations within the imaging and radiotherapy modalities.
- Emergent modalities (such as proton beam therapy).
- Changes in clinical practice and guidelines.
- Activity requirements for increased breast-screening age range and population size.
- Further integration of imaging into radiotherapy (eg the use of MRI).
- Political policy driving change for reduction in cancer waiting time targets and diagnostics of the *Five Year Forward View 2014*<sup>3</sup> and the *Five Year Forward View Next Steps 2017*<sup>2</sup>.
- Spiralling increases in multi-disciplinary team (MDT) and MDT preparation requirements.
- Requirements of the 24/7 and seven-day service delivery models.

*“73% of survey respondents in the cancer workforce identified staff shortages as a barrier to providing efficient cancer treatments and excellent patient experience<sup>1</sup>.”*

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There are other factors that are specifically workforce-related, such as:

- Undergraduate commissioning in the past was linked neither to service development nor to commissioning intentions; of concern is that the new agreements between educators and practice-placement providers are still not part of a national focus.
- Reduction in real-term funding, along with increased activity.
- Reduced job-satisfaction, often expressed as less available ‘time to care’.
- Dissatisfaction with work/life balance due to the pace of the job.
- An ageing workforce.
- Difficulty in accessing funds or study-leave for training.
- Dissatisfaction with pay.
- Removal of pre-registration student bursaries and tuition fee introduction (thus reducing mature entrants).
- Attrition in pre-registration, particularly in radiotherapy student numbers;
- Retention issues: ‘28% of diagnostic radiographers are expected to leave for non-retirement reasons’<sup>2</sup>.
- An expanding private sector not being factored into the commissioning numbers.
- The fact that radiographers have a transferable skillset and are educated to science degree level, and that the workforce is effectively mobile into other professions as a result.
- Practice-placement availability for training.

Other significant driving factors:

**Career progression.** The introduction of the ‘4 Tier Structure’ model within radiography has allowed the inclusion of assistant practitioners to supplement the imaging workforce, both for radiographic and technician staff. This has served to bolster workforce numbers in the short-term, but it doesn’t provide for funded transition from assistant practitioner (AP) to qualified radiographer; as a result there is stasis and dissatisfaction at assistant practitioner grade, particularly so within mammography.

**Diversification.** The radiography profession is diversifying and expanding. As radiographers move into advanced practice and consultant roles, this leaves a widening gap at the practitioner bandings, resulting in increased vacancies due to lack of available workforce for backfill.

### **What solutions are under development?**

The gap between political policy and workforce planning has been recognised within The Cancer Workforce Plan<sup>2</sup>. It is clear that the workforce commissioning system will need to undergo radical change and that there should be a link to policy and commissioning intent.

Whilst there is no silver bullet, a range of measures are in progress, including 'return to practice' initiatives and the intention to improve retention. The Cancer Workforce Plan notes that failure to act will not deliver the diagnostic radiography numbers that are required by 2021<sup>2</sup>.

HEE plans to increase the numbers of training places for radiologists, advanced practice radiographers and sonographers, through increased commissioning of training numbers, and by growing the Radiology Academy model to facilitate this ambition.

### **The direct entry model and modality practitioners**

Other HEE initiatives include a proposal for the recognition of sonography as a registered profession, combined with its own direct entry routes and a formalised career structure; this is currently out to consultation. 'Establishing sonography as a separate profession with its own independent supply line so as not to recruit from the existing radiography workforce, should help to increase capacity in the medium- to long-term'<sup>2</sup>. This is intended to reduce losses into sonography from the diagnostic workforce via the traditional route. Question: Could this model with non-ionising radiation modalities also be applied to MRI? Question: We already have assistant practitioners trained across the modalities, so could apprenticeship be the vehicle to formalise this?

The current mammographic workforce model may also lend itself to a skills development model. Whilst this might be welcome from an employer's perspective, in workforce availability terms, it might serve to reduce the numbers going into radiography at undergraduate level or indeed be perceived by the workforce as career limiting.

We should encourage open debate to explore fully the potential outcomes. By improving direct entry to the broader imaging modalities, do we risk fragmentation of the profession and dilution of the traditional diagnostic imaging discipline? Might this also happen for radiotherapy as its own modalities develop?

**Funding the training-capacity gap.** A financially constrained training budget is problematic for the non-medical workforce. Apprenticeships may provide some answers, especially for post-registration training.

### **Apprenticeships: Where are we now?**

Apprenticeship is a training system that allows the learning of set skills within a paid role. That learning is usually to a set standard designed by the employer; ideally, it should be universally recognised and portable across employers. An apprenticeship post must carry a 30-hour week paid employment requirement, with 20% 'off the job' training time, and the promise of a substantive post at the end of the training period.

Employers will need to measure each apprentice's progress and in all likelihood, will have to integrate this monitoring into their existing processes. Some employers are acting as Trailblazers to develop the apprenticeship standards, although ultimately these will need to be accepted by the institute, as well as by professional bodies and The Health and Care Professions Council (HCPC). This is a challenging prospect; there are still many unknowns, and timeframes are short. It should be noted that today's student radiographer is not an employee, but the employer will fund tomorrow's apprentice.

The apprentice levy could provide a funding boost for post-registration training, and this could be a significant and welcome improvement on the current position. Equally, for pre-registration training, it could provide an upskilling route from assistant practitioner to qualified radiographer, closing the aforementioned gap in workforce progression at the AP level.

The removal of radiography degree funding and bursaries has reduced the numbers of mature students. Paid apprenticeships, however, have the potential to attract mature students, potentially increasing the recruitment pool and widening access to the profession. Generally, mature students are likely to come from, and be settled in, the local population, and hence are more likely to stay within the locality when offered the opportunity to fill a post at the end of training. The positive benefits for long-term retention are clear.

Apprenticeships are a hot topic at the moment, but the fundamental concern is development of the necessary standards and access to funding.



From there, we must further develop the detailed infrastructure and protocols that will be required by this new system.

### What do we know in respect of the non-medical workforce?

The Institute for Apprenticeships is the governing body. It manages the process of identifying, ratifying and developing new standards<sup>5</sup>.

Currently, within radiography and its associated disciplines, only a few relevant apprenticeship standards have been agreed, as shown in the table below<sup>5</sup>. The number of standards under development is increasing. By the time this article is published, the list below may probably be out of date.

Standard	Status
Healthcare support worker (Level 2)	Complete and ready for use.
Mammography assistant (associate) practitioner (Level 3)	In development. Currently out for consultation
Healthcare assistant practitioner (Level 5)	Complete and ready for use.
Radiographer (diagnostic Level 6 degree)	Recently agreed for development.
Radiographer (therapeutic Level 6 degree)	Recently agreed for development.
Sonographer (Level 6 degree)	Not yet ready.
Degree apprenticeship standard advanced clinical practitioner (Level 7)	Not yet ready. Available to review.

It should be noted that there are no generic standards. A standard has to relate to a specific occupation, thus for example a mature standard (eg the assistant practitioner) cannot be used as a basis for developing a new standard (eg the advanced clinical practitioner). It is not a quick process and there is much to be done. There will undoubtedly be a mismatch (if only initially) between employers' needs and the ability of the system to deliver.

It is possible that apprentice-levy funding could fund training for assistant practitioners to complete a radiography degree – a potentially attractive proposition. This might equally be possible for direct entry to modality-specific training routes. Question: Should standards be developed for other modalities also (as is currently being done with ultrasound)?

### What don't we know?

Will the political climate change? Apprenticeship is a politically driven system. The

required quotas are due to be in place by 2020<sup>6</sup> and the imperative could change once these are achieved – or perhaps sooner if there is a change in government.

Can employers find the funding? The Cancer Plan<sup>2</sup> notes that 'widening access to radiography through apprenticeships will help overcome barriers to accessing training (removal of bursaries/paying tuition fees)'. Question: Can employers afford to provide training for a paid, but partially supernumerary, workforce? Traditionally, employers have not funded undergraduate training and so future affordability will be an issue.

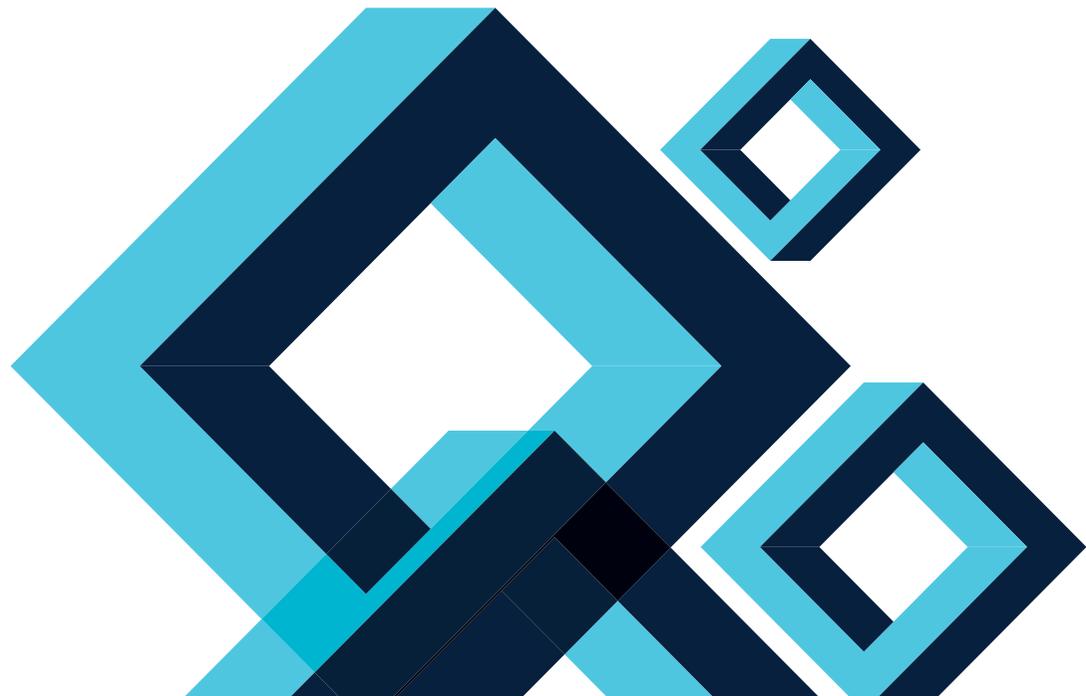
Who will undertake the work-based education? How will the quality of this education be assured?

Will there be sufficient practice-placement opportunities? A widening of access routes and student/apprentice training numbers will require more

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***“Today’s student radiographer is not an employee, but the employer will fund tomorrow’s.”***

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practice placement opportunities. Question: Will training places be available in the required numbers or will practice-placement capacity become the rate-limiting factor? There is a move for some parts of the independent sector to take part in practice placement training for undergraduates; will this become more widespread, and will they commission?

### **Is there potential for discord?**

There may be potential for discord between pre-registrant trainees, between those who pay and those who are paid to train. Question: Why would a potential student pay for the traditional undergraduate entry route when they could instead join an apprenticeship scheme? Question: How will apprentices reconcile the study requirements of a degree level course with the demands of a day-to-day job?

### **Conclusion**

Things are changing: there will inevitably be a widening of entry routes into the profession.

There will be the possibility of a 'skills escalator' whereby assistants could train to become assistant practitioners via the higher apprentice route, and then into radiography via the degree apprentice route. The provision of apprentice funding would enable training at advanced practitioner or Master's degree level. Perhaps this is the ultimate solution, whereby we could see a clear allied health professions career framework, supported all the way from assistant to consultant practitioner using the apprenticeship route?

The probability of modality specific, direct entry, provides a solution to the lack of workforce; however, it also potentially opens the door to fragmentation of the profession through diversification.

The apprentice route also provides the opportunity for the emergence of a 'new breed' of radiographer, a 'dual-qualified imaging specialist' who could work across diagnostics and therapy to provide the specific skillsets required for new technological advances.

In employers' terms, there will be a paradigm shift in the financial requirements if we employ trainees up to and including entry level. There will be a requirement to provide the necessary monitoring, mentoring, pastoral and administration requirements of a new workforce cohort. It may be that we see a portfolio approach from employers, whereby they just train who they need (or can afford), irrespective of any future formal commissioning process; a challenging proposition. However, such an approach may well prove attractive when compared to the costs associated with international recruitment, outsourcing and waiting

list initiatives, not to mention the reputational damage associated with missed targets and cancer waiting times.

Serious problems call for radical solutions. The apprenticeship levy and direct modality entry routes are certainly challenging in terms of concept, design and delivery. However, it is clear that to succeed we must seize the opportunity, whilst we have the attention of DoH and HEE, to act in concert as a community of employers, educators, professional bodies, regulators and commissioners.

Whatever the professional landscape may become, our imperative is to ensure that patient-centred care is at the start, middle and end of the change process. We should focus our attention on delivering this.

One final question remains: while we might be rightly wary of the unknowns concerning apprenticeship, can we really afford not to embrace the concept?

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# The Ionising Radiation (Medical Exposure) Regulations 2017 – Issues in Compliance

The Ionising Radiation (Medical Exposure) Regulations 2017 (IR(ME)R 2017) will have come into force on the 6 February 2018. Essentially, they are transposing the European Council Directive 2013/59/Euratom (Medical Exposures) but of course in UK law, they are an update of the Ionising Radiation (Medical Exposure) Regulations 2000 (IR(ME)R 2000). In consequence, there is much in the legislation that will stay the same but there is some important amending of, and additions to, these regulations. This article will look at some particular areas where there will be more significant changes within the legislation which may well increase the regulatory burden and accountability of an employer, and other duty holders operating under these regulations, and questions on how compliance may be achieved.

## Accidental or unintended doses

Radiation protection in the form of the control of exposures to patients is the primary purpose of the IR(ME)R regulations, and Schedule 1 (Employers Procedures) of Regulation 4 of IR(ME)R 2000 required that any written procedures for medical exposures would have to include ‘procedures to ensure that the probability and magnitude of accidental or unintended doses to patients from radiological practices are reduced so far as reasonably practicable’<sup>1</sup>.

Where a patient was suspected of receiving a dose much greater than intended the ‘employer’, in compliance with Regulation 4 of IR(ME)R 2000<sup>5</sup>, was required to ‘make an immediate preliminary investigation of the incident and, unless that investigation shows beyond a reasonable doubt that no such overexposure has occurred, he shall forthwith notify the appropriate authority and make or arrange for a detailed investigation of the circumstances of the exposure and an assessment of the dose received’<sup>1</sup>.

Because of this, there has been a requirement under these regulations to report doses deemed to be greater than intended to our independent regulator for the quality and safety of care – the Care Quality Commission (CQC).

In IR(ME)R 2017, ‘accidental or unintended exposure’ gets its own regulation (Employers Duties Regulation 8). In this new regulation, the requirements relating to such exposures are expanded in that:

- i) The employer’s procedures must provide that the referrer, the practitioner, and the patient or their representative, are informed of the occurrence of any relevant clinically significant unintended or accidental exposure and of the outcome of the analysis of this exposure (Regulation 8<sup>1</sup>).

## *“Who will regulate the regulator?”*

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- ii) The employer’s quality assurance programme must, in respect of radiotherapeutic practices, include a study of the risk of accidental or unintended exposures. (Regulation 8<sup>2</sup>).
- iii) The employer must establish a system for recording analyses of events involving or potentially involving, accidental or unintended exposures proportionate to the radiological risk posed by the practice (Regulation 8<sup>3</sup>).

There is obviously still a requirement to inform the CQC about the outcome of an investigation (and any corrective measures undertaken) but this now will have to be carried out within a time period which will be specified by the CQC.

Interestingly, it is indicated that IR(ME)R 2017 will also place regulatory responsibilities in this area on the CQC, as Regulation 9 will place a duty on them to ‘put in place mechanisms enabling the timely dissemination of information, relevant to radiation protection in respect of medical exposures, regarding lessons learned from significant events’<sup>2</sup>.

So, who will regulate the regulator?

### **Licensing the administration of radioactive substances**

IR(ME)R 2017 has not only replaced IR(ME)R 2000, it has also replaced The Medicines (Administration of Radioactive Substances) Regulations 1978 – the so-called MARS regulations<sup>3</sup> – and Regulation 5 of IR(ME)R 2017 requires both an ‘employer’ (in respect of each medical installation) and ‘practitioners’ (in order to justify ..... an exposure involving the administration of radioactive substances’) to hold ‘licences’ for the administration of radioactive substances for diagnosis, treatment or research<sup>2</sup>.

In consequence, a new licensing system operating under the 2017 IR(ME)R regulations, will be replacing the current certification scheme operated under the MARS regulations. The Administration of Radioactive Substances Advisory Committee (ARSAC) currently issues approvals under their certification process<sup>4</sup>, and while Regulation 4 of IR(ME)R 2017 indicates that there will be a licensing authority (defined in the regulations as either The Secretary of State, Scottish Ministers or Welsh Ministers), ARSAC would appear to be continuing in this role and – as at the writing of this article at the beginning of January 2018 –





has indicated that ‘application forms for licences under IR(ME)R will be available in due course’<sup>4</sup>. The licences will define the range of purposes for the administration of radioactive substances, and under Regulation 4<sup>1</sup> both employers and practitioners will be required to pay a fee to obtain a licence.

ARSAC has indicated that a practitioner will only require one licence, irrespective of the number of employers they may work for (those employers however, must also have a licence before any procedures involving the administration of radioactive substances can take place on their site) and that the practitioner’s license will reflect their relevant training and experience<sup>4</sup>.

So how much will a licence cost? Will the fee be different for an employer or a practitioner? Will the practitioners themselves be expected to pay for their licence? If so, will they want to?

At least there will be a certain amount of time to get the answers to these questions as ‘any current ARSAC certificates due to expire after the new regulations come into force will remain valid and be considered as equal to a licence for both the practitioner and the employer until the expiry date’<sup>4</sup>.

### **Comforters and carers/carers and comforters**

Under the Ionising Radiations Regulations 1999 (IRR99) a ‘comforter and carer’ was defined as ‘an individual who (other than as part of his occupation) knowingly and willingly incurs an exposure to ionising radiation, resulting from the support and comfort of another person who is undergoing or who has undergone any medical exposure’<sup>5</sup>. However, responsibility for this group (termed in IR(ME)R as a ‘carer and comforter’) will now be taken under the auspices of the IR(ME)R 2017 (Regulation 3(d)) where the definition of ‘medical exposure’ in the regulations is indicated as being: ‘exposure incurred by patients or asymptomatic individuals, as part of their own medical or dental diagnosis or treatment, and intended to benefit their health, as well as exposure incurred by carers and comforters and by volunteers in medical or biomedical research’<sup>2</sup>.

For this group the employer under IR(ME)R 2017 must now:

- a) Establish ‘dose constraints’ with regard to the protection of carers and comforters (Regulation 6<sup>5</sup> (d)<sup>2</sup>).
- b) In consideration of the justification of exposures, where appropriate, have regard where there is to be an exposure to a comforter or carer, such an exposure would show a sufficient net benefit, taking into account (i) the likely direct health benefits to a patient; (ii) the possible benefits to the carer or comforter; and (iii)

the detriment that the exposure might cause (Regulation 11<sup>3</sup>(b)). and c) In consideration of the 'optimisation' of exposures, 'the employer's procedures must provide that appropriate guidance is established for the exposure of carers and comforters' (Regulation 12<sup>5</sup>)<sup>2</sup>.

It would seem therefore, that the role of the operator will be particularly important in ensuring adherence to the appropriate guidance, and it is not unlikely that this guidance (with associated consent forms to be signed by the carer or comforter?) will already exist in medical exposures situations.

But what are the dose constraints? Who will justify the exposure of the carer or comforter?

### Quality assurance

In Regulation 6 of IR(ME)R 2017, it is part of an employer's responsibilities to establish quality assurance control programmes, and the legislation defines quality assurance as 'all those planned and systematic actions necessary to provide adequate assurance that a structure, system, component or procedure will perform satisfactorily in compliance with agreed standards. Quality control is a part of quality assurance'. Quality control is defined as the set of operations (programming, coordinating, implementing) intended to maintain or to improve quality. It includes monitoring, evaluation and maintenance at required levels of all characteristics of performance of equipment that can be defined, measured, and controlled. Reference to quality assurance can also be found in Regulations 8, 12, 14 and 15 – and in Schedules 1, 2, 3 and 4<sup>2</sup>.

In December 2017, the Department of Health 'Response to the Consultation on the draft Ionising Radiation (Medical Exposure) Regulations 2017' stated that 'IR(ME)R 2017 offers an opportunity to include in one set of regulations requirements relating to medical exposure (rather than occupational or public exposure) associated with medical radiological equipment, including inventories, surveillance and quality assurance programmes'. A large majority of respondents (87.8%) agreed with the inclusion of quality assurance programmes for equipment when used in medical exposures, commenting that 'this fits more 'naturally' under IR(ME)R 2017, and is more suitably aligned with the MPE role' and that 'it will simplify roles and responsibilities'<sup>6</sup>.

I note that in comments from stakeholders, with regard to quality assurance programmes related to equipment testing, that while most 'seemed positive about the inclusion of this requirement in IR(ME)R 2017' some 'focused on resource strain and a lack of expertise among inspectors for QA of equipment'.

The Department of Health comment to this was that further to these comments, 'discussions with regulators in England have indicated that they would not expect this change to significantly add to the burden of their current work' as apparently 'Public Health England (PHE) has a pool of expertise which would be made available to inspectorates across the devolved administration which would mitigate the issue of capability'<sup>6</sup>.

Presumably, this will be undertaken by radiation protection advisers (RPAs)/ medical physics experts (MPEs)/radioactive waste advisers (RWAs) from the PHE Centre for Radiation Chemical and Environmental Hazards, so this does appear to suggest that Public Health England will be part of the regulatory assessment by the regulatory body.

Is this not a conflict of interest when they are also currently acting as appointed RPA/MPE/RWAs to those very same medical institutions they will be assessing with the regulators (for example in dentistry)? Does this finally negate the claim the PHE is not a state department?

### Non-medical imaging

The term 'non-medical imaging exposures' in IR(ME)R 2017, (defined as 'any deliberate exposure of humans for imaging purposes, where the primary intention of the exposure is not to bring a health benefit to the individual being exposed'<sup>2</sup>) has replaced the term 'medico-legal procedure' (defined as 'a procedure performed for insurance or legal purposes without a medical indication') used in IR(ME)R 2000<sup>1</sup>.

Schedule 2 of IR(ME)R 2017 'Employer's Procedures' furthermore requires that the 'employer's written procedures for exposures must include procedures ..... to be observed in the case of non-medical imaging exposures'<sup>2</sup>.

It appears to be accepted across the medical community that the inclusion of the non-medical imaging exposures concept when using medical radiological equipment was appropriate. However, the regulations give no indication of exactly what areas constitute this type of exposure and whether a number of the regulations in IR(ME)R 2017 applied to non-medical, as well as medical exposures<sup>6</sup>. To take a specific medical area as an example, Professor Keith Horner's analysis of how the draft IR(ME)R 2017 will affect dentists and dental practice teams (he is the Co-Editor of the Faculty of General Dental Practice's (FGDP UK) *Selection Criteria for Dental Radiography* publication) includes the following comments:

'An example in the dental context might be radiological imaging for the purpose of preparing legal reports. Another example is the use of dental radiographs for age assessment for population groups, such as refugees and asylum seekers'<sup>7</sup>.

But there are professional body checks and balances in place, and in regard to the age assessment comment he does state that: ‘This practice goes against FGDP (UK)’s radiography guidelines and has been condemned as unethical by the British Dental Association and Royal Colleges in the UK’. Disconcertingly however, he also concludes that: ‘Many dentists may not be indemnified for this procedure, which may nonetheless still be happening in the UK at the request of public authorities’<sup>7</sup>.

He does however also conclude (perhaps ‘tongue in cheek’?) that because there will be a requirement for employers to have these procedures in place; This means a bit more paperwork, and therefore gives another reason for GDPs not to perform such exposures in the first place<sup>7</sup>.

So, what does constitute a non-medical exposure? Are they ‘medico-legal’, research, asymptomatic exposures? Do they only apply to ‘living’ humans? And how will a practitioner be able to justify a ‘net benefit’ which is not related to the health of an individual<sup>6</sup>?

More guidance please?

### Medical physics expert

When the Ionising Radiation (Medical Exposure) Regulations 2000 (IR(ME)R 2000) came into force on the 1 June 2000, they defined the medical physics expert (MPE) as ‘a person who holds a science degree or its equivalent and who is experienced in the application of physics to the diagnostic and therapeutic uses of ionising radiation’<sup>1</sup>.

This essentially meant that there was no formal certification or qualification for the MPE role. In consequence, the Institute of Physics and Engineering in Medicine (IPEM) proffered a further definition of the MPE in their 2002 guidance notes, as a state registered clinical scientist with corporate membership of IPEM (MIPEM) or equivalent and six years of appropriate experience in the clinical speciality, and expanded this definition in paragraphs 2.41 to 2.44 and Appendix 5<sup>8</sup>. In practice a radiation protection adviser (RPA) – a role that had been formally certificated since the coming into force of the IRR99 – would most likely also act in the role of a MPE as well. However, there were significant issues in relation to this definition, particularly within the ‘independent’ radiation protection sector where there were RPAs acting as MPEs who were not state registered clinical scientists or MIPEM, but who were as equally (or more) qualified than those who were.

IR(ME)R 2017 now defines a MPE as an individual or a group of individuals, having the knowledge, training and experience to act or give advice on matters relating to radiation physics applied to exposure, whose competence in this respect is recognised by the Secretary of State<sup>2</sup>; now the competence of the MPE will need to be recognised through a formal training and/or certification route.

IR(ME)R 2017 now requires that a MPE must ‘meet such criteria of competence as may from time-to-time be specified in guidance issued by the Secretary of State’. Additionally, MPE responsibilities under IR(ME)R 2017 Regulation 14, also include the requirement to ‘be closely involved in every radiotherapeutic practice other than standardised therapeutic nuclear medicine practices; be involved in practices including standardised therapeutic nuclear medicine practices, diagnostic nuclear medicine practices and high dose interventional radiology and high dose computed tomography; be involved as appropriate for consultation on optimisation, including patient dosimetry and quality assurance, and to give advice on matters relating to radiation protection concerning exposures, as required, in all other radiological practices; and contribute to the matters specified in Schedule 3 (for example be involved in the optimisation of the radiation protection of patients and other individuals subject to exposures, including the application and use of diagnostic reference levels; the definition and performance of quality assurance of the equipment and the acceptance testing of equipment)’<sup>27</sup>.

A MPE may however, advise in completely exclusive specialist areas – essentially diagnostic imaging, radiotherapy, or nuclear medicine – or in overlapping modalities, such as positron emission tomography/computed tomography (PET/CT), and in consequence, there have been several discussions between stakeholders as to how this competence will be assessed.

In consequence, the group RPA2000 (currently the assessors of the competence of RPAs and RWAs) were firstly tasked to compile ‘a list of individuals who have been authorised to act as a MPE by an employer in the UK under IR(ME)R (2000)’<sup>9</sup> – which will be displayed on the RPA2000 website – and then be involved in the development of the criteria for the assessment and certification of MPEs. Applications for this list closed on the 31 December 2017 and it appears that there will now be a ‘grandfather rights’ period, during which those on the list will be tasked to provide a portfolio of evidence to confirm their competence in their area/s of MPE expertise.

But who will assess their initial portfolios? After what period of time will they be required to renew that certification? How will they re-certificate? Will a MPE be accountable for the advice they give?

### Conclusion

An update of a piece of legislation that has lasted 17 years has (perhaps not surprisingly) left relevant stakeholders with a substantial number of questions in many areas regarding its scope and interpretation. Guidance will, therefore, be essential from the relevant professions Society and College of Radiographers

(SCoR), British Institute of Radiology (BIR) and IPEM for example) for those who will be tasked with the practical implementation of the regulations – employers and duty holders, MPEs, and yes, the regulatory bodies as well. After all, is it not as important to ensure the safety of patients in the area of radiation protection, just as much as in any other area of medicine?

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***“It is indicated that IR(ME)R 2017 will also place regulatory responsibilities in this area on the CQC.”***

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# Understanding the UK Non-Surgical Cancer Treatments Workforce

More than 360,000 people in the UK are diagnosed with cancer each year<sup>1</sup>. By 2022, it is projected that this figure will reach 422,000 people<sup>2,3</sup>.

*Early diagnosis followed by access to the best, evidence-based treatments, is critical to ensure more people survive their cancer. As we strive towards earlier diagnosis of cancer, treatments will change. Increasingly, treatments are tailored to an individual's cancer; combinations of treatment types are being used to target cancers differently and there are more treatment options than ever before.*

As such, ensuring better access to treatments is rightly a priority in the cancer strategies for England<sup>4</sup>, Scotland<sup>5</sup>, and Wales<sup>6</sup>. Northern Ireland does not have an up-to-date cancer strategy at the point of publishing this report. Having the right staff with the right skills, is fundamental to ensuring treatment can be provided to meet the needs of patients.

We knew at the start of the research, that data on staffing levels are limited across the UK. The lack of data makes it difficult for health bodies to make well-informed decisions about workforce planning. For example, in England, healthcare providers report staffing requirements based on projected budgets, rather than what is needed to deliver best practice care to patients<sup>7,8</sup>. This means that workforce levels do not reflect need, but instead reflect budget available.

## Our approach

Cancer Research UK (CRUK) commissioned this research study to investigate the current and future needs, capacity, and skills of the non-surgical cancer treatments

workforce. Our research included the workforce providing systemic anti-cancer therapy (such as chemotherapy and immunotherapy); hormone therapy; stem cell therapy; and radiotherapy. Surgical services for cancer have been explored in a previous report<sup>9</sup>.

Our study combined analysis of available workforce data; a survey of the workforce across the UK (with more than 2500 responses); in-depth interviews with workforce staff; and expert advice from health professionals. We also consulted people affected by cancer throughout the report, to ensure that the views of those being treated were represented.

We developed a 'best practice treatment model' (see Figure 1). This model was developed through extensive clinical consultation to understand how patients should ideally be treated, and the workforce needed to do that. This gives us a picture of actual patient need in cancer services, highlighting the difference between the modest vacancy rates, and the widely reported pressures and worsening performance in UK cancer services.

The 'best practice treatment model' consists of four key steps:

1. Calculating case load (ie the number of patients undergoing relevant treatment or follow-up regimes) using incidence figures by cancer site and incidence by stage data.
2. Defining the steps in the treatment pathway by consulting the best practice clinical guidelines for treatment (for example NICE and SIGN). Nationally and locally produced treatment pathways outline the treatment options available to patients.
3. Assigning workforce demand to pathways which identify how long these activities should take and who should be carrying them out. We were aware of the variability of this depending on tumour type, so we used expert input to estimate typical durations on a tumour site basis.





▲ Figure 1: Best practice treatment model.

4. Making the final calculation by combining the number of patients and the workforce burden for their treatment pathway. We also accounted for the need for protected time for training, professional development and other responsibilities, such as research activities.

CRUK believes that workforce planning for providing cancer treatment should be based on this best practice model. This will enable an improved understanding of true patient demand and the development of comprehensive UK workforce strategies.

### Current staff shortages

Based on available data, there were more than 9000 health professionals working in the UK non-surgical cancer treatments services in 2015. The workforce has been growing over the recent years in absolute terms, although not to the same degree as

demand for treatment. Treatment demand has increased, due to the growing number of patients diagnosed with cancer or living with the disease and the complexity of the treatments they need. Trend data are available for the number of medical and clinical oncologists and therapeutic radiographers. This shows that staff numbers in these three roles combined, have grown by nearly 4% per year on average over the last three years. However, cancer incidence alone is increasing by 2% per year.

The current vacancy figures across the non-surgical cancer treatments workforce seem relatively low compared to other health professionals. For example, the vacancy figure for therapeutic radiographers in 2015 was 6.4%. But our research suggests that these are underestimates of the true workforce gaps, because:

- Vacancy rates only reflect current vacancies; services often remove a job advert if they fail to fill the post and redesign the team structure to deliver the service instead.

*“Without time to research and develop treatments, it will feel like the early 90s again, when we were really behind the rest of Europe and our techniques were out of date. [In those days] our outcomes were right at the bottom of the table.”*

- Many posts have been vacant for up to two years – this means that the figures do not reflect the longevity of the issues experienced by cancer services.

During our site visits, it was also widely recognised that there are not enough health professionals trained to fill all vacant posts.

### **Impact of staff shortages**

Nearly three in four (73%) of our survey respondents identified staff shortages as a barrier to providing efficient cancer treatments and excellent patient experience. This results in:

- Insufficient capacity to undertake clinical research.
- Deteriorating patient experience.
- Missed opportunities for service improvement.
- Less frequent sharing of best practice with other cancer treatment providers.
- Lack of head space to focus on short- vs long-term job planning.
- Inefficient use of the workforce’s skills and experience.
- Decreased staff wellbeing and morale, and increased working hours.

### **Preparing for the future**

Discussions with our expert panel highlighted concerns that these shortages would be exacerbated in the future due to changes being made now. The example of the removal of bursaries for student nurses and therapeutic radiographers, demonstrates the potential long-term impact of changes to training pathways. The Institute for Physics and Engineering in Medicine (IPEM) also highlights its concerns around low uptake of clinical technology places.

More staff will be needed to deliver the non-surgical cancer treatments in the future. With treatment demand increasing and a patient population who will have more complex needs, attention needs to be paid to the following changes:

- 1. Dramatic changes in treatments:** The increased implementation of hypofractionation, intensity-modulated radiation therapy (IMRT), stereotactic ablative radiotherapy (SABR) and proton beam therapy will affect the resources required to treat patients using radiotherapy.
- 2. Development of new technologies:** New software will help automate some work. However, some new technology makes the treatment techniques more complex and time-consuming to plan. Discussions with clinical technologists highlighted this as an area of concern.



**3. Changes to treatment delivery:** Some treatments will be delivered through networks. This will affect where staff are needed and how they will be working with others across the UK.

### **Skill mix can help alleviate pressure**

Teamwork is fundamental to the successful delivery of cancer treatments. The non-surgical cancer treatments workforce already shares their workload and responsibilities. Teams develop new ways of safely providing these treatments to patients, using different team members' skills and experiences. The importance of implementing innovative ways to better utilise the mix of skills within the team – known as skill mix approaches – was a key finding of this research. Better use of skill mix approaches requires changes to the size and skills of different workforce groups.

70% of our survey respondents agreed that skill mix would be a positive development for their place of work. We identified three key skill mix opportunities:

- Training more advanced clinical practitioners;
- increasing implementation of non-medical prescribing; and
- non-medical professionals taking on responsibility for:
  - o Treatment review;
  - o Radiotherapy treatment planning; and
  - o Radiotherapy plan checking.

However, more capacity is needed in the current workforce to adopt these changes. For example, trained clinical technologists and therapeutic radiographers are taking on more of the radiotherapy treatment planning and plan checking. This will require training more clinical technologists and therapeutic radiographers to take on these responsibilities, and they will need additional time in their schedule to learn new skills. The knock-on effect of this is that clinical oncologists will also need more time to train them. As a result, the service delivery model needs to adapt.

Further changes that would facilitate skill mix include:

- Professional bodies providing more guidance on skill mix approaches.
- Cancer services exploring further implementation of open access, stratified and telephone follow-ups to free up capacity.
- Ensuring future health service contracts for the workforce groups in scope, reflect current and increasing future workload.

*“Treatments are getting more complex, which requires more time both for the planning and treatment delivery. Extra time would allow patients to feel they can spend more time with us on questions. I think they are very conscious of the pressures, and worry about holding us up.” Therapeutic radiographer*

- Increased professional and senior buy-in at cancer treatment service level, facilitating implementation of skill mix approaches.

### **Conclusion**

Cancer services across the UK must address workforce challenges to optimise treatment delivery. This research demonstrates the importance of workforce planning driven by patient demand, not what is affordable according to hospitals' budgets. Staff shortages across the workforce have both direct and indirect implications for the workforce and the treatments they can deliver. The lack of time to do research came up as a key issue across all the workforce groups, which means that we would not be able to improve the treatments available to patients in the future.

The survey, interviews and site visits, highlighted how important team work is for the delivery of cancer treatments. This includes both traditional team structures, where most of the responsibility for the patient lies with the oncologist, as well as new skill mix approaches where other members of the workforce are trained to take on additional responsibilities. However, the lack of staff is acting as a barrier to the skill mix interventions being implemented. More staff are needed to take on more advanced roles, training other staff to take on these new



responsibilities and to backfill the roles. Currently, the shortage of oncologists is having an impact on our ability to deliver best practice and improve the service.

The research also showed that workforce planning needs to consider how changes to treatments, improvements in technology and early diagnosis initiatives, will impact the demands on the non-surgical cancer workforce. In the future, we are likely to have shortages in most of the workforce. To implement the skill mix approaches more widely, national workforce planning bodies should look at how the UK can increase the number of therapeutic radiographers and clinical technologists. Alongside this, there is a need for a continued increase in training places for oncologists to take on the most specialised treatment techniques. The Health Education England (HEE) cancer workforce plan published in December 2017<sup>10</sup>, reflected this need for oncologists, as it increased the number of oncology training places in England.



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*Cancer Research UK is the world's largest independent cancer charity, dedicated to saving lives through research. It supports research into all aspects of cancer, and this is achieved through the work of over 4000 scientists, doctors and nurses. In 2016-17, CRUK spent £432 million on research institutes, hospitals and universities across the UK. We receive no funding from the Government for our research and are dependent on fundraising with the public. Cancer Research UK wants to accelerate progress so that three in four people survive their cancer for ten years or more by 2034.*

# Do We Have a Role in Public Health?

**Life expectancy continues to rise but more of us are spending longer in poor health. It is estimated that around two thirds of early deaths and early onset of disease could be prevented by addressing key public health issues, such as a poor diet, being overweight, smoking and high blood pressure<sup>1</sup>.**

## **Making the case for change**

Many of the lifestyle behaviours which contribute are common. Two in ten adults smoke, seven in ten men and six in ten women are overweight or obese; a third of people drink alcohol at levels which could be considered harmful; and half of women and a third of men do not take enough exercise<sup>2</sup>.

These unhealthy behaviours, when clustered, have a cumulative and massive effect on health. For example, an individual who smokes, drinks excessively, has a poor diet and inadequate exercise, is four times more likely to die in the next ten years, than somebody of an equivalent age who does none of these things<sup>3</sup>.

The choices a person makes are influenced by income, education, physical environment, emotional wellbeing and social norms, as well as local and national policy decisions. These wider determinants of health explain the gap in health inequalities across different sectors of the community.

Policy documents across the UK call for a much greater focus on prevention<sup>4-7</sup>. Why? Because the burden of preventable disease negatively impacts on many people's lives, and threatens the sustainability of health and social care services. It is estimated that if the public were fully involved in managing their health and engaged in prevention activities, £30 billion could be saved<sup>8</sup>.





### The contribution of healthcare professionals

The NHS engages with over a million patients every 36 hours across the UK. As health and care professionals, we have relationships with individual people, families and communities, and reach across all ages. This means that there is a huge opportunity for ‘health promoting practice’ to make a difference to health outcomes and health inequalities. In addition, acting collectively, we can be a force for change in building a culture of health and wellbeing in our society.

We need a new approach where we encourage everyone to gain more control of their health; where prevention and early intervention are the norm, recognising that action on health inequalities requires action across all the wider determinants of health; and where the assets of individuals, families and communities are built upon to support improved health.

Allied Health Professionals (AHPs) have risen to the prevention challenge

and are recognised as an integral part of the wider public health workforce. The 2015 report by the Centre for Workforce Intelligence and the Royal Society for Public Health, identified AHPs as professionals with the opportunity, skills and enthusiasm to address public health issues<sup>9</sup>. Publications over the last few years have demonstrated this enthusiasm and the opportunities for AHPs to do more. Table 1 gives examples of AHP reports focusing on public health and prevention in the UK.

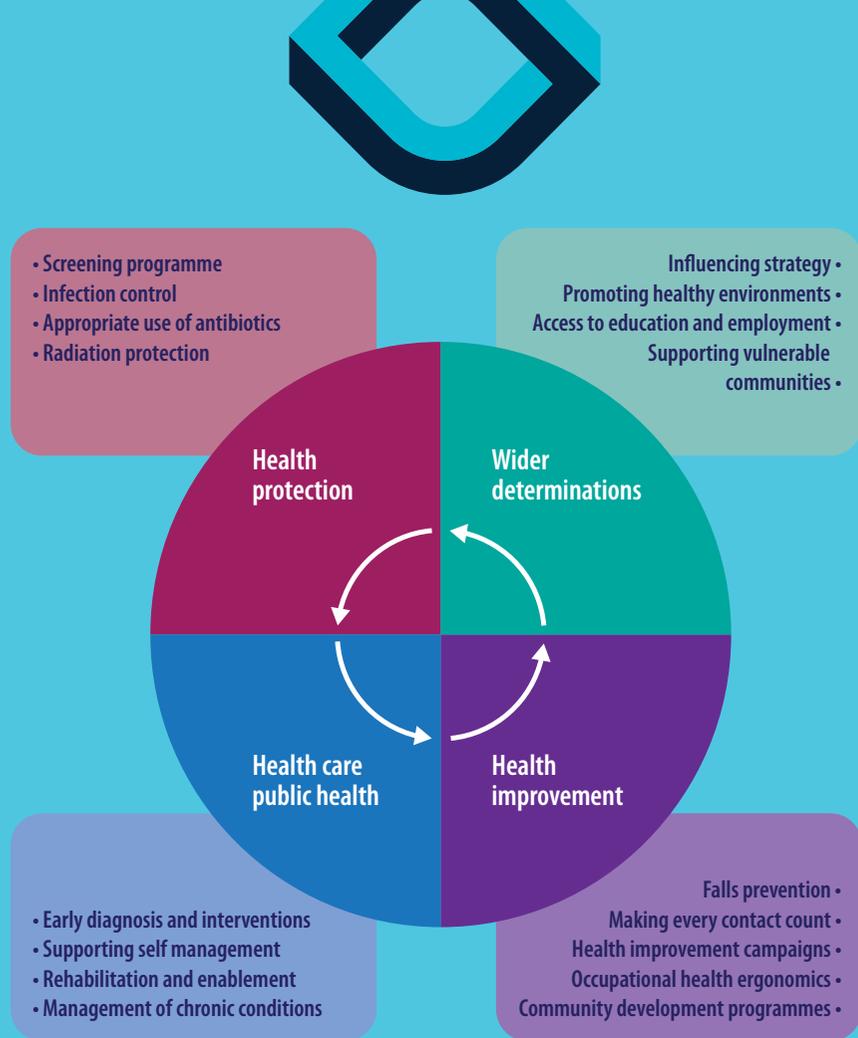
Frontline AHPs have indicated the growing importance of public health and prevention in practice. In 2011 Needles et al. performed a review of the health promotion activity of AHPs and concluded that interventions were focused on individuals with identified pre-existing conditions, rather than approaches that identify risk factors<sup>10</sup>. The conclusion of this review encouraged AHPs to consider the balance in their practice between a traditional ‘diagnose and treat’ paradigm, and a more contemporary ‘predict and prevent’ paradigm.

DOCUMENT	SUMMARY	LINK
Allied Health Professions into Action:	This document describes the transformative potential and role of AHPs within the health, social and wider care system in England, It was developed through crowdsourcing and has a significant focus on public health.	<a href="https://www.england.nhs.uk/wp-content/uploads/2017/01/ahp-action-transform-hlth.pdf">https://www.england.nhs.uk/wp-content/uploads/2017/01/ahp-action-transform-hlth.pdf</a>
A strategy to develop the capacity, impact and profile of allied health professionals in public health 2015-2018		<a href="http://www.ahpf.org.uk/files/AHP%20Public%20Health%20Strategy.pdf">http://www.ahpf.org.uk/files/AHP%20Public%20Health%20Strategy.pdf</a>
Public Health Strategic Framework for Allied Professions in Wales	These strategies set out the vision for the role of AHPs in public health, including details on strategic implementation, goals and measures of success.	<a href="http://gov.wales/docs/phhs/publications/170315frameworken.pdf">http://gov.wales/docs/phhs/publications/170315frameworken.pdf</a>
AHP Strategy 2012 -2017 – Improving Health and Wellbeing through Positive Partnerships		<a href="http://www.publichealth.hscni.net/ahp-strategy-2012-2017">http://www.publichealth.hscni.net/ahp-strategy-2012-2017</a>
AHPs in Scotland – Active and Independent Living Programme		<a href="http://www.knowledge.scot.nhs.uk/ahpcommunity.aspx">http://www.knowledge.scot.nhs.uk/ahpcommunity.aspx</a>
Guidance: Public Health Content within the Pre-Registration Curricula for Allied Health Professions	This guidance supports AHP professional bodies and universities delivering AHP pre registration education, to develop and assess the public health content.	<a href="https://councilofdeans.org.uk/wp-content/uploads/2017/09/Public-Health-Content-within-the-Pre-Registration-Curricula-for-Allied-Health-Professions.pdf">https://councilofdeans.org.uk/wp-content/uploads/2017/09/Public-Health-Content-within-the-Pre-Registration-Curricula-for-Allied-Health-Professions.pdf</a>
Healthy conversations and the AHPs	This report shows there is both a clear appetite from AHPs as well as the public, to have healthy conversations on a whole host of different topics from physical activity to obesity.	<a href="https://www.rsph.org.uk/our-work/policy/allied-health-professionals.html">https://www.rsph.org.uk/our-work/policy/allied-health-professionals.html</a>
Allied health professionals: interventions that improve public health	Examples of interventions delivered by allied health professionals that improve the public's health.	<a href="https://www.gov.uk/government/publications/allied-health-professionals-interventions-that-improve-public-health">https://www.gov.uk/government/publications/allied-health-professionals-interventions-that-improve-public-health</a>

▲ Table 1: Examples of AHP reports focusing on public health and prevention in the UK.

INTERVENTION	EXAMPLE
Involvement in national screening programmes	Breast screening, bowel cancer screening.
Promotion of public health campaigns in waiting areas	Be Clear on Cancer, Stoptober.
Using a 'making every contact count' (MECC) approach to promote healthy lifestyles with all patients	Very brief interventions where appropriate.
Using motivational interviewing and behaviour change techniques to support people to change behaviour	Smoking cessation in people being treated for cancer.
Supporting people living with cancer	Supporting emotional health and wellbeing, supporting people to return to work.
Radiation protection	Providing advice and guidance to protect the public and workforce.

▲ Table 2: Public health examples relevant to imaging and oncology.



▲ Figure 1.

What does this mean in the context of AHP and radiotherapy practice? Public health is defined as the science and art of promoting and protecting health and wellbeing, preventing ill health and prolonging life through the organised efforts of society (Faculty of Public Health). AHPs contribute to this through their work on physical, mental and social health with individuals, communities and populations across the four domains of public health (Figure 1). Table 2 gives examples specific to imaging and oncology.

A 2016 survey of AHPs explored current practice, attitudes, opportunities and barriers to AHPs implementing public health activities as part of their practice (unpublished Lowe et al.). More than 2000 AHPs responded during a three week period in May 2016, with radiographers making up 8% of respondents. Eighty seven per cent of AHPs considered improving the public's health to be a core part of their role. The responses indicated that AHPs deliver interventions across a wide range of public health priorities, from reducing social isolation to helping people manage pain. The topics they are most comfortable discussing vary by profession and context, but the results were similar to the *Healthy Conversations and the Allied Health Professionals* report published by the Royal Society for Public Health in 2015<sup>11</sup>. Diagnostic radiographers reported being most comfortable discussing falls prevention or pain management, with 63% never discussing smoking, whereas therapeutic radiographers were much more likely to undertake healthy conversations about smoking.

Both surveys indicated that while AHPs recognised the importance of prevention activities, there were barriers to systematically adopting them. Barriers which may be real or perceived, include limited time available, belief that additional knowledge and skills are needed, lack of access to supporting information and opportunities to signpost to other services, and lack of organisational support due to pressure to achieve treatment outcomes.

### Supporting staff working in imaging and oncology to undertake health improvement as part of routine practice

Radiographers agree that they have a role in improving the public's health, so what can individual practitioners do to increase the impact of their many contacts with the public? Making every contact count (MECC) is an approach to behaviour change that utilises the millions of day-to-day interactions which organisations and people have with other people, to encourage changes in behaviour that have a positive effect on the health and wellbeing of individuals, communities and populations. MECC enables the delivery of consistent and concise healthy lifestyle information and enables individuals to engage in conversations about their health at scale, across organisations and populations.

MECC was originally developed as a behaviour change intervention, to support people to change particular lifestyle behaviours, namely smoking, alcohol consumption and physical activity. Excellent e-learning tools and resources have been developed to support its implementation<sup>12</sup>. Most NHS organisations have asked staff to incorporate MECC into their work, as this was included in the standard NHS contract in 2016. It is important that making every contact count is about brief, opportunistic interventions and signposting to services, rather than a tick box exercise.

The key to making every contact count is recognising the opportunities where it would be worth intervening; using appropriate motivational language that empowers people to change and is non-judgemental; having the key public-health messages at your fingertips and knowing enough about the services in your local area to allow you to signpost people for more support if needed.

Can MECC really be done in just a few minutes? Experts in brief interventions suggested that these interventions can be done in as little as 90 seconds<sup>13</sup>, see Box 1. If all health professionals used MECC, we have the potential to make a very significant health impact at a population level. One in every eight people who have a conversation about reducing alcohol, end up reducing their level of alcohol risk by one level; similarly half of all people who set a quit date with a local stop smoking service go on to successfully quit. So, imagine if every reader of this article undertakes ten brief interventions over a year, it is highly likely that each of you will make a difference to someone's life expectancy; for less than half an hour of your time, that's got to be worth it.

*All Our Health* developed by Public Health England, brings together priority topics to help address the major factors causing premature death, ill health and health inequalities (see Table 3)<sup>14</sup>. The framework includes tools and resources to support health and care professionals, with quick links to evidence and impact measures and top tips on what works.

*All Our Health* is designed to provide professional colleagues with brief summaries, therefore not taking much time to work. The site includes infographics for those who like to learn visually and many helpful and practical resources.

If every health and care professional could commit to supporting one area in this framework, the impact across the system would be transformational. We already know that thousands of professionals have started to use *All Our Health* but we need even more to make a difference. Together, we can support people to live longer and healthier lives, and also contribute to reducing the demands on health and care services for the future.



### Topics Included in All Our Health

Healthy beginnings  
Childhood obesity  
Child oral health  
Early adolescence  
Sexual and reproductive health and HIV  
Workplace health  
NHS Health Check  
Respiratory health  
Liver disease  
Dementia  
Smoking and tobacco  
Adult obesity  
Alcohol  
Physical activity  
Antimicrobial resistance  
Falls  
Tuberculosis  
Pressure ulcers  
Place-based services of care

▲ Table 3: Topics included in All Our Health.

Patient coughs and says: “Oh dear smoker’s cough.”

**Radiographer:** “Are you worried about your smoking?”

**Patient:** “Of course, I’ve tried to stop before but haven’t managed to keep going.”

**Radiographer:** “Support to stop smoking has really improved over the last few years. Did you know that half of all people who try to stop smoking with NHS smoking cessation services are successful? ...Would you like me to give you some information about the service?”

Box 1: Example of a very brief intervention for smoking.

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*Agile!*



## Inspired by Nature, Designed by Carestream.

We looked to Mother Nature for inspiration when we designed our new DRX-Revolution Nano Mobile X-ray System.

We found it in the agility and speed of the cheetah. In the small size and weight of a chipmunk. And, in the articulating limbs of a grasshopper.

The result? The Revolution Nano delivers superb DR imaging and high performance, scaled down for a highly economical price.

### DRX-Revolution **Nano**

*Innovation is in our nature.*

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