



Radiology Training

What good looks like,
now and in the future

Foreword

In 2016 we set out our [vision](#)¹ for radiology training over the next ten years. Now, halfway through that period and following the major upheaval of COVID-19, we have taken stock and considered the progress made, the progress still to be achieved and the changing healthcare landscape.

Like all in the NHS, radiology trainees were impacted in a myriad of ways by the pandemic. Some were redeployed, all found access to training disrupted and ultimately adapted to new ways of learning. The delivery of teaching and training, both diagnostic and procedural, had to change almost overnight, but the last two years have elicited a tremendous amount of innovation; innovation that we must harness and build upon.

One thing that hasn't changed since 2016 is the urgent need to build our workforce. The number of radiologists per head of population remains in the bottom quartile of all European countries. The demand for medical imaging continues to increase at a much greater rate than the rate of increase in the radiology workforce.² Simply put, we need to train more radiologists. We welcome the increases in both training numbers and in the number of imaging academies that have been seen in recent years, but there is still a long way to go and simply increasing numbers is not going to be possible without also addressing the capacity constraints that hinder growth.

Embracing the innovations in training that have emerged from the pandemic, while continuing to develop and incorporate newer solutions, will be essential to reaching the goals we laid out for 2026 and beyond.

Dr William Ramsden, Vice President, Clinical Radiology

1. *Radiology Training 2016-2026: A vision and a solution*. London: The Royal College of Radiologists, 2016.

2. The Royal College of Radiologists. *Clinical Radiology UK workforce census 2020 report*. London: The Royal College of Radiologists, 2021.



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The demand for medical imaging continues to increase at a much greater rate than the rate of increase in the radiology workforce.

Introduction

In 2016 the RCR published [Radiology Training 2016–2026: A vision and a solution](#)³ which called for increases in training numbers and in the number of academies, as well as wider implementation of academy models of training through greater investment in and development of innovative training methods.

Much of this is progressing well, and the recent expansion in training numbers and in the number of imaging academies is very welcome. However, more is needed to meet consultant targets such as those set out in the [Richards report](#).⁴ To achieve these targets, we need to continue to increase training capacity to help meet demand, while maintaining the highest standards of radiology training.

The COVID-19 pandemic has had a dramatic and sudden impact on how radiology training is delivered. There was a rapid move from in-person teaching and training to remote formats for both small and large trainee groups. This was a tremendous achievement and was very effective under the circumstances. There are several articles on how radiology teaching and training adapted to the need for no face-to-face interactions. In addition, we have heard from members and Fellows about training innovations during the pandemic which proved successful and could now be incorporated into mainstream training.

As we move into a post-vaccination world, face-to-face teaching and training is starting to return more widely, so we now need to reset what good training looks like.

Some of the recent innovations may deliver training of better quality and may permit training provision to a larger audience, either regionally through an imaging academy or cross-region/nationally. They may also have a positive impact on the wider carbon footprint of training delivery, something that all innovations must consider.

Equally, it is crucial that face-to-face training remains, and there are some forms of training which simply cannot be delivered remotely. We explore the benefits of both face-to-face and virtual teaching, diagnostic imaging training and procedural training, and review how traditional and new methods may be adapted to meet the challenges of the future. Finally, we look at what is needed to ensure this vision of the future becomes a reality.



3. The Royal College of Radiologists. *Radiology Training 2016-2026: A vision and a solution*. London: The Royal College of Radiologists, 2016.

4. Richards PSM. *Diagnostics: Recovery and Renewal. Report of the Independent Review of Diagnostic Services for NHS England*. NHS England, 2020

Target 1

Teaching

Teaching

Trainees and trainers from across the UK have told us about some of the methods they used to adapt to remote forms of teaching:

- Local and regional teaching sessions delivered via Zoom/Microsoft (MS) Teams, often several a day, ensured that teaching continued and was accessible to all
- Some teaching sessions were pre-recorded and uploaded to a remote access portal for regional access at a time and place to suit the trainees
- Provision of webcams improved interaction and engagement with online teaching
- Consultant 'hot seat' style teaching transferred effectively to online platforms, with greater multispecialty consultant attendance, providing broader learning opportunities
- FRCR Part 2B teaching moved online and is likely to remain this way to mirror the adapted model of exam delivery
- Regional on-call discrepancy meetings for trainees, simulated multidisciplinary team meetings (MDTMs) and tutorials for other healthcare workers, such as medical students, all went virtual, as did access to national and international conferences and webinars
- Access to online radiology educational resources was provided

Benefits of face-to-face teaching

- Helps to build rapport and encourages teamwork
- Promotes instantaneous feedback
- Conducive to impromptu discussions
- Creates an informal atmosphere for learning
- Helps to build social connections

Benefits of remote teaching

- Improves local, regional and national links through networking and sharing of best practice
- Increases reach
- Provides flexibility and accessibility, particularly for those working less than full-time, on parental leave, living or working further afield
- Access to teaching and cases from centres with different equipment and expertise
- Saves on travel time and thereby reducing carbon footprint



Case examples of virtual methods of teaching

National webinars

The RCR national trainee webinar programme was developed as a means of supplementing local teaching. A series of presentations were delivered by national training experts on a broad range of radiology topics, focussing on those important for everyday practice and some more specialist topics. Some topics were targeted at trainees at particular stages of training. These were well received by trainees, with all respondents to the [Junior Radiologists' Forum's \(JRF\) survey](#)⁵ describing these as either 'useful' or 'very useful'. These were made available for trainees to join either live or on demand.

Some Special Interest Groups (SIGs) run weekly webinars covering a range of topics targeted at varying levels of trainee seniority, and these have proved very popular. Some have provided online workshops, while others have delivered national virtual grand rounds with senior trainees presenting difficult cases with the opportunity for questions and answers.

Local teaching initiatives

Some training programmes have established local 'Rad Rounds', lunchtime themed teaching sessions with trainees contributing teaching points from a series of cases. Other programmes have introduced 'Cases of the week', with cases accessed by trainees via a shared internal drive. Trainees' responses are then used as a basis for consultant teaching.

How teaching is evolving with lifting of restrictions

- A hybrid model is now increasingly common with face-to-face teaching returning, but with those based off site joining via MS Teams
- Most training programmes are looking to 'blend' online and face-to-face teaching

What 'good' radiology teaching now looks like

A survey⁶ by the Junior Radiologists' Forum suggests 'that a combination of face-to-face and remote teaching will continue in future' and, based on the standard of teaching maintained during the first wave of the pandemic, remote teaching can be delivered effectively.

The greater accessibility that remote teaching brings means this should be maintained. It seems likely that a blend of face-to-face and remote virtual teaching will evolve, but remote teaching is likely to be the predominant option.



5, 6. Fossey S, et al. *Impact of COVID-19 on Radiology Training: Royal College of Radiologists Junior Radiologists Forum national survey*. *Clinical Radiology* 76 (2021) 549.e9-549.e15.

Target 2

Diagnostic Training

Diagnostic Training

Diagnostic training also had to adapt during the pandemic and feedback from training programmes shows the innovative methods that were adopted:

- Clinical training by consultants continued remotely via MS Teams, where trainees could join a consultant reporting session and view their screens
- Virtual reporting sessions, where trainees are required to submit provisional reports to the trainer for review
- Trainees receiving direct feedback from consultants via MS Teams on the cases they have provisionally reported, utilising the screen sharing function to explain imaging findings, interpretation and report construction
- Feedback on imaging reports communicated electronically, enabling completion of workplace-based assessments
- Checking and second reading of senior trainees' verified imaging reports carried out virtually by trainers, with audit performed and addenda added as needed
- Virtual MDTMs makes attendance easier for trainees but makes it more difficult to gain opportunity to present cases



Benefits of face-to-face training

(In addition to points listed for face-to-face teaching):

- Informal and tacit learning from trainers, peers and other staff
- Builds experience, confidence, teamwork and leadership skills
- Interaction enables easier identification of strengths and weaknesses
- Can be easier to provide pastoral support in person
- A recent study⁷ suggests that trainees 'learn the role' of the radiologist in the workplace
- Helps develop rapport between trainees and consultant colleagues



Benefits of remote training

(In addition to points listed for remote teaching):

- Potentially fewer interruptions for the trainer and trainee, leading to better productivity
- Simulated reporting and remote MDTMs

7. Upadhyay N, Wadkin JCR. Can training in diagnostic radiology be moved online during the COVID-19 pandemic? UK trainee perceptions of the Radiology-Integrated Training Initiative (R-ITI) e-learning platform. *Clinical Radiology* 76 (2021) 854 – 860.

Case examples of virtual methods of training

Training using simulated reporting lists

Some trainers have established virtual reporting lists as a novel means of providing training in image analysis and reporting. Trainees receive a series of anonymised cases to work through with the relevant clinical history provided.

The cases have been separated from previous imaging and reports and include normal cases and those demonstrating some pathology. In the allotted time, each trainee analyses the cases, ideally in an environment similar to their normal workspace, and provides reports which are submitted electronically to the trainer. This gives trainees experience in signing off reports, simulating verifying.

The trainer is then able to review the reports and feedback can be provided. They may provide an ideal peer exemplar report for each case, and possibly some example phrases to avoid. The trainer can identify areas of strength and weakness in the individual trainee and the trainee cohort, both in the outcome of image analysis and in report construction/subsequent recommendations. It enables an evaluation of the ability of the trainee to commit to a diagnostic opinion.

This can also identify areas of training/practice that need specific focus and can permit tailoring of a teaching session, particularly if the submitted cases are themed.

Methods of audited verification of trainee imaging reports

Some training programmes have developed methods for permitting trainees to progress to independent reporting of cross-sectional imaging studies using remote report checking, audit, and reducing levels of consultant review, while always providing a means for trainees to seek help with difficult cases. Some radiology information systems (RIS) allow for consultant remote review and comments, together with levels of agreement to be sent back to the trainee within the RIS system. These feedback comments can be collated by the trainee and their supervisors. Some training programmes have developed a coded audit for each report indicating degrees of trainee confidence in the report and the degree of agreement by the trainer. This can result in the trainee being supported to report cases independently with a decreasing proportion of these cases directly reviewed, but with the ability of the trainer to add an addendum as necessary.

Training using Google Classroom

Some trainers have created a training schedule and collection of resources on Google classroom. The consultant trainers can contribute example cases for training with explanations, key journal article references and links to other online resources. This can be expanded to cover much of the curricular requirements in that anatomical area of special interest.





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The JRF COVID-19 survey found that 50% of respondents felt that local training was of lower quality during the pandemic.



How diagnostic imaging training is evolving with lifting of restrictions

- Day-to-day feedback/in-person feedback on reporting is returning
- Face-to-face MDTMs may return or evolve to a blended model.

What ‘good’ diagnostic imaging training now looks like

The JRF COVID-19 survey⁸ found that 50% of respondents felt that local training was of lower quality during the pandemic, contrasting with only 23% stating regional training was of lower quality and 9% for national training. Many stated lower case volumes as reasons for the reported challenges.

It is likely that a blended or hybrid system of face-to-face and remote training will develop, with face-to-face training particularly important for junior trainees and for all trainees undertaking departmental duty sessions. Remote training facilities should be available for all.

8. Fossey S, et al. *Impact of COVID-19 on Radiology Training: Royal College of Radiologists Junior Radiologists Forum national survey*. *Clinical Radiology* 76 (2021) 549.e9-549.e15.

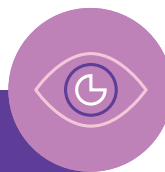
Target 3

Procedural Training

Procedural Training

Procedural training was most impacted by the pandemic and training programmes have shared their reflections:

- Procedural training declined during the pandemic because of the importance of the presence of trainer and trainee for this to happen effectively
- Specific training ultrasound (US) lists for junior trainees are very beneficial in learning practical skills
- Need for increased access to simulation training/video-streaming or recording of procedures
- Introduction of simulation/phantoms for biopsy and procedural training
- A good trainer is more important than a good simulator



Benefits of face-to-face training

(In addition to points listed for face-to-face teaching and training):

- Interaction with patients helps to develop communication skills
- Creates informal training opportunities through huddles, board rounds and debriefs
- Helpful for learning how to manage complications
- Opportunities to hone or learn the finer points of a technique



Benefits of remote training

(In addition to points listed for remote teaching and training):

- Simulation suitable for basic training
- Encourages trainers to utilise remote tools/functionalities e.g. screen sharing, live streaming etc

Case examples of remote methods of procedural training

Training using remote methods

Interventional radiology (IR) colleagues have developed video recordings of commonly performed procedures from the view of the operator (using head-mounted video recording devices such as the 'GoPro') to teach trainees on the equipment required and procedural steps. This gives trainees a stepwise tour through a procedure and provides key points to ensure good procedural outcomes.

Procedural training using phantoms

Ultrasound-guided biopsy procedures can be simulated using low-cost phantoms, such as a gelatine-based gel medium or using real cow's liver, with added olives to simulate targets to biopsy. Some training centres have similarly supported training in drainage procedures by creating drainage phantoms. These models allow trainees to improve hand-eye coordination skills and increase their confidence in undertaking these procedures in a controlled and safe environment.

Training using simulated reality

Technological advances have led to the development of simulated reality technologies which include virtual reality (VR) and augmented reality (AR). VR provides an immersive three-dimensional (3D) environment which the user can interact with, whereas AR overlays virtual components and objects onto a real-world background e.g. holograms. While these technologies are not in use yet, industry developers have started to develop AR technology to overlap diagnostic cross-sectional imaging onto patients, cadavers and/or phantoms which allow direct visualisation of treatment targets for percutaneous procedures. In the future, these technologies are likely to play a greater role in procedural training.

What 'good' procedural training now looks like

The JRF COVID-19 survey⁹ highlights ultrasound and procedural skills as key areas to be prioritised in training recovery.

Whilst the delivery of hands-on procedural training is likely to remain largely traditional, with consultant trainer presence for patient-facing activities, developments during the pandemic showcase future possibilities with video recording of procedures, increasingly sophisticated simulation models and simulated reality technologies likely to take an expanding role. More importantly, these kinds of methods may help to increase capacity for procedural training and support the interventional capabilities required by the new curriculum, particularly for trainees in the early years of training.



9. Fossey S, et al. *Impact of COVID-19 on Radiology Training: Royal College of Radiologists Junior Radiologists Forum national survey*. *Clinical Radiology* 76 (2021) 549.e9-549.e15.

Goals

**What needs to
be achieved to
realise the future**

What needs to be achieved to realise the future

As a result of the pandemic there has been rapid change in the way teaching and training is delivered.

The new methods complement the recommendations in the 2016 vision and those that have proved successful are beginning to be embedded into regular practice. However, to fully achieve the vision laid out by 2026, there remains a need to evolve, both to better support trainees and trainers and importantly to increase training capacity.

What the RCR will do

- Continue to work with the Statutory Education Bodies of the four UK nations to ensure the new academies become established and deliver high-quality training
- Continue to push for increased recognition of training time within job plans and supporting professional activities (SPA) allocation
- Facilitate the sharing of good practice between training programmes to encourage the creation of local, regional and national networks, enabling teaching resources to be more widely available
- Explore the possibilities for establishing an online training forum/community to facilitate the sharing of resources
- Expand the range of teaching materials available to trainees by developing new online resources through the RCR Learning platform
- Create a guidance resource on how to optimise remote teaching and virtual training for trainees and trainers, with an inbuilt quality assurance process to ensure alignment with the RCR Clinical Radiology curricula
- Explore the potential role of simulated reality technologies within procedural training

What we ask others to do

Training programmes:

- Develop local teaching archives and picture archiving and communication system (PACS)-based teaching material
- Increase progression to supported senior trainee independent reporting using audit

Statutory Education Bodies:

- Continue to work with us to support realisation of the original vision by 2026 and continue to increase radiology training places
- Support our calls for greater recognition of time for training in job plans
- Increased investment and opportunities for simulation training within US and IR
- Greater flexibility in the use of funding to free up training time

Employers:

- Recognise the importance of protecting time for training in job plans
- Provide increased IT support with digital learning helpdesks to assist trainers and trainees
- Increase provision for remote working with improved access to homeworking stations for trainers, senior trainees and those trainees required to work remotely



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