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Title:

Expanding training capacity for radiographer reporting using simulation: evaluation of a pilot academy project

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Introduction

Whilst there is increasing demand on radiology services in the UK, pressures are restricting the expansion of the multi-professional workforce. A pilot academy for radiography reporting was established to augment the traditional university and clinical education in a simulated environment using focussed teaching and real image worklists in a dedicated environment away from departments.

Methods

Located at a facility to replicate the clinical reporting environment, the emphasis of the nine-month pilot was to provide extensive 'hands-on' training to eight trainees. Evaluation of the academy was undertaken through focus groups, telephone interviews, and online surveys to consider the experiences of the trainees and their managers and mentors.

Results

There was overwhelming support for the academy from trainees, mentors, and managers. Key benefits included relieving pressures on department and mentors; providing an intense, structured, and safe environment to learn; and, perhaps most importantly, an extensive and cohesive peer-support network. Issues identified included conflict within departments due to differences in reporting style and the need for greater collaboration between the university, academy, and departments.

Conclusion

The use of simulation in education is widely researched, however, there are a number of key factors that need to be considered when implementing it into practice. Peer-support and reflection is seen as essential for its success. Extensive dedicated time to focus on reporting alongside peers can support the development of these skills away from the clinical environment and as such can reduce pressure on service delivery and positively influence learner outcomes.

Keywords:

simulation; radiographer reporting; image interpretation; advanced practice; post-graduate education; clinical mentorship

Highlights

- Academy model supports clinical departments in mentoring reporting radiographers
- Benefits of intensive and structured learning in a safe, simulated environment
- Reports standardisation might influence successful transition into practice
- Peer support a major factor in the success of trainees on the reporting academy

Introduction

With ever increasing demand for health services, workforce pressures are the greatest challenge to the NHS,[1] with radiology and radiography professions both affected.[2,3] In response, the 2017 Cancer Workforce Plan[4] for England confirmed further expansion of radiologist training but also promoted greater multi-disciplinary working, announcing an additional 300 reporting radiographers by 2020. Clinical reporting by radiographers is a well-established practice within the United Kingdom,[5] supported by a body of evidence that confirms, with appropriate education and training, they can expand capacity, providing accurate and effective clinical reports across a wide spectrum of examinations.[6]

Professional guidance for non-medical advanced practice roles, including reporting, is that the education should include a Master's level qualification.[5,7] Alongside this university programme trainees will require extensive clinical experience and workplace mentorship.[5,8] However, current service pressures mean the existing hospital-based training models may not be able to meet demand[6,9] and alternative education strategies must be considered to meet local and national expectations.[4,9] The radiology profession established the concept of academy-style learning in 2005 with the aim of expanding training numbers. The academy setting was to provide a different learning environment, increasing the use of simulation alongside traditional clinical practice, but such a model has not been previously explored for radiographer reporting training.[10,11]

Simulation is a widely established pedagogical approach in healthcare and aims to imitate a real process or situation, requiring a trainee to act as they would in the real-world.[12-17] It allows the supervised and safe practice of a skill in a controlled environment, enabling repetition until the required competence is attained.[12,13,18] There is a growing body of evidence to illustrate that simulation increases knowledge, skill performance, critical thinking, confidence, and satisfaction.[15,16,19]

This article discusses the development and evaluation of a pilot academy designed to develop of a cohort of radiographers to be capable of independently reporting musculoskeletal radiographs. The aim was to provide experiential learning in a simulated clinical environment to augment the traditional academic and hospital-based training.

Method

Setting

Located at a dedicated facility based at a district general hospital site (maximum 40 miles from the trainee's hospital base sites) an existing IT suite was purposefully adapted. This included eight reporting workstations (a standard PC monitor plus a single diagnostic quality 3.5 Megapixel monitor for image review) and an educator's workstation with large screen wall-mounted monitor to facilitate tutorials and other activities. All workstations, trainees, and educators were able to access the host Trust's picture archive and communication system (PACS) with access to current and previous imaging and clinical history. Trainees were blinded to definitive reports on the images under review to ensure they were not influenced in their decision making. To maintain information governance standards trainees were unable to create new data or author reports onto the patient record. Reports generated by the trainees, other resources and presentations were stored in an encrypted local shared folder. Support from the local PACS team ensures that the appropriate worklists of images were produced to the specifications of the academy educators. These focused, but randomly presented, image banks of different anatomical regions provided extensive access to real-life (already reported) cases. Rather than producing artificially skewed banks of abnormal images, the worklists replicated clinical practice much more closely. Trainees were encouraged to report the images individually, reports were then reviewed and discussed as

a peer group, facilitated by a clinical educator. Clinical governance arrangements were established with the host organisation, including honorary contracts, and the educators had sight of the original definitive reports. Any discrepancies identified were identified for follow up by the Trust.

The academy provided a standardised approach protected from the workload and staffing pressures of their own diagnostic imaging departments. This included dedicated mentorship and peer-support alongside, but not replacing, on-going local clinical mentorship and academic learning. Trainees enrolled on an established postgraduate programme in September 2017 at a local Higher Education Institution (HEI). The academy programme ran alongside the postgraduate certificate stage of the Masters programme over a nine-month period. The academy learning took place over three distinct phases, with teaching strategies designed to underpin the relevant stage of development. This was intended to front-load their learning and aid their transition to independent practice within their own department at the end of the training period.

Phase 1 (months 1-4)

The trainees commenced their academic programme and attended the academy for two consecutive days per week, away from their own department. This initial phase was dedicated to the development of underpinning skills; specifically anatomy, systematic approach to image interpretation and report writing. The focus at this time was predominantly trauma related, with the trainees progressing through all areas of the musculoskeletal system in a systematic manner.

Phase 2 (months 5-6)

The trainees continued to attend the academy for one day per week where the focus moved towards non-traumatic pathology. Within their own departments, the trainees were encouraged to spend their study day undertaking supervised reporting sessions and also gain experience within a range of other clinical departments, including attending the emergency department, outpatient clinics, and multidisciplinary team meetings. This was aimed at developing their clinical knowledge outside of image interpretation, an expectation of the advanced clinical practitioner (ACP) role.[7]

Phase 3 (months 7-9)

The trainees spent two study days per week in their own departments, returning to the academy for one day per month for peer support. It was during this final phase that the trainees undertook their audit of competence within their workplace, a requirement of the HEI and professional guidance.[5] This coincided with completion of the other academic assessments.

Mentorship within the academy setting was predominantly provided by two radiographers, both with extensive experience of independent reporting and education. These were also supported by a radiologist in an advisory role, as well as other consultant clinicians both from within and outside radiology. In addition, a 'WhatsApp' group was created to allow on-going peer and mentor support.

Evaluation

A two phase multi-method evaluation was undertaken following ethical approval by the local HEI. To identify trainee expectations of the academy an online survey (Bristol Online Survey, Bristol, UK) was completed prior to the academy commencing and this also

captured baseline demographics. A parallel electronic survey was circulated to clinical managers and mentors to establish their understanding of the academy model.
A focus group with all the trainees was conducted following the final academy session nine-months later. Facilitated by an independent researcher, this aimed to establish their views on the project and identify areas for potential future development. Additionally, invitations to participate in a follow-up telephone interview were extended to clinical mentors and managers at each site to understand their perspective on the progress of the trainees and the overall clinical experience. The focus group and interviews were audio recorded and transcribed verbatim and participants were sent a copy of the transcript to check for accuracy. All gave informed written consent and to preserve confidentiality only roles are identified, with directly attributable quotes reported in italics.

Results

Eight trainees (5 female and 3 male) were nominated from seven individual hospital sites within a single geographic region. The average post-registration experience of the trainees was six years (range 1-14 years). All took part in the pre-academy survey and final focus group. The parallel manager/mentor pre-academy survey was completed by nine individuals, with some respondents fulfilling both roles. Final follow-up telephone interviews were conducted with three managers and/or mentors.

<u>Pre-academy expectations</u>

The trainees saw the academy as a way of increasing their confidence and knowledge around pathology, report writing and communication, whereas those around them perceived it as an opportunity to develop differently to the traditional route. However, both managers

and trainees felt that the programme would differ from the traditional hospital-based schemes, as the method of training will be more intense and focused (manager 1). They also then went on to suggest that the training will be consistent whereas in the department the training can vary depending on who they spend time with.

Because the trainees were learning together some respondents thought that the academy would lead to greater report standardisation although this could also be perceived as a challenge to current practice for some

> I feel that, unlike previous years, the radiographer will return with reports which will be written in the style of choice for the course leaders, not the host department. This may be positive or negative (manager/mentor 2).

A consistent view was around the ability of the academy setting to provide group learning and collaboration, as they hoped to feel less isolated and able to learn as part of a group and learn from each other (trainee 1). They saw that this would provide opportunity to discuss progress with others at same level of learning (trainee 2) with more peer support … more group focussed, encouraging group discussion (manager 1).

Many identified challenges with the traditional method of training in relation to clinical practice workloads. This was illustrated by one trainee who stated that*… finding the time to* meet with mentors in the clinical environment can often be difficult due to staffing issues (trainee 3). Many of the managers and mentors also acknowledged the same issue

> Giving support throughout training which is sometimes difficult in the hospital setting due to staffing levels and pressures for report turnaround. (manager 3)

> Less pressure on the trust, no interruptions to planned teaching sessions due to staffing issues in the department (mentor 4).

In comparison with the traditional training there was also an expectation that the output would be focussed towards advanced practice roles, recognising differences between 'reporting' and the wider skills required at this level. This was identified by one mentor, as an emphasis on the reporting radiographer as an advanced practitioner, not just an extended scope worker (mentor 4) and another suggested that the output will be an advanced practitioner rather than simply a reporter (manager/mentor 2).

Post-academy evaluation

One of the key findings from the trainee focus group was the consistency that the academy attendance gave them. The guaranteed timetabled time was seen as invaluable, enabling the cohort to learn together. Importantly, this approach was felt to reduce local variation, identified as a key benefit over the traditional model where they [the trainees] would be learning different things from different mentors (trainee 4). For some, the impact was greater

> Some people's workplaces are better for that than others, whereas this way you all get the same exposure or the same kind of learning. [If it wasn't for the academy] *I'd* have had to drop out, because work would have pulled me out, because they *wouldn't have been able to support me* (trainee 2).

The planned timetable was supported by another trainee, who stated the way it is structured so you focussed on different topics per week, I found really helpful. *… if like you were just* learning your reporting at work, you might only do 2 [facial bone radiographs] *a week, you're* never going to build up your skills or your confidence, whereas 1 week here we did an image

bank of 50 facial bones x-rays in a row (trainee 5). One also suggested the increase in confidence was attributed to their experience of

> … getting into the routine of sitting down, looking at a worklist, reporting cases in a group environment where you are all at the same level, I think that has been one of the benefits of doing it like this. (Trainee 2)

The first phase of the academy programme was seen to prepare trainees for learning in the clinical setting with the simulated reporting tasks providing a safe environment, be*cause it's not an official report it's all practice reporting, you get your confidence* (trainee 5). But this also was seen to have an impact on the clinical departments as they saw themselves as being useful as well at work.

> *The structure … and the fact that you've got a baseline knowledge you wouldn't have* before you start sitting with your colleagues to start doing reporting, which makes *learning a little bit quicker because you've already got the basics to progress from* there (trainee 6).

This dedicated time early in the training also reduced the need for introductory education from the department, suggesting that on traditional reporting courses I would have had a much higher input at the beginning (manager/mentor 3). This appeared to free up the clinical mentor time to enable continuity of imaging service provision;

> that has absolutely freed my time up, *we've had to make sure they are working with* someone in the department, so that in essence takes 2 people out of the department, *whereas this is more structured and... it's had little impact on the day*-to-day activity *because they've been going to the academy* (manager/mentor 3).

But the academy–clinical transition was not as easy for all the trainees, with one stating I *had a drop in confidence … when we weren't coming on a regular basis and you were being* kind of left to your own (trainee 4).

For many departments the workload pressures meant that the academy protected trainee study time with guaranteed exposure to learning and reporting practice.This was particularly critical for sites with staffing shortages and this intensive period also meant when they started undertaking supervised clinical reporting in the workplace they were perceived as less of a burden on the mentors and other reporting staff.

> T*hey've come in with the skills and the understanding*, *where then it's not just* observing, they have been partaking in reporting sessions, so there has been a massive benefit (manager/ mentor 3).
>
> T*hey've had more reporting time in the academy which is good because I don't think he'd have got that in the department* (mentor 5).

The inability to utilise the trainees in their clinical radiographic roles did provide some challenges to departments as they felt whilst the trainees were in the academy we could not pull them back. So there was a little lack of flexibility (manager/mentor 2).

The expected standardisation of reports did emerge as a theme in the post-academy evaluations, with the trainees seeing that through the academy you want to create something where people report in a similar fashion (trainee 2). However, this proved challenging for some trainees, with one saying they teach us here [at the academy] to describe everything we see, not just saying no fracture, whereas in the clinical department she was told *"we don't do it like that"* (trainee 7). Another described a similar experience, you *come across someone like that who just goes "no I don't like it" and just deletes* your words

(trainee 2).

There was overwhelming support for the academy programme and as expected a key feature was the peer-learning. This enabled them to collaborate beyond image interpretation, exploring wider areas of clinical practice. One mentor, explained that *it's not just* about reporting, [trainee has] *come back with knowledge about protocols and he's allow*ed to speak to all different Trusts (mentor 5). The small cohort size was felt to be important in terms of building a peer network, the trainees felt it was really good *to form links as well … we'll still communicate and ask for advice which is so valuable* (trainee 8). This seemed to help meet the aspiration of the academy programme to develop broader skills and understanding. Mentors recognised the difference in the trainees, having seen them move beyond the expectations of a traditional reporting programme and transition easier to an advanced practice role;

> *they've come out having done presentations, with teaching skills, with a broader knowledge of advanced practice ...it's probably moved that process forwards by a* year or two (manager 3).

Although this element was seen as important to the trainees, with one explaining that there had been a lot of discussions about the role of the advanced practitioner and how you approach situations at work, the timing was questioned as they thought that came a bit too soon (trainee 8).

All of the trainees had been allocated a radiographer as a clinical mentor and this allowed them to reflect on the differences between this programme and their own experiences, both as a student and mentor on other programmes/approaches, citing it as better than typical reporting course *… I've seen a huge difference in their skill set and their confidence* (manager/mentor 3).

There were opportunities for future improvement, with the need for greater communication between the academy and clinical sites, and where possible the university, being identified. A number of the mentors indicated that they would have liked to meet face-to-face with the academy team and discuss the timetable and lecture content. They also expressed the desire to receive more regular feedback from the academy in terms of trainee progress and milestones (manager/mentor 2). Although the academic component has not been evaluated the trainees felt a disconnect between academic and clinical learning, with one stating that it did not feel like they [academy/university] entirely gelled together, meaning that they were more focussed on getting the reporting done and then thinking [about] assignments (trainee 8).

All eight trainees successfully completed their academic component, including their local audit of reporting in clinical practice (minimum 500 cases) signed by their mentor, achieving >95% sensitivity and specificity and are all now independently reporting in their workplaces.

Discussion

Shiner's[12] systematic review of the use of simulation in diagnostic radiography education identified relatively limited literature on the topic. She did, however, suggest that it could be employed in a wide range of forms to address different objectives at both pre and post-registration stages with potential to be integrated into all forms of education. It is common for simulation to take place in dedicated, purpose-designed facilities. In healthcare these are often referred to as 'clinical skills laboratories',[15,19] in science they are 'learning laboratories',[21] whereas in engineering and manufacturing the term 'learning factory' is

commonplace.[17,22] Regardless of name, they aim to contextualise the simulation and replicate the real-life environment to:

- reinforce knowledge and concepts introduced in other teaching methods
- provide an opportunity to develop competencies relating to the appropriate discipline
- increase knowledge of wider principles around the skills to be achieved
- introduce awareness of variation, and the ability to deal with variation, from the norm
- develop further skills such as application of knowledge, critical thinking, communication and team-working, resilience, and problem-solving[21]

To date there has been limited evaluation of the development of clinical reporting skills in an academy setting and in particular to consider whether the use of simulation in this environment can assist learning and manage placement capacity issues. A review conducted in 2017 suggested that academy-based radiology schemes had greater structure and the protected environment was seen to improve training quality and enhance the learning experience.[23] This echoes a previous survey of radiology trainees which suggested that academy based trainees experienced more protected time and less service-related challenges.[24] Woznitza[9] used a different model to support the clinical education of a cohort of radiographers in chest radiograph reporting. His centralised model brought trainees together for regular 2-hour tutorials and was also seen to be efficient and helped to build confidence.

The requirements of the clinical skills environment were described by Haraldseid et al[19] as; the physical, psychosocial, and organisational. The environment provides a context for the learning and allows the trainee to associate the task with clinical practice[16,19] and also relates

to the equipment available, the facilities and location. In the context of the academy, this specifically included the availability of reporting workstations and PACS images, the latter being more challenging in a university setting. Psychosocial factors relate to the opportunity for open discussions with tutors and the availability of peer-support. [12,13,19] The relationships between students, tutor and students and the quality of the tutors are critical,[16,19] for the pilot academy this meant the employment of dedicated, credible educators, a fact acknowledged by the trainees. Peer support, learning as part of a team, and not being afraid to make mistakes are significant factors in the development process. This echoes Cuthbertson[8] who identified the 'camaraderie' of the peer group and cooperative-learning as key.

To be effective simulation should have three distinct parts; namely a briefing, the learning activity or intervention, and a debrief or reflection on the experience.[12,15,16,18] Evidence suggests that perhaps the reflection is the most valuable part of the simulation process and is integral to the evolution of critical thinking skills of the trainee.[12,16,18] When used effectively it should also allow the trainee to undertake all four aspects of Kolb's theory around experiential learning so entrenched in health education programmes; namely experience, reflection, conceptualisation, and experimentation.[15,16,25] It is recognised that the use of the reflective element of simulation, and in particular the use of peer-reflection, has a longer term effect on the trainee by allowing them to recall more information than if the activity is just undertaken and not evaluated.[12,16,26] Within the academy there was extensive opportunity for the educators and trainees to reflect upon each other's contributions as a group, dedicated time was given on each day to review activities. A key challenge identified within the pre and post-academy evaluation phases was around report language. Peer learning and sharing of report content throughout their development did lead to greater standardisation, which proved a challenge for some trainees. This appeared to be

exacerbated by variation in the scope of practice of radiographers at the different hospital sites. This project, and the university academic programme, encompasses both trauma and non-trauma pathologies, however many organisations still limit radiographers to reporting only trauma radiographs.[8,27-29] This mismatch in capability and utilisation led to conflict between trainees and colleagues, but such issues require addressing if more regionalised reporting networks are to become a reality. This issue may also go some way to identify why it was felt there was some disconnect between the university, academy, and clinical departments, trainees felt there were different expectations from each. It may be that the true role of the academy was not fully understood or that further development of the transition between each facet is required.

The cost implications of simulation will inherently impact on the feasibility and its extent of its use. The net benefit must outweigh the cost and this may be hard to quantify as the benefit might relate to a range of stakeholders (such as patients) at a much later date.[13,15,17,18,21] The simulation activities in the radiology academies were seen to enable trainees to develop their capabilities earlier, enabling them to transition to independent practice sooner than hospital-based trainees.[23] Although this was not factored into the review of the radiology academies it is an important outcome and mirrors the experiences of the pilot radiographer academy, which was funded, although the budget was significantly less than any of the radiology ones. It is expected that the academy model can provide value for money, as rather than separate individual clinical mentorship and education sessions, the cohort structure enables efficiencies. This was particularly key for this pilot project as the provision of individual clinical education and mentorship by radiologists and reporting radiographers is an expensive resource, particularly in the face of burgeoning workloads and workforce shortages.[8,9,27] The aspiration for multiprofessional academies[4] will provide an opportunity to

replicate this pilot at scale but the structure may be challenging due to different timescales, development requirements and the need for an associated academic programme for radiographers. Whilst the concept of the academy model appears to have evaluated well, it is important to assess its impact on practice. Future research into how trainees following this route directly compare to traditional training methods is needed to fully assess its potential.

Conclusion

Simulation in health education is an established method of developing clinical skills in a safe and supportive environment. The pilot project aimed to supplement the traditional teaching and mentorship models through the use of an authentic learning environment and extensive peer support and reflection. The concept of providing focussed training away from the workplace protected training time and enabled efficiencies, whist maintaining clinical capacity. It needs to be ensured, however, that the academy model is developed in collaboration with HEIs and clinical departments to ensure that the trainees experience a more streamlined approach to their development.

The academy was initially devised as a collaborative approach workforce development in response to increasing demands. It is envisaged, however, that this initial project could effectively be developed as a reproducible model across a range of health disciplines and specialities and could underpin any future plans for a networked reporting workforce.

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