



## Advanced and extended scope practice of radiographers: The Scottish perspective



I. Henderson <sup>a, \*</sup>, S.A. Mathers <sup>a, b</sup>, J. McConnell <sup>a, c</sup>, D. Minnoch <sup>a</sup>

<sup>a</sup> School of Health Sciences, Robert Gordon University, Garthdee Road, Aberdeen, AB10 7QG, UK

<sup>b</sup> NHS Grampian Health Board, Aberdeen, AB24 2ZN, UK

<sup>c</sup> Department of Radiology, Queen Elizabeth University Hospital, Glasgow, G51 4TF, UK

### ARTICLE INFO

#### Article history:

Received 24 September 2015

Received in revised form

20 November 2015

Accepted 7 December 2015

Available online 28 December 2015

#### Keywords:

Extended scope  
Advanced practice  
Skill mix  
Role development  
Role extension

### ABSTRACT

**Purpose:** The impact of changing roles, skill mix and a shortage of consultant radiologists on the profession of diagnostic radiography is not clearly understood in Scotland although the anecdotal perspective suggests the situation in many areas does not equate to that of England.

**Method:** A questionnaire survey was administered to 'lead diagnostic radiographers' across all Health Boards in Scotland and this was supplemented with telephone interviews.

**Results:** The implementation of skill mix initiatives and particularly advanced/extended scope practice was found to be geographically variable with limited evidence of change in some areas. Lack of effective funding and backfill for training was found to be a major barrier to change, although it was also acknowledged that opposition from some professional groups could be a major factor.

**Conclusion:** Although there is some optimism and evidence of accelerating change, development of the radiographic workforce in Scotland does not in general compare favourably to the findings of Price et al., in 2007. The reasons are multi-factorial including fiscal, professional and geographical elements.

© 2015 The College of Radiographers. Published by Elsevier Ltd. All rights reserved.

### Introduction

Healthcare imperatives in Scotland align with the rest of the UK in terms of demographic change and the challenges of achieving cost effectiveness. Health policy in Scotland is fully devolved from the rest of the UK, therefore the evolution of practice generally and diagnostic radiographic practice specifically, cannot be assumed to mirror that of England.

Evolution of radiographic practice has been a consistent feature of the profession historically, with examples and documented commentary appearing at least 50 years ago, influenced by a range of factors.<sup>1–5</sup> Skill mix and role changes are prominent features of health policy development<sup>6–8</sup> and despite evidence of service enhancement,<sup>9–12</sup> such change has led to a patchy and often incoherent implementation, based as often on professional preference or opposition, than service need or evidence.<sup>13–17</sup> Workforce development and allocation of resources in Scotland, has resulted in a notably different environment.<sup>18–20</sup>

Relevant literature is predominantly UK wide with limited Scotland specific data. Notably however, McKenzie et al., exploring radiographer performed barium enemas, reported low rates of participation in Scotland.<sup>21</sup> In 2002, Price et al.<sup>22</sup> again identified comparatively low participation rates in a study of 'the extent and scope of changes to radiography practice'. More recently, lower participation rates were identified in Scotland<sup>13,23</sup> where seven (out of twelve) Health Boards in Scotland had radiographers undertaking diagnostic image reporting, compared with ten (out of ten) English regions.

A scoping exercise was undertaken to initiate a Scottish evidence base, inform service development and provide a comparator with other health systems.

### Aims

- Profile extended or advanced scope practice in diagnostic radiography across Scotland.
- Identify strategic and demographic features influencing the development of radiographer roles.
- Identify features or barriers that impact on development of radiographer roles.

\* Corresponding author. Tel.: +44 01224263362.

E-mail address: [p.i.henderson@rgu.ac.uk](mailto:p.i.henderson@rgu.ac.uk) (I. Henderson).



**Table 2**  
Roles undertaken by radiographers as described by respondents.

Roles	No. of practitioners
Departmental audit	159
Part of advanced trauma life support/resus team	2
Perform intravenous injection cannulation	152
Supplementary prescribing	1
Contracted research role greater than 0.2 wte	0
Contracted clinical education role above 0.2 wte:	
Undergraduate students	74
Post-graduates	18
Assistant practitioners	32
CPD for radiology dept staff	67
CPD for radiology SPRs	9
Others: including medical students, nurses.	24
Radiographer led <sup>a</sup> IVU	11
Reporting IVU's	0
Radiographer led <sup>a</sup> CT scans	5
Reporting CT scans	0
Radiographer led <sup>a</sup> MRI	0

<sup>a</sup> Radiographer led means radiographers complete that type of procedure within a given protocol without radiologist input during the examination.

undertaken by reporting radiographers (Table 5). There is a wide scope of practice underway, though in some areas there are only single instances, eg. barium swallow, CT brain and stroke, chest.

A variety of reasons were given for radiographers taking on reporting:

*'after a radiography review (radiographers) suggested reporting as there was no radiologist on site..... we wanted a piece of paper to say we were doing it legitimately' (47,RR). And; 'in the beginning it was a fight as there was a lot of resistance, but finally the radiographer was able to do the course with rigorous controls put in place that are still adhered to, despite being in place for a number of years' (103,U).*

**Evidence of service improvement**

Firm evidence of service improvement was seldom described, however; *'our bone age waiting times were sometimes 2–3 months, now it is done in 2-3 days' (20,U)*. Comments were mainly anecdotal; *'anything that speeds up treatment and diagnosis must improve the quality of care' (47,RR)*. And; *'carrying out IV injections makes the throughput faster, less hanging around for the patient as you wait for a radiologist' (108,U)*.

Others were more forthright; *'without advanced practice the service would not have been able to cope, we just wouldn't have been able to deliver a service at all' (103,U)*; *'developing the skills of radiographers absolutely gives you more capacity, we are very cost effective and as long as they [radiographers] have proper training and adequate support for the role it gives patients access to a service and diagnosis, and the care they require' (57,RR)*.

*'Advanced practice' was described as; 'increasing job satisfaction and staff morale' (21,R)*. One interviewee stated; *'thoroughly enjoying being able to report and having the confidence to report, broadens the outlook and increases your standing in the hospital (47,RR)*. Another added; *'I do feel they respect me when they come and ask me and we look at films together' (27,RR)*. It was suggested advanced practice; *'had sharpened our practice because taking the responsibility [for the image] inevitably makes sure you are looking at things properly' (27,RR)*. It was also suggested that advanced practice is not for everyone; *'not all radiographers want to take on the added responsibility' (57,RR)*, but; *'the presence of advanced practice does aid retention of staff if there are training and role development opportunities' (57,RR)*.

**Table 3**  
Type of provision and methods of sonographer<sup>a</sup> reporting as reported by respondents (n = 40). Missing values indicate non response.

Type of report procedure used	Type of ultrasound examination														
	Early pregnancy	Obstetrics	Nuchal thickness	Neonatal head	Gynaecology	Abdominal	Transrectal	Small parts	Vascular	Musculoskeletal	Cardiac	Breast examinations	Contrast	Nerve blocks	Other
Ares in which a service is provided	9	15	8	4	20	0	0	16	15	5	0	2	0	0	3
Sonographer completed form or tick chart										1		1			
Sonographer completed form or tick chart verified by another e.g. radiologist	2	3	2	1	1		1	1	1						
Sonographer completed form or tick chart verified by sonographer															
Sonographer generated free text report verified by another e.g. radiologist	5	4	4	2	16	17	13	13	4	4	1	1			2
Sonographer generated free text report verified by the sonographer															

<sup>a</sup> In the context of this survey, sonographers are defined as radiographers who have a postgraduate qualification to perform ultrasound.

**Table 4**  
Number of departments where radiographers with a formal postgraduate reporting qualification produce written reports independent of a radiologist<sup>a</sup> (n = 40).

Area of reporting	No. of sites			How many radiographers?	Radiologist independent?
	NO	N/A	YES		
Appendicular skeleton radiographs	23		10	15	9
Axial skeleton radiographs	23		8	13	7
Chest radiographs	29		1	1	1
Abdominal radiographs	29		1		
Breast imaging	21		3	5	2
IVU	24				
Paediatrics	26		2	5	1
Bone densitometry (DEXA)	21		2	2	1
Barium meal	24	9			
Barium swallow			1		
Barium enema			6	7	
Venography	22				
Micturating cystography					
Proctography					
Any other conventional radiography or fluoroscopy areas (please state)			2	6	2
CT Brain Trauma			1		
CT Brain Stroke			1		
CT other (please state)					
MRI IAMs					
MRI knee					
MRI spine (disc problems)					
MRI other (please state)					
e.g. Orbits check for pre MRI IOFB					

<sup>a</sup> Radiologist independent means without radiologist confirmation of image content, but with radiologist to consult if necessary.

#### Other roles

Six sites described radiographers taking on roles previously carried out by groups such as nurses and doctors. These included a fracture liaison service; palatograms and urodynamics; US guided neck FNAs, stereotactic breast biopsies; ultrasound examinations of the breast; breast care previously provided by nurses.

#### Professional liaison

Participants were asked which professional groups had supported or obstructed developments (Table 6). Whilst radiologists are most likely to obstruct the development of radiographer roles, particularly into advanced practice, they are also more likely than not to support such developments. Resistance from radiologists was described; 'part of the argument against it was if they give reporting duties it would take some of the work away from radiologists and negate the argument for having another radiologist to support the service' (21,R).

Advanced practitioners see their role differently; 'reporting radiographers are really there as a support for radiologists aren't they?' (47,RR). One added; 'there is a financial issue here. Reporting radiographers are much cheaper than radiologists and if they can do

the basic reporting it frees up the radiologist to take on more advanced techniques such as those in interventional radiology' (47,RR).

Another suggested; 'a bit of professional protectionism goes on as we extend our roles into things normally done by radiologists and is still in some areas resisted' (57,RR). 'I think it is more difficult for radiographers to extend their role possibly because doctors, Consultant surgeons/physicians possibly have a different relationship with nursing staff than consultant radiologists have with radiographers who many see as more technicians rather than clinicians' (57,RR). It was acknowledged that times and thoughts may be changing; 'there seems to be more willingness for recognition that radiographers could possibly contribute to an increase in service delivery' (27,R).

Participants were asked if having a radiographer in an advanced practitioner role made a difference to other staff. Benefits were indicated; 'especially in rural hospitals where there was little budget or opportunity for training' (21,R). 'Advanced practitioner 'mentorship' for the rest of the staff was especially beneficial for newly qualified radiographers'. (47,RR). 'As I was a trained reporting radiographer I was able to do a red dot course right here. If I report on another radiographer's film, I may not be able to report it because it is not a good lateral or AP; a training opportunity exists to improve the quality of imaging within the department' (47,RR).

**Table 5**  
Procedures in which radiographers report images and the approximate percentage of total workload they carry out.

Procedural reporting	Yes	<25%	26-50%	51-75%	>75%
a Fluoroscopic GI procedures	4	1		1	1
b GI procedures with CT					
c US procedures	16	1	1	6	5
d Adult MSK radiography reporting	6	4	2		
e Adult chest radiography reporting	1	1			
f Paediatric MSK radiography reporting	3	3			
g Paediatric chest radiography reporting					
h Abdominal radiography reporting					
i CT reporting	1				
j MRI reporting					
k Other area of reporting	3	1			2

**Table 6**Staff groups who promoted and/or obstructed extended and advanced practice for radiographers ( $n = 40$ ).

	Radiographer	Radiologist	Local Dept manager	Health board manager	Other
<b>Extended scope practice</b>					
Promoted	18	6	10	2	1
Obstructed	0	5	1	0	2
<b>Advanced practice</b>					
Promoted	18	14	11	0	3
Obstructed	1	8	0	1	3

It was stated that radiographers made a difference to service delivery 'clinicians here can make a definitive diagnosis without waiting for a radiologist report; our GP run hospital relies heavily on me giving a report' (47,RR).

#### Four tier workforce<sup>8</sup>

##### Assistant practitioners

40% ( $n = 16/40$ ) of sites employed assistant practitioners. Data relating to this role is not however included in this discussion.

##### Practitioners

The greatest proportion of diagnostic radiographers is employed at practitioner level. Their numbers, bandings and duties carried out are described in Table 7. In respect of image commenting, seven sites provide this and four have future plans to implement.

##### Advanced practitioners

Twenty five respondents described having advanced practitioners employed at band 6-8b (Table 8). When asked if these radiographers held a postgraduate qualification one site said radiographers with this title were lead CT radiographers and another did not know if they had a postgraduate qualification.

Fishers exact test was employed to compare the implementation of advanced practice between urban and remote and rural sites. No significant difference was demonstrated ( $P = 0.761$ ).

Less than a third of skeletal reporting is non-A&E and there is a wide variation in the grading of the radiographers carrying this out. Interviewees noted; 'Some are carrying out advanced practice, but not being recognised or remunerated for it' (20,U). And; 'I am a very busy reporting radiographer, I am paid at a Band 6, it is really disheartening. This has been challenged, but still not resolved' (47,RR).

Variation in grading was attributed to two causes: 'There has been a big problem with Agenda for Change. It was supposed to look at the individual roles and reward people for the work they do not what their job title is. And; 'Affluent boards can afford to set their bandings high to attract and retain good staff while Boards who are strapped for cash under-band to keep their costs low (57,RR).

**Table 7**

Tasks carried out by radiographers at practitioner level.

Practitioners as defined by the Society of radiographers (UK) 4-tiered career framework					
Radiographers participating in the following radiographic practices	NO	YES	Number	AfC banding	If no, have plans to implement?
a) Red dot scheme		31	185	Band 5-8a	
b) Initial commenting	4	7	21	Band 5-8a	4
c) Routine rotation into CT	13	13	111	Band 5-8	No
d) Routine rotation into MRI	21	3	15	Band 6-7	No
e) Intravenous cannulation	14	13	88	Band 5-8	No
f) Fluoroscopic examinations such as ERCP's	16	9	62	Band 5-8a	No
g) Other: DEXA (no details provided)					

They also reported; 'despite training radiographers to carry out advanced roles – these are not currently used, as advanced practice is not written in their job description so they are not banded to carry out the duties, so we can't use their abilities' (57,RR).

##### Consultant radiographers

Two respondents described having a Consultant radiographer; one in the field of trauma imaging and another in ultrasound. A breast imaging centre stated they had a radiographer 'carrying out the duties' of a consultant, but not so titled. These radiographers were employed at bandings 8b and 8c. A further two stated that to employ at this level was a strategic objective and the posts would be in the area of trauma imaging.

##### Education and training

21% ( $n = 8$ ) of respondents had a training budget specifically for radiographers. None had employed a radiographer within the past five years who possessed a postgraduate qualification in an advanced practice area that had been unable to use their skills. Two sites identified that they had trained radiographers to a post-graduate level and then were unable to use their skills. This was mainly due to issues of mentoring and supervision, and resistance from radiologists. It was not only the lack of a training budget that was problematic; 'there is never enough money for backfill' (57,RR). This comment was echoed on a number of occasions; 'limited budget and no backfill' (21,RR).

##### Access to education and training

Respondents were asked to describe how radiographers accessed post qualifying training to support advanced practice (Table 9). Additional means were also given including use of professional journals and professional update courses. In addition to formal education through the higher education sector, the predominant sources of training are e-based or in-house.

##### Barriers to education and training

Barriers participation in post qualifying training (Table 10) are mixed. Although budget, backfill and pay protection issues are most

**Table 8**  
Radiographers at advanced practitioner LEVEL were reported as carrying out the following tasks.

Advanced practitioners as defined by the society of radiographers (UK) 4-tiered career framework				
Areas of advanced radiographic practice in which they work	No	Yes	Number	AfC banding
a) Trauma imaging	5	7	32	6-8b
b) Gastro-intestinal imaging	7	6	9	7-8b
c) General diagnostic ultrasound	3	12	30	7-8a
d) CT	5	8	21	6-8b
e) MRI	8	3	4	6-7
f) Breast imaging	4	8	12	6-8a
g) Interventional procedures	5	4	2	7
h) Other: DEXA (no details provided)				
Advanced practitioners reporting images in the following areas of practice				
	No	Yes	Number	AfC banding
a) Reporting of appendicular skeletal images (A&E referred)	10	9	12	6-7
b) Reporting of axial skeletal images (A&E referred)	11	7	10	6-7
c) Reporting of chest images (A&E referred)	16	1	1	7
d) Reporting of abdominal images (A&E referred)	17			
e) Reporting of appendicular skeletal images (non-A&E)	15	1	4	7
f) Reporting of axial skeletal images (non-A&E)	15	2	4	7
g) Reporting of chest images (non-A&E)	16	1	1	7
h) Reporting of abdominal images (non-A&E)	17			
i) Reporting of CT images	14	1	1	7
j) Reporting of ultrasound images	5	15	23	7-8a
k) Reporting of fluoroscopy images	10	6	7	7-8a
l) Reporting of MRI images	14			
m) Reporting of breast images	14	2	4	7
n) Other: DEXA		1	2	7

significant, there is a fairly even spread in other categories. Notably however are difficulties associated with lack of interest, lack of support from radiologists and 'mismatch' with the service model. Rural or community location of sites, mixed support for radiographers for certain areas of extended or advanced practice and low staff morale were also identified. Three sites had withdrawn advanced practice after implementation. This was due to prioritisation of radiologist training needs; fall in demand for relevant examinations and replacing a reporting radiographer at retirement with a radiologist.

#### Departmental CPD

Respondents described the CPD activities available for staff in their departments (Table 11). The role of staff meetings in providing development is notable along with study day participation and in-house delivery. Also common were practice audits and use of e-Learning for Healthcare. Journal clubs and participation in research showed least uptake. Fifteen sites included assistant practitioners in their CPD sessions.

#### Service delivery

##### Provision of image reporting

Eight respondents (21%) contracted with an external company to provide reporting. These included conventional imaging ( $n = 5$ ); MRI ( $n = 1$ ); general CT ( $n = 1$ ) and head CT ( $n = 1$ ).

**Table 9**  
Sources of post-qualification education to support advanced practice.

Method of education	Yes	No	Don't know
a) In house	23	5	3
b) University attendance	23	6	1
c) University e-learning	14	7	6
d) Independent education sector	4	12	6
e) College of Radiographers e-learning	18	5	5
f) NHS e learning for healthcare imaging modules	18	5	4
g) Independent e-learning	5	5	6

##### Unreported images

Four sites had images unreported that should have received a report within a clinically appropriate timeframe. These included OPTs, operative cholangiograms, and some conventional images. Respondents were asked if areas of referral existed where it was formally agreed that certain images could be left unreported. Respondents identified dental images ( $n = 3$ ); orthopaedic images with orthopaedic surgeons interpreting follow up images ( $n = 1$ ); conventional imaging ( $n = 1$ ) and intra-operative imaging interpreted by an attending consultant ( $n = 1$ ).

##### Waiting times

The patients' wait from referral to examination (Table 12) indicates that the majority of examinations are undertaken within two weeks of referral, whether from GP or clinic. Waits for ultrasound, CT and MRI examinations are significantly longer in a number of sites with some waits of up to nine weeks.

The wait from examination to report (Table 13) identifies a high number of sites in which the time taken for report turnaround is in excess of a week, with some taking up to nine weeks.

It should be noted that this data provides only a snapshot in time and therefore may be subject to some variation.

**Table 10**  
Barriers to post-qualification education as described by responders (NB: Respondents were not limited to one statement).

Barrier	Yes	No
a) Lack of supervisors or mentors	16	8
b) Lack of training budget	23	5
c) Problems with backfilling post	27	2
d) Access to courses	15	9
e) Non-relevant content	10	7
f) Lack of interest by radiographers	12	13
g) Lack of support from radiologists	16	7
h) Does not fit with radiology service model	16	3

**Table 11**

Availability of CPD activities to radiographers in Departments (NB: Respondents were not limited to one statement).

Type of CPD activity	Yes	No
a) Staff meetings	34	6
b) Journal Clubs	7	24
c) Evidence based practice sessions to review department approaches	13	15
d) External study day attendance	34	4
e) External award based course attendance	17	10
f) Participation in multidisciplinary team meetings	19	12
g) Practice audits	30	6
h) In house teaching sessions	32	4
i) NHS e learning for health imaging modules	29	3
j) Participate in research leading to paper or presentation	9	15

## The future

There was an optimistic feel about the future of extended/advanced practice in Scotland. In general; *'we just have to keep on knocking on doors and hopefully we will have someone with advanced skills in this department in the near future'* (123,RR). The National Delivery Plan<sup>27</sup> was described; *'as focussing the mind'* (21,R) and has potential in providing funding for training radiographers in reporting, but a reservation was voiced; *'we can't all of a sudden introduce this without the planning behind it. I would reckon it takes 3–4 years for a radiographer to be fully trained in reporting'* (20,U).

It was suggested that newly qualified radiographers see their future differently; *'Radiography staff are changing ... they are not content to stay in the same job ... they want to expand their knowledge and skills in the profession and see what else they can do with their knowledge'* (47,RR).

Participants from remote hospitals described problems with IT across Health Boards hindering a joined up imaging service; *'we have separate referral systems and although we are all PACS, we don't see their referral proforma or their reports'* (47,RR).

## Discussion

The results present a diverse and sometimes contradictory picture of practice across the sample and some of the messages probably align with common assumption. The scenario is one of variable activity and recognition for that activity. There are pockets of quite specialised practice, although a number of these appear to be on a very limited scale. The general sense is one of inconsistent implementation geographically, despite a fairly consistent message in health policy terms. No significant difference was demonstrated

in the introduction of extended/advanced practice between urban and remote and rural sites.

## Practice

The development of radiographer roles shows predictable patterns with high levels of participation in areas such as IV injection or audit. Image abnormality flagging is common, however implementation of initial image commenting is not as widespread as might have been expected, given the lack of 'technical' controversy.

In conventional imaging there is evident development of roles where reporting of skeletal imaging occurs in a wide range of settings. It is notable that a considerable majority of this is A&E, with non-A&E forming less than 33% of the whole.

An additional feature is the variation of AfC bandings demonstrated for reporting radiographers. Notable is the number of reporting radiographers at AfC band 6, despite the definition of reporting as an advanced practice by the professional body.<sup>8</sup> This may reflect the fiscal pressures in the environment, however it may act as a disincentive.

## Barriers

The barriers to evolving roles are multi-faceted. Fiscal pressures restrict developments in a number of ways including frequently, the lack of training budget. In addition, there are issues associated with access to postgraduate training, many of which are related to geography despite the availability of e-learning postgraduate courses with no requirement for attendance.

Professional resistance to change or protectionism, is apparent across a range of healthcare disciplines where workforce change is being advocated. It cannot be ignored that one of the major barriers is the lack of support, or indeed direct opposition to change from other professionals, most notably the radiology profession. In addition to reported resistance, it is interesting to note that there is also evidence of a conflict in priorities where it is seen that the perceived training needs of radiologists may impact on the implementation of radiographer reporting and in one instance a retiring radiographer replaced by a radiologist, presumably at extra cost.

One interviewee suggested that in radiography, the relationship between radiographers and radiologists may be different. There may be historical reasons for this, though technically there is no rationale for a group of professionals to claim rights over the practice of another.

**Table 12**

Approximate waiting time from referral to examination of non-emergency or cancer related cases (NB: Not all participants provided data).

	GP referral			Clinic referral		
	Radiography	General US	Barium studies	General US	CT	MRI
Immediate/same day	7	8	3	8	5	3
Walk in service	0	0	0	0	0	0
<1 week	11	1	1	1	0	0
1–2 week	7	3	4	3	3	1
2–3 weeks	1	0	1	1	2	0
3–4 weeks	0	2	0	2	0	2
>4 weeks	0	7 <sup>a</sup>	4 <sup>b</sup>	5 <sup>c</sup>	4 <sup>d</sup>	2 <sup>e</sup>
Other	1					

<sup>a</sup> Range 5–9 weeks.

<sup>b</sup> Range 7–9 weeks.

<sup>c</sup> Range 7–8 weeks.

<sup>d</sup> Range 8–9 weeks.

<sup>e</sup> Range 8–9 weeks.

**Table 13**

Approximate waiting time for report return to referrers for non-emergency or cancer related referrals (NB: Not all participants provided data).

	GP referral			Clinic referral		
	Radiography	General US	Barium studies	General US	CT	MRI
Immediate/same day	3	1	1	1	0	0
Walk in service	0	2	1	2	0	0
<1 week	8	7	4	8	3	1
1–2 week	8	2	2	2	3	1
2–3 weeks	3	1	1	1	4	3
3–4 weeks	1	0	0	0	0	0
>4 weeks	2 <sup>a</sup>	2 <sup>b</sup>	2 <sup>c</sup>	2 <sup>d</sup>	1 <sup>e</sup>	1 <sup>f</sup>
Other	2	1	0	1	0	0

<sup>a</sup> Range 7–9 weeks.<sup>b</sup> Range 4–8 weeks.<sup>c</sup> Range 6–8 weeks.<sup>d</sup> Range 4–8 weeks.<sup>e</sup> Range 7–8 weeks.<sup>f</sup> Range 8–9 weeks.

### Education

Prevalent sources of training are in-house, study day and university provided options. It is significant that e-learning programmes are also commonly in use. In the case of university based education, postgraduate award bearing courses are significant, providing transferable qualifications not attainable through other means. Strategies to support professional development are variable and the relatively low incidence of research activity is notable, though the opportunities to initiate and pursue meaningful research are inevitably limited by opportunity in many locations. Journal clubs also appear to be less popular which raises the question of whether this may be an indication of perceived relevance to clinical practice.

### Service delivery

There are a number of features influencing service delivery. Notably, waiting times for both examinations and reports where it is seen that there are waits of up to nine weeks for some examinations, failing to comply with the Scottish Government's standard of six weeks for Barium studies, CT and MRI scans.<sup>18</sup> For report turnaround, the picture is perhaps even more disturbing. Considered in the wider sense, it is evident that in some cases, waiting times for examinations are excessive and the return of reports compromises the diagnostic value of many examinations.

These data indicate anomalies in service delivery that could be related to resourcing or workforce deployment, leading back to the issue of staffing and skill mix. In 2014 the Royal College of Radiologists (RCR) identified a shortage of radiologists in England and the same situation seems evident in Scotland.<sup>28</sup> The RCR paper describes a means for developing a new service model which acknowledges that 'reporting of some images by radiographers is already an established part of service in most UK radiology departments'. Read in conjunction with the College of Radiographers (CoR)/RCR 'team working' document of 2012,<sup>16</sup> this should be seen as encouraging to both radiographers and radiologists in highlighting what can be achieved if both work together to improve service delivery. Notably, at the CoR Managers Conference in 2015 Cavanagh, a radiologist, stated that radiographers should be reporting on all conventional images (reported in Synergy magazine, June 2015).

### Conclusion

This is the first study carried out to identify the spectrum of diagnostic radiographic practice across Scotland. Limitations are acknowledged related to response rate and some aspects of how data was returned. The quantitative and qualitative elements

together however, provide a useful profile of activity, perspectives and practices across Scotland.

The primary messages are:

Implementation of advanced and extended scope roles is variable and compared with Price et al.,<sup>13</sup> Scotland continues to lag significantly behind much of England.

The predominant extended role is conventional image reporting. In the context of practice in England<sup>13</sup> the potential to develop into more specialist roles remains to a significant extent untapped.

Barriers to development are often fiscal or workforce related, however access to appropriate training is also an issue, both geographically and in terms of suitable courses. Additionally, despite the findings of Forsyth and Robertson,<sup>15</sup> the radiological community is ambivalent in its support of radiographers, in cases exerting undue influence over the deployment of radiographers.

Nevertheless, change is occurring and there is evident optimism for the future amongst many respondents, though the rate of change will be linked to changing attitudes and the changing clinical environment.

### Conflicts of interest statement

None

### Acknowledgements

The authors would like to acknowledge the cooperation and efforts of those who took part in the study and funding from the College of Radiographers Industry Partnership (CoRIPS) grant number 080 that enabled this work to take place.

### References

- Shanks SC. The duties of radiographers in special radiological examinations. *Radiography* 1965;**31**:172.
- Manners AR. Must radiologists do all the reporting? *BJR* 1976;**49**:97.
- College Of Radiographers. *Reporting by radiographers: a vision paper*. 1997. CoR.
- Price RC, Le Masurier SB. Longitudinal changes in extended roles in radiography: a new perspective. *Radiography* 2007;**13**(1):18.
- College of Radiographers. *Medical image interpretation and clinical reporting by non-radiologists: the role of the radiographer*. 2006. CoR.
- College of Radiographers. *A strategy for the education and professional development of radiographers*. 2002. CoR.
- Woodford AJ. An investigation of the impact/potential impact of a four-tier profession on the practice of radiography: a literature review. *Radiography* 2006;**12**:318.
- College of Radiographers. *Education and career framework for the radiography workforce*. 2013. CoR.
- College of Radiographers. *Role development revisited: the research evidence*. 2003. CoR.



10. Coleman L, Piper K. Radiographic interpretation of the appendicular skeleton: a comparison between casualty officers, nurse practitioners and radiographers. *Radiography* 2009;**15**(3):196.
11. Culpán DG, Mitchell S, Hughes M. Double contrast barium enema sensitivity: a comparison of studies by radiographers and radiologists. *Clin Radiol* 2002;**57**:604.
12. Brearley S, Scally A, Hahn S. Accuracy of radiographer plain radiograph reporting in clinical practice: a meta-analysis. *Clin Radiol* 2005;**60**(2):232.
13. Price RC, Edwards H, Heasman F, Herbland A, Le Masurier S, Miller L, et al. *Scope of Radiographic Practice*. University of Hertfordshire; 2008.
14. Snaith B, Hardy M. Radiographer abnormality detection schemes in the trauma environment: an assessment of current practice. *Radiography* 2008;**14**(4):277.
15. Forsyth LJ, Robertson EM. Radiologist perceptions of radiographer role development in Scotland. *Radiography* 2007;**13**:51.
16. Royal College of Radiologists and College of Radiographers. *Team working in clinical imaging*. 2012. RCR, CoR.
17. Royal College of Radiologists. *Skills mix in clinical radiology*. 1999. RCR.
18. Scottish Executive. *Our national health: a plan for action, a plan for change*. 2001. Scottish Executive.
19. Scottish Executive. *Building on success: future directions for the allied health professions in Scotland*. 2002. Scottish Executive.
20. NHS education for Scotland. *Role development for radiographers, assistant practitioners and support workers: national scoping report*. 2004. NHS Education for Scotland.
21. McKenzie GAS, Mathers S, Graham DT. An investigation of radiographer-performed barium enemas. *Radiography* 1998;**4**(1):17.
22. Price RC, Miller LR. Longitudinal changes in extended roles in radiography. *Radiography* 2002;**8**(4):223.
23. Snaith B, Hardy M. *Radiographers reporting of trauma images: evaluation of practice in the United Kingdom*. Application 001, Snaith; Radiographer reporting paper, [www.sor.org/about-us/awards/corips-research-awards](http://www.sor.org/about-us/awards/corips-research-awards); 2010 [accessed July 2012].
24. Arthur S, Nazroo J. Designing fieldwork strategies and materials. In: Ritchie J, Lewis J, editors. *Qualitative research practice: a guide for social science students and researchers*. London: Sage; 2009. p. 136.
25. Ritchie J, Lewis J, Elam G. Designing and selecting samples. In: Ritchie J, Lewis J, editors. *Qualitative research practice: a guide for social science students and researchers*. London: Sage; 2009. p. 81.
26. Pope C, Zeibland S, Mays N. Qualitative research in healthcare. Analysing the Data. *Br Med J* 2000;**320**:114–6.
27. The Scottish Government. *The national delivery plan for the allied health professions in Scotland*. 2012. The Scottish Government.
28. Royal college of radiologists. *Clinical radiology UK workforce census*. London: RCR; 2014.