

An investigation into the clinical scope of practice of MRI reporting radiographers within the United Kingdom



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ABSTRACT

Introduction: Radiographers have been reporting Magnetic Resonance Imaging (MRI) examinations for over ten years, and there is an increasing body of evidence confirming the efficacy of this role expansion. However, little is known about the clinical scope of practice of radiographers undertaking this enhanced level of practice. The aim of this study was to investigate the clinical scope of practice of MRI reporting radiographers within the United Kingdom (UK).

Methods: MRI reporting radiographers who are actively reporting within the UK were invited to participate in a short online survey investigating the anatomical areas reported, clinical referral pathways and onward referral practices they routinely undertake. The survey was distributed via social media channels with snowball sampling encouraged.

Results: There were $n = 14$ responses received, with an estimated response rate of 21.5%. The majority (93% $n = 13/14$) practised in England, with one response from Scotland. All participants ($n = 14/14$) undertook reporting of general practitioner (GP) and community healthcare practitioner's referrals, with 93% reporting for outpatient referrers. There was statistically significant variation in the anatomical areas reported when compared against those qualified less than two years and those qualified over ten years ($p = 0.003$). No other statistically significant variation was seen.

Conclusion: There was no statistical difference in the implementation of MRI reporting by radiographers identified. All participants indicated reporting for GP and community healthcare practitioner referrers which align well with the implementation of community diagnostic centre rollout across the UK.

Implication for practice: This is believed to be the first study of its kind in the realm of MRI reporting. The study has suggested that MRI reporting radiographers are well placed to contribute to the rollout of community diagnostic centres within the UK.

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Introduction

Magnetic resonance imaging (MRI) is increasingly being used in the imaging, diagnosis and management of a range of conditions. It is estimated that 0.32 million MRI examinations were performed in the United Kingdom (UK) in the 2021–22 financial year,¹ with

increasing demand seen over the last ten years.² This increasing service demand comes with a corresponding increase in demand for the reporting of these examinations. The Royal College of Radiologists (RCR) have identified a 29% current shortfall in the radiology workforce, with a forecasted 39% shortfall by 2026.³ The result of these two pressures may affect the quality of patient care.⁴

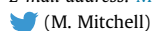
Recent years have seen a re-evaluation of the roles and skills mix of diagnostic radiographers⁵ with increasing numbers of radiographers undertaking reporting roles in response to local service needs.⁶ Although plain film reporting by radiographers now appears well established in UK clinical practice⁷ similar role expansion within MRI has been slower to develop.

There is increasing evidence that, following suitable post-graduate training and assessment, experienced MRI radiographers can report MRI examinations to a high standard^{8–10} with a later

Abbreviations: ANOVA, Analysis of Variance; AfC, Agenda for Change; AHP, Allied Health Professions; CT, Computed Tomography; HCPC, Health and Care Professions Council; MRI, Magnetic Resonance Imaging; MSK, Musculoskeletal; RCR, The Royal College of Radiologists; SOR, Society of Radiographers; SCOR, Society and College of Radiographers; UK, United Kingdom.

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study comparing radiographer and radiologist reports against an index neuroradiologist¹¹ suggesting that reporting radiographers can report neurological MRI examinations at a comparable level to a consultant radiologist.

Several studies have investigated the number of MRI reporting radiographers in the UK^{12,6} establishing that there are at least $n = 57$ radiographers from $n = 38$ trusts reporting MRI studies in May 2020,¹² with a later survey indicating MRI reporting by radiographers available in $n = 27$ National Health Service (NHS) trusts.⁶ The discrepancy between these two studies is thought to be the result of differing methods as opposed to a drop in the number of departments utilizing radiographer reporting in MRI.

Within other radiographer reporting imaging modalities, there can be considerable variation in the range of clinical practice, which may be due to service development meeting local needs, demands and service provision.¹³ Some authors have attempted to identify the degree of variation within the clinical scope of practice within roles such as Computed Tomography (CT)¹⁴ and plain film reporting.⁷ Lockwood¹⁴ identified that there was some variation in CT head reporting radiographer's scope of practice, particularly around referral to other modalities and agreed referral pathways. Stevens⁷ similarly reported variation in referral to other modalities and agreed referral pathways for plain film reporting radiographers within the west midlands of the UK.

A literature review has indicated that there is no published investigation into the scope of practice of MRI reporting radiographers within the UK. This may be due to the later development of MRI reporting by radiographers¹⁵ as well as the limited number of reporters in practice.¹²

In response to criticism of radiographer reporting,¹⁶ (suggesting that reporting radiographers will likely descriptive reports which do not include clinical judgements) reporting radiographers should adhere to agreed and published standards of reporting which include advice on next steps in management and onward referral.¹⁷

Unlike previous MRI reporting radiographer papers, this paper investigates the clinical scope of practice of MRI reporting radiographers within the UK, investigating anatomical areas reported, clinical referral pathways and onward referral. The study will be using similar methodologies to previous investigations involving different reporting modalities.^{7,14}

Methods

An online survey was constructed utilizing a combination of closed, multi-answer questions and open-ended free text questions. The survey was subdivided into four distinct sections investigating participant demographics, examinations and clinical referral pathways, onward referral and the enablers, barriers and future practice. The study received ethical approval from the author's institutional research and ethics procedures. The approval letter is available in appendix 2.

The survey was piloted by practising MRI reporting radiographers with varied reporting training and scopes of practice ($n = 2$). Responses from the piloted responses led to minor layout changes to the questionnaire. A copy of the final survey can be found in appendix 3.

The expected study population was unknown; a recent study has suggested that $n = 57$ participants were eligible¹²; it should be noted that this study was conducted in 2019–20, and this number is likely to have increased due to the subsequent qualification of further MRI reporting radiographers since 2019. An estimated population of $n = 65$ participants is assumed. The survey was hosted on an online survey platform (Online Surveys (Jisc) 2022, Belfast, UK) with an accessible link distributed via three of the

author's social media accounts (Twitter 2022, San Francisco, USA; Facebook 2022, Menlo Park, California, USA; LinkedIn 2022, Sunnyvale, California, USA). The survey was open to responses between 31st of May 2022 and 30th of June 2022.

The social media posts included a suggestion for individual network dissemination (individual snowball sampling). Participants were assessed for eligibility via the online questionnaire, and consent was provided before the questionnaire could be completed. Participants were only identified through an individually generated participant number, ensuring anonymity. Participants were free to remove consent and request deletion of study data through use of the individual participant number.

At the end of the study period, responses were downloaded for analysis (Microsoft Excel 2022, Washington USA). Descriptive statistics were initially used to investigate the quantitative (closed multi-answer) questions, with inferential statistics (Kruskal Wallis non-parametric test for independent groups¹⁸) used to investigate significant differences between samples. Multiple post hoc tests were also used to identify significant variation between groups within each sample.¹⁹

Responses from the open-ended free text questions were entered into qualitative data analysis software (NVivo 12.6.1 Pro, QSR International 2021, Victoria, Australia) and used to support the discussion of the results.

Results

Survey distribution analytics were available from both Twitter and LinkedIn platforms with a total of $n = 4310$ impressions (Twitter $n = 2943$; LinkedIn $n = 1367$) and $n = 135$ engagements (Twitter $n = 109$; LinkedIn $n = 26$). Analytics for clicks to the survey links was only available via the Twitter platform, with a total of $n = 16$. Detailed analytics as not available from the Facebook platform.

Completed responses were received from $n = 14$ participants. All participants indicated that they were Health and Care Professions Council (HCPC) registered radiographers working in the UK and that clinical reporting of MRI scans was part of their clinical role.

As the true number of MRI reporting radiographers currently in practice in the UK is unknown, a true response rate could not be determined. If a study population of $n = 65$ eligible participants is assumed, a response rate of 21.5% ($n = 14/65$) is estimated.

Demographics

A total of 93% ($n = 13/14$) of participants were from England, with a single participant from Scotland ($7\% n = 1/14$). No responses were received from Wales or Northern Ireland.

Regional representation demonstrated a spread of responses from across England. Most participants were recorded from the southeast of England, northeast England and northwest of England, making up 63% of responses ($n = 9/14$). Fig. 1 shows the distribution for all regions.

Five participants (36% $n = 5/14$) had been qualified in MRI clinical reporting for less than two years, with 21% being qualified between two and four years ($n = 3/14$), 14% qualified between four and six years ($n = 2/14$), 7% qualified six to eight years ($n = 1/14$) and 21% being qualified over ten years ($n = 3/14$). Fig. 2 shows the distribution by the length of qualification.

Most participants were paid at Agenda for Change (AfC) band 7 when reporting (71% $n = 10/14$), with 14% paid at band 8a ($n = 2/14$) and 14% paid at band 8 b ($n = 2/14$).

Half of the participants indicated that their current job title was "reporting radiographer" ($n = 7/14$), with 36% indicating "advanced practitioner" as their current job title ($n = 5/14$). A single

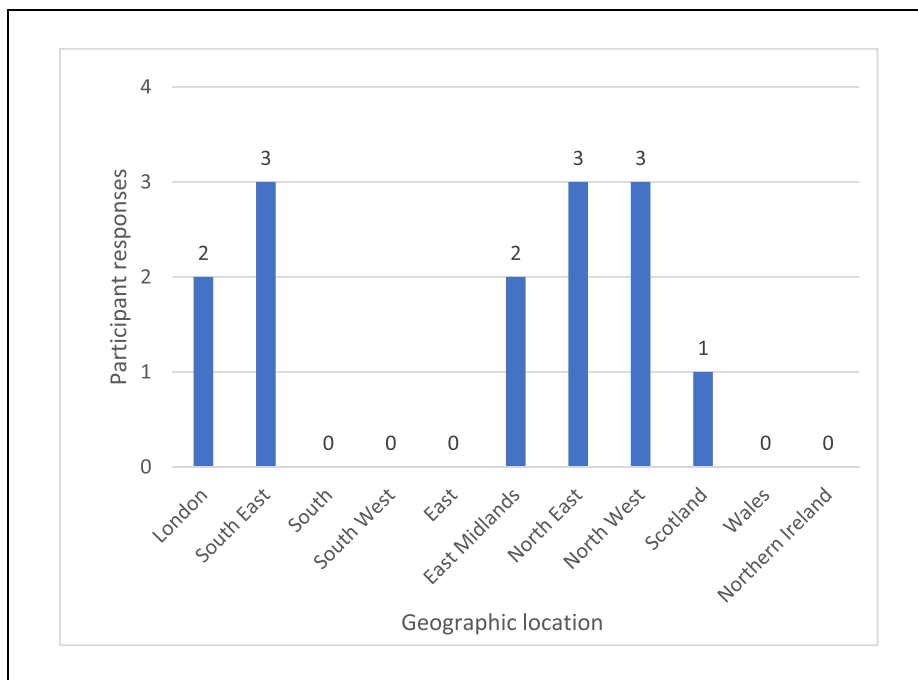


Figure 1. Geographic location of participant responses.

participant identified their job title as “consultant practitioner” and one as an “MRI manager” (7% $n = 1/14$ respectively).

When responding to the highest qualification received by the individual, most participants (71% $n = 10/14$) indicated a post-graduate certificate (PgC) qualification, with 14% indicating post-graduate diploma ($n = 2/14$). A single response was received for Master of Science and Doctorate level qualifications, respectively (7% $n = 1/14$).

Examinations and referral sources

Only one participant indicated that they additionally reported plain film musculoskeletal examinations, and one participant

indicated that they reported plain film orbit x-rays for the exclusion of intra-orbital foreign bodies prior to MRI examinations.

All but one participant indicated that they reported MRI thoracic and lumbar spine examinations (93% $n = 13/14$), with 11 indicating MRI knee examinations in their reporting scope of practice (79% $n = 11/14$). Other reported areas of practice included MRI of the internal auditory meati 50% $n = 7/14$, brain (36% $n = 5/14$), cervical spine (36% $n = 5/14$) and hips/pelvis (7% $n = 1/14$). Additional areas were indicated by a free text “other” response which included two participants indicating sacro-iliac joint examinations and one indicating orbit examinations. Fig. 3 shows the distribution of areas of practice across all participants.

When considering specialties that the participants accepted referrals from, all participants reported referrals from general

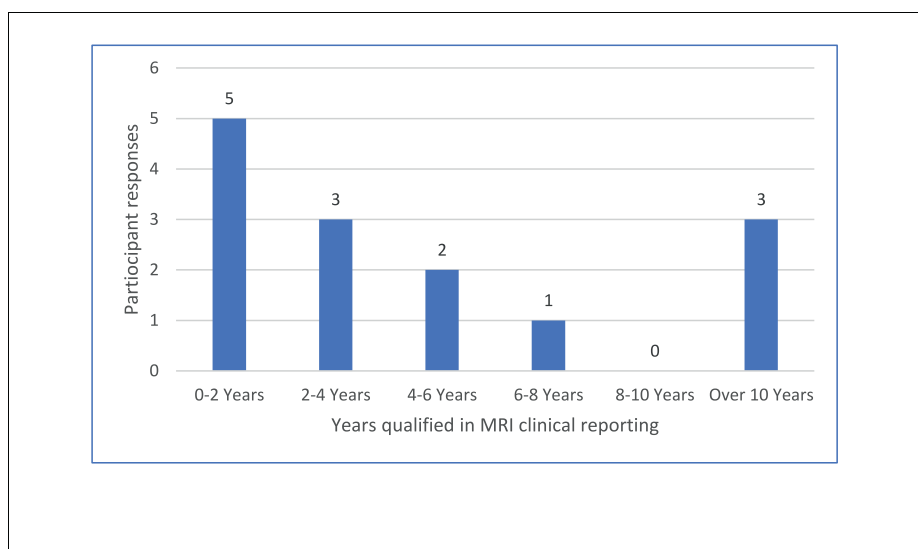


Figure 2. Number of years qualified in clinical reporting.

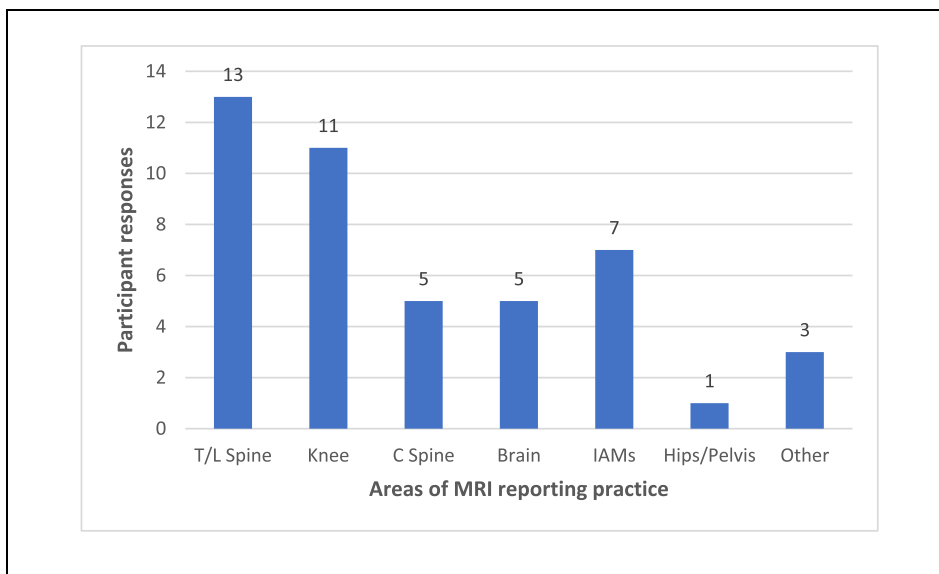


Figure 3. Area of clinical practice.

practitioner and community health care professionals, with only one participant not reporting outpatient consultant referrals. Accident and emergency and inpatient referrals were less commonly accepted as referral sources for the participants. No participants indicated that they reported pediatric examinations. The distribution of specialties who the participants accepted referrals from is given in Fig. 4

Onward referral

Half of the participants ($n = 7/14$) were able to independently refer patients forward for MRI or Ultrasound within their scope of practice with 43% ($n = 6/14$) able to refer for contrast enhanced MRI, 36% able to refer for plain film x-ray examinations ($n = 5/14$) and 14% for CT. No participant was able to refer for nuclear medicine scans independently.

A greater proportion of participants were able to refer for CT (57% $n = 8/14$) and nuclear medicine scans (29% $n = 5/14$) following case discussion with a consultant radiologist.

Onward specialty referral was possible for 71% of participants ($n = 10/14$). Of the four participants who indicated they could not refer to a specialism, one participant added a free text comment

Participant 9 - "I can recommend referral if I report MRI images from GPs/community physio".

Fig. 5 demonstrates the distribution of specialties that the participants were able to refer to.

A comparison was made across the participant groups against responses using Kruskal Wallis non-parametric test for independent groups. In addition to tests of variance against the responses, a further comparison was made between groups to

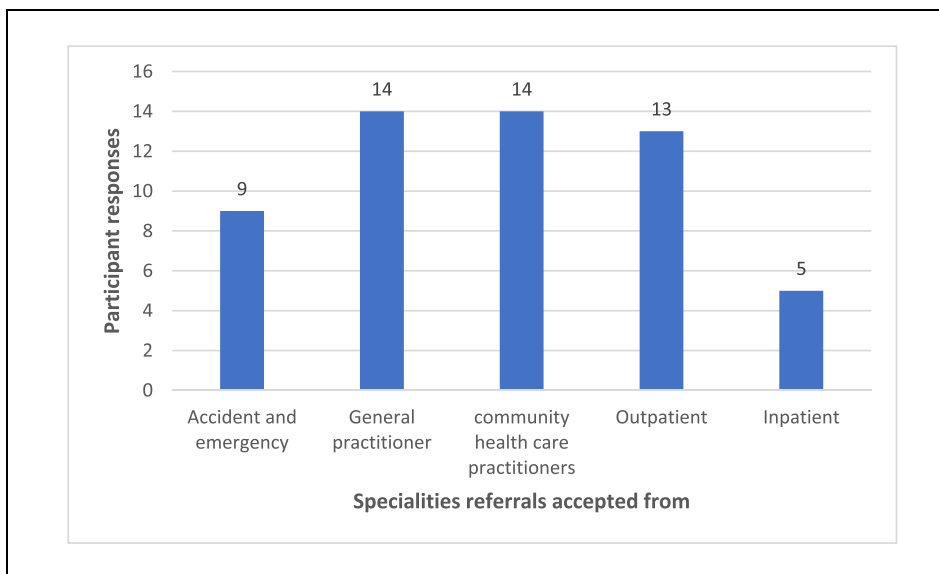


Figure 4. Specialities referrals are accepted from.

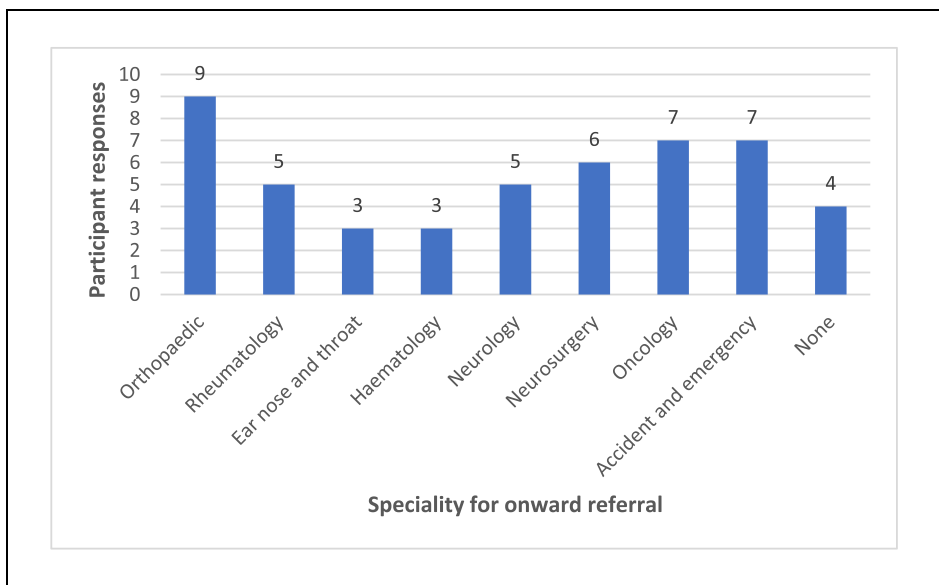


Figure 5. Specialities for onward referral.

identify any areas of variance between individual groups (pairwise comparison).

No statistically significant result ($p < 0.05$) was found for the nine comparisons of groups and responses. Pairwise comparison between groups showed that there was significant variation within the areas of reporting practice for participants who were qualified zero-two years and those who qualified over ten years ($p = 0.003$). No other significant pairwise variance was observed within the other groups or comparators. The results of the statistical comparison can be found in Table 1.

Discussion

The results of this survey indicate that MRI reporting by radiographers is a developing realm of practice with evidence of development across England and Scotland. Statistical Analysis of Variance (ANOVA) between groups of reporters, whether by qualification, geographic region of practice or level of practice showed no statistically significant differences. This is an encouraging finding as it provides confirmation that the reporting of MRI examinations by radiographers provides a comparable service across England and Scotland with no significant variation.

It is recognized by Heales, Mills and Ladd¹³ that variation in clinical practice will likely reflect local reporting pressures and service needs, and this can be seen in this study with some variation in individual practice, such as the single participant reporting hip examinations. This view is further supported by the Framework

Table 1
Statistical analysis of 9 comparators.

Independent Variable	Dependent variable	Kushkal Wallis p. Value
Geographic location	Anatomical area reported	$p = 0.800$
Years Qualified	Anatomical area reported	$p = 0.063$
Years Qualified	Referral pathway	$p = 0.967$
Years Qualified	Imaging modalities referred onward to	$p = 0.956$
Years Qualified	Speciality teams referred to	$p = 0.775$
Qualification	Speciality teams referred to	$p = 0.944$
Region	Years Qualified	$p = 0.611$
Region	Qualification	$p = 0.269$
Job Title	Years qualified	$p = 0.395$

for Advanced Clinical Practice²⁰ which states that advanced practice workforce planning should meet the needs of the local population. This local variation can be observed in the free text responses from the participants:

Participant 6 - “There are some specialist cholesteatoma referrals and dementia clinic referrals asking specifically for a consultant report, which I oblige by not reporting these.”

Participant 2 – when asked about restriction to practice indicated that they reported “non contrast only”.

Participant 13 - “I do not report inpatients, they are all done by the duty radiologist.

A&E lumbar spines are reported by the radiology registrar.”

Some responses did indicate that there were multiple factors which govern the scope of practice, some of which may be reliant on personal choice rather than local need.

Participant 6 – “I self limit myself by not reporting Surveillance MS or specialist dementia heads.”

This self-limitation of practice was not reported by any other participant, however, there were other restrictions to reporting practice identified. It was not clear if these restrictions were due to local service needs, self-limitation or other external factors. The SOR Code of Professional Conduct²¹ and HCPC Standards for Conduct and Ethics²² both state that radiographers should work within the limits of their own skill, knowledge and competence. The self-limiting of practice and minor variations in practice may reflect this expectation at an individual level.

A single statistically significant variation was found between the areas reported of participants who qualified for less than two years and those qualified over ten years. This is not unexpected, given the postgraduate MRI clinical reporting courses available in the UK. It has previously been reported that 96% of MRI reporting radiographers were trained in a single southeast of England university.¹² A typical program structure of this course provides PgC qualification (MRI knee and thoraco-lumbar spine studies) with further post-graduate studies leading to additional reporting areas.^{8,10,11} Some students may undertake individual bespoke modules outside of the

PgC structure. This finding further supports the notion of structured and comparable development of MRI reporting by radiographers within the UK supported by educational providers.

The results demonstrate that the majority of participants reported thoracic and lumbar spine examinations, with a high proportion reporting knee examinations. This links with referrals from general practitioners and community healthcare professionals (such as physiotherapy musculoskeletal clinical assessment services).

The global impact of musculoskeletal conditions affecting the quality of life has risen in recent years,²³ with the global disability burden rising from 2.0% to 6.8% between 2004 and 2012. Recent publications have identified the increasing role specialist physiotherapy musculoskeletal MSK services can have on reducing demand on general practice.²⁴

Community diagnostic centres (CDCs) have been purported to be a solution to the increasing demand for diagnostic services and are a service model which promotes extended/advanced practice roles for allied health professions (AHPs) as well as improved access to diagnostics for the community.^{13,25} The results of this survey suggest that there are already close interprofessional relationships developing between reporting radiographers and community referrers. These interprofessional working relationships are likely to continue or indeed expand with the expansion of CDCs.

The RCR and SCoR recommend that actionable reports should not only provide a diagnosis, including differentials, but should also offer advice on further investigation,^{17,26} including referral to further imaging or specialist opinion. The results of this survey broadly support this recommendation, with 71% of participants able to refer to other specialities and 71% able to refer to at least one other imaging modality. Some participants were able to refer to further imaging for specialist opinion following a discussion with a consultant radiologist; however, one participant indicated that they were unable to refer at all. It is unclear why some participants were unable to refer to other modalities or specialist teams. It is possible that this may be due to limited experience or confidence in referral by the participants (one participant did not refer for imaging or specialist opinion but had been reporting for over ten years) or may be due to local referral practices. The possible impact of a power imbalance between the participant and their referrers was alluded to in one of the free text responses:

Participant 6 – *“We need the respect and support of both radiologists and referrers and sometimes we lack this, especially with referrers. This may be due to a harsher reaction to discrepancies made in the past by reporting radiographers as opposed to any discrepancies from a radiologist.”*

Increasing exposure of referrers to MRI reporting by radiographers and radiographer participation in multidisciplinary team meetings may contribute to increased confidence of both referrers and consultant radiologists in the ability and capabilities of MRI reporting radiographers. This can further be increased with the continued publication of evidence supporting the role of radiographers in the reporting process, with increasing evidence of the clinical impact of MRI reporting by radiographers adding to this evidence base.

The results showed a mixed response when participants were asked about their aspirations for future development of reporting practice. Half anticipated increasing their scope of practice and indicated that they could undertake further postgraduate study, with a few indicating expansion of current capabilities. The remaining half did not see any change in their practice in the immediate future. This shows that there is certainly a desire for reporting radiographers to develop their scope of practice further.

Limitations

The method of survey distribution may have introduced a selection bias due to the exclusive use of social media for distribution. This may explain the low response rate.²⁷ It is certainly feasible that a proportion of active MRI reporting radiographers were either not engaging with the applied social media channels or that they were not engaging within the specific communities the snowball sampling method used.

It has previously been identified that no national register of MRI reporting radiographers is available,¹² making targeted recruitment problematic. Future studies into this topic should make use of more reliable survey distribution methods such as using gatekeeper organisations to electronically distribute the survey or through targeting of all NHS trusts in the UK.

The power of the statistical analysis is reduced due to the low response rate, and future surveys with a higher response rate may increase the reliability of the statistical analyses.

Conclusion

As far as the author is aware, this is the first published survey investigating the clinical scope of practice of MRI reporting radiographers in the UK. The survey has demonstrated that there is little variation in the clinical practice of MRI reporting services across the UK, reinforcing the view that MRI reporting provision by radiographers follows an academically supported pathway. It can be expected that there should be some minor variation at the local level as services are tailored to the needs and demands of local services. However, this variation is not shown to be statistically significant in this study.

A major theme that has come out of this investigative study has been the alignment of the MRI reporting services with the developing multidisciplinary nature of healthcare provision as evidenced by all respondents accepting referrals from community healthcare practitioners. This is especially true with the recent and ongoing introduction of CDCs, giving additional opportunities for MRI reporting radiographers to contribute to the timely and locally provisioned diagnostic services.

The low response rate for this study highlights inherent problems in identifying the reporting radiographers who are currently in practice. It has been previously suggested¹² that a central register or mailing list of active reporting radiographers could assist researchers, service leads and policymakers in identifying those undertaking this role. Such a central register could be established by the radiographer's professional body.

This study has investigated the clinical scope of practice of MRI reporting radiographers and further investigation should be made to build on these findings, investigating the reasons for practice developments and restrictions at an individual level. Investigation into the impact MRI reporting radiographers can and do make within the CDC setting, including the impact on report turnaround times, could also be undertaken to further support local and governmental policy with respect to diagnostic service provision.

Conflict of interest

The author is a program lead for the postgraduate MRI reporting courses at Canterbury Christ Church University.

References

1. NHS England and NHS Improvement. *Diagnostic imaging dataset statistical release*. Available at: <https://www.england.nhs.uk/statistics/wp-content/>

- uploads/sites/2/2022/07/Statistical-Release-21st-July-2022-PDF-875KB.pdf; 2022 (Accessed: 28/December/2022).
2. Halliday K, Maskell G, Beeley L, Quick E. *Radiology GIRFT programme national specialty report*. Available at: <https://gettingitrightfirsttime.co.uk/wp-content/uploads/2020/11/GIRFT-radiology-report.pdf>; 2020 (Accessed: 28/December/2022).
 3. The Royal College of Radiologists. *Clinical radiology UK workforce census report 2020*. The Royal College of Radiologists; 2021. Available at: <http://www.rcr.ac.uk/publications.aspx?PageID=310&PublicationID=359> (Accessed: 28/December/2022).
 4. Care Quality Commission. *Radiology review A national review of radiology reporting within the NHS in England A national review of radiology reporting within the NHS in England*. Available at: <https://www.cqc.org.uk/publications/themed-work/radiology-review>; 2018 (Accessed: 28/December/2022).
 5. Department of Health. *Radiography Skills Mix: a report on the four-tier service delivery model*. 2003. p. 1–48. Available at: https://webarchive.nationalarchives.gov.uk/+/http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4007123 (Accessed: 28/December/2022).
 6. Woznitza N, Pittock L, Elliot J, Snaith B. Diagnostic radiographer advanced clinical practice in the United Kingdom – a national cross-sectional survey. *BJR|Open Br Inst Radiol* 2021;**3**(1). <https://doi.org/10.1259/bjro.20210003>.
 7. Stevens BJ. A survey assessment of reporting radiographers' scope of practice in the West Midlands region of the United Kingdom. *Radiography* 2019;**25**(3): 214–9. <https://doi.org/10.1016/j.radi.2019.01.006>.
 8. Piper K, Buscall K, Thomas N. MRI reporting by radiographers: findings of an accredited postgraduate programme. *Radiography* Elsevier Ltd. 2010;**16**(2): 136–42. <https://doi.org/10.1016/j.radi.2009.10.017>.
 9. Brealey S, Piper K, King D, Bland M, Caddick J, Campbell P, et al. Observer agreement in the reporting of knee and lumbar spine magnetic resonance (MR) imaging examinations: selectively trained MR radiographers and consultant radiologists compared with an index radiologist. *Eur J Radiol* 2013;**82**(10). <https://doi.org/10.1016/j.ejrad.2013.05.024>.
 10. Piper K, Pittock L, Woznitza N. Radiographer reporting of neurological magnetic resonance imaging examinations of the head and cervical spine: findings of an accredited postgraduate programme. *Radiography* 2018;**24**(4):366–9. <https://doi.org/10.1016/j.radi.2018.05.006>.
 11. Piper K, Mitchell M, Griffin K, Morgan T, Roy A, Thomas A, et al. Concordance between a neuroradiologist, a consultant radiologist and trained reporting radiographers interpreting MRI head examinations: an empirical study W.B. Saunders. *Radiography* 2020. <https://doi.org/10.1016/j.radi.2020.10.016>.
 12. Estall H, Mitchell M. MRI reporting radiographers - a survey assessment of number and areas of practice within the United Kingdom. Elsevier Ltd *Radiography* 2020;**27**(2):568–173. <https://doi.org/10.1016/j.radi.2020.11.017>.
 13. Heales CJJ, Mills K, Ladd E. Radiographer advanced and consultant practice and community diagnostic hubs – a vision for the future. *Radiography*. Elsevier Ltd, 2021;**27**(xxxx):S28–33. <https://doi.org/10.1016/j.radi.2021.05.004>.
 14. Lockwood P. An evaluation of CT head reporting radiographers' scope of practice within the United Kingdom. *Radiography*. W.B. Saunders Ltd. 2020;**26**(2):102–9. <https://doi.org/10.1016/j.radi.2019.09.001>.
 15. Piper KJ, Buscall KL. MRI reporting by radiographers: the construction of an objective structured examination. *Radiography* 2008;**14**(2):78–89. <https://doi.org/10.1016/j.radi.2007.02.003>.
 16. Donovan T, Manning DJ. Successful reporting by non-medical practitioners such as radiographers, will always be task-specific and limited in scope. *Radiography* 2006;**12**(1):7–12. <https://doi.org/10.1016/j.radi.2005.01.004>.
 17. The Royal College of Radiologists. *Standards for interpretation and reporting of imaging investigations*. 2nd ed. Clinical Radiology; 2018 Available at: <https://www.rcr.ac.uk/publication/standards-interpretation-and-reporting-imaging-investigations-second-edition> (Accessed: 28/December/2022).
 18. D. Bowers, *Medical statistics from scratch: an introduction for health professionals*, 4th ed. Proquest Ebook Central, 2020. p.243 [Online]. Available at: <https://ebookcentral.proquest.com/lib/canterburychristchurch/reader.action?docID=5855517>. (Accessed: 28/December/2022).
 19. Herzog MH, Francis G, Clarke A. *Understanding statistics and experimental design: how not to lie with statistics*. Library.open.org; 2019. Available at: <https://library.open.org/bitstream/handle/20.500.12657/23029/1007132.pdf;jsessionid=D3BE13D8DC3CB6F0B48920C86D3EDFBE?sequence=1> (Accessed: 28/December/2022).
 20. Health Education England. *Multi-professional framework for advanced clinical practice in England*. *Health Educ Engl* 2017. Available at: <https://www.hee.nhs.uk/sites/default/files/documents/multi-professionalframeworkforadvancedclinicalpracticeinengland.pdf> (Accessed: 28/December/2020).
 21. Harris R. Code of professional conduct. *Society Radiogr* 2013. <https://doi.org/10.1177/030802269005300406>.
 22. The Health and Care Professions Council. *Standards of conduct, and ethics*. Hcpc; 2016. p. 1–17. Available at: <https://www.hcpc-uk.org/standards/standards-of-proficiency/> (Accessed 28/December/2022).
 23. Murray CJL, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012;**380**: 2197–223. www.thelancet.com.
 24. Babatunde OO, Bishop A, Cottrell E, Jordan J, Corp N, Humphries K, et al. A systematic review and evidence synthesis of non-medical triage, self-referral and direct access services for patients with musculoskeletal pain. *PLoS One*. Public Library of Science. 2020;**15**. <https://doi.org/10.1371/journal.pone.0235364>.
 25. Richards M. *Diagnostics: recovery and renewal*. Available at: <https://www.england.nhs.uk/wp-content/uploads/2020/10/BM2025Pu-item-5-diagnostics-recovery-and-renewal.pdf>; 2020 (Accessed 28/December/2022).
 26. Society of Radiographers. *Preliminary clinical evaluation and clinical reporting by radiographers: policy and practice guidance*. *Society Radiogr* 2013. Available at: <https://www.sor.org/learning/document-library/preliminary-clinical-evaluation-and-clinical-reporting-radiographers-policy-and-practice-guidance> (Accessed 28/December/2022).
 27. Wu M, Zhao K, Fils-Aime F. Response rates of online surveys in published research: a meta-analysis. *Comput Human Behav Rep*. Elsevier Ltd. 2022;**7**(May):100206. <https://doi.org/10.1016/j.chbr.2022.100206>.