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Evaluation of the current use of MRI to aid the diagnosis of axial spondyloarthritis in the UK: results from a freedom of information request

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AIM: To evaluate the impact of recommendations from the 2019 consensus exercise conducted by radiologists and rheumatologists on the use of magnetic resonance imaging (MRI) to investigate axial spondyloarthritis (axSpA) in clinical practice.

MATERIALS AND METHODS: A freedom of information (FOI) request was used to assess the use of MRI in the diagnosis of axSpA and radiologists' awareness of the 2019 guidance across all NHS Trusts and Health Boards in the UK, including England, Scotland, Northern Ireland, and Wales.

RESULTS: The FOI request was sent to 150 Trusts/Health Boards, and 93 full responses were received. Of the 93 respondents (97%), 90 reported familiarity with the term axSpA and 70/93 (75%) reported familiarity with the 2019 recommendations. Awareness of recommendations regarding specific MRI features supportive of the diagnosis of axSpA was 74/93 (80%) for the sacroiliac joints (SIJs) and 66/93 (71%) for the spine. The median wait for MRI acquisition was 2−3 months. Fifty-two of the 93 (56%) reported at least some outsourcing of axSpA MRI (33%/29% for specialist/non-specialist outsourcing respectively); 32/93 (34%) reported some scans being reported in-house by non-musculoskeletal radiologists.

CONCLUSION: There have been several positive developments in the understanding and use of MRI for the diagnosis of axSpA in the UK since the 2017 survey, although substantial scope for further improvement remains. Several new challenges have also emerged, including the

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increase in waiting times, reliance on outsourcing, and the reporting of MRI by non-musculoskeletal radiologists.

Introduction

In recent years, magnetic resonance imaging (MRI) has emerged as a valuable, non-invasive, and non-ionising method for the early diagnosis and assessment of axial spondyloarthritis (axSpA). The development of MRI and its ability to visualise inflammation has led to a greater ability to identify many patients with "non-radiographic disease" (i.e., disease that cannot be detected using plain radiography), known as non-radiographic axSpA ([nr-axSpA).[1,2] This has enabled patients with axSpA to receive appropriate treatment, including targeted therapy, earlier in their disease course[3] and potentially preventing structural damage and thus improving long-term outcomes[4]; however, despite the clear potential value of MRI to improve management, several studies have raised concerns about its implementation in standard care.[5,6] In particular, a survey of 699 UK radiologists conducted by Bennett *et al.*, in 2017 found wide variations in approaches to the use of MRI, including the acquisition protocols and the features used to interpret the images.[6] Despite expert guidance available at the time,[2] in this survey, 18% did not use subchondral bone marrow oedema of the sacroiliac joint (SIJ) to help diagnose axSpA and 18% did not use vertebral corner inflammatory lesions.[6] Awareness of axSpA as a disease entity was reported by only 75% of radiologists, and awareness of definitions for positive MRI of the SIJ and spine were reported by only 31% and 25%, respectively.[6] This lack of consistency and awareness of definitions may be an important contributor to suboptimal management of patients with axSpA by causing diagnostic delays and denying patients the opportunity to access appropriate care.

To address the inconsistency in the use of MRI, an exercise was performed in 2019 to systematically review the available literature on the use of MRI in the diagnosis of axSpA[7] and to develop recommendations based on this literature, with input from both rheumatologists and radiologists, under the auspices of the British Society of Spondyloarthritis (BRITSpA).[8] The 2019 recommendations document provides practical guidance around the use of MRI for standard care, including recommendations on both acquisition (including anatomical coverage, sequences and acquisition planes) and interpretation (comprising the specific features in the SIJs and spine, and how these should be used in combination to assist the diagnosis of axSpA). The overarching principles and recommendations produced in this work are summarised in Table 1. The overall objective of this work was to standardise practice around the use of MRI and ensure a more informed, consistent approach to the diagnosis of axSpA.

Table 1
Summary of overarching principles (OP) and recommendations (Rec) from 2019 British Society of Spondyloarthritis (BRITSpA) recommendations document.[8]

	Overarching principle or recommendation
OP1	The diagnosis of axSpA is based on clinical, laboratory and imaging features
OP2	Some patients with axSpA can have isolated inflammation of either the SIJs or spine
Rec1	When requesting an MRI for suspected axSpA, imaging of both the SIJs and the spine is recommended
Rec2	T1-weighted and fat-suppressed, fluid-sensitive sequences (including STIR, fat-saturated or Dixon methods) are recommended for suspected axSpA
Rec3	The minimum protocol when requesting an MRI for suspected axSpA should include sagittal images of the spine with extended lateral coverage and images of the SIJs that are in an oblique coronal plane to the joint
Rec4	In the SIJs, the presence of bone marrow oedema, fatty infiltration or erosion is suggestive of the diagnosis of axSpA. The presence of more than one of these features increases the diagnostic confidence of axSpA
Rec5	In the spine, the presence of multiple corner inflammatory lesions and/or multiple corner fatty lesions increases the diagnostic confidence of axSpA
Rec6	In the SIJs and/or spine the presence of characteristic new bone formation increases the diagnostic confidence of axSpA
Rec7	The full range and combination of active and structural lesions of the SIJs and spine should be taken into account when deciding if the MRI scan is suggestive of axSpA or not

axSpA, axial spondyloarthritis; SIJs, sacroiliac joint; MRI, magnetic resonance imaging; STIR, short tau inversion recovery.

The present study assessed current practice regarding the use of MRI in the investigation of patients with suspected axSpA across the UK, and evaluated whether previous inconsistencies in MRI use in clinical practice have improved since the development and publication of the 2019 BRITSpA recommendations document.

Materials and methods

The survey was completed anonymously and did not include any patient data; therefore, ethical review and approval were not required in accordance with local ethics committee guidance.

A freedom of information (FOI) request was designed and sent by the National Axial Spondyloarthritis Society (NASS) to all NHS Trusts and Health Boards across the UK, including England, Northern Ireland, Scotland, and Wales, in September 2022. The FOI requests were sent to the FOI team at each Trust, requesting that the requests were forwarded

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to musculoskeletal radiologists in the Trust or, if there were no musculoskeletal radiologists, to the radiology team. A FOI request can be made under the Freedom of Information (FOI) Act, a UK law that gives the public the right to access information held by public authorities; this includes government departments, local councils, and some publicly funded organisations. This was a different method of questionnaire distribution from the Bennett *et al.*[2] survey as sending to individual radiologists is now more difficult following the introduction of the General Data Protection Regulation (GDPR) directive providing a new framework for data protection laws in 2018. The FOI request assessed the use of MRI in the diagnosis of axSpA and radiologists' awareness and use of the 2019 BRITSpA consensus guidance.[8] The survey analysed the availability of local MRI services, knowledge of axSpA terminology/nomenclature (as per the BRITSpA 2019 guidance), knowledge of standard MRI protocols and sequences used in assessing patients with possible axSpA, and collaboration between rheumatologists and radiologists. The radiologists' knowledge of MRI lesions suggestive of axSpA and standard definitions of a positive MRI for the SIJ and the spine in axSpA was also assessed against the 2019 guidance[7] and recent updates from the Assessment of Spondyloarthritis international Society (ASAS) work group.[9,10] Responses were collated and any whole surveys that were predominantly incomplete (i.e., where the majority of questions were not answered) were disregarded. Descriptive statistics were derived across all responses and also after subdividing by the presence of a specialist axSpA service (i.e., an axSpA-specific service supported by a multidisciplinary team, and with dedicated axSpA clinics), access to specialist musculoskeletal radiologists, use of outsourcing, and UK nation. Results were compared descriptively against those from the 2017 BRITSpA survey to evaluate changes in practice since the 2019 BritSpA guidance.

Results

Overview

The FOI request was sent to 150 Trusts/Health Boards, and 93 full responses (62%) were received. Of the 93 full responses, 71 were from England, five were from Northern Ireland, 11 were from Scotland, and were six from Wales. The results of the FOI request are summarised in an infographic in Fig 1.

Access to MRI

All but one Trust reported access to an MRI scanner capable of performing a full spinal scan; seven (8%) had access to one scanner, 21 (23%) had access to two, 24 (26%) had access to three and 40 (43%) had access to four or more (the median number of MRI scanners was three). Ninety (97%) had access to at least one 1.5 T scanner and 35 (38%) had access to at least one 3 T scanner.

Waiting times

Average wait times for MRI were as follows: <2weeks for two Trusts (2%), 2–4 weeks for nine Trusts (10%), 1–2 months for 47 Trusts (51%), 2–3 months for 17 Trusts (18%) and >3 months for 18 Trusts (19%).

Sub-specialisation of reporting radiologists and use of outsourcing

Eighty-five Trusts (91%) reported that at least some of their MRI examinations were reported internally by a specialist musculoskeletal radiologist, 32 (34%) indicated some examinations being reported internally by a non-musculoskeletal radiologist, 31 (33%) reported some examinations being outsourced to a specialist musculoskeletal radiologist, and 27 (29%) reported some examinations being outsourced to a non-musculoskeletal radiologist. Combining both specialist and non-specialist outsourcing, 52 (56%) reported at least some outsourcing of axSpA examinations. Three Trusts (3%) indicated some examinations being reported by reporting radiographers.

Collaboration between radiology and rheumatology

Thirty-three Trusts (35%) reported weekly meetings between radiology and rheumatology, 19 (20%) reported fortnightly meetings, 16 (17%) reported monthly meetings, one (1%) reported quarterly meetings, 21 (22.6%) reported meetings as required, and three (3%) reported never having joint meetings.

Use of MRI in the diagnosis of axSpA

All responding Trusts reported using MRI in some capacity for the diagnosis of axSpA. Ten (11%) reported only using MRI if the radiographs of the SIJs were normal or not diagnostic, 79 (85%) reported using MRI as a diagnostic test, irrespective of whether there was an abnormality on plain radiographs, and three (33%) reported performing MRI if specifically requested by rheumatology.

MRI protocols

Duration

The mean (SD) duration of MRI protocols was 39 (13) minutes.

Anatomical coverage

The majority of Trusts (64/93, 69%) scanned SIJs and whole spine. One Trust (1%) reported a protocol including the SIJs only; one Trust (1%) scanned SIJs and lumbar spine, 12 Trusts (13%) scanned SIJs and thoracolumbar spine. Fifteen Trusts (16%) reported scanning the SIJs and any other spinal segment, as requested by a rheumatologist. Of the 30 Trusts not scanning the whole spine, 21 gave a rationale for not doing so: 12/21 reported that this was because they

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Figure 1 Infographic highlighting the key results of the study.

considered that imaging of the lumbar/thoracolumbar spine was sufficient for assessing spinal features of axial SpA, 1/21 reported that it took too long to scan the spine, 1/21 reported that scanning the whole spine was too expensive, and 7/21 reported scanning the whole spine only in cases of specific clinical concern.

Acquisition planes

For the SIJs, 41 Trusts (44%) reported using semi-coronal acquisitions only, and 49 (53%) reported using both semi-coronal and semi-axial acquisitions. Two sites (2%) reported not scanning the SIJs; one site (1%) did not respond.

For the spine, 12 Trusts (13%) reported using sagittal, axial, and coronal plane acquisitions, 35 (38%) reported sagittal and axial plane acquisitions only, and 37 (40%) reported sagittal plane acquisitions only. Two Trusts (2%) reported not scanning the spine and seven (8%) did not respond.

Sequences

Ninety-one Trusts (97%) utilised fat-suppressed water-sensitive sequences and 75 (81%) used fat-sensitive sequences. Thirty Trusts (33%) also included conventional T2-weighted (T2W) imaging, and four Trusts (4%) included gradient echo imaging.

Use of contrast

Almost all Trusts reported using protocols that did not include contrast-enhanced imaging. Only one Trust (1%) reported using contrast medium in the SIJs, and two Trusts (2%) reported using contrast medium in the spine.

Knowledge of axSpA and MRI lesions and definitions

Results of the survey in terms of familiarity with the term "axial spondyloarthritis", familiarity with the 2019 recommendations, and knowledge of formal recommendations

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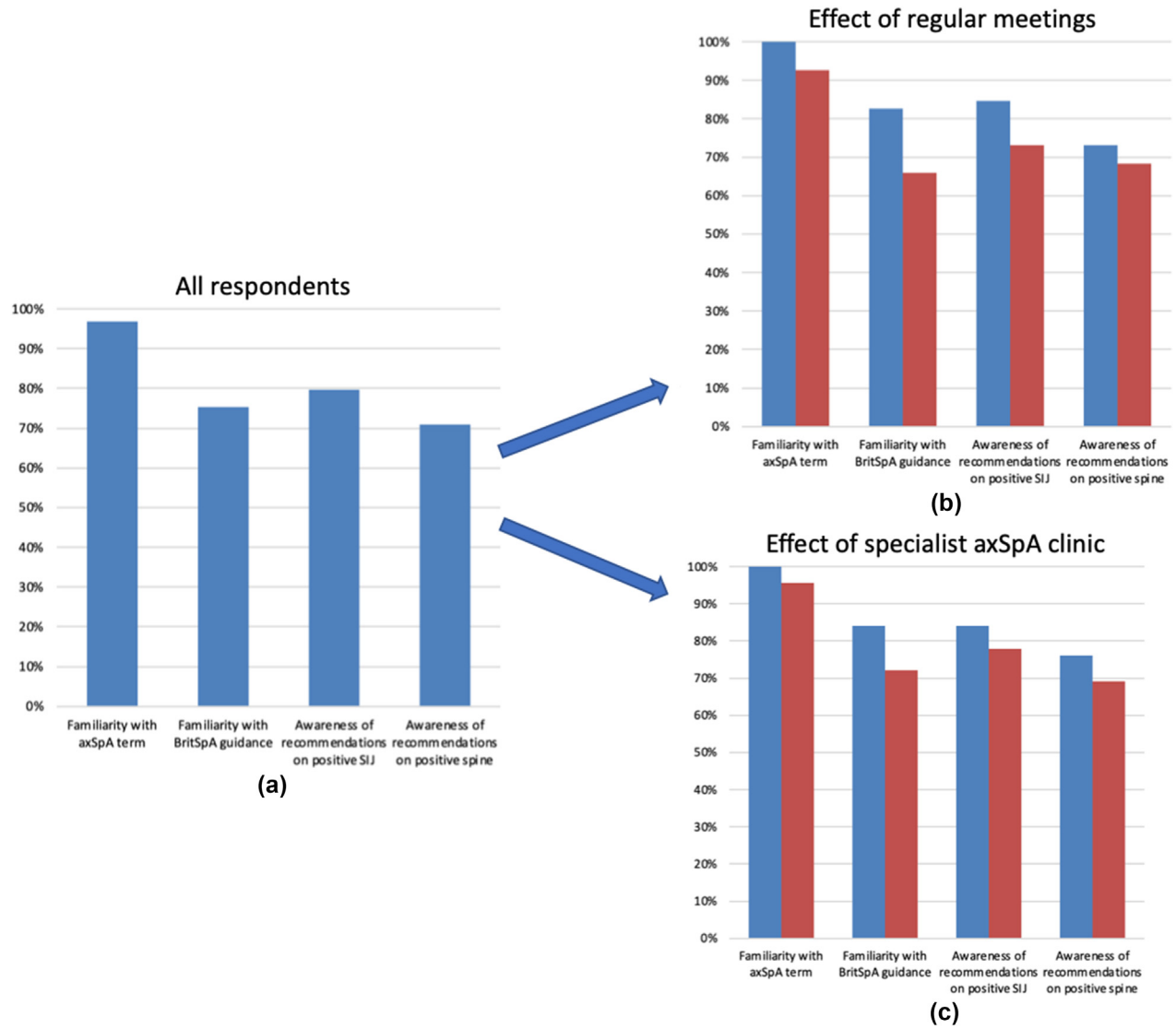

Figure 2 Familiarity with "axial spondyloarthritis term", 2019 recommendations document and diagnostic recommendations contained therein, and relationship between having regular meetings/a specialist axSpA clinic and knowledge of terminology/guidance. (a) Responses from all responding Trusts. (b) Responses divided by whether Trusts had regular (at least fortnightly) meetings (sites having/not having at least fortnightly meetings are shown in blue/red). (c) Responses divided by whether trusts had a specialist axSpA clinic (sites with/without specialist axSpA clinics are shown in blue/red).

regarding imaging features and their contribution to diagnosis are summarised in Fig 2a. Ninety respondents (97%) reported familiarity with the term axial spondyloarthritis, and three (3%) reported being unfamiliar with the term. Seventy respondents (75%) reported familiarity with the 2019 BritSpA consensus guidelines, and 23 (25%) reported not being familiar with the guidelines.

Knowledge of formal recommendations regarding imaging features and their contribution to diagnosis

Seventy-four respondents (80%) reported being aware of formal recommendations regarding specific MRI features in the sacroiliac joints used in the diagnosis of axial SpA, and 19 (20%) reported being unaware of such formal recommendations. Sixty-six respondents (71%) reported being aware of formal recommendations regarding specific MRI features in the spine used in the diagnosis of axial SpA, and 27 (29%) reported being unaware. For both anatomical sites, there were widely varying descriptions of the recommendations used to guide diagnosis, and only six sites (both SIJ and spine) specifically reported awareness of the 2019 BritSpA guidelines.

Radiological features used to make a diagnosis

Radiologists reported using a variety of radiological features and combinations of features (in both the SIJs and spine) for diagnosis, but the specific features (and combinations) varied widely. In the SIJs, 33 respondents (36%) reported using all available features, and 48 (52%) reported using some combination of the features available. Of those who reported the individual features used, 42/48 used bone marrow oedema/osteitis, 40/48 used erosions, 35/48 used

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fat infiltration, 31/48 used sclerosis, 23/48 used joint space widening/effusion, 30/48 used enthesitis, 18/48 used capsulitis, 19/48 used fat deposition in the joint space (backfill), 25/48 used synovitis, 32/48 used new bone formation (area of ankylosis).

In the spine, 34 respondents (37%) reported using all available features, and 49 (53%) reported using some combination of the features available; the remainder did not respond or used individual features (one site reported using vertebral corner oedema as the only diagnostic feature in the spine, and no other feature was used as a solitary diagnostic criterion). Of those who reported the individual features used, 41/49 used vertebral corner bone marrow oedema/osteitis, 20/49 used endplate oedema, 8/49 used diffuse vertebral body oedema, 26/49 used posterior element bone marrow oedema, 40/49 used vertebral corner fat infiltration and 37/49 used syndesmophyte formation.

Association of radiological specialism and knowledge of terminology/guidance

The association between having regular meetings and a specialist axSpA clinic on radiologist awareness of definitions is shown in Fig 2, and the effect of radiologist specialism and the use of outsourcing is shown in Fig 3. The

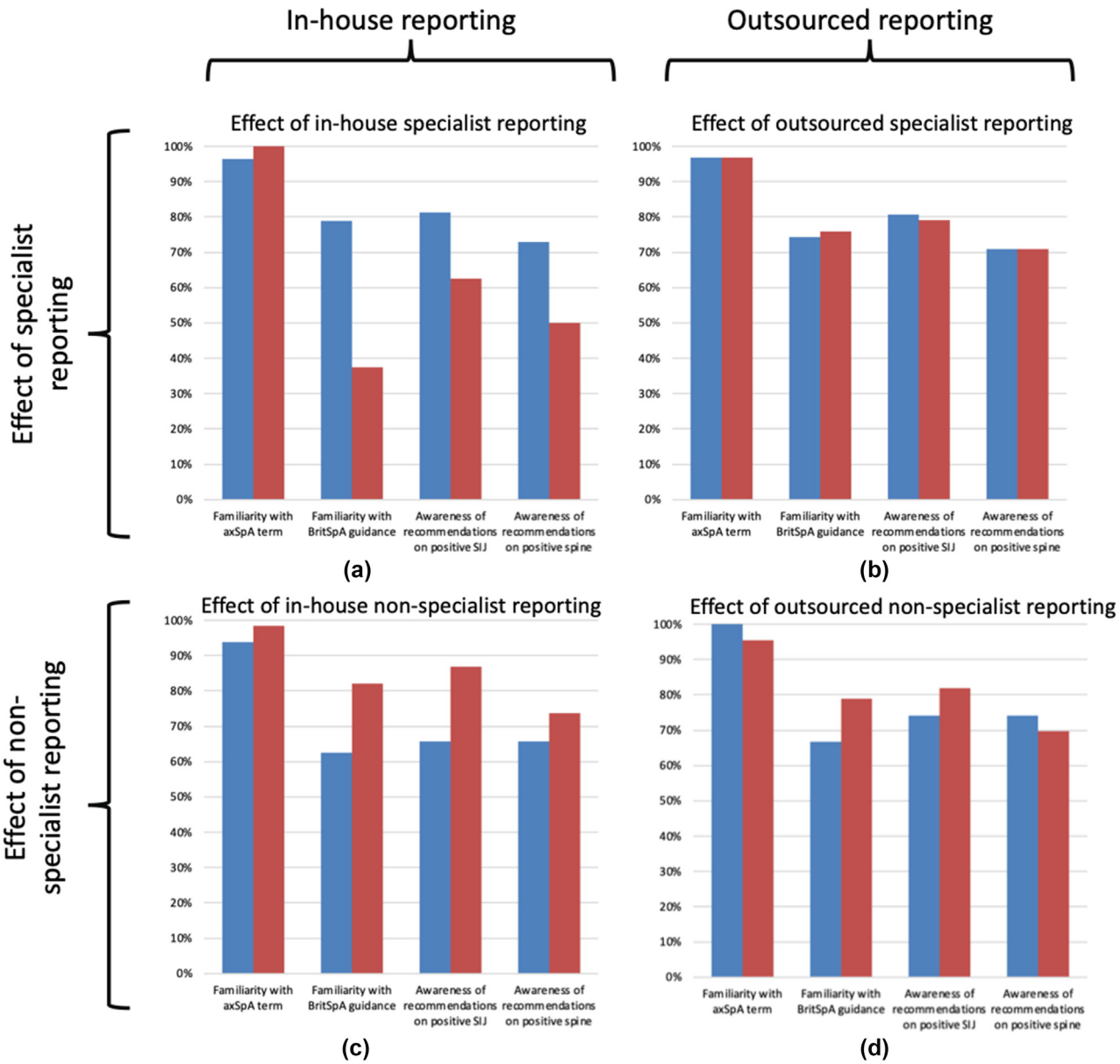

Figure 3 Effect of specialist reporting and outsourcing. Separate blue/red bars are shown for sites using/not using the relevant radiological reporting method, for example in (a) sites with at least some in-house reporting are shown in blue, and sites not using any in house reporting are shown in red. The effect of specialist reporting is shown in the top row (note that the awareness rates are generally higher for sites with this), and the effect of non-specialist reporting is shown in the bottom row (awareness is generally lower for sites with this). The effect of in-house reporting is shown on the left column and the effect of outsourced reporting is shown on the right.

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results contributing to Fig 2 and Table 2 are also summarised in Table 2.

The presence of a specialist SpA clinic was associated with similar but slightly higher familiarity with the term axSpA and with the BRITSpA guidance and awareness of recommendations on the features contributing to a positive SIJ and spine MRI.

Having at least fortnightly meetings between radiologists and rheumatologists was associated with greater familiarity with the term axSpA, greater familiarity with the BRITSpA guidance, greater awareness of recommendations on the features contributing to a positive SIJ, and similar awareness of recommendations on the features contributing a positive spine MRI.

Having at least some scans reported by an in-house specialist MSK radiologist was associated with similar familiarity with the term axSpA, but greater familiarity with the BRITSpA guidance and greater awareness of recommendations on the features contributing to a positive SIJ and spine MRI.

Having at least some scans reported by internal non-specialist radiologists was associated with similar familiarity with the term axSpA, but lower familiarity with the BRITSpA guidance and awareness of recommendations on the features contributing to a positive SIJ and spine MRI.

The use of outsourcing to specialist radiologists was associated with similar familiarity with the term axSpA, familiarity with the BritSpA guidance, awareness of recommendations on the features contributing to a positive SIJ and awareness of recommendations on the features contributing a positive spine MRI.

The use of outsourcing to non-specialist radiologists was associated with similar familiarity with the term axSpA but lower familiarity with the BRITSpA guidance and awareness of recommendations on the features contributing to a positive SIJ. Awareness of recommendations on the features contributing a positive spine MRI was similar for sites that did/did not use non-specialist outsourcing.

Trends by nation

For the four UK nations, familiarity with the term axSpA was 96/100/100/100% (for England/Scotland/Wales/NI), familiarity with the BRITSpA guidance was 77/45/83/80%, awareness of recommendations on the features contributing to a positive SIJ was 80/63/83/100%, and awareness of recommendations on the features contributing a positive spine MRI was 71/63/67/80%.

Discussion

The 2019 recommendations developed by UK-based radiologists and rheumatologists aimed to standardise practice regarding the use of MRI and ensure a more informed, consistent approach to the diagnosis of axSpA; however, there has been no previous evaluation of whether this exercise has been effective, and current clinical practice around the use of MRI for diagnosing axSpA is unknown. Here, using an FOI request, the present study investigated the current use of MRI across Trusts/Health Boards in the UK. Several important changes in practice were noted compared to the survey conducted in 2017,[6] and also some aspects of UK practice were described that were not

Table 2
Familiarity and awareness of recommendations analysed by the presence of specialist axSpA clinics, regular meetings and reporter type.

Aspect of practice	Familiarity/awareness metrics			
	Proportion of respondents familiar with the term "'axial spondyloarthritis"	Proportion of respondents familiar with the 2019 BRITSpA guidance	Proportion of respondents aware of the features contributing to a positive SIJ MRI	Proportion of respondents aware of the features contributing to a positive spine MRI
Specialist axSpA clinic (yes versus no)	25/25 (100%) versus 65/68 (96%)	21/25 (84%) versus 49/68 (72%)	21/25 (84%) versus 53/68 (78%)	19/25 (76%) versus 47/68 (69%)
Regular meetings (at least fortnightly) (yes versus no)	52/52 (100%) versus 38/41 (93%)	43/52 (83%) versus 27/41 (66%)	44/52 (85%) versus 30/41 (73%)	38/52 (73%) versus 28/41 (68%)
Reporting by in-house specialist MSK radiologists (yes versus no)	82/85 (96%) versus 8/8 (100%)	67/85 (79%) versus 3/8 (38%)	69/85 (82%) versus 5/8 (63%)	62/85 (73%) versus 4/8 (50%)
Reporting by in-house non-specialist radiologists (yes versus no)	30/32 (94%) versus 60/61 (98%)	20/32 (63%) versus 50/61 (82%)	21/32 (66%) versus 53/61 (87%)	21/32 (66%) versus 45/61 (74%)
Reporting via outsourced specialist MSK radiologists (yes versus no)	30/31 (97%) versus 60/62 (97%)	23/31 (74%) versus 47/62 (75%)	25/31 (81%) versus 49/62 (79%)	22/31 (71%) versus 44/62 (71%)
Reporting via outsourced non-specialist radiologists (yes versus no)	27/27 (100%) versus 63/66 (95%)	18/27 (67%) versus 52/66 (79%)	20/27 (74%) versus 54/66 (82%)	20/27 (74%) versus 46/66 (70%)

Each entry in the table gives the proportion of respondents who did/did not report awareness/familiarity with a particular aspect of practice.
axSpA, axial spondyloarthritis; SIJs, sacroiliac joint; MRI, magnetic resonance imaging; MSK, musculoskeletal.

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captured by the previous survey, particularly around the use of outsourcing and the degree of specialism of radiologists. The results of this study have been used to create a National Axial Spondyloarthritis Society (NASS) policy document, which lays out a set of service-level recommendations regarding the optimal use of MRI in radiology workflows.[11]

Firstly, the present results suggest that there has been an improvement in several aspects of MRI practice compared to the previous survey. There is now a greater willingness to use MRI, with 85% of Trusts/Health Boards reporting use of MRI as a diagnostic test irrespective of radiographic abnormalities, whereas previously only 18% of radiologists "routinely used MRI instead of radiographs of the SIJ and spine".[6] Inclusion of the spine in MRI acquisition protocols has also increased, with 99% of Trusts now including at least some coverage of the spine (previously 95%) and a large proportion (69% compared to 30% previously) now scanning the whole spine. The large majority of Trusts now use acquisition protocols in line with the 2019 recommendations,[8] although some include elements that are arguably unnecessary, for example, some centres acquire spinal images in three planes and some acquire T2W imaging of the SIJs in addition to specific water- and fat-sensitive imaging sequences: both of these are unnecessary based on the 2019 recommendations. These centres could potentially remove these additional sequences and shorten their protocols, with the potential to increase capacity. Almost no Trusts used gadolinium-enhanced imaging in the spine and sacroiliac joints, in keeping with the 2019 BRITSpA recommendations.[7]

Secondly, awareness of axSpA terminology has improved compared to the previous survey. In particular, knowledge of the term 'axial SpA or axSpA' has substantially increased, with 97% of respondents now reporting being familiar with the term "axial spondyloarthritis" (previously 75%). Further, 75% of respondents reported familiarity with the 2019 consensus guidelines.[8] Awareness of definitions of positive MRI in the SIJs has also increased, with 80% reporting being aware of definitions in the SIJ (previously 31%) and 71% reporting being aware of definitions in the spine (previously 25%); however, it should be noted that the actual descriptions of what definitions were used were variable, and only a small minority reported being specifically aware of the definitions highlighted in the 2019 recommendations document. Overall, the results suggest that there is greater awareness of the MRI features contributing to diagnosis in axSpA, but there remains some variability in the specific use and interpretation of these features.

Thirdly, the present results suggest that the availability of MRI has deteriorated compared to 2017. Although Trusts now have access to a greater range of MRI machines (the median number of MRI machines is now three, compared to two previously[6]), this has not translated into a reduction in waiting times. Whereas previously 90% of respondents reported waiting times of <2 months, now only 62% of examinations are performed in <2 months. This suggests that, although more machines are available, this increase has not matched the greater demand. Furthermore, although the 6-week target set by the NHS was not included as a specific question,[12] the data suggest that around half of examination times are not meeting this target. Some of these delays may be driven by increases in waiting lists and staff shortages stemming from the COVID-19 pandemic; however, it is likely that the wider, continued increase in demand for medical imaging services is also a major contributor.[13,14]

Fourthly, the present results also suggest that reporting services may be under greater pressure than before. Whereas the UK survey did not mention the use of outsourcing (presumably because outsourcing was not, or was only rarely, used at that time), a substantial proportion of Trusts reported outsourcing at least some scans: 33% reported outsourcing to specialists and, strikingly, 29% reported outsourcing to non-specialists, with 56% of Trusts using at least some outsourcing. Again, this likely reflects a broader trend towards the use of imaging and a greater reliance on outsourcing services; however, the use of non-specialists by a large number of Trusts (and the consequent impact on knowledge of axSpA terminology and diagnostic criteria) is a concerning development that could negatively impact on the quality of care.

Finally, the present study provides some insights into the effect of specialism and of rheumatology–radiology collaboration on awareness of the relevant terminology. The presence of a specialist axSpA clinic, having regular meetings between radiologists and rheumatologists and having at least some scans reporting in-house by a specialist MSK radiologist were associated with greater familiarity with the term axSpA and the 2019 guidance. These results suggest that collaboration between rheumatology and radiology makes an important contribution to the quality of care that patients receive. In terms of radiologist specialism, having at least some scans reported in-house by a specialist MSK radiologist was associated with greater familiarity with the term axSpA and the 2019 guidance, while reporting by non-specialist radiologists (either in-house or by outsourcing) was associated with poorer familiarity with the term axSpA and the 2019 guidance; however, interestingly, the use of outsourcing to specialist radiologists had no detrimental effect on awareness, suggesting that the degree of specialism may be a more important consideration than whether the scans are reported in-house or through outsourcing.

Based on the results of this work, NASS have created a series of recommendations regarding the optimal use of MRI in clinical workflows.[11] These recommendations are summarised in Table 3.

A limitation of this study is that direct comparison with the previous work is made more difficult by some differences between the surveys, for example, the previous survey was of radiologists rather than Trusts (partly due to differences in data protection practice since the previous survey since the introduction of GDPR), and some of the questions in this work have been slightly modified to avoid ambiguity. Some additional questions were also included to capture aspects of current practice (e.g., outsourcing) that have emerged since the previous work was conducted. A formal statistical comparison of the results of the two surveys were not performed due to these differences; however,

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Table 3
Summary of recommendations from the accompanying NASS policy document.

	Recommendation
Rec1	When utilising MRI in the diagnosis of axial SpA, all Integrated Care Boards (ICB), Health Boards or Health and Social Care Boards should adopt axial SpA spinal MRI protocols in line with the British Society of Spondyloarthritis (BRITSpA) consensus guidance. The protocols should be implemented by all Trusts, hospitals, or secondary care providers
Rec2	All local axial SpA pathways should ensure that all patients with suspected axial SpA as deemed clinically necessary by a rheumatologist to be in need of an MRI receive one of at least the lumbar and thoracic spine, plus SIJ, as part of their diagnostic assessment
Rec3	All Trusts, Health Boards and Health and Social Care Boards have access to specialist MSK radiologists so that all axial SpA spinal MRIs are interpreted by specialists with appropriate knowledge, even if this is via an outsource arrangement
Rec4	Education is in place for MSK radiologists, both during training and as part of ongoing professional development on best practice spinal MRI protocols and axial SpA diagnostic criteria
Rec5	All rheumatology teams who see axial SpA patients have access to MSK radiologists and have joint working practices in place to aid collaboration and ongoing improvement
Rec6	Outsourced MRI should be monitored closely and local arrangements for accountability and accuracy put in place

MRI, magnetic resonance imaging; SpA, spondyloarthritis; SIJs, sacroiliac joint; MSK, musculoskeletal.

the present data have been interpreted in light of, and are broadly consistent with, broader trends in how imaging services have changed over time, yet provide new insights into the trends in imaging services and how these have impacted imaging of patients with axSpA in the UK. Additionally, a formal statistical analysis was not performed to determine which of the various aspects of practice (e.g., regular meetings and the degree of radiologist specialism) was most “important”, as this was beyond the scope of the present study; however, the present data are some of the first to highlight the potential importance of these elements of the quality of care and suggest that further investigation into this subject is warranted. A further limitation of the study is that the data were only collected in the UK; however, it seems likely that many of the same trends will also be observed in other countries.

In conclusion, there have been several positive developments in the understanding and use of MRI for diagnosis of axSpA in the UK since the 2017 survey: radiologists are now more willing to use MRI for axSpA diagnosis and have a greater understanding of the relevant diagnostic features, albeit with scope for further improvement; however, several new challenges have emerged from this study, including the increase in wait times, reliance on outsourcing and the effect of non-specialism on awareness of axSpA terminology and recommendations.

Conflict of interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Timothy Bray reports financial support was provided by National Axial Spondyloarthritis Society. Pedro Machado reports financial support was provided by AbbVie, BMS, Celgene, Eli Lilly, Galapagos, Janssen, MSD, Novartis, Orphazyme, Pfizer, Roche and UCB. Karl Gaffney reports financial support was provided by NASS, AbbVie, Pfizer, UCB, Novartis, Lilly, Celgene, Celltrion, Janssen, Gilead and Biogen. Karl Gaffney reports a relationship with SpA Academy that includes: equity or stocks.

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References

1. Rudwaleit M, Landewé R, van der Heijde D, *et al*. The development of Assessment of SpondyloArthritis international Society classification criteria for axial spondyloarthritis (part I): classification of paper patients by expert opinion including uncertainty appraisal. *Ann Rheum Dis* 2009;**68**(6):770–6.
2. Rudwaleit M, van der Heijde D, Landewé R, *et al*. The development of Assessment of SpondyloArthritis international Society classification criteria for axial spondyloarthritis (part II): validation and final selection. *Ann Rheum Dis* 2009;**68**(6):777–83.
3. National Institute for Health and Care Excellence. TNF-alpha inhibitors for ankylosing spondylitis and non-radiographic axial spondyloarthritis. Technology appraisal guidance [TA383]. Published: 1 February 2016. Available at: https://www.nice.org.uk/guidance/ta383.
4. Danve A, Deodhar A. Treatment of axial spondyloarthritis: an update. *Nat Rev Rheumatol* 2022;**18**(4):205–16.
5. Hamilton L, Gilbert A, Skerrett J, *et al*. Services for people with ankylosing spondylitis in the UK—a survey of rheumatologists and patients. *Rheumatology (Oxford)* 2011;**50**(11):1991–8.
6. Bennett AN, Marzo-Ortega H, Kaur-Papadakis D, *et al*. The use of magnetic resonance imaging in axial spondyloarthritis: Time to bridge the gap between radiologists and rheumatologists. *J Rheumatol* 2017.
7. Jones A, Bray TJP, Mandl P, *et al*. Performance of magnetic resonance imaging in the diagnosis of axial spondyloarthritis: a systematic literature review. *Rheumatology (United Kingdom)*. 2019;**58**(11):1955–65.

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8. Bray TJP, Jones A, Bennett AN, *et al*. Recommendations for acquisition and interpretation of MRI of the spine and sacroiliac joints in the diagnosis of axial spondyloarthritis in the UK. *Rheumatology (United Kingdom)* 2019;**58**(10):1831–8.
9. Maksymowych WP, Lambert RGW, Østergaard M, *et al*. MRI lesions in the sacroiliac joints of patients with spondyloarthritis: an update of definitions and validation by the ASAS MRI working group. *Ann Rheum Dis* 2019;**78**(11):1550–8.
10. Baraliakos X, Østergaard M, Lambert RGW, *et al*. MRI lesions of the spine in patients with axial spondyloarthritis: an update of lesion definitions and validation by the ASAS MRI working group. *Ann Rheum Dis* 2022;**81**(9):1243–51.
11. Eddison J, Bray TJP, Webb D, *et al*. *The use of MRI in the diagnosis of axial SpA—a UK survey of protocols for magnetic resonance imaging (MRI) in the diagnostic process of axial spondyloarthritis (axial SpA)*. Available at:. 2023 https://nass.co.uk/wp-content/uploads/2023/04/NASS-uses-of-MRI-DIGITAL-version.pdf.
12. NHS England and NHS Improvement. *NHS diagnostic waiting times and activity data NHS England and NHS improvement 2 NHS diagnostic waiting times and activity data January 2022 monthly report*. Available at:. 2022 https://www.england.nhs.uk/statistics/statistical-work-areas/diagnostics-waiting-times-and-activity/monthly-diagnostics-waiting-times-and-activity/.
13. Maskell G. Why does demand for medical imaging keep rising? *BMJ* 2022:o2614.
14. NHS England. *Diagnostics: recovery and renewal*. Available at:. 2020 https://www.england.nhs.uk/wp-content/uploads/2020/10/BM2025Pu-item-5-diagnostics-recovery-and-renewal.pdf.

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