Advancing Early Identification of Axial Spondyloarthritis: An Interobserver Comparison of Extended Role Practitioners and Rheumatologists

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ABSTRACT. ***Objective.*** To compare clinical impression and confidence of extended role practitioners (ERP) with those of rheumatologists experienced in axial spondyloarthritis (axSpA) according to (1) evaluation of patients with chronic back pain assessed for axSpA; and (2) magnetic resonance imaging (MRI) recommendation for further investigation of these patients.

Methods. Patients with ≥ 3 months of back pain and age of onset < 45 years were referred for axSpA evaluation. An ERP assessed consecutive patients and recorded standardized clinical information in written form. Three rheumatologists subsequently evaluated each patient based on the recorded information. Patients were classified as having axSpA or mechanical back pain based on clinical and investigative findings. Level of confidence was noted for classification and MRI indication. Agreement between assessors was evaluated using percentage agreement and κ coefficient.

Results. Fifty-seven patients were assessed. Interobserver agreement of clinical impression for all raters was moderate (κ = 0.52). Agreement of clinical impression between ERP and rheumatologists ranged between 71.2% (κ = 0.41) and 79.7% (κ = 0.57). Agreement of clinical impression among rheumatologists ranged from 74.1% (κ = 0.49) to 79.7% (κ = 0.58). All rater agreement for MRI indication was fair (κ = 0.37). ERP agreement with rheumatologist for MRI recommendation ranged from 64.2% (κ = 0.32) to 75% (κ = 0.48). Agreement for MRI indication among rheumatologists ranged from 62.9% (κ = 0.27) to 74% (κ = 0.47). Confidence in clinical impression was similar among all practitioners.

Conclusion. ERP with specialty training in inflammatory arthritis demonstrate clinical impressions comparable with those of rheumatologists in the assessment of axSpA. Incorporation of such roles into existing models of care may assist in early detection of axSpA. (First Release August 15 2019; J Rheumatol 2020;47:524–30; doi:10.3899/jrheum.180787)

Key Indexing Terms:
SPONDYLITIS EARLY DIAGNOSIS HEALTH SERVICES AXIAL SPONDYLOARTHRITIS

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Axial spondyloarthritis (axSpA) is a chronic autoimmune disease primarily affecting the spine that manifests in pain, progressive stiffness, and involvement of peripheral joints and extraarticular manifestations affecting the ocular, gastrointestinal, and dermal systems[1]. The incidence of radiographic axSpA (i.e., ankylosing spondylitis) can vary from 0.4 to 15.0 per 100,000 patient-years, with prevalence rates per 100,000 persons ranging from 6.5 to 540, depending on geographic region[2]. Early detection is critical in improving longterm outcomes in patients with axSpA[3,4]. A study demonstrated that 47% of patients with axSpA waited at least 5 years before receiving a definitive diagnosis for their back pain, with this diagnostic delay extending as long as 10

years[5,6,7,8]. Early diagnosis is important for this patient population because it may lead to better control of symptoms, improved functional outcomes, and enhanced quality of life through timely initiation of appropriate treatments[9,10,11]. Moreover, access to rheumatology care may be a contributing factor in delayed detection of axSpA, with provision of rheumatology care often outmatched by demand[12,13]. These factors combine to create a degree of urgency for early detection and treatment, if patients with axSpA are to avoid prolonged wait times, unnecessary diagnostic procedures, and inappropriate interventions.

Several models have been proposed to address the lack of rheumatology specialists and to improve access to care. Extended-scope models of care have used allied health professionals (physiotherapists, occupational therapists, and nurses) with advanced training to provide assessment and management to improve access to care[14,15,16]. These extended role practitioners (ERP) work in a capacity whereby they assume roles beyond their traditional scope through the use of medical directives to order and interpret investigations and thereby make diagnoses within their clinical expertise[14,15]. There are numerous models in the literature that use ERP for triage of musculoskeletal conditions including osteoarthritis and inflammatory arthritis[14,15,17]. Physiotherapists working in extended scope are particularly well positioned to fulfill ERP roles, given their extensive training in assessment of the musculoskeletal system and its associated pathologies, including degenerative and inflammatory joint diseases[18,19,20]. Despite the development of such models, none have specifically examined the role of ERP in the area of axSpA. We compared the clinical impression and confidence of ERP with rheumatologists experienced in axSpA according to (1) the evaluation of patients with chronic back pain being assessed for axSpA, and (2) magnetic resonance imaging (MRI) recommendation for further investigations for these patients.

MATERIALS AND METHODS

Patients with more than 3 months of back pain with onset prior to the age of 45 years (and with no previous diagnosis of axSpA) who were attending community primary care (primary care physicians or physiotherapists) were referred to the Toronto Western Hospital Spondylitis Screening Clinic for evaluation of possible axSpA. Given that axSpA can present in isolation or as an overlap with other SpA, patients attending gastroenterology clinics for inflammatory bowel disease, or ophthalmology clinics for anterior uveitis, with complaints of back pain (for > 3 months and no previous diagnosis of axSpA) were also referred for axSpA evaluation (Figure 1). Consecutive patients who met the referral criteria above were initially assessed by an experienced ERP associated with the Toronto Western Hospital Spondylitis Program for 3 years and certified as an Advanced Clinician Practitioner in Arthritis Care[21]. The assessment included a thorough back pain history; medical history (including extraarticular manifestations of SpA, i.e., uveitis, psoriasis and/or inflammatory bowel disease); use of medications; and physical examination, laboratory studies (erythrocyte sedimentation rate, C-reactive protein, and human leukocyte antigen-B27 typing), and plain radiographs (anterior-posterior pelvis, anterior-posterior and lateral lumbar and cervical spines). Details of each patient's history and examination were recorded on a standardized data collection form. Patients were classified by the ERP as having axSpA[22], mechanical back pain (MBP), or "other," if indicated, based on clinical and investigative findings. Level of confidence on a 10-point numeric rating scale regarding the ERP's clinical impression (0, indicating no confidence, to 10, indicating high confidence) was noted. The ERP also specified whether an MRI for further investigation was indicated.

Evaluation data (i.e., history, physical examination, and investigations) were collated for each patient and presented to 3 rheumatologists (2 staff rheumatologists specializing in axSpA and a Rheumatology Fellow) as a "paper patient." Each rheumatologist was required to review the evaluation data and then classify each patient as having either axSpA or MBP. The rheumatologists were also asked to note their level of confidence on a 10-point numerical rating scale regarding their clinical impression. Lastly, the rheumatologist indicated whether an MRI for further investigation was warranted.

Interobserver agreements for back pain classification and for MRI recommendation between ERP and rheumatologists and among the rheumatologists were estimated using percentage agreement. A multimodal analysis of interobserver agreement included Cohen's κ coefficient and the prevalence-adjusted bias-adjusted κ (PABAK) to ensure validity of results. Confidence in back pain classification was compared using 1-way ANOVA, with case-wise omission to account for missing values. ANOVA results were then confirmed using the Tukey honestly significant difference test. SAS version 9.1 was used for analyses.

This study was approved by the University Health Network (UHN) research ethics board (no. 11-0362-BE). Written informed consent was obtained from all patients participating in the study according to policy and procedures of the UHN research ethics board.

RESULTS

A total of 57 patients were assessed by the ERP and rheumatologists. The majority of patients were referred from gastroenterology clinics (47%) or primary care (44%). Patients were predominantly male (56.1%) and had a mean age of 38.5 ± 12.2 years. Table 1 outlines the demographic and clinical characteristics of patients assessed by ERP in the Spondylitis Screening Clinic. Most patient participants reported an insidious onset of back pain, with a mean age at onset of 28 ± 10.9 years, most frequently affecting the lumbar and sacral regions of the spine (86.0% and 57.9%, respectively) and sacroiliac joints (47.4%). Morning stiffness was present in 87.7% of patients, lasting a mean duration of 73.7 min; 14.3% of patients were HLA-B27–positive and 12.5% met the modified New York criteria[23].

Impression for axSpA among the various practitioners ranged from 35.7% (staff rheumatologist 1) to 55.4% (staff rheumatologist 2) of reviewed cases. Recommendation for further investigation (i.e., MRI) ranged from 37% (ERP) to 62.5% (staff rheumatologist 2) of cases reviewed.

The ERP agreed with the rheumatologist consensus (consensus defined as ≥ 2 out of 3 rheumatologists classifying patients as either axSpA or MBP) in 75.5% of all cases, representing a Cohen's κ of 0.5 and PABAK of 0.51, indicating a moderate level of agreement (see Table 2 for interpretation of κ results[24]). Similar findings were observed when the ERP was compared to each individual rheumatologist (Table 3). Among the participating rheumatologists, agreement on back pain classification ranged from 74.1% to 79.7%, with

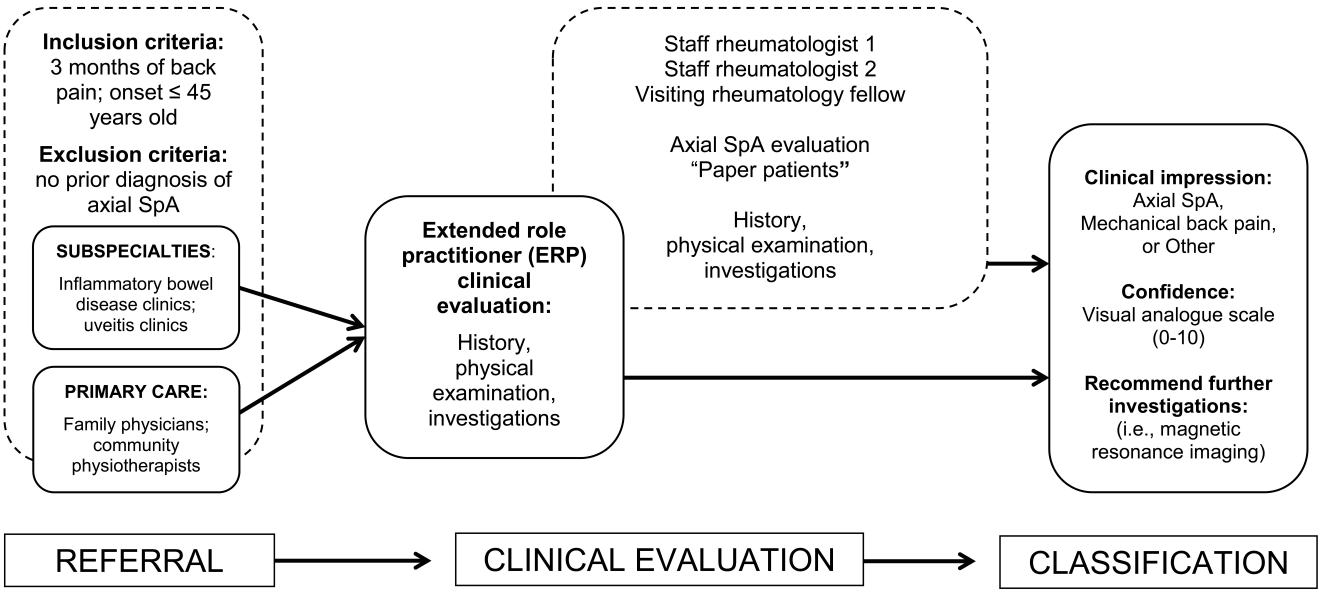

Figure 1. Screening protocol for patients referred to the Toronto Western Hospital Spondylitis Screening Clinic for evaluation of possible axial spondyloarthritis. SpA: spondyloarthritis.

Cohen's κ ranging from 0.49 to 0.58 and PABAK ranging from 0.48 to 0.59, indicating a moderate level of agreement.

Regarding MRI recommendation for further investigation for evidence of inflammatory changes in the sacroiliac joints or spine, the ERP agreed with the rheumatologists' consensus in 71.1% of cases, representing moderate agreement (Cohen's κ = 0.43, PABAK = 0.42; Table 4). Percentage agreement was slightly less when the ERP was compared to each individual rheumatologist, ranging from 64.2% to 75%, with fair to moderate agreement (Cohen's κ ranging from 0.31 to 0.48 and PABAK ranging from 0.29 to 0.50). In comparison, percentage agreement between rheumatologists ranged from 62.9% to 74% (Cohen's κ ranging from 0.27 to 0.47 and PABAK ranging from 0.26 to 0.48), representing a fair level of agreement (Table 4).

Figure 2 illustrates the confidence in back pain classification among the practitioners. The median level of confidence in back pain classification among the rheumatologists was 6 [range 2 to 10 on a 10-point visual analog scale (VAS)]. In comparison, the ERP's median level of confidence was 7 (range 3 to 10). There was no significant difference in confidence levels between the ERP and the rheumatologists ($p = 0.068$).

DISCUSSION

Our study is the first to compare interobserver agreement between ERP and rheumatologists in the detection of axSpA. The majority of studies to date that compared interobserver agreement between ERP and physicians have been conducted predominantly in orthopedics, assessing the detection of a variety of specific musculoskeletal disorders. These studies have shown similar results in agreement, ranging from κ = 0.69 to 0.87[14,25,26,27]. Often included in these studies is the analysis of diagnostic accuracy of the ERP. This outcome was not examined in our study, because determination of diagnostic accuracy requires a gold standard to assess specificity and sensitivity. As is the case for many rheumatological conditions, the gold standard for diagnosis of axSpA rests with the clinical opinion of the rheumatologist, which is based on the overall impression of the patient's history, examination, and investigative results and takes into consideration both the presence and absence of pertinent findings[28]. Inclusion of diagnostic accuracy in our study would have relied on the clinical opinion of the rheumatologist and created a circular process in the assessment of diagnosis for axSpA. To avoid this circularity, the objectives of the study were to examine the interobserver agreement between ERP and rheumatologist and between rheumatologists, based on clinical impression using established criteria for disease classification[22].

This study shows that ERP with advanced training in arthritis care demonstrate clinical decision-making skill in patients presenting with back pain that is comparable to that of rheumatologists; however, agreement among ERP and rheumatologists in the evaluation of axSpA was found to be moderate at best. These findings are consistent with reports reflecting wide interobserver variation among the various domains used in classification of axSpA, such as imaging interpretation of sacroiliitis[29,30]. Further, there was comparable confidence in clinical decision-making between ERP and rheumatologists. Other studies have examined the confidence of disease classification in patients presenting with chronic back pain and found similar results, with confidence ranging from 5 to 10 on a VAS[31]. These moderate levels of

Table 1. Demographic data and back pain characteristics of patients assessed by extended role practitioner in the Spondylitis Screening Clinic.

Characteristic	n = 57
Male, %	56.1
Mean age (SD), yrs	38.5 (12.2)
Back pain characteristics	
Onset, insidious, %	80.7
Mean age at onset (SD), yrs	28 (10.9)
Mean Oswestry[36] score (SD)	22.2 (12.4)
Location of pain, %	
Cervical	26.3
Thoracic	40.4
Lumbar	86.0
Buttocks	43.9
Sacrum	57.9
Sacroiliac joint*	47.4
Presence of morning stiffness, %	87.7
Mean duration of morning stiffness (SD), min	73.7 (56.7)
Improvement with activity, %	69.6
Improvement with rest, %	42.9
Alternating buttock pain, %	24.6
Nocturnal back pain, %	63.2
Responsive to NSAID, %	47.3
Presence of extraarticular manifestations, %	
Inflammatory bowel disease	50.8
Psoriasis	15.8
Uveitis	8.8
Positive family history of SpA, %	33.3
Mean (SD) BASMI score	2.2 (0.8)
Investigative findings, %	
Elevated ESR	17.0
Elevated CRP	11.5
Presence of HLA-B27	14.3
Meets modified New York criteria	12.5

*Located in proximity to the posterior superior iliac spine (i.e., dimples of Venus). NSAID: nonsteroidal antiinflammatory drug; SpA: spondyloarthritis; BASMI: Bath Ankylosing Spondylitis Metrology Index; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein.

Table 2. Categorization of interobserver agreement by κ index.

κ	Agreement
0.81–1.00	Almost perfect
0.61–0.80	Substantial
0.41–0.60	Moderate
0.21–0.40	Fair
0–0.20	Slight
< 0	Poor

confidence, in addition to moderate levels of interobserver agreement, suggest that clinical decision-making for this patient population may be challenging for the clinician. Moreover, the phenotypical heterogeneity of the various subsets of axSpA (i.e., radiographic axSpA and nonradiographic axSpA), and the absence of a single clinical or investigative feature for the diagnosis of axSpA, adds to the challenge of accurately identifying patients with axSpA[3]. Further study into the decision-making process of clinicians

Table 3. Interobserver agreement for clinical impression between extended role practitioner (ERP) and rheumatologists (n = 57).

Clinical Impression	Percentage Agreement	Cohen's κ (95% CI)	PABAK
ERP and Rheumatologist consensus	75.5	0.50 (0.26–0.73)	0.51
ERP and Rheum 1	79.7	0.57 (0.35–0.79)	0.59
ERP and Rheum 2	77.7	0.56 (0.33–0.77)	0.55
ERP and Fellow	71.2	0.41 (0.17–0.67)	0.42
Rheum 1 and Rheum 2	76.8	0.55 (0.35–0.75)	0.54
Rheum 1 and Fellow	79.7	0.58 (0.37–0.8)	0.59
Rheum 2 and Fellow	74.1	0.49 (0.26–0.71)	0.48

PABAK: prevalence-adjusted, bias-adjusted κ.

Table 4. Interobserver agreement for MRI recommendation between extended role practitioner (ERP) and rheumatologists (n = 57).

MRI Recommendation	Percentage Agreement	Cohen's κ (95% CI)	PABAK
ERP and Rheum consensus	71.1	0.43 (0.2–0.66)	0.42
ERP and Rheum 1	75	0.48 (0.23–0.72)	0.50
ERP and Rheum 2	64.2	0.32 (0.1–0.5)	0.28
ERP and Fellow	64.7	0.31 (0.13–0.55)	0.29
Rheum 1 and Rheum 2	63.7	0.29 (0.06–0.53)	0.27
Rheum 1 and Fellow	62.9	0.27 (0.02–0.52)	0.26
Rheum 2 and Fellow	74	0.47 (0.24–0.71)	0.48

PABAK: prevalence-adjusted, bias-adjusted κ; MRI: magnetic resonance imaging.

working with chronic back pain may provide better insight into the clinical reasoning process for patients with axSpA.

The rate of axSpA classification was high in this study, with clinicians classifying patients with axSpA (including imaging and clinical investigations) in a range from 37.5% to 57.4% of reviewed cases. This is high compared to other population studies of ankylosing spondylitis (AS), a subset of axSpA, with incidence rates ranging from 0.4 to 15.0 per 100,000 patient-years and AS prevalence rates ranging from 6.5 to 540.0 per 100,000 persons[2]. Almost half (47%) of patients reviewed in this study were referred from gastroenterology clinics, with a known diagnosis of inflammatory bowel disease, which may have contributed to an increased pretest probability of a diagnosis of axSpA.

The use of a multimodal analysis of interobserver agreement added to the validity of the results. The inclusion of the PABAK statistic adjusted for potential bias regarding disagreement between observers, and also accounted for potentially very high or very low data distribution by disease classification (i.e., axSpA vs MBP). The differences between the Cohen's κ statistics and the PABAK were negligible and the overall interpretation of the κ statistic did not vary between analyses (Table 2), suggesting an accurate interpretation of interobserver agreement.

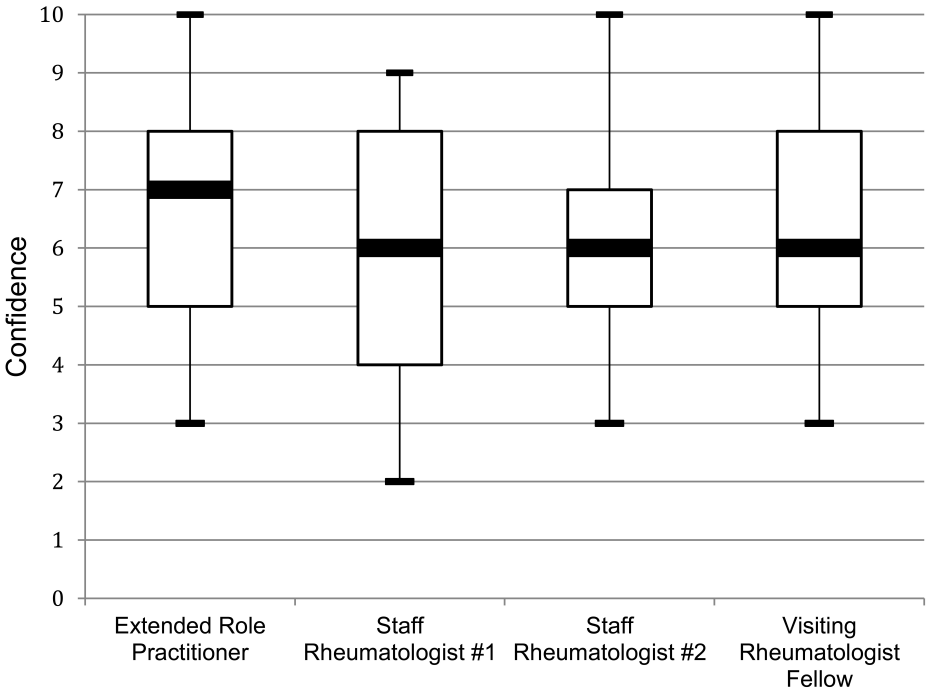

Figure 2. Representation of confidence in back pain classification among the practitioners (n = 57). The median level of confidence in back pain classification among the rheumatologists was 6 (range 2–10) on a 10-point visual analog scale. The median level of confidence of the extended role practitioner was 7 (range 3–10). There was no significant difference in confidence levels between the ERP and the rheumatologists (p = 0.068).

The use of "paper patients" may raise a legitimate question regarding the validity of the rheumatologist's clinical opinion, as the rheumatologists did not assess the patients face to face and perhaps may have come to different clinical decisions if they had done so. Similar methods have been described in the literature and were used in the development of the Assessment of SpondyloArthritis international Society (ASAS) classification criteria for axSpA[31]. Using "paper patients" as a form of clinical review was most feasible in our study because it allowed for multiple reviews from a number of rheumatologists on the same patient. To optimize validity of the "paper patients" and minimize potential bias, standardized data collection forms were used for the patient history and physical examination. The rheumatologist also had access to all handwritten notes and any investigative results pertaining to the axSpA screening examination in the patient's clinic chart and electronic medical record.

The criteria used in the diagnosis of axSpA itself may be a cause for delay in early detection of this patient population. For example, application of the modified New York criteria for AS requires at least a grade 2 bilateral sacroiliitis, or a grade 3 or 4 unilateral sacroiliitis, in addition to at least 1 criterion from a list of clinical criteria[23]. The inherent problem with these criteria is that the radiographic changes may take several years after the onset of symptoms[3]. Brandt, *et al* have suggested that diagnosis in the nonradiographic stage can be made through a combination of clinical and laboratory findings and MRI results[32]. The inclusion of MRI results has been well endorsed by the ASAS consensus criteria for axSpA, and it has been reported that a targeted history, examination, and investigation can significantly increase the index of suspicion for SpA from a 5% disease probability in those with general chronic low back pain to an 85% disease probability with the appropriate combination of clinical, laboratory, and MRI findings[3]. Unfortunately, in many locations, access to MRI can be limited. Prolonged wait times for a limited number of MRI machines, in addition to fiscal constraint, remains a clinical challenge in the early detection of nonradiographic axSpA[33].

Our results demonstrated that the ERP was conservative in the recommendation for further MRI investigation, compared to the participating rheumatologists. This may be because current provincial legislation impedes licensed physiotherapists working in Ontario, Canada, from ordering MRI[34], and therefore ERP may be more judicious in their recommendation for MRI investigation. The results showed moderate agreement between ERP and rheumatologist when recommending further investigation, specifically MRI, to assess for evidence of inflammatory changes in the sacroiliac joints and/or spine. These findings were comparable to the agreement between participating rheumatologists. By revealing comparable clinical judgment between the ERP and rheumatologist for further diagnostic imaging, it is antici-

pated these results will support endorsement of medical directives for ERP that may bridge legislative hurdles in the early detection of axSpA.

This is the first study comparing the clinical impression of nonphysician healthcare professionals (i.e., ERP) with rheumatologists in the evaluation of patients with chronic back pain assessed for axSpA. A number of limitations must be addressed. First, the study took place in an academic tertiary referral center, and therefore patients with high risk for axSpA from specialty clinics (i.e., patients with inflammatory bowel disease and uveitis) comprised the majority of participants. It may be argued that the pretest probability of identifying patients with axSpA is higher given the presence of extraarticular manifestations associated with this form of inflammatory arthritis. However, the aim of the study was to determine the clinical impression agreement between healthcare professionals, regardless of final diagnosis. Thus, that these patients may have had a higher pretest probability of axSpA should not influence the comparison of clinical impression between the ERP and the rheumatologist. Second, the results of the study use a single ERP for the initial axSpA screen, suggesting external validity of the results may be limited. However, the advanced training undertaken by the participating ERP is from a competency-based credentialed program offered through an academic institution[35], and therefore similar results would be expected from other ERP who have received similar training. Finally, our study did not undertake an *a priori* examination of the validity of the ERP assessment compared to the rheumatologists' assessment. Future studies addressing the validity of ERP and rheumatologists' assessments of axSpA are recommended to confirm findings outside the context of this study.

In an era of policy shifts due to fiscal constraints and limited access to timely healthcare, the use of nonphysician healthcare professionals such as ERP who are highly skilled in assessment of axSpA has the potential to improve a number of patient and system-related outcomes (e.g., patient and provider satisfaction, wait times). Our study contributes to the growing body of literature supporting the use of nonphysician healthcare providers to enhance access to appropriate arthritis and musculoskeletal care. In the case of axSpA, ERP with advanced training demonstrated clinical judgment comparable to that of rheumatologists in the assessment of axSpA. Use of such extended practice roles, in collaboration with physician colleagues, may assist in improving the early detection of axSpA, facilitating early treatment, and improving overall outcomes in this patient population.

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