

Early Diagnosis Of Inflammatory Arthritis By Primary Care Physicians Following Training By A Rheumatologist

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Background: Early diagnosis and therapeutic management of inflammatory arthritis (IA) is crucial for minimizing disease progression and improving outcomes. We recently developed the New Early Arthritis Referral Criteria to help improve the detection of suspected early IA via musculoskeletal (MSK) examination. The present study aimed to evaluate the agreement between rheumatologists and primary care physicians (PCPs) trained by rheumatologists in detecting IA when applying the standardized MSK examination techniques used to develop this criteria in a real-world setting in Jeddah, Saudi Arabia.

Methods: This quasi-experimental study was conducted in 4 primary health centers and involved 30 PCPs and 3 rheumatologists. All PCPs were trained by rheumatologists to apply the standardized MSK examination techniques used to develop the New Early Arthritis Referral Criteria. Patients were eligible if they were >18 years of age and presented with small-joint pain that persisted for >6 weeks. Patients were excluded if they had prior diagnosis of osteoarthritis, hand fractures, or rheumatic disease associated with IA. All patients were examined separately by a PCP and a rheumatologist, with the findings compared via kappa statistics and the rheumatologist's findings considered the "gold standard".

Results: Data from 202 of the 203 enrolled patients were analyzed. There was fair-to-moderate agreement between PCPs and rheumatologists when assessing swelling of the small joints and wrist of the right side (range of kappa: 0.14–0.41) and low-to-moderate agreement in similar examinations of the left side (range of kappa: 0.04–0.42). Assessments of joint tenderness showed fair-to-moderate agreement for both the right side (range of kappa: 0.22–0.47) and left side (range of kappa: 0.24–0.45). P-values were significant for virtually all comparisons.

Conclusion: MSK examinations by PCPs showed a promising extent of agreement in detecting IA with those by rheumatologists following training. Refinement of the standardized training process could further improve accuracy and help PCPs to confidently identify cases of early IA, thus allowing earlier intervention than is typical in this setting.

Keywords: arthritis, physician training, primary care, referral criteria, rheumatic disease

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Introduction

Inflammatory arthritis (IA) is a broad clinical term that covers various rheumatic diseases and represents one of the most common causes of disability among the general population.^{1,2} The damage caused to joints by IA can lead to a loss of function that creates difficulties for those affected in terms of their ability to care for themselves and

to work. Early diagnosis and therapeutic management of IA is therefore crucial for minimizing the progression of joint damage and improving outcomes.^{3,4}

Rheumatic diseases often affect multiple organs and there is often a lack of any clear sign or symptom that provides a physician with an indication of the specific nature of the condition. This uncertainty can lead to patients experiencing a delay in receiving a diagnosis and treatment, which increases their risk of permanent joint damage and disability.^{3,4} Indeed, a study of Saudi patients with rheumatoid arthritis (RA) showed that the period between symptom onset and diagnosis can be as long as 30 months,⁵ while a separate study showed that the majority (55%) of Saudi patients with RA experience a >50% decrease in their work capacity.⁶ The prevalence of RA in Saudi Arabia has been reported to be approximately 2.2 cases per 1000 individuals.⁷ It is unclear whether this disparity represents a true difference in susceptibility within these national populations or a consequence of differences in diagnostic criteria, or a combination of both these factors. Nonetheless, musculoskeletal (MSK) disorders overall represent the second most frequent cause of outpatient visits to primary health centers (PHCs) and private clinics in Saudi Arabia.⁸ In addition, research from various regions around the world suggests that the level of expertise in applying MSK examination techniques by non-rheumatologists is inconsistent.⁹⁻¹⁴

The most common scenario in which an individual with potential IA interacts with the Saudi health care system is when they first visit a primary care physician (PCP) and describe experiencing joint pain. According to local procedures, the PCP will then likely apply a set of referral criteria in order to identify cases appropriate for a consultation with a rheumatologist. Despite the growing dependence upon advanced radiologic techniques for the diagnosis of rheumatic diseases,¹⁵ their lack of availability in PHCs makes it important for PCPs to be confident and knowledgeable regarding MSK examinations for suspected IA. We have recently published a set of referral criteria (the New Early Arthritis Referral Criteria) that are intended to improve the detection of early IA via MSK examination.^{16,17} The aim of the present study, which used the same cohort of patients enrolled in the new referral criteria study,^{16,17} was to evaluate the agreement between rheumatologists and PCPs trained by rheumatologists in detecting IA when applying the standardized MSK examination techniques used in the New Early Arthritis Referral Criteria in a real-world setting in Saudi Arabia.

Methods

Study Design

This quasi-experimental study was conducted in 4 of the 39 PHCs located in Jeddah, Saudi Arabia, with a single PHC from each of Jeddah's 4 main regions selected randomly from those within each. Prior to the study's commencement, the protocol was approved by the institutional review boards at each of the participating PHCs, as well as by the Directorate of Health Affairs at the Saudi Ministry of Health. This study has been conducted in accordance to the Declaration of Helsinki. A total of 30 PCPs and 3 rheumatologists participated in the study. All 30 PCPs received the same training at the same time from the 3 rheumatologists, via a standardized process that ensured they were capable of correctly applying the MSK examinations of the hands and wrists described in the New Early Arthritis Referral Criteria. Detailed definitions and descriptions of these MSK examination techniques have been described previously.¹⁶

Patients

Any patient who visited a PHC clinic at one of the 4 participating PHCs (Al-Safa, Al-Hamra, Ghulail, or Al-Bawadi) was eligible to be included in the study if they were >18 years of age, presented with pain in the small joints that had persisted for >6 weeks, and provided written informed consent. Patients were excluded if they had already been diagnosed with osteoarthritis, fractures of the hands, or a rheumatic disease associated with IA. Each patient who met the eligibility criteria was examined separately by a PCP and then by a rheumatologist, with the findings from each examination recorded and subsequently compared via statistical analysis. The final diagnosis that each patient received was based on the findings of the rheumatologist and the results from subsequent ultrasound and laboratory tests.

Statistical Analysis

As described previously,¹⁷ the overall sample size calculated to be appropriate for the cross-sectional study that served as the basis for the current analysis was 203 patients. Kappa statistics with 95% confidence intervals and Fisher's exact tests were used to evaluate the extent of agreement between the MSK examination findings reported by the PCPs and the rheumatologists, with the findings of the rheumatologists' examinations, laboratory findings included, considered as the gold standard. The

extent of agreement as indicated by kappa values was defined, according to Cohen's criteria, as follows: none to slight (kappa <0.20), fair (kappa 0.21–0.40), moderate (kappa 0.41–0.60), substantial (kappa 0.61–0.80), and almost perfect (kappa 0.81–1.00).¹⁸ The statistical software we used was SPSS (Version 23).

Results

Patient Demographics

A total of 203 participants were enrolled, with data from 202 patients included in the present analysis and data from 1 patient excluded due to incompleteness. This cohort has been described previously (Table 1).¹⁷

Application Of The Standardized MSK Examination Techniques Used In The New Early Arthritis Referral Criteria By PCPs Following Training By Rheumatologists

Joint Swelling

Comparison of the examination findings obtained by the PCPs and rheumatologists showed that kappa values for the extent of agreement with regards to assessing swelling of the metacarpophalangeal (MCP) and proximal interphalangeal joints (PIP) and wrist of the right side ranged from 0.14 to 0.41, indicating a slight-to-moderate extent of agreement,

with the majority of kappa values in the slight-to-fair range (Table 2). P values were significant for all ($p < 0.01$ for all except MCP 4, for which $p = 0.04$), which indicates that the extent of agreement observed was highly unlikely to be due to chance. The extent of agreement with regard to swelling of the MCP and PIP joints of the left side was in the slight-to-fair range of kappa values (0.04 to 0.37), while agreement in regard to swelling of the left wrist was moderate (kappa value: 0.41). P values were significant ($p < 0.01$ for all) for all comparisons except the MCP 4 and MCP 5 joints.

Joint Tenderness

Similar to the results obtained from evaluations of joint swelling, comparisons of the examination findings obtained by the PCPs and rheumatologists when assessing joint tenderness in the MCP and PIP joints gave kappa values that ranged from 0.22 to 0.39 for the right side, indicating a fair extent of agreement, with a moderate extent of agreement for the right wrist (kappa value: 0.47). P values were highly significant for all ($p < 0.001$ for all; Table 3). Similarly, fair-to-moderate extent of agreement was observed in comparisons of joint tenderness on the left side, with kappa values ranging from 0.24 to 0.45 and p values being highly significant for all ($p < 0.001$ for all).

Confirmed Diagnoses Of Inflammatory Arthritis

Overall, there were 128 of the 203 enrolled patients (63.1%) who received a final diagnosis of IA.

Discussion

The present study investigated the extent of agreement between rheumatologists and PCPs trained by rheumatologists in detecting IA when applying the standardized MSK examination techniques used in the New Early Arthritis Referral Criteria to suspected cases of IA in a real-world setting in Saudi Arabia. Overall, agreement between PCPs and rheumatologists was fair and in some cases moderate. We believe that these promising findings may be built upon by further refining the standardized training process so that, ultimately, the PCPs are capable of identifying early IA with an accuracy similar to that of a rheumatologist. Providing PCPs with the requisite level of training needed to identify IA via MSK examination early and with confidence is expected to improve outcomes for patients, in terms of earlier diagnosis and treatment to minimize disease progression and improve quality of life. Additional positive outcomes for society in general would

Table 1 Patient-Reported Clinical And Demographic Variables

	N	Disease Status		p-Value
		Yes	No	
Sex				
• Male	37	24	13	0.50
• Female	165	104	61	
Age				
• <40 years	74	52	22	0.08
• ≥40 years	128	76	52	
Loss of appetite^a				
• Yes	31	25	6	0.04
• No	171	103	68	
Stiffness^a				
• Yes	93	51	42	0.02
• No	109	77	32	
Family history of uveitis				
• Yes	7	1	6	0.01
• No	195	127	68	

Notes: All p-values were obtained using one-tailed Fisher's exact test, except for loss of appetite (two-tailed). ^aPatient-reported.

Table 2 Agreement Between PCPs And Rheumatologists In The Detection Of Joint Swelling

Joints	Positive Finding	n	Negative Finding	n	Kappa Value (95% CI)	P value
Right hand						
MCP 1	True	8	True	172	0.35 (0.14 to 0.56)	<0.001
	False	14	False	8		
MCP 2	True	8	True	156	0.18 (0.01 to 0.36)	0.008
	False	18	False	20		
MCP 3	True	14	True	156	0.36 (0.19 to 0.54)	<0.001
	False	15	False	17		
MCP 4	True	2	True	183	0.14 (-0.09 to 0.37)	0.040
	False	7	False	10		
MCP 5	True	2	True	190	0.24 (-0.07 to 0.55)	<0.001
	False	5	False	5		
PIP 1	True	7	True	178	0.41 (0.18 to 0.64)	<0.001
	False	11	False	5		
PIP 2	True	11	True	151	0.23 (0.06 to 0.40)	0.001
	False	18	False	22		
PIP 3	True	11	True	144	0.18 (0.02 to 0.34)	0.009
	False	23	False	23		
PIP 4	True	6	True	167	0.22 (0.02 to 0.43)	0.001
	False	13	False	14		
PIP 5	True	4	True	179	0.25 (0.01 to 0.49)	<0.001
	False	7	False	11		
Wrist	True	27	True	123	0.35 (0.20 to 0.49)	<0.001
	False	15	False	36		
Left hand						
MCP 1	True	7	True	165	0.27 (0.08 to 0.46)	<0.001
	False	19	False	9		
MCP 2	True	7	True	163	0.22 (0.03 to 0.41)	0.001
	False	20	False	11		
MCP 3	True	6	True	164	0.18 (-0.00 to 0.36)	0.007
	False	20	False	12		
MCP 4	True	1	True	181	0.04 (-0.13 to 0.20)	0.606
	False	9	False	11		
MCP 5	True	1	True	182	0.05 (-0.12 to 0.22)	0.451
	False	13	False	6		

(Continued)

Table 2 (Continued).

Joints	Positive Finding	n	Negative Finding	n	Kappa Value (95% CI)	P value
PIP 1	True	6	True	179	0.37 (0.15 to 0.60)	<0.001
	False	9	False	8		
PIP 2	True	12	True	162	0.37 (0.19 to 0.56)	<0.001
	False	16	False	12		
PIP 3	True	13	True	151	0.29 (0.12 to 0.46)	<0.001
	False	19	False	19		
PIP 4	True	5	True	172	0.21 (0.00 to 0.42)	0.002
	False	11	False	14		
PIP 5	True	5	True	179	0.33 (0.08 to 0.57)	<0.001
	False	7	False	9		
Wrist	True	79	True	64	0.42 (0.29 to 0.54)	<0.001
	False	35	False	23		

Abbreviations: CI, confidence interval; MCP, metacarpophalangeal; PIP, interphalangeal.

include reducing the impact of the disease on family and friends and limiting the costs associated with advanced disease and lost workplace productivity.

The promising results demonstrated by the PCPs trained during our study should also be considered in light of published accounts of the inconsistent level of expertise in applying MSK examination techniques by non-rheumatologists in various geographic regions. Indeed, Zaini and colleagues reported low confidence among internal medicine residents in Saudi Arabia when conducting MSK examinations,¹⁴ and a US study reported that 78% of internal medicine residents demonstrated a lack of skills in assessing the MSK system via examination.¹¹ Furthermore, a study of medical students from Harvard University noted their inadequate preparation in MSK medicine, including a lack of clinical confidence and cognitive mastery in the field.¹⁰ Similar conclusions have been reached by Coady and colleagues, who identified a lack of agreement on what to teach, a lack of confidence in teaching amongst non-MSK specialties, and poor communication between specialties as barriers to improving the teaching of MSK examination,⁹ Oswald and colleagues, who noted the relatively limited hours devoted to training of MSK examination skills in Canadian medical schools, which ignores the prevalence of these conditions within the general population,¹² and Stansfield and colleagues, who reported an evident lack of clinical skills in

Table 3 Agreement Between PCPs And Rheumatologists In The Detection Of Joint Tenderness

Joints	Positive Finding	n	Negative Finding	n	Kappa Value (95% CI)	P value
Right side						
MCP 1	True	25	True	130	0.36 (0.22 to 0.51)	<0.001
	False	32	False	15		
MCP 2	True	38	True	106	0.36 (0.23 to 0.49)	<0.001
	False	41	False	17		
MCP 3	True	37	True	110	0.39 (0.26 to 0.52)	<0.001
	False	40	False	14		
MCP 4	True	27	True	118	0.31 (0.17 to 0.44)	<0.001
	False	43	False	14		
MCP 5	True	26	True	126	0.37 (0.24 to 0.51)	<0.001
	False	40	False	8		
PIP 1	True	18	True	126	0.22 (0.08 to 0.36)	<0.001
	False	45	False	13		
PIP 2	True	47	True	85	0.29 (0.16 to 0.42)	<0.001
	False	49	False	21		
PIP 3	True	47	True	81	0.27 (0.14 to 0.40)	<0.001
	False	50	False	22		
PIP 4	True	38	True	96	0.29 (0.16 to 0.42)	<0.001
	False	50	False	17		
PIP 5	True	31	True	104	0.26 (0.13 to 0.39)	<0.001
	False	52	False	15		
Wrist	True	33	True	126	0.47 (0.34 to 0.60)	<0.001
	False	9	False	33		
Left side						
MCP 1	True	30	True	130	0.45 (0.31 to 0.59)	<0.001
	False	30	False	12		
MCP 2	True	34	True	115	0.38 (0.24 to 0.51)	<0.001
	False	38	False	15		
MCP 3	True	34	True	115	0.39 (0.26 to 0.52)	<0.001
	False	42	False	11		
MCP 4	True	27	True	128	0.40 (0.26 to 0.53)	<0.001
	False	38	False	8		

(Continued)

Table 3 (Continued).

Joints	Positive Finding	n	Negative Finding	n	Kappa Value (95% CI)	P value
MCP 5	True	28	True	125	0.40 (0.26 to 0.53)	<0.001
	False	39	False	8		
PIP 1	True	18	True	130	0.26 (0.12 to 0.40)	<0.001
	False	43	False	11		
PIP 2	True	38	True	89	0.24 (0.12 to 0.36)	<0.001
	False	58	False	16		
PIP 3	True	46	True	88	0.32 (0.20 to 0.45)	<0.001
	False	52	False	15		
PIP 4	True	42	True	95	0.32 (0.19 to 0.45)	<0.001
	False	48	False	17		
PIP 5	True	36	True	97	0.27 (0.14 to 0.40)	<0.001
	False	52	False	17		
Wrist	True	78	True	64	0.41 (0.28 to 0.54)	<0.001
	False	34	False	25		

Abbreviations: CI, confidence interval; MCP, metacarpophalangeal; PIP, interphalangeal.

diagnosing common pathologies of the knees, shoulders, and back among final-year students.¹³

Our study has some limitations. It was conducted at 4 PHCs within the same geographic region of Saudi Arabia (Jeddah) and the training of PCPs was provided by 3 rheumatologists who were involved in the development of the New Early Arthritis Referral Criteria and who have expert knowledge of the techniques involved. Whether the training of PCPs can be as effective when scaled up and implemented by a wider team of rheumatologists is not known. Furthermore, our study excluded patients who had a prior diagnosis of osteoarthritis, hand fractures, and rheumatic diseases associated with IA. Understanding the outcomes of our training process in a population that includes those patients would require additional investigation. Moreover, to demonstrate the effect of training in MSK examination skills, a control group of PCPs who did not undergo training by rheumatologist to identify IA would have reduced bias in agreement. Additional limitations include the fact that variability in skills among PCPs and agreement among rheumatologists could not be determined.

In conclusion, our results demonstrate that the training of PCPs by rheumatologists led to an overall fair extent of

agreement in detecting IA between these two groups when applying the New Early Arthritis Referral Criteria to suspected cases of IA in a real-world setting in Saudi Arabia. Given the lack of confidence and technical skills that have been highlighted in published studies investigating the competency of MSK examinations, we believe that the use of standardized MSK examination techniques in a standardized teaching process provided by rheumatologists may be capable of equipping PCPs with the skills they need in order to accurately identify cases of early IA. This would, in turn, be expected to provide benefits to patients and wider society in general by allowing earlier therapeutic intervention that would limit the progression of joint damage and improve quality of life for patients as well as reducing associated health care costs and workplace disability.

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References

- Centers for Disease Control and Prevention (CDC). Prevalence of disabilities and associated health conditions among adults – United States, 1999. *MMWR Morb Mortal Wkly Rep.* 2001;50(7):120–125.
- Stoddard S, Jans L, Ripple J, Kraus L. *Chartbook on Work and Disability in the United States, 1998. An InfoUse Report.* Washington, DC: Research USNIoDaR; 1998.
- Finckh A, Liang MH, van Herckenrode CM, de Pablo P. Long-term impact of early treatment on radiographic progression in rheumatoid arthritis: a meta-analysis. *Arthritis Rheum.* 2006;55(6):864–872. doi:10.1002/(ISSN)1529-0131
- van Nies JA, Krabben A, Schoones JW, Huizinga TW, Kloppenburg M, van der Helm-van Mil AH. What is the evidence for the presence of a therapeutic window of opportunity in rheumatoid arthritis? A systematic literature review. *Ann Rheum Dis.* 2014;73(5):861–870. doi:10.1136/annrheumdis-2012-203130
- Hussain W, Noorwali A, Janoudi N, et al. From symptoms to diagnosis: an observational study of the journey of rheumatoid arthritis patients in Saudi Arabia. *Oman Med J.* 2016;31(1):29–34. doi:10.5001/omj.2016.06
- Janoudi N, Almoallim H, Husien W, Noorwali A, Ibrahim A. Work ability and work disability evaluation in Saudi patients with rheumatoid arthritis. Special emphasis on work ability among housewives. *Saudi Med J.* 2013;34(11):1167–1172.
- Al-Dalaan A, Al Ballaa S, Bahabri S, Biyari T, Al Sukait M, Mousa M. The prevalence of rheumatoid arthritis in the Qassim region of Saudi Arabia. *Ann Saudi Med.* 1998;18(5):396–397. doi:10.5144/0256-4947.1998.396
- Kingdom of Saudi Arabia Ministry of Health. *The Annual Health Report – 1430H-2009.* Riyadh: Health KoSAMo; 2009.
- Coady DA, Walker DJ, Kay LJ. Teaching medical students musculoskeletal examination skills: identifying barriers to learning and ways of overcoming them. *Scand J Rheumatol.* 2004;33(1):47–51. doi:10.1080/03009740310004108
- Day CS, Yeh AC, Franko O, Ramirez M, Krupat E. Musculoskeletal medicine: an assessment of the attitudes and knowledge of medical students at Harvard Medical School. *Acad Med.* 2007;82(5):452–457. doi:10.1097/ACM.0b013e31803ea860
- Freedman KB, Bernstein J. Educational deficiencies in musculoskeletal medicine. *J Bone Joint Surg Am.* 2002;84(4):604–608. doi:10.2106/00004623-200204000-00015
- Oswald AE, Bell MJ, Snell L, Wiseman J. The current state of musculoskeletal clinical skills teaching for preclerkship medical students. *J Rheumatol.* 2008;35(12):2419–2426. doi:10.3899/jrheum.080308
- Stansfield RB, Diponio L, Craig C, et al. Assessing musculoskeletal examination skills and diagnostic reasoning of 4th year medical students using a novel objective structured clinical exam. *BMC Med Educ.* 2016;16(1):268. doi:10.1186/s12909-016-0780-4
- Zaini R, Almoallim H, Hafiz W, et al. Musculoskeletal teaching and training in Saudi internal medicine residency programmes. *Creat Educ.* 2016;7(6):824–830. doi:10.4236/ce.2016.76085
- Tan YK, Østergaard M, Conaghan PG. Imaging tools in rheumatoid arthritis: ultrasound vs magnetic resonance imaging. *Rheumatology (Oxford).* 2012;51(Suppl 7):vii36–vii42. doi:10.1093/rheumatology/kes329
- Almoallim H, Attar S, Jannoudi N, et al. Sensitivity of standardised musculoskeletal examination of the hand and wrist joints in detecting arthritis in comparison to ultrasound findings in patients attending rheumatology clinics. *Clin Rheumatol.* 2012;31(9):1309–1317. doi:10.1007/s10067-012-2013-5
- Almoallim H, Janoudi N, Attar SM, et al. Determining early referral criteria for patients with suspected inflammatory arthritis presenting to primary care physicians: a cross-sectional study. *Open Access Rheumatol.* 2017;9:81–90. doi:10.2147/OARRR
- Brennan P, Silman A. Statistical methods for assessing observer variability in clinical measures. *BMJ.* 1992;304(6840):1491–1494. doi:10.1136/bmj.304.6840.1491

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