

## EXTENDED REPORT

# Education improves referral of patients suspected of having spondyloarthritis by general practitioners: a study with unannounced standardised patients in daily practice

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## ABSTRACT

**Objectives:** To evaluate the practice performance of general practitioners (GPs) and GP residents in recognising and referring patients suspected for having axial or peripheral spondyloarthritis (SpA), and to investigate the influence of education on this performance.

**Methods:** GP (residents) were visited in two rounds by standardised patients (SPs) simulating axial SpA, peripheral SpA or carpal tunnel syndrome (CTS) with in between an educational intervention on SpA for part of the participants. Participants were unaware of the nature of the medical problem and study purpose. CTS was included as diversionary tactic. The primary outcome was  $\geq 40\%$  improvement in (considering) referral of the SPs with SpA to the rheumatologist after education. Secondary outcomes included ordering additional diagnostic tests, correct recognition of SpA and identification of variables contributing to this.

**Results:** 68 participants (30 GPs and 38 GP residents) were included, of which 19 received education. The primary outcome was met. A significantly higher proportion of GP (residents) from the intervention group referred patients to the rheumatologist compared with the control group after education (change scores, axial SpA +71% vs +15% ( $p < 0.01$ ); peripheral SpA +48% vs 0% ( $p < 0.001$ )). Participants who received education, more frequently correctly recognised SpA compared with controls (change scores, axial SpA +50% vs -5% ( $p < 0.001$ ); peripheral SpA +21% vs 0% ( $p = 0.01$ )).

**Conclusions:** Recognition and referral of patients suspected for having SpA by GP (residents) is low, but targeted education markedly improved this. This supports the development of educational initiatives to improve recognition of SpA and hence referral to a rheumatologist.

## INTRODUCTION

Musculoskeletal complaints account for 20% of all consultations in primary care.<sup>1-3</sup> The

## Key messages

### What is already known about this subject?

- The diagnostic delay of patients with axial and peripheral spondyloarthritis may be up to 10 years or longer.
- Part of this delay is due to unawareness of physicians about the heterogeneous clinical presentation of spondyloarthritis.
- An educational programme with focus on spondyloarthritis might improve referral of patients, but the evidence base for this is currently inadequate.

### What does this study add?

- General practitioner residents who received education significantly more often recognised and referred standardised patients simulating axial and peripheral spondyloarthritis in comparison with the control group.

### How might this impact on clinical practice?

- Educational initiatives to improve referral and recognition of patients suspected for spondyloarthritis should be developed and supported.

challenge for general practitioners (GPs) is to filter patients with a high suspicion of an inflammatory rheumatic disorder.<sup>4</sup> Insufficient knowledge might result in a diagnostic delay, which subsequently may have a negative impact on physical functioning, social participation and quality of life in an individual patient.<sup>5 6</sup> Among all rheumatic diseases, spondyloarthritis (SpA) has the longest diagnostic delay, which may be up to 10 years or even longer.<sup>7 8</sup>

Many patients with SpA are not adequately recognised, as illustrated by a study in primary care where 24% of the patients with

chronic low back pain that started before the age of 45 years, were classified as having axial SpA after careful evaluation.<sup>9</sup> It is important to obtain an early diagnosis in order to tailor treatment to the individual needs of a patient and to prevent a debilitating disease course.<sup>10</sup> A short disease duration before initiation of treatment is also a good predictor of achieving a major clinical response on treatment.<sup>11–13</sup>

In order to improve timely diagnosis, several referral tools, which include characteristic features of SpA, have been proposed for axial SpA.<sup>14–18</sup> Application of a referral tool increases the probability of a disease in referred patients from 5% to 33–45%.<sup>18</sup> However, for successful implementation of such a tool, knowledge about SpA in primary care is essential.<sup>19–20</sup> A qualitative study involving GPs showed that GPs were aware of ‘classic’, but long-term features of axial SpA, that is, hyperkyphosis and a bamboo spine. Knowledge about the entire disease spectrum, including early disease, extra-articular manifestations and other characteristic SpA features, was limited.<sup>21</sup>

We hypothesised that education with special focus on SpA might improve the recognition of SpA features and early referral of patients suspected for having SpA. The objectives of this study were to evaluate (1) the current practice performance of GPs and GP residents in recognising and (considering) referral of patients suspected for having axial or peripheral SpA, and (2) to assess the influence of education on this performance, by using unannounced standardised patients (SPs) who visit GP (residents) in their own practices.

## METHODS

### Study design and participants

This study is a prospective controlled multicenter educational intervention study in primary care. GP residents and their supervising GPs were recruited through the department of General Practice from the Maastricht University Medical Centre (MUMC). Every trimester, 1–2 group(s) of 10–12 GP residents enter the final year of their residency. Once a week, they meet at the MUMC for training. We used this structure for providing an educational programme, ‘the intervention’, to half of the groups. Each group was alternately assigned to either the intervention group or the control group. This allocation strategy was only applied to the GP residents. The groups did not have direct contact hours with each other. A similar training structure was not available for GPs. It was logistically not possible to organise an extra-training conference for GPs without revealing the topic of interest in advance. Therefore, despite GPs may be supervising a resident who received intervention, we decided to assign all GPs to the control group.

The ethics committee of the academic hospital Maastricht considered this study as ‘evaluation and improvement of daily clinical practice’. No further approval was required. The GP (residents) were

informed about SPs visiting their practice for ‘evaluation of using SPs in daily practice and education’, and were asked to sign informed consent. No further specification was provided on the purpose of the study and the nature of the medical problems, nor were they informed that the education was related to the study with unannounced SPs.

The SP encounters took place 3 months before and 3 months after the intervention.

The study started in September 2012, and was ended prematurely in May 2014.

### Standardised patients

SPs, recruited from a pool of SPs working at the Maastricht University medical school and among clerkships, had to meet the following criteria: stable health, ability to play the role and to fill out the case-specific checklists, no confounding physical symptoms and sufficient time available for the visits.<sup>22</sup>

All SPs were trained to simulate one case. Two 2 h training sessions were organised and guided by several GPs and rheumatologists, during which the SPs were trained in playing their role, and how to behave during the physical examination, in a valid and reliable way. GPs and a rheumatologist not involved in the development of the cases judged whether the SP simulated realistically. Close attention was paid on completion of the checklist to secure uniform data quality and comparability. Discrepancies in checklist rating scores were discussed.<sup>22</sup> Based on good reproducibility demonstrated in previous studies, and after this thorough training, we assumed good representation of the cases by the SPs.<sup>23–25</sup>

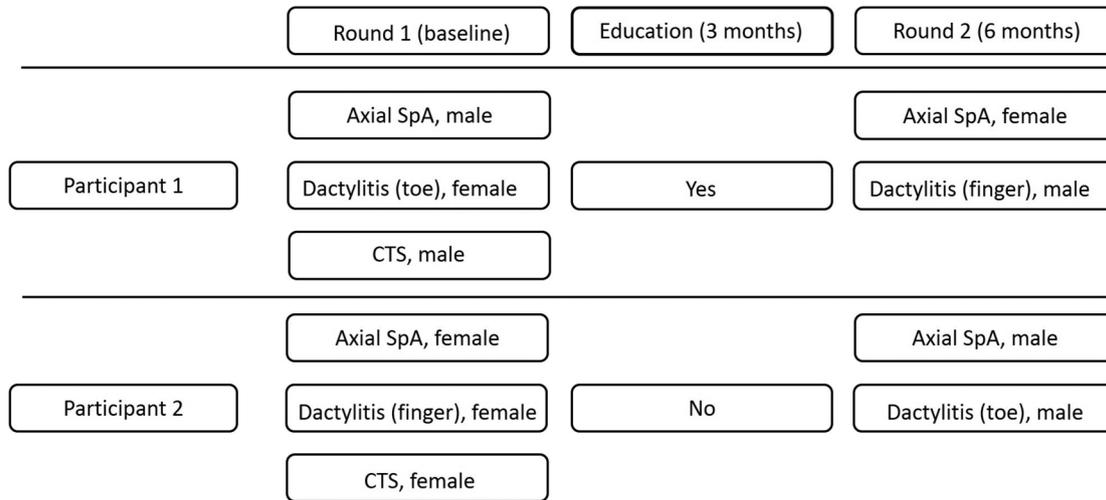
All participants faced two cases of axial SpA, two cases of peripheral SpA, and one case of carpal tunnel syndrome (CTS). **Figure 1** shows an example of a predefined schedule for two participants. The CTS case was included as a diversionary tactic, preventing premature identification of the objectives of the study, but was also considered as ‘common knowledge’. Recognition of CTS by the far majority of participants was expected and therefore only simulated during round 1. Each SpA case was simulated by a male and a female SP, in random order, according to a predefined schedule (**figure 1** shows an example). A short description of the included cases is provided in **box 1**. The SPs were unaware which participants received education. The SPs received a small allowance for every visit.

### Practice visits and checklist

At the practice visit, the SPs identified themselves as an SP, without providing further information. The duration of one consultation was 10–15 min, corresponding to the standard consultation time by a GP (resident).

After the visit, the SP immediately completed the case-specific checklist reporting the activities of participants during the visit, which consisted of:

- ▶ Disease related items (eg, onset of symptoms, presence of low back pain, family medical history);



**Figure 1** Example of a predefined schedule for 2 participants. CTS, carpal tunnel syndrome; SpA, spondyloarthritis.

- Items on physical examination (eg, of the joints and/or back).

The GP (residents) indicated for this specific case which additional diagnostic investigations they would

have ordered, which medication they would have prescribed (if any), and whether referral to another health-care professional (and which) would be advised. Participants also ranked their differential diagnosis, from 1 (most likely) to 3 (less likely). The SPs were responsible for collecting and returning all forms to the study coordinator.

**Box 1** Summary of included cases, simulated by standardised patients

Early axial spondyloarthritis (SpA):

- Case 1a: a 27-year-old male/female, suffering from chronic back pain with an inflammatory character since 1 year. He/she has a history of Achilles tendinitis. Physical therapy has a limited effect in back pain relief. The patient visits the general practitioner (GP) (resident) because the back pain is now also present in the thoracic spine. An aunt has Crohn’s disease.
- Case 1b: a 26-year-old male/female with chronic back pain with an inflammatory character since 1.5 years. There are also symptoms of anterior chest wall pain. Physical therapy has a limited effect on back pain relief. The patient visits the GP (resident) because of progressive work disability. A brother has psoriasis.

Early peripheral SpA:

- Case 2a: a 27-year-old male/female, who presents with a painful and swollen middle finger of the right hand with morning stiffness since a few weeks. The standardised patient (SP) hands over a photograph to the GP (resident), showing dactylitis of the affected finger. He/she has a history of knee arthritis 3 years ago that resolved with non-steroidal anti-inflammatory drugs (NSAIDs). The mother has psoriasis.
- Case 2B: a 26-year-old male/female, who presents with and a painful and swollen second toe of the right foot with morning stiffness since a few weeks. The SP hands over a photograph to the GP (resident), showing dactylitis of the affected toe. The patient experienced similar complaints of a finger about 1 year ago. The brother has psoriasis.

Carpal tunnel syndrome:

- Case 3: a 50-year-old male/female, with a tingling and burning sensation of the index, middle and ring finger since 3 months. The symptoms are worst at night. Flicking the wrist gives symptom relief.

**Educational intervention**

The interactive 3 h case-based educational programme took place at the department of General Practice of the MUMC. Three topics, were presented and discussed by two rheumatologists:

- Diagnosis and management of gout (duration 45 min);
- Axial and peripheral SpA (duration 90 min), that is, concept and epidemiology of SpA, history taking and physical examination of patients suspected for having SpA, and criteria for referral of these patients to the rheumatologist.
- Safety considerations for biological therapy (ie, anti-tumor necrosis factor  $\alpha$  therapy; duration 45 min).

Printed materials, including SpA features, were supplied to the participants supporting self-directed learning after the training.

**Study outcomes**

Our primary outcome was referral or considering referral of the SP to a rheumatologist by the GP (resident). We decided to combine both referral and considering referral, because GPs may spread diagnostic interventions over several consultations or only refer to secondary care when complaints fail to resolve within a few weeks after the first consultation. Secondary outcomes included (1) correct recognition of axial SpA, peripheral SpA and CTS, respectively by the GP (resident), (2) ordering of additional diagnostic tests, (3) identification

**Table 1** Characteristics of the participating general practitioners and residents

	GP residents (n=38)	GPs (n=30)	All participants (n=68)
Age (years)	28 (1.6)	52 (5.9)	39 (12.9)
Male	12 (32%)	24 (80%)	36 (53%)
Working experience, including training (years)	2 (0.4)	22 (7.2)	11 (10.9)
Weekly consultations (number)	62 (15.6)	107 (26.5)	82 (30.6)
Specific interest in musculoskeletal disorders	2 (7%)	1 (3%)	3 (4%)

The values are expressed as mean (SD) or as number (%).  
GP, general practitioner.

of variables contributing to correct recognition of SpA or CTS (GP vs GP resident, and gender of the SPs).

### Statistical analysis

The sample size calculation was based on the primary outcome, (considering) referral of the SP to the rheumatologist. We estimated that 20% of the SPs would be referred without education and aimed at increasing this by 40%. To detect a 40% difference in the change scores between the intervention group and control group in the proportion of SPs referred to the rheumatologist, 23 complete pre-education and posteducation SP encounters were needed per group (80% power,  $\alpha$  of 0.05).

Descriptive analyses were used for the demographic data.  $\chi^2$  Tests and Fisher's exact tests, as appropriate, were used to analyse the primary and secondary end points. The difference in change scores between the intervention group and control group with regard to (considering) referral of the SP and correct recognition of SpA was compared with the Mann-Whitney U test. Within-group changes in referral and recognition of SpA before and after education were analysed with McNemar tests. Only participants that completed both

rounds of SP encounters were included in these analyses. Descriptive analysis was used for investigating which diagnoses were mentioned by GP (residents) and the frequency of ordering additional diagnostic tests by GP (residents). SPSS software V.20.0 was used for all analyses.

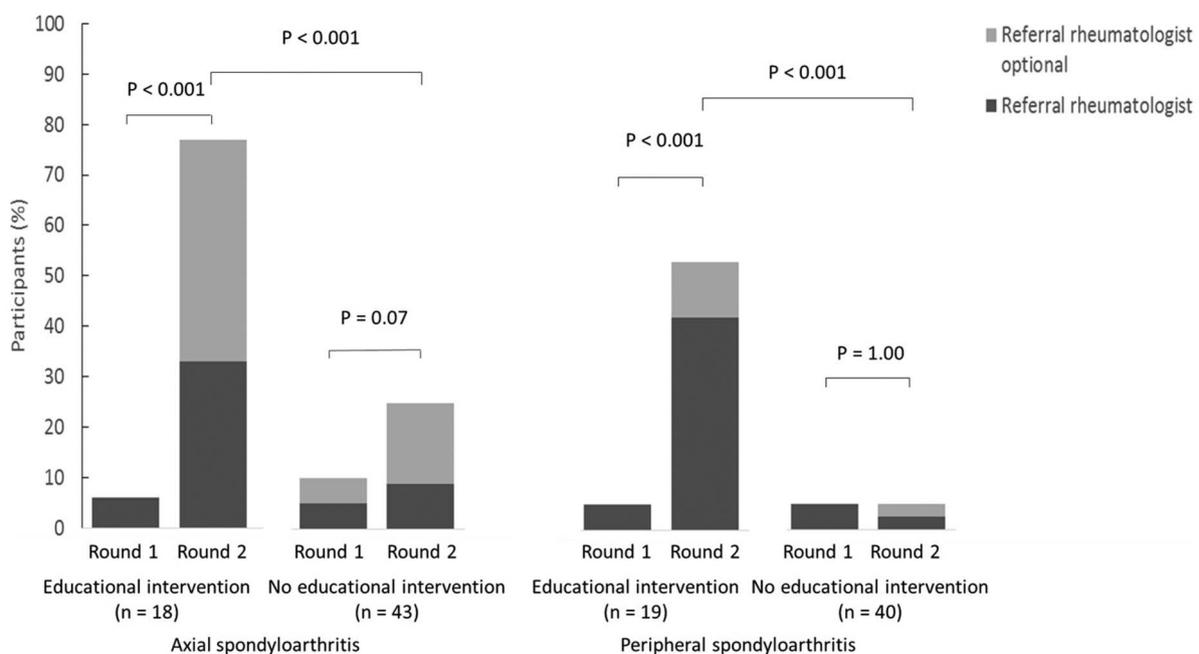
## RESULTS

### Participant characteristics

In total, 117 GPs residents and their supervising GPs were invited, of which 68 (38 GP residents and 30 GPs) participated in the study. Reasons for non-participation were not collected. The study was ended prematurely, because many GP (residents) declined participation, and the chance that newly enrolled GP residents came into direct contact with GP (residents) that already participated was considered high. The a priori sample size was therefore not pursued.

Baseline characteristics of the participants are shown in table 1. Three (4%) participants mentioned an interest in musculoskeletal disorders.

In total, 256 SP encounters took place, excluding the CTS cases. Both rounds were completed by 61 (90%)



**Figure 2** Referral of standardised patients simulating axial and peripheral spondyloarthritis to a rheumatologist.

and 59 (87%) participants for the axial SpA and peripheral SpA case, respectively. Reasons for incomplete SP visits were: illness (n=6), unable to schedule an appointment within the given time frame (n=4), late arrival by SP due to traffic problems (n=3), GP left for a medical emergency (n=2), and maternity leave (n=1).

## Axial SpA

### Primary end point

#### *Referral of SPs simulating axial SpA*

In the first round of SP encounters, 6% of the participants in the intervention group (n=18) and 10% of participants in the control group (n=43) referred or considered referral of the SP to the rheumatologist (figure 2). Participants who received the educational programme clearly more often referred or considered referral in the second round of SP encounters than controls (changes scores: +71% vs +15% (p<0.001); figure 2).

### Secondary end points

#### *Recognition of axial SpA*

In the first round of SP encounters, 4 (22%) of 18 participants in the intervention group and 8 (19%) of 43 participants in the control group ranked axial SpA as their number 1 diagnosis. Non-specific back pain was most frequently ranked as number 1 diagnosis by 10 (56%) of 18 participants in the intervention group and 31 (72%) of 43 participants in the control group (table 2). In total, 34 (56%) of 68 participants ranked axial SpA as number 1, 2 or 3 in their differential diagnosis before education.

In the second round, the intervention group more frequently ranked axial SpA as their number 1 diagnosis (round 1: 22% vs round 2: 72% (p=0.01); table 2), which was statistically significantly different from the control group (changes scores: +50% intervention group vs -5% control group, (p<0.001); table 2). In the second round, non-specific back pain remained the number 1 diagnosis in 74% of the participants from the control group (table 2).

#### *Additional diagnostic tests*

In the intervention group less human leucocyte antigen B27 tests were ordered in the second round, whereas in the control group the opposite was seen (changes scores: -22% intervention group vs +12% control group, (p=0.01); table 2).

#### *Variables contributing to recognition of axial SpA*

No difference between the GPs and GP resident characteristics with regard to correct recognition of axial SpA was found (data not shown). In addition, male and female SPs were equally considered to have axial SpA (data not shown).

**Table 2** Diagnosis and management in standardised patients simulating axial spondyloarthritis

	Educational group (n=18)				Control group (n=43)				p Value (change scores, between groups)
	Round 1 (%)	Round 2 (%)	Change score (%)	p Value (within group)	Round 1 (%)	Round 2 (%)	Change score (%)	p Value (within group)	
Number 1 diagnosis									
Axial SpA	4 (22)	13 (72)	9 (50)	0.01	8 (19)	6 (14)	-2 (-5)	0.73	<0.001
Non-specific back pain	10 (56)	5 (28)	-5 (-28)	0.23	31 (72)	32 (74)	1 (2)	1.00	0.05
Sacroiliac joint dysfunction	2 (11)	0 (0)	-2 (-11)	0.50	2 (5)	4 (9)	2 (5)	0.50	0.03
Herniated nuclei pulposi	1 (6)	0 (0)	-1 (-6)	1.00	2 (5)	1 (2)	-1 (-2)	1.00	0.66
Poor posture	1 (6)	0 (0)	-1 (-6)	1.00	0 (0)	0 (0)	0 (0)	NA	0.12
Additional diagnostic tests									
Laboratory tests (general)	5 (28)	6 (33)	1 (5)	1.00	13 (30)	18 (42)	5 (12)	0.18	0.78
HLA-B27 test	6 (33)	2 (11)	-4 (-22)	0.13	4 (9)	9 (21)	5 (12)	0.13	0.01
Pelvic radiograph	3 (17)	3 (17)	0 (0)	1.00	4 (9)	8 (19)	4 (10)	0.22	0.43
Management									
NSAIDs prescribed	4 (22)	5 (28)	1 (5)	1.00	8 (19)	8 (19)	0 (0)	1.00	0.65
Follow-up consultation with GP (resident) arranged	14 (78)	13 (72)	-1 (-6)	1.00	29 (67)	30 (70)	1 (3)	1.00	0.66

Values are expressed as number (percentage) of participants. Numbers may not add up due to rounding. McNemar tests were used within groups and Mann-Whitney U tests were used between groups. GP, general practitioner; HLA-B27, human leucocyte antigen B27; NA, not assessed; NSAIDs, non-steroidal anti-inflammatory drugs; SpA, spondyloarthritis; SPs, standardised patients.

**Table 3** Diagnosis and management of standardised patients simulating peripheral SpA

	Educational group (n=19)				Control group (n=40)				p Value (change scores, between groups)
	Round 1 (%)	Round 2 (%)	Change score (%)	p Value (within group)	Round 1 (%)	Round 2 (%)	Change score (%)	p Value (within group)	
Number 1 diagnosis									
Peripheral SpA	2 (11)	5 (26)	3 (16)	0.45	4 (10)	4 (10)	0 (0)	1.00	0.21
Reactive arthritis	2 (11)	1 (5)	-1 (-6)	1.00	4 (10)	3 (8)	-1 (-2)	1.00	0.79
SpA	0 (0)	3 (16)	3 (16)	0.25	0 (0)	0 (0)	0 (0)	NA	0.01
Psoriatic arthritis	0 (0)	1 (5)	1 (5)	1.00	0 (0)	0 (0)	0 (0)	NA	0.15
Tenosynovitis	0 (0)	0 (0)	0 (0)	NA	0 (0)	1 (3)	1 (3)	1.00	0.49
Arthritis, not otherwise specified	5 (26)	8 (42)	3 (16)	0.45	15 (38)	16 (40)	1 (2)	1.00	0.44
Rheumatoid arthritis	5 (26)	3 (16)	-2 (-10)	0.69	2 (5)	5 (13)	3 (8)	0.45	0.18
Gout	1 (5)	1 (5)	0 (0)	1.00	8 (20)	6 (15)	-2 (-5)	0.77	0.70
Sprain	4 (21)	1 (5)	-3 (-16)	0.25	6 (15)	5 (13)	-1 (-2)	1.00	0.30
Skin or nail infection/insect bite	2 (11)	0 (0)	-2 (-11)	0.50	3 (8)	1 (3)	-2 (-5)	0.25	0.70
Trauma	0 (0)	1 (5)	1 (5)	1.00	1 (3)	1 (3)	0 (0)	1.00	0.49
Other or no differential diagnosis	0 (0)	1 (5)	1 (5)	1.00	1 (3)	2 (5)	1 (2)	1.00	0.71
Additional diagnostic tests									
Laboratory tests (general)	8 (42)	5 (26)	-3 (-16)	0.38	17 (43)	18 (45)	1 (3)	1.00	0.18
HLA-B27 test	0 (0)	0 (0)	0 (0)	NA	0 (0)	0 (0)	0 (0)	NA	1.00
IgM RF and/or ACPA test	5 (26)	2 (11)	-3 (-16)	0.38	11 (28)	7 (18)	-4 (-10)	0.29	0.64
Radiograph of the hand or foot	0 (0)	1 (5)	1 (5)	1.00	4 (10)	8 (20)	4 (10)	0.22	0.59
Management									
NSAIDs prescribed	13 (68)	13 (68)	0 (0)	1.00	21 (53)	22 (55)	1 (3)	1.00	0.86
Arranged follow-up consultation with GP (resident)	10 (53)	10 (53)	0 (0)	1.00	23 (58)	25 (63)	2 (5)	0.82	0.82

Values are expressed as number (percentage) of participants. Numbers may not add up due to rounding. McNemar tests were used within groups and Mann-Whitney U tests were used between groups.

ACPA, anticitrullinated protein antibody; GP, general practitioner; HLA-B27, human leukocyte antigen B27; NA, not assessed; NSAIDs, non-steroidal anti-inflammatory drugs; RF, rheumatoid factor; SpA, spondyloarthritis; SPs, standardised patients.

**Table 4** Comparison between GPs and GP residents with regard to ordering additional diagnostic tests in the case of peripheral SpA

	Round 1			Round 2		
	GP residents (n=32)	GPs (n=27)	p Value	GP residents (n=32)	GPs (n=27)	p Value
Additional diagnostic tests						
IgM RF	6 (19)	6 (22)	0.74	2 (6)	4 (15)	0.40
ACPA test	1 (3)	10 (37)	<0.001	1 (3)	6 (22)	0.04
ESR	9 (28)	14 (52)	0.06	7 (22)	14 (52)	0.02
CRP	3 (9)	9 (33)	0.02	3 (9)	10 (37)	0.01
Uric acid	3 (9)	8 (30)	0.05	6 (19)	13 (48)	0.02
Radiograph of the hand or foot	0 (0)	4 (15)	0.04	2 (6)	7 (26)	0.07

Values are expressed as number (percentage) of participants.  $\chi^2$  and Fisher's exact tests as appropriated were used between groups. ACPA, anti-citrullinated protein antibody; CRP, C reactive protein; ESR, erythrocyte sedimentation rate; GP, general practitioner; RF, rheumatoid factor; SpA, spondyloarthritis.

## Peripheral SpA

### Primary end point

#### Referral of SPs simulating peripheral SpA

In the first round, participants in the intervention (n=19) and control group (n=40) referred the SPs to the rheumatologist in 5% of cases (figure 2). The intervention group referred or considered referral more frequently compared to the control group in the second round (change scores: +48% vs 0% (p<0.01); figure 2).

### Secondary end points

#### Recognition of peripheral SpA

In the first round of SP encounters, 2 (11%) of 19 participants in the intervention group and 4 (10%) of 40 participants in the control group ranked peripheral SpA as their number 1 diagnosis (table 3). All specified this as 'reactive arthritis'. Two participants ranked psoriatic arthritis in their differential diagnosis as number 2 or 3. 'Arthritis not otherwise specified' was ranked by most participants as number 1 diagnosis (5 (26%) participants in the intervention group and 15 (38%) participants in the control group; table 3).

Four (21%) of the 19 participants from the intervention group correctly recognised 'spondyloarthritis' or 'psoriatic arthritis' after education, compared with none of the participants in the control group (change scores: +21% vs 0% (p=0.01); table 3).

#### Additional diagnostic tests

No differences between the intervention and control group regarding ordering laboratory and diagnostic imaging tests were found in rounds of SP encounters (table 3).

#### Variables contributing to recognition of peripheral SpA

No difference between the GPs and GP residents with regard to correct recognition of peripheral SpA was found in the first round of SP encounters. However, in general, GPs ordered more additional diagnostic tests in both rounds of SP encounters (table 4).

In the first round of SP encounters, gout was more often ranked as number 1 diagnosis in male than in female SPs (male SPs: 8 (26%) of 31 diagnoses; female SPs: 1 (4%) of 28 diagnoses (p=0.03)).

**Table 5** List of diagnoses and management in patients suspected for CTS

	GP resident (n=37)	GP (n=28)	p Value	All participants (n=65)
Number 1 diagnosis				
CTS	30 (81%)	24 (86%)	0.75	54 (83%)
Osteoarthritis	1 (3%)	0 (0%)	1.00	1 (2%)
Sprain	6 (16%)	4 (14%)	1.00	6 (16%)
Additional diagnostic tests				
Radiography of the hand	0 (0%)	2 (5%)	0.50	2 (3%)
EMG	3 (11%)	3 (8%)	1.00	6 (9%)
Management				
NSAIDs prescribed	3 (8%)	3 (11%)	0.52	6 (9%)
Local injection with corticosteroids	2 (7%)	8 (22%)	0.17	10 (15%)
Splint	7 (25%)	15 (41%)	0.29	22 (34%)
Follow-up consultation with GP (resident) arranged	10 (35%)	21 (57%)	0.13	31 (47%)
Referral to neurologist	1 (4%)	2 (5%)	0.57	3 (5%)

CTS, carpal tunnel syndrome; EMG, electromyography; NSAIDs, non-steroidal anti-inflammatory drugs; GP, general practitioner.

## Recognition and management of CTS

As expected, CTS was ranked as the number 1 diagnosis by 54 (83%) of 65 participants, and by 61 (90%) in their top 3 (table 5). No differences between the GP and GP resident or gender of the SP regarding ranking CTS as number 1 diagnosis were found. Also the management and follow-up of the CTS case were similar for the GP and GP resident.

## DISCUSSION

In this study we showed that education is an important means to change clinicians' practice behaviour regarding recognition and referral of patients with SpA. While medical history and symptoms simulated by SPs would have acknowledged a referral to a rheumatologist, such a policy was executed by only 10% of the GPs. Specific SpA-aimed education improved this policy dramatically. The primary outcome, more than 40% improvement in (considering) referral for axial and peripheral SpA after education, was met.

Approximately 20% of the adult population consult their GP because of musculoskeletal symptoms, among which chronic low back pain is the most prevalent.<sup>1-3 26</sup> Although it is impossible for GPs to have considerable expertise in all areas, the high exposure to musculoskeletal disorders (MSD) warrants development of high-quality training programmes aiming at gaining and maintaining sufficient expertise on MSD. Several studies, however, suggest that graduated medical students and residents lack knowledge and confidence in this respect.<sup>27-30</sup> Multifaceted education interventions, including mixed interactive and didactic learning activities focusing on pertinent outcomes have shown to sustainably change physicians' behaviour.<sup>31 32</sup> In the present study, we also applied multifaceted educational tools including interactive power-point presentations, case vignettes and printed materials, which may have added to a better recognition of SpA 3 months after the intervention. Future studies may shed light on the sustainability of education in this context.

Strengths of our study are that we have used a prospective, multicenter design and that we have included a control group for an evaluation of the effect of education. In addition, our study was conducted in primary care which is the source of most referrals of SpA to the rheumatologist. Furthermore, the SP-model has proven reliability for the assessment of physicians' knowledge and -skills in a 'genuine' clinical setting.<sup>23-25 33 34</sup>

Several limitations of this study require discussion. First, SPs did not truly have signs of their disease detectable at physical examination, which may have jeopardised recognition. SPs performing a role of peripheral SpA, for example, showed a photograph with dactylitis to the GP. Dactylitis is a relatively uncommon (albeit specific) manifestation of peripheral SpA. Nevertheless, one in two GPs (residents) ranked an inflammatory rheumatic disease as the diagnosis of highest likelihood in both

SP encounters. This observation suggests that a knowledge deficit about peripheral SpA prevented an adequate diagnosis but not the recognition of a rheumatic disease. While referral to a medical specialist would have been the best option here, only a minority of the patients was indeed referred.

Second, information to GPs about an SP visiting their practice may have raised arousal leading to different diagnostic behaviour. However, GP (residents) were neither aware of the specific case presentation or the purpose of the study nor were they informed about education being part of this study. In addition, participants were visited in their own practices by SPs during regular working hours. Since a previous study has failed to demonstrate a difference in performance by residents evaluating real patients and SPs,<sup>35</sup> we believe the precautions we have taken have assured a most truthful performance of GP (residents) in daily practice.

Third, one may argue that the GP (residents) suspected the SP was simulating SpA, but that they were unaware of the fact that referral would have been indicated in this case. Making a correct diagnosis was a secondary outcome in our study. Before education, only a minority of GPs correctly diagnosed axial SpA (20%) and peripheral SpA (10%). In contrast, CTS was recognised by the large majority of participants (83%), indicating that GPs have sufficient knowledge of common disorders. However, they fall short regarding SpA, which is more unfamiliar than CTS.

Fourth, we were unable to include the projected number of participants. Nevertheless, the primary outcome was met. A small sample size, however, may limit generalisability of results to a larger population.

In conclusion, recognition and referral of patients suspected for having SpA by GP (residents) is in general low, but targeted education can markedly improve this. Increased awareness of a potential underlying inflammatory condition in patients presenting with musculoskeletal complaints and timely referral may prevent a debilitating disease course in patients with SpA. Therefore, we recommend the combination of a referral tool targeted at SpA and educational activities that maximise practitioner engagement and support for practice change.

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