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# Improving diagnosis of early inflammatory arthritis: results of a novel triage system

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## ABSTRACT

**Objective.** *Early treatment of inflammatory arthritis (IA) leads to reduced disease activity, reduced joint damage, decreased functional impairment and increased chance of remission. However, delay often occurs from referral to rheumatology appointment. This survey evaluated whether a preliminary triage carried out by healthcare workers without formal medical training could be effective in identifying patients with or without early IA.*

**Methods.** *Patients were recruited during their first call to our centre, before their first visit. A simple questionnaire, including three questions and aimed at investigating the presence of sign and symptoms of IA was developed. The same survey was administered twice: the first time, during patient's first call to our centre (telephone survey), and the second time, during their first visit with the rheumatologist (Ambulatory visit survey). We compared the outcomes of the survey with the actual diagnosis made by the rheumatologist following standard medical examination.*

**Results.** *In total 484 patients were included in the study, and 34/484 (7.02%) were confirmed to have early IA. The telephone survey was able to detect the non-early IA patients in 99.5% of cases; the same result was reported for the ambulatory visit survey. The median time required to complete the questionnaire was 1 minute in both surveys.*

**Conclusion.** *The adoption of a simple survey, also administered by non-medical personnel, may effectively contribute to the early detection of IA.*

## Introduction

The inflammatory arthritis (IA) are a group of chronic, often debilitating disorders characterised by synovial inflammation and progressive joint destruction, including ankylosing spondylitis, psoriatic arthritis, other spondyloarthritis, undifferentiated arthritis (UA) and rheumatoid arthritis (RA) (1, 2). It is generally accepted that early treatment of IA leads to reduced disease activity, reduced joint damage, decreased functional impairment and increased chance of remission (2-5). Even a brief delay in starting therapy can affect disability: for instance, a large majority of patients with RA develop bone erosions within the first year (6-8). In addition, joint damage accumulates consistently over time and, if untreated, leads to permanent structural damage and eventual long term disability reinforcing the importance of early diagnosis (9-13).

The issue of continuous rheumatology care for early arthritis patients is still underestimated and need improvement (14). It is also well recognised that there are many barriers to the early diagnosis and treatment of IA from the initial reluctance of the patient to seek medical care, followed by delays in primary care and referral, to the fact that early symptoms of IA are sometimes non-specific and inconclusive. Moreover, although positive outcomes are closely associated with early diagnosis and treatment, access to specialist care for many patients is far from optimal and is punctuated by long delays. In most health care systems patients require a referral to see a rheumatologist and for patients their first port of call is their primary care provider. In addition lack of awareness among primary care providers (PCP) of the impact of early diagnosis and to economic and logistical issues may delay referral (3).

In general once patients are seen by a rheumatologist there is no delay in instigating appropriate therapy but the main delays occur in referral by the PCP to the rheumatologist and from referral to rheumatology appointment. In one recent study conducted on patients with RA, fewer than 25% of the patients were treated within 3 months of symptom onset and the median time from symptom onset to DMARD treatment was >6 months. Median time from symptom onset to rheumatology referral was 3 months, and from PCP referral to rheumatology appointment to therapy initiation was >2 months (15). The challenge for rheumatologists is what they can do to identify and treat patients with IA as early as possible to ensure health-related quality of life (16). In addition to appropriate patient screening and education and encouraging PCPs to follow approved referral guidelines, it is vital that rheumatologists have appropriate evidence-

based triage systems in place using up-to-date diagnostic criteria. As referral is often prolonged by a shortage of rheumatologists and long waiting lists, we developed a novel triage system at our hospital whereby patients referred by their PCP and on the waiting list to see a rheumatologist, were contacted by telephone by secondary healthcare professionals with no formal medical training. Patients were asked a series of simple questions to determine the stage of their disease. The objectives of the survey, the results of which we report here, were first to determine if a preliminary triage could be successfully carried out by healthcare workers without formal medical training and second to ascertain if this novel triage system was effective in identifying patients with early IA.

## Methods

*Study population*

All patients included in the survey were referred by their PCP to our centre – a large city centre hospital with a specialist rheumatologist unit – from January 2009 to January 2010, for any musculoskeletal symptom. Patients were selected at random and gave their informed consent to participate (no patient declined the opportunity to be included in the study). The study was approved by the Local Ethics Committee.

*Survey*

The survey consisted of three simple questions, administered in Italian:

- Do you have any difficulty in making a fist when just awake, for at least 30 minutes? If yes, did this difficulty start less than 6 months ago?
- Do you have swollen hands when just awake, for at least 30 minutes? If yes, did this symptom start less than 6 months ago?
- Do you feel pain when someone shakes or squeeze your hands? If yes, did this symptom start less than 6 months ago?

*Study protocol*

Patients were recruited during their first call to our centre, before their first visit. The same survey was administered twice: the first time, during patient's first call to our centre (telephone survey), and the second time, during their first visit with the rheumatologist (rheumatologist appointment survey).

*Telephone survey*

Telephone surveys were carried out by non-medical personnel who had no formal medical training but had worked in the administration department of our unit for an average period of five years. They were experienced in dealing with patients and were familiar with the terminology used in IA. Patients were defined as being positive for early IA if they replied "Yes" to at least one of the questions reported above.

*Ambulatory visit survey*

The same patients were then assessed by the rheumatologist at the prearranged visit 7–14 days after the initial telephone survey. At the beginning of the visit, before clinical assessment, the same survey was administered to patients by an experienced rheumatologist blinded to the result of the telephone survey. Again, patients were defined as being positive for early IA if they replied "Yes" to at least one of the questions reported above.

The rheumatologist made a final diagnosis based not only on the result of the survey but also on the clinical examination and laboratory tests evaluation.

*Data analysis*

We compared the outcomes of the survey with the diagnosis made by the rheumatologist (which was considered as correct). To evaluate the performance of the survey in early identifying early IA patients, we considered the following measurements:

- True negative: patients who were correctly identified as not having early IA;
- False negative: patients with early IA who were identified as not having early IA;
- True positive: patients who were correctly identified as having early IA;
- False positive: patients without early IA who were identified as having early IA.

From these measures, we defined the Negative predictive value (NPV), Specificity, Positive predictive value (PPV), and the Sensitivity.

In addition, we measured the time needed to complete the telephone and the ambulatory visit survey

## Results

In total 484 patients (363 females, age [mean± SD] 57±16 years) consented to participate in the study. Overall 34/484 patients (prevalence: 7.02%) were confirmed to have early IA. The final diagnosis, based not only on the result of the survey but also on the patient's assessment during the visit and on clinical examinations, disclosed that 15 patients had RA, 12 patients had UA, three connectivitis, two reactive arthritis, one spondyloarthritis and one was affected from gout.

Table I summarises the results of the two surveys.

*Telephone survey*

In the telephone survey, the NPV was 99.5%: of the 376 patients who were identified as not having early IA, 374 were correctly identified (true negatives). Hence, the telephone survey was able to detect the non- early IA patients in almost all cases. The specificity was 83.11%, because the non-early IA detected by the survey were 374 on 450 patients confirmed as not having early IA. There was a residual 17% probability to identify as early IA a patient not affected by early IA (false positives). 32 patients were identified as early IA (true positives), thus leading to a PPV of 29.6% and an high sensitivity (94.1%). This observation implies that there is a residual 5.9% probability to identify as non-early IA patients who conversely were affected by early IA (false negative, 2 patients). The median time needed to complete the survey was 1 minute (mean: 1 minutes and 12 seconds).

*Ambulatory visit survey*

When the survey was administered during ambulatory visit, results were very similar to those obtained through the telephone survey. The NPV was again 99.5%, with 417 patients correctly

identified as not having early IA, on a total of 419 identified as negative. The two unidentified patients were the same as in the telephone survey and were affected by spondyloarthropathy, and dactylitis/tenosynovitis, respectively. During visits, the specificity of the survey increased to 92.7%, with a decreased (7.3%) residual probability to identify as early IA patients who were not affected by early IA. As well as during telephone survey, 32 patients were correctly identified as early IA patients on a total of 34 patients with this condition. The survey during ambulatory visit had therefore the same high sensitivity as the telephone survey (94.1%), and an higher PPV (49.2%). The median time needed to complete the survey was 1 minute, the same as in the telephone survey (mean: 1 minute and 3 seconds).

**Table I.** Results of the telephone survey and of the rheumatologist visit survey.

| | | Patients without early IA | Patients with early IA | Total |
|---|---|---|---|---|
| Tephone survey | Identified as non-early IA (negative test) | 374 | 2 | 376 |
| | Identified as early IA (positive test) | 76 | 32 | 108 |
| | Total | 450 | 34 | |
| | | Patients without early IA | Patients with early IA | |
| Ambulatory visit survey | Identified as non-early IA (negative test) | 417 | 2 | 419 |
| | Identified as early IA (positive test) | 33 | 32 | 65 |
| | Total | 450 | 34 | |

## Discussion

In this work, we have tested the possibility to identify patients likely affected by early IA and who need priority in scheduling their first visit with a rheumatologist, through a simple telephone survey that can be administered also by non-specialised personnel. The results obtained by the telephone survey are very similar to those obtained by the same survey when administered by a trained rheumatologist during ambulatory visit. With a very low rate of false negatives, this innovative and simple approach might be valuable in discriminating patients who are not affected by early IA and do not need to be prioritised in the waiting list for a first visit from those who needed a priority visit. This study was hence a pilot experience aimed to understand whether the administration of the questionnaire might be a valuable tool to establish a prioritisation in the patient waiting list. Note that, during the study, the result of the questionnaire was not used to change the priority of patients because it was not validated yet.

However, we must point out that we have considered the final diagnosis made by the rheumatologist (which was IA for about 7% of patients) as the reference for the identification of false positive and negatives, and we did not further verify its actual correctness. This limitation should be taken into account when considering the results of our study.

Another potentially-relevant limitation of this study lies in the fact that we decided to focus only on hand symptoms because it was easier for patients to evaluate their hand status than the status of other joints, especially feet. This approach might leave out patients with feet/large joint swelling, but we decided to take this position due to the explorative nature of our study. We must also point out that we included in our survey patients who were referred to our Centre for any musculoskeletal symptom, not only because PCPs suspected an inflammatory arthritis.

Non-medically trained personnel administered the survey here presented with results very similar to those obtained when trained medical professionals administered the same survey. Hence, it may be easily adopted also by general practitioners and other non-rheumatologists, thus leading them to recognise the clinical picture of early inflammatory arthritis and refer patients promptly for a specialist opinion. Interestingly, the time needed to complete the survey was relatively short (about one minute), and it was comparable between the telephone survey and the rheumatologist assessment survey. This will help overcoming the critical delay at the primary care level. On the other hand, patients already recognised as possible IA by the survey can be given priority in the waiting list for ambulatory visits, thus decreasing the time needed to access the first rheumatology assessment.

The low rate of false negatives reported by the survey means that this approach has a high fidelity in recognising patients affected by early IA, when it was administered both by non-medical personnel and by medical professionals. Conversely, the administration of the survey by non-trained personnel increased the number of false positives, thus leading to a higher number of patients referred to as early IA who were not affected by early IA. This, however, does not affect the early detection capability of the survey, but simply slightly increases the number of prioritised patients.

The early detection of IA might ameliorate the probability of a positive outcome of treatments, including an enhanced possibility of remission, which is now considered as a major goal of treatment (17). In fact, there is a period in which the natural history of the disease can be altered which has been called 'the window of opportunity' (18, 19) and the evidence suggests that this is a 3-month period (8, 18, 19). Hence, the early the detection, the highest the probability to start the treatment during the opportunity window. We believe that the early detection of disease may provide major benefits especially in patients affected from initial RA or UPA. In fact, the results here reported show that the adoption of the survey may provide advantages to two of the three critical areas for early detection of RA identified in a recent review (19): the

pre-primary care level (from symptom offset to primary care), the primary care level (in which potential RA patients should be referred to specialised centres), and the first point of access for rheumatology assessment.

In addition, the importance of an early recognition and the use of therapeutic intervention have been recently advocated for patients with UA, in order to delay or halt disease progression and its long-term consequences (20).

Finally, the adoption of the survey here presented might contribute to the challenge of having patients assessed early by a rheumatologist as this delivers the best outcomes at no increased cost (21-23): the survey administration is easy, and it does not require additional time for educating ad-hoc personnel. Nor it requires more time during the first call to the specialised rheumatologist centre, because it consists of only three simple questions.

In conclusion, this study suggests that the adoption of a simple survey, also administered by non-medical personnel, effectively contributes to the early detection of IA. We believe that this survey may find an application both in primary care and in the prioritisation of patients during their first access to specialised centres.

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