Can diagnostic triage by general practitioners or rheumatology nurses improve the positive predictive value of referrals to early arthritis clinics?


Objectives. To determine whether diagnostic triage by general practitioners (GPs) or rheumatology nurses (RNs) can improve the positive predictive value of referrals to early arthritis clinics (EACs).

Methods. Four GPs and two RNs were trained in the assessment of early inflammatory arthritis (IA) by four visits to an EAC supervised by hospital rheumatologists. Patients referred to one of three EACs were recruited for study and assessed independently by a GP, an RN and one of six rheumatologists. Each assessor was asked to record their clinical findings and whether they considered the patient to have IA. Each was then asked to judge the appropriateness of the referral according to predetermined guidelines. The rheumatologists had been shown previously to have a satisfactory level of agreement in the assessment of IA.

Results. Ninety-six patients were approached and all consented to take part in the study. In 49 cases (51%), the rheumatologist judged that the patient had IA and that the referral was appropriate. The assessments of GPs and RNs were compared with those of the rheumatologists. Levels of agreement were measured using the kappa value, where 1.0 represents total unanimity. The kappa value was 0.77 for the GPs when compared with the rheumatologists and 0.79 for the RNs. Significant stiffness in the morning or after rest and objective joint swelling were the most important clinical features enabling the GPs and RNs to discriminate between IA and non-IA conditions.

Conclusion. Diagnostic triage by GPs or RNs improved the positive predictive value of referrals to an EAC with a degree of accuracy approaching that of a group of experienced rheumatologists.

Key words: General practitioner, Rheumatology nurse, Triage, Early inflammatory arthritis.

Rheumatoid arthritis (RA) is a common disorder that affects approximately 0.5–1% of the population worldwide [1]. There is mounting evidence that early diagnosis and treatment with disease-modifying anti-rheumatic drugs (DMARDs) improves patient outcomes [2–7]. This has led to the development of ‘early arthritis clinics’ (EACs) to permit the rapid assessment of patients with suspected early inflammatory arthritis (IA) so that patients can avoid long waiting lists and be commenced on disease-modifying agents at an early stage of the disease process [8, 9]. Nevertheless, the diagnosis of early IA is often difficult and confusing for the general practitioner (GP) [10, 11]. This can lead to delays in the referral of IA from primary...
care and inappropriate referrals to EACs (an inappropriate referral in this context refers to a patient with non-IA who has been ‘fast tracked’ to an EAC in the mistaken belief that they have IA). In a recent survey, 46% of patients referred to an EAC were found to have non-IA conditions, such as fibromyalgia and osteoarthritis [12]. This points to an inefficient use of a valuable resource resulting in further delays in the assessment of patients with IA. A recent review article described a simple evidence-based clinical tool to assist primary care doctors in identifying potential patients with early active RA [13]. In this study, we have sought to determine whether GPs and rheumatology nurses (RNs) can adopt similar principles and triage referrals to EACs in a manner which would enhance the positive predictive value of such referrals.

Method

EAC referral guidelines

Referral guidelines were developed by local GPs and rheumatologists, and incorporated established criteria for referrals to EACs [14]. Clinical features suggesting an IA included:

1. **History**
   - Pain and/or swelling in several joints
   - Significant stiffness in the morning or after rest
   - Deteriorating function of the affected joints
   - Symmetry of the affected joints
   - A good response to non-steroidal anti-inflammatory drugs

2. **Examination**
   - Tenderness, swelling and warmth of the affected joints
   - Restricted range of joint movement

Appropriate referrals to the EAC included any patient with features suggestive of early IA whose symptoms were of less than 2-yr duration [15] and who had not seen a hospital rheumatologist before [16]. Inappropriate referrals included patients with primary fibromyalgia, non-inflammmatory osteoarthritis, soft tissue rheumatism or mechanical low back pain. These referral guidelines were circulated by mail to all GPs in the study catchment area and disseminated via the local medical press.

Prior experience and training

Three of the triage GPs had no prior hospital training in rheumatology and one had worked for 6 months as a senior house officer in a rheumatology unit, 12 months prior to the study commencing. Each GP/RN was provided with a copy of the referral guidelines for the EAC and with relevant abstracts from a standard rheumatology text [17]. Each was trained by several rheumatologists in the application of these guidelines at four half-day clinic sessions. Participants observed the rheumatologist assessing patients and, after discussion, the specialist then observed the trainee as they assessed other patients chosen at random from the EAC.

Study population

All patients referred by their GP to one of three EACs in the greater Belfast area were considered eligible for the study. Subjects were selected at random and invited to participate. Those who agreed gave their informed written consent.

Assessments

Each study patient was independently assessed by one of four trained GPs and by one of two trained RNs. Patients were unaware of the status of the assessor and balanced combinations of GPs and RNs assessed equal numbers of patients. Each assessment took a maximum of 15 min and the assessor was asked to record: (i) whether or not they considered the patient to have IA; (ii) whether the referral was appropriate or not and (iii) the clinical findings.

The patient’s diagnosis and management were not discussed by either the GP or RN. Each patient was then assessed immediately by one of six hospital rheumatologists (four consultants and two specialist registrars), who had been shown in a previous study to have a satisfactory level of diagnostic agreement in the diagnosis of IA [18]. The rheumatologist carried out an identical assessment to the GP and NS, but also informed the patient of their clinical diagnosis and recommended a plan of management. All patients were reviewed by a rheumatologist after 6 months in order to reassess their clinical diagnosis and treatment.

Statistics

The kappa coefficient was used to assess the level of agreement between GPs, RNs and rheumatologists in their assessment of IA with regard to the appropriate-ness of each referral. \( \chi^2 \)-testing was used to analyse the intra-observer and inter-observer variability amongst GPs and RNs. Logistic regression was used to explore the relationship between clinical features detected and the diagnosis of IA by GPs and RNs. All analyses were carried out using the SPSS (version 11.0) program.

The study was approved by the Queens University of Belfast Research Ethics Committee (Application No: 332/99).

Results

Ninety-six eligible patients were approached and all consented to participate in the study. Amongst these, 50 (52.1%) patients were deemed to have IA by the assessing rheumatologist. The remaining 46 (47.9%) patients were thought to have non-IA. A total of 49 (51.0%) referrals were deemed by the rheumatologists to be appropriate. One patient had clinical features of IA which had been present for more than 2 yr and was therefore deemed an inappropriate referral to an EAC.
by the rheumatologists as having IA and appropriately referred, the RNs correctly identified 43 (87.8%).

**True negatives.** Of the 47 patients who were assessed by the rheumatologists as having non-IA and being inappropriately referred, the RNs correctly identified six (12.2%) to be inappropriate referrals.

**False positives.** Of the 47 patients who were assessed by the rheumatologists as having non-IA and being inappropriately referred, the RNs considered four (8.5%) to be appropriate referrals.

The PPV for the RNs was 91.5%.

**Levels of agreement on the diagnosis of IA and the appropriateness of referrals**

The kappa coefficient between the GPs and the rheumatologists was 0.77 (confidence interval, CI 0.64–0.90) where a figure of 1.0 represents total agreement. Kappa was 0.79 (CI 0.67–0.91) between the RNs and the rheumatologists, but the difference in the performance of GPs and RNs was not statistically significant (inter-observer variability). There was no statistical difference between the assessments of individual GPs (χ² = 2.24; 3 df; P = 0.052) or those of the two RNs (χ² = 0; 1 df; P = 1) (intra-observer variability).

**The relationship between clinical features and the diagnosis of IA**

Each GP and RN recorded features of their clinical assessment on a structured proforma. These observations were then correlated with the diagnosis of IA by the rheumatologist. This analysis showed that, for both GPs and RNs, a history of significant stiffness in the morning or after rest and a finding of objective joint swelling were the most important features distinguishing IA from non-IA conditions (Table 3).

If the symptom of significant stiffness in the morning or after rest was detected, RNs were five times more likely and GPs 13 times more likely to diagnose IA. If the sign of joint swelling was detected, RNs were 16 times more likely and GPs 39 times more likely to diagnose IA. Other symptoms such as joint pain, joint swelling, loss of function, good response to NSAIDs and signs such as metacarpophalangeal, metatarsophalangeal joint involvement, joint tenderness, redness, heat and reduced range of movement did not have significant discriminatory value.

**Six-month follow-up**

All patients were reassessed by a rheumatologist 6 months after their initial visit. In 90 cases (93.7%) the diagnosis remained unchanged. In six cases a diagnosis of IA was changed to one of non-IA (three cases of degenerative arthritis, two of fibromyalgia and one of post-viral arthralgia), but in no case was a diagnosis of non-IA changed to IA. In 23 patients (24%) a diagnosis of RA was given at 6 months.

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**Comparison between assessments made by the GP and the rheumatologist**

Table 1 compares the decisions of GPs and rheumatologists with regard to the appropriateness of each referral.

**True positives.** Of the 49 patients who were identified by the assessing rheumatologists as having IA and being appropriately referred, the GPs correctly identified 44 (89.8%).

**True negatives.** Of the 47 patients who were assessed by the rheumatologists as having non-IA and being inappropriately referred, the GPs considered six (12.8%) to be inappropriate referrals.

**False negatives.** Of the 49 patients who were assessed by the rheumatologists as having IA and being appropriately referred, the GPs correctly identified 44 (89.8%).

**False positives.** Of the 47 patients who were considered by the rheumatologists as having non-IA and being inappropriately referred, the GPs considered four (8.5%) to be appropriate referrals.

The PPV for the GPs was 91.5%.

Table 1 compares the decisions of GPs and rheumatologists with regard to the appropriateness of each referral.

**Comparison between assessments made by the RN and the rheumatologist**

Table 2 compares the decisions of RNs and rheumatologists with regard to the appropriateness of each referral.

**True positives.** Of the 49 patients who were identified by the rheumatologists as having IA and being appropriately referred, the RNs considered five (10.2%) to be appropriate referrals.

**False positives.** Of the 47 patients who were assessed by the rheumatologists as having IA and being inappropriately referred, the RNs considered four (8.5%) to be appropriate referrals.

The PPV for the RNs was 91.5%.

**Table 1. Comparison between GPs’ and rheumatologists’ decisions regarding the appropriateness of referrals**

<table>
<thead>
<tr>
<th>Rheumatologists’ decisions on appropriateness of referrals</th>
<th>Appropriate</th>
<th>Inappropriate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained GPs’ decisions on appropriateness of referrals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appropriate</td>
<td>44</td>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>Inappropriate</td>
<td>5</td>
<td>41</td>
<td>46</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>47</td>
<td>96</td>
</tr>
</tbody>
</table>

**Table 2. Comparison between RNs’ and rheumatologists’ decisions regarding the appropriateness of referrals**

<table>
<thead>
<tr>
<th>Rheumatologists’ decisions on appropriateness of referrals</th>
<th>Appropriate</th>
<th>Inappropriate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained RNs’ decisions on appropriateness of referrals</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Appropriate</td>
<td>43</td>
<td>4</td>
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</tr>
<tr>
<td>Inappropriate</td>
<td>6</td>
<td>43</td>
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<tr>
<td>Total</td>
<td>49</td>
<td>47</td>
<td>96</td>
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</table>
Cases where there was disagreement between the rheumatologist and the GP and/or RN

In total, there were 15 (15.6%) cases in which the rheumatologist’s initial opinion on the diagnosis of IA and/or the appropriateness of the referral differed from the GP and/or RN (Table 4). In eight cases, the GP and/or RN thought that the patient had non-IA and was inappropriately referred, but the rheumatologist thought that they had IA and were appropriately referred. At 6 months, the rheumatologist felt that six out of the eight patients still had IA. In two cases, the rheumatologist changed the diagnosis from IA to non-IA (one case of osteoarthritis and one of fibromyalgia). In both cases the RN diagnosed non-IA at the initial assessment and in one case the GP diagnosed non-IA. In seven cases the GP and/or RN thought that the patient had IA and was appropriately referred, but the rheumatologist thought that they had non-IA and were inappropriately referred. In none of these cases did the rheumatologist change his/her opinion at 6 months.

Discussion

The treatment of rheumatoid arthritis has seen major advances in the past decade and one of the most important has been the aggressive use of second-line therapies at an early stage in the disease. EACs are now commonplace throughout the developed world but their success depends on the early recognition of the signs and symptoms of synovitis in the primary care setting. The evidence suggests that many GPs have difficulty with this [10]. During the 2-yr period preceding this study we circulated EAC referral guidelines to local GPs, identical to those used in this study. Despite this, a recent audit showed that only half of the patients referred to our EAC had IA [12].

The results of our diagnostic triage were impressive. They led to a potential increase in the referral rate of IA to the EAC from approximately 50 to 90%. In practice, this would mean a significant improvement in the use of valuable clinic time. We cannot tell whether this was a result of attendance at the training clinics, the provision of an assessment tool or skills already present in the assessors. It is interesting to note that the three GPs who had no previous training in a rheumatological post performed as well as their colleague who had been a senior house officer in rheumatology for 6 months.

In detecting early IA the symptom of significant joint stiffness and the sign of objective joint swelling were the most important clinical features enabling the GPs and RNs to discriminate between IA and non-IA conditions. These findings are in keeping with more formal studies [19, 20]. We designed the study so that the triage process would reflect, as much as possible, the normal consultation in

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**Table 3. Clinical features, detected by GPs and RNs, that significantly distinguished between IA and non-IA conditions**

<table>
<thead>
<tr>
<th>Clinical feature</th>
<th>df</th>
<th>P value</th>
<th>Odds ratio</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNs Significant stiffness in the morning or after rest</td>
<td>1</td>
<td>0.003</td>
<td>5.0</td>
<td>(1.7–14.7)</td>
</tr>
<tr>
<td>Clinically observed joint swelling</td>
<td>1</td>
<td>0.0001</td>
<td>16.4</td>
<td>(5.1–53.3)</td>
</tr>
<tr>
<td>GPs Significant stiffness in the morning or after rest</td>
<td>1</td>
<td>0.0001</td>
<td>12.7</td>
<td>(3.6–45.8)</td>
</tr>
<tr>
<td>Clinically observed joint swelling</td>
<td>1</td>
<td>0.0001</td>
<td>39.4</td>
<td>(7.4–208)</td>
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</table>

**df, degrees of freedom.**

**Table 4. Six-month follow-up of cases in which the GP and/or RN disagreed with the rheumatologist in their initial assessment of the appropriateness of the referral**

<table>
<thead>
<tr>
<th>Decisions on appropriateness (yes or no) of referral at patient’s initial assessment</th>
<th>Patient’s primary diagnosis at 6 months</th>
<th>Patient commenced on a DMARD at initial assessment?</th>
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<tbody>
<tr>
<td>Rheumatologist</td>
<td>GP</td>
<td>RN</td>
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<td>Yes</td>
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<td>No</td>
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</tbody>
</table>

*Cases in which rheumatologist’s initial diagnosis of IA changed to non-IA after 6-month follow-up.*
primary care. Each interview was limited to 15 min and we avoided the use of formal scoring systems for quantifying clinical disease activity. The triage was intended as a 'snap shot' to guide the decision-making process regarding the route of referral.

Any triage system must have checks and balances to ensure that patients with false-negative diagnoses are not denied access to treatment. Early IA is sometimes missed, even by experienced rheumatologists, so training must emphasize the need to keep an open mind about the diagnosis in difficult cases. All of our assessors were taught the maxim, 'if in doubt, refer'. There were very few instances where the GP or RN rejected patients who subsequently proved to have IA requiring early DMARD therapy. In the rare instances where this did occur, the patient would have been offered a routine out-patient appointment and not denied access to secondary care.

In order to measure the discriminatory power of triage, the outcome of the intervention needs to be compared with an independently established standard. ‘Gold standards’, providing full certainty, are rare [21]. Since there are no clinical, immunological or radiological features that are pathognomonic of IA, a diagnostic gold standard of IA does not exist [22]. We tried to overcome this limitation by using rheumatologists who had previously been shown to have a satisfactory level of agreement in the diagnosis of IA [18]. Evidence suggests that where no gold standard exists, the clinical follow-up of patients is the best approach—an approach that we have tried to adopt [23].

Although the setting for our study was a hospital outpatient clinic, it is likely that the skills of the GP or RN specialist would be best deployed in an intermediate care setting. In recent times there have been exciting changes in nursing and primary care [24]. Many units have embraced the development of GP specialists and rheumatology nurse specialists and their development provides an opportunity to improve expertise in rheumatology in the community. The postgraduate training of GPs in rheumatology deserves greater priority and there is much room for improvement [25]. We need to move away from traditional systematic teaching of our subject to a more problem-oriented approach. GPs often think that blood tests and radiographs are the key to early diagnosis in rheumatic disease. It needs to be emphasized that history taking and ‘hands-on’ examination are much more important means of assessment. Nowhere is this more true than in the assessment of patients for the signs of early inflammatory arthritis.

Conflict of interest

The authors have declared no conflicts of interest.

References