

# Triage of Referrals to an Outpatient Rheumatology Clinic: Analysis of Referral Information and Triage

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**ABSTRACT. Objective.** Rheumatologists triage referrals in order to assess those patients who may benefit from early intervention. Success of triage strategies requires accurate transfer of clinical information between the primary caregiver and rheumatologist. We describe a prototype triage system and formally evaluate the quality of referral content to a rheumatologist's practice.

**Methods.** All new referrals were reviewed by a rheumatologist and, based on the information conferred, assigned a grade using a prototype triage system. This grade reflected each case's suspected urgency and guided the timing of consultation. After the initial rheumatologic consultation a post hoc grade was assigned to each case based on the clinical information gathered. Agreement between referral and consultation grades was assessed. All cases graded as urgent at the time of consultation, and thus felt to be truly urgent, were examined for the quality of content of their referral letters.

**Results.** Two hundred six referrals were evaluated. Ninety-six cases (47%) experienced a grade change between referral and consultation. Thirty-five cases (17%) were upgraded to urgent status after consultation, reflecting inappropriately triaged truly urgent patients. Analysis of referral letters for truly urgent cases revealed the absence of a presumptive diagnosis, symptom duration, and documentation of involved joints in over 30% of referrals.

**Conclusion.** The absence of basic historical, examination, and laboratory markers accounted for inappropriate triage of urgent cases. Our study recognizes dysfunction within the current model of care and questions the development of standardized referral tools as a solution. Other models of care should be investigated for this patient population. (First Release May 15 2008; J Rheumatol 2008;35:1378-83)

## Key Indexing Terms:

TRIAGE REFERRAL CONSULTATION PATIENT CARE DELIVERY OF HEALTHCARE

The prevalence of musculoskeletal pain in the general population has been estimated at more than 20%<sup>1</sup>, and at least 10% of visits to family physicians are due to rheumatologic disorders<sup>2</sup>. Primary care physicians, however, frequently express low levels of confidence in their ability to diagnose and manage such disorders<sup>3</sup>. Given the burden of musculoskeletal disease, as well as the increasing wait times for rheumatologist consultation, various practice management and referral triage strategies have been developed<sup>4-6</sup>. These programs have focused on changes to appointment scheduling, the development of specialized care streams, or pre-appointment screening of referrals for appropriateness. The success of these programs, however, requires the accurate transfer of clinical information between the primary caregiver and rheumatologist.

The importance of triage strategies for rheumatologic referrals is highlighted by the now well accepted concept that rheumatoid arthritis (RA) in its early stages is a relative emergency. Indeed, many studies have shown that a large majority of patients with RA develop bone erosions within the first year<sup>7,8</sup>. Further, there is growing evidence that a brief delay in therapy can affect disability, development of bone erosions, and the achievement of remission<sup>9-11</sup>. Triage strategies focusing on identifying potential cases of early inflammatory arthritis, and seeing them in a timely manner, have the potential to significantly improve patient outcomes.

There are a number of challenges to the development of appropriate triage tools for rheumatologic referrals. For example, the adequacy and appropriateness of referrals from primary care physicians remain a daily challenge for rheumatologists. In a study of rheumatology and orthopedic referrals in the UK, critical information including duration of symptoms, level of function, examination and laboratory findings, and presumptive diagnosis was absent in more than 50% of cases<sup>12</sup>. An analysis of referral letters to an outpatient rheumatology clinic in Norway yielded slightly more optimistic findings, where 95% of referrals were said to outline the clinical problem appropriately, and 76% of referrals included an examination<sup>13</sup>. Notably, however, neither of

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Accepted for publication February 4, 2008.

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these studies specifically outlined the clinical and laboratory details included in the referral letters, or the consequences of absent information on timely patient assessment. Moreover, there remain numerous anecdotal reports from rheumatologists who describe inaccurate referral information resulting in inappropriate triage of patients.

The development of a standardized rheumatologic referral tool for family physicians provides an opportunity to educate at the primary care level, as well as improve triage, treatment, and outcomes for patients with early RA. While rheumatology remains a decidedly clinical specialty, there has been no formal evaluation of the quality of rheumatologic referrals with respect to specific historical data and examination findings that may help facilitate the appropriate identification of patients with early inflammatory arthritis.

We used a plan-do-study-act (PDSA) process to develop and evaluate a triage tool to improve patient access to care<sup>14,15</sup>. The goals of our study were to describe a prototype for a triage system in rheumatology and to formally evaluate the quality of referral information received from referring physicians.

## MATERIALS AND METHODS

Our study involved one rheumatologist's outpatient practice located at St. Joseph's Health Centre, London, Ontario, affiliated with the University of Western Ontario, Canada. The rheumatologist has the shortest waiting list and had been in practice for 1 year in the current city at the time of the referrals. Patient referrals received between January and May 2005, from general practitioners and specialist physicians (including rheumatologists requesting a second opinion or transfer of care due to relocation/

retirement), were evaluated. All referring physicians were unaware of this study.

Referral letters were triaged for urgency by the consultant rheumatologist. Triage criteria were developed empirically as there are, to date, no validated triage tools in the literature, and each case was assigned a triage "grade" between A+ and D (Table 1). Upon receipt of each referral, the rheumatologist reviewed the referral information, made a broad presumptive diagnosis, and assigned an initial triage grade as described above. Notably, referrals graded initially as D (i.e., not appropriate for rheumatology) were declined. All other referrals underwent an initial rheumatologic consultation consisting of a history, as well as a general and musculoskeletal examination. As part of the initial rheumatologic consultation, all patients completed standardized assessments including a Health Assessment Questionnaire (HAQ) and 10-cm visual analog scales for pain, fatigue, sleep, and global disease activity. After the initial rheumatologic consultation each patient was given a presumptive diagnosis and assigned a consult triage grade based upon the information gathered (post hoc). While the same rheumatologist assigned each of the grades (initial and consult), he was unaware of the referral's initial grade at the time he was assigning the consult grade. The consult grade was assumed to be the most accurate reflection of urgency, and agreement between the referral and consult grades was assessed.

All urgent cases (graded as A at the time of referral or consult) were further evaluated, creating 2 groups: (1) cases graded as presumptively urgent based on the content of the referral letter; and (2) cases thought to be truly urgent based on the clinical consultation. Using a standard protocol, the content of the referral letter and consultation note was examined by an independent physician (internal medicine resident, SLG). Specifically, the referral note was evaluated for the presence or absence of a provisional diagnosis, basic historical data, clinical examination findings, and relevant laboratory investigations. This information was compared with data from the consultation note for agreement. Specifically, we were interested in cases that, at consultation, were either (1) "upgraded" to an A, reflecting inappropriately triaged urgent cases, or (2) "downgraded" from an A, reflecting inappropriately triaged non-urgent patients. Each upgraded and

Table 1. London triage grading system.

Category	Description	Examples
A+	For patients who require assessment and treatment on an urgent basis within 24–48 h. Reserved for patients whose physicians personally contact the rheumatologist to outline clinical details	<ul style="list-style-type: none"> <li>• Septic arthritis</li> <li>• Giant cell arteritis</li> </ul>
A	For patients who require assessment and treatment on an emergency basis within 2–4 wks. Reserved for patients with a recent onset inflammatory arthritis where early intervention is critical to a successful outcome	<ul style="list-style-type: none"> <li>• CTD with major organ decompensation</li> <li>• New onset IA</li> <li>• Severe IA with impact on ADL</li> <li>• CTD</li> <li>• Vasculitis</li> <li>• PMR</li> </ul>
B	For patients who require assessment and treatment on an elective basis within 2–4 mo. Reserved for patients with information that suggests an inflammatory syndrome where immediate intervention is not necessarily as important but treatment is necessary	<ul style="list-style-type: none"> <li>• Established IA</li> <li>• Undiagnosed or subacute or probable IA</li> <li>• Crystalline arthritis</li> </ul>
C	For patients who require assessment and treatment on an elective basis within the next 6–12 mo. Reserved for patients with stable treated inflammatory disorders or noninflammatory disorders	<ul style="list-style-type: none"> <li>• Severe OA with a major impact on ADL</li> <li>• Previously diagnosed rheumatic disease (stable) referred for diagnostic re-evaluation or review of treatment</li> <li>• FM not previously seen by rheumatologist</li> <li>• Possible IA but not deemed highly likely</li> <li>• OA which may benefit from consultation</li> </ul>
D	For patients with a problem which is best assessed by another healthcare provider. Appointments are not given unless discussed with referring physician. Reserved for patients with established chronic pain conditions who would be better treated by specialists in orthopedics, chronic pain, or rehabilitation.	<ul style="list-style-type: none"> <li>• Diagnosed FM</li> <li>• Chronic MBP</li> <li>• Soft tissue pain</li> </ul>

IA: inflammatory arthritis; CTD: connective tissue disease; OA: osteoarthritis; ADL: activities of daily living; FM: fibromyalgia; MBP: mechanical back pain; PMR: polymyalgia rheumatica.

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downgraded referral was evaluated on a case-by-case basis by the independent evaluator (SLG) to assess the suspected reason for this change.

## RESULTS

**Demographics.** Two hundred thirty-nine referrals were reviewed. Thirty-three were not included in our study as they were not in the scope of the consulting rheumatologist's practice, declined to be seen, cancelled the referral, or had moved. As such, 206 referrals remained for evaluation, with a mean age of 52 (median 53) years. Mean number of days from referral to consultation was 155 (median 156).

**Distribution of grades.** Table 2 displays the distribution of grades assigned. Ninety-six cases (47%) experienced a change in grade, with 36 being upgraded and 60 downgraded. The distribution of upgrades and downgrades (i.e., C to A; A to B) is shown in Table 3. Most notably, 18 cases (9% of all referrals) were upgraded to urgent status, representing inappropriately triaged urgent cases, and 20 cases were downgraded from urgent status, representing inappropriately triaged non-urgent cases.

**Characteristics of truly urgent cases (graded A at consult).** Demographics: Forty-five patients were graded A at the time of consult. Mean age in this group was 51 years (median 54 yrs).

**Referral time:** Mean time from referral to consultation was 75 days (median 50 days) for all cases graded A at consult. Referral time for cases upgraded to A status was 122 days. Referral time for cases whose grade remained the same (i.e., A at referral and consult) was 44 days.

**Diagnoses after consultation:** Inflammatory arthritis constituted the majority of urgent cases (31 cases, 69%), compared to systemic lupus erythematosus (SLE) or connective tissue disease (CTD) not yet diagnosed in 10 cases (22%). The distribution of diagnoses is listed in Table 4.

Table 2. Distribution of triage grades at referral and consultation.

Grade	Referral (n = 206)		Consultation (n = 206)	
	n	(%)	n	(%)
A+	1	(0.5)	0	(0)
A	46	(22)	45	(22)
B	90	(44)	74	(36)
C	69	(33.5)	80	(39)
D	—	—	7	(3)

Table 3. Distribution of grade changes (n = 96).

Change	Upgrades		Downgrades	
	n	Percentage of All Study Referrals	n	Percentage of All Study Referrals
To A	18	9	—	—
To B	17	8	—	—
A to B	—	—	15	7
A to C	—	—	5	2
Other	—	—	41	20

Table 4. Distribution of rheumatologist diagnoses in truly urgent cases (A at consult).

Diagnosis	n (%)
Rheumatoid arthritis	14 (31)
Inflammatory polyarthritis	5 (11)
Systemic lupus	12 (27)
Polymyalgia rheumatica	3 (7)
Connective tissue disease	2 (4)
Possible connective tissue disease	2 (4)
Inflammatory monoarthritis	3 (7)
Still's disease	1 (2)
Sacroiliitis	1 (2)
Psoriatic arthritis	1 (2)
Other	1 (2)
Total	45 (—)

**Clinical and laboratory content of referral letters:** Pain was the only consistently reported symptom, found in 100% of referral letters. Otherwise, 15 cases (33%) were referred without a presumptive diagnosis. Twenty-one referrals (47%) did not document duration of the current symptoms, 19 referrals (42%) did not mention which joints were tender, and 36 referrals (80%) did not comment on morning stiffness. Thirty-seven referrals (82%) did not include an assessment of connective tissue disease symptoms. Of the 10 cases found to have a possible or probable CTD, however, 6 referrals did not include a connective tissue assessment. A brief assessment for CTD may have included the presence of a rash, photosensitivity, oral ulceration, serositis, sicca symptoms, or Raynaud's phenomenon. Forty-two referrals (93%) did not mention functional status, and 29 (64%) referrals did not include an examination for joint swelling (see Table 5 for details). Fifteen referrals (33%) did not include a complete blood count (CBC) or erythrocyte sedimentation rate (ESR). Rheumatoid factor (RF), however, was reported in 36 cases (80%) and antinuclear antibodies (ANA) in 34 cases (75%) (Table 5).

**Characteristics of upgrades.** Eighteen referrals were upgraded to urgent (Grade A) at the time of consultation. Of these upgraded referrals, 9 were inappropriately triaged due to insufficient historical information, and 2 had previously been seen by a rheumatologist and were referred with an inappropriate diagnosis. In 4 cases, clinical status deteriorated during the waiting period for consultation, thus resulting in an upgrade to urgent. Finally, 3 cases were wrongly triaged at the time of referral; these cases should have been seen urgently, but clinical and laboratory information in the referral letter was lacking.

**Characteristics of downgrades.** Twenty referrals were downgraded from urgent status (Grade A) to non-urgent status (Grade B and C). Six of these referrals (32%) were triaged as urgent based on a clinical history of possible early inflammatory arthritis or CTD, but were found not to have these conditions. Nine referrals (47%) were downgraded

Table 5. Content of referral and consultation notes in truly urgent cases (A at consult).

	Referral (n = 45)			Consult (n = 45)		
	Present (%)	Absent (%)	Not Mentioned (%)	Present (%)	Absent (%)	Not Mentioned (%)
Symptom duration	53	—	47	98	—	2
Joint count	58	—	42	98	—	2
Stiffness > 60 min	20	0	80	67	20	13
Decreased energy	4	0	96	58	22	20
Sleeplessness	7	0	93	53	18	29
Weight loss	4	0	96	27	53	20
Decreased appetite	0	2	98	15	56	29
Fever	4	2	94	11	33	56
CTD symptoms	11	7	82	33	67	0
Functional status	11	—	89	93	—	7
CBC	67	—	33	—	—	—
ESR	67	—	33	—	—	—
CRP	33	—	67	—	—	—
RF	80	—	20	—	—	—
ANA	75	—	25	—	—	—

CTD: connective tissue disease; CBC: complete blood count; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; RF: rheumatoid factor; ANA: antinuclear antibodies.

based on the severity and duration of symptoms. In these cases, inflammatory symptoms had been present for years, or there was no functional disability. Other reasons for downgrading included: documenting joint swelling in the referral letter but not substantiated at consultation (n = 1), an improvement in symptoms from referral to consultation (n = 1), misleading results of a bone scan suggesting an inflammatory arthritis (n = 1), and wrongful triage (n = 1).

*Sensitivity, specificity, positive and negative predictive values.* The probability of assigning an urgent grade at referral for those patients who were deemed to be truly urgent at consultation was 59% (sensitivity). The probability of assigning a non-urgent grade at referral among those patients who were deemed to be truly non-urgent at consult was 87.6%. Given a referral grade of A, the probability of the referral being graded as A at consult was 56.5% (positive predictive value). Given a referral grade of B or C, the probability of the referral being graded as a B or C at consult was 88.7% (negative predictive value).

## DISCUSSION

The purpose of our study was to evaluate the quality of information received in a standard rheumatology referral, and to document the effectiveness of a potential triage system based on this content. Unfortunately, we found that most rheumatology referrals lacked basic details of an inflammatory history, physical examination, and laboratory evaluation. Moreover, this paucity of referral information led to inappropriate patient triage.

Morning stiffness, for example, was not documented in 80% of urgent referrals, while 67% of these patients were found to have significant symptoms at the time of consulta-

tion. Joint swelling was not documented in 64% of cases, in spite of nearly 70% of patients showing evidence of this when examined by the rheumatologist. Functional status, well known in rheumatologic patients to be a surrogate marker of poor outcomes, was ignored in 89% of urgent referrals even though the average HAQ score was found to be 0.96 at consultation, indicating moderate disability. While basic markers of inflammation (CBC, ESR, CRP) were missing from more than 30% of truly urgent referrals, RF and ANA were drawn in more than 80% and 75% of these cases, respectively, thus indicating a concerning trend toward the inappropriate use of serologic screening for undifferentiated musculoskeletal complaints.

Based on the information provided in the referring letter, our triage tool yielded a sensitivity of only 59%, which is unacceptably low to reliably screen referrals. Six of the cases upgraded to urgent status after consultation, for example, were inappropriately triaged based on the paucity or inaccuracy of historical details and examination findings conferred in the referral note. Absent or inaccurate estimates of disease duration, in contrast, were primarily responsible for referrals being downgraded from urgent status after consultation.

Perhaps more concerning than the paucity of referral data in our study is the prolonged wait time from referral to consultation. Patients waited a mean period of 4 months for rheumatologic assessment. Notably, only 3 patients did not attend their initial appointment, and, as such, unexpected cancellations did not affect overall wait time. Urgent cases (at referral) were seen in a mean of 48 days. However, the mean duration of symptoms in these urgent patients prior to referral was more than 7 months. Therefore, urgent cases,

many of whom were potential cases of “early” inflammatory arthritis in our study, were not assessed until approximately 8 months after symptom onset. While this may point to a deficiency at the primary care level with respect to delayed referral of early inflammatory arthritis, it also highlights the system-wide issue of rheumatology manpower. Further, the bidirectional shift of patients between categories A and B suggests that a higher percentage of appointed patients than can be accommodated need to be seen sooner to provide optimal care. The United States Rheumatology Workforce recently developed a supply and demand model to predict future rheumatologic care needs. They estimate that by 2025 the demand for rheumatologic care will exceed supply by more than 2500 trained rheumatologists<sup>16</sup>. That referral information was inadequate in predicting patient acuity in our study only reinforces the need for local and system-wide changes to accommodate appropriate referral demands. Triage would not be an issue if all patients could be seen in a timely fashion.

Given that referral details appear insufficient to appropriately triage referrals, and that the demands of musculoskeletal disease are expected to outweigh supply, changes to the current care model should be reviewed to ensure that rheumatology patients are assessed in a timely fashion. Previous strategies to improve musculoskeletal care have included improved musculoskeletal education, diagnostic algorithms, pre-appointment screening, interdisciplinary care, and central triage. We will explore each of these strategies in more detail.

*Musculoskeletal education.* Some studies have emphasized the need for improved musculoskeletal education<sup>13,17</sup>. A study of diagnostic agreement among primary care physicians and rheumatologists, for example, showed that more than half of primary care referrals to rheumatology were found to have soft-tissue rheumatism or spinal pain syndromes, rather than a defined rheumatic disease<sup>17</sup>. The absence of a simple inflammatory history at the time of referral in our study supports the suspicion that the understanding of inflammatory, degenerative, and soft-tissue musculoskeletal complaints at the primary care level is modest. While curriculum changes at the undergraduate and resident levels are feasible, the benefits of such improvements on the current system will not be seen for years. Moreover, with their current time constraints and burden of work, we question the ability of continuing medical education programs to institute change at the primary care level.

*Diagnostic algorithms.* Simple algorithms to enable the rapid rheumatologic assessment of early inflammatory arthritis have also been developed. Based on prognostic factors for early inflammatory arthritis, as well as expert consensus, Emery, *et al* developed a referral algorithm to be used by primary care<sup>18</sup>. Their criteria include the presence of 3 or more swollen joints, a positive lateral compression test of the metacarpophalangeal or metatarsophalangeal

joints, or morning stiffness lasting more than 30 minutes. This screening tool relies heavily on appropriate examination findings. Given that more than half of the referrals we reviewed did not document any assessment of swollen joints, we question the reliability of the musculoskeletal examination at the primary care level. Moreover, while this screening algorithm helps identify early inflammatory arthritis, it does not address the larger issue of appropriate triage of all referrals to a busy rheumatology practice.

*Pre-appointment screening.* Pre-appointment screening has been proposed to decrease wait times, while appropriately triaging referrals. Harrington and Walsh describe a method whereby all referrals are prescreened by the consulting rheumatologist<sup>5</sup>. All relevant notes, laboratory results, and imaging are obtained or arranged before the patient is seen. Based on this prescreening, referrals deemed inappropriate for rheumatology are redirected, while those not requiring a rheumatology visit (e.g., low titer ANA without symptoms) are handled via telephone with the primary caregiver. Using this approach, 41% of referrals were redirected, thus allowing for efficient assessment of the remaining referrals. The authors of that study were fortunate to find outside physicians accommodating to their requests for further information prior to appointment scheduling and they also point out that this process has, in fact, worked in other practices having an even higher percentage of outside referrals. Unfortunately, this has not been our experience; we have found it incredibly difficult to obtain further information from referring physicians for triage purposes. The authors of this study acknowledge both the financial and nonfinancial limitations to pre-appointment management, but do indicate it to be of value to their rheumatology practice. Whether or not such pre-appointment screening is feasible in other areas remains to be seen.

*Interdisciplinary care.* In addition to prescreening referrals, Newman, *et al* propose a method of expediting new patient referrals by eliminating backlog (all return patients who should have already been seen). In this model, backlog was reduced by involving nurse practitioners in followup care, as well as lengthening the followup interval for routine patients when appropriate. Using this strategy, as well as strategies to eliminate last-minute cancellations, the authors were able to decrease their third available rheumatology appointment from 60 days to less than 2 days. Triage, in this setting, was unnecessary, as all referrals made to rheumatology were assessed in an urgent fashion.

*Central triage.* While the above examples propose change at the local level, preserving the current model of primary care referral for individual subspecialty care, changes at the system level have also been proposed. Rheumatologists, pain specialists, and orthopedic surgeons in Wales, for example, developed a central triage system for referrals to their undifferentiated musculoskeletal services department<sup>4</sup>. Web-based generic referral forms were used to screen patients

and assign them to specific care streams managed by various specialists or allied health professionals. This model eliminated duplicate referrals to multiple services, and in so doing decreased wait times in spite of an increasing number of referrals. Similarly, early arthritis clinics in Northern Ireland evaluated a program in which specially trained general practitioners and rheumatology nurses performed screening examinations on referred patients in order to assess their acuity<sup>19</sup>. Agreement between screening assessment and rheumatologist diagnosis was high, lending support to this protocol as a credible alternative to the current model.

Our study has a number of limitations. Admittedly, the grading of referral letters at triage and at consultation was performed by the same physician, albeit without explicit knowledge of the prior grade. In addition, we have highlighted only a small snapshot of dysfunction within our current model of care. Indeed, while we demonstrated that a paucity of referral information at the primary care level can influence appropriate triage by the rheumatologist, we cannot comment on those patients inappropriately referred from primary care to other specialty services (e.g., surgical, physical medicine, and rehabilitation) who would otherwise have been best served by a rheumatologist. One might also question whether referral patterns to a new rheumatology practice reflect usual rheumatology referrals. Perhaps our referrals reflected a disproportionate amount of noninflammatory disease, thus increasing wait times for truly urgent, inflammatory cases. When compared to the referral study by Harrington and Walsh, however, our cohort includes equal if not more cases of inflammatory arthritis (31% vs 18%)<sup>5</sup>. As such, it is unlikely that our wait times were falsely increased by noninflammatory disease. A notable limitation of our study was a lack of patients in category D at referral. It was difficult to truly screen out “chronic pain” due to the paucity of information provided in the referral letters and therefore no patients fell into category D.

Our study recognizes dysfunction within the current model of care regarding accurate and timely referral for musculoskeletal complaints. System-level change must involve a focus on improving manpower issues in rheumatology. At the local level, arthritis referral tools, pre-appointment screening to eliminate unnecessary referrals, timely implementation of the electronic patient record, appropriate use of nurse practitioners in patient care, and multidisciplinary approaches to referral all hold promise to improve the efficiency of rheumatologic care.

## REFERENCES

1. Picavet HS, Schouten JS. Musculoskeletal pain in The Netherlands: prevalences, consequences and risk groups, the DMC(3)-study. *Pain* 2003;102:167-78.
2. Bjelle A, Magi M. Rheumatic disorders in primary care. A study of two primary care centres and a review of previous Swedish reports

- on primary care. *Scand J Rheumatol* 1981;10:331-41.
3. Matheny JM, Brinker MR, Elliott MN, Blake R, Rowan MP. Confidence of graduating family practice residents in their management of musculoskeletal conditions. *Am J Orthop* 2000;29:945-52.
4. Maddison P, Jones J, Breslin A, et al. Improved access and targeting of musculoskeletal services in northwest Wales: Targeted Early Access to Musculoskeletal Services (TEAMS) programme. *BMJ* 2004;329:1325-7.
5. Harrington JT, Walsh MB. Pre-appointment management of new patient referrals in rheumatology: a key strategy for improving health care delivery. *Arthritis Rheum* 2001;45:295-300.
6. Newman ED, Harrington TM, Olinginski TP, Perruquet JL, McKinley K. “The rheumatologist can see you now”: Successful implementation of an advanced access model in a rheumatology practice. *Arthritis Rheum* 2004;51:253-7.
7. van der Heijde DM. Joint erosions and patients with early rheumatoid arthritis. *Br J Rheumatol* 1995;34 Suppl:74-8.
8. Mottonen TT. Prediction of erosiveness and rate of development of new erosions in early rheumatoid arthritis. *Ann Rheum Dis* 1988;47:648-53.
9. Mottonen T, Hannonen P, Korpela M, et al. Delay to institution of therapy and induction of remission using single-drug or combination-disease-modifying antirheumatic drug therapy in early rheumatoid arthritis. *Arthritis Rheum* 2002;46:894-8.
10. Wiles NJ, Lunt M, Barrett EM, et al. Reduced disability at five years with early treatment of inflammatory polyarthritis: results from a large observational cohort, using propensity models to adjust for disease severity. *Arthritis Rheum* 2001;44:1033-42.
11. Lard LR, Visser H, Speyer I, et al. Early versus delayed treatment in patients with recent-onset rheumatoid arthritis: comparison of two cohorts who received different treatment strategies. *Am J Med* 2001;111:446-51.
12. Speed CA, Crisp AJ. Referrals to hospital-based rheumatology and orthopaedic services: seeking direction. *Rheumatology Oxford* 2005;44:469-71.
13. Gran JT, Nordvag BY. Referrals from general practice to an outpatient rheumatology clinic: disease spectrum and analysis of referral letters. *Clin Rheumatol* 2000;19:450-4.
14. Harrington JT, Newman ED. Redesigning the care of rheumatic diseases at the practice and system levels. Part 1: practice level process improvement (Redesign 101). *Clin Exp Rheumatol* 2007;25 Suppl 47:55-63.
15. Newman ED, Harrington JT. Redesigning the care of rheumatic diseases at the practice and system levels. Part 2: system level process improvement (Redesign 201). *Clin Exp Rheumatol* 2007;25 Suppl 47:64-8.
16. Deal CL, Hooker R, Harrington T, et al. The United States rheumatology workforce: supply and demand, 2005-2025. *Arthritis Rheum* 2007;56:722-9.
17. Gamez-Nava JI, Gonzalez-Lopez L, Davis P, Suarez-Almazor ME. Referral and diagnosis of common rheumatic diseases by primary care physicians. *Br J Rheumatol* 1998;37:1215-9.
18. Emery P, Breedveld FC, Dougados M, Kalden JR, Schiff MH, Smolen JS. Early referral recommendation for newly diagnosed rheumatoid arthritis: evidence based development of a clinical guide. *Ann Rheum Dis* 2002;61:290-7.
19. Gormley GJ, Steele WK, Gilliland A, et al. Can diagnostic triage by general practitioners or rheumatology nurses improve the positive predictive value of referrals to early arthritis clinics? *Rheumatology Oxford* 2003;42:763-8.