

Referrals for Musculoskeletal Disorders: Patterns, Predictors, and Outcomes

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ABSTRACT. Objective. To examine factors associated with musculoskeletal referral and determine whether referral influences clinical outcomes.

Methods. Patients included in the study presented with knee or shoulder pain to primary care physicians affiliated with an academic teaching hospital. The primary clinical outcome was change in pain or function measured up to 12 months after initial presentation. Covariates included baseline pain and function, duration of complaint, initial diagnosis, insurance status, and several demographic factors.

Results. Forty-one percent (65 of 160 patients) were referred for knee or shoulder conditions, 47 (29%) patients were referred only to an orthopedic surgeon, and 12 (8%) only to a rheumatologist; 6 (4%) patients saw both specialists. For patients with knee pain, the only variable correlated with referral was an initial diagnosis of internal derangement ($p = 0.02$). No variable was significantly associated with referral for shoulder pain. Baseline pain, baseline function, duration of complaint, age, and insurance status were not associated with referral for either knee or shoulder pain (all p values > 0.05). The variables most associated with improvement in pain and function were more severe pain and function at baseline (all p values < 0.0001). In multivariate analyses controlling for clinical and demographic factors among patients with shoulder complaints, referral was associated with significantly less improvement in clinical outcomes than non-referral ($p = 0.02$). Referral was not associated with clinical outcomes for patients with knee pain.

Conclusions. Referral was common for patients with knee or shoulder conditions. The only baseline variable correlated with referral was a diagnosis of knee internal derangement. Referral was not associated with improvement in pain or function and may actually be correlated with worse outcomes among patients with shoulder pain, although this is likely due to unmeasured factors contributing to the referral decision. (J Rheumatol 2001;28:2090–5)

Key Indexing Terms:

REFERRAL PATTERNS
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KNEE PAIN
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Musculoskeletal symptoms account for 10% of physician office visits and many of these visits prompt specialty referral¹. Referral to orthopedic surgeons and rheumatolo-

gists is an important decision point in the management of patients with musculoskeletal disease that may trigger costly diagnostic testing and invasive procedures. The American College of Rheumatology and the American Academy of Orthopedic Surgeons have developed guidelines for initial management of such patients, including when to consider referral, but few data are available regarding patterns and outcomes of referral²⁻⁴.

Recent findings suggest that while patients prefer to have their primary care physician involved in their care, access to specialists is also an important determinant of satisfaction⁵. Other investigators have examined patterns and outcomes of referral in care of patients with cardiac disease and found that non-clinical issues such as race and gender are important correlates of referral for invasive procedures⁶. When referral patterns have been examined in large administrative databases, non-clinical factors such as insurance status and patient income have been found to be associated with specialty referral⁷. Survey results from generalists suggest that one-third of formal referrals could have been avoided by training in simple procedures such as joint or tendon

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injections or by facilitating easier informal communication with specialists⁸.

The goals of this study were to describe patterns of musculoskeletal referrals, examine factors associated with referral, and analyze whether referrals were associated with improvement in pain or function. We hypothesized that patients with more severe pain and function at baseline would be most likely to be referred. We further hypothesized that patients' referral status would not correlate with their overall clinical improvement, even after adjusting for baseline pain and function.

MATERIALS AND METHODS

Patients. Subjects were recruited as part of an observational cohort study of musculoskeletal care at Brigham and Women's Hospital, a large academic medical center⁹. Consecutive patients presenting with acute knee or shoulder pain to general internists, rheumatologists, or orthopedic surgeons were eligible for the parent study. For the present analyses, we included only patients seen initially by an internist. Study staff searched the hospital's electronic ambulatory medical record for any new mention of knee or shoulder pain on the problem list and billing data to identify potential subjects who had been seen in the prior week and were diagnosed with non-inflammatory knee or shoulder disorders. (For a complete list of diagnoses, please contact the authors.) The medical records were then reviewed to determine whether patients met the following inclusion criteria: age over 18 years; treating physician was a staff member or postgraduate fellow in internal medicine; no visit in the prior 6 months to a provider at Brigham and Women's Hospital for the same complaint; less than 4 joints involved at the time of presentation; no history of inflammatory arthritis; and no history of total joint replacement in the involved musculoskeletal structure. All patients meeting the above criteria were offered 5 dollars for each questionnaire completed, one at baseline, one at 3 months, and another at 12 months. The study was approved by the Brigham and Women's Hospital Human Research Committee, and all patients provided written consent.

Variables. Referral was defined as any visit to a rheumatologist or orthopedic surgeon occurring after the initial visit to a general internist. The visit to the musculoskeletal specialist was noted in one of 2 ways. The patient could have designated in the baseline, 3 month, or 12 month questionnaires that they had been seen by a rheumatologist or orthopedic surgeon after their initial visit with a general internist. Alternatively, the visit could have been noted in Brigham and Women's Hospital billing data pertaining to the 12 months after the initial visit.

The covariates we examined included: patient age, gender, race, and type of insurance coverage; whether the patient claimed worker's compensation or was involved in litigation; whether the patient had completed high school; the number of comorbid conditions reported by the patient; the duration of the current episode of musculoskeletal pain; pain and function at baseline; and the diagnosis at the initial visit. Insurance coverage was categorized into Medicare, Medicaid, commercial, managed care with capitation, managed care without capitation, and other. Diagnoses were taken directly from the initial visit notes of the general internist. Diagnostic categories for knee pain were: osteoarthritis (OA); internal derangement consisting of meniscal damage, anterior and posterior cruciate ligament lesions, and medial and lateral collateral ligament damage; patellofemoral syndrome including malalignment syndrome and anterior knee pain; and other diagnoses encompassing gout, bursitis, osteonecrosis, fracture, hemarthrosis, and no specific diagnosis. No diagnosis was coded when no mention of the knee pain was made in the assessment and plan. Diagnostic categories for shoulder pain included: OA; rotator cuff tears including partial and full; tendinitis/bursitis encompassing rotator cuff tendinitis, supraspinatus tendinitis, bicipital tendinitis, subacromial or subdeltoid bursitis, impingement syndrome, and adhesive capsulitis; and other diag-

noses including instability, thoracic outlet syndrome, and avascular necrosis. No diagnosis was coded when no mention was made of the shoulder pain in the assessment or plan. In multivariate models, diagnoses were coded with dummy indicator variables; knee OA and internal derangement were compared with all others separately and shoulder OA and rotator cuff tears were compared with all others separately.

Outcomes. We examined change in pain and function from the initial visit to the last self-report. Pain and function were measured using the Western Ontario McMaster Osteoarthritis Index (WOMAC) for knee patients and the Shoulder Pain and Disability Index for shoulder patients; both indices include valid, reliable subscales for pain and function^{10,11}. Patients who did not fill out a questionnaire after the baseline were excluded from these analyses since change in pain and function could not be calculated ($n = 29$). If a 12-month questionnaire was returned ($n = 88$), this was used to calculate the difference between baseline and followup. For those who did not return a 12 month questionnaire, the 3 month self-report was used ($n = 43$).

Analyses. We examined the rates of referral to orthopedic surgeons and rheumatologists and analyzed the relationship between baseline patient factors and referral. Initially, we analyzed the data separately for patients completing only the 3 month questionnaire versus those also completing the 12 month questionnaire. The results for these separate cohorts were similar, and thus all analyses presented are for the combined group. Statistical associations were assessed using chi-square tests for categorical variables and t tests for continuous variables. A multivariate logistic regression model was fit with referral status as the dependent variable and the baseline patient variables as independent predictors. We conducted four sets of analyses to examine the relationship between referral status and change in pain and function; pain and function were assessed as separate outcomes for patients with knee conditions and then for those with shoulder conditions. We analyzed these relationships using a hierarchical framework employing generalized linear models (PROC GLM in SAS)¹². First, referral status was regressed against change in pain or function. Then baseline pain or function was added to the model. Finally, age, race, gender, duration, and diagnosis were added to the multivariate models. Both non-standardized and standardized β estimates from the multivariable models were examined. Standardized β estimates were calculated by dividing the raw, non-standardized β estimates from the model by the standard errors. All analyses were carried out in SAS¹².

RESULTS

One hundred sixty patients initially saw a general internist for musculoskeletal conditions, 97 for knee, and 63 for shoulder disorders (Table 1). The group was middle aged, two-thirds female, and mostly Caucasian. Over 80% had at least completed high school. The median duration of pain was 15 weeks. Patients' insurance coverage varied widely and included managed care with and without capitation, Medicare, Medicaid, and commercial. Frequent initial diagnoses for patients with knee pain were patellofemoral syndrome (23%), internal derangement (19%), and OA (11%); for patients with shoulder disorders, the most frequent diagnoses included tendinitis/bursitis (44%), OA (7%), and rotator cuff tears (5%). Of these 160 patients, 65 (41%) were referred to a musculoskeletal specialist, 47 only to an orthopedic surgeon, and 12 only to a rheumatologist; 6 patients saw both types of specialists.

We examined whether any of the baseline characteristics were associated with referral status. In analyses that adjusted for age, gender, educational attainment, insurance status, duration of knee or shoulder pain, and baseline pain

Table 1. Patient characteristics, referred compared with not referred.

Attribute	All Patients (n = 160)	Knee (n = 97)		Shoulder (n = 63)	
		Referred (n = 39)	Not Referred (n = 58)	Referred (n = 26)	Not Referred (n = 37)
Age, mean ± SD	47 ± 15	48 ± 13	42 ± 14	47 ± 16	53 ± 15
Gender, % female	66	67	78	68	47
Race, % white	87	94	83	82	88
Education, % beyond high school	83	82	90	92	68
Episode duration, median (25,75)	15 (8,40)	10 (6,20)	12 (8,26)	27 (14,90)	22 (10,50)
Baseline pain, mean ± SD	—	2.1 ± 0.7	2.0 ± 0.8	2.4 ± 0.9	2.3 ± 0.9
Baseline function, mean ± SD	—	2.2 ± 0.8	1.9 ± 0.9	1.7 ± 0.8	1.8 ± 0.8
Comorbidities, mean ± SD	1.8 ± 12.7	2.0 ± 1.6	1.6 ± 1.5	1.7 ± 2.4	1.9 ± 1.5
Insurance type, number (row %)					
Medicare	21	4 (57)	3 (43)	5 (36)	9 (64)
Medicaid	7	2 (33)	4 (67)	0 (0)	1 (100)
Managed care, non-capitated	28	8 (40)	12 (60)	5 (63)	3 (37)
Managed care, capitated	62	17 (44)	22 (56)	12 (52)	11 (48)
Commercial	30	6 (32)	13 (68)	3 (27)	8 (73)
Other	7	1 (33)	2 (67)	1 (25)	3 (75)
Diagnosis					
Osteoarthritis	—	4 (40)	6 (60)	0 (0)	4 (100)
Patello-femoral syndrome	—	5 (23)	17 (77)	—	—
Internal derangement	—	13 (72)	5 (28)	—	—
Tendinitis/bursitis*	—	—	—	9 (33)	18 (67)
Rotator cuff tear†	—	—	—	2 (67)	1 (33)
Instability	—	—	—	3 (100)	0 (0)
Other	—	14 (37)	24 (63)	7 (44)	9 (56)
No diagnosis given	—	2 (33)	4 (67)	3 (38)	5 (62)

Episode duration was measured in months. Baseline pain and function for patients with shoulder complaints was measured with the Shoulder Pain and Disability Index; pain scores ranged from 0–5 and function scores ranged from 0–8. For knee patients, the WOMAC scale was used; pain scores ranged from 0–5 and function scores from 0–13. Higher values always refer to more severe pain or function. All p values > 0.05 for differences between patients referred and not referred, except for a diagnosis of internal derangement of the knee, p value = 0.02 (Fisher's exact). Three patients with knee pain and 2 patients with shoulder pain had missing information regarding their insurance status. Diagnostic data were missing on 3 knee patients and 2 shoulder patients.

* Included impingement syndrome.

† Included partial and complete tears.

and function, the diagnosis of knee internal derangement was positively associated with referral ($p = 0.02$). No other variable listed in Table 1 was associated with referral status in unadjusted or adjusted analyses (all p values > 0.05).

We then examined whether referral was associated with a greater improvement in pain or function. The 29 patients without followup were excluded from these analyses. However, this group was similar in age, gender, and baseline pain and function to those included (all p values > 0.05). In unadjusted and adjusted analyses of patients with knee pain, referral status had no association with improvement (both p values > 0.05) (Table 2). Baseline pain and function were the variables most strongly associated with improvement, with more severe pain or function at baseline associated with greater improvement (all p values < 0.0001). These baseline variables remained significant in multivariate models. For patients with shoulder complaints, referral was correlated with worse pain at followup in adjusted analyses ($p = 0.02$) (Table 3). Referral status was not associated with

function at followup. No demographic variables were associated with improvement in function for knee or shoulder patients. Having completed high school was associated with improvement in pain for patients with shoulder pain, but not knee pain ($p = 0.001$). Specific diagnoses did not predict improvement in pain or function for patients with knee disorders, but shoulder OA was associated with improvement in pain ($p = 0.02$).

DISCUSSION

We enrolled a prospective cohort of patients with knee or shoulder pain seen by general internists affiliated with an academic medical center. Forty-one percent of these patients were referred to an orthopedist and/or a rheumatologist for specialty care. The only baseline variable that predicted referral was internal derangement for patients with knee pain. Insurance status, gender, and baseline pain and function were not associated with referral status. Likewise, referral was not associated with improvement in final pain

Table 2. Determinants of improvement in pain and function for patients with knee pain. Values are standardized and non-standardized parameter estimates (β) and p values from multivariate generalized linear models.

Covariate*	Improvement in Pain			Improvement in Function		
	β	β	p	β	β	p
Referred	-0.31	-1.6	0.11	0.01	0.06	0.95
Worse baseline pain, per point	0.58	4.9	0.0001	NA	NA	NA
Worse baseline function, per point	NA	NA	NA	0.51	5.4	0.0001
Older age, per year	-0.043	-0.57	0.57	-0.0082	-1.2	0.2
Female	0.13	0.69	0.49	0.057	0.3	0.2
More education, per year	-0.31	-0.99	0.32	-0.19	-0.7	0.5
Longer duration of knee pain, per month	-0.19	-1.7	0.10	0.011	-2.6	0.01
Osteoarthritis	0.10	0.35	0.77	0.16	0.04	0.9
Internal derangement	0.18	0.77	0.44	0.16	0.7	0.5

For knee pain, n = 67 due to missing values and the model $R^2 = 0.36$. For knee function, n = 69 due to missing values and the model $R^2 = 0.42$. NA: variable not tested in model.

* Baseline pain and function were measured using the WOMAC; pain scores ranged from 0–5 and function scores from 0–13.

Table 3. Determinants of improvement in pain and function for patients with shoulder pain. Values are standardized and non-standardized parameter estimates (β) and p values from multivariate generalized linear models.

Covariate*	Improvement in Pain			Improvement in Function		
	β	β	p	β	β	p
Referred	-0.50	-2.4	0.02	-0.21	-1.4	0.17
Worse baseline pain, per point	0.53	4.2	0.0002	NA	NA	NA
Worse baseline function, per point	NA	NA	NA	0.51	4.9	0.0001
Older age, per year	0.0086	1.2	0.24	-0.0042	-0.80	0.46
Female gender	0.27	1.4	0.2	0.19	1.3	0.20
More education, per year	0.88	3.3	0.0019	0.38	2.1	0.047
Longer duration of shoulder pain, per month	-0.29	-2.2	0.038	-0.11	-1.2	0.24
Osteoarthritis	1.2	2.3	0.026	0.36	1.0	0.34
Rotator cuff tear	0.53	1.4	0.19	0.33	1.1	0.26

For shoulder pain, n = 49 due to missing values. Model $R^2 = 0.56$. For shoulder function, n = 50 due to missing values and the model $R^2 = 0.47$. NA: variable not tested in model.

* Baseline pain and function were measured using the SPADI; pain scores ranged from 0–5 and function scores ranged from 0–8.

or function. In fact, for patients with shoulder pain, referral was associated with increased pain at followup. Worse baseline pain or function was strongly associated with more improvement in both knee and shoulder patient groups.

What accounts for the seemingly paradoxical relationship between referrals and worse clinical outcomes? We examined many potential associations, and a false positive finding is possible. On the other hand, general internists may recognize patients whose musculoskeletal conditions are likely to be recalcitrant to standard conservative treatment and refer these patients preferentially. While we adjusted for baseline pain and function, other unmeasured variables may drive referrals. For example, it is possible that depression may prompt general internists to refer patients and depressed patients may not improve as quickly. We did not measure mental health and prior data suggest that

depression is more frequently encountered in patients visiting a rheumatology practice¹³. Thus, this may have been an unmeasured confounder.

Our data suggest that general internists favor referral for internal derangement of the knee. This seems appropriate in that knee internal derangement often requires consideration of surgical therapy. The lack of clear association between rotator cuff tears and referral may have been due to insufficient power, ambiguity in coding of tears versus tendinitis, and the uncertain role of surgery in the management of partial rotator cuff tears. The fact that there was a trend toward higher educational attainment predicting referral for patients with shoulder pain may have been due to patients asking questions that the internist was not able to answer sufficiently, thus prompting a referral. In addition, education is correlated with socioeconomic status and primary care

physicians may be more likely to refer patients with higher socioeconomic status. This relationship requires further investigation.

The study has several limitations. We had limited power to assess differences in rates of improvement in pain and function for patients who were referred compared with those who were not referred. Post hoc power calculations suggest that with this study's sample size, we had a 70% power to detect a 20% difference in rates of improvement assuming a false-positive rate of 0.05. Thus, there is a small chance that we missed a significant difference between groups because of an insufficient sample size. Another possible explanation for our negative finding is the substantial heterogeneity in the non-inflammatory musculoskeletal conditions that we examined, resulting in limited power to analyze referral outcomes for specific diagnoses. Additionally, diagnoses were not confirmed using a standardized protocol; instead, we accepted the diagnoses given in the chart. This leaves some uncertainty as to the exact diagnoses of the patients included in this study¹⁴.

Another potential limitation is in our definition of referral. We considered that a patient had been referred if he or she reported a visit with an orthopedic surgeon or rheumatologist, or their billing data from Brigham and Women's Hospital showed a visit to such a specialist after their initial visit with a general internist. Fifty-two percent of the patients who answered that they had been seen by an orthopedic surgeon or rheumatologist had no records of such a visit with a Brigham and Women's Hospital physician, suggesting that they were seen for their referrals outside of the Brigham and Women's Hospital System; we did not access such records to confirm these visits. Since we included all self-reports of a specialist visit as referrals, we do not believe this method introduced substantial bias or inaccuracy. Some patients who were referred may have been misclassified as not referred, due to inaccurate recall. We doubt this occurred frequently since we asked patients about referrals 3 times over the course of the 12 month followup. All visits with orthopedic surgeons or rheumatologists were considered referrals, regardless of whether the primary care physician had directed the referral. Finally, we did not include referrals to allied health professionals such as physical or occupational therapists or doctors of chiropractic medicine.

While we did not control for the treatments given to patients who were referred and to those not referred, this was not the goal of our study. Rather, we considered the visit to the specialist as the treatment assignment and examined whether this resulted in improvement in pain or function. Further adjustments for the specific treatments might have helped explain any differences in outcomes, if any were observed.

Prior research suggests that internal medicine and family practice residents receive poor training in rheumatic and

musculoskeletal diseases^{15,16}. Medical students and residents spend little time learning examination techniques or methods for assessment and treatment. However, what exactly should they be taught? What aspects of musculoskeletal care should be managed by general internists and which patients should they consider referring for specialist care? Our data suggest that, in our institution, referrals for musculoskeletal care are not based on a patient's pain or functional level, but rather on type of diagnosis. This may be appropriate since certain diagnoses, such as internal derangement of the knee, can be treated surgically.

We do not know on the basis of this work and that of others which patients should receive musculoskeletal referrals. Our observational data suggest that referred and non-referred musculoskeletal patients are quite similar in baseline features and in outcomes. These findings should be interpreted cautiously due to the observational study design. Potential confounders, such as depression, household income, attitudes toward health, and health related behaviors were not controlled and may explain why some referred patients had worse outcomes. As well, we did not adjust for the general internists' skill level in musculoskeletal care; it may have been the case that internists more skilled in such care would have lessened the impact of referrals. Assessment of the true value of a referral for musculoskeletal care may require a randomized controlled trial. Such a study would be justified based on our findings.

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