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Predictors of the use of physical therapy services among patients with rheumatoid arthritis

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Background. Although physical therapy is a proven and recommended intervention for managing rheumatoid arthritis (RA), few studies have explored correlates of physical therapy service use among people with RA.

Objective. The purposes of this study were: (1) to describe physical therapy use among people with RA and (2) to identify biopsychosocial factors associated with physical therapy use. It was expected that use of physical therapy services would be lower than previously reported, considering recent medical advancements, and that including contextual factors may lead to identification of new factors associated with physical therapy use.

Design. This was a cohort study.

Methods. Of 1,032 patients prospectively recruited from a large hospital registry, 772 completed baseline and laboratory assessments, received a physical examination, and completed a 1-year follow-up survey regarding physical therapy service use. Measures included: demographics (ie, age, sex, marital status, race, employment, disability status, insurance, income, comorbidities, and education), disease duration, RA medications, self-efficacy (assessed with the Arthritis Self-Efficacy Scale), social support (assessed with the Berkman-Syme Social Network Index), function (assessed with the Multi-Dimensional Health Assessment Questionnaire), and disease activity (assessed with the Rheumatoid Arthritis Disease Activity Index). Self-reported use of physical therapy (yes/no) was assessed at the 1-year follow-up. A staged regression approach, based on a theoretical model, was used to select and enter variables into the regression to develop a parsimonious set of predictors.

Results. The patients were well educated and had modestly high incomes, and most had health insurance. Approximately 15.3% of the patients used physical therapy services during the designated follow-up period. Using multivariable modeling, the most significant predictors of physical therapy service use were moderate to high disease activity (odds ratio [OR]=1.4, 95% confidence interval [CI]=1.1–1.8), less than a college education (OR=0.5, 95% CI=0.2–0.8), greater social networks (OR=2.1, 95% CI=1.3–3.5), and being on disability (OR=2.4, 95% CI=1.3–4.6).

Limitations. The limitations of this study were use of a convenience sample and the potential for misclassification of physical therapy service use.

Conclusions. Patients with less than college education were less likely to receive physical therapy services, and those with more active disease, those who were on disability, and those who had greater social networks were more likely to receive physical therapy services.

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Rheumatoid arthritis (RA), a systemic autoimmune inflammatory disease, affects 1.3 million adults in the United States annually, as reported in 2003,[1] and results in persistent inflammation of synovial tissue. Rheumatoid arthritis is characterized by destructive erosion of bone and loss of joint integrity[2] and frequently leads to disability. Individuals with RA are 8 times more likely to have functional disability compared with adults in the general population from the same community and when untreated; 20% to 30% of patients have permanent work disability within the first 3 years of diagnosis.[3] Thus, RA causes dramatic interference with quality of life if early diagnosis and appropriate treatment are not obtained.[4]

Evidence-based practice guidelines published by the American College of Rheumatology recommend early, aggressive pharmacologic therapy (eg, use of disease-modifying antirheumatic agents within the first 6 months of symptom onset) along with nonpharmacologic interventions such as self-management, occupational therapy, patient education, and physical therapy to improve health outcomes and reduce disability.[4] These recommendations are based on systematic reviews[5,6] and high-quality randomized controlled studies[7,8] of outcomes of people with RA who received nonpharmacologic care such as therapeutic exercise and manual therapy. Physical therapists play an integral role in the nonpharmacologic management of RA. They help patients with RA cope with chronic pain and disability through the design of programs that address flexibility, endurance, strength (force-generating capacity), bone integrity, coordination, balance, and risk of falls,[6,7,9] thereby increasing patients' ability to perform activities of daily living.[10] The benefits of physical therapy interventions have been well documented.[5,6,8] Research also indicates that patients who are treated by specially trained physical therapists report significant improvements in self-efficacy and disease activity ($P<.01$), and these improvements are maintained at 1 year.[8]
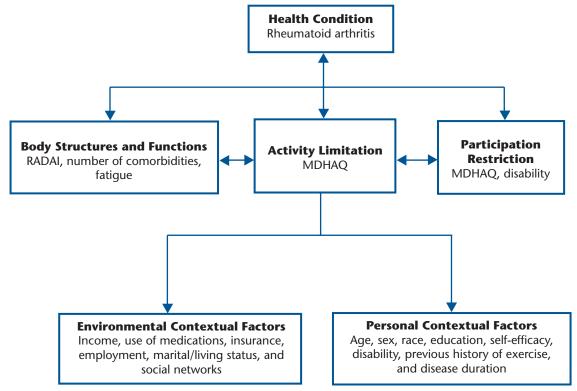
A number of studies have examined the use of physical therapy services for people with other musculoskeletal conditions such as low back pain and following joint arthroplasty surgery.[11-13] Previous studies of health service use by people with RA, however, have focused predominantly on examination of the social burden of illness,[14] health care costs, and use of medical visits. Two large-scale retrospective studies of health care utilization by people with RA suggest that medical office visits account for the majority of medical service visits and costs.[15,16] Khanna and Smith[15] reported that prescription claims accounted for 74.6% of the total cost of RA care and that the majority of these costs (54.1%) resulted from the use of biologic agents.

Although physical therapy has proven to be effective in managing the symptoms of RA[5,6] and is recommended in evidence-based guidelines,[10] previous data from North America and Europe indicate that services may be underutilized and that patients may have delayed access to therapy.[17-22] Among the limited number of studies of physical therapy utilization rates in people with RA, there was variability in the selection of primary outcomes, making direct comparisons difficult. For example, some studies focused on physician referral rates,[17-19] some studies focused on actual use of physical therapy,[20,22,23] and one study focused on patients' perceived need for therapy.[21] To understand physical therapy and occupational therapy referral patterns for people with RA, Li and Bombardier[19] surveyed 115 Ontario rheumatologists regarding their use of physical therapy and occupational therapy referrals. Of these rheumatologists, 30 (26.5%) referred patients for physical therapy and occupational therapy services. In the United States, Iversen et al[17] conducted a prospective study of 126 patients with RA (mean age=54 years) and their rheumatologists recruited from a large tertiary care hospital arthritis-based clinic in the Northeast and found that 26% of the patients were referred for physical therapy following a clinical visit with their rheumatologist.

In a large-scale retrospective study conducted in 2001 using a German national database of 12,992 patients with RA from 24 arthritis centers, approximately 44% of the patients received individual physical therapy sessions; 17% received group physical therapy sessions; and 18% received electrotherapeutic modalities.[20] Jacobi et al[23] reported similar rates of physical therapy use among a cohort of 725 Dutch patients with RA (mean age=59 years). In this large-scale cohort study, 40% of the patients reported use of physical therapy services during the preceding year. In this cohort, older adults with RA experienced greater issues with access to care compared with younger adults.

Among studies that examined patients' perceived need for and use of rehabilitation or physical therapy services,[18,21] there appear to be discrepancies between perceived need for and access to services. Martin
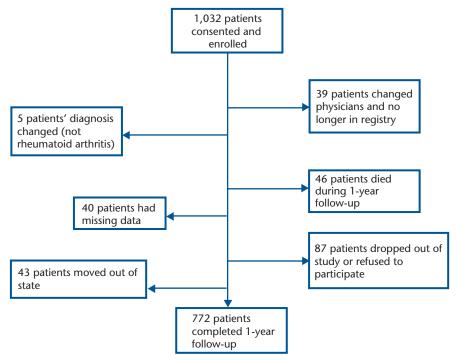
Figure 1.
Application of the *International Classification of Functioning, Disability and Health* to classify factors in patients with rheumatoid arthritis. RADAI=Rheumatoid Arthritis Disease Activity Index, MDHAQ=Multi-Dimensional Health Assessment Questionnaire.

et al[21] explored the perceived need for additional health services using a cross-sectional survey of 123 patients with RA aged 60 years and older who attended an outpatient rheumatology clinic in the United Kingdom. Among these patients, 22% reported unmet demands for physical therapy.[21] Similarly, Hagglund et al[18] conducted a cross-sectional survey of 409 American adults with osteoarthritis and rheumatoid arthritis to determine use of health services. Thirty-nine percent of the participants reported not obtaining needed rehabilitation services. The most common reason reported by the participants for not receiving rehabilitation services was lack of health insurance, followed by costs of care.

In sum, referrals for physical therapy services vary across countries, and access may differ across socioeco-nomic groups. Data also indicate that medical office visits account for the largest percentage of care received by patients. Few studies have examined factors associated with the use of physical therapy services among patients with RA. To quantify the impact of socioeconomic status on health care service utilization for people with RA, Jacobi et al[22] conducted a survey of 878 patients. The data indicated that patients with low socioeconomic status used fewer health care services compared with people with high socioeconomic status. Waltz,[24] in a study of health services use in patients with active RA, found fatigue was a strong predictor of physical therapy service use. These studies[17,21-25] have identified impairments and environmental factors as predictors of physical therapy service use. The majority of these studies were retrospective or cross-sectional in nature. One study[17] used a prospective design and a theoretical approach to identify predictors of exercise behaviors in patients with RA and the influence of clinical discussions with rheumatologist on exercise behaviors.

These limited data, coupled with the use of early aggressive medications to manage RA,[26,27] indicate the need for research to determine physical therapy resource allocation and factors associated with use of physical therapy services in people with RA. Thus, we conducted this study to identify biopsychosocial factors associated with the use of outpatient physical therapy services among people with RA. Health service models, such as Andersen and Newman's model,[28] have been used to describe social determinants of health care utilization. However, they have been criticized for a lack of focus on other contextual factors.[29] We used a ho-

Figure 2.
Description of recruitment and retention of patients with rheumatoid arthritis.

listic biopsychosocial model, the *International Classification of Functioning, Disability and Health* (ICF)[30] (Fig. 1), to assess factors related to physical therapy service utilization. This model was chosen because it allows examination of personal, environmental, and contextual factors, as well as impairments, activity limitations, and participation.[30,31] These factors have been studied in people with other musculoskeletal conditions[11–13,29] but have not been addressed previously in studies of physical therapy service use in people with RA. We hypothesized: (1) that physical therapy service use may be lower than previously reported due to advances in medical therapy and (2) that a theory-based approach to analysis would uncover new factors associated with outpatient physical therapy service utilization in people with RA. To address our aims, we recruited a large, well-characterized prospective cohort of patients with RA to describe physi-

cal therapy service use and to identify the attributes of patients who received physical therapy services.

Method
Design
We conducted a secondary data analysis of a large prospective cohort recruited from a registry of patients with RA. This registry is housed in an arthritis outpatient clinic of a large academic medical center in the United States. Data collected include clinical, laboratory chemistry, and health outcome data collected at standardized intervals. Patients complete standardized questionnaires and receive a physical examination by a rheumatologist at baseline and at 12 months. Confirmation of diagnosis was made using clinical data and ICD billing codes (716.9, 714.0, 720.0).[32] Informed consent was obtained from all patients.

The registry contained data for 1,032 patients. Of these 1,032 patients,

772 patients (75%) completed a 1-year follow-up survey, and 260 patients (25%) did not. Figure 2 provides the details on the patients from baseline to the 1-year follow-up.

Participants
Patients included in the registry are aged 18 years and over, are diagnosed with RA or sero-negative inflammatory arthritis, and meet the American College of Rheumatology criteria for RA.[33] Patients are excluded if they have been diagnosed with psoriasis or systemic lupus erythematosus or are younger than 18 years of age.

Measures
The primary outcome variable, assessed using a patient self-report questionnaire at 1-year follow-up, was use of physical therapy services in the previous 6 months (yes/no). Demographic data collected at baseline included: age, sex, education, race, employment, insurance,

income, and marital status. The duration of disease, use of RA medications, presence of comorbidities, and disability were assessed via questionnaires as a part of the medical history of these patients. At baseline, we used standardized outcome measures to assess patient domains such as general health and functional status, self-efficacy, disease activity, disease severity, mental health, and social networks.

Self-efficacy, which was defined as a person's confidence in his or her ability to manage RA, is a factor known to influence health behaviors.[34] Self-efficacy was assessed using the Arthritis Self-Efficacy Scale (ASE). The ASE consists of 3 subscales measuring pain, function, and other symptoms associated with arthritis such as fatigue, regulation of activity, and feeling "blue." Each question is scored on an interval scale, with scores varying from 10 ("very uncertain") to 100 ("very certain"). Subscales are scored separately by calculating the mean of the subscale items. If one fourth or less of the data are missing, the score is a mean of the completed data. If more than one fourth of the data are missing, no score is calculated. These subscales have a good to excellent internal reliability and test-retest reliability, with Cronbach alpha values varying from .76 to .89 and correlation coefficients (*r*) varying from .85 to .90.[35]

Each patient's social network, a factor known to influence morbidity and mortality in people with chronic disease,[36,37] was assessed using the Berkman-Syme Social Network Index (BSNI). The BSNI is a valid and reliable index that has 4 domains: marital status, nature of relationship with friends and relatives, church membership, and membership in other organizations and clubs.[36,37] The index score is based on both the quality and number of networks. The

final network score is reported as 4 levels (I–IV), with higher levels indicating stronger social networks.

Functional status was measured using the Multi-Dimensional Health Assessment Questionnaire (MDHAQ), the most common outcome measure used in people with RA and included in the ICF RA Core Sets for RA.[38] This questionnaire uses an ordinal scale varying from 0 ("completely independent") to 3 ("completely dependent– unable to perform").[39,40] This scale has good to excellent test-retest reliability (estimated kappa scores=.65–.81) and good internal consistency (Cronbach alpha=.66– .92).[40,41] The MDHAQ, a recognized quality-of-care indicator, also assesses pain and fatigue using visual analog scales (VASs) and includes items to assess disability in these patients.[40,41]

Disease activity was measured using the Rheumatoid Arthritis Disease Activity Index (RADAI), which is a self-administered questionnaire that has high correlation with joint synovitis and acute flares.[42] The total score is calculated as the mean of nonmissing items and varies from 0 to 10, with higher scores indicating greater disease activity. The standard classification of disease activity using the RADAI is: a change of 1.4 is clinically meaningful.[39,42] This measure has excellent reliability (*r*=.91) for group comparisons and excellent internal consistency (Cronbach alpha=.90).[42] This measure has been validated by correlating the scale with physician global assessment scores (*r*=.59, *P*<.0001), Health Assessment Questionnaire scores (*r*=.55, *P*<.0001), and the number of tender joints (*r*=.55, *P*<.0001), and it has been determined to be a valid measure of disease activity.[41]

Self-reported time since onset of symptoms was used to classify early versus established RA. This is a stan-

dard metric in rheumatology practice. *Early rheumatoid arthritis* was defined as onset of symptoms less than 2 years ago, and *established rheumatoid arthritis* was defined as onset of symptoms 2 years ago or longer.[43] Self-reported comorbidities and depression were assessed using a comorbidity checklist. Patients also indicated whether they had exercised in the past or had ever received physical therapy services (yes/no).

As fatigue is a highly prevalent symptom of RA and is likely associated with physical therapy service use,[24] we included a measure of fatigue in our study. Fatigue was assessed using a VAS for fatigue. The use of a VAS for fatigue is a reliable and valid technique. The VAS for fatigue has been found to correlate moderately with poor sleep (*r*=.6) and mood state (*r*=.4–.5).[44] Patients indicated their fatigue severity on a scale varying from 0 ("no fatigue") to 100 ("maximum fatigue").

Data Analysis

Descriptive statistics were used to characterize the sample and primary outcome variable. We used *t* tests and chi-square tests to examine potential differences between the patients who completed the 1-year follow-up survey (n=772) and those who did not (n=260). Continuous variables were categorized based on the distribution of the variables (age, fatigue),[45,46] by established clinical classifications (eg, RADAI, MDHAQ), or by established standards (education). Variables were organized by groups: impairments, activity and participation, environmental factors, and personal factors according to the ICF[30] and the ICF Core Sets for RA.[38] This process of sorting clinical and biopsychosocial variables associated with RA has recently been validated.[31] The *Body structures and function* group consisted of disease activity (RADAI), disease severity, number of comorbidities and

Table 1.
Comparison of Baseline Features of Patients With Rheumatoid Arthritis Who Responded to the 1-Year Follow-up Questionnaire on Use of Physical Therapy Services and Those Who Did Not Respond (N=1,032)

Baseline Measures[a]	No Response (n=260)	Response (n=772)	P
No. of female patients	208 (80%)	642 (83.2%)	.3
Marital/living status			.1
Never married	42 (16.1%)	102 (13.2%)	
Married	164 (63.1%)	498 (64.6%)	
Separated	3 (1.1%)	10 (1.3%)	
Divorced	15 (5.8%)	79 (10.3%)	
Widowed	34 (13.1%)	69 (9.0%)	
Significant other	2 (0.8%)	12 (1.6%)	
Some graduate school or completed graduate school	63 (25%)	200 (26%)	.5
Caucasians	251 (98.8%)	750 (97.6%)	.3
Income	(n=196)	(n=637)	.7
Under $10,000	12 (6.1%)	29 (4.5%)	
$10,000–$29,999	31 (15.8%)	84 (13.2%)	
$30,000–$49,999	35 (17.9%)	101 (15.8%)	
$50,000–$69,999	29 (14.8%)	103 (16.2%)	
$70,000–$89,999	26 (13.3%)	87 (13.7%)	
$90,000 or more	63 (32.1%)	233 (36.6%)	
Employment	111 (47.6%)	368 (50.8%)	.4
Had health insurance (n=668)	64 (98.5%)	593 (98.3%)	.9
On disability	25 (10.7%)	71 (9.8%)	.7
Rheumatoid arthritis diagnosis <2 y	63 (24.2%)	155 (20.1%)	.2
Age (y), $\overline{X}$ (SD)	56.2 (15.5)	56.3 (13.6)	.9
Disease activity (RADAI), $\overline{X}$ (SD)	3.74 (2.3)	3.47 (2.2)	.1
Depression, $\overline{X}$ (SD)	63 (24)	160 (20.7)	.2
Self-efficacy (ASE), $\overline{X}$ (SD)	70.0 (19.5)	72.5 (19.0)	.1
Fatigue (VAS), $\overline{X}$ (SD)	42.5 (29.1)	42.2 (28.8)	.9
Function (MDHAQ), $\overline{X}$ (SD)	0.63 (0.6)	0.62 (0.5)	.1

[a] RADAI=Rheumatoid Arthritis Disease Activity Index, ASE=Arthritis Self-Efficacy Scale, VAS=visual analog scale, MDHAQ=Multi-Dimensional Health Assessment Questionnaire.

self-reported fatigue. The activity limitation and participation restriction group included the MDHAQ. Personal contextual factors were demographic features such as age, sex, race, disease duration, education, self-efficacy, being on disability, previous history of exercise, and presence of depression. Environmental contextual factors consisted of home income, medication use, insurance, employment, marital status or living arrangement, and social networks (Fig. 1).

Next, bivariate comparisons were used to determine the relationship between each independent variable in the domain and the outcome variable use of physical therapy services (yes/no). A staged approach to regression modeling, which is a form of path analysis,[47] was used to allow for the examination of significant variables within each ICF domain,[30] allowing like variables to be entered into the model in groups to determine which were the strongest predictors in each domain.

Next, the significant factors from each domain were entered into the regression model. Selection of final variables in the regression model was based on 3 factors: the effect of variables on parameter estimates, the influence on C statistic,[48] and 95% confidence interval (CI) for each variable. The final model was confirmed with forward and backward

regression. This method was used to develop a parsimonious set of predictors.

Results

There were no detectable differences in the baseline characteristics of patients who completed the 1-year follow-up survey and those who did not complete the survey (Tab. 1). Of the 772 patients who completed the 1-year follow-up survey, the majority were Caucasian (97.6%), female (83.2%), and married (64.7%) and had a mean age of 56.3 years (SD=13.6). Half of the sample was employed, and 36.6% had an annual income of $90,000 or more. The study participants were well educated. Two hundred patients (26%) had attended graduate school or had completed their graduate education. The majority of the patients had established RA, and 654 patients (84.7%) did not use physical therapy services (Tab. 2). Of 118 patients (15.3%) who used physical therapy services, the majority had 1 to 8 physical therapy visits or more than 21 physical therapy visits (Tab. 2).

Among the 772 participants, 354 patients (45.8%) had mildly active disease, 23.8% had moderately active disease, and 30.3% had highly active RA. Patients reported high self-efficacy for managing their arthritis (median ASE score=72, range=10–100). Twenty-five percent of the patients had difficulties performing functional activities (median MDHAQ score=0.65, range=0–3). Less than a third of the patients reported no prior participation in exercise; 43.5% of these patients performed some kind of stretching exercise, and 27.1% performed exercises on a regular basis. Based on the BSNI, 100 patients (14.9%) had low social networks, 286 (42.6%) had modest social networks, 148 (22.0%) had strong social networks, and 138 (20.5%) had very strong social networks. Seventy-one patients (9.8%)

Table 2.

Use of Physical Therapy Services by Patients With Rheumatoid Arthritis in the Registry at 1-Year Follow-up (n=772)

No. of Physical Therapy Visits	No. of Patients (%)
No physical therapy service use	654 (84.7%)
1–4 visits	33 (4.3%)
5–8 visits	23 (3.0%)
9–12 visits	19 (2.4%)
13–16 visits	10 (1.3%)
17–20 visits	6 (0.8%)
≥21 visits	27 (3.5%)

reported being on disability. Approximately 21% of the sample reported depression. Patients reported a moderate amount of fatigue (Tab. 1).

Table 3 illustrates the distribution of variables across patients who reported use of physical therapy services on the 1-year follow-up survey (use of physical therapy services in the previous 6 months [yes/no]) and those who did not. Table 4 presents the bivariate relationships between the variables and the primary outcome measure (physical therapy service use in the previous 6 months [yes/no]). From this table, factors such as income, disease activity, social networks, education, and so on were significantly associated with physical therapy service use. Factors were entered into the model as groupings of variables based on the ICF theoretical framework, and significant predictors within each domain were identified. In the body structures and function domain, these factors were disease activity (mild versus moderate and highly active disease, as assessed with the RADAI) and comorbidities (categorized as none, 1-2, or more than 3 comorbidities). For the outcome measure MDHAQ from the activity and participation domains (combined as in Stucki and colleagues' ICF Core Sets for RA[38]), the significant predictor was categorized as none or somewhat disabled versus moderate to severe disability. Factors

significant in the contextual domains were income (high versus moderate to low), social networks (high versus moderate or few), being on disability (yes/no), and education (less than college graduate versus college graduate or more).

Using multivariable logistic regression, our final additive model included 691 participants (89.5%). Upon examination, missing data for the independent variables did not follow a specific pattern, and thus we did not impute missing values. The most significant predictor among body structures and function was disease activity, measured using the RADAI (odds ratio [OR]=1.4, 95% confidence interval [CI]=1.1–1.8). Among activity limitation and participation restriction, the MDHAQ scores did not reach significance. Among the contextual factors, education (less than college education versus college graduate or more) (OR=0.5, 95% CI=0.2–0.8), social networks (OR=2.1, 95% CI=1.3-3.5), and being on disability (OR=2.4, 95% CI=1.3–4.6) were the most significant factors predicting use of physical therapy services in the previous 6 months. This model was able to correctly predict the outcome, use of physical therapy services, 69% of the time (C statistic=0.69)[43] (Tab. 5).

Table 3.
Comparison of Baseline Features Between Patients Who Received Physical Therapy and Those Who Did Not Receive Physical Therapy (n=772)

Variable[a]	Received Physical Therapy (n=118)	Did Not Receive Physical Therapy (n=654)	P
Female	100 (85%)	542 (83%)	.6
Married	73 (62%)	437 (67%)	.3
College graduate or graduate education	62 (52%)	243 (37%)	.01
Caucasian	114 (97%)	636 (98%)	.9
Income (n=637)			.006
$10,000–$29,999	17 (18%)	96 (18%)	
$30,000–$59,999	18 (19%)	83 (15%)	
$60,000–$69,999	25 (27%)	78 (14%)	
$70,000 or more	34 (36%)	286 (53%)	
Employment	111 (48%)	368 (51%)	.4
Had health insurance (n=585)	86 (97%)	507 (99%)	.2
On disability (n=769)	21 (18%)	55 (8.5%)	.001
Used DMARDs, biologics, or steroids	112 (95%)	595 (91%)	.2
Previous history of exercise	71 (60%)	404 (62%)	.4
Rheumatoid arthritis diagnosis <2 y	19 (16%)	136 (21%)	.2
Low social networks	12 (11%)	99 (16%)	.05
Age (y), $\overline{X}$ (SD)	57 (13)	56 (14)	.5
Disease activity (RADAI), $\overline{X}$ (SD)	4.1 (2.3)	3.3 (2.2)	.005
No. of comorbidities, $\overline{X}$ (SD)	1.3 (1.3)	1.05 (1.2)	.03
Depression, $\overline{X}$ (SD)	46 (27)	41.3 (29)	.08
Self-efficacy (ASE), $\overline{X}$ (SD)	69.8 (19.6)	72.7 (18.8)	.1
Fatigue (VAS), $\overline{X}$ (SD)	46.5 (41.5)	41.4 (39)	.08
Function (MDHAQ), $\overline{X}$ (SD)	0.78 (0.55)	0.60 (0.50)	.0009

[a] DMARDs=disease-modifying antirheumatic agents, RADAI=Rheumatoid Arthritis Disease Activity Index, ASE=Arthritis Self-Efficacy Scale, VAS=visual analog scale, MDHAQ=Multi-Dimensional Health Assessment Questionnaire.

Discussion and Conclusion

This study aimed to describe physical therapy service use among people with RA and to identify predictors of physical therapy service use in people with RA at a 1-year follow-up. In this sample, 15.7% of the patients reported use of physical therapy services in the previous 6 months, assessed at 1-year follow-up. This percentage is slightly lower than previously published rates of physical therapy service use, ranging from 40% to 44%.[20,23] These observed rates of physical therapy service use may be attributable to many factors, including different time frames used for assessment of the outcome and variability in disease activity level in the samples. In our study, use of physical therapy services was assessed for a 6-month period rather than a full year, which may account for some of the differences in physical therapy service use. With respect to the influence of disease activity on the use of physical therapy services, levels of disease activity in our cohort were not very different from disease activity levels reported in other published studies.[19,49] A third potential factor influencing physical therapy service use in this cohort was the change in approach to the management of RA. Data on physical therapy service use in people with RA were reported in studies published in 2001.[20,23] Over the past decade, with the advent of biologics, the approach to management of RA has shifted to early, aggressive pharmacotherapy.[26] This shift to an emphasis on aggressive medical management and use of biologics may lead to changes in physical therapy referral rates, as biologics have a shorter latency period to effectiveness than more conservative RA medications. This supposition cannot be supported with the data from the present study; however, it

Table 4.
Bivariate Relationships Between Baseline Features of Patients With Rheumatoid Arthritis and the Primary Outcome Variable (ie, Use of Physical Therapy Services) (n=772)

Predictor[a]	Odds Ratio	95% Confidence Interval
Age (<60 vs ≥60 y)	1.0	0.7–1.6
Female	1.2	0.7–2.0
Less than college education	0.5	0.3–0.8
Caucasian	1.1	0.3–3.1
Income >$70,000*	2.0	1.2–3.1
On disability*	2.4	1.4–4.3
Had health insurance	1.5	1.0–2.3
Previous history of exercise*	1.8	1.1–3.0
Married or living with partner	1.2	0.8–1.8
Established rheumatoid arthritis (diagnosis >2 y)	1.4	0.8–1.9
Moderate to high disease activity (RADAI)*	1.4	1.1–1.9
On DMARDs, biologics, or steroids	1.9	0.8–4.4
Function (MDHAQ)*	1.8	1.2–2.7
Moderate fatigue (VAS)	1.15	0.98–1.4
Self-efficacy (ASE)	0.9	0.8–1.1
No. of comorbidities*	1.2	1.03–1.4
Social networks (BSNI)*	1.3	1.02–1.6

[a] RADAI=Rheumatoid Arthritis Disease Activity Index, DMARDs=disease-modifying antirheumatic agents, MDHAQ=Multi-Dimensional Health Assessment Questionnaire, VAS=visual analog scale, ASE=Arthritis Self-Efficacy Scale, BSNI=Berkman-Syme Social Network Index. Asterisk indicates significant factor.

is an interesting potential factor and warrants further study.

To help inform the process of identifying predictors of physical therapy service use in people with RA, we used a biopsychosocial model, the ICF, to guide our analysis and classified our variables based on the ICF Core Sets for RA.[38] Our results indicate that patients with more active disease were 48% more likely to use

physical therapy services than those with mild disease. High RA disease activity has been significantly correlated with greater perceived need for physical therapy services.[21] We also found that patients who were on disability and those with strong social networks were 2 times more likely to use physical therapy services. Individuals who had less than college education were less likely to use physical therapy services than those

who were college graduates or who had attended graduate school. This model correctly predicted use of physical therapy services 69% of the time in our cohort.

Consistent with the epidemiology of RA, 83% of our patients were female, limiting our ability to assess gender differences in physical therapy use. One quarter of the patients had completed graduate education, the

Table 5.
Predictors of Physical Therapy Service Use Among Patients With Rheumatoid Arthritis (n=691)[a]

Predictor	Odds Ratio	95% Confidence Interval
Body structures and function		
Disease activity (moderate to high activity)[b]	1.4	1.1–1.8
Contextual factors		
Less than college education	0.5	0.2–0.8
On disability	2.4	1.3–4.6
Social support	2.1	1.3–3.5

[a] The model was able to correctly predict the outcome, use of physical therapy services, 69% of the time (C statistic=0.69).
[b] Disease activity was measured using the Rheumatoid Arthritis Disease Activity Index.

majority had health insurance, and more than 50% belonged to the high income group ($70,000–$90,000 annually). The homogeneity of our sample may explain the lack of significance of contextual factors such as demographic features and other socioeconomic variables (eg, income), in contrast to prior reports of physical therapy utilization, which included samples of more socioeconomically diverse patients.[23,50] For example, Hagglund et al[18] identified lack of insurance and health care costs as deterrents to use of physical therapy services. In our sample, insurance status did not appear to affect service use, but this finding may have been due to the fact that income and insurance are closely associated.

Patients on disability were significantly more likely to use physical therapy services. These individuals were likely to report lower MDHAQ function scores and have more severe disease or more active disease, leading to chronic pain and disability and, in turn, increasing physical therapy service use.[24] Although fatigue is a common complaint among people with RA, particularly during active flares, and has been shown to predict physical therapy service use,[24] we did not identify fatigue as a significant predictor in our model after adjusting for other factors. One possible explanation for the lack of significance of fatigue may relate to the method used to measure fatigue. In our study, we used a single VAS, whereas Waltz[24] assessed fatigue using 2 multidimensional scales: the Composite Index of Fatigue Impairment and the Nottingham Health Profile. Therefore, our measure may have been too crude to discriminate all aspects of fatigue associated with the use of physical therapy services. Another possible explanation relates to the level of fatigue reported by patients. In our sample, patients did not report high levels of fatigue. We believe fatigue may still be an important factor affecting the use of physical therapy services.

Social support and social networks have been shown to affect health outcomes. Berkman[37] showed that people who are socially isolated are more likely to use fewer health services compared with those with strong social networks. Lower levels of social support also have been shown to increase disease activity at a 3-year follow-up in patients with RA.[51] We found stronger social networks were predictive of physical therapy service use among our sample of well-educated individuals who had moderate to high family incomes and the majority of whom had health insurance. A possible explanation for the influence of social networks on the use of physical therapy services is that social networks may provide patients with information and advice about health care alternatives during the course of the disease. Another explanation may be that social networks may motivate patients to seek physical therapy services to manage their disease.[36,37] Thus, we recommend that health care professionals assess their clients' social networks (friends, community connections, and family) and encourage patients to engage their social connections to provide support for exercise and adherence to therapy.

In this sample, patients reported high self-efficacy for managing their disease. This attribute was not measured in earlier studies of service use.[23,24] As self-efficacy influences health behavior,[52] we included this variable in our multivariable model. In our final model, self-efficacy was not a significant predictor. One possible explanation for the lack of significance of this attribute may be the presence of external factors, such as patients' social networks, that may influence their perceptions of their ability to manage their health condition. For example, a patient may be less confident in his or her ability to manage arthritis; however, this lack of self-efficacy may be buffered by the motivating and positive reinforcement provided by strong social networks.

We recognize that our study has limitations. First, as with all convenience samples, our results cannot be generalized to all patients with RA. Our sample was not racially or highly socioeconomically diverse. However, from a social perspective, it is important to understand health service use by all subgroups, including people with relatively high income and who, for the most part, have health insurance. Second, there is the potential for misclassification bias regarding physical therapy service use, as we may not have captured all patients using physical therapy services. This misclassification is likely random, as this was not the primary aim of the original cohort. Third, although the study captured information about many known attributes of patients with RA, we were unable to capture information about all known attributes that might have influenced physical therapy utilization. Finally, our final multivariable model represented 691 patients (89.5% of the sample). Missing data on visual inspection did not follow a pattern and thus should not have influenced the results in any biased manner.

The strengths of our study include: the use of a theory-based approach to examining health services use; the implementation of a combination of demographic, health, and psychological factors and clinical measures to identify predictors of physical therapy service use; no observable differences between those patients who did not complete the 1-year follow-up questionnaire on service use and those who did complete the survey; well-validated and reliable measures; and the use of a large

prospective sample to guide the analysis.

This study highlights the influence of social networks on use of physical therapy services. This factor has not been studied in earlier reports of physical therapy utilization, although it has been reported as associated with use of other health services such as medical care for diabetes and other chronic illnesses. Thus, we recommend providers consider the impact of the quality and number of social networks a patient has when recommending health services. This information may be informative for both physical therapists and patients.

We propose a follow-up qualitative study designed to more fully explore factors influencing physical therapy service use in people with RA to confirm assumptions about the interplay of social, environmental, personal, and biological factors on physical therapy service use. Using these data, we can educate primary care physicians and rheumatologists about specific guidelines for referring patients for physical therapy services and counseling patients about the benefits of physical therapy for management of RA.

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