Factors Associated with Continued Employment Among Patients with Rheumatoid Arthritis: A Survival Model

SUSAN REISINE, JUDITH FIFIELD, STEPHEN J. WALSH, and RICHARD FEINN

ABSTRACT. ***Objective.*** To evaluate the association of demographic, disease, workplace, social, and household factors with the ability of patients with rheumatoid arthritis (RA) to remain employed over time.

Methods. Four hundred seventy-two employed patients with RA recruited from a national sample of rheumatology practices were followed. Patients were interviewed once a year by telephone for 9 years and patients' physicians provided data on clinical aspects such as disease stage, joint deformity, and flares. A proportional hazards survival model based on stepwise variable selection was developed to investigate the association between continuance of work over a 9 year period and demographic, work, attitudinal, disease, and social support variables.

Results. In the univariate analysis, the significant factors associated with longer work survival were being younger, being self-employed, having a higher prestige occupation, working more hours per week, having higher education level, and missing fewer days of work during the baseline year. The final multivariate model included age, type of occupation and number of days missed from work as a time varying co-variate.

Conclusion. Ability to remain employed over the 9 year study was more strongly associated with age, work characteristics, and time lost from work than with disease factors. The underlying mechanisms related to occupational prestige as a predictor of work survival should be investigated in order to develop interventions to reduce the risk of work disability. (J Rheumatol 2001;28:2400–8)

Key Indexing Terms:
ARTHRITIS WORK DISABILITY

Patients with rheumatoid arthritis (RA) typically have a high rate of work disability, with more than 50% of employed individuals diagnosed with RA leaving the workforce within 10 years[1-4]. The consequences of the disease on work status are felt even in the early stages of RA, as one study reports that 20% of employed individuals leave work or retire within 2 years of diagnosis[5]. RA also affects worker productivity. Van Jaarsveld and colleagues[6] report an average reduction of 21 hours per week for patients with early stage RA who reported that RA affected their working capabilities. The associated costs of musculoskeletal conditions are high. In the United States in 1995[7] more than $215 billion was spent on these conditions, with 59% attributable to indirect costs resulting from lost productivity. Among just arthritis patients, the cost was $82.4 billion, with 74% of that from indirect costs. These data illustrate the large economic impact of RA on society, particularly in terms of work disability.

Along with the economic impact, work disability among RA patients is associated with poorer physical and psychological well being[8,9]. Unemployed people with RA report lower self-esteem[10], higher pain, and higher depression than those who are employed[8]. RA patients who work fulltime (over 35 hours per week) report fewer functional limitations[8,11-13], less pain, and less joint involvement than those who work fewer hours[13].

Many people with RA would like to work, but are unable to, not only because of the severity of their disease, but because of conditions in the workplace. Work conditions that present problems to RA patients include inflexible hours, limited work autonomy or control over the pace of work, difficulty climbing stairs at work, standing, and having to lift heavy materials or manipulate controls or objects on the job[3,14,15]. Other problems involve difficulty driving or taking public transportation[16]. Personal characteristics such as being older[17,18], having a lower level of educa-

From the Department of Behavioral Sciences and Community Health, University of Connecticut School of Dental Medicine, and the Departments of Family Medicine and Community Medicine and Health Care, University of Connecticut School of Medicine, Farmington, Connecticut, USA.

Supported by the University of Connecticut Multipurpose Arthritis and Musculoskeletal Disease Center grant AR20621 and the National Arthritis Foundation Clinical Sciences Grant.

S. Reisine, PhD, Professor, Department of Behavioral Science and Community Health; J. Fifield, PhD, Associate Professor, Department of Family Medicine; S. Walsh, ScD, Assistant Professor, Department of Community Medicine and Health Care; R. Feinn, MA, Research Assistant III, Department of Behavioral Sciences and Community Health.

Address reprint requests to Dr. S. Reisine, University of Connecticut School of Dental Medicine, Department of Behavioral Sciences and Community Health — MC3910, 263 Farmington Avenue, Farmington, CT 06030. E-mail: Reisine@nso1.uchc.edu

Submitted January 25, 2001; revision accepted May 31, 2001.

tion[16,18-24], and having lower motivation to work[16,20] are all associated with the inability of RA patients to remain in the paid workforce. Disease characteristics and severity seem to be less important as predictors of work disability, but one study shows that number of deformed joints and number of joint groups that flare each year also predict work disability[20].

The literature reveals that a number of disease, workplace, and personal characteristics all contribute to work disability among patients with RA. However, many of these findings come from studies that were cross-sectional in design or that followed patients for a short period of time. Our study was designed to investigate, over a longer time period, the factors that contribute to the ability to remain employed among individuals with RA. Patients in the sample were followed for 9 years and their work history was documented to assess the workplace characteristics, personal characteristics, and disease factors that contribute to their ability to remain in, or need to drop out of the paid workforce.

Based on the results of previous studies, we expected that the following demographic, disease and work characteristics, attitudes, and family factors would influence ability to remain employed — being younger, having a higher education level, lower pain, fewer deformed joints, and a lower number of joint groups that flared would predict work survival. In addition, work characteristics such as high autonomy, high occupational prestige, supervision of others, and little physical labor required on the job would predict survival. Wanting to work, liking work, having few problems with family role functions due to arthritis, and having greater social support were also expected to predict work survival.

MATERIALS AND METHODS

Patient recruitment. The patients were part of the National Rheumatoid Arthritis Study, a prospective 10 year study that followed participants from 1988 through 1997. Patients were recruited through rheumatology practices randomly selected from the list of American College of Rheumatology (ACR) members in 1987. Physicians were contacted by mail and by telephone. Fifty-six physicians (48% of those contacted) agreed to participate. Participating offices offered patients with a diagnosis of definite or classical RA, according to the ACR criteria[26], the opportunity to learn more about the study. Interested patients completed a response card that was returned to the study coordinators by the physician's office.

Patients were contacted by telephone and asked if they would be willing to be interviewed over the telephone, and also if they would be willing to have their physicians submit medical information from their charts. The initial interview was a structured questionnaire consisting of over 100 items related to self-reported health status, employment status, work characteristics, family role responsibilities, mood, and social support. Followup interviews were done once each year, and were similar to the structured questionnaire used the first year. For the first 3 years, physicians completed forms assessing the patient's stage of disease progression, disease activity, joint deformities, and number of flares. This information was based on information from the office visit closest to the time of the patient telephone interview.

Sample. A total of 1049 patients indicated interest in the study, and 988 (94%) agreed to participate. Of those agreeing to participate, 497 patients were employed at entry into the study, the other 491 participants were not employed at baseline. Of the 497 participants employed at baseline, 260 (52%) remained in the study and completed interviews for 9 years. Fifty-eight percent, or 150, of the remaining 260 participants stopped working during the study. For the survival analysis, 25 participants had missing data and could not be used in the multivariate statistical analysis. Therefore, data on 472 participants were used in the survival analysis as this analytical technique, described below, takes advantage of censored cases, that is, those who leave the study.

Demographic characteristics. The structured questionnaire asked patients about their age, sex, marital status, education level, income, and race. Age was calculated in years based on the date of birth. For the purposes of the survival analysis (see below for a description of the survival analysis method) age was categorized as (1) < 55 years, (2) 55 to 64, and (3) ≥ 65. Marital status was coded as (1) married or living together vs (2) not married (single, separated, divorced, or widowed). Age was treated as a time-varying covariate in the Cox regression analysis.

Respondents were asked how many years of education they had completed and then education was coded as (1) < 12 years, (2) 12 years, (3) 13–16 years, and (4) > 16 years. Income was categorized as (1) < $10,000, (2) 10,000 to 19,999, (3) 20,000 to 29,999, (4) 30,000 to 49,999, and (5) ≥ 50,000. For the survival analysis income was recoded into 4 categories by quartiles, (1) < $20,000, (2) 20,000 to 29,999, (3) 30,000 to 49,999, and (4) ≥ 50,000. Because the sample was predominantly white (92%), race/ethnic background was not included in the analysis. Baseline demographic characteristics were used in the analyses.

Self-reported disease characteristics. Self-reported health status was measured by asking the patients to report on a scale of 0 (none) to 100 (the most pain possible), how much arthritis pain they had during the last week[25]. Pain was then categorized as (1) 0 to 10, (2) 11 to 30, (3) 31 to 50, and (4) 51 and above, based on dividing the sample into quartiles. Level of self-reported pain was used as a time-varying covariate in the Cox regression analysis such that the effects of pain were assessed each year on the probability of leaving the workforce. Patients were also asked how long ago they were diagnosed with RA to determine disease duration. Duration was split into (1) 0 to 4 years, (2) 5 to 9 years, and (3) ≥ 10 years and also was treated as time-varying for the regression analysis. Finally, patients reported how many days in the past 2 weeks they had missed work because of RA. In the univariate analysis, the number of days missed from work in the baseline year was used. This variable also was a time-varying covariate in the Cox regression analysis such that the effects of days lost from work were assessed each year on the probability of leaving the work force. The variable was dichotomized as "no days missed from work" and "one or more days missed" for both the univariate and multivariate analyses.

Clinical health status. Clinical health status was measured using 3 variables from the clinical assessment form completed by the patient's physician. The first variable, joint deformity, was evaluated by the presence or absence of joint deformities in the wrist/hands, knees, ankles/feet, elbows, or other joints. The separate measures from those 5 areas were combined to form a composite measure of joint deformity ranging from 0 (no areas) to 5 (all areas). For the second variable, physicians reported which of the 5 categories of joints had flared within the past year. The number of categories was summed for a total of 0 to 5 areas that flared in the past year. The third variable physicians reported was disease severity based on the ACR criteria[26], in which radiographic disease progression is categorized into 4 stages, with a higher stage number indicating a more severe stage of RA.

Work characteristics. Structural work characteristics of occupational prestige, control over the pace and activity of work, and the number of hours worked per week were used. Occupational prestige was assessed by assigning the Hollingshead Occupational Prestige Score[27] to paid jobs held by the participants. The 7 prestige rankings ranged from high prestige executive positions (1) to low prestige unskilled occupations (7). These

were later modified into 3 categories for the survival analysis. Management consisted of (1) executive and (2) manager; white collar consisted of (3) administrator and (4) clerical, sales, and technicians; and blue collar consisted of (5) skilled manual, (6) machine operator and semiskilled, and (7) unskilled. Very few individuals changed jobs, and those who did change did not change the type of work and remained in the same occupational prestige category. Participants also were asked to rate how physically demanding the work on the job was on a 3 point scale: (1) mostly mental; (2) part physical, part mental; (3) mostly physical.

Schedule autonomy. Control over the pace of work was measured by asking participants if they could take a break, come in late, leave early to visit the doctor, take a day off, or take a week off, (1) without permission, (2) with permission, or (3) if they could not do it at all. Responses for each item were added to construct a measure of overall autonomy, with lower numbers indicating greater autonomy (Cronbach's[28] alpha = 0.81). This scale was based on the work of Yelin, *et al*[4]. The scores on this scale were dichotomized for the analysis: those having a score > 2 were categorized as having low autonomy and those with a score ≤ 2 were considered to have high schedule autonomy. Hours worked each week were divided into 2 categories: working < 30 hours or ≥ 30 hours per week.

Work attitude. Work attitude was evaluated by asking the participants to report their desire for work and enjoyment of work. Desire for work was measured by asking: If you could do anything you wanted, would you rather be employed fulltime, work part-time, or be at home? How much a person liked work was measured on a 4 point scale of (1) a great deal, (2) moderate amount, (3) some, and (4) not at all. However, because of the scarcity of cases for response 4, the last 2 choices were collapsed for the survival analysis.

Instrumental impact. Family role impact was assessed by asking the participants to report the extent to which arthritis had an effect on 6 instrumental functions: cooking, cleaning, shopping, finances, auto maintenance, and yard work[29]. The 6 functions were measured on a scale of (1) a lot, (2) some, and (3) not at all, but the scale was later reversed so that a higher score meant greater effect. Reliability using Chronbach's alpha[29] for the instrumental impact scale ranged from 0.72 to 0.85 over the 9 years it was administered.

Social support. Social support was evaluated by the Qualitative Social Support Scale[30], designed to measure how supportive the social network is perceived to be. It contains 20 Likert-type items scored on a scale of 0 (never true) to 3 (always true) asking about perceptions of social support received by important others, such as feedback, task assistance, and ego support. Four items assessed relationship strain (e.g., the extent to which a relationship is stressful) and were reverse scored (Chronbach's alpha = 0.83).

Baseline measures of all work characteristics, family work, and social support were used in the analyses.

Work survival. Work survival, the dependent variable, was a categorical variable obtained by asking participants if they were employed outside the home. Participants were asked: Are you currently working for pay outside the home? For each year, this answer was compared to their previous answer to determine what year each person stopped working for pay. The number of people who worked continuously and the number who stopped working in each year were calculated.

Data analysis. Because this was a longitudinal study, participants could stop working during the study or could remain in the workforce until the conclusion of the study. In addition, some members of the sample did not remain in the study over the entire 9 year period. Survival analysis was chosen to identify factors predictive of stopping work because it incorporates a dependent variable (stopping work), adjusts for time (year that work cessation occurred), and permits the incorporation of censored cases (persons who do not stop work during the observation period as well as those who drop out of the study in the interim).

Survival analysis was conducted using proportional hazards regression[31]. Initially, univariate regressions were performed based on work survival as the dependent variable and each of the demographic, disease, workplace, social, and household factors individually as the independent variable. Hazard and log-minus-log plots were used to establish that the proportional hazards assumption was met.

Multivariate proportional hazards regression was used to build a model that incorporated predictive factors that best explained work stoppage. The model building strategy involved a mixed backward and forward stepwise approach. Initially, all independent variables were entered together in the regression equation. Variables that were not statistically significant ($p \geq 0.05$) were sequentially eliminated starting with the variable with the largest nonsignificant p value. When only statistically significant independent variables remained in the model, each variable that had been eliminated was added, one at a time, to see if the best model from backwards selection now permitted their inclusion.

RESULTS

Sample attrition. The initial sample consisted of 497 employed participants. The overall attrition rate of the study for those who were employed in the first year was 48% (237/497) or about 5% per year, a relatively good annual rate of retention. Analysis of differences between those who remained in the study (n = 260) and those who dropped out (n = 237) showed few significant differences between the groups. Compared to those remaining in the study (n = 260), those who dropped out (n = 237) had significantly more deformed joints, fewer family influences, unskilled occupations, more physically demanding work, and were more likely to be male. The sample for the survival analysis consisted of 472 participants for whom we had complete data at baseline as survival analysis takes advantage of using censored cases.

Univariate analysis. Figure 1 depicts the Kaplan-Meier survival curve (i.e., the rate of continuous employment versus time) among individuals who were employed at the study baseline. As can be seen, there was a relatively consistent decline in work survival over time from year 1 to year 9. The survival estimate at year 9 is 32.4% (standard error of the estimate = 0.023). This estimate reflects censoring that

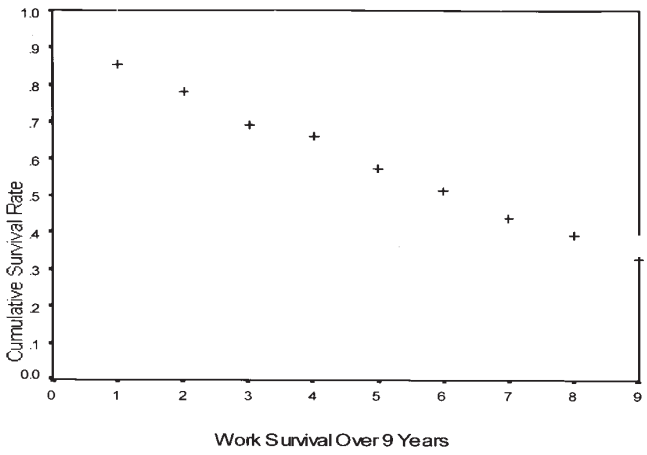

Figure 1. Kaplan-Meier work survival curve of the individuals who were employed at baseline.

occurred both through loss to followup (i.e., deaths and dropouts) and through continued employment of 110 subjects at the end of the 9 year observation period. These 110 subjects constituted 22% of the original 497 employed subjects and 42% of the 260 subjects who were still in the study during the ninth year.

Table 1 presents the descriptive characteristics of the total sample (n = 497) and the univariate Cox regression analysis of these characteristics and work survival. The hazard ratios for each variable are reported with 95% confidence intervals.

Most of the sample is less than age 55 at the midpoint of the study, mostly female, married, highly educated, and relatively affluent, with more than a quarter of the sample having a family income over $50,000 in 1988. Members of the sample report moderate pain, with more than half rating their pain between 11 and 30 on a 100 point scale; most have been recently diagnosed, 39% having a disease duration of 5 years or less. Most are in radiographic Stage I or II and 36.9% have no deformed joints at entry into the study.

Regarding work characteristics, the participants tend to have relatively high prestige occupations, 51.4% with white collar jobs and 25.6% having management jobs. Most have considerable work autonomy (57.9% high), like their work (62.2%), and report no days missed from work (87.3%). Most work more than 30 hours (78.2%), are employed by others (85.2%), do not have mostly physical work (8%), and supervise others (53.1%). There appears to be a relatively even split between those who want to work fulltime (47.1%) or part-time (52.3%). Participants report relatively strong social support systems, with more that 75% having scores > 56 on an 80 point scale; 20.9% have scores between 70 and 80, the maximum score. Participants also report high effects on family work, with 72.1% of respondents stating that arthritis has affected their ability to perform family work; 37.6% indicate considerable effects, with scores of 5–12 on this scale.

The results of the univariate Cox regression shows that of the demographic characteristics, age and education have a significant effect on remaining in the workforce: those who are younger and those with more education are more likely to remain employed compared to older and less educated participants. The hazards ratios for age indicate that risk of leaving the workforce increases substantially with age, as those 65 and over are 2.5 (95% CI 1.51–4.16) times more likely to stop working than those < 55 years of age. For health status, neither pain nor any of the clinical disease factors reported by physicians was significantly related to remaining employed; not missing time from work at baseline was significantly related to staying employed (hazards ratio = 1.46; 95% CI 1.1–2.0).

Several workplace characteristics were significantly related to staying employed: those with higher occupational prestige, those who worked > 30 hours per week, those who were self-employed, and those who had less physically demanding work were more likely to remained employed compared to those with lower occupational prestige, working < 30 hours, not being self-employed, and having more physically demanding work. None of the work attitudes or social support and family effect factors significantly influenced work survival.

Table 2 presents the results of the multivariate Cox hazards regression analysis for the demographic, self-reported health status, workplace characteristics, work attitudes, social support, and family effect variables. Because of a high rate of missing data on the physician reported clinical disease variables (> 10%) that precluded most methods of data substitution and because these variables were not significantly related to work status in the univariate Cox analysis, they were excluded in the multivariate regression analysis. The final model, as displayed in Table 2, consists of the independent variables age, time missed from work, and occupational prestige. This model is highly significant in explaining work status; chi-square = 35.49, $p < 0.0001$. Again, those who were younger, missed fewer days from work, and had a high prestige occupation were more likely to remain employed. The hazard ratios for each significant variable shown in Table 2 are the relative risks of work survival contrasted to a comparison group. RA patients ≥ 65 years old are 2.39 times more likely to stop working than patients under 55 years of age. Those who have missed one or more day from work because of RA are 1.42 times more likely to leave the workforce. Those with a blue collar job are 1.65 times more likely to become unemployed compared to those with a management job.

Figures 2A-C illustrate the survival curves for the 3 significant variables in the final regression model, age, occupation, and days missed from work. Figure 2A depicts the curve for age, which represents the age of an individual at the midpoint of the study. Participants who were 65 or over by the midpoint of the study have a fairly rapid rate of work disability in the early years that continues, but moderates over time. Those who were 55–64 at this point are more similar to the youngest age group, but left the labor force more rapidly towards the end of the study and approached the rate of those over 65. The youngest age group, under 55, had the lowest rate, which was fairly constant over the 9 years.

Figure 2B illustrates work survival by occupation. Management workers had a higher rate of work survival compared to white collar and blue collar workers. Blue collar workers seemed to be at greater disadvantage in the later years of the study compared to white collar workers. Finally, missing time from work, particularly in the early years of the study as shown in Figure 2C, increased the likelihood of leaving the paid workforce compared to having no days of missed work.

Table 1. Frequency distributions of demographic, health status, workplace, social support, and family effect characteristics and the univariate Cox regression analysis of these characteristics and work survival (n = 497).

Variable	%	Univariate Hazards Ratio	95% CI
Demographic characteristics			
Age at Year 5 of study			
Less than 55	52.2	Comparison group	
55 to 64	36.4	1.71***	1.31–2.20
65 and over	11.4	2.50***	1.51–4.16
Sex			
Female	70.6	Comparison group	
Male	29.4	1.1	0.81–1.39
Marital status			
Married	68.9	Comparison group	
Not married	31.1	0.96	0.73–1.26
Education, yrs			
Less than 12	9.3	Comparison group	
12	37.2	0.63*	0.41–0.95
13 to 16	41.6	0.58**	0.39–0.88
Over 16	11.8	0.43**	0.25–0.73
Income			
< $20,000	16.5	Comparison group	
$20–29,000	20.9	0.99	0.67–1.46
$30–49,000	34.9	0.74	0.51–1.06
≥ $50,000	27.7	0.76	0.52–1.10
Health status			
Pain			
0–10	23.3	Comparison group	
11–30	33.6	1.01	0.72–1.44
31–50	25.4	1.06	0.73–1.53
51 and over	17.8	1.21	0.86–1.70
Missed work			
No days missed	87.3	Comparison group	
1 or more days missed	12.7	1.46*	1.05–2.02
Duration, yrs			
0 to 5	39.1	Comparison group	
6–10	26.2	1.06	0.73–1.56
Over 10	34.7	0.88	0.61–1.28
Disease stage			
I	19.2	Comparison group	
II	39.7	0.89	0.63–1.26
III	39.5	0.75	0.52–1.07
IV	1.6	1.12	0.48–2.61
Deformed joints			
0	36.9	Comparison group	
1	34.5	1.08	0.81–1.46
2–5	28.6	1.15	0.85–1.57
Flares			
0	22.2	Comparison group	
1	22.4	0.75	0.51–1.11
2	26.4	1.07	0.75–1.53
3–5	29.0	1.28	0.91–1.80
Work characteristics			
Occupation			
Management	25.6	Comparison group	
White collar	51.4	1.60**	1.16–2.21
Blue collar	23.0	1.72**	1.19–2.50
Autonomy			
Permission/could not do	42.1	Comparison group	
Without permission	57.9	0.87	0.68–1.12
Like work			
Great deal	62.2	Comparison group	
Moderate/not at all	37.8	1.11	0.87–1.43
Work hours			
Less than 30	21.8	Comparison group	
30 or more	78.2	0.70*	0.53–0.92

Table 1. Continued

Variable	%	Univariate Hazards Ratio	95% CI
Self-employed			
Not self-employed	85.2	Comparison group	
Is self-employed	14.8	0.70*	0.51–0.98
Physical demands of job			
Mostly mental	34.5	Comparison group	
Mental and physical	57.5	1.01	0.77–1.31
Mostly physical	8.0	1.69*	1.07–2.67
Desire for paid work			
Want fulltime	47.1	Comparison group	
Want part-time/stay home	52.3	1.22	0.88–1.73
Supervise others			
Do supervise	53.1	Comparison group	
Do no supervise	46.9	1.05	0.82–1.35
Social support scale			
20–56	23.3	Comparison group	
57–63	29.0	1.22	0.87–1.71
64–69	26.8	1.03	0.72–1.48
70–80	20.9	1.01	0.69–1.47
Family work effect			
0–2	27.9	Comparison group	
3–4	34.5	0.72	0.52–0.98
5–12	37.6	0.86	0.64–1.16

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

DISCUSSION

This study provides further insight into factors influencing the major impact of RA on social functioning. Forty-two percent of those employed at entry and still remaining in the study at the end of 9 years (n = 260) are no longer working. This rate of leaving the workforce is somewhat higher than reported in other studies, but is generally consistent with the belief that more than half of all patients with RA stop working for pay within 10 years of their diagnosis. The Cox survival analysis provides a better estimate of work survival than just the raw percentage, as this methodology takes censored data into account. The Cox regression analysis projects a survival rate of 32.4%, again a somewhat lower rate of survival than in other studies. This estimate may possibly be more valid as this estimate includes data on all participants, whereas most other studies report data only for

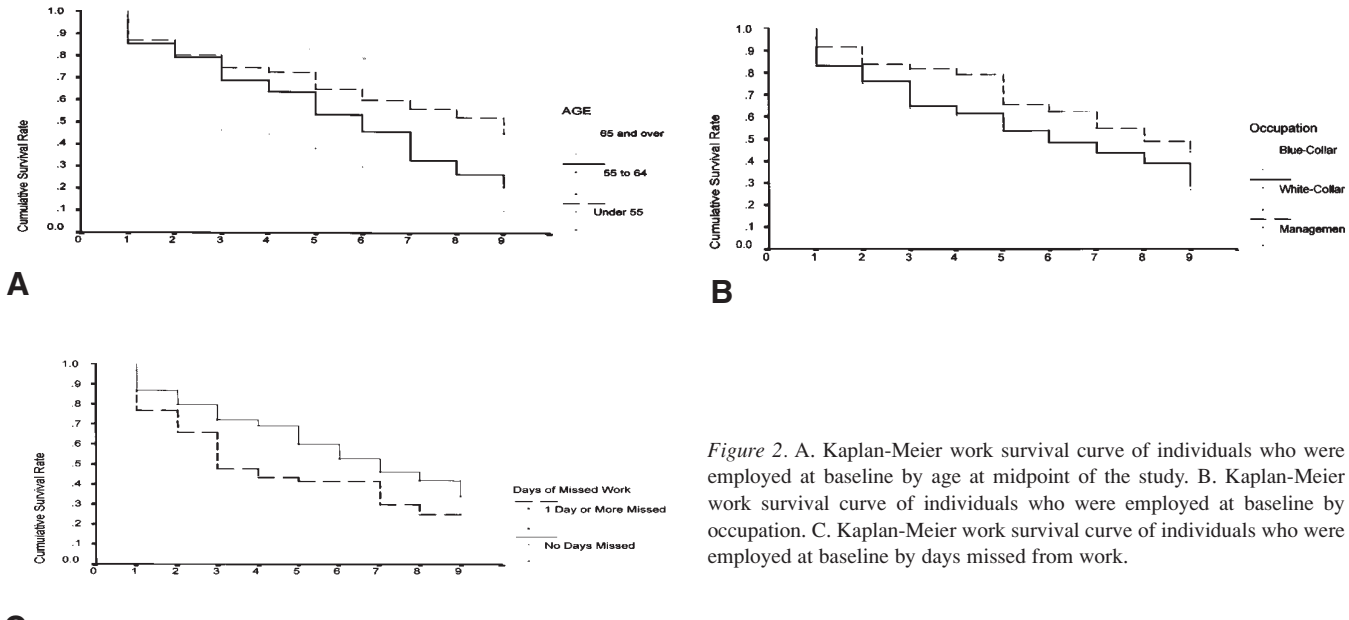

Figure 2. A. Kaplan-Meier work survival curve of individuals who were employed at baseline by age at midpoint of the study. B. Kaplan-Meier work survival curve of individuals who were employed at baseline by occupation. C. Kaplan-Meier work survival curve of individuals who were employed at baseline by days missed from work.

Table 2. Variables in final model of Cox proportional hazards regression predicting work survival over a 9 year period (n = 472). Age is at the midpoint of the study.

Variable	Category	Hazard Ratios	95% CI
Age	< 55 yrs	Comparison group	
	≥ 55 and < 65	1.66***	1.29–2.15
	≥ 65	2.39***	1.43–3.99
Miss work	Zero days	Comparison group	
	1 or more days	1.42*	1.01–2.06
Occupation	Management	Comparison group	
	White collar	1.49**	1.08–2.06
	Blue collar	1.65	1.13–2.39

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

those remaining in the study and do not account for censored cases.

As many other studies have shown[17,18,20,32], we found that age influences work survival, with younger participants being more likely to continue working than older participants. The consistency of this finding indicates the importance of helping older workers with RA to identify workplace, family, and financial factors that affect their decision to leave the labor force and that will enable them to remain employed longer. It is noteworthy that the average age of people who stop working at the end of 9 years is 59 (± 10), somewhat younger than an expected retirement age of 65. However, the oldest age group that is at greatest risk of leaving work would have been older than 70 by the end of the study, and these individuals under normal circumstances would not be expected to be employed at that age.

Clinical characteristics such as disease stage, number of deformed joints, and number of joint groups that flare each year were not significantly associated with work survival. Our previous analysis of predictors of work disability in this sample after 5 years[20] showed that number of deformed joints and joints that flared in the first year of the 5 year followup predicted work disability. It is possible that clinical disease factors are more important determinants of remaining in the work force in the earlier years of the disease, but their influence becomes less important over time. The changing importance of clinical factors emphasizes the importance of following participants over longer periods of time. Most studies of work disability among RA patients[2,4,16] generally do not find that disease severity is predictive of work disability. Rather, psychosocial factors and the structure of work are more important in leaving employment. It is noteworthy that self-reported symptoms of pain also were not significant in the univariate Cox regression analysis, so that neither clinical nor perceived disease status was a factor in work survival in this sample. A limitation of the study is that we only have clinical information on participants for the first 3 years, and if clinical data had been available for the duration of the study, these clinical variables may have emerged as being important.

A self-reported health status measure, number of days missed from work, was significantly related to work survival in both the univariate and multivariate Cox regression analyses. Those who experience more time lost from work in the preceding year were more likely to leave work. This indicator is an easily observable marker for increased risk of leaving work and could be a flag for clinicians concerned with preventing loss of employment for their patients.

A distinction is made here between clinical disease characteristics reported by physicians and self-reported measures of health status collected during interviews. This distinction is based on a biopsychosocial framework that differentiates the biological dimensions of disease from the psychosocial dimensions of the disease experience. Two individuals may have similar levels of clinical disease severity but very different experience of the disease, which we term illness[33]. The findings from this study reinforce the importance of this distinction in that in the early course of RA, the biological aspects of arthritis may have greater influence on work disability, but as the disease course progresses, illness may grow in importance. Further, the social context of the experience also will influence employment patterns.

Workplace factors including occupational prestige, self-employment, physical demands of the work, and working more than 30 hours predicted work survival in the univariate analysis, but only occupational prestige remained significant in the final model. These findings emphasize the importance of workplace conditions in work survival and the relatively greater influence of working conditions on work survival compared to clinical disease variables. These results agree with previous studies[3,4,15] that type of occupation is important. Having a blue collar job is particularly difficult, in that having this type of occupation makes a person with RA 1.65 times more likely to leave the workforce compared to those with a management job. However, it should be noted that even those with high prestige occupations also experience considerable declines in employment over time. Studies[4,14] suggest that control over work and job autonomy explain why type of occupation is important in predicting work disability. However, these work characteristics were included in the present analysis and they did not contribute significantly to the predictive model. The economy in the United States is changing rapidly as new types of jobs are being created, and the structure of the workplace responds to that change. Previous conceptual models about the workplace and how it influences work disability need to be challenged and rethought. These indicators of occupational prestige capture an underlying dimension of work that goes beyond control and perhaps assesses the intrinsic satisfaction and economic rewards that higher prestige jobs represent. These and other aspects of

the occupational structure should be investigated as potential intervention points.

The other important work characteristics predicting work survival were the number of work days missed during the 2 weeks prior to the interview and the number of hours worked, although hours worked was only significant in the univariate analysis. These 2 variables may be indicative of a gradual withdrawal from the workplace, culminating in premature departure from the workforce. Individuals with RA who are absent from work may first try to limit number of hours, work part-time, and then decide they are no longer able to work. Workers with RA who miss time from work because of RA should be identified as being at risk and helped to identify ways to remain employed.

Several other variables that were expected to be important factors in predicting work survival were not significant, including sex, income, education, attitudes, social support, and family work. Sex does not seem to play a role in influencing work disability in this sample, although men were more likely to drop out of the study than women. Social class factors measured by income and education also do not seem to be important, although education is a significant predictor of work survival in the univariate analysis. Once occupation enters the analysis, education is not a significant variable. Occupational prestige, also a measure of social class, appears to be the factor that is most proximal in the decision to leave employment.

The participants in the study generally have strong supportive social networks and perceive that their needs are being met, as shown by high scores on social support[30]. The limited variation in this variable may account for its lack of importance in the analysis. Finally, desire for paid work and satisfaction with paid work do not predict work survival. Perceptions about work and being employed have been important in previous studies of work disability. Because these attitudes were measured at baseline their influence on the work survival may diminish over time as other factors, such as age and missing time from work, assume greater weight.

Although the study has much strength, there also are limitations that should be considered. The statistical technique of survival analysis overcomes some of the problems of subject attrition, yet the issue of bias in the sample should be recognized. Few differences were found between those in the final sample and those who dropped out, but there could be a bias for those who are healthier and those in higher prestige occupations to remain in the study. Another limitation is the limited amount of physician reported clinical data available for the analysis and future studies should expand the number and quality of measures collected on clinical variables of disease activity and severity to assess the influence of the biological dimension of disease course on social outcomes. Finally, generalizability of the results is limited to rheumatology practices.

Our study consists of a fairly large sample of employed people with RA followed for 9 years. Many variables assessing the conceptual dimensions of demographic, workplace structure, disease variables, family demands, and social support were included in the multivariate model to predict work disability. Only 3 factors significantly predicted work disability in the survival model: age, occupational prestige, and days missed from work. Although the model provides important data on identifying those at risk, it offers limited insight into how to intervene to reduce risk of work disability for those with RA. Further investigation of how to reduce risk from the workplace perspective is warranted, and more intensive qualitative studies are needed to ascertain how the workplace influences the decision to leave the workforce.

ACKNOWLEDGMENT

We recognize the contribution of Darlene K. Winkelman, PhD, for preparation of the data files, preliminary analyses, and literature reviews in the early development of this paper.

REFERENCES

1. Callahan LF, Bloch DA, Pincus T. Identification of work disability in rheumatoid arthritis: Physical, radiographic and laboratory variables do not add explanatory power to demographic and functional variables. J Clin Epidemiol 1992;45:127-38.
2. Pincus T, Callahan LF, Sale WG, Brooks AL, Payne LE, Vaughn WK. Severe functional declines, work disability and increased mortality in 75 rheumatoid arthritis patients over 9 years. Arthritis Rheum 1984;27:864-72.
3. Yelin E, Henke C, Epstein W. The work dynamics of the person with rheumatoid arthritis. Arthritis Rheum 1987;30:507-12.
4. Yelin E, Meenan R, Nevitt M, Epstein W. Work disability in rheumatoid arthritis: The effects of disease, social and work factors. Ann Intern Med 1980;93:551-6.
5. Sokka T, Kautiainen H, Mottonen T, Hannonen P. Work disability in rheumatoid arthritis 10 years after the diagnosis. J Rheumatol 1999;26:1681-5.
6. van Jaarsveld CH, Jacobs JW, Schrijvers AJ, van Albada-Kuipers GA, Hofman DM, Bijlsma JW. Effects of rheumatoid arthritis on employment and social participation during the first years of disease in The Netherlands. Br J Rheumatol 1998;37:848-53.
7. Praemer A, Furner S, Rice DP. Musculoskeletal conditions in the United States. Rosemont, IL: American Academy of Orthopaedic Surgeons; 1999.
8. Fifield J, Reisine S, Grady K. Work disability and the experience of pain and depression in RA. Soc Sci Med 1991;33:579-85.
9. Fifield J, Reisine S, Pfeiffer CA, Affleck G. Workplace disability: Gender, technology, and the experience of rheumatoid arthritis. In: Ratcliff K, editor. Healing technologies: Feminist perspectives. Ann Arbor: University of Michigan Press; 1989:305-25.
10. Gaston-Johansson F, Gustafsson M, Felldin R, Sanne H. A comparative study of feelings, attitudes, and behaviors of patients with fibromyalgia and rheumatoid arthritis. Soc Sci Med 1990;31:941-7.
11. Allaire SH, Meenan RF, Anderson JJ. The impact of rheumatoid arthritis on the household work performance of women. Arthritis Rheum 1991;34:669-78.
12. MacKinnon JR. Occupational profiles. Individuals with rheumatoid arthritis and a matched comparison sample. Work 1992;2:39-49.
13. Reisine ST, Grady KE, Goodenow C, Fifield J. Work disability among women with rheumatoid arthritis. Arthritis Rheum 1989;32:538-43.

14. Allaire SH, Anderson JJ, Meenan RF. Reducing work disability associated with rheumatoid arthritis: Identification of additional risk factors and persons likely to benefit from intervention. Arthritis Care Res 1991;9:349-57.
15. Mau W, Bornmann M, Weber H, Weidemann HF, Hecker H, Raspe HH. Prediction of permanent work disability in a follow-up study of early rheumatoid arthritis: Results of a tree structured analysis using recpam. Br J Rheumatol 1996;35:652-9.
16. Robinson HS, Walters K. Patterns of work — rheumatoid arthritis. Int Rehab Med 1979;1:121-5.
17. Straaton KV, Maisiak R, Wrigley JM, White MB, Johnson P, Fine PR. Barriers to return to work among persons unemployed due to arthritis and musculoskeletal disorders. Arthritis Rheum 1996;39:101-9.
18. Doeglas D, Suurmeijer T, Krol B, Sanderman R, van Leeuwen M, van Rijswijk M. Work disability in early arthritis. Ann Rheum Dis 1995;54:455-60.
19. Reisine S, McQuillan J, Fifield J. Predictors of work disability in rheumatoid arthritis patients. A five-year followup. Arthritis Rheum 1995;38:1630-7.
20. Vliet Vlieland TPM, Buitenhuis NA, van Zeben D, Vandenbroucke JP, Breeveld FC, Hazes JMW. Sociodemographic factors and the outcome of rheumatoid arthritis in young women. Ann Rheumatic Dis 1994;53:803-6.
21. Pincus T, Callahan LF. Formal education as a marker for increased mortality and morbidity in rheumatoid arthritis. J Chronic Dis 1985;38:973-84.
22. Pincus T, Callahan LF. Formal education level as a significant marker of clinical status in rheumatoid arthritis. Arthritis Rheum 1988;31:1346-57.
23. Wolfe F, Hawley DJ. The longterm outcomes of rheumatoid arthritis: Work disability – a prospective 18 year study of 823 patients. J Rheumatol 1998;25:2108-17.
24. Ropes MW, Bennett GA, Cobb S, Jacox R, Jessar RA. 1958 revision of diagnostic criteria for rheumatoid arthritis. Bull Rheum Dis 1958;9:175-6.
25. Fries JF, Spitz P, Kraines RG, Holman HR. Measurement of patient outcome in arthritis. Arthritis Rheum 1982;23:137-45.
26. Steinbrocker O, Trager CH, Batterman RC. Therapeutic criteria in rheumatoid arthritis. JAMA 1949;140:659-62.
27. Hollingshead AB, Redlich FC. Social class and mental illness. New York: Wiley;1958.
28. Cronbach LJ. Essentials of psychological testing. 3rd ed. New York: Harper & Row; 1970.
29. Reisine S, Goodenow C, Grady KE. The impact of rheumatoid arthritis on the homemaker. Soc Sci Med 1987;25:89-95.
30. Goodenow C, Reisine S, Grady K. The quality of social support and associated social and psychological functioning among women with RA. Health Psychology 1990;9:265-84.
31. Steinberg M. Cox regression examples. In: SPSS advanced statistics 7.5. Chicago: SPSS Inc.; 1997:285-310.
32. Albers JM, Kuper HH, van Riel PL, et al. Socio-economic consequences of rheumatoid arthritis in the first year of the disease. Rheumatology 1999;38:423-30.
33. Engle GL. The need for a new medical model: a challenge for biomedicine. Science 1997;196:129-36.