Survey Nonresponse Is Associated with Increased Mortality in Patients with Rheumatoid Arthritis and in a Community Population

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ABSTRACT. ***Objective.*** To determine whether nonresponse to a mailed health survey predicts mortality in patients with rheumatoid arthritis (RA) and in a community sample in Finland.

Methods. A 5-page health questionnaire was administered in 2000. Two years later the vital status of the subjects was ascertained from the Population Registry.

Results. A total of 1095 (73%) patients with RA and 1530 (77%) community control subjects returned a completed questionnaire. Over the 2-year period, the number of deaths was 57 (5.2%) in RA responders and 37 (9.3%) in RA nonresponders (p = 0.004). The corresponding figures in community controls were 34 (2.2%) and 23 (4.9%) (p = 0.002). In a Cox regression model adjusted for age and sex, RA patient and community control nonresponders were respectively 1.65 (95% CI 1.07 to 2.55) and 2.89 (95% CI 1.69 to 4.94) times more likely to die over the 2 years compared to the responders.

Conclusion. Nonresponders to a mailed health survey were more likely to die over 2 years compared to responders. The possible nonresponse bias should be kept in mind in the interpretation of the results of studies that are based on mail questionnaires only. (J Rheumatol 2005;32:807–10)

Key Indexing Terms:
SURVEY RESEARCH NONRESPONSE HEALTH ASSESSMENT QUESTIONNAIRE
RHEUMATOID ARTHRITIS MORTALITY COMMUNITY POPULATION

Over the past 2 decades, patient self-report questionnaires have become an important tool to measure various dimensions of health as part of routine clinical care. On a population level, questionnaires are administered to map risk factors as well as to estimate the prevalence of public health problems.

Nonresponse is a potential source of bias in survey research. The extent of nonresponse bias depends on the difference between responders and nonresponders. Nonresponse bias cannot be estimated accurately without data about nonresponders and without knowledge of the response rate.

Characteristics of nonresponders include lower socioeconomic status, lower education level, and poorer health compared to responders[1,2]. Nonresponders are more often young and male[3-5]. Compared to responders, lifestyle choices of nonresponders more often include current smoking, imbalanced diet including heavy drinking, and lack of physical activity[6,7]. Nonresponse to a mailed health survey was a predictor of mortality in studies on the effects of primary prevention of cardiovascular disease[4,8] and in a survey concerning smoking[9]. Wealthier patients were more likely to continue participation over 10 years in a study of characteristics of patients with rheumatoid arthritis (RA) who participated in longterm research and were interviewed by telephone annually[10]: 46% of patients remained in the study for 10 years.

In rheumatology, the largest databases providing the most extensive longitudinal observational data to rheumatology literature, the ARAMIS (American Rheumatism Association Medical Information System, later Arthritis, Rheumatism and Aging Medical Information System)[11,12] and the National Data Bank for Rheumatic Diseases (NDB)[13] collect data primarily using mailed questionnaires. While characteristics of the nonresponders[1-7,10] and the issue of nonresponse in general[14,15] have been discussed in epidemiology research, these issues have not been raised in terms of rheumatology mailed surveys until recently[16].

In this study, a health questionnaire was mailed to 1495 patients with RA and 2000 community controls in the Central Finland Health Care District in 2000. Our primary objective was to compare self-report functional capacity in patients with RA and community controls and has been reported elsewhere[17]. Two years after the initial survey, the vital status of the subjects was ascertained from the Population Registry in order to study whether the mortality rate over 2 years is different in nonresponders compared to responders.

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MATERIALS AND METHODS

Location. The Central Finland Health Care District is located in the southern part of Finland. Its population of 263,869 (in 2000) constitutes 5% of the total population of Finland.

Patients with RA. Jyväskylä Central Hospital is the only rheumatology center in the Central Finland Health Care District. All new patients with RA are referred to this center for diagnostics and therapy. Most patients with severe RA visit the outpatient or inpatient clinic regularly. The Central Finland RA Database includes demographic measures, treatments, and outcomes of all patients with RA seen in the clinic since January 1993. It is updated daily by a research nurse. By June 2000, the database contained 1763 RA patients, 1495 of whom were still living. These 1495 patients were mailed a questionnaire. The questionnaire results were entered into the RA database and analyzed along with the patients' disease characteristics and treatments.

Community control subjects. To obtain a population sample, the names and addresses of 2000 people who were at least 30 years old and living in the district were requested from the Ministry of Social Affairs and Health. The sample was drawn from a database that includes an identification number, date of birth, demographic data, name, and address of all individuals living in Finland. In order to match for age and sex to the RA patient group, the population sample was designed to have a mean age of 55 and to include 70% women, but was otherwise random. The sampling was performed by Statistics of Finland. This organization administratively operates under the Ministry of Finance, but is fully and independently responsible for its statistics. Statistics of Finland obtains the majority of the data from diverse administrative registers and produces two-thirds of all government statistics in Finland (www.stat.fi).

Study design. A questionnaire including the Health Assessment Questionnaire (HAQ) for functional status[18,19], visual analog scales for pain and global health, comorbidities, education level, height, weight, smoking status, and frequency of physical exercise was mailed to 1495 patients with RA and to 2000 community controls in June 2000. A reminder was sent 8 weeks later to nonresponder controls.

The collected data showed that RA is associated with a > 7-fold risk of disability compared with that in a general population[17]. Patients with RA and the community controls with similar levels of disability appeared to have a similar likelihood of mortality over 2 years[20]. History of smoking was shown to be associated with an increased risk for rheumatoid factor positive RA in men[21]. Further, normative values for the HAQ in a general population were established[22].

Endpoint measurements. Two years after administration of the questionnaire, the vital status of the subjects was ascertained from the Population Registry according to personal identification numbers, which have been used in all main registers in Finland since 1967.

Statistical analysis. Data analyses were performed with the SPSS 11.0 (SPSS, Chicago, IL, USA) software. The results for continuous variables are given as means (± standard error, SE) and for dichotomous variables as percentages. The differences among the groups were computed by chi-square test (for dichotomous data) or Student's 2-tailed t test (for continuous data) for independent samples when appropriate.

A Cox regression model was used to compare mortality over 2 years in responders versus nonresponders in patients with RA and in community controls, adjusted for age and sex.

A Kaplan-Meier survival curve was used to illustrate mortality according to the response to the survey in 4 groups: RA responders, RA nonresponders, control responders, and control nonresponders. This analysis was unadjusted.

The study was approved by the Ethics Committee of Jyväskylä Central Hospital and the Population Register Centre of Finland.

RESULTS

Patients. A total of 1095 (73%) subjects with RA returned a completed questionnaire. The mean age of the nonresponders versus responders was 60 versus 62 years (p = 0.017). No other statistically significant difference was found in demographic variables or disease characteristics in the nonresponders versus responders: 32% and 29% were male; the mean disease durations were 11.2 and 11.3 years; 67% and 69% had positive rheumatoid factor; and 60% and 60% had erosions in their hand or foot radiographs, respectively (Table 1).

Controls. A total of 1530 (77%) controls returned a completed questionnaire. The nonresponders were younger than the responders (51 vs 56 yrs; p < 0.001) and more often male (37% vs 28%; p < 0.001; Table 1). No other data concerning community nonresponders were available for comparisons.

Mortality. During the 2-year followup period, the number of deaths was 57 (5.2%) of 1095 subjects with RA who completed the questionnaire and 37 (9.3%) of 400 subjects who did not respond (p = 0.004). In the controls, 34 (2.2%) of 1530 responders and 23 (4.9%) of 470 nonresponders died (p = 0.002; Table 1).

In the Cox regression model, adjusted for age and sex, nonresponse was an independent predictor for death, with a hazard ratio of 1.65 (95% confidence interval, CI, 1.07 to 2.55) in patients with RA, and 2.89 (95% CI 1.69 to 4.94) in the general population (Table 2).

Figure 1 shows the unadjusted Kaplan-Meier estimates of the probability of death in patients with RA and community controls over the 2-year period according to the response/nonresponse to the questionnaire.

DISCUSSION

Our main observation is that nonresponders to a mailed questionnaire, whether RA patients or community control subjects, were more likely to die over 2 years compared to responders. The observation is in accord with the findings of Barchielli and Balzi[9] of higher mortality among nonresponders versus responders over 9 years following a survey on smoking habits. Nonresponse to a mailed health survey was also a predictor of mortality in studies about the effects of primary prevention of cardiovascular disease[4,8].

Low response rate is a major source of bias in population health and lifestyle surveys because of obvious differences between responders and nonresponders. In addition to increased mortality shown in this study and others[4,8,9], characteristics of nonresponders include lower socioeconomic status, lower education level, poorer health, and younger age compared to responders[1,2]. Nonresponders are more often men[3-5], have unhealthy lifestyle choices[6,7], and have negative attitudes to the health care system and lack of interest in the study[23,24].

We found that nonresponders and responders with RA had similar disease characteristics including duration of RA, rheumatoid factor status, and erosiveness (Table 1). Nonresponders with RA were younger (60.3 vs 62.4 yrs)

Table 1. Comparison of demographic data and some disease characteristics at baseline in patients with RA and controls, according to responses to the questionnaire. The results for continuous variables are given as mean (± SE) and for dichotomous variables as percentages.

Variable	Patients with RA				Community Controls			
	Responders, n = 1095	Nonresponders, n = 400	Total, n = 1495	p	Responders, n = 1530	Nonresponders, n = 470	Total, n = 2000	p
Age, yrs	62.4 ± 0.4	60.3 ± 0.8	61.8 ± 0.4	0.017	55.5 ± 0.4	51.0 ± 0.7	54.4 ± 0.3	< 0.001
Sex, % M	29.0	32.0	29.8	0.27	28.7	37.4	30.0	< 0.001
Duration of RA, yrs	11.3 ± 0.3	11.2 ± 0.5	11.3 ± 0.3	0.83				
Positive RF, %	68.6	66.8	68.1	0.54				
Erosions present, %	59.9	59.5	59.8	0.89				
Mortality over 2 yrs, %	5.2	9.3	6.3	0.004	2.2	4.9	2.9	0.002

Student's t test was performed for continuous variables, and chi-square test for noncontinuous variables. RF: rheumatoid factor.

Table 2. Cox proportional hazards model of mortality over 2 years in responders compared to nonresponders in patients with RA and controls, adjusted for age and sex.

Variable	Patients with RA				Controls			
	Hazard Ratio	95% CI Lower	95% CI Upper	p	Hazard Ratio	95% CI Lower	95% CI Upper	p
Age	1.09	1.07	1.11	< 0.001	1.12	1.09	1.14	< 0.001
Sex, M vs F	2.01	1.32	3.07	0.001	1.73	0.98	3.06	0.060
Nonresponders vs responders	1.65	1.07	2.55	0.025	2.89	1.69	4.94	< 0.001

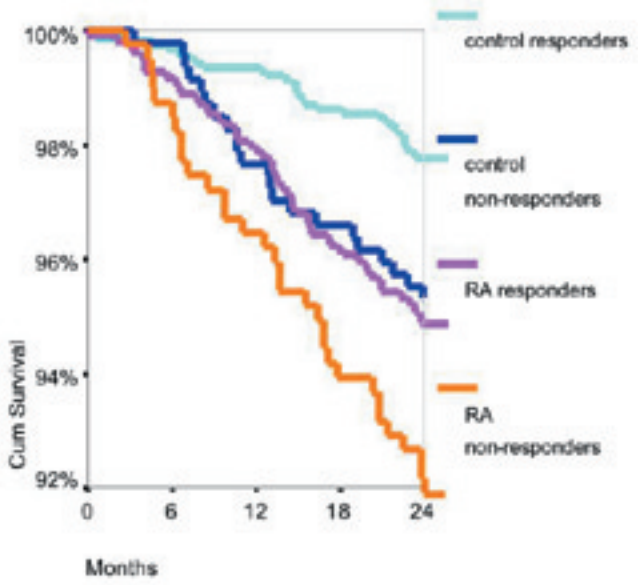

Figure 1. Unadjusted Kaplan-Meier estimates of the probability of death over 2 years in 1495 patients with RA and in 2000 community controls according to response/nonresponse to the questionnaire.

and more often male (32% vs 29%) compared to responders, while greater differences were seen in control nonresponders compared to responders (age 51.0 vs 55.5 yrs; male 37.4% vs 28.7%; Table 1). This observation suggests that reasons for nonresponse may have been different in the 2 cohorts[1,25]. More data concerning nonresponders in our study would have been of interest as nonresponse behavior appears to be associated with unfavorable circumstances and unhealthy lifestyle that are associated with mortality. Indeed, nonresponse behavior may be regarded as a sign of underlying factors that promote mortality.

A response rate of 73–77% in our study was higher compared to other studies with response rates available[26]. Therefore, we did not pursue reaching the remaining 23–27% of people. Indeed, most rheumatology mailed surveys do not even report response rates and accordingly, no data may be available concerning nonresponders. To improve the response rates of mailed surveys, the responders are paid in some surveys, while in some others the returned questionnaires are included in a lottery.

A mailed survey is a convenient research tool as it is easy and inexpensive to administer and a variety of validated self-report questionnaires are available for use. In rheumatology, the most comprehensive longterm observational studies are based on mailed questionnaires. The quality of the obtained data has been shown to be highly valid[27]. However, possible nonresponse bias, as well as unwillingness to participate as the primary exclusion criterion, should be kept in mind in interpretations of the results.

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