

# Preventive Medical Services Among Patients with Rheumatoid Arthritis

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**ABSTRACT. Objective.** To assess the degree to which patients with rheumatoid arthritis (RA) receive health maintenance and preventive care procedures recommended by the United States Preventive Services Task Force (USPSTF), a government appointed independent expert panel whose recommendations are based on a systematic review of the evidence of effectiveness of clinical preventive services.

**Methods.** Clinical data from 1987 to 1995 were abstracted from the complete (inpatient and outpatient) medical records of a population based sample of patients with RA (defined using the 1987 American College of Rheumatology diagnostic criteria). We assessed probability of receiving 6 preventive medical services: blood pressure testing (once every 2 years), lipids profile (once every 5 years), flu vaccination (once a year for persons over 65), pneumococcal vaccination (one time for persons over 65), as well as mammograms (biennially for ages 40–49 and annually for those 50 and over) and cervical cancer screening (once every 3 years). These probabilities were summarized using the Kaplan-Meier method. Cox proportional hazards models were used to assess the association of a number of clinical variables with time to performance of each preventive service.

**Results.** A total of 67 men and 197 women, with a mean age of 64.4 years and median length of followup time of 5.4 years, were identified. In this cohort, the probability of lipids screening by 5 years was 88% and blood pressure screening by 2 years was 95%. Among the 169 patients aged  $\geq$  65 years, the probability of a one-time pneumococcal vaccination was 38% by 5 years of followup and the probability of a yearly flu vaccination was 32%. Among 185 women without a history of breast cancer, mammograms were performed for 68% of women by the end of 2 years from ages 40 to 49 years and for 33% of women by one year beginning at age 50 years. Of the 133 women without a history of hysterectomy, the probability of Papanicolaou smears within 3 years was 77%. No consistent statistically significant association of age, sex, calendar year, total or rheumatologist visits, Charlson comorbidity index, or RA disease characteristics with performance of these preventive services was detected.

**Conclusion.** Patients with RA do not receive optimal health maintenance and preventive care services. Efforts should be made, on the part of all physicians who care for RA patients, to ensure that these effective preventive services are provided. (J Rheumatol 2003;30:1940–7)

## Key Indexing Terms:

RHEUMATOID ARTHRITIS

PREVENTIVE CARE

SCREENING

Effective clinical preventive services for prevention and early detection of certain diseases are associated with substantial reductions in morbidity and mortality. Nevertheless, studies have shown that various immunization and screening services are underused due to a variety of patient, physician, and health care system related factors that include inadequate reimbursement, insufficient time with patients, and uncertainty as to which services should be offered or skepticism about their effectiveness<sup>1-12</sup>.

It has been reported that the presence of a chronic disease reduces the likelihood of not only primary preventive services but also treatment of unrelated disorders<sup>13-15</sup>. Patients with chronic diseases such as rheumatoid arthritis (RA) have been reported to be at increased risk for additional chronic diseases and to have a shorter life expectancy compared to the general population<sup>16-23</sup>. They might thus constitute a group with a high need to be targeted for recommended preventive medical care. Little is known, however, about achievement of recommendations for clinical preventive care services among patients with RA<sup>24</sup>.

The goal of our study was to assess over a 9-year period the degree to which patients with RA received health maintenance and preventive care services recommended by the US Preventive Services Task Force (USPSTF)<sup>25,26</sup>. The USPSTF was convened by the US Public Health Service to rigorously evaluate clinical research in order to assess the merits of preventive measures, including screening tests, counseling, immunizations, and chemoprevention.

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## MATERIALS AND METHODS

The population of Rochester, Minnesota, is well suited for an investigation of achievement of various preventive medical services in RA patients because comprehensive medical records for all residents seeking medical care for over half a century are available. A records linkage system allows ready access to the medical records from all healthcare providers for the local population, including the Mayo Clinic and its affiliated hospitals, the Olmsted Medical Group and the Olmsted Community Hospital, local nursing homes, and the few private practitioners. The potential of this data system for use in population based studies has been described<sup>27,28</sup>. This system assures virtually complete medical encounters for all clinically recognized cases of RA.

Using a previously assembled, population based incidence and prevalence cohort of persons with RA in Rochester, we identified a community sample of 264 adults with a clinical diagnosis of RA. Case ascertainment methods have been described<sup>29,30</sup>. All cases fulfilled the 1987 American College of Rheumatology (ACR) criteria for RA<sup>31</sup>.

Achievement of recommendations of the USPSTF<sup>25,26</sup> and various other agencies was assessed in this population for the following 6 preventive services: screening for high blood cholesterol, screening for hypertension, screening for breast and cervical cancer, and pneumococcal and influenza vaccinations. Achievement of services was assessed as follows: (1) for high blood cholesterol, compliance with the recommendations of the National Cholesterol Education Program's Expert Panel sponsored by the National Institutes of Health, including routine measurement of nonfasting serum cholesterol in all adults at least once every 5 years<sup>32-34</sup>; (2) for hypertension, compliance with the recommendations of the Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure for adults, including routine blood pressure measurement at least once every 2 years<sup>35-37</sup>; (3) for breast cancer screening, compliance with the recommendations of the American Cancer Society, the National Cancer Institute, the American Medical Association, the American College of Obstetricians and Gynecologists, the American College of Physicians, and the American College of Radiology, including a baseline mammogram between the ages of 35 and 40 years followed by annual or biannual mammograms from ages 40 to 49 years and annual mammograms beginning at age 50 years<sup>38-48</sup>; (4) for cervical cancer, compliance with the consensus recommendations of the American Cancer Society, the National Cancer Institute, the American Medical Association, the American College of Obstetricians and Gynecologists, the American Nurses Association, the American Academy of Family Physicians, and the American Medical Women's Association, including an annual Papanicolaou smear (Pap smear) for women with a history of an abnormal smear and every 2-3 years for women with no previously abnormal smear (with the exception of those who had a hysterectomy)<sup>44-46</sup>; (5) for pneumococcal vaccination and for influenza vaccination, compliance with the recommendations of the Advisory Committee on Immunization Practices (ACIP), including, respectively, a one-time vaccination and a yearly vaccination for all persons aged 65 years and older<sup>49-55</sup>.

Trained nurse abstractors reviewed the complete medical records using a standardized protocol with predefined variables. Data were entered directly into computers using interactive screens. Data quality was monitored and maintained on a continuous basis through random re-abstractions, determinations of reasons for discrepancies, and focused abstractor training. Nurse abstractors met weekly with the entire project team to discuss and resolve any data collection issues. Information on all inpatient and outpatient medical encounters with any local health provider between January 1, 1987, and December 31, 1995, was abstracted. Data were collected on the frequency and timing (year of service) of the preventive services described above through date of last followup. A baseline date was abstracted for each preventive service. This date indicated the date the intervention was performed (if at all) prior to index date for RA incidence cases or prior to January 1, 1987, for prevalence cases. The date of last followup was defined as the last time a patient was seen by a doctor or prior to December 31, 1995. A preventive care service was considered performed

when the medical records indicated the date or the result of the test or when the record explicitly recorded that the patient reported that the test had been done elsewhere.

*Data analyses.* Separate analyses were performed for each of the 6 specified preventive recommendations. The SAS statistical program (SAS Institute Inc., Cary, NC, USA) was used to perform statistical analyses.

We computed a comorbidity score based on the weights assigned by Charlson, excluding RA diagnoses<sup>56</sup>. Since only the year was recorded for each preventive service performed, an independent randomly assigned month and day (uniform distribution) was generated separately for each occurrence of a distinct preventive service in each patient. The random assignments were restricted to be prior to their known date of last followup for any services performed during the year of their last followup. The probability of each preventive service over time was estimated using the Kaplan-Meier method. The corresponding survival curves were generated with the start of observation being the date of diagnosis of RA, except for pneumococcal vaccination, in which a patient's observation time started when they became 65 years old. A separate Cox proportional hazards model was used to assess the association of a number of variables with performance of each preventive service. These variables included age, sex, calendar year, RA status (i.e., incidence vs prevalence cases), rheumatoid factor positivity, disease duration, followup time, Charlson comorbidity index, number of visits to a rheumatologist per year, and total number of visits to both rheumatologists and generalists per year. Since each patient could have "multiple events" of a given type (e.g., multiple blood pressure screenings), a robust estimate of the standard errors for the predictor variables was used to assess the significance of the estimated regression coefficients.

For each model, the (summed) Martingale residuals for each patient were computed<sup>57</sup>. These residuals reflect the difference between the observed time to the occurrence of each specific preventive service and the expected time based on the predictor variables in the proportional hazards model (i.e., age, sex, duration of RA, etc.). A positive association between 2 sets of residuals indicates a corresponding shortening (or lengthening) for the differences between observed and expected times for the two types of service. The association between these residuals (one per patient per type of preventive service) was assessed using Spearman's correlation coefficient to examine the association between the occurrence of the different types of preventive services.

## RESULTS

The total study cohort comprised 264 cases of RA. Of these 197 (74.6%) were female and 67 (25.4%) were male (Table 1). There were 138 prevalent RA cases by January 1, 1987, with a median duration of disease of 6.8 years, and the remaining 126 cases received a clinical diagnosis of RA after January 1, 1987. Mean age was 64.4 years on incidence date or January 1, 1987. Median length of followup time was 5.4 years. During the entire followup period, median numbers of doctor and rheumatologist visits per year were 5.2 and 2, respectively. A total of 169 patients were 65 years or older at study entry or during followup and were eligible for assessment of influenza and pneumococcal vaccinations. Performance of screening mammographies was assessed in 185 women aged 40 years or older and with no diagnosis of breast cancer. Cervical cancer screening was assessed among 133 women with no hysterectomy.

Figure 1 shows the cumulative probabilities of individual preventive services. The probability of cholesterol testing by 5 years of followup was 88%. Similarly, the probability of patients having blood pressure checked by 2 years was 95%.

Table 1. Overall characteristics of the base populations for each preventive service.

	Cholesterol Screening (once every 5 yrs) Blood Pressure Screening (once every 2 yrs)	Pneumococcal Vaccination (1 time > 65 yrs) Influenza Vaccination (once a yr > 65 yrs)	Mammogram (once every 2 yrs)	Pap Smear (once every 3 yrs)
Base population, n	264	169	185*	133**
Mean age $\pm$ SD, yrs	64.4 $\pm$ 13.5	72.4 $\pm$ 9.0	64.2 $\pm$ 13.5	63.0 $\pm$ 14.9
minimum–maximum	35.3–95.5	56.2–95.5	35.3–95.5	35.3–95.5
Female, n (%)	197 (74.6)	125 (74.0)	185 (100)	133 (100)
Prevalent cases, n (%)	138 (52.3)	106 (62.7)	103 (55.7)	69 (51.9)
Median (25th, 75th) disease duration <sup>†</sup> , yrs	6.8 (3.5, 13.1) <sup>†</sup>	7.5 (4.0, 16.1) <sup>†</sup>	7.6 (4.0, 15.4)	6.9 (3.8, 12.5) <sup>†</sup>
minimum–maximum	0.2–30.8	0.3–30.8	0.2–30.8	0.2–30.2
Median doctor visits per year, n	5.2	5.6	5	5.3
minimum–maximum	0.4–91.3	0.6–91.3	0.4–88.8	0.4–42.3
Median rheumatologist visits per year, n	2	2	2	2.2
minimum–maximum	0–65.4	0–65.4	0–65.4	0–28
Median (25th, 75th) followup time, yrs	5.4 (2.2, 9.0)	6.1 (2.4, 9.0)	5.7 (2.3, 9.0)	5.5 (2.3, 9.0)
minimum–maximum	0.04–9.0	0.04–9.0	0.1–9.0	0.1–9.0

\* Female patients with no diagnosis of breast cancer. 34 women were 40–49 years and 166 women were  $\geq$  50 years during followup. \*\* Female patients with no hysterectomy. <sup>†</sup> Only for prevalent cases.

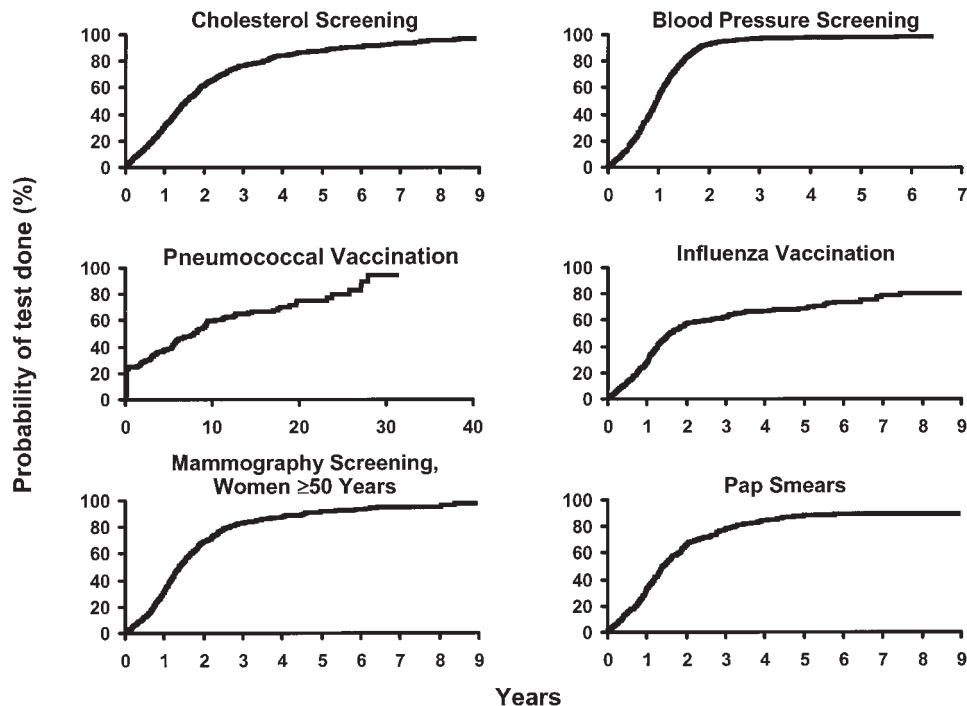


Figure 1. Cumulative performance probability of individual preventive services.

Twenty-one percent of the 169 patients aged 65 years or older received their pneumococcal vaccine prior to their 65th birthday. The probability of pneumococcal vaccination within a year of 65th birthday was 24% and improved only gradually thereafter. The probability reached only 59% by

the age of 75 years. For the same population, the probability of a yearly flu vaccination was around 32%.

Among women aged 40–49 years with no breast cancer, the probability of a mammogram by 2 years was 68% and reached to 90% by the end of third year of followup (not

shown in Figure 1). About 33% of women 50 years and above received mammograms within a year, 68% by the end of 2nd year, and 91% by 5 years. Among the 133 eligible women without history of hysterectomy, the probability of having a Pap smear within 3 years was 77%.

Finally, we examined demographic and clinical predictors of performance of these preventive care services using Cox proportional hazards models (Table 2). Only a few of the predictors considered were statistically significant, but none was strongly predictive or consistent across types of services. Sex, rheumatoid factor positivity, and disease duration were not associated with any of the preventive services. Patients with newly diagnosed RA were more likely to receive blood pressure screening [hazard ratio (HR) 1.28; 95% CI 1.10, 1.47]. Overall, the number of visits per year to a rheumatologist increased the HR of influenza vaccinations, whereas each additional visit per year to any physician increased the HR of cholesterol screening, blood pressure screening, and mammograms. The HR of influenza vaccination increased over time, compared to a decrease in blood pressure screening. In addition, age and rheumatologist visits were statistically significant predictors for yearly influenza vaccinations. The HR for being vaccinated against influenza increased by 5% for each additional visit to a rheumatologist and 14% for each calendar year. Increasing age was negatively associated with mammograms and Pap smears, where each additional year of age decreased the HR of being tested by 2% and 3%, respectively. Increasing age was also negatively associated with cholesterol screening. Among younger women (< 50 years), comorbidity had a strong effect on the performance of mammograms (HR 2.16, 95% CI 1.06, 4.43). Finally, no demographic or disease related characteristic played a significant role in predicting implementation of pneumococcal vaccinations.

We further investigated the concordance between various screening services using the Martingale residuals from the proportional hazards regression models for each type of service. After adjusting for the relevant covariates, we observed positive associations between cholesterol and blood pressure screenings, as well as influenza vaccinations and cholesterol and blood pressure screenings. These findings, for example, imply that delayed cholesterol tests were associated with corresponding delays in blood pressure measurements. Similarly, time to influenza vaccinations was prolonged in association with delayed cholesterol and blood pressure tests. Among women > 50 years, longer times to mammograms corresponded to longer times to cholesterol and blood pressure tests, Pap smears, and influenza vaccinations.

## DISCUSSION

Our study indicates that patients with RA did not receive optimal health maintenance and recommended preventive care procedures. Performance of cholesterol and blood pressure tests was relatively better than other preventive care services. We identified age, RA status, and contact with the health care system indicated by the number of visits as weak predictors of implementation of various preventive services, and there was no consistency across various services.

Findings of our study are consistent with previous studies showing reduced health care and screening services delivered to patients with chronic diseases such as RA<sup>14,24</sup>. MacLean and colleagues were the first to raise awareness of the need for increased attention to preventive care for patients with RA<sup>24</sup>. This large-scale study involved 1355 RA patients and assessed quality of various health care services, including preventive services, using administrative insurance data over a 4-year period. The quality score for

Table 2. Predictors of performance of each preventive medical service from the multivariate Cox proportional hazards model. Data shown are hazards ratios (95% CI).

Characteristics	Cholesterol Screening	Blood Pressure Screening	Pneumococcal Vaccination	Influenza Vaccination	Mammogram 40–49 yrs	Mammogram 50+ yrs	Pap Smear
Female	0.94 (0.77, 1.14)	1.10 (0.96, 1.26)	0.67 (0.40, 1.12)	1.34 (0.97, 1.85)	—	—	—
Incidence cases	1.19 (0.96, 1.47)	1.28* (1.10, 1.47)	0.85 (0.39, 1.86)	1.12 (0.78, 1.61)	1.15 (0.35, 3.77)	1.02 (0.77, 1.34)	1.07 (0.77, 1.49)
Rheumatoid factor+	0.90 (0.75, 1.07)	0.96 (0.84, 1.09)	0.97 (0.62, 1.53)	1.00 (0.72, 1.37)	0.54 (0.26, 1.11)	0.91 (0.74, 1.12)	1.01 (0.79, 1.30)
Age at RA diagnosis**	0.99* (0.98, 1.00)	1.00 (1.00, 1.01)	0.98 (0.86, 1.12)	0.97* (0.95, 0.99)	1.09 (0.94, 1.27)	0.98* (0.97, 0.99)	0.97* (0.96, 0.98)
Disease duration**	0.99 (0.97, 1.00)	0.99 (0.98, 1.00)	0.99 (0.95, 1.02)	1.01 (0.99, 1.03)	0.85 (0.56, 1.27)	1.00 (0.98, 1.01)	1.02 (1.00, 1.04)
Rheumatologist visits**	1.00 (0.99, 1.01)	1.01 (0.99, 1.02)	0.98 (0.75, 1.29)	1.05* (1.01, 1.08)	1.01 (0.90, 1.13)	1.01 (0.99, 1.03)	1.01 (0.97, 1.06)
Total doctor visits**	1.03* (1.02, 1.04)	1.03* (1.02, 1.04)	1.06 (0.92, 1.24)	1.00 (0.98, 1.02)	1.10* (1.02, 1.18)	1.02* (1.00, 1.04)	1.02 (0.99, 1.05)
Calendar year**	0.98 (0.95, 1.02)	0.98* (0.95, 1.00)	1.07 (0.94, 1.22)	1.14* (1.07, 1.21)	1.15 (0.98, 1.35)	1.04 (1.00, 1.09)	0.95 (0.90, 1.01)
Charlson index	1.10 (0.92, 1.32)	0.99 (0.88, 1.12)	1.21 (0.54, 2.70)	1.19 (0.90, 1.58)	2.16* (1.06, 4.43)	0.84 (0.68, 1.03)	0.97 (0.76, 1.26)

\* Statistically significant with  $p < 0.05$ . \*\* Results reflect hazard ratios for per-year or per-visit increase.



colorectal, breast, and cervical cancer screenings was 42%, and generalist care was associated with timely performance of cancer screenings.

Recent nationwide data for selected preventive services indicate that the screening and vaccination rates are improving over time and are probably higher than for this RA cohort<sup>10,11,58-60</sup>. However, these national figures are based on cross-sectional surveys and assessed compliance at one point in time. Our longitudinal followup design and statistical estimates to reflect the cumulative probability of having tests done, including retesting, allowed us to estimate compliance over time. In addition, these national surveys collected data through interviews. We relied on abstracted information from patients' complete medical records.

Similar to previous studies<sup>61,62</sup>, comorbid diseases other than RA had a strong influence on the performance of mammograms among younger women. Lack of any strong association of comorbidity with other preventive services is in line with the hypothesis that screening rates increase with comorbidity in the population as a whole where the proportion of individuals with chronic diseases is small, whereas in patients with RA who are under regular medical care due to their disease, the opposite may be true<sup>14</sup>.

We also found that the performance rates were relatively high for blood pressure checks (95%) and cholesterol testing (88%). We believe this is due to the fact that these tests are performed as part of routine care and monitoring of RA patients. In contrast, mammograms, Pap smears, and vaccinations are not part of routine RA care. Instead, health care providers and patients must initiate and make special arrangements/appointments for mammograms, Pap smears, and vaccinations. In addition, younger patients were more likely than older ones to have received timely Pap smears, mammograms, and cholesterol screening, and to have been vaccinated against influenza. Declining rates by increasing age had previously been demonstrated for screening mammograms<sup>12,63</sup>. Furthermore, age effect could be expected for Pap smears, since screening is usually discontinued after age 65 years for women who previously have had consistently normal findings.

A possible explanation for our findings is that when dealing with a complex multisystem disease like RA, management of the disease itself consumes physicians' time, leaving little time to discuss preventive services during a routine office visit. RA is a prominent health concern for both patient and physician and it may result in limited attention to other less imminent health problems<sup>64</sup>. In addition, RA patients may be less willing to accept additional procedures or therapy. This is unfortunate, since patients with chronic diseases such as RA have more contact with the health care system<sup>65</sup> and each face to face contact is a missed opportunity for delivery of preventive services. Another likely explanation is that physicians may be less

likely to refer elderly RA patients whose life expectancy they believe is already shortened by their disease<sup>66</sup>. As expected, we observed an increasing trend for preventive services with increasing number of visits per year to any physician. Indeed, rheumatologist visits increased the likelihood of influenza vaccinations. It is encouraging to see that certain preventive care services do not appear to be different for patients whose care is provided primarily by rheumatologists than generalists.

The preventive services included in our analysis have proven effectiveness in reducing morbidity and mortality due to several of the comorbidities identified in patients with RA<sup>25,26</sup>. These comorbidities are cardiovascular disease (CVD), malignancies, and infections<sup>22,67</sup>. The number of comorbidities is also an independent risk factor for premature death in RA<sup>68</sup>. It is ironic that RA is not the cause of death in this elderly population but the diseases preventable through the preventive services reviewed in our study. Cardiovascular disease is the leading cause of morbidity and mortality in RA<sup>20,69-71</sup> and routine blood pressure and lipid profile screening will definitely help to identify and treat high risk patients with hypertension and dyslipidemia. Another leading cause of morbidity and mortality in RA is infections<sup>20,70,72</sup> and routine influenza and pneumococcal vaccinations will help to reduce the likelihood of complications. Most studies suggest an increased risk of malignancies and associated mortality in RA<sup>70,73,74</sup>. Although breast and cervical cancers do not seem to have increased, regular mammograms and Pap smears may increase awareness and help identification of other malignancies.

Low adherence to recommendations can be expected early in introduction of guidelines as well as due to variation of guidelines over time. We collected data between 1987 to 1995, whereas the National Cholesterol Education Program was first launched in 1988. The first USPSTF recommendations were issued only in 1989<sup>75</sup>. Also, during the period of the study, recommended upper and lower age limits for screening mammography changed<sup>48</sup>. Contrary to our expectations, we observed a modest increase in the likelihood of certain preventive services over time.

The strengths of this study include a population based design, the use of a standardized systematic approach for case ascertainment, and the completeness of ascertainment of all medical encounters and related procedures. We assessed implementation of preventive services through medical record review, which had been found to be more reliable than self-reports<sup>76</sup>.

The results of this study must be interpreted in light of certain limitations. As some racial and ethnic groups are under-represented in Rochester, MN, where the population in 2000 was 90.3% white according to the US census data, the results of our population based study are only generalizable to the US white population. In this relatively isolated community, nearly all medical care is provided by the Mayo

Clinic and Olmsted Medical Center and its affiliated hospital. Therefore, variability of clinical practice due to institutional characteristics is minimal. The unique strength of this data source is the ability to examine the various determinants of preventive health services in a single population, from which all aspects of medical care can be optimally ascertained because of the availability of longitudinal data. Another limitation is that, although we studied a community based sample, some of the patients might have received these preventive services outside the catchment area. Our results may also be criticized for not including a control group. Our main objective was to assess performance in comparison to national recommendations by the USPSTF and therefore a control group was not required. We also did not take into account the severity of RA or several patient and physician characteristics (e.g. knowledge, previous experience and perceptions, physician specialty, education level, ethnic origin, socioeconomic status, costs or insurance status, or family history of cancer) previously shown to influence delivery of screening and vaccination services<sup>4,6,66,77-83</sup>.

Further research is needed to identify the reasons behind this finding, to identify strong predictors of compliance and whether the benefits of screening and vaccination services persist in the presence of RA. If so, we need to ensure that patients with RA receive needed preventive care to reduce morbidity and mortality. Physicians caring for RA patients need to be aware of the value of preventive services, since their advice is one of the most important determinants of vaccinations or screening procedures<sup>83-85</sup>.

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