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Outreach to Promote Management of Cardiovascular Risk in Primary Care Among Patients With Rheumatoid Arthritis Seen in Rheumatology Practice

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Objective. Rheumatoid arthritis (RA) confers a 1.5- to 2.0-fold increased risk of cardiovascular disease (CVD). A prior multifaceted quality improvement approach to improving CVD preventive care increased CVD risk factor assessments, but there was no significant effect on the management of risk factors. We tested the impact of adding a proactive outreach strategy promoting primary care treatment of CVD risk factors among patients with RA through their rheumatology practice.

Methods. Through electronic health record searches, we identified patients with RA who were potential candidates for hypertension treatment initiation or intensification, statin therapy, or a smoking-cessation intervention. A nonclinician care manager contacted patients by phone and mail on behalf of the rheumatologists, provided information about the identified risk factor(s), recommend follow-up with primary care physicians (PCPs), sent correspondence to PCPs, and followed up with patients to see what actions had been taken. We measured preventive cardiology quality indicators and compared preintervention and intervention time periods using interrupted time series methods.

Results. During the 6-month intervention period, the proportion of patients prescribed at least moderate-intensity statin treatment for primary prevention rose from 18.4% to 23.8%. The rate of increase was 1.06% greater per month than during the preceding period ($P < 0.001$). Rates of increase in hypertension diagnosis and control improved more rapidly during this phase ($P < 0.001$ for each) and reversed preceding negative trends.

Conclusion. Implementing proactive nonclinician outreach to encourage primary care–based treatment of CVD risk factors was associated with increases in statin prescribing and in hypertension diagnosis and control. Smoking was not affected.

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death in individuals with rheumatoid arthritis (RA), with CVD risk increased 1.5- to 2.0-fold above that of the general population (1–3). Measurement and treatment of conventional CVD risk factors is strongly advocated to reduce the burden of CVD in individuals with RA. However, despite guideline recommendations to lower the thresholds for risk factor management in RA (4–6), it has been shown that both rheumatologists and primary care physicians (PCPs) identify and manage cardiovascular risk factors less often in patients with RA compared with patients without RA (2,5–9).

Reasons for inadequate cardiovascular risk factor identification and control may include lack of clinician or patient awareness of risk, competing clinical priorities, poor care coordination, clinical inertia, difficulty with health behavior change, and poor adherence to medications (10,11).

Strategies to improve CVD prevention in patients with RA have included the use of a specialty clinic for CVD prevention in patients with inflammatory joint disease (12) and efforts to improve collaborative care between rheumatologists and primary care (13–16). Previously, we tested implementing a multifaceted quality improvement intervention consisting of clinician education, clinical decision support at the point of care, performance measurement and feed-

back to rheumatology clinicians, and individualized mailed recommendations to patients to measure CVD risk factors and to address hypertension, cholesterol treatment, or smoking when applicable. This combined intervention led to considerable increases in the proportion of patients with RA with all major CVD risk factors assessed but did not lead to significant improvements in CVD risk factor management or control (16). Furthermore, the rheumatologists surveyed were supportive of facilitating the referral process to PCPs for medical management of CVD risk factors. Therefore, we added a proactive outreach intervention to this existing set of quality improvement activities to attempt to increase primary care treatment of CVD risk factors in patients with RA. We studied the effects of this intervention using interrupted time series analysis.

PATIENTS AND METHODS

Setting and eligible patients. We performed this study at a large rheumatology practice affiliated with an academic medical center in Chicago, IL, that used a commercial electronic health record (EHR) (EpicCare, version Spring 2014; Epic Systems Corporation). The Northwestern University Institutional Review Board approved the study, which was performed as a practice-wide quality improvement activity. Clinician and patient data were included in the study with a waiver of consent. Patients were eligible for inclusion if they had two or more office visits with any rheumatology clinician in the practice (including an attending rheumatologist, rheumatology fellow, advanced practice nurse, or physician assistant) within the 18 months preceding a measurement date, had RA (*International Classification of Diseases, 10th Revision, Clinical Modification* code M05.XX or M06.XX) as a diagnosis for two or more visits in the 24-month time period preceding the measurement date or as an active problem list diagnosis, and met the other outcome-measure-specific denominator criteria (described below). These patients received care from 10 attending rheumatologists, 4 rheumatology fellows, 1 advanced practice nurse, and 2 physician assistants. Most of these clinicians had previously taken part in a prior cardiovascular disease prevention improvement study (16).

Intervention. The intervention consisted of identifying patients with one or more potentially unaddressed preventive cardiology care needs by using searches of EHR data and then having a nonclinician care manager conduct proactive outreach.

The four clinical criteria we identified were patients with RA with 1) undiagnosed hypertension (the last two office blood pressure levels were both greater than or equal to 140/90 mm Hg), 2) diagnosed hypertension that was uncontrolled (most recent office blood pressure level was greater than or equal to 140/90 mm Hg), 3) current smoking status, and 4) at least a moderate risk of atherosclerotic cardiovascular disease (ASCVD) and not prescribed a statin. We defined at least a moderate risk of ASCVD in RA as follows: we calculated the 10-year risk of an ASCVD event using the pooled cohort risk models that are incorporated into the American College of Cardiology/American Heart Association 2013 guidelines for cholesterol management (17). These guidelines recommend that statin therapy be considered for patients with an ASCVD risk greater than or equal to 5% and strongly recommend it at a level of 7.5%. Because patients with RA have excess ASCVD risk beyond what is conferred by traditional risk factors (1–3), those with a 10-year risk estimated at 5% likely have a true level of risk exceeding 7.5%.

We added this care management strategy in December 2016 to a prior set of interventions that included clinician education, point-of-care clinical decision support, performance feedback to clinicians, and mailed recommendations from the care manager to the patient advising discussion of the patient's CVD risk factors with the rheumatologist (16).

Approximately monthly, a care manager who was part of the study staff sent lists of patients seen in the past month who were identified from the search criteria above to the patients' rheumatologists using e-mail within the EHR. Rheumatologists were given 1 week to respond back to indicate that it was acceptable for the listed patients to be contacted for care manager–facilitated referral to primary care or to indicate which patients should not be contacted. Rheumatologists who did not respond were e-mailed a second time.

The care manager attempted to contact each patient by phone (up to six attempts). Once reached by phone, the care manager described why he was calling and asked if the patient had already completed a visit with his or her PCP to address the identified CVD risk condition(s). If not, the care manager provided information about the clinical condition or conditions that were identified and reviewed why the patient was being referred from rheumatology to primary care. The care manager encouraged patients to schedule prompt primary care follow-up. If the patient indicated that a primary care visit was already scheduled, then the care manager recorded this and asked permission to follow up by phone after that visit was completed. The care manager informed the patient that he would send information to the patient's primary care provider about the identified CVD risk factors and would mail this information to the patient as well. If a patient identified a reason for not wanting to obtain a primary care appointment to address the identified CVD risk factor(s), the care manager recorded this from a list of potential reasons. The care manager documented these discussions in the EHR and sent this to the

rheumatologist and, if the PCP was within the health system, to the PCP. When the PCP was external to the health system, the care manager sent this information by fax or mail. The messages highlighted the identified CVD risk factors and the rationale for addressing them. After the telephone contact, or when the care manager did not reach the patient after six call attempts, he sent the patient a mailing that included information about the CVD risk factor recommendations for discussion with the PCP.

After 4 weeks, or in the week following the date when a patient indicated that a PCP visit was scheduled, the care manager followed up by phone to determine what care the patient received, to determine which relevant steps were taken, and, when actions were not taken, to identify reasons why not. We also performed a manual review of the patient's EHR chart for patients who had a PCP visit within Northwestern Medical Group and recorded whether the conditions of interest were addressed at the office visit.

Measurements. We assessed patient characteristics and clinical measures using Structured Query Language queries of EHR data stored in Northwestern University's Enterprise Data Warehouse. Age, sex, and race/ethnicity were obtained from the EHR's demographic tables. Comorbidities were assessed from encounter-linked diagnoses and from patients' active problems lists by using lists of *International Classification of Diseases, 10th Revision* terms. Smoking status was collected from a discrete field in patients' social history, and medications were assessed by examining active medication lists, which included medications prescribed by a clinician within the health system and patient-reported medications that were prescribed elsewhere. Patient-reported new statin initiation was also included.

The preventive cardiology measures we examined for patients with RA are described in Table 1. For all measures at each measurement time point, patients met the inclusion criteria for eligible patients. The assessed measures included 1) moderate- or high-intensity statin treatment for primary prevention prescribed for all patients with RA 40 to 75 years of age,

2) hypertensive patients aged 18 to 85 years with RA who had hypertension diagnosed, 3) patients with diagnosed hypertension and RA who whose most recent office blood pressure level was less than 140/90 mm Hg, and 4) smoking status recorded as nonsmoking among ever smokers. Although we only targeted patients with RA with at least moderate ASCVD risk for the promotion of statin treatment, we used the overall population of patients with RA 40 to 75 years of age who did not have a diagnosis of ASCVD as the denominator for the statin measure rather than using a denominator based on calculated ASCVD risk. We did this for two reasons. First, this would keep new, untreated patients from being added to the measure denominator as risk factor data became available, and second, this would avoid patients moving in or out of the denominator based on changes in risk factor levels. Because not all patients with RA had moderate or high ASCVD risk, we did not expect this measure to be as high as the other measures.

Statistical analysis. We calculated each quality measure for patients who met the measure eligibility criteria on the first of each month from July 2016 through June 2017. For each measure, the primary comparison was between the time period before the care management intervention took place (July 2016 to December 2016) and the period of time the care management activity was performed (January 2016 to June 2017), which was referred to as the intervention period. This yielded two time series for each measure. A linear model was fit to each series by using time as a continuous predictor, the intervention period as a dichotomous indicator variable, and a term for the interaction between time and intervention. Subsequently, we determined the autoregressive order of the model residuals by minimizing Akaike's information criterion (18). Finally, we fitted a linear regression model with autoregressive errors (using the appropriate number of autoregressive parameters if any were necessary) to each series. These fitted models were used to test statistical significance. To ensure model validity, we examined several residual diagnostics, the Jarque-Bera and the Shapiro-Wilk tests for normality of

Table 1. Electronic clinical quality measures applied to eligible patients with RA

Performance Measure	Denominator Criteria	Numerator Criteria
Moderate- or high-intensity statin treatment for primary prevention[a]	Age 40-75 years old; excluding diagnosed ASCVD	Moderate- or high-intensity statin on active medication list on measurement date
Hypertension diagnosis	Blood pressure ≥140/90 on the 2 most recent measurements or hypertension diagnosis code on active problem list or visit diagnosis	Hypertension diagnosis code on active problem list or visit diagnosis
Controlled hypertension	Age 18-85 years old and hypertension diagnosis code on active problem list or visit diagnosis	Most recent blood pressure was <140/90
Nonsmoking	Current or former smoker recorded in social history	Former smoker recorded in social history

Abbreviation: ASCVD, atherosclerotic cardiovascular disease.
[a]Because not all patients with RA had moderate or high ASCVD, we did not expect this measure to be as high as the other measures (see Patients and Methods).

residuals, and normal Q-Q and autocorrelation plots (19–21). For analyses, we used SAS version 9.4 (SAS Institute Inc) and R version 3.3.2 (R Foundation for Statistical Computing).

RESULTS

Overall, there were 1399 eligible adult patients with RA (Table 2), among whom 378 had 1 or more potential preventive cardiology care need identified. Characteristics of these 378 patients are presented in Table 3. The mean age was 63.9 (11.1) years, and a majority of patients were women (80.42%). These patients had 229 different primary care clinicians (123 from within the health system and 106 external to the health system). The most common potential care gap found was at least a moderate ASCVD risk and not being prescribed moderate- or high-intensity statin therapy, followed by uncontrolled hypertension, persistently elevated blood pressure without diagnosed hypertension, and current smoking status. Rheumatologists responded with approval to contact 69.1% of patients, responded that 7.9% of patients should not be contacted, and did not respond for 23.0%. Of the 261 patients who were approved for outreach, the care manager successfully reached 84.7% by telephone. The flow of patients through the care management program is depicted in Figure 1.

Rates of each measure prior to implementing the care management activity and at the end of the follow-up period are shown in Table 4. The percentage of patients meeting the statin prescribing measure rose from 18.4% to 23.8%, and the rate of increase for the measure was significantly greater during the care management period compared with baseline, a difference of 1.06% increase per month (95% confidence interval [CI] 0.94-1.17; $P < 0.001$). The percentage with hypertension controlled rose from 59.1% to 65.9% (difference from baseline of 2.09% per month [95% CI 1.67-2.50; $P < 0.001$]), and the percentage of hypertensive patients who had hypertension diagnosed rose from 74.8% to 75.5% (difference from baseline of 1.05% per month [95% CI 0.65-1.45; $P < 0.001$]). Nonsmoking status among current or

Table 2. Characteristics of all patients with RA with 2 or more rheumatology visits in the 18 months prior to December 1, 2016

Characteristic	N = 1399
Age, mean (SD)	57.8 (14.5)
Female sex, n (%)	1171 (83.7)
Hispanic or Latino, n (%)	176 (12.6)
Race and/or ethnicity, n (%)	
Asian	39 (2.8)
Black or African American	228 (16.3)
White	759 (54.3)
Other	373 (26.7)
Current smoker, n (%)	75 (5.4)
Diabetes, n (%)	144 (10.3)
Hypertension, n (%)	362 (25.9)
Diagnosed ASCVD, n (%)	103 (7.4)

Abbreviation: ASCVD, atherosclerotic cardiovascular disease.

Table 3. Characteristics of patients with RA identified with potentially unaddressed preventive cardiology care needs

Characteristic	N = 378
Age, mean (SD)	63.9 (11.1)
Female sex, n (%)	304 (80.4)
Race and/or ethnicity, n (%)	
Hispanic or Latino	29 (7.7)
Non-Hispanic white	182 (48.2)
Non-Hispanic black	100 (26.5)
Other	67 (17.7)
Potentially unaddressed preventive cardiology care need identified[a]	
Moderate or high estimated ASCVD risk and no statin prescribed	215 (56.9)
Undiagnosed hypertension	71 (18.8)
Uncontrolled hypertension	106 (28.0)
Current smoking	63 (16.7)

Abbreviation: ASCVD, atherosclerotic cardiovascular disease.
[a]Individuals could have more than one care need identified.

former smokers did not change. Measure values over time and estimated trend lines are shown in Figure 2.

DISCUSSION

We implemented a patient outreach program in which we specifically sought to address the limitations we observed in our prior work aimed at improving preventive cardiology practice among patients with RA (16). In that prior study, we found that when several contemporary quality improvement strategies were employed (namely clinician education, audit and feedback, point-of-care clinical decision support, and mailed patient outreach), rheumatologists increased their measurement of patients' CVD risk factors, but these methods did not appear to lead rheumatologist to directly manage CVD risk factors themselves, nor were these approaches strong enough to cause these risk factors to be treated in primary care. This extension of that prior work added a more active form of outreach that combined phone and mailed recommendations to patients to encourage them to address the identified cardiac risk factors in primary care, promoted timely appointments, and included planned follow-up. The care management also included direct e-mail, mail, or faxed communication to PCPs on behalf of the patients' rheumatologists that explained the clinical rationale and recommendations for addressing the identified CVD risk factors. With this approach, substantially more patients with RA were prescribed statins, and the rates of hypertension diagnosis and control improved.

We used research staff to conduct the outreach and obtained institutional review board oversight, but we expect that in many settings, practice staff who are authorized to assist with patient care could perform this role without such oversight. It is important to note, however, that maintaining this form of outreach program requires ongoing staff support for care coordination, which may not be available in every health system. In our own institution, as of
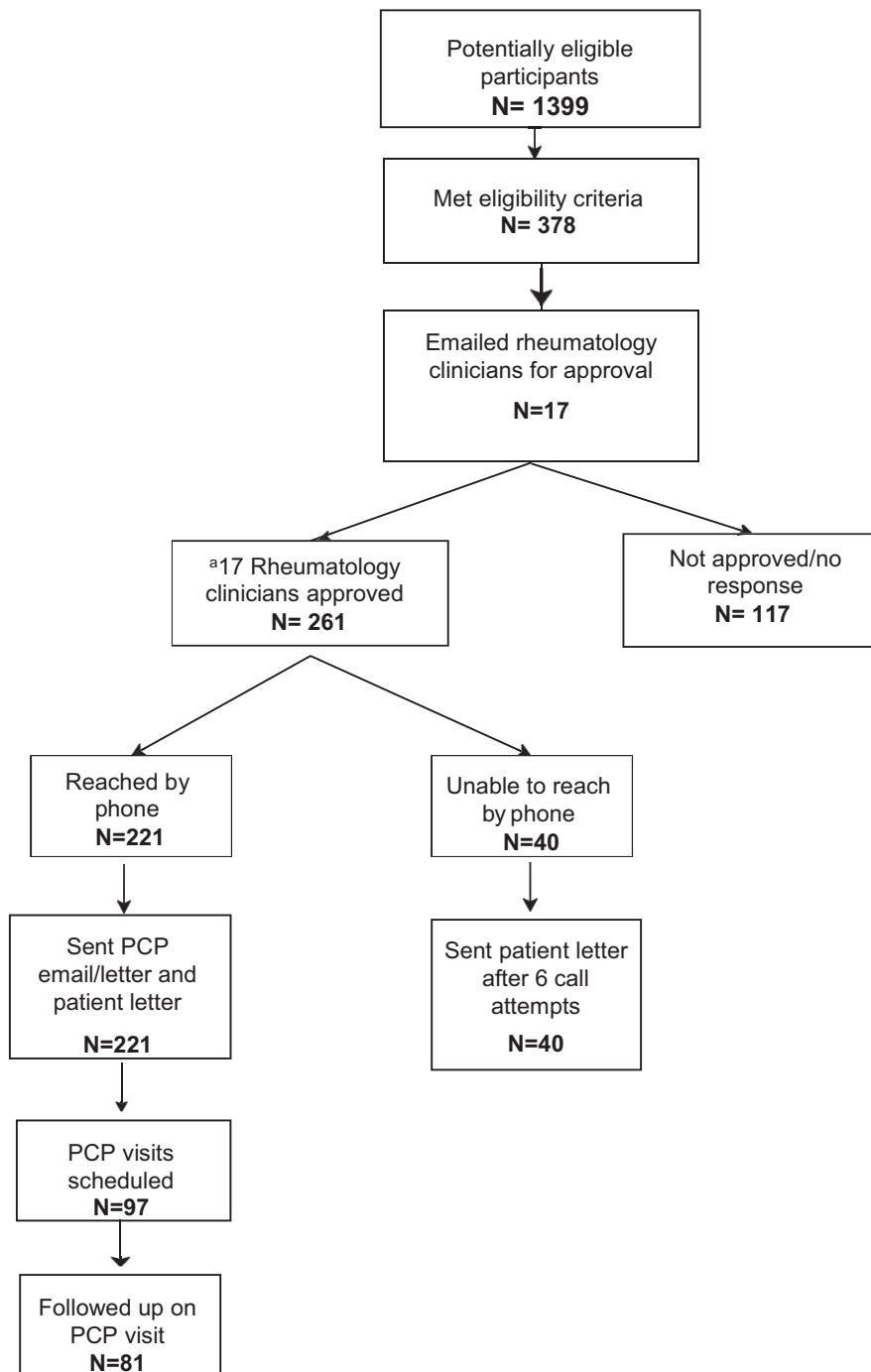
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          │  Potentially eligible   │
          │      participants       │
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          │  Met eligibility criteria │
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│ ª17 Rheumatology     │   │  Not approved/no     │
│ clinicians approved  │   │     response         │
│      N= 261          │   │      N= 117          │
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│ Reached by   │  │ Unable to reach│
│   phone      │  │   by phone   │
│   N=221      │  │    N=40      │
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┌──────────────┐  ┌──────────────┐
│ Sent PCP     │  │ Sent patient │
│ email/letter │  │ letter       │
│ and patient  │  │ after 6 call │
│ letter       │  │ attempts     │
│   N=221      │  │    N=40      │
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│ PCP visits   │
│ scheduled    │
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│ Followed up on│
│ PCP visit    │
│   N=81       │
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Figure 1.　Participant flow diagram. ªAll rheumatology clinicians gave approval for at least some of their patients to be contacted. PCP, primary care physician.

this writing, we have not yet made this service available outside of a research context. Data such as these are important to promote future use of the health system's resources for coordination of care for CVD risk management. Furthermore, as quality measures become an increasingly important component of reimbursement for medical care, it may be that care management approaches, such as that tested here, will provide sufficient return on investment to make them financially feasible.

Significant prior work has been focused on increasing the assessment of CVD risk factors among individuals with RA and on the collaboration between rheumatologists and primary care to enact risk factor management (13,14). However, we are not aware of a previously tested improvement strategy of CVD risk management in RA that relied on care coordination between rheumatology and primary care that has demonstrated increased rates of treatment or control of CVD risk factors. One previously tested model

Table 4. Percentage of eligible patients meeting quality measures and modeled rates of change in performance before and during care management

	Prior To Care Management (November 30, 2016), n/N (%)	End of Follow-up Rate (June 30, 2017), n/N (%)	Slope in Baseline Period,[a] % per Month	Difference in Slope Before and During the Intervention, % per Month	P
Moderate- or high-intensity statin treatment, 40-75 years old[b]	116/625 (18.4)	150/630 (23.8)	0.05	1.06	<0.001
Hypertension diagnosis	491/656 (74.8)	517/685 (75.5)	−0.60	1.05	<0.001
Controlled hypertension	273/462 (59.1)	321/487 (65.9)	−0.93	2.09	<0.001
Nonsmoking among former or current smokers	432/506 (85.4)	445/518 (85.9)	0.03	0.02	0.35

[a]Baseline period: July 2016 to December 2016.
[b]Many individuals included in this group would not be in a group expected to be prescribed a statin.

for CVD prevention in RA used a specifically designed preventive cardio-rheumatology clinic to provide CVD prevention and demonstrated high levels of achieving lipid treatment targets (12). But in the absence of the widespread availability of this kind of specialized service, effective ways to coordinate rheumatology and primary care, such as the approach we employed, will likely be needed to meet the existing preventive cardiology needs of this population. It is important to note that we actively transmitted CVD prevention recommendations from rheumatology to primary care and included information about the elevated CVD risk found in RA. This was intended to overcome previously observed knowledge deficits about the elevated CVD risk associated with RA and to overcome inadequate levels of risk factor assessment and management that has been observed among primary care clinicians (8,10).

Limitations of this study should be noted. There was no control group, so we cannot be assured that contemporaneous factors other than our intervention produced the changes we observed. We were not able to track the adherence to statins or subsequent effects on cholesterol. The smoking measure relied on self-report. We did not conduct an economic analysis, so the cost-effectiveness of this approach is not known. We had already implemented a set of quality improvement strategies so we do not know what, if any, effects (either positive or negative) these may have had on the effectiveness of the current quality improvement activity. Finally, these data were collected at a single large academic rheumatology practice, and the findings may not be generalizable to other practice settings.

Adding care manager outreach to actively promote the treatment in primary care of cardiovascular risk factors identified among patients with RA seen in rheumatology practice was associated with increased statin prescribing, increased hypertension diagnosis in patients with repeatedly elevated blood pressure
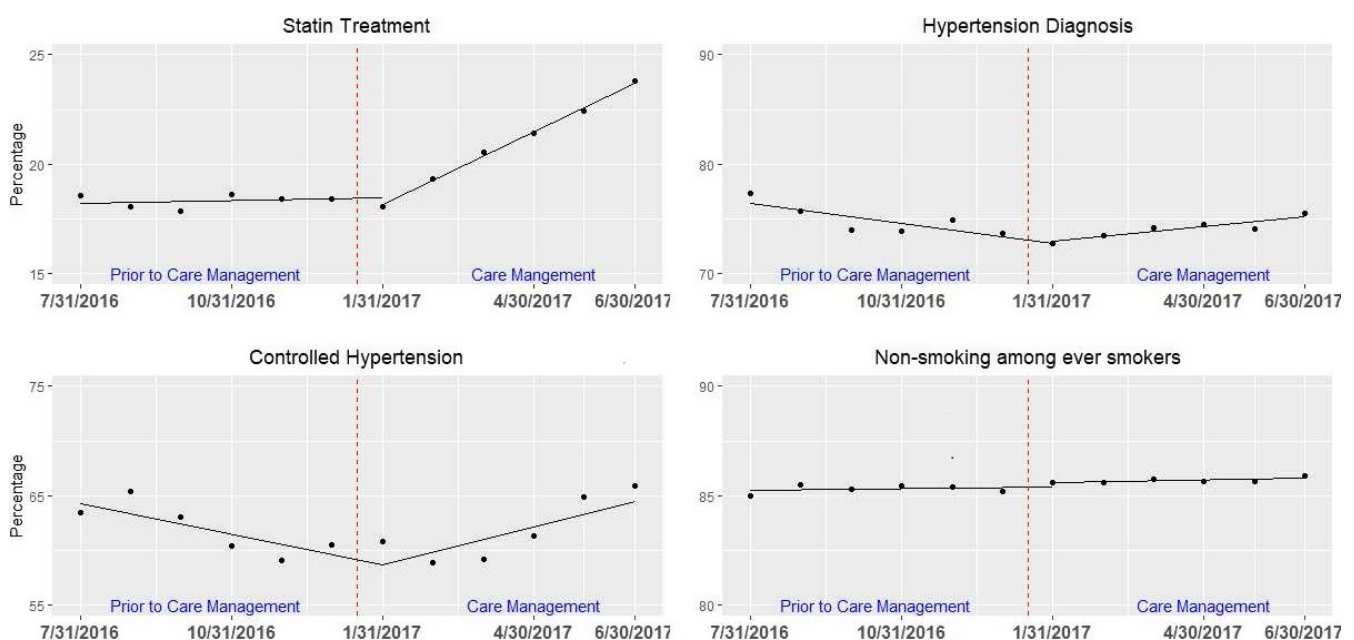
Figure 2. Measured performance at monthly intervals for four preventive cardiology measures before and during the outreach intervention. Trend lines show rates of change in the measures before and during phone and mailed outreach to encourage primary care–based treatment of risk factors and potentially unaddressed preventive cardiology care needs.

levels, and improved hypertension control. This approach to CVD prevention among patients with RA is one approach that practices with sufficient information technology and staffing resources could consider, and this approach could be tried in other clinical areas that require coordination of care across two disciplines.

AUTHOR CONTRIBUTIONS

All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be published. Dr. Persell and Ms. Lee had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study conception and design. Persell, Lee, Lipiszko, Peprah, Ruderman, Schachter, Majka.

Acquisition of data. Lee, Lipiszko, Peprah.

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ROLE OF THE STUDY SPONSOR

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