

© Health Research and Educational Trust  
DOI: 10.1111/j.1475-6773.2012.01429.x  
RESEARCH ARTICLE

# The Patient-Centered Medical Home and Patient Experience

*Grant R. Martsolf, Jeffrey A. Alexander, Yunfeng Shi, Lawrence P. Casalino, Diane R. Rittenhouse, Dennis P. Scanlon, and Stephen M. Shortell*

---

**Objective.** To examine the relationship between practices' reported use of patient-centered medical home (PCMH) processes and patients' perceptions of their care experience.

**Data Source.** Primary survey data from 393 physician practices and 1,304 patients receiving care in those practices.

**Study Design.** This is an observational, cross-sectional study. Using standard ordinary least-squares and a sample selection model, we estimated the association between patients' care experience and the use of PCMH processes in the practices where they receive care.

**Data Collection.** We linked data from a nationally representative survey of individuals with chronic disease and two nationally representative surveys of physician practices.

**Principal Findings.** We found that practices' use of PCMH processes was not associated with patient experience after controlling for sample selection as well as practice and patient characteristics.

**Conclusions.** In our study, which was large, but somewhat limited in its measures of the PCMH and of patient experience, we found no association between PCMH processes and patient experience. The continued accumulation of evidence related to the possibilities of the PCMH, how PCMH is measured, and how the impact of PCMH is gauged provides important information for health care decision makers.

**Key Words.** Patient-centered medical home, patient care experience, primary care, chronic disease

---

The U.S. health care system exhibits substantial gaps between current practices and optimal care. These gaps have been associated with preventable deaths, morbidity, cost, and consumer dissatisfaction (Institute of Medicine, Committee on Quality of Health Care in America 2001). To address these problems, groups such as the American College of Physicians, the American Academy of Family Physicians, and others have promoted the redesign of

organizational infrastructure and clinical care processes in accordance with the functional domains of the patient-centered medical home (PCMH). PCMH is a “team-based model of care led by a personal physician who provides continuous and coordinated care throughout a patient’s lifetime in order to maximize health outcomes” (American College of Physicians 2010). The seven principles of the PCMH include a personal physician, physician-directed medical practice, whole-person orientation, coordinated and integrated care, quality measurement and improvement, enhanced access to care, and payment reforms (Patient-Centered Care Collaborative 2007).

Much of the existing research on the PCMH has focused on the relationship between medical homes<sup>1</sup> and health care–related outcomes. Several studies, for example, suggest that medical homes are associated with increased utilization of preventive services (Gill et al. 2005; Ferrante et al. 2010; Jaen et al. 2010) and decreased hospitalizations and emergency room visits (Palfrey et al. 2004; Gill et al. 2005; Martin et al. 2007; Cooley et al. 2009; Rankin et al. 2009; Roby et al. 2010). Others have also identified improvements in quality (Rankin et al. 2009; Reid et al. 2009, 2010; Jaen et al. 2010) and reduced clinician burnout (Reid et al. 2009, 2010).

However, the relationship between PCMH and patients’ care experience has received less research attention, despite the fact that the PCMH model places both practical and philosophical emphasis on patient-centered care. The limited existing research in this area has produced mixed findings. While some studies have found an association between the PCMH and improved patient experience, others have found that patients have had negative or no significant changes in experiences after PCMH implementation (DeVoe et al. 2008; Reid et al. 2009, 2010; Jaen et al. 2010).

This study examines the relationship between the degree to which physician practices use PCMH processes and patients’ perceptions of the care experience in those practices. Previous related studies have been limited to

---

Address correspondence to Grant R. Martsolf, R.N., M.P.H., Doctoral Candidate, Pennsylvania State University, Department of Health Policy and Administration, 610 N Euclid Ave., Pittsburgh, PA 15206; e-mail: martsolfgr@upmc.edu. Jeffrey A. Alexander, Ph.D., is with the Department of Health Policy and Management, University of Michigan, Ann Arbor, MI. Yunfeng Shi, Ph.D., is with the Center for Health Care Policy and Research, Pennsylvania State University, PA. Lawrence P. Casalino, M.D., M.P.H., Ph.D., is with the Department of Public Health, Weill Cornell Medical College, New York, NY. Diane R. Rittenhouse, M.D., M.P.H., is with the Department of Family and Community Medicine, University of San Francisco, San Francisco, CA. Dennis P. Scanlon, Ph.D., is with the Department of Health Policy and Administration, Pennsylvania State University, PA. Stephen M. Shortell, Ph.D., M.P.H., M.B.A., is with the School of Public Health, University of California, Berkeley, CA.

single-source survey data (such as the Medical Expenditure Panel Survey), single health systems, or practices that had self-selected into a PCMH demonstration project. Our study attempts to address some of these limitations by using a large novel dataset that links responses from a national survey of individuals with chronic disease to two independently administered national surveys of physician practices. Furthermore, this dataset allows us to analyze the association between PCMH processes and patient experience across a large number of diverse practices. A recent paper issued by the Agency for Healthcare Research and Quality ([AHRQ] AHRQ 2011) suggested that, instead of evaluating PCMH implementation within a small set of practices with a large number of patients at each practice, researchers should instead use data from across multiple practices with fewer patients in each practice (AHRQ 2011). Our dataset is uniquely structured to do that. Using this dataset, we address the following research question: Do patients who receive care in physician practices that use more PCMH processes report better care experiences, conditional on other patient and practice characteristics?

## PCMH AND PATIENT EXPERIENCE

The concept of patient experience, as contrasted to the more generic “patient satisfaction,” pertains to how patients perceive specific aspects of the care they receive from their provider. In contrast to patient satisfaction, patient experience is thought to be a more useful indicator of quality because it provides a clear basis for actionable improvements (Jenkinson, Coulter, and Bruster 2002). We focus on three aspects of patient experience: interpersonal exchange, treatment goal setting, and out-of-office contact.

### *Interpersonal Exchange*

Under the basic principles of the PCMH, patients actively participate in decision making and physicians seek feedback to ensure patients’ expectations are being met. Positive interpersonal exchange occurs when providers spend time listening to patients, develop whole-person knowledge, explain things clearly, and provide the kinds of information each patient wants. Such experiences can establish a supportive context for patients to shift from the traditional passive role to one where they participate more actively in their health care (Stewart 1995; Blanquicett et al. 2007). Empirical evidence suggests that high-quality physician communication with patients has been linked to higher

levels of patient adherence to treatment plans, improved self-management of disease, greater recall of important treatment information, and improved mental and physical health status (Roter, Hall, and Aoki 2002; Travaline, Ruchinskas, and D'Alonzo 2005; Ratanawongsa et al. 2008).

### *Treatment Goal Setting*

Treatment goal setting involves joint physician-patient decision making to develop clear and agreed-upon care plans that specifically incorporate preferences of both physicians and patients. The nature and extent of patients' involvement in decision making about their care plan can affect patients' perceptions of their role in their health and health care, their attitude towards this role, and their confidence to successfully perform the required behaviors to achieve better health.

### *Out-of-Office Contact*

Under the PCMH principles, enhanced access to care should be available through new options for communication between patients, their personal physician, and practice staff, including those that link providers and patients outside of the traditional office visit. For example, e-mail communication has been found to be a more convenient form of communication that increases satisfaction among patients (Leong et al. 2005; Rosen and Kwoh 2007; Stalberg et al. 2008; Ye et al. 2010). The importance of out-of-office contact is supported by the fact that approximately one-fifth of U.S. adults reported that they do not get "enough time" with their physician during an office visit (Kaiser Family Foundation 2005) and almost half of them said that they had difficulty in understanding instructions they received from the physician's office (The Commonwealth Fund 2002). Extending physician-patient communication beyond the traditional office visit may provide opportunities to impart and develop patients' knowledge, skills, understanding, and confidence in their role as active participants in their own care.

## METHODS

### *Data*

The study group was obtained by merging three datasets: (1) the Aligning Forces for Quality Consumer Survey (AF4QCS), (2) the 2nd National Survey of

Physician Organizations (NSPO2), and (3) the National Survey of Small and Medium Physician Practices (NSSMPP). The AF4QCS was a population-based random-digit-dial survey of individuals with chronic conditions administered between June 2007 and June 2008. The survey included questions related to consumer engagement, exposure to and use of public reports, and patient experience with their providers. The sample consisted of individuals who were 18 or older with one or more of five chronic conditions: asthma, diabetes, hypertension, heart disease, and depression. Respondents were randomly sampled from the 14 original communities that received grant funding from the Robert Wood Johnson Foundation (RWJF) through the Aligning Forces for Quality project ([AF4Q] Painter and Lavizzo-Mourey 2008). This sample was supplemented by a national sample of consumers from non-AF4Q communities. The final sample size was 8,140 individuals. The overall response rate for the survey was 27.6 percent using the AAPOR (American Association of Public Opinion Research) method of response rate calculation and 45.8 percent using the CASRO (Council of American Survey Research Organizations) method. To assess the degree of nonresponse bias in our survey, we compared respondents in our sample against the 2008 National Health Interview Survey (NHIS) because NHIS has achieved a 90 percent response rate and thus is arguably less likely to be subject to nonresponse bias. We found negligible differences between our respondents and the comparable NHIS sample on demographic characteristics and prevalence of chronic conditions. For example, 49.6 percent of our weighted sample was male compared to 48.3 percent in the NHIS. Similarly, 27.4 percent of our weighted sample had hypertension compared to 27.1 percent of the NHIS sample.

NSPO2 was a nationally representative sample of large physician practices funded by the RWJF that was conducted from March 2006 to March 2007. Practices were included in the sample if they had 20 or more physicians and were primary care, single-specialty cardiology, endocrinology, or pulmonology, or multispecialty practices with significant numbers of physicians in these specialties. Five hundred thirty-eight practices responded to this survey; the overall response rate was 60.3 percent.

NSSMPP, also funded by RWJF, was a nationally representative sample of small and medium sized physician practices that included oversamples in the AF4Q communities. NSSMPP was conducted from July 2007 to March 2009. Practices were included in the survey if they had between 1 and 19 physicians in the same practice types as NSPO2. The final sample size for this survey was 1,809 practices. The overall adjusted response rate was 63.9 percent.

Both NSSMPP and NSPO2 were 40-minute telephone interviews with a practice leader, such as the highest ranking physician or a nonphysician administrator in the practice and included questions related to practices' use of key processes and structures such as information technology, care management processes, and provision of preventive care services. Details related to NSPO and NSSMPP can be found in Rittenhouse et al. (2008, 2011), respectively.

Because the three surveys were conducted independently, it was necessary to merge consumer survey responses with the physician practice information. At the end of the AF4QCS, respondents were asked the name of the doctor that they saw most frequently, the name of the group or clinic that the doctor belonged to, and the city and state in which the doctor (or group/clinic) was located. These answers were used to match AF4QCS respondents to physician survey respondents. The final matching was performed based on conservative matching rules by a trained research assistant. The AF4QCS respondents correctly matched to a primary care or multispecialty practice in the physician surveys were retained in the dataset.

About 1,304 consumers in the AF4QCS (16 percent of all respondents) were matched to 393 physician practices in either NSSMPP or NSPO2; 872 (66.9 percent) of the consumer matches were to practices participating in NSSMPP. Matched respondents were more likely to be white, male, high-income, and better educated. It is important to note, therefore, that our sample should be considered a study group rather than a nationally representative sample. Respondents remained unmatched for two specific reasons. First, a practice reported by an AF4QCS respondent may not have been surveyed in NSSMPP or NSPO2. This type of nonmatch represented the majority (roughly 65 percent) of nonmatches. Our sample also includes more medium-sized practices, primary care practices, and practices with a higher proportion of Medicaid and uninsured patients than the full sample of practices. Accordingly, our sample should be considered as a study group. Second, a respondent may not have provided useful physician practice information or refused to answer the questions. These types of nonmatches represented a minority (roughly 35 percent), but still significant proportion of the nonmatches. We employed a selection model (explained below) that attempted to correct for the potential bias due to systematic nonmatches.

### *Dependent Variables*

Our study examined three measures of patient care experience: (1) interpersonal exchange, (2) treatment goal setting, and (3) out-of-office contact. These

measures of patient experience were based on nine survey items related to patients' interactions with their physician during and outside of care visits over the past 6–12 months. The specific items can be found in Appendix S1. These items have been used in previous studies of patients' perceptions of the care experience. The interpersonal exchange measure captures the quality of interpersonal exchange during office visits; for example, whether the physician explains things clearly and spends enough time with the patient (Hays et al. 1999). Treatment goal setting is an indicator of collaboration between physicians and patients when establishing care plans (Glasgow et al. 2005; Strouse et al. 2009). Out-of-office contact represents contact by physicians through phone, mail, or e-mail, outside of the office visit (Albright et al. 1999; Freeman, Sullivan & Company 1999; Wasserman et al. 2001).

Responses to these nine items were subjected to a confirmatory factor analysis to assess whether they constituted distinct dimensions of the patient experience. Factor analysis results supported a three-factor solution consistent with the three theoretical dimensions of patient care experience (Bentler and Bonett 1980; Browne and Cudeck 1993). Accordingly, three scales were constructed by averaging the scores for the three relevant items in each factor. All items were scored such that higher scores reflected more positive patient experience. A number of alternative approaches to calculating these variables were also considered. For example, we made each of the individual items binary and calculated the average of those items. We also calculated factor scores, but because the factor loadings were nearly identical the factor score was essentially the same as the simple mean. The results were robust to different calculation schemes.

### *Patient-Centered Medical Home Index*

The main independent variable is the PCMH Index, which measures the use of specific PCMH processes. This index is comprised of four subindices that measure 4 of 7 principles of the PCMH model, which were combined to form a single index. These subindices are created using the same approach as previous studies (Rittenhouse et al. 2008, 2011) and include the following: physician-directed medical practice, coordination and integration, quality and safety, and enhanced access. The specific components are outlined in Appendix S2.

The PCMH Index was calculated as the summation of the four subindex scores after they were standardized on a 0–1 scale (ranging from 0 to 4). Practices with 1–2 physicians were not asked about primary care teams, so the

PCMH Index ranged from 0 to 3 for those practices. Therefore, the PCMH Index for those practices was calculated as a percent of the total possible points for that practice and multiplied by 4. To check the sensitivity of the results to different calculation techniques, we also calculated the PCMH Index by adding the total points in each subindex (ranging from 0 to 17) without standardizing. Results were very similar using both approaches.

It is important to emphasize that our PCMH Index is not intended to represent PCMH as an integrated system of care, but rather a measure of the extent to which physician practices use processes associated with the PCMH model. The measure makes no assumptions about the relationship among these processes, the order in which they are adopted and implemented, or the relative importance of the process to the PCMH model of care.

### *Covariates*

We also included a number of practice-level and patient-level covariates that we believe, based on the literature and theory, were likely associated with both being in a practice with more PCMH processes and perceiving a better care experience. The variable specifications for the patient-level and practice-level control variables are shown in Table 1.

*Practice-Level Covariates.* We included three variables that capture characteristics of the physician practices where patients receive their care, including practice size, primary care versus multispecialty practices, the ownership status of the practice, and the proportion of revenue that came from patients that had either Medicaid or were uninsured. Each of these variables likely affects the type and level of resources available as well as the interest and willingness to implement PCMH processes (Rittenhouse et al. 2008; Goldberg and Kuzel, 2010; Rittenhouse et al. 2011). Furthermore, patients at practices with different levels of practice-level covariates are also likely to have different care experiences (Rodriguez et al. 2009).

*Patient-Level Covariates.* Three categories of patient-level control variables were incorporated in this study: socio-demographics, health status, and exposure to health care provider. Four socio-demographic variables included race, age, education, and income. Health status was measured by the presence any of five chronic conditions (diabetes, hypertension, heart disease,



Table 1: Sample Descriptive Statistics

	<i>Mean/Proportion</i>	<i>SD</i>
<i>Patient experience variables</i>		
Interpersonal exchange (0–4 scale)	3.47	0.53
Treatment goal setting (0–4 scale)	2.93	0.75
Out-of-office contact (0–2 scale)	0.52	0.33
<i>PCMH variable</i>		
PCMH Index	1.47	0.86
<i>Practice-level covariates</i>		
Practice size		
1–2 physicians	14.49%	–
3–7 physicians	36.27%	–
8–12 physicians	11.2%	–
13–19 physicians	4.91%	–
20+ physicians	33.13%	–
Practice composition		
PCP	58.28%	–
Multispecialty practice	41.72%	–
Revenue source		
Percentage revenue: Medicaid and uninsured	18.71%	18.75
<i>Patient-level covariates</i>		
Sociodemographics		
Race		
White, non-Hispanic	71.08%	–
Black, non-Hispanic	18.08%	–
Hispanic	5.31%	–
Other	5.54%	–
Age	58.46	14.35
Education	14.40	6.96
Income	\$49,298.21	\$34,161.24
Health status		
Diabetes	31.90%	–
Hypertension	70.25%	–
Heart disease	17.41%	–
Asthma	20.86%	–
Depression	32.06%	–
Exposure to health care provider		
Provider visits		
Mean	1.42	2.03
Switch provider		
Yes	11.58%	–
No	88.42%	–

asthma, and depression). Measures of respondents' exposure to their current provider included the number of provider visits over a 3-month period and whether the respondent switched providers over the past year. We included patient-level characteristics because they may be associated with being in a

practice that uses more PCMH processes (Raphael et al. 2009; Stevens et al. 2009) and because they are also likely correlated with the patient care experience (The Commonwealth Fund 2002; Willems et al. 2005; Wilshire et al. 2009).

## ANALYTICAL MODEL

### *Baseline Analysis*

As a baseline analysis, we estimated a linear regression model with the following specification:

$$PE_{ij} = \alpha + \beta * PCMH_j + \sum_{k=1}^K \theta_k X_i + \sum_{n=1}^N \gamma_n Z_j + \varepsilon_{ij} \quad (1)$$

where  $i$  and  $j$  index patients and physician practices, respectively. The outcome variable on the left-hand side measures (a particular aspect of) the patient experience. Our key explanatory variable is *PCMH*. There are  $K$  patient-level and  $N$  practice-level covariates ( $X$ 's and  $Z$ 's) included, corresponding to the same number of parameters. The stochastic term  $\varepsilon$  represents unobserved patient and practice characteristics. We estimated the model using ordinary least-squares (OLS) with robust standard errors clustered at the level of physician practices.

### *Sample Selection*

Because many patients could not be matched to a practice in the physician surveys, there was a potential concern about sample selection bias, as the patients who gave usable physician information may systematically differ from those who failed to do so. If such (unobserved) systematic differences were correlated with patient experience, our regression coefficients from OLS would be biased and inconsistent.

To address this potential problem, we adopted the selection model proposed by Heckman (1979). Our motivation for using the model was two-fold. First, an initial comparison showed that the average experience measures of the patients included in the final sample were higher than patients who responded to the survey but were not matched to a NSSMPP or NSPO2 practice. Second, the *potential* effects of the PCMH on the experience of *all* the patients in the consumer survey (not just the study group)

were of interest in this case. Without correcting for the possible selection bias, our conclusion from the model cannot be generalized beyond the study group.

The Heckman approach extended our baseline model to include the following selection equation:

$$\Pr(S_i = 1 | W_i) = F(\phi_0 + \sum_{m=1}^M \phi_m W_i) \quad (2)$$

where  $S$  is a binary variable indicating whether the patient was in the final study group. There are  $M$  predicting variables ( $W$ 's) in the equation, including patient-level characteristics from the main equation (1) including age, race, income, and education.  $F(\cdot)$  is the standard normal cumulative distribution function. Equations (1) and (2) are estimated sequentially by the standard two-step procedure (Heckman 1979), with adjusted standard errors. Because the predicting variables were also used in the main equation, the selection model presented here relies solely on the normality assumption for identification.

In an alternative specification, we also used additional exclusion restrictions as “selection instruments.”<sup>2</sup> Four variables were created from the data and used as exclusion restrictions in the first-stage equation of our selection model. We used three dummy variables (1 = nonmissing, 0 = missing) measuring an individual’s tendency and accuracy of reporting potentially sensitive personal information, including (1) working e-mail address, (2) street address, and (3) reference contact that could be used to locate the respondents for a follow-up survey. We also included another variable indicating the general missingness patterns in the responses, counting the frequency (ranging from 0–7) of missing and “don’t know” among the following variables: income, having a regular physician, diagnosis of diabetes, diagnosis of heart disease, diagnosis of hypertension, diagnosis of asthma, and diagnosis of depression. The regressors in this selection equation (first stage) were jointly significant, indicating that our first-stage model had overall explanatory power for the selection mechanism. Also, two of the variables serving as exclusion restrictions (count of missing values and missing follow-up references) were individually significant, indicating that our “selection instruments” were operational (Madden 2008). However, since the validity of those exclusion restrictions cannot be easily checked and results across both selection models were nearly identical, we chose to present the version without them.

## RESULTS

### Multivariate Regression Results

Table 2 presents multivariate regression results for the relationship between the use of PCMH processes and the three measures of patient experience. Based on the estimated coefficients, the use of PCMH processes was not significantly associated with any of the three measures of patient experience. Results are discussed for the OLS model, while the selection model (Table 3) was considered as a secondary specification. The results from the two models

Table 2: Ordinary Least-Squares (OLS) Multivariate Regression Results

	<i>Interpersonal Exchange</i>	<i>Treatment Goal Setting</i>	<i>Out-of-Office Contact</i>
PCMH Index	-0.014 [0.025]	0.068 [0.034]	0.017 [0.015]
3–7 physicians <sup>†</sup>	-0.081 [0.050]	0.048 [0.075]	0.03 [0.029]
8–12 physicians <sup>†</sup>	-0.05 [0.069]	0.03 [0.095]	0.014 [0.035]
13–19 physicians <sup>†</sup>	0.036 [0.108]	-0.063 [0.124]	-0.035 [0.050]
20+ physicians <sup>†</sup>	-0.046 [0.075]	-0.15 [0.115]	0.065 [0.045]
Hospital-owned practice <sup>‡</sup>	-0.042 [0.043]	-0.082 [0.061]	-0.008 [0.025]
Jointly-owned practice <sup>‡</sup>	0.125 [0.044]*	-0.045 [0.063]	-0.052 [0.035]
Other-owned practice <sup>‡</sup>	0.066 [0.049]	0.114 [0.091]	-0.016 [0.028]
Percentage revenue:			
Medicaid and uninsured	-0.001 [0.001]	-0.001 [0.001]	-0.001 [0.000]
Multispecialty practice <sup>§</sup>	-0.065 [0.059]	0.059 [0.084]	-0.024 [0.034]
Age	0.001 [0.001]	0.002 [0.002]	0.002 [0.001]*
Income	1.09e-06 [4.80e-07]*	-6.92e-07 [7.34e-07]	2.37e-07 [2.59e-07]
Education	0.007 [0.003]*	-0.001 [0.005]	-0.002 [0.002]
Black, non-Hispanic <sup>¶</sup>	0.002 [0.040]	0.15 [0.061]	0.076 [0.026]*
Hispanic <sup>¶</sup>	-0.151 [0.070]*	0.022 [0.090]	0.031 [0.032]
Other race <sup>¶</sup>	-0.12 [0.055]	0.018 [0.091]	0.045 [0.040]
Diabetes	0.068 [0.029]	0.251 [0.049]*	0.118 [0.020]*
Hypertension	0.013 [0.037]	0.051 [0.051]	0.002 [0.024]
Heart disease	0.028 [0.038]	0.072 [0.048]	0.063 [0.022]*
Asthma	0.015 [0.042]	-0.035 [0.073]	0.089 [0.021]*
Depression	-0.013 [0.042]	-0.107 [0.042]	-0.006 [0.024]
Provider visits	-0.019 [0.008]*	0.006 [0.011]	0.01 [0.004]*
Switch provider	-0.177 [0.061]*	-0.232 [0.085]*	-0.026 [0.031]
Intercept	3.4 [0.111]*	2.706 [0.162]*	0.285 [0.073]*
N	1281	1183	1292

Table cells shows beta coefficients with standard errors in brackets.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

<sup>†</sup>Referent group is 1–2 physicians.

<sup>‡</sup>Referent group is physician-owned practice.

<sup>§</sup>Referent group is primary care practice.

<sup>¶</sup>Referent group is white, non-Hispanic.

Table 3: Heckman Selection Model Results

	<i>Interpersonal Exchange</i>	<i>Treatment Goal Setting</i>	<i>Out-of-Office Contact</i>
Second stage			
PCMH Index	-.015 [0.026]	0.065 [0.037]	0.015 [0.016]
3–7 Physicians <sup>†</sup>	-0.094 [0.048]	0.053 [0.069]	0.034 [0.029]
8–12 Physicians <sup>†</sup>	-0.057 [0.064]	0.038 [0.093]	0.011 [0.039]
13–19 Physicians <sup>†</sup>	0.002 [0.089]	-0.040 [0.133]	-0.036 [0.054]
20+ Physicians <sup>†</sup>	-0.063 [0.076]	-0.143 [0.111]	0.055 [0.046]
Hospital-owned practice <sup>‡</sup>	-0.036 [0.043]	-0.079 [0.063]	-0.001 [0.026]
Jointly-owned practice <sup>‡</sup>	0.118 [0.077]	-0.023 [0.111]	-0.053 [0.047]
Other-owned practice <sup>‡</sup>	0.060 [0.048]	0.119 [0.094]	-0.008 [0.033]
Percentage revenue: Medicaid and uninsured	-0.001 [0.001]	-0.001 [0.001]	-0.001 [5.24e-04]*
Multispecialty practice <sup>§</sup>	-0.064 [0.056]	0.061 [0.081]	-0.020 [0.034]
Age	0.001 [0.001]	0.001 [0.002]	0.002 [0.001]**
Income	8.94e-09 [8.12e-07]	-1.65e-06 [1.14e-06]	-5.19e-07 [5.24e-07]
Education	0.005 [0.004]	-0.006 [0.006]	-0.004 [0.003]
Black, non-Hispanic <sup>¶</sup>	0.152 [0.112]	0.319 [0.162]*	0.195 [0.071]**
Hispanic <sup>¶</sup>	-0.013 [0.106]	0.125 [0.141]	0.121 [0.069]*
Other race <sup>¶</sup>	-0.114 [0.082]	0.038 [0.120]	0.058 [0.053]
Diabetes	0.064 [0.034]*	0.247 [0.049]***	0.119 [0.071]***
Hypertension	0.018 [0.036]	0.064 [0.052]	0.006 [0.022]
Heart disease	0.027 [0.042]	0.081 [0.049]	0.078 [0.026]*
Asthma	0.018 [0.039]	-0.035 [0.074]	0.099 [0.022]**
Depression	-0.022 [0.035]	-0.117 [0.052]*	0.001 [0.022]
Provider visits	-0.019 [0.008]**	0.006 [0.011]	0.01 [0.005]**
Switch provider	-0.169 [0.047]***	-0.222 [0.069]**	-0.021 [0.029]
Inverse Mills ratio	-0.761 [0.459]*	-0.837 [0.713]	-0.556 [0.289]*
Intercept	4.615 [0.744]***	4.080 [1.154]*	0.511 [0.208]
First stage			
Age	0.001 [0.001]	0.001 [0.001]	0.001 [0.001]
Black, non-Hispanic <sup>¶</sup>	-0.263 [0.056]***	-.249 [0.47]***	-.263 [0.46]***
Hispanic <sup>¶</sup>	-0.164 [0.076]*	-0.137 [0.077]	-0.168 [0.076]
Other race <sup>¶</sup>	-0.018 [0.079]	-0.063 [0.082]	-0.015 [0.079]
Income	1.01e-06 [5.67e-07]	9.85e-07 [5.80e-07]	1.01e-06 [5.66e-07]
Education	0.068 [-0.020]**	0.059 [-0.021]**	0.069 [-0.020]**
Intercept	-1.196 [1.101]***	-1.118 [1.103]***	-1.193 [1.101]***
Chi-square	52.75**	78.5***	105.3***
N	7125	7039	7135

Table cells shows beta coefficients with standard errors in brackets.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

<sup>†</sup>Referent group is 1–2 physicians.

<sup>‡</sup>Referent group is physician-owned practice.

<sup>§</sup>Referent group is primary care practice.

<sup>¶</sup>Referent group is white, non-Hispanic.

were similar. Associations between patient experience and each of the practice-level and patient-level covariates are discussed below.

*Interpersonal Exchange.* Patients were significantly more likely to express positive perceptions of their interpersonal exchange with providers if the practice in which they received care was jointly owned by physicians and a hospital compared to those in a purely physician-owned practice. Individuals who had higher levels of education and income were more likely to hold positive perceptions of the quality of interpersonal exchange while Hispanic patients, those with more provider visits, and those who recently switched providers were less likely to hold positive perceptions.

*Treatment Goal Setting.* No practice characteristics were significantly associated with patients' perceptions of the quality of treatment goal setting with their providers. Patients who had diabetes were more likely to perceive higher quality treatment goal setting experiences with their physicians. However, patients who recently switched physicians were less likely to positively view the treatment goal setting experience with providers.

*Out-of-Office Contact.* No practice characteristics were associated with patients' perceptions of out-of-office contact with providers. Individuals who were older, black, who had diabetes, heart disease, or asthma, and who had more provider visits in the past year were more likely to hold positive views of out-of-office contact with their providers.

*Joint Significance of Grouped Covariates.* As shown in the main results (Table 2), the majority of the covariates were not significant individually and there was no clear pattern. To address our concern for the overall explanatory power of the model, we combined patient-level and the practice-level covariates into three groups and tested the joint significance of the grouped variables. The three groups were the following: (1) patient socio-demographic characteristics (i.e., age, race, income, and education); (2) patient health status (i.e., the five chronic illness indicators); and (3) physician practice characteristics (other than the PCMH Index). The results are presented in Table 4. Both practice and patient characteristics were jointly associated with a number of the patient

Table 4: Joint Significance of Grouped Covariates

	<i>Interpersonal Exchange</i>		<i>Treatment Goal-Setting</i>		<i>Out-of-Office Contact</i>	
	<i>F</i>	<i>p-value</i>	<i>F</i>	<i>p-value</i>	<i>F</i>	<i>p-value</i>
Socio-demographics*	4.54	0.0002	1.50	0.1771	3.23	0.0041
Health status*	1.52	0.1840	8.54	0.0000	14.84	0.0000
Practice characteristics*	1.92	0.0484	1.36	0.2026	2.10	0.0284

\*Specific variables found in Table 1.

care experience variables, even if many of the individual variables were not significant.

## DISCUSSION

Despite the importance of patient-centered care in the PCMH model, relatively little research has assessed the care experienced by patients in practices conforming to the PCMH model. We find that, after accounting for sample selection bias and controlling for patient and practice characteristics, greater use of PCMH processes was not associated with our measures of patient experience. We believe that there are five possible explanations for the lack of association.

First, our measure includes a large number of processes necessary, but not sufficient, for the full implementation of the PCMH model. These processes correspond to four of the seven PCMH principles and exclude important aspects of patient-centered care such as having a personal physician or whole-person care that, if measured, might impact patient experience. Some of the processes that we measured may not have a strong impact on the elements of patient experience included in our study. For example, whereas the use of patient registries is an important component of the PCMH model, patients are unlikely to be aware of such registries or to understand their use. The use of registries and other “back office” components of the PCMH model will influence patients’ care experience only to the extent that the use of these components contributes to, or distracts from, the delivery of patient-centered care. Furthermore, our measures of the four PCMH principles are comprehensive but not complete. For example, our measures of enhanced access are limited to only two processes and do not include a measure of afterhours care.

Second, most practices we surveyed were not explicitly attempting to become a PCMH and used relatively few of the measured PCMH processes; none had implemented the full complement. It is plausible that the impact of the PCMH may not be felt by patients until practices are closer to full implementation of the model, and that implementation of the whole is more than the sum of its parts. The holistic view of the PCMH would suggest that until the PCMH is fully integrated as a system of care in a physician practices, measureable results at the patient level may be limited.

Third, we estimated essentially a contemporaneous relationship between the PCMH Index and patient care experience. However, it may be the case that PCMH processes have a lagged effect on patient experience. It may take time for measureable results to be detected. For example, as practices begin to incorporate electronic health records and change provider roles and workflows, these changes may initially increase wait times and provider frustration and have a mixed impact on the patient experience. Related to the timing of the data collection, it is worth noting that some of the physician survey data was collected after some of the consumer survey data. To the extent that the PCMH processes were undertaken by the practice after a patient's data was collected, the timing of the surveys may contribute to the null findings.

Fourth, another potential explanation is that we may not have a large enough sample size to estimate small effects of PCMH on patient experience. Because the dependent variables and the PCMH Index are aggregates from ordinal scales, it is hard to know a priori what the effect size might be. Therefore, it is difficult to assess whether power is an important explanation for the lack of statistically significant findings. However, our sample size is similar to or larger than other studies that have investigated the relationship between PCMH and patient experience. We believe that our sample, combined with the detailed information of PCMH processes, is already an improvement over previous studies in terms of data.

Finally, it is possible that the PCMH model may not actually have an association with patient experience. Patient experience is a complex, multidimensional concept driven by an array of individual and environmental influences that the PCMH model, or any practice model, may not be able to address (Stevens and Shi 2003; Rodriguez et al. 2009). These influences are likely to be varied and vast, including patient characteristics that cannot be easily measured such as prior expectations, preferences, attitudes, and available resources that may be in place before a patient ever interacts with a



provider. Therefore, patient experience may be difficult to impact, given that providers may have limited interaction with patients and lack control over outside or prior factors that may shape expectations, preferences, and attitudes. Although the PCMH aims to transform the nature of the physician-patient relationship, it is not yet known whether patients will become more active in their care or change their expectations of the care encounter with their providers under the PCMH.

Our results raise a number of questions and considerations. First, many of the existing measures of the PCMH illustrate an important conceptual question: Is PCMH more than the sum of its parts? PCMH is a holistic model. However, in practice, the model can be operationalized as a collection of processes and changes. It is unclear at what point a practice might cross over from having a number of PCMH processes to becoming a "PCMH" that might begin to significantly affect patient experience. Also, our findings raise an important question about how the impact of the PCMH might be measured. We find that contemporaneous measures of patient experience are not associated with the use of PCMH processes. This does not mean that patient experience is not important, but it does suggest the need for more thinking about how and when to measure the impact of PCMH. As criteria are developed to gauge PCMH implementation and its impact, decision makers should consider the complex associations between particular aspects of the model, multiple important outcomes, and time.

Finally, despite the fact that we did not find a statistically significant association between the use of PCMH processes and patient experience, patient-centeredness remains a foundational concept underlying the PCMH model. Our results do suggest that practices should execute the model with close attention to enhancing the experience of patients. Furthermore, policy may also have to include incentives for patients to assume a more active role in their care in addition to supporting physician payment reform.

## LIMITATIONS

Our study has important limitations. The study group that we used may not be representative of a given population of patients or practices. The matching of patients and practices was incidental, and we were able to match only a small proportion of patients from the patient survey. Although we used the Heckman model to correct for patient selection in our study group, such a

procedure would not completely solve the problem of a nonrepresentative patient sample. Therefore, our results need to be interpreted with caution, especially when generalizing. However, there are very little data on the relationship between patient experience and the PCMH, and our approach yields a sample that is larger and more geographically diverse than most other similar studies.

In addition, this is a cross-sectional study and causality cannot be inferred. Although our model controlled for a number of important patient and practice characteristics, the PCMH Index is likely endogenous as there may still be unobserved factors associated with both the PCMH Index and patient experience. For example, if the physicians in a practice are highly motivated to improve patient care because of organizational culture or strong local competition, they may implement more PCMH processes while taking other unobserved actions that improve the care experience. In such a case, the estimated PCMH coefficient in our model would be biased upward.

## CONCLUSION

The PCMH has emerged as a prominent approach to improving physician practice and is being adopted, endorsed, and promoted by stakeholders from across the health care landscape (Rittenhouse and Shortell 2009; Centers for Medicare and Medicaid Services 2011). In our study, which included a large number of patients and practices but is somewhat limited in its measures of the PCMH and of patient experience, we did not find a significant cross-sectional association between the use of PCMH processes and patient experience. The continued accumulation of evidence related to the possibilities and limitations of the PCMH, how PCMH is measured, and how the impact of PCMH is gauged can provide critical information to health care leaders working to develop more effective ambulatory care delivery systems.

## ACKNOWLEDGMENTS

*Joint Acknowledgment/Disclosure Statement:* This research was supported by the Robert Wood Johnson Foundation through the Aligning Forces for Quality project.

## NOTES

1. Some of this literature focuses on “medical homes” more generally, as opposed to the more recent specification of “patient-centered medical homes.” However, the operational differences are not large enough to warrant considering them different models.
2. As those variables were also used in the main equation, the selection model presented here relies solely on the normality assumption for identification. In an alternative specification, we used additional exclusion restrictions as our “selection instruments.” No meaningful difference has been found between the two specifications. Since the validity of those exclusion restrictions cannot be easily checked, we choose to present the version without them.

## REFERENCES

- AHRQ. 2011. “Improving Evaluations of the Medical Home” [accessed on January 20, 2012]. Available at: [http://pcmh.ahrq.gov/portal/server.pt/gateway/PTARGS\\_0\\_12547\\_955655\\_0\\_0\\_18/Improving%20Evaluations%20of%20the%20Medical%20Home.pdf](http://pcmh.ahrq.gov/portal/server.pt/gateway/PTARGS_0_12547_955655_0_0_18/Improving%20Evaluations%20of%20the%20Medical%20Home.pdf)
- Albright, A. L., D. Hopkins, G. Boyce-Smith, and J. Wasserman. 1999. *California Collaborative to Improve Diabetes Management (CCHRI)*. Chicago: American Public Health Association Conference.
- American College of Physicians. 2010. “Patient-Centered Medical Homes” [accessed on September 7, 2010]. Available at [http://www.acponline.org/running\\_practice/pcmh/](http://www.acponline.org/running_practice/pcmh/)
- Bentler, P. M., and D. G. Bonett. 1980. “Significance Tests and Goodness of Fit in the Analysis of Covariance Structures.” *Psychological Bulletin* 88: 588–606.
- Blanquicett, C., J. H. Amsbary, C. Mills, and L. Powell. 2007. “Examining the Perceptions of Doctor-Patient Communication.” *Human Communication* 10 (4): 421–35.
- Browne, M. W., and R. Cudeck. 1993. “Alternative Ways of Assessing Model Fit.” In *Testing Structural Equation Models*, edited by K. A. Bollen and J. S. Long, pp. 445–55. Newbury Park, CA: Sage Publications.
- Centers for Medicare and Medicaid Services. 2011. “Details for Medicare Medical Home Demonstration” [accessed on February 8, 2011]. Available at <https://www.cms.gov/demoprojectsevalrpts/md/itemdetail.asp?filterType=none&filterByDID=99&sortByDID=3&sortOrder=descending&itemID=CMS1199247&intNumPerPage=10>
- The Commonwealth Fund. 2002. “Diverse Communities, Common Concerns: Assessing Health Care Quality for Minority Americans” [accessed on August 8 2011]. Available at <http://www.commonwealthfund.org/~media/Files/Publications/Fund%20Report/2002/Mar/Diverse%20Communities%20%20Common%20Concerns%20%20Assessing%20Health%20Care%20>

Quality%20for%20Minority%20Americans/collins\_diversecommun\_523%20pdf.pdf

- Cooley, W. C., J. W. McAllister, K. Sherrieb, and K. Kuhlthau. 2009. "Improved Outcomes Associated with Medical Home Implementation in Pediatric Primary Care." *Pediatrics* 124 (1): 358–64.
- DeVoe, J. E., L. S. Wallace, N. Pandhi, R. Solotaroff, and G. E. Fryer Jr. 2008. "Comprehending Care in a Medical Home: A Usual Source of Care and Patients Perceptions about Healthcare Communication." *Journal of the American Board of Family Medicine* 21 (5): 441–50.
- Ferrante, J. M., B. A. Balasubramanian, S. V. Hudson, and B. F. Crabtree. 2010. "Principles of the Patient-Centered-Medical Home and Preventive Services Delivery." *Annals of Family Medicine* 8 (2): 108–16.
- Freeman, Sullivan & Company. 1999. *Survey Operations Report: Diabetes Patient Survey*. Prepared for the California Collaborative to Improve Diabetes Management. San Francisco: Freeman, Sullivan & Co.
- Gill, J. M., H. B. Fagan, B. Townsend, and A. G. Mainous. 2005. "Impact of Providing a Medical Home to the Uninsured: Evaluation of a Statewide Program." *Journal of Health Care for the Poor and Underserved* 16 (3): 515–35.
- Glasgow, R. E., E. H. Wagner, J. Schaefer, L. D. Mahoney, R. J. Reid, and S. M. Greene. 2005. "Development and Validation of the Patient Assessment of Chronic Illness Care (PACIC)." *Medical Care* 43: 436–44.
- Goldberg, D. G., and A. J. Kuzel. 2010. "Elements of the Patient-Centered Medical Home in family practices in Virginia." *Annals of Family Medicine* 7 (4): 301–8.
- Hays, R., J. Shaul, V. Williams, J. Lubalin, L. Harris, S. Sweeny, and P. Clearly. 1999. "Psychometric Properties of the CAHPS 1.0 Survey Measures." *Medical Care* 37: 22–31.
- Heckman, J. 1979. "Sample Selection Bias as a Specification Error." *Econometrica* 47 (1): 153–61.
- Institute of Medicine, Committee on Quality of Health Care in America. 2001. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: Institute of Medicine.
- Jaen, C. R., R. L. Ferrer, W. L. Miller, R. F. Palmer, R. Wood, M. Davila, E. E. Stewart, B. F. Crabtree, P. A. Nutting, and K. C. Stange. 2010. "Patient Outcomes at 26 Months in the Patient-Centered Medical Home National Demonstration Project." *Annals of Family Medicine* 8 (1): S57–S67.
- Jenkinson, C., A. Coulter, and S. Bruster. 2002. "The Picker Patient Experience Questionnaire: Development and Validation Using Data from In-Patient Surveys in Five Countries." *International Journal of Quality in Health Care* 14 (5): 353–8.
- Kaiser Family Foundation. 2005. "Health Care Costs Survey" [accessed on May 22, 2011]. Available at <http://www.kff.org/newsmedia/upload/7371.pdf>
- Leong, S. L., D. Gingrich, P. R. Lewis, D. T. Mauger, and J. H. George. 2005. "Enhancing Doctor-Patient Communication Using Email: A Pilot Study." *Journal of the American Board of Family Practice* 18 (3): 180–8.

- Madden, D. 2008. "Sample Selection Versus Two-Part Models Revisited: The Case of Female Smoking and Drinking." *Journal of Health Economics* 27: 300–7.
- Martin, Brock A., S. Crawford, J. C. Probst, G. Smith, R. P. Saunders, K. W. Watkins, and K. Luchok. 2007. "Medical Homes for Children with Special Health Care Needs." *Journal of Health Care for the Poor and Underserved* 18 (4): 916–30.
- Painter, M. W., and R. Lavizzo-Mourey. 2008. "Aligning Forces for Quality: A Program to Improve Health and Health Care in Communities across the United States." *Health Affairs* 27 (5): 1461–3.
- Palfrey, S., L. A. Sofis, E. J. Davidson, J. Liu, L. Freeman, and M. L. Ganz. 2004. "The Pediatric Alliance for Coordinated Care: Evaluation of a Medical Home Model." *Pediatrics* 113 (5): 1507–16.
- Patient-Centered Care Collaborative. 2007. "Joint Principles of the Patient-Centered Medical Home" [accessed on June 23, 2011]. Available at <http://www.pcpcc.net/content/joint-principles-patient-centered-medical-home>
- Rankin, K. M., A. Cooper, K. Sanabria, H. J. Binns, and C. Onufer. 2009. "Illinois Medical Home Project: Pilot Intervention and Evaluation." *American Journal of Medical Quality* 24 (4): 302–9.
- Raphael, J. L., B. A. Guadagnolo, A. C. Beal, and A. P. Giardino. 2009. "Racial and Ethnic Disparities in Indicators of a Primary Care Medical Home for Children." *Academic Pediatrics* 9: 221–7.
- Ratanawongsa, N., D. Roter, M. C. Beach, S. L. Laird, S. M. Larson, K. A. Carson, and L. A. Cooper. 2008. "Physician Burnout and Patient-Physician Communication during Primary Care Encounters." *Journal of General Internal Medicine* 23 (10): 1581–8.
- Reid, Robert J., Paul A. Fishman, Yu Onchee, Tyler R. Ross, James T. Tufano, Michael P. Soman, and Eric B. Larson. 2009. "Patient-Centered Medical Home Demonstration: A Prospective, Quasi-Experimental, before and after Evaluation." *American Journal of Managed Care* 15 (9): 71–87.
- Reid, R. J., K. Coleman, E. A. Johnson, P. A. Fishman, C. Hsu, M. P. Soman, C. E. Trescott, M. Erikson, and E. B. Larson. 2010. "The Group Health Medical Home at Year Two: Cost Savings, Higher Patient Satisfaction, and Less Burnout for Providers." *Health Affairs* 29 (5): 835–43.
- Rittenhouse, D. R., and S. M. Shortell. 2009. "The Patient-Centered Home: Will It Stand the Test of Health Reform?" *Journal of the American Medical Association* 301 (19): 2038–40.
- Rittenhouse, D. R., L. Casalino, R. R. Gilles, S. S. Shortell, and B. Lau. 2008. "Measuring the Medical Home Infrastructure in Large Medical Groups." *Health Affairs* 27 (5): 1246–58.
- Rittenhouse, D. R., L. Casalino, R. R. Gilles, S. S. Shortell, J. A. Alexander, S. McClellan, and M. Drum. 2011. "Small and Medium-Sized Physician Practices Use Few Patient-Centered Medical Processes." *Health Affairs* 30 (8): 1575–84.

- Roby, D. H., N. Pourat, M. J. Pirritano, S. M. Vrungos, H. Dajee, D. Castillo, and G. F. Kominski. 2010. "Impact of Patient-Centered Medical Home Assignment on Emergency Room Visits among Uninsured Patients in a County Health System." *Medical Care Research and Review* 67 (4): 412–30.
- Rodriguez, H. P., T. von Glahn, W. H. Rogers, and D. G. Safran. 2009. "Organizational and Market Influences on Physician Performance on Patient Experience Measures." *Health Services Research* 44 (3): 880–901.
- Rosen, P., and C. Kwoh. 2007. "Patient-Physician E-Mail: An Opportunity to Transform Pediatric Health Care Delivery." *Pediatrics* 120 (4): 701–6.
- Roter, D. L., J. A. Hall, and Y. Aoki. 2002. "Physician Gender Effects in Medical Communication: A Meta-Analytic Review." *Journal of the American Medical Association* 288 (6): 756–64.
- Stalberg, P., M. Yeh, G. Ketteridge, H. Delbridge, and G. Delbridge. 2008. "E-Mail Access and Improved Communication between Patient and Surgeon." *Archives of Surgery* 143 (2): 164–8.
- Stevens, G. D., and L. Shi. 2003. "Racial and Ethnic Disparities in the Primary Care Experiences of Children: A Review of the Literature." *Medical Care Research and Review* 60 (1): 3–30.
- Stevens, G. D., T. A. Pickering, M. Seid, and K. Y. Tsai. 2009. "Disparities in the National Prevalence of a Quality Medical Home for Children with Asthma." *Academic Pediatrics* 9: 235–42.
- Stewart, M. A. 1995. "Effective Physician-Patient Communication and Health Outcomes: A Review." *Canadian Medical Association Journal* 152 (9): 1423–33.
- Strouse, R., B. Carlson, J. Hall, and K. Cybulski. 2009. "Report on Survey Methods In the Community Tracking Study's 2007 Round Five Household Survey-Final." Report submitted to the Center for Studying Health System Change. (HSC Technical Publication No. 72). Princeton, NJ: Mathematica Policy Research, Inc.
- Travaline, J. M., R. Ruchinskas, and G. E. D'Alonzo Jr. 2005. "Patient-Physician Communication: Why and How." *Journal of the American Osteopathic Association* 105 (1): 13–18.
- Wasserman, J., G. Boyce-Smith, D. S. P. Hopkins, V. Schabert, M. B. Davidson, R. J. Ozminkowski, A. Albright, and S. Kennedy. 2001. "A Comparison of Diabetes Patients' Self-Reported Health Status with Hemoglobin A<sub>1c</sub> Test Results in 11 California Health Plans." *Managed Care* 10 (3): 59–70.
- Willems, S., S. De Maesschalck, M. Deveugele, A. Derese, and J. De Maeseneer. 2005. "Socio-Economic Status of the Patient and Doctor-Patient Communication: Does It Make a Difference?" *Patient Education and Counseling* 56 (2): 139–46.
- Wilshire, J., V. Roberts, R. Brown, and G. Sarto. 2009. "The Effects of Socioeconomic Status on Participation in Care among Middle-Aged and Older Adults." *Journal of Aging and Health* 21 (2): 314–35.
- Ye, J., G. Rust, Y. Fry-Johnson, and H. Stothers. 2010. "E-Mail in Patient-Provider Communication: A Systematic Review." *Patient Education Counseling* 80 (20): 266–73.

## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Appendix S1: Items Used to Create Dependent Variables.

Appendix S2: Items Used to Create PCMH Index.

Please note: Wiley-Blackwell is not responsible for the content or functionality of any supporting materials supplied by the authors. Any queries (other than missing material) should be directed to the corresponding author for the article.