Impact of a Patient-Centered Medical Home on Access, Quality, and Cost

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ABSTRACT Context: Patient-centered medical homes (PCMHs) are intended to actively provide effective care by physician-led teams, where patients take a leading role and responsibility. Objective: To determine whether the Walter Reed PCMH has reduced costs while at least maintaining if not improving access to and quality of care, and to determine whether access, quality, and cost impacts differ by chronic condition status. Design, setting, and patients: This study conducted a retrospective analysis using a patient-level utilization database to determine the impact of the Walter Reed PCMH on utilization and cost metrics, and a survey of enrollees in the Walter Reed PCMH to address access to care and quality of care. Outcome measures: Inpatient and outpatient utilization, per member per quarter costs, Healthcare Effectiveness Data and Information Set metrics, and composite measures for access, patient satisfaction, provider communication, and customer service are included. Results: Costs were 11% lower for those with chronic conditions compared to 7% lower for those without. Since treating patients with chronic conditions is 4 times more costly than treating patients without such conditions, the vast majority of dollar savings are attributable to chronic care. Conclusions: Results suggest focusing first on patients with chronic conditions given the greater potential for early gains.

INTRODUCTION

The dual mission of the U.S. Military Health System (MHS) is to provide medical support for military operations and to care for 9.6 million Department of Defense (DoD) beneficiaries.[1] Given the fact that over 17% of enlisted personnel and 49% of officers complete a 20-year military career, and as a result incur lifetime health care benefits, the MHS has a vested interest in its beneficiaries' long-term health. Furthermore, a large number of children from military families go on to serve their own military careers, creating a cradle-to-grave health interest for the MHS. Thus, the MHS has been extremely interested in a primary care delivery model that directly promotes improved access to care, population health, military readiness, and reduced health care costs.

The patient-centered medical home (PCMH) concept is "an approach to providing comprehensive primary care [in] a health care setting that facilitates partnerships between individual patients, the personal [provider and the medical home team], and when appropriate, the patient's family."[2] Unlike traditional care, the PCMH model uses a physician-led team approach that focuses on providing more patient-centric care, proactively addressing patients' needs by effectively utilizing other team members such as nurse practitioners and physician assistants, registered nurses, licensed practical nurses, and administrative assistants to perform at a level commensurate with their professional expertise. The concept of the "right patient at the right place and right time" is vital to the appropriate utilization of health care services across a broad spectrum of patient needs and interventions. Instead of relying on face-to-face visits, the medical home team and patients also interact virtually to manage chronic conditions, administer health risk assessments, provide preventive care management, and co-ordinate care. The provision of many of these services virtually allows providers to use appointments to focus on managing those patients with complex and acute care needs.

Multiple studies have shown that both continuity and longevity of patient–provider relationships can improve preventive care, reduce hospitalizations, and reduce health care costs.[3–6] Similarly, several studies suggest that optimal case management can improve patient outcomes, enhance provider productivity, and be cost effective.[7–9] Although the PCMH delivery model has a number of innovations that are widely expected to optimize population health indicators and enhance patient experience, previous reports have shown mixed results on the issue of overall costs. Milstein and Gilbertson[10] identified four PCMHs whose patients incurred 15% to 20% less costs than peer sites. Similarly, studies have shown that Community Care of North Carolina's PCMH program resulted in a reduction in per member per month cost by 17% in 2004 and by 11% in 2007.[11] Meanwhile, a Geisinger PCMH pilot at two sites showed a 7% cost reduction after 1 year, but a later study at 11 sites did not show a statistically significant reduction.[6,12] Moreover, results at a PCMH demonstration at the Group Health Cooperative showed no statistically significant cost differences after 1 year, even though emergency room (ER) visits decreased by 29%.[13]

The variability of the outcomes is not surprising given that the PCMH is not a single, well-developed model of care but rather a set of guiding principles and that each patient

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population, organizational structure, and culture are unique, and may deserve unique work flow processes and team make up. The specific design and implementation process must not only follow these principles but also be well thought out and executable. Other possible contributing factors of variability include the differing reimbursement systems and the population settings in which the care was delivered (hospital vs. ambulatory practice). In addition, when the principles are applied in isolation, there are often unintended consequences that occur elsewhere in the system of care that may result in clinically appropriate cost increases (such as increased utilization of preventive care services). This makes a successful solution in one system difficult to generalize without broader consistency in the reimbursement model and basic functional attributes of the system of care.

The literature provides an array of studies that evaluate the effectiveness of a subset of the expected PCMH impacts, such as cost or hospitalizations, but lacks a refined analysis of how the new delivery model fared among populations with and without chronic conditions. This study attempts to close this gap by examining the prolonged impact of the Walter Reed National Military Medical Center (WRNMMC) PCMH (formerly the National Naval Medical Center PCMH) on its health care access, quality metrics such as patient satisfaction and Healthcare Effectiveness Data and Information Set (HEDIS), and cost data. Furthermore, this study also analyzed the effect of the PCMH model on patients with and without chronic conditions. This is important because a focus of the PCMH model is to effectively manage patients with chronic diseases and to prevent chronic diseases from manifesting later in those currently without such conditions.

METHODS

We conducted this comprehensive analysis of the Walter Reed PCMH (WR PCMH) using a patient-level utilization database and a patient survey. Table I shows the metrics we used for access, quality, and cost, as well as the data source for these metrics. We derived these metrics from two data sources. The access metrics and most of the quality metrics come from a patient satisfaction survey. This survey enabled us to assess patients' perceptions of access and quality. The remaining quality metrics (HEDIS and primary care manager [PCM] continuity) and the cost and utilization metrics come from a patient-level utilization database. For access, quality, and cost metrics, we designed our approach to facilitate an analysis of PCMH impacts for patients with and without chronic conditions. Given the emphasis of the PCMH model on managing and preventing chronic diseases from manifesting, this is a critical distinction. The following sections discuss the methods behind each of these data sources.

Cost (and Utilization) Methods

We used a differences-in-differences approach to conduct the utilization analysis for a pre–post comparison of the Walter Reed PCMH against itself while controlling for trends at comparison sites. The clinic began its transition to a PCMH starting June 2008 and completed its transition in January 2009. Accordingly, we used six quarters of patient-level utilization data before and after the transition period as the basis of the pre–post analysis. For comparison sites, we used enrollees of the internal medicine clinics at the Navy's medical centers in Portsmouth, Virginia and San Diego, California; as well as the Navy's teaching hospital in Pensacola, Florida. The similarities of these sites in mission, graduate medical education, and patient demographics minimize self-selection and comparison problems related to patient equivalence, practice equivalence, and external factors that can be problematic in evaluations.[11]

Unlike prior research that measures the impact of PCMH on utilization using a multivariate regression methodology, we used a two-step regression methodology. Multivariate regression is econometrically problematic because the distribution of the dependent variable—in this case, utilization—is highly skewed and has a heavy weight on zero (no utilization). Such data do not satisfy the assumptions of normality, homoscedasticity, or independence that multivariate regression requires.[14] With sufficient data, this approach will provide unbiased estimates, but the standard errors may be too small, thus overestimating the significance.[14]

A two-step model, in which the first equation estimates the probability of use of a particular health care service and the second equation estimates the amount of use for users,

TABLE I. Access, Quality, and Cost Measures

Area	Metrics	Data Source
Access	Ability to See PCM When Needed	Patient Survey
	Ability to Get Routine and Urgent Care Appointments	
	Getting Timely Answers to Medical Questions	
	Wait Time to See PCM	
	Ease of Scheduling Appointments	
Quality	Satisfaction With Health Care at Clinic	Patient Survey
	PCM Rating	
	Provider Communication	
	Customer Service	
	Patient Activation	
	HEDIS Metrics	Patient-Level Utilization Database
	PCM Continuity	
Cost (and Utilization)	Per Member Per Quarter Costs	Patient-Level Utilization Database
	Inpatient Admissions	
	Inpatient Days	
	ER Visits	
	Specialty Care Encounters	
	Primacy Care Encounters	
	Pharmacy Costs	
	Ancillary Costs	

overcomes these limitations.[15] Not only is this approach econometrically sound, but it also provides additional information that the standard multivariate regression approach cannot. For example, multivariate regression may provide an estimate showing reductions in ER services, but it does not provide information about whether fewer patients are presenting at the ER (i.e., the probability of use) or whether those presenting at the ER are using less ER care (i.e., the amount of ER use for ER users) is the reason for reduced ER utilization overall. The two-step methodology allows us to answer these questions. Table I shows descriptive statistics for the data used in this analysis.

Access and Quality Methods

To estimate the impact of the Walter Reed PCMH on access and quality, we conducted a patient survey to compare Walter Reed's PCMH enrollees to enrollees in its traditional internal medicine clinic. The patient survey was designed to assess enrollees' satisfaction with access to their PCM and clinic staff, PCM communication, and care co-ordination. We drew questions from several existing surveys, most prominently from the Consumer Assessment of Healthcare Plans and Services survey, Clinicians and Groups; the Insignia Health Patient Activation Measure; and the Primary Care Assessment Survey (PCAS). The survey instrument was developed in consultation with providers and researchers at Walter Reed, the Uniformed Services University, and the Center for Naval Analyses. The survey instrument and protocol were reviewed and approved by the Walter Reed Institutional Review Board with secondary reviews by TRICARE Management Activity and the Defense Manpower Data Center Survey Office.

We administered the survey via a mail invitation to complete the survey either online or by mail. In total, 4,090 completed surveys were received for a 39% response rate in both the medical home and the comparison clinic. This response rate is in line with the 40% response rate among the DoD population per the 2011 Health Care Survey of DoD Beneficiaries.[16] More specifically, our response rates for subpopulations such as active duty at 16% were in line with the 2011 Health Care Survey of DoD Beneficiaries. We also had varying response rates by chronic condition status (47% for those with a chronic condition compared to 32% for those without a chronic condition) and by age (71% for those 65 and older compared to 28% for those under 65). The survey results were weighted to account for these differing response rates so that the results better reflect the Walter Reed PCMH enrollee population. We weighted the survey results to account for differences in selection and nonresponse; Specifically, the weights correct for such differences in gender, age, and beneficiary type so that the weighted survey responses reflect the population.

As noted in Table I, all quality methods except the HEDIS measures and PCM continuity are based on the patient survey. For the HEDIS measures and PCM continuity, we relied on the patient-level utilization database.

RESULTS

Cost and Utilization

We first present the results for the impact of the Walter Reed PCMH on utilization and cost (Fig. 1). The results show that a statistically higher percentage of Walter Reed PCMH enrollees had some primary care use (i.e., the probability of having some primary care utilization increased). In addition, the amount of primary care services these enrollees received was statistically higher than the comparison sites (21%). This is consistent with the idea that PCMHs provide more comprehensive care to reduce the amount of more costly specialty, inpatient, and ER care. Note that our primary care measure is encounters not just in-office visits. Encounters include in-house visits and virtual care, including secure e-mail and telephone consultations. Although the number of primary care encounters has increased, the composition has changed as well. For example, before PCMH implementation, telephone consultations accounted for 16% of encounters, but after implementation, this figure was 24%. For the comparison clinics, this trend was either flat or reversed. These trends are consistent with the notion that more of the care occurs in the PCMH. The question, then, is whether this increase in primary care is offset by utilization and cost reductions elsewhere in the system.

The results show that ER visits decreased 6.8% for WR PCMH enrollees because of a reduction in the probability of using the ER (i.e., the likelihood of having any ER care). For pharmacy and ancillary costs, we observe decreases in both the probability of use and the amount of use. Combining all forms of utilization, the results show that costs for Walter Reed PCMH enrollees are 9% less overall.

We conducted this same analysis on the strata of those with and without chronic conditions. For those without chronic conditions, there is no significant impact of the Walter Reed PCMH on inpatient utilization and ER visits and no substantial impact on primary care encounters. Conversely, there are significant and substantial impacts on inpatient days, ER visits, and primary care for enrollees with chronic conditions. These results are logical in that relatively healthier patients are infrequent users of inpatient and ER services. Interestingly, the results were mixed for inpatient care, with an overall 4% reduction in inpatient admissions and a 19% increase in the number of inpatient days. These results are consistent with the expected decrease in admissions for healthier patients with conditions that are either prevented or caught early, so they never progress to require an inpatient admission.

The results show that the Walter Reed PCMH is associated with an increase in specialty care utilization overall (2%). In concept, PCMH models should lead to less utilization of specialty care in the long run. Whether this is true and

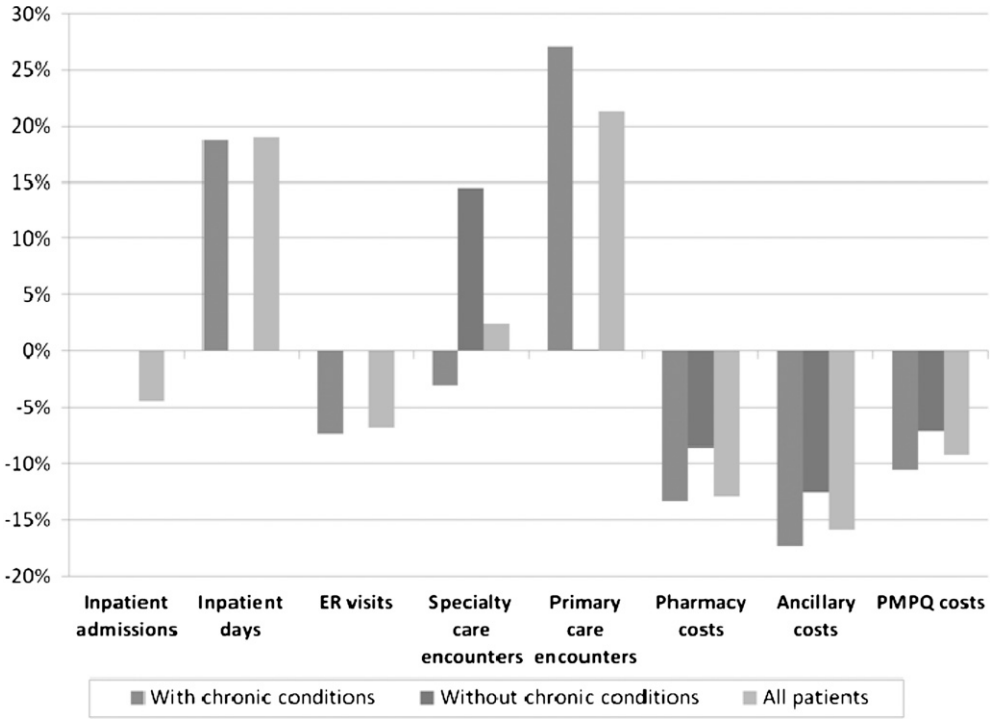

FIGURE 1. Cost and utilization impact by chronic condition status.

when it might occur are not known. Although these questions remain to be answered, a continued evaluation of the Group Health PCMH demonstration showed an increase in specialty care visits with PCMH patients, but that the magnitude of the specialty care increase declined from 6% after 12 months to 3% after 21 months.[17] Perhaps, specialty care will also decrease at some point, but it clearly does not seem to happen immediately. Adding to this literature, our analysis shows that specialty care encounters increased for enrollees without chronic conditions (15%) and decreased for those with chronic conditions (3%). It is an open question why we observe this pattern, but one possibility is that the Walter Reed PCMH is driving some nonchronic patients to specialty care as a matter of prevention, and bringing some of the complex patients' care back from specialty care as it takes more active management of patients with chronic conditions and works with patients to teach them how to better manage their conditions. An analysis of only the overall population can easily mask the opposite impacts we find when analyzing chronic condition status.

As for specialty care costs, the results show cost improvements for both those with (11%) and those without (7%) chronic conditions, or $83 and $13 reductions per quarter, respectively. This reminds us that since treating enrollees with chronic conditions costs four times more than treating enrollees without chronic conditions, there may be substantially greater impact to trim health care costs when focusing PCMH initiatives on this very same population and preventing healthy enrollees from falling into that category. Note that we also analyzed subpopulations with a specific chronic condition, such as diabetes, hypertension, hyperlipidemia, chronic obstructive pulmonary disease, coronary artery disease, and mental health, and found that the overall pattern we observed for those with a chronic condition holds for all of these subgroups.

Access and Quality

The HEDIS measures are an important quality indicator. In looking at the HEDIS metrics for the Walter Reed PCMH, it is the case that they have improved postimplementation relative to preimplementation of the PCMH. This is true for multiple metrics such as annual hemoglobin A1c (HbA1c) testing with values greater than 9.0; low-density lipoprotein-cholesterol (LDL-C) values less than 100 mg/dL; asthmatics with appropriately prescribed medication; and screening rates for mammography and colorectal cancer. At the same time, we observed that the HEDIS metrics also improved at the comparison sites. These improvements are likely because of the influence of pay-for-performance programs in the MHS; hence, we cannot conclude that the improved HEDIS metrics at Walter Reed PCMH were necessarily because of the implementation of the PCMH model of care. However, we can conclude that the PCMH model has been successful in improving cost and utilization metrics while improving the HEDIS metrics at the same time (Table II). In other words, our results show that the Walter Reed PCMH has been able to reduce costs while at least maintaining the HEDIS levels.

Another quality indicator for a PCMH model of care is PCM continuity, since it is a process or approach that PCMHs use to achieve desired outcomes. As such, understanding the

TABLE II. WRNNMC PCMH HEDIS Scores Pre- and Postimplementation

HEDIS Measure	Preperiod (%)	Postperiod (%)
HbA1c Test	84.5	91.8
HbA1c > 9.0	25.9	17.6
LDL Screening	78.2	88.6
LDL-C Value < 100 mg/dL	53.3	66.1
Asthmatics Appropriately Prescribed	93.9	96.1
Pap Smear Test	80.6	87.4
Mammography Screening	75.3	82.8
Colorectal Cancer Screening	60.7	68.5

The values for the preperiod are monthly averages for January–May 2008 compared to February–December 2009 for the postperiod. The transition period was from June 2008 to January 2009.

degree to which the Walter Reed PCMH has been successful in increasing its PCM continuity is indicative of its ability to affect change. When looking at PCM continuity, we observed that it rose following PCMH implementation, but that it has been extremely difficult to keep PCM continuity at a high level. PCM continuity is highly sensitive to outside influences such as deployments of providers, permanent changes of station (military orders to change location), Family Medical Leave Act absences of providers, and the merger of the National Naval Medical Center and the Walter Reed Army Medical Center during the postimplementation period.

We now turn to the results for the access and quality metrics, such as patient satisfaction, PCM communication, trust, customer service, and patient activation, that we estimated through the patient survey (Table III).

For access, the composite access measure is significantly higher for the Walter Reed PCMH relative to the comparison sites. Similarly, Walter Reed PCMH enrollees are more satisfied overall, are more likely to have high PCM ratings, have a higher level of satisfaction with the office staff (customer satisfaction), and are more likely to have the highest level of patient activation. There are also statistically significant differences between the PCMH and its comparison sites for communication and trust. Overall, the results of these composite measures indicate that the Walter Reed PCMH has improved access and quality while reducing costs. Furthermore, these differences exist for patients with and without chronic conditions alike. The magnitudes of these differences are fairly consistent by chronic status, but the significance is generally greater for patients with chronic conditions.

We wanted to understand how the Walter Reed PCMH could improve patients' perceptions of access and quality. Accordingly, we analyzed the factors associated with higher satisfaction. We found that the odds ratios (ORs) for being satisfied were 2.10 (confidence interval [CI]: 1.40–3.16) and 1.88 (CI: 1.16–3.04) for those who perceived a high level of access and provider communication, respectively. That information alone does not indicate how the clinic can improve access and communication, so we then analyzed the drivers of access and communication to see which factors are most highly correlated with access and communication. The results

TABLE III. Access and Quality Measures by Chronic Condition Status

	With Chronic Conditions (N = 2,293)			Without Chronic Conditions (N = 1,768)			All Patients (N = 4,090)		
Measures	WR PCMH	Comparison Site	Difference	WR PCMH	Comparison Site	Difference	WR PCMH	Comparison Site	Difference
Satisfied With Health Care at Clinic	85.56	81.46	4.10**	80.18	77.02	3.16	81.98	78.37	3.61**
High Rating of PCM	79.65	77.82	1.83	70.23	66.48	3.75***	73.41	69.92	3.49***
Access									
Composite (Getting Care Quickly)	78.33	70.82	7.51*	72.22	61.83	10.39*	74.34	64.59	9.75*
Able to See PCM When Needed	78.65	68.88	9.77*	73.09	61.66	11.43*	74.95	63.89	11.06*
Satisfied With Ease of Scheduling Appts	79.27	75.02	4.25**	74.00	67.95	6.05**	75.77	70.11	5.66*
Provider Communication									
Provider Communication Composite	91.91	89.07	2.84***	87.88	85.31	2.57	89.24	86.45	2.79**
PCM Listens Carefully Often to Always	92.54	90.30	2.24***	88.75	85.70	3.05***	90.03	87.1	2.93**
PCM Explains Things Often to Always	94.25	89.63	4.62*	90.60	87.61	2.99***	91.83	88.22	3.61**
Customer Service (Office Staff)	91.45	88.21	3.24**	86.63	81.77	4.86**	88.25	83.74	4.51*
Trust in PCM Composite (PCAS)	78.33	77.16	1.17	74.21	72.03	2.18	75.59	73.58	2.01**
Patient Activation Composite (Level 4)	67.56	57.41	10.15*	68.84	64.27	4.57***	68.37	61.91	6.46**

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

show that the biggest drivers of access are ease of scheduling appointments (OR: 4.60; CI: 3.01–7.03), ability to get a routine care appointment (OR: 4.42; CI: 3.16–6.17), and ability to get an urgent care appointment (OR: 3.74; CI: 2.53–5.54). In comparison, the time spent waiting to see the PCM is a relatively minor factor. Similarly, the analysis of communication drivers shows that the two most important drivers are whether the PCM listens carefully (OR: 13.47; CI: 6.39–28.39) and provides complete and accurate information (OR: 12.89; CI: 5.21–31.86). These results indicate clear directions for improvement in individual PCMHs.

Limitations

This study, of course, is not without limitations. Among the challenges we faced in analyzing the impacts of the WRNMMC PCMH on access, quality, and cost was the substantial churn and disruption caused by the merger of the National Naval Medical Center and Walter Reed. Although the actual merger did not occur until September 2011 (after the period of our data), all of the premerger work to prepare for integrating clinics and the construction to accommodate the merger no doubt impacted the PCMH teams and patients.

Another challenge with this evaluation was to identify comparison clinics that were not PCMHs. The Walter Reed PCMH was the first PCMH in the MHS; but since it started, all primary clinics have transitioned to or are in the process of transitioning to PCMHs. Although the comparison sites we selected were not PCMHs during the most of the analysis period, they were nonetheless planning for and beginning the process of transitioning to PCMHs. We see this as less of a limitation if one presumes that transitioning to a PCMH would have made the comparison sites more effective in addressing access, quality, and cost, thus making these sites more robust comparisons.

DISCUSSION

The U.S. health care system is undergoing a period of rapid change as the provisions of the Patient Protection and Affordable Care Act are implemented. Beyond this, cost pressures are driving the need to arrest cost growth and put it on a sustainable path. Also, numerous studies and reports link health care costs and cost growth to chronic conditions, most of which are a result of patients' poor health choices and lifestyles.

The results for the WRNMMC PCMH suggest that if other PCMHs are similarly effective that the PCMH model is a good first step to address these trends and challenges. Our results show that the Walter Reed PCMH has been successful in the short term by reducing costs while improving access, quality, and patient satisfaction. These findings were consistent across the study population but were greatly amplified for patients with chronic conditions. Consequently, if our nation's current health care systems cannot afford to be all things to all people, our results suggest starting with those patients suffering from chronic conditions. Furthermore, the rationale in the literature is also compelling: "78% of health spending is devoted to people with chronic conditions. Quality medical care for people with chronic conditions requires a new orientation toward prevention of chronic disease and provision of ongoing care and care management to maintain health status and functioning."[18]

Although our study and the literature generally show desirable results for medical homes, there are exceptions. This suggests that PCMHs have value, but successful implementation is not guaranteed, and not all care models can be easily generalized without careful considerations of patient demographics and needs as well as system limitations and unique characteristics of both. The implementation and execution of any PCMH must be actively managed and evolve with changing needs and trends. The entrenched systems and attitudes inherent in health care add an additional layer of complexity that necessitates an analysis of the overarching organizational culture and subcultures that will have to adapt to the PCMH model (K. Dorrance, P. Grundy, J. LaRochelle, S. Lynch, F. Mael, S. Ramchandani, unpublished data, 2012). Moreover, although the results are positive, we emphasize that they are only near-term results—1.5 years postimplementation.

Although PCMH is a good first step, we must address the root cause of the current health care crisis—poor health behaviors and individual lack of responsibility for lifestyle choices. The true test for PCMH success is whether it will have an impact on the rate at which patients develop chronic conditions and not just on treating chronic conditions in a more cost-effective way. The PCMH must also facilitate patient activation and responsibility for health behaviors that can ultimately reverse many of the chronic conditions. This cannot be understated; the long-term success of health care transformation and our ability to rescue the American health care system relies on the reduction of the ever-increasing burden of chronic (preventable) disease. Without such a shift from health care to health, we simply delay the demise of the American health care system. Whether PCMHs are successful in changing patient behavior and lifestyle choices over the long run still needs to be shown, and the addition of these efforts in future studies must not be ignored.

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