Early Changes in VA Medical Home Components and Utilization

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The spread of the patient-centered medical home (PCMH) model to numerous healthcare systems can be attributed to the promise of revitalized primary care delivery through team-based care aiming to improve continuity, coordination, quality, and access, as well as to reduce costs. Based on these principles, the Veterans Health Administration (VA) began a vast initiative in 2010 to implement the PCMH model, called Patient Aligned Care Teams (PACTs), across the entire VA healthcare system, which included more than 800 primary care clinics caring for more than 5 million patients.

Several healthcare systems have implemented pilot programs of the PCMH and found significant improvements in quality of care, reductions in acute care, and cost savings.[1,2] The PACT model is expected to experience similar results since it focuses on improving access to primary care, increasing telephone and other non–face-to-face care, as well as reducing unnecessary emergency department (ED) visits and hospitalizations. Lower costs are expected, in part, from a reduction in (often very costly) acute care episodes.

An early PACT evaluation found that after implementation, there were significant changes: greater use of telephone care, fewer face-to-face visits, improved appointment access and continuity, and better follow-up after hospital discharge.[3] However, PACT models encompassed a multiplicity of PCMH features that ranged from routinely scheduling same-day appointments to tracking specialty consultations, and from coordinating post discharge care to the use of electronic decision support systems. Baseline adoption of these features was highly variable across clinics[4]—and clinics may have implemented new PACT features to varying degrees—so it is unknown how differences in early implementation influenced utilization and costs.

This study evaluated the changes in adoption of different PCMH components by VA clinics, and the relationship to patients' utilization of acute and non-acute care and total

ABSTRACT

Objectives: In 2010, the Veterans Health Administration (VA) began national implementation of its patient-centered medical home (PCMH) model, called Patient Aligned Care Teams (PACTs), to improve access, coordination, and patient-centered care. We evaluated changes in reported implementation of PCMH components in all VA primary care clinics, and patients' utilization of acute and non-acute care and total costs after 2 years.

Study Design: Longitudinal study of 2,607,902 patients from 796 VA primary care clinics.

Methods: Clinics were surveyed for their implementation of PCMH components. Patient outcomes were measured by outpatient visits for primary care, specialty care, telephone care, and emergency department (ED) care; hospitalizations for an ambulatory care–sensitive condition (ACSC); and costs of VA care in fiscal years (FYs) 2009 and 2011. Multi-level, multivariable models predicted changes in utilization and costs, adjusting for patients' health status, clinic PCMH component scores, and a patient fixed effect.

Results: Clinics reported large improvements in adoption of all PCMH components from FY 2009 to FY 2011. Higher organization of practice scores was associated with fewer primary care visits ($P = .012$). Greater care coordination/transitions was modestly associated with more specialty care visits ($P = .010$) and fewer ED visits ($P = .018$), but quality/performance improvement was associated with more ED visits ($P = .032$). None of the PCMH components were significantly related to telephone visits, ACSC hospitalizations, or total healthcare costs.

Conclusions: Improvements under organization of practice and care coordination/transitions appear to have impacted outpatient care, but reductions in acute care were largely absent.

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Take-Away Points

Take-up of medical home components appeared to be high after Patient Aligned Care Teams (PACTs) began in the Veterans Health Administration. However, while improvements under organization of practice and care coordination/transitions seemed to have impacted outpatient care, reductions in acute care were largely absent.

- Identifying areas that would benefit from ongoing improvement is critical for the long-term success of PACTs.
- Better measures of PACTs implementation are also needed to evaluate the longer-term consequences of PACTs.

costs after 2 years. We focused on a cohort of primary care patients who used VA care from 2009 to 2011, and were therefore most likely to experience the effects of PACT. This examination can guide ongoing PACT implementation, suggesting what PCMH components and aspects of care might be emphasized most productively in later stages.

METHODS

Data Sources and Cohort

We conducted a longitudinal study of a panel of primary care patients using data from before PACT implementation (fiscal year [FY] 2009) and shortly after PACT implementation began (FY 2011); VA FYs begin the October 1 prior and end September 30, of the indicated year. We obtained VA patient-level utilization and cost records and linked them to clinic-level data for FYs 2009 and 2011. Patient data included sociodemographic characteristics, VA inpatient and outpatient utilization, diagnoses, lab test results, and costs of all care; clinic data included clinic characteristics and reporting of PCMH features. The study cohort was limited to patients who had at least 2 primary care visits in FY 2009 and used any VA outpatient care in FY 2011; altogether, 544,984 patients were excluded. Patients were linked to the clinic where they had a plurality of visits. The study cohort included 2,607,902 patients from 796 clinics; our cohort was older, predominantly male, more likely to be service-connected or below the means test, and sicker based on risk scores and chronic conditions compared with excluded patients. This study received approval from the Stanford University Institutional Review Board (protocol #20124).

Measures

Non-acute care outcomes were measured for each patient by number of primary care visits, specialty care visits, and telephone visits. Acute care outcomes were measured by ED visits and potentially avoidable hospitalizations. We also measured total annual costs of care in each study year. Outpatient visit data were obtained from the VA Medical Statistical Analysis System utilization files and categorized based on the visit location for outpatient services. Potentially avoidable hospitalizations were obtained from inpatient records and identified by primary diagnosis for an ambulatory care–sensitive condition (ACSC).[5] The total annual costs were obtained from Decision Support System records for services provided by the VA, and from Fee Basis records for services provided by non-VA providers and paid by the VA. Because of the short study period, we did not adjust costs for inflation.

Our main independent variable, reporting of PCMH features, came from the American College of Physicians Medical Home Builder (MHB) survey administered to all VA primary care clinics in 2009 and 2011. The MHB is a self-administered practice advisor used to support practices toward recognition of National Committee for Quality Assurance (NCQA) 2008 PCMH standards.[6] The MHB covers 7 PCMH components: patient-centered care and communication (support for patients' self-management and decision making and staff communication training); access and scheduling (scheduling flexibility such as same-day appointments and non–face-to-face services); care coordination and transitions in care (coordinating visits to other physicians, creating individualized treatment plans, assessing treatment barriers); organization of practice (tracking procedures, test results, medication lists, team huddles); population management (patient registries, clinical guidelines, identifying unmet needs); quality improvement and performance improvement (performance measures, satisfaction surveys); and use of technology (practice management systems, electronic health records, decision support systems). These components overlap with 6 of NCQA's standards for receiving PCMH certification, so the MHB captures elements similar to NCQA's measures.

The MHB was self-administered by the clinic director or other clinic leader, and the survey response rate was 100% in 2009, and 98% in 2011. The sum of PCMH features within each component was obtained for the component scores. The component scores were grouped into low and high categories based on the baseline distribution below or above the median.

In multivariable models, we included measures of time-varying patient factors in both years. We measured the Charlson Comorbidity Index (CCI) score, a measure of comorbidity burden, for each patient based on diagnoses

from inpatient and outpatient records.[7] We also created an indicator of risk based on available lab results reported during the study years. We chose lab tests that could, if increasing or decreasing during the study period, indicate higher risk of morbidity and mortality: cholesterol tests (>100 mg/dL), hemoglobin A1C test (>8%), anemia hemoglobin (<13 g/dL), and kidney function (eGRF <45).

For descriptive purposes, we measured several patient and clinic characteristics in the baseline year that were time invariant. Clinic measures included clinic rurality, assessed by metropolitan/nonmetropolitan codes from the Area Resource File.[8] Clinic type was categorized as based at a VA medical center (VAMC); VA-owned community-based outpatient clinic (CBOC)—owned by the medical center and staffed by VA providers; leased CBOC—staffed by VA providers with VA governance; or contracted CBOC—staffed by contract providers without VA governance.[9] Patient-level measures, including age, sex, race/ethnicity, marital status, service connection, means test, and insurance, were obtained from utilization records in FY 2009. Area income and education came from US Census data on income and maximum years of educational attainment linked to patients' zip codes. We also estimated patients' distance to their primary care clinic.

Statistical Analysis

In bivariate analyses, we compared the mean number of primary care, specialty care, telephone care, and ED visits, and ACSC hospitalizations, and total costs of care per patient in FY 2009 and FY 2011 using 1-way ANOVA with year as the independent variable to determine significant changes over time. In multivariate analyses, we estimated the longitudinal association between changes in PCMH components scores with changes in utilization and cost measures using multi-level, linear regression models for each outcome. Regression models included a fixed effect for each patient and adjusted for time-varying patient factors (risk indicator and CCI score), dummy variables for high versus low clinic PCMH component scores, and an indicator for year. The regression model for costs used the log of costs as the dependent variable since costs had a skewed distribution.

In our models, the fixed effect controls for all factors fixed over time, such as patient sociodemographic factors and clinic characteristics (eg, rurality and size). The model estimates the "within" estimator; the coefficients represent the effect of a unit change in each time-varying predictor on patient outcomes.[10] The coefficient for the year indicator represented the time trend in outcomes that was not explained by changes in PCMH components or health status. Additionally, regression models adjusted standard errors to account for cluster (the intra-class correlations between patients within a primary care site).[11] We also conducted regressions using Poisson models for utilization measures since they were counts, but standard errors could not be adjusted for clustering within clinics since we used a fixed effect. The effect sizes were similar with linear models, and these results are presented in the **eAppendix** (available at **www.ajmc.com**). All regressions and data analyses were conducted using Stata 11.0 (StataCorp LP, College Station, Texas).[12]

RESULTS

Description of Study Cohort and Clinics

At baseline, most of the primary care patients in the study cohort were middle-aged (45%) or elderly (46%) (**Table 1**). The study cohort was predominantly male (95%), a majority were white (67%), and a majority of patients were also married (58%). The largest proportion of veterans (42%) was eligible for VA care because of a service-connected disability, or they were within 5 years of military service. Relatively few patients (19%) had a disability rating greater than 50%, and many patients (40%) reported no other health insurance. Patients traveled a mean distance of 18 miles to their primary care clinic, the mean income of their area of residence was $40,541, and less than half of patients (46%) lived in areas where more than one-fourth of the population had a college degree.

The percent of patients with high risk (as measured by lab values) for cholesterol, diabetes, anemia, or kidney function decreased slightly from 61% of the cohort in FY 2009, to 56% in FY 2011. The CCI score, which measured total comorbidity burden, increased from 0.86 (SD = 0.84) to 0.90 (SD = 0.85) during that time.

In the baseline year, the low and high categories of each PCMH component represented roughly equal distributions of clinics; the exceptions were access and scheduling, which had more scores in the low category (**Table 2**). The range of the component scores overall, and for low and high categories, is also shown in Table 2. The proportion of clinics in the high-scoring groups increased over time, and the majority of clinics reported PCMH component scores in the high-scoring groups for all components in FY 2011. Almost one-fifth of primary care clinics represented in the study sample were large VAMC-based clinics, and most were community-based outpatient clinics (CBOCs), with the majority of these being leased CBOCs. Almost one-third of clinics were in nonmetropolitan areas.

Table 1. Cohort Characteristics of VA Primary Care Patients, (N = 2,607,902)

	N (% of Patients) / Mean (SD)	
Patient Fixed Sociodemographic Characteristics	**2009**	**2011**
Age group (in years)		
<45	237,451 (9)	—
45-64	1,185,120 (45)	—
65+	1,185,331 (46)	—
Gender		
Female	131,634 (5)	—
Male	2,476,268 (95)	—
Race/ethnicity		
White	1,747,022 (67)	—
Black	384,207 (15)	—
Hispanic	138,906 (5)	—
Other/unknown	337,767 (13)	—
Marital status		
Married	1,506,375 (58)	—
Separated/divorced/widowed	760,945 (29)	—
Single	340,582 (13)	—
Means test		
Service-connected	1,096,367 (42)	—
Below means test	789,287 (30)	—
Above means test	668,387 (26)	—
Other	53,861 (2)	—
Service connectedness (in %)		
0	1,549,431 (59)	—
1-50	567,431 (22)	—
51-100	491,040 (19)	—
Insurance		
No insurance	1,041,974 (40)	—
Medicare/Medicaid	1,074,119 (41)	—
Private	453,759 (17)	—
Other	38,050 (2)	—
Distance to home clinic (in miles)	18 (19)	—
Mean area-level income	$40,541 ($14,176)	—
Area-level education		—
Percent of residents college attainment ≤25%	1,404,351 (54)	—
Percent of residents college attainment >25%	1,203,551 (46)	—
Patient time-varying health status characteristics		
High risk	1,584,188 (61)	1,466,804 (56)
CCI score	0.86 (0.84)	0.9 (0.85)

CCI indicates Charlson Comorbidity Index; VA, Veterans Health Administration.

Changes in Utilization and Costs Over Time

During the study period from just prior to widespread PACT implementation to 2 years after PACT implementation began, the mean number of primary care visits decreased from 4.81 to 3.99 visits per patient, which represented a 17% decrease. The rate of specialty care visits was negligibly higher, and telephone visits rose by 85% (all P <.001) (Table 3). ED visits per patient rose slightly (7%), and ACSC hospitalizations per patient also rose from 0.02 to 0.03 per patient (all P <.001). The mean total costs of VA care increased from $8469 to $9887 per patient during the study period (P <.001).

Increased Medical Home Features and Utilization and Costs

Multi-level, multivariable models adjusted for both time-varying factors and fixed effects for time-invariant factors, and estimated how changes in reported PCMH components in primary care clinics explained some of these increases or decreases in use of VA care over time (Table 4). High organization of practice scores was significantly related to 0.13 fewer mean primary care visits per patient compared with patients in low-scoring clinics (P = .012). High care coordination and transitions in care scores were significantly related to 0.06 more specialty care visits compared with the low scores (P = .010), after controlling for patients' health status and time trend. The change in telephone visits was significantly higher over time (P <.001), but changes due to increases from low to high PCMH scores across all components were not statistically significant. High scores in care coordination and transitions in care decreased the mean number of ED visits by 0.04 visits per patient (P = .018), but high quality and performance improvement increased ED visits by 0.03 visits per patient (P = .032), relative to low scores. Admissions for an ACSC also increased over time after adjusting for worse health status (both P <.001), and none of the PCMH components were related to higher admissions. The only significant increase in costs was explained by high risk or

worse comorbidity (P <.001), and again, none of the PCMH component scores were significantly related to total costs per patient.

DISCUSSION

VA primary care clinics reported large improvements in adoption of all PCMH components from FY 2009 to FY 2011, and there were significant changes in utilization and costs for a cohort of primary care patients during this time. While various PCMH components (eg, access and scheduling) were hypothesized to increase access to and frequency of primary care, the only component that was related in adjusted models was organization of practice. Features such as team huddles and tracking lab tests were actually associated with fewer primary care visits per patient, possibly through better efficiency of primary care practice. Greater specialty care visits were modestly related to higher care coordination/transitions in care scores, so better procedures to coordinate care appeared to facilitate referrals to specialty care.

While increased care coordination/transitions of care was significantly related to fewer ED visits, higher quality and performance improvement scores were related to more ED visits. Care coordination features that reduced problems due to transitions from hospitalization or referral appeared to reduce ED care that may be unnecessary. It is unclear why greater quality/performance improvement features would be related to more use of ED care by patients. There was a significant increase in telephone visits over time, and although it was not related to any specific changes from low to high PCMH components, the push overall to increase virtual care under PACT may have led to increased telephone care. None of the PCMH components were related to potentially avoidable hospitalizations for an ACSC, although the rates in both years were very low in this cohort. Changes in healthcare costs were also not associated with increased PCMH component scores.

Our findings contribute new evidence on the specific aspects of PCMH implementation that are related to different types of healthcare utilization, and some of these results are consistent with early evidence from a PCMH demonstration in Group Health, which showed that patients had higher rates of telephone visits and specialist visits, and lower rates of ED visits in PCMH sites after 1 year.[2] In addition, the Group Health demonstration showed significant reductions in hospitalizations and costs per patient after 2 years, which we did not observe.[1] Unlike the Group Health demonstration, which was implemented in 1 clinic, VA's PACT initiative was rolled out to all clinics—that have considerable heterogeneity in size, staffing, governance, quality improvement orienta-

Table 2. Characteristics of VA Primary Care Clinics (N = 796)

	N (% of Clinics)	
Clinic Medical Home Feature Scores	**2009**	**2011**
Patient-centered care & communication (0-19)		
Low (0-10)	398 (50)	153 (19)
High (11-19)	398 (50)	643 (81)
Access & scheduling (0-9)		
Low (0-6)	517 (65)	254 (32)
High (7-9)	279 (35)	542 (68)
Organization & practice (0-16)		
Low (0-11)	349 (44)	160 (20)
High (12-16)	447 (56)	636 (80)
Coordination & transitions of care (0-18)		
Low (0-12)	366 (46)	194 (24)
High (13-18)	430 (54)	602 (76)
Use of technology (0-37)		
Low (0-24)	377 (47)	117 (15)
High (25-37)	419 (53)	679 (85)
Population management (0-13)		
Low (0-9)	351 (44)	198 (25)
High (10-13)	445 (56)	598 (75)
Quality/performance improvement (0-15)		
Low (0-13)	352 (44)	255 (32)
High (14-15)	444 (56)	541 (68)
Clinic type		
VA medical center-based clinic	151 (19)	—
Community-based outpatient clinic	645 (81)	—
Contracted	112 (14)	—
Leased	480 (60)	—
VA-owned	53 (7)	—
Rurality		
Metropolitan	550 (69)	—
Nonmetropolitan	246 (31)	—

VA indicates Veterans Health Administration.

Table 3. Changes in Utilization/Costs Among VA Primary Care Patients in 2009 and 2011 (N = 2,607,902)

Type of Utilization/Costs	Mean Annual Number (SD) Per Patient		Change (2011-2009)	Percent Change	ANOVA *P*
	2009	2011			
Primary care visits	4.81 (4.07)	3.99 (4.14)	–0.82	–17%	<.001
Specialty care visits	3.21 (6.02)	3.28 (6.71)	0.07	2%	<.001
Telephone visits	0.68 (2.85)	1.26 (3.99)	0.58	85%	<.001
ED visits	0.60 (1.66)	0.64 (1.78)	0.04	7%	<.001
Hospitalizations for an ACSC	0.02 (0.19)	0.03 (0.23)	0.01	50%	<.001
Total costs	$8469 (17,311)	$9887 (22,622)	$1418	17%	<.001

ACSC indicates ambulatory care–sensitive condition; ED, emergency department; VA, Veterans Health Administration.

Table 4. Changes in Patients' Costs and Utilization Based on Clinic Changes in Medical Home Component Scores, 2009-2011 (N = 2,607,902)

	Primary Care Visits	Specialty Care Visits	Telephone Visits	All-Cause ED Visits	Inpatient Admissions for an Ambulatory Care–Sensitive Condition	Total Costs (in Log Dollars)
Year 2011	–0.79**	0.03	0.52**	0.04**	0.007**	–0.011
High risk	0.68**	0.62**	0.20**	0.16**	0.013**	0.290**
CCI score	0.72**	1.18**	0.27**	0.27**	0.021**	0.439**
Patient-centered care & communication						
High (vs low)	0.06	0.03	0.07	0.03	0.001	0.001
Access & scheduling						
High (vs low)	–0.09	–0.04	0.06	–0.01	0.001	0.008
Organization & practice						
High (vs low)	–0.13*	0.004	0.05	0.02	0.000	–0.001
Coordination & transitions of care						
High (vs low)	0.13	0.06*	–0.07	–0.04*	–0.000	–0.008
Use of technology						
High (vs low)	–0.06	0.03	0.08	0.01	0.001	–0.014
Population management						
High (vs low)	0.05	–0.02	–0.03	–0.04	0.001	0.014
Quality/performance improvement						
High (vs low)	–0.02	0.02	–0.04	0.03*	–0.001	0.008

CCI indicates Charlson Comorbidity Index; ED, emergency department.
The symbols ** and * indicate significance at 1% and 5%, respectively.
Estimates are from 6 separate multi-level, linear regression models for each outcome. Each patient had 2 observations for 2009 and 2011. Regression models included a fixed effect for each patient, which accounted for all patient and clinic factors that were fixed over time, and standard errors were adjusted for clustering within clinic.

tion, and patient populations served—which may partly explain differences in evaluation results.

An earlier VA study found that higher baseline adoption of PCMH components of access/scheduling and care coordination/transitions were significantly related to lower risk of avoidable hospitalizations among primary care patients.[4] While we found that increased scores of these PCMH components were not related to avoidable hospitalizations, there may be a lag between implementation of features and observing effects in patients' outcomes. Moreover, reducing ACSC hospitalizations in a stable cohort of patients may be difficult to achieve.

It is also unknown to what extent individual PCMH features (eg, using an open-access model or maintaining a disease registry) were fully functioning. The percent of clinics in the high categories of all medical home com-

ponents score jumped during the study period so that most clinics reported adopting a high number of possible PCMH features. Hence, some implementation may have been rudimentary. Preliminary evidence suggests wide variation in how VA practices adopted various PCMH features, such as enhancing open access through practice redesign, or new interventions[13] with successful implementation influenced by local VA leadership engagement, staffing resources, and access to information and knowledge.[13] Additional challenges, including defining team roles and interpersonal conflict, have also caused implementation barriers in some sites.[14]

In addition to site-specific factors affecting PACT implementation, the total number of VA enrollees increased from 5.1 million veterans in 2009, to 5.5 million veterans in 2011.[15] The challenges of serving a larger volume of patients may have contributed to fewer face-to-face visits and placed additional burdens on providers in some sites.

Limitations

The Medical Home Builder survey was self-reported, so we were not able to validate the adoption of reported PCMH features; because of ongoing PACT evaluation efforts, clinics may have been motivated to provide more positive responses as a result. While the statistical methods used here accounted for measurable and unmeasurable fixed factors over time, it did not account for any time-varying omitted factors, so if unmeasured time-varying factors such as some other technological change were related to reported PCMH features and patients' utilization and costs, the effects of PCMH features would be biased.

We did not have reports of non-VA utilization, so if patients shifted to using more non-VA care such as ED visits, we could not measure this change. Finally, we focused on regular primary care users who continued to use VA outpatient care during the study period, so our results may not be generalizable to less frequent users of primary care or new users who were younger and had different demands for VA care.

CONCLUSIONS

These results document short-term changes during the early implementation of PACT that can provide feedback as PACT continues to be implemented and developed. While take-up of many PCMH features appeared to be high after the initiative began, certain improvements in care under organization of practice and care coordination/transitions appear to have affected only certain types of non-acute outpatient care; reductions in acute care ED visits and potentially avoidable hospitalizations largely remain to be seen. Identifying areas for ongoing improvement is critical to ensuring long-term success of care transformation under PACT. Refining PACT models in later stages may require more than adding new interventions; it may involve evaluation of staffing and other resource needs, better understanding of cost-effective care, ensuring support of clinical leadership, and widespread dissemination of successful practices. Better measures of PACT implementation are also needed to evaluate the longer-term consequences of PACT.

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e**Appendix**

Table. Incidence Rate Ratio of Changes in Patients' Utilization Based on Clinic Changes in Medical Home Component Scores, 2009-2011, N = 2,607,902

	Incident Rate Ratios				
	Primary care visits	**Specialty care visits**	**Telephone visits**	**All-cause ED visits**	**Inpatient admissions for an ambulatory care–sensitive condition**
Year 2011	0.830**	0.992**	1.750**	1.044**	1.265**
High risk	1.189**	1.236**	1.188**	1.290**	1.860**
CCI score	1.192**	1.456**	1.336**	1.498**	3.524**
Patient-centered care & communication					
High (vs low)	1.012**	1.006**	0.999	0.004**	1.018
Access & scheduling					
High (vs low)	0.974**	0.985**	1.094**	0.987**	1.013
Organization & practice					
High (vs low)	0.972**	1.003	1.049**	1.018**	1.017
Coordination & transitions of care					
High (vs low)	1.028**	1.017**	0.889**	0.929**	0.997
Use of technology					
High (vs low)	0.993**	1.008**	1.099**	1.024**	1.006
Population management					
High (vs low)	1.006**	0.992**	0.977**	0.938**	1.051**
Quality/performance improvement					
High (vs low)	1.000	1.009**	0.980**	1.045**	0.958**

CCI indicates Charlson Comorbidity Index; ED, emergency department.
**Significant at 1%.
Estimates are from 6 separate multi-level models for each outcome. Each patient had 2 observations for 2009 and 2011. Regression models included a fixed effect for each patient, which accounted for all patient and clinic factors that were fixed over time. All outcomes used a Poisson model.