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Authors

Reddy, Ashok
Wong, Edwin
Canamucio, Anne
et al.

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Association between Continuity and Team-Based Care and Health Care Utilization: An Observational Study of Medicare-Eligible Veterans in VA Patient Aligned Care Team

Ashok Reddy ⓘD, *Edwin Wong* ⓘD*, Anne Canamucio, Karin Nelson, Stephan D. Fihn, Jean Yoon* ⓘD*, and Rachel M. Werner* ⓘD

Objective. It remains unknown whether high-functioning teams can compensate for poor continuity of care to support important patient outcomes.

Data Source. Linked VA administrative and Medicare claims data to measure the relationship of team-based care and continuity of care with high-cost utilization.

Study Design. Retrospective cohort study of 1.2 million VA-Medicare dual eligible Veterans assigned to a VA primary care provider (PCP) in 2012. Continuity was the proportion of primary care visits to the assigned VA provider of care. Clinics were categorized as low, average, or high-team functioning based on survey data. Our primary outcomes were the number of all-cause hospitalizations, ambulatory care sensitive (ACSC) hospitalizations, and emergency department (ED) visits in 2013.

Principal Findings. A 10-percentage point increase in continuity with a VA PCP was associated with 4.5 fewer hospitalizations ($p < .001$), 3.2 fewer ACSC hospitalizations ($p < .001$), and 2.6 more ED visits ($p = .07$) per 1,000 patients. Team-based care was not significantly associated with any high-cost utilization category. Associations were heterogeneous across VA-reliant and nonreliant Veterans. Finally, the interaction results demonstrated that the quality of team-based care functioning could not compensate for poor continuity on hospitalizations, ACSC hospitalizations, or ED visits. Conclusions: In Veterans who were reliant on the VA for services, increasing continuity with a VA PCP and high-functioning team-based care clinics was associated with fewer ED visits and hospitalizations. Furthermore, leveraging combined data from VA and Medicare allowed to better measure continuity and assess high-cost utilization among Veterans who are and are not reliant on the VA for services.

Key Words. Continuity of care, team-based care, primary care, medical home

Over a decade of research demonstrates patients with higher continuity of care with their primary care provider (PCP) have greater use of preventive and chronic care services, report higher satisfaction, have fewer hospital and ED visits, and incur lower total costs of care (Saultz and Albedaiwi 2004; Saultz and Lochner 2005; Nyweide et al. 2013; Hussey et al. 2014). The benefits of continuity are largely conceptualized through three main domains; informational, longitudinal, and interpersonal continuity (Saultz 2003). Informational continuity consists of providers having up-to-date information at each encounter, which is often accomplished via electronic health records. Longitudinal continuity refers to the ability for patients to see the same provider over time. When longitudinal continuity exists, there is a chance for a patient and provider to also develop interpersonal continuity, meaning a patient can build a knowledgeable and trusting relationship with their provider to support better care (Haggerty et al. 2003; Andres et al. 2016). Yet, provider continuity of care with patients is difficult to control and is often disrupted as providers retire or leave a practice (Misra-Hebert, Kay, and Stoller 2004; Reddy et al. 2015).

When longitudinal continuity is disrupted, team-based primary care may offer a potential substitute. Team-based primary care uses nurse care mangers, social workers, and pharmacists to integrate care across team members and aims to deliver efficient and effective services (Wagner 2000). Team-based care interventions may improve the delivery of high-quality care, especially for disease-specific conditions such as hypertension, depression, and diabetes (Gilbody et al. 2006; Shojania et al. 2006; Walsh et al. 2006). Fundamental to a team-based care approach is the belief that, when practices use a multidisciplinary team, patients are more likely to get the care they need through enhanced access, better self-management support, and improved

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Address correspondence to: Ashok Reddy, M.D., M.Sc., VA Puget Sound HSR&D, 1660 South Columbian Way, Seattle, WA 98108; and also Department of Medicine, School of Medicine, University of Washington, Seattle, WA; e-mail: ashok.reddy@va.gov. Edwin Wong, Ph.D., and Karin Nelson, M.D., M.S.H.S., are also with the VA Puget Sound Healthcare System Health Services Research & Development, Seattle, WA. Edwin Wong, Ph.D., Karin Nelson, M.D., M.S.H.S., and Stephan D. Fihn, M.D., M.P.H., are also with the Department of Health Services, University of Washington School of Public Health, Seattle, WA. Anne Canamucio, M.S., and Rachel M. Werner, M.D., Ph.D., are also with the VISN 4 Center for Evaluation of PACT, Philadelphia VA Medical Center, Philadelphia, PA. Karin Nelson, M.D., M.S.H.S., and Stephan D. Fihn, M.D., M.P.H., are also with the Department of Medicine, School of Medicine, University of Washington, Seattle, WA. Jean Yoon, Ph.D., M.H.S., is with the Health Economics Resource Center, VA Palo Alto Health Care System, Palo Alto, CA. Rachel M. Werner, M.D., Ph.D., is with the Perelman School of Medicine at the University of Pennsylvania, Pennsylvania, PA.

coordination (Schottenfeld et al. 2016). However, many patients who are used to seeing a regular PCP may find it disconcerting to shift to a team-based care model in which they are expected to have relationships with additional clinical and nonclinical team members (Pandhi and Saultz 2006).

The Veterans Affairs Health Care System (VA) is an ideal setting for examining the relationships between care continuity, team-based care, and use of high-cost services. First, VA is a major health care delivery system in the United States, with 6 million enrolled Veterans receiving care at more than 900 clinical sites across the United States (Chokshi 2014). Second, VA launched a patient-centered medical home (PCMH) model nationally across all clinical sites in 2010 through the Patient Aligned Care Team (PACT) initiative. Briefly, the PACT model seeks to deliver continuous and coordinated primary care that is centered on the needs of individual patients (Rosland et al. 2012). Central to the creation of the PACT was the establishment of a "teamlet" which consists of a primary care provider (PCP), a nurse care manager, a clinical associate (LPN or medial assistant) and an administrative clerk (Helfrich et al. 2014b). Finally, work through the PACT Demonstration Lab Coordinating Center has developed an extensive data infrastructure to examine the effects of specific components of PCMH, including team-based care and continuity, on patient outcomes (Nelson et al. 2014a).

Previous evaluations demonstrated that team-based care and continuity are important predictors of health care utilization (Hebert et al. 2014; Nelson et al. 2014a). However, there is limited evidence on how PCMH changed care continuity. In a cross-sectional study, National Committee for Quality Assurance (NCQA)-PCMH recognized practices had higher continuity than non-NCQA-PCMH recognized practices (Perry et al. 2016). Moreover, research has not examined how continuity and team-based care affect utilization among VA enrollees dually enrolled in Medicare. This is important because it is well established that VA enrollees often use care both within and outside the VA (Borowsky and Cowper 1999). By combining data from VA and Fee-for-Service Medicare, we can more accurately measure continuity and health service utilization at the patient level. Given the comprehensive nature of coverage through VA and Medicare collectively, it is unlikely that Veterans seek care outside of these two programs. Therefore, a linked dataset across these two programs reduces measurement error in health service use among dual users of VA and Medicare (Liu et al. 2010, 2011; Burgess et al. 2011). Finally, initiatives such as PACT likely have differential impacts depending on how much Veterans rely on VA for care and therefore the level of exposure to PACT elements. Thus, combining VA and Medicare data also allow an

exploration of effects of team-based care and continuity among Veterans who use and do not use the VA for health care services.

In this paper, we studied the association of team-based care and continuity of care on high-cost health care utilization including all-cause hospitalizations, ambulatory care-sensitive (ACSC) hospitalizations, and emergency department (ED) visits among Medicare-eligible Veterans. We hypothesized that patients seen at high functioning team-based care clinics and patients who have higher continuity with a VA PCP would have lower rates of hospitalizations, ACSC hospitalizations and ED visits. We also hypothesized that these effects would be different among Veterans reliance on VA services given greater exposure to PACT components, including team-based care. Furthermore, we hypothesized that being seen at high-functioning team-based care clinics would compensate for low continuity with a PCP in its effect on ED visits, ACSC hospitalizations, and all-cause hospitalizations.

METHODS

Overview

We conducted a retrospective cohort study of patients dually eligible for both VA and fee-for-service Medicare in 2012–2013. Our independent variables were a patient-level measure of continuity of care in 2012 and clinic-level measures of team-based functioning in 2012. Our primary outcomes were the number of all-cause hospitalizations, ACSC hospitalizations, and ED visits in 2013. The institutional review board determined that the study's purpose was quality improvement and therefore was exempt from institutional review board review and approval.

Data Sources and Cohort

The primary sources of data were administrative data from the VA Corporate Data Warehouse (CDW) and Medicare claims data covering years 2012–13 (Hynes et al. 2007; Fihn et al. 2014). VA and Medicare data were linked by patients' scrambled social security number. Using CDW, we identified 4.18 million VA patients enrolled in FFS Medicare on or before 1/1/12 (Figure 1). Of those, 2.02 million were alive and had a VA PCP on 1/1/13. Excluding Veterans with <2 primary care visits (in the VA and FFS Medicare combined files) in 2012 resulted in a sample of 1.54 million patients. The final study

sample included 1.16 million patients after excluding patients with missing data on all covariates of interest.

We then divided the cohort to assess whether team-based care and continuity had differential effects on Veterans who did and did not regularly get care in the VA. To do this we examined reliance on VA primary and specialty care, defined as the proportion of all VA and Medicare face-to-face primary and specialty care visits that occurred in VA in 2012 (Burgess et al. 2011; Liu et al. 2011). The cohort with 100 percent of services in the VA were called VA reliant ($n = 521,022$) and the cohort with <100 percent of services in the VA were non-VA reliant ($n = 634,120$). We had 5,223 cases in which reliance data was missing (0.5 percent of the total).

Independent Variables

Continuity of Care. To measure continuity, we used administrative data tracking all PCP visits in VA and Medicare FFS to construct the Usual Provider Continuity (UPC) score, which reflects the proportion of a patient's visits that were with the assigned VA primary care (Pollack et al. 2016). VA primary care appointments were identified using administrative codes in CDW. In the VA, a primary care provider is defined as a physician, nurse practitioner, or physician assistant. To classify primary care visits in Medicare FFS, we used a previously developed algorithm to identify evaluation/management Current Procedural Terminology (CPT) codes into primary care visits (Burgess et al. 2011). Finally, to calculate the UPC, the numerator is the total number of

Figure 1:   Main Analytic Cohort

VA patients enrolled in fee-for-service Medicare on or before 1/1/12 (N=4,183,819 patients)		
Excluded		**Included**
244,217	Alive on 1/1/13	3,939,602
1,917,215	Had 1 VA primary PCP on 1/1/13	2,022,387
484,919	Had 2 PC visits in 2012 (VA, FEE or Medicare)	1,537,468
104,934	Had all covariates	1,432,534
271,103	Had all independent variables	1,161,431
1,066	Had PCP panel size	1,160,365

Notes. PCP, primary care provider; PC, primary care; FEE, fee basis [Color figure can be viewed at wileyonlinelibrary.com]

primary care visits to the assigned VA provider (on 1/1/13) while the denominator is the total number of primary care visits identified in VA or Medicare FFS in 2012. UPC scores ranged from 0 to 1, with a higher score indicating higher continuity with the assigned VA provider.

Team-Based Care. The PACT Primary Care Personnel Survey is a VA instrument designed to measure several medical home functions (Helfrich et al. 2014a). The target population was all VA primary care personnel, including the 4 occupations comprising PACT teams: PCPs, nurse care managers, medical associates (e.g., licensed practical nurses and medical technicians), and administrative clerks. Data were collected from May-June 2012. While the survey instrument used to measure team-based care had an estimated response rate of approximately 25 percent ($n = 4,819$), respondents were of similar demographics compared with a primary care sample from the VA All Employee Survey (Helfrich et al. 2014a,b).

The 18-question survey on team-based care included items assessing two major domains: team structure and team care processes. Team structure questions assessed whether the teamlet was fully staffed; whether respondents were assigned to more than one teamlet; and whether respondents spent time in team meetings. Team processes assessed how well teams delegate tasks to support patient care (i.e., screening for diseases, completing forms, and responding to messages). Delegation of clinical activities from the PCP to team members was measured with 15 items. Delegation items were scored on a four-point scale from "not at all" to "a great deal." The validity of the survey was measured as it relates to other variables including perceived improvements in patient-centered care, staff, and physician burnout (Helfrich et al. 2014b; Nelson et al. 2014a). The survey questions and details of scoring have previously been published (Nelson et al. 2014a). For each VHA clinic, a site-level score was calculated as the mean of standardized z-scores of the 18 team-based care items. Site-level scores were used to create three categories clinics: High (top 25 percent), average (middle 50 percent), and low (bottom 25 percent) team functioning clinics.

Outcomes

We calculated three utilization outcomes: patient-level counts of all-cause hospitalizations, ACSC hospitalizations, and ED visits in 2013, that occurred in VA or FFS Medicare. We measured our outcomes in a separate year from our independent variable to reduce the likelihood that there was a causal loop

between the measured outcome and independent variable. To identify these visit types, we used previously validated VA-related stop codes, CPT codes, and Medicare revenue codes (see Appendix SA2). Hospitalizations for ACSC were based on Agency for Healthcare Research and Quality Prevention Quality Indicators and were identified through standardized protocols using International Classification of Diseases, Ninth Revision, diagnoses, and CPT codes (Indicators 2001). We specifically looked at ACSC hospitalizations as they were postulated to be most avoidable through provision of effective primary care (Kruzikas 2004).

Covariates

Using the CDW, we obtained baseline year (2012) patient characteristics including age, sex, race, marital status, and income. Furthermore, we controlled for patient comorbidity using the validated measure developed by Gagne et al. (Gagne et al. 2011), reason for Medicare enrollment (disability or age), VA copayment status (copayment-exempt vs. not copayment-exempt), and the number of primary care visits in the baseline year. We also adjusted for characteristics of patients' residence area including median household income, number of hospital beds in the county per capita, primary care physician per capita (Health and Services 2013). Finally, we controlled for assigned VA PCP panel size.

Statistical Analysis

Our main analysis used negative binomial regression model to test the association between our two independent variables (continuity and team-based care) and utilization, controlling for covariates. Each utilization outcome was modeled separately, and each regression model included both independent variables. We presented estimates of both continuity and team-based care on high-cost utilization, each of which controls for the effect of the other. Then, in separate regressions, we estimated the effect of continuity, team-based care, and the interaction of these two variables on each measure of utilization. The latter model examined whether the degree of team-based care measured at the facility-level can compensate poor continuity.

We accounted for clustering at the clinic level, creating estimates that were cluster- and heteroskedastic-robust. All results were presented as average marginal effects. We estimated marginal models to generate population-averaged estimates because our analysis was interested in the effects of care

continuity and team-based care from the perspective the VA health system. For UPC score, the average marginal effect reflected the change in adjusted utilization counts associated with a 10-percentage point increase in the UPC score. For team-based care, average marginal effects reflected the difference in adjusted utilization counts between the three levels of team-based care. Finally, in the model with interactions, we presented average marginal effects for the UPC score, conditional on the three team-based care levels. If the interaction term was negative and nonzero then team-based care could compensate for poor continuity, and we would expect the effect of the UPC score to be smaller in magnitude when there is a higher level of team-based care. In sensitivity analysis, we also estimated alternative models with random facility-level intercepts to assess the potential mediating effect of other unobserved facility-level factors. These models did not qualitatively differ from our main results. All statistical analyses were performed using STATA version 14.0 (STATA Corp., College Station, TX). A nominal p-value of 0.05 was used to assess all statistical hypotheses.

RESULTS

Table 1 presents descriptive statistics of 1,160,365 veterans from 626 VA clinics who were dual users of VA and FFS Medicare and met the inclusion criteria. The majority of veterans were male (97 percent), White (82 percent), and married (64 percent). The average continuity of care with an assigned VA provider in 2012 was similar whether patients were seen at low (.59), average (.59), or high (.56) team-based performance clinic. Close to half of the cohort relied on the VA for 100 percent of their outpatient services. Medicare-eligible Veterans who primarily use VA services were younger and more ethnically and racially diverse when compared with non-VA reliant cohort. Continuity with VA PCP differed significantly between the VA reliant (.81) and nonreliant (.40) Veterans.

Continuity with a VA PCP was associated with lower all-cause hospitalization and ACSC hospitalization but not ED visits. For example, a 10-percentage point increase in continuity was associated with 4.5 fewer total hospitalizations (95 percent CI, -5.3 to -3.7) and 3.2 fewer ACSC hospitalizations (95 percent CI, -3.4 to -2.9) per 1000 patients (Table 2). In contrast, a 10-percentage point increase in continuity was associated with a nonsignificant 2.6 more ED visits per 1000 patients (95 percent CI, -0.2 to 5.4). We also found that continuity had differential impacts in the VA reliant and nonreliant

Table 1:   Characteristics of Study Sample

Patient Characteristics	Full Sample (n = 1,160,365)	VA Reliance (n = 521,022)	VA Reliance < 1 (n = 634,120)
	Mean (SD)		
Age	72 (10.8)	69 (10.5)	75 (9.9)
Male	97% (17%)	96% (19%)	98% (15%)
Race			
White	82%	75%	88%
African-American	12%	17%	8%
Hispanic	5%	7%	3%
Marital status			
Married	64%	52%	74%
Divorced	18%	27%	11%
Widowed	10%	9%	10%
Other/Unknown	8%	12%	5%
Gagne score	0.73 (1.7)	0.92 (1.9)	0.58 (1.6)
Average continuity (UPCI)	0.59 (.37)	0.81 (.30)	0.40 (.32)
Average # of PCP visits in 2012	4.8 (3.6)	3.7 (2.6)	5.6 (4.1)
% of Patients at*			
Low team-based performing clinics	24%	26%	23%
Medium team-based performing clinics	58%	58%	58%
High team-based performing clinic	18%	16%	19%
Average # of Hospitalizations per 1,000 pts (2013)	404 hospitalizations	376 hospitalizations	427 hospitalizations
Average # of ACSC hospitalizations per 1,000 pts (2013)	69 ACSC hospitalizations	49 ACSC hospitalizations	85 ACSC hospitalizations
Average # of ED visits per 1,000 pts (2013)	1005 ED visits	1085 ED visits	939 ED visits

*Team-based care categories based on a z-score capturing the average of the standardized means of 18 items from a staff survey, as described in Nelson et al. (2014a,b) JAMA Intern Med. Low team-based care defined as z-score = 0–0.25, medium team-based care defined as z-score = 0.26–0.75, high team-based care defined as z-score = 0.76–1.
UPCI, usual provider of care index; PCP, primary care provider; ACSC, ambulatory care sensitive; ED, emergency department.

cohorts. Specifically, a 10-percentage increase in continuity was associated with 15.2 fewer ED visits (95 percent CI, −18,7 to −11.6) in the VA-reliant cohort and 10.6 more ED visits (95 percent CI, 7.9 to 13.2) in the nonreliant cohort.

Team-based clinic-level performance was not associated with patient utilization outcomes (Table 3).While the number of all-cause hospitalizations

Table 2:   The Effect of a 10-Percentage Point Increase in PCP Continuity on Hospitalizations, ACSC, and ED Visits (Controlling for Team-Based Care)

	Full Sample	
	Number of events per 1,000 patients	*95% CI*
Hospitalizations	4.5 fewer hospitalizations	(−5.3 to −3.7)
ACSC hospitalizations	3.2 fewer ACSC hospitalizations	(−3.4 to −2.9)
ED visits	2.6 more ED visits	(−0.2 to 5.4)
	VA reliance = 1	
Hospitalizations	1.6 fewer hospitalizations	(−2.7 to −0.5)
ACSC hospitalizations	0.2 fewer ACSC hospitalizations	(−.5 to .2)
ED visits	15.2 fewer ED visits	(−18.7 to −11.6)
	VA reliance < 1	
Hospitalizations	2.5 fewer hospitalizations	(−3.5 to −1.5)
ACSC hospitalizations	2.4 fewer ACSC hospitalizations	(−2.8 to −1.9)
ED visits	10.6 more ED visits	(7.9 to 13.2)

ACSC, ambulatory care sensitive; ED, emergency department.

and ED visits were less at high-functioning clinics compared to the low-functioning clinics, differences between the groups were not statistically significant. However, we found that among the VA reliant cohort, high-functioning team-based care was associated with 28 fewer hospitalizations (p = 0.03) and 98 fewer ED visits (p = 0.05) per 1000 patients when compared with low-functioning clinics.

Finally, we tested the interaction between team-based care and continuity to see whether team-based care can compensate for poor continuity. We found that team-based care did not compensate for UPC on hospitalizations, ACSC hospitalization, or ED visits (Figure 2 and Appendix SA2). Increased continuity had a larger effect on hospitalization rates at high-team-based clinics (which was the opposite of the hypothesized effect), but the differences between clinics grouped by team-based care were not statistically significant.

DISCUSSION

In this study, we found greater continuity with a VA PCP among all Medicare-eligible Veterans was associated with lower hospitalizations and ACSC hospitalizations, but was not associated with ED visits. We also found that clinics that had high team-based care scores did not have better patient outcomes. However, these overall findings masked heterogeneous effects between

Table 3:   Adjusted Average Marginal Effect of Team-Based Care on Hospitalization, ACSC Hospitalization, and ED Visits (at Mean Continuity)

	Number of Events per 1,000 Patients				
	Low Team-Based Performing Clinics	*Average Team-Based Performing Clinics*	*High Team-Based Performing Clinics*	*Difference Between Average-Low (p-Value)*	*Difference Between High-Low (p-Value)*
Hospitalizations	349	346	339	3 (.57)	10 (.11)
ACSC hospitalizations	49	50	51	1 (.71)	2 (.28)
ED visits	910	910	855	0 (.99)	55 (.16)
VA reliance = 1					
Hospitalizations	317	310	289	7 (.38)	28 (.03)
ACSC hospitalizations	35	34	34	1 (.69)	1 (.77)
ED visits	981	989	883	8 (.80)	98 (.05)
VA reliance < 1					
Hospitalizations	377	377	379	0 (.94)	2 (.75)
ACSC hospitalizations	64	66	68	2 (.37)	4 (.11)
ED visits	845	845	828	0 (.99)	17 (.38)

ACSC, ambulatory care sensitive; ED, emergency department.

Veterans who were and were not reliant on VA outpatient services. Higher continuity among Veterans who were reliant on the VA was associated with fewer ED visits and hospitalizations. Furthermore, high-functioning teams were associated with fewer ED visits and hospitalizations only among Veterans who were VA-reliant, and likely had greater exposure to elements of the PACT model. Finally, high functioning team-based care clinics did not compensate for poor continuity on hospitalizations, ACSC hospitalizations, or ED visits.

Our study has important implications for primary care practices implementing the PCMH model. First, we found that patients seen at high performing team-based care clinics did not experience lower continuity with their usual PCP. Second, we found that patients with higher continuity with their VA PCP had a lower probability of experiencing many types of high-cost health care utilization. Using the combined Medicare and VA data, a low continuity score may be related to two scenarios. First, a patient may not be seeing their assigned VA PCP, and are instead intermittently seeing a different VA PCPs or other non-VA PCPs through Medicare. Second, the patient may be

Figure 2:   Interaction of Continuity and Team-Based Care on Patient Outcomes.
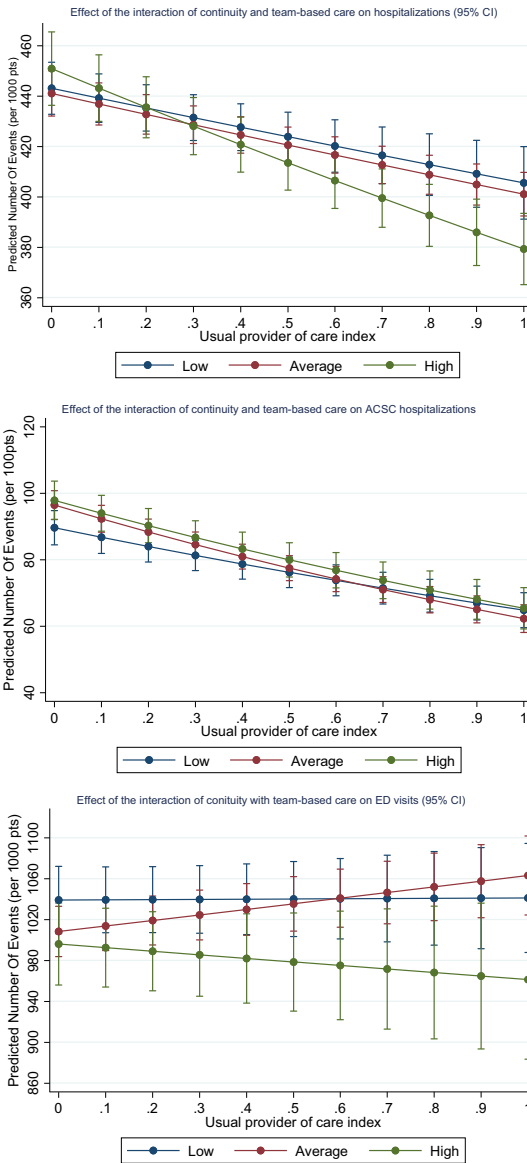
Notes: Predicted Number of Hospitalizations, ACSC Hospitalizations, and ED Visits by Team-Based Function and Continuity [Color figure can be viewed at wileyonlinelibrary.com]

seeing a Medicare PCP outside of VA as their usual provider, in lieu of their assigned VA PCP. To limit the misclassification that may happen in the latter scenario, we examined the association of continuity in Veterans who exclusively use the VA and found that higher continuity with a VA PCP was associated with fewer hospitalizations and ED visits. This finding adds to the literature on the significance of continuity of care on hospitalizations (Nelson et al. 2014b; Romaire et al. 2014; Bayliss et al. 2015). Interestingly, we also found that increased continuity with a VA-provider in the non-reliant cohort was associated with fewer hospitalizations and ACSC hospitalizations. However, increased continuity was associated with more ED visits among nonreliant cohort. One potential reason for the difference in the effect of continuity in the two cohorts may be a difference in informational continuity. VA providers may not have ready access to the patient's data if they are seeing providers outside the VA. Moreover, this discontinuity in informational continuity can lead to an increased likelihood of medical errors; including a lack of understanding of current medical treatments, implementation of competing medical regimens, and inability to coordinate a patient's acute medical care at the time of the visit. These scenarios may in part explain an increase in ED visits among nonreliant cohort.

We also found that the degree of team-based care did not have an independent effect on patient utilization. At first glance this may be surprising, but the transition to team-based primary care requires profound changes in the culture and organization of care. Many authors have discussed the challenges of transitioning to team-based primary care; including education and training of providers, personnel, and patients (Chesluk and Holmboe 2010). Thus, one possibility is that as practices become more experienced and improve team-based care performance the effects on utilization will become more pronounced. This may in fact be happening among Veterans who are reliant on the VA. In this cohort we find that patients in high-functioning team-based clinics had fewer hospitalization and ED visits than those in low-functioning clinics.

Finally, the degree of team-based care did not compensate for provider continuity on patient outcomes. One reason may be that while team-based care may provide consistent longitudinal continuity, it may not provide the same effects on interpersonal continuity. Another reason may be in part due to the design structure of the team itself. Indeed, the PACT teamlet structure focuses on the provider, as the other team members serve to support his/her functioning. These members are structured to complement the services provided by the PCP and do not serve as a substitute. We observed some evidence that the effect of continuity was associated with less hospitalizations and ED

visits at high-functioning team-based clinics, although not statistically significant. This finding suggests a possible synergistic effect of PCP continuity and team functioning, but more research as needed to confirm and understand these results. As health care policies promote team-based care, our results suggest primary care practices should continue to strengthen continuity between patients and primary care physicians.

We acknowledge several limitations in our study. Specifically, there are some key limitations in measuring team-based care. First, a key danger of selection bias exists because of the low response rate to the team-based care survey. However, respondents were of similar demographics compared with a primary care sample from the VA All Employee Survey, distributed nationally (Helfrich et al. 2014a). In addition, the team-based care score was derived from 4,819 surveys representing 626 VA clinics, making it one of the largest surveys to measure team-based care. Second, the PACT team-based survey is measured at the facility-level and not at the teamlet-level. This limits our ability to understand how individual providers and teams effect patient outcomes. However, the measure of team-based care is a unique and valuable measure allowing us to generate novel inferences related to team-based care. Third, team-based survey items primarily address two dimensions of team-based care: team structure and task delegation (from the PCP to the RN care manager). Although these are important concepts, teamwork also relates to communication, participatory decision making, and role clarity, which were not included in this survey. Finally, this is an observational study, which limits our ability to infer causality. Specifically, there may be unmeasured patient or clinic-level factors related to continuity, team-based care, and patient utilization.

A key strength of our study is the ability to leverage a dataset linking administrative data from VA and non-VA services. In doing so, we reduced potential errors in measurement of key explanatory and outcome variables. Moreover, we increased our understanding of heterogeneity in the association of continuity and team-based care with high-cost utilization between Veterans with varying exposure to VA outpatient care. As more Veterans are choosing to get care outside of the VA, the ability to combine and link data across multiple systems will be invaluable in better understanding and evaluating VA program initiatives.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix SA1: Author Matrix.
Appendix SA2: Table of Full Negative Binomial Regression Results from Interaction Models.