

Examining Differential Performance of 3 Medical Home Recognition Programs

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Many medical practices are pursuing primary care transformation using a medical home (MH) model.^{1,2} These models incorporate the joint principles of the patient-centered medical home (PCMH), which describe features of a strong primary care delivery system, including enhanced access, coordinated and comprehensive care, and continuous quality improvement.³⁻⁵ With time, additional administrative and financial burdens associated with primary care transformation have prompted a need to distinguish practices that systematically adhered to MH principles from those that did not.^{3,6-8}

Over time, payers have encouraged practices to pursue MH recognition in order to codify practices' use of PCMH principles.^{9,10} As of 2017, 3 organizations offer 3 common forms of MH recognition: National Committee for Quality Assurance (NCQA; 12,000 practice sites), the Accreditation Association for Ambulatory Health Care (AAAHC; 6000 practice sites), and The Joint Commission (TJC; 1400 practice sites).¹¹⁻¹³

Despite the rapid growth of these programs, limited evidence exists on the relative effectiveness of different recognition types on patient outcomes.¹⁴⁻¹⁸ Although each program's recognition standards align with core elements of the MH model, required elements vary for each program and may contribute to differences in outcomes. For example, recognition programs have differing criteria related to use of health information technology (IT), care coordination, and medication management. Additionally, each program assigns a different weight to these areas when measuring the extent of implementation of each program's requirements.

Although descriptive work has compared recognition programs' application procedures and recognition standards, no analyses have examined patient outcomes associated with these programs.¹⁹⁻²³ Using data from a nationwide evaluation of an initiative to assist federally qualified health centers (FQHCs) in becoming PCMHs, we examine changes in utilization, quality, and Medicare expenditures associated with the terminal (ie, highest) MH recognition status of 3 recognition programs: NCQA 2011 Level 3 PCMH, TJC Primary Care MH, and AAAHC MH. As NCQA 2011 Level 1 and Level 2 PCMH are not terminal recognition levels, they are not included in this analysis.

ABSTRACT

OBJECTIVES: We examined differences in patient outcomes associated with 3 patient-centered medical home (PCMH) recognition programs—National Committee for Quality Assurance (NCQA) Level 3, The Joint Commission (TJC), and Accreditation Association for Ambulatory Health Care (AAAHC)—among Medicare beneficiaries receiving care at federally qualified health centers (FQHCs).

STUDY DESIGN: We used data from CMS' FQHC Advanced Primary Care Practice Demonstration, in which participating FQHCs received assistance to achieve NCQA Level 3 PCMH recognition. We assessed the impact of the 3 recognition programs on utilization, quality, and Medicare expenditures using a sample of 1108 demonstration and comparison FQHCs.

METHODS: Using propensity-weighted difference-in-differences analyses, we compared changes in outcomes over 3 years for beneficiaries attributed to FQHCs that achieved each type of recognition relative to beneficiaries attributed to FQHCs that did not achieve recognition.

RESULTS: Recognized FQHCs, compared with nonrecognized FQHCs, were associated with significant 3-year changes in FQHC visits, non-FQHC primary care visits, specialty visits, emergency department (ED) visits, hospitalizations, a composite diabetes process measure, and Medicare expenditures. Changes varied in direction and strength by recognition type. In year 3, compared with nonrecognized sites, NCQA Level 3 sites were associated with greater increases in ambulatory visits and quality and greater reductions in hospitalizations and expenditures ($P < .01$), TJC sites were associated with significant reductions in ED visits and hospitalizations ($P < .01$), and AAAHC sites had changes in the opposite direction of what we anticipated.

CONCLUSIONS: Heterogeneous changes in beneficiary utilization, quality, and expenditures by recognition type may be explained by differences in recognition criteria, evaluation processes, and documentation requirements.

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We hypothesized that changes in visits to FQHCs, primary care outside of FQHCs, specialists, and emergency departments (EDs); inpatient admissions; quality of care; and expenditures would vary by MH recognition type.

METHODS

MH Recognition Programs

The 3 recognition programs examined differ in the content and specificity of their criteria, evaluation processes, and documentation requirements. We reviewed descriptive studies comparing these programs, as well as their online resources, to provide context for our analysis.²²⁻²⁶

NCQA has a practice site-level recognition program, meaning that sites affiliated with the same medical practice must individually pursue recognition. Practices pursuing recognition may achieve Level 1, 2, or 3 recognition based on the extent to which they meet specific standards.²⁷ NCQA emphasizes meaningful use requirements; almost half of its recognition score is derived from IT capabilities.

In contrast, TJC recognition is awarded at the organizational level, meaning that a single recognition award is given to the organization spanning all of its practice sites. Practices seeking MH recognition must also meet criteria for TJC's ambulatory care accreditation, which requires sites to implement foundational components for MH content areas; these do not disproportionately emphasize health IT capabilities. Uniquely, TJC requires sites to collect data on patient experience, which is not required for NCQA recognition.^{19,28}

Similar to TJC, AAAHC operates an organizational-level program allowing practices to pursue MH recognition in addition to a foundational ambulatory care certification.²¹ Burton et al found that a large proportion of AAAHC recognition criteria require practices to develop policies related to patient care, staff development, and prevention practices. However, limited guidance is provided about the specification of these policies, which allows variance in site-level interpretation and implementation.¹⁹ Almost a quarter of the AAAHC recognition score derives from the development of these policies.

Study Sample

The site and beneficiary sample used in this analysis was drawn from our evaluation of CMS' FQHC Advanced Primary Care Practice (APCP) Demonstration.²⁹⁻³² Demonstration sites received financial support and technical assistance to achieve NCQA Level 3 recognition within a 3-year period. Independent of this demonstration, both demonstration and comparison sites utilized other technical and financial resources through the Health Resources & Services Administration and CMS during the same period.³⁰ Details of this demonstration's evaluation methodology have been published and are supplemented in the [eAppendix](#) (available at [ajmc.com](#)).^{29,30}

We used Medicare claims data from 2010 to 2014 to attribute beneficiaries to FQHCs based on the plurality of their primary care visits during the year before the demonstration. The attribution

TAKEAWAY POINTS

This study contributes to the literature assessing the effectiveness of medical home (MH) recognition programs on patient outcomes:

- ▶ This analysis is the first to compare beneficiary outcomes across multiple MH recognition programs.
- ▶ We document heterogeneity in the association between achievement of MH recognition and beneficiary outcomes among 3 MH recognition programs.
- ▶ These study findings support the need to better understand how different components of MH recognition programs contribute to site-level changes and patient outcomes.

process was repeated in each subsequent year for beneficiaries who utilized primary care in the years following the start of the demonstration. This analysis used data on beneficiaries attributed to 1 of 1108 of the evaluation's 1330 FQHCs. We included 393 FQHCs with NCQA Level 3 (n = 232,990 beneficiaries), 100 FQHCs with TJC (n = 55,471), and 14 FQHCs with AAAHC (n = 14,020) recognition, and a group of 601 FQHCs that did not achieve recognition (n = 302,480) by the end of 2014 (**Figure**). Each of the 4 groups included demonstration and comparison sites under the FQHC APCP Demonstration (**Table 1**). This analysis focuses on outcomes of beneficiaries attributed to 3 terminal recognition programs as distinct from foundational programs (eg, NCQA PCMH Level 1 and 2, TJC accreditation, and AAAHC certification). The remaining 222 of 1330 sites were excluded because they received a foundational recognition (n = 147), achieved multiple recognition types (n = 59), or were recognized by a program other than the 3 considered in this analysis (n = 16).²⁹

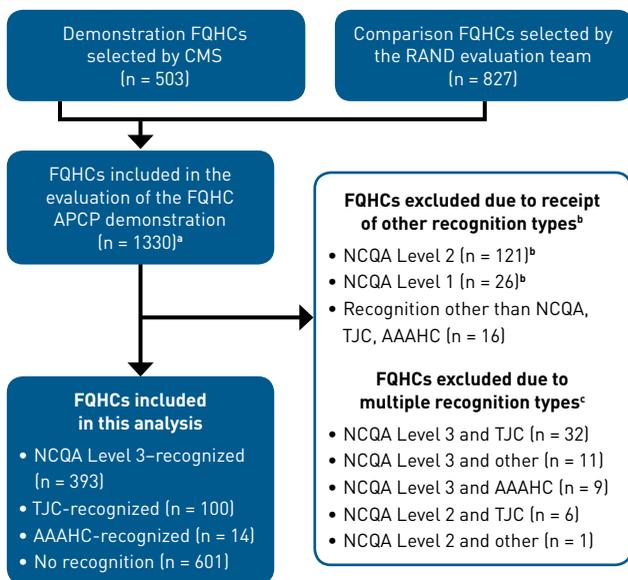
Description of Outcomes

Utilization measures included FQHC visits, non-FQHC primary care visits (ie, visits to rural health clinics or physician offices but not FQHCs), and specialist visits. In each category, the visit could be to a physician, nurse practitioner, or physician assistant. Also included were ED visits, inpatient admissions, admissions for ambulatory care-sensitive conditions (ACSCs), and 30-day unplanned readmissions. We used 1 composite and 4 diabetes process quality measures (glycated hemoglobin [A1C] testing, low-density lipoprotein cholesterol testing, retinal eye exams, and nephropathy testing within the past year) and a measure of annual lipid tests for patients with ischemic vascular disease. We assessed effects on Medicare expenditures in 3 categories: inpatient, Part B (physician and supplier), and total Medicare expenditures (consisting of inpatient, outpatient, skilled nursing facility, home health, hospice, durable medical equipment, and Part B expenditures).

Statistical Analysis

We used difference-in-differences (DID) analyses to compare changes in outcomes from baseline to the end of each demonstration year for beneficiaries attributed to NCQA Level 3-, TJC-, or AAAHC-recognized FQHCs compared with beneficiaries attributed to nonrecognized sites. A positive DID estimate can result from

FIGURE. Inclusion and Exclusion of FQHCs



AAAHC indicates Accreditation Association for Ambulatory Health Care; APCP, Advanced Primary Care Practice; FQHC, federally qualified health center; NCQA, National Committee for Quality Assurance; TJC, The Joint Commission.

*No evaluation site in this group of 1330 FQHCs had NCQA Level 3 2011, TJC, or AAAHC recognition prior to the demonstration.

^bDifferences in outcomes among FQHCs achieving NCQA Level 1 or 2 recognition will be reported separately in a forthcoming publication.

^cThese FQHCs were excluded in order to estimate the independent effects of each type of recognition.

TABLE 1. Achievement of Medical Home Recognition by the End of the FQHC APCP Demonstration

Demonstration Participation Status	All N (%)	Type of Recognition			
		NCQA Level 3 n (%)	TJC n (%)	AAAHC n (%)	None n (%)
Demonstration sites only	421 (38.0)	314 (79.9)	24 (24.0)	1 (7.1)	82 (13.6)
Comparison sites only	687 (62.0)	79 (20.1)	76 (76.0)	13 (92.9)	519 (86.4)
Both demonstration and comparison sites	1108 (100.0)	393 (100.0)	100 (100.0)	14 (100.0)	601 (100.0)

AAAHC indicates Accreditation Association for Ambulatory Health Care; APCP, Advanced Primary Care Practice; FQHC, federally qualified health center; NCQA, National Committee for Quality Assurance; TJC, The Joint Commission.

either a greater increase or smaller decrease in outcome measures for recognized versus nonrecognized sites. We used 2-part models to estimate effects on utilization and Medicare expenditures, with the first part using logistic regression and the second part using either negative binomial (utilization) or linear models (expenditures).^{33,34}

Readmissions and process measures were modeled using logistic regression. We used multinomial logistic regression to create propensity score weights reflecting each beneficiary's propensity

to be attributed to a site that achieved each recognition based on beneficiary and site-level characteristics measured the year prior to each beneficiary's attribution (eAppendix). To provide context for the DID estimates, we present information on trends occurring between the baseline year and year 3 for all 4 groups. Lastly, we analyzed trends among groups for 2 years prior to the study to confirm DID model assumptions (eAppendix).

RESULTS

Sites associated with the 4 recognition outcomes were similar with respect to the demographics of patients they serve (Table 2). The majority of FQHC users were female; half were disabled. When using propensity score weights to balance baseline characteristics across the 4 groups, we found only a few remaining differences: Beneficiaries attributed to AAAHC-recognized sites were more likely to be white and less likely to be black than those attributed to nonrecognized sites; beneficiaries attributed to TJC-recognized sites were more likely to live in metropolitan areas and less likely to live in rural areas than those attributed to nonrecognized sites; beneficiaries attributed to AAAHC-recognized sites were less likely to live in metropolitan or rural areas, more likely to live in urban areas, and less likely to live in high-poverty areas relative to those attributed to nonrecognized sites; AAAHC sites were likely to have fewer specialists relative to sites without recognition; and AAAHC sites had approximately 3 times the average number of Medicare beneficiaries as nonrecognized sites.

Several patterns in outcome measures emerged from baseline to the end of each demonstration year for beneficiaries attributed to recognized sites relative to nonrecognized sites. The first 4 columns in Table 3 show the direction of 3-year trends for each outcome measure for beneficiaries associated with each group. The remainder of Table 3 shows DID estimates and P values for analyses comparing sites with each recognition type with nonrecognized sites.

For FQHC visits, the first 4 columns show a statistically significant decrease across all 4 groups. The remaining columns show a net increase of 88, 172, and 180 more visits per 1000 beneficiaries for years 1, 2, and 3, respectively (P < .001). These estimates reflect a smaller reduction in FQHC visits among NCQA Level 3 sites compared with nonrecognized sites. For TJC- and AAAHC-recognized sites, compared with nonrecognized sites, all significant estimates are negative. This reflects a larger reduction among TJC- and AAAHC-recognized sites relative to nonrecognized sites.

All 4 groups were associated with an increase in non-FQHC primary care visits, but a smaller rate of increase for NCQA Level 3 sites and a larger rate of increase for AAAHC sites led to a relative reduction of 90 visits and a relative increase of 166 visits per 1000 beneficiaries in year 3, respectively, compared with nonrecognized sites (P < .01). Specialist visits similarly increased over time for all 4 groups, but only NCQA Level 3 sites were associated with a relative decrease over time (45 fewer visits per 1000 beneficiaries in year 3) relative to nonrecognized sites (P < .01).

For nonambulatory utilization measures, only TJC sites achieved greater reductions in ED visits than nonrecognized sites (39 fewer ED visits per 1000 beneficiaries; $P < .01$). By contrast, AAAHC sites were associated with an increase of 78 visits per 1000 beneficiaries in year 3 relative to nonrecognized sites ($P < .01$). This was due to a smaller reduction in ED visits compared with nonrecognized sites, rather than an increase in ED utilization over time. Although inpatient admissions increased in all 4 groups, NCQA Level 3 and TJC sites had smaller increases (11 and 18 fewer admissions per 1000 beneficiaries in year 3, respectively; $P < .001$). Recognized sites were not associated with reductions in admissions for ACSCs or readmissions.

Few clear trends emerged among process measures. Both NCQA Level 3 and AAAHC sites were associated with larger increases over time in the diabetes composite measure (1.6 and 2.7 percentage points, respectively, in year 3) relative to nonrecognized sites ($P < .05$). However, for the individual diabetes measures, only NCQA Level 3 sites were associated with relative increases in A1C tests (1.0 percentage points), eye exams (1.4 percentage points), and nephropathy tests (2.1 percentage points). These were largely driven by smaller decreases in rates over time relative to nonrecognized sites.

Medicare expenditures increased over time for all 4 groups in each of the 3 categories we examined. However, only NCQA Level 3 sites had a smaller rate of increase than nonrecognized sites, leading to a relative decrease in total Medicare (\$300 per beneficiary), inpatient (\$214 per beneficiary), and Part B (\$72 per beneficiary) expenditures in year 3 ($P < .01$).

DISCUSSION

We compared trends in utilization, quality, and expenditures over 3 years for Medicare beneficiaries attributed to sites that received 1 of 3 types of MH recognition relative to sites with no recognition. The former were more likely to demonstrate changes in outcomes consistent with better access and quality of care, lower inpatient utilization, and lower expenditures in year 3. However, the direction and strength of these associations varied by recognition type.

Each recognition program was associated with a distinct pattern of relative change in FQHC utilization rates: a net increase, net decrease, or no difference relative to trends among nonrecognized

TABLE 2. Characteristics of Medicare Beneficiaries Attributed to FQHCs With Different Types of Medical Home Recognition

Characteristics	Type of Medical Home Recognition				Propensity-Weighted Standardized Difference With Nonrecognized FQHCs ^a		
	None	NCQA			NCQA Level 3	TJC	AAAHC
		Level 3	TJC	AAAHC			
Sites, n	601	393	100	14			
Beneficiaries, n	302,480	232,990	55,471	14,020			
Beneficiary Characteristics							
Age (years) as of first attribution quarter, mean	63.2	62.7	62.5	67.0	0.004	0.016	0.113
Female, %	55.6	54.8	55.2	55.7	0.003	0.006	0.008
Race/ethnicity, %							
White	67.6	70.8	62.6	86.2	0.004	0.088	0.252
Black	21.5	15.3	17.8	6.5	0.051	0.046	0.209
Asian	2.3	4.1	1.7	0.3	0.071	0.062	0.174
Hispanic	5.8	6.7	14.0	4.4	0.003	0.190	0.131
Other/unknown	2.8	3.1	3.9	2.7	0.025	0.010	0.045
Disabled, %	52.3	53.3	52.9	43.1	0.005	0.012	0.155
Dual eligible, %	45.9	47.5	49.8	35.6	0.004	0.037	0.140
HCC score, ^b mean	1.1	1.1	1.1	1.2	0.002	0.011	0.012
Site-Level Characteristics							
Location, %							
Metropolitan area	64.8	68.7	83.9	52.5	0.038	0.250	0.271
Nonmetropolitan urban	21.0	16.5	8.0	47.5	0.104	0.033	0.520
Nonmetropolitan rural	14.2	14.8	8.1	–	0.140	0.277	0.552
Household poverty in Census tract, mean %	23.4	20.8	24.7	19.7	0.022	0.016	0.238
Years in operation, mean	20.0	18.5	21.6	21.5	0.007	0.029	0.117
Service delivery sites of attributed FQHC, mean	8.4	11.0	14.3	7.3	0.007	0.108	0.037
Primary care providers, mean	6.5	7.5	9.5	10.4	0.007	0.092	0.174
Specialists, mean	1.1	1.2	1.8	0.2	0.003	0.076	0.373
Medicare beneficiaries, mean	548.7	523.2	552.0	1530.2	0.018	0.019	0.144
Total revenue per site, US\$ (millions per year), mean	2.1	2.6	2.6	2.5	0.026	0.043	0.129

AAAHC indicates Accreditation Association for Ambulatory Health Care; FQHC, federally qualified health center; HCC, Hierarchical Condition Category; NCQA, National Committee for Quality Assurance; TJC, The Joint Commission.

^aA standardized difference between groups of 0.2 standard deviations is commonly used to define a “small” level of imbalance between groups.

^bThe HCC score was created using the CMS-HCC risk-adjustment model.

sites. Relative changes in non-FQHC primary care visit rates were in the opposite direction to those of FQHC visits, suggesting that beneficiaries are exhibiting greater loyalty to FQHCs. Only NCQA Level 3–recognized sites achieved significant relative reductions in specialty visits by year 3, which may reflect reduced need due to the consolidation of primary care at these recognized FQHCs or implementation of more efficient referral systems.

TABLE 3. Changes in Utilization, Quality, and Medicare Expenditures for 3 Medical Home Recognition Programs Relative to Sites With No Recognition

Outcome Measure ^b	Direction of 3-Year Trend ^a				DID Estimates								
	None	NCQA L3	TJC	AAHC	NCQA L3 Recognition (n = 393)			TJC Recognition (n = 100)			AAHC Recognition (n = 14)		
					Estimate			Estimate			Estimate		
					Y1	Y2	Y3	Y1	Y2	Y3	Y1	Y2	Y3
FQHC visits	↓	↓	↓	↓	87.6***	171.5***	179.8***	-61.2**	1.5	-16.1	-54.3	-82.9	-106.6**
Non-FQHC primary care visits	↑	↑	↑	↑	-25.3*	-84.0***	-90.1***	-16.5	-37.0	-17.2	-4.2	97.9	166.3**
Specialist visits	↑	↑	↑	↑	-17.5	-35.1*	-44.8**	-18.8	-70.6**	-15.2	81.8	-40.6	31.4
ED visits	↓	↓	↓	-	-6.3	-9.8	-4.6	-25.2	-64.8***	-38.5**	39.4	110.0***	78.2**
Inpatient admissions	↑	↑	↑	↑	-6.1	-4.2	-10.6***	-5.3	-15.3**	-18.3***	-1.0	17.2	15.2
Inpatient ACSC admissions	↑	↑	↑	↑	-0.8	-1.7	-1.2	0.6	-3.0	-3.4	1.4	-2.6	3.7
Readmissions, percentage points	↑	↑	↑	↑	0.4	0.1	-0.5	0.6	0.9	-1.0	1.8	-0.1	0.9
All 4 diabetes tests	-	↑	-	↑	1.7***	1.3***	1.6***	-0.3	0.7	0.6	-2.2	1.4	2.7*
A1C test	↓	↓	↓	↓	2.0***	0.9*	1.0*	1.5*	1.4*	-0.8	-2.7*	-2.0	-1.3
LDL cholesterol test	↓	↓	↓	↓	0.1	-0.5	0.8	-0.1	1.1	1.3	1.2	1.6	-0.9
Eye exam	↓	-	-	-	2.1***	1.6***	1.4**	0.3	0.0	0.2	-3.4	3.0	1.2
Nephropathy test	-	↑	-	-	2.0***	2.4***	2.1***	-3.2***	-0.7	-0.3	-3.9	-2.8	0.7
Lipid test for patients with IVD	↓	↓	↓	↓	0.0	-0.3	-0.1	2.6*	2.1	1.6	0.7	2.6	-2.8
Total Medicare expenditures	↑	↑	↑	↑	-207*	-206*	-300**	27	-59	-126	-302	602	-16
Inpatient expenditures	↑	↑	↑	↑	-152*	-145*	-214***	41	-74	-150	-184	157	-279
Part B expenditures	↑	↑	↑	↑	-43*	-65***	-72***	27	16	-26	44	210	40

A1C indicates glycated hemoglobin; AAHC, Accreditation Association for Ambulatory Health Care; ACSC, ambulatory care-sensitive condition; DID, difference-in-differences; ED, emergency department; FQHC, federally qualified health center; IVD, ischemic vascular disease; LDL, low-density lipoprotein; NCQA L3, National Committee for Quality Assurance, Level 3; TJC, The Joint Commission; Y, year.

*P < .05; **P < .01; ***P < .001.

^aEach symbol reflects the direction and statistical significance of differences between baseline and demonstration year 3: “↓,” statistically significant decrease over time; “↑,” statistically significant increase over time; “-,” no statistically significant change over time. This information helps to interpret the DID estimates. For example, a positive DID can result from a greater increase in recognized sites relative to nonrecognized sites. In each measurement year, NCQA L3 sites had higher rates of providing all 4 diabetes tests to patients with diabetes relative to sites that did not achieve recognition. Additionally, a positive DID can also result from a smaller decrease in recognized sites relative to nonrecognized sites (eg, FQHC visits). For example, there was a decrease in FQHC visits among NCQA L3 sites in years 1 to 3, but there was a larger decrease in FQHC visits among nonrecognized sites, such that NCQA L3 sites are associated with a greater number of FQHC visits relative to nonrecognized sites. We do not report numerical estimates of trends because the arithmetic difference in trends between groups is not equivalent to the reported DID estimate, due to the use of nonlinear models.

^bFQHC visits include any visit to an FQHC regardless of provider specialty. Non-FQHC primary care visits include visits to primary care physicians, nurse practitioners, and physician assistants who practice in rural health clinics or office settings. Specialist visits include visits to specialists who practice at FQHCs, rural health clinics, or primary care clinics. ED visits include both outpatient-only ED visits that did not lead to a hospitalization and ED visits that were followed by hospital admission, and observation stays. Inpatient ACSC admissions are based on the Agency for Healthcare Research and Quality’s Prevention Quality Indicators and include hospitalizations with a primary diagnosis of 1 of 9 chronic ACSCs: (1) diabetes short-term complications (ketoacidosis, hyperosmolarity, coma), (2) diabetes long-term complications (renal, eye, neurological, or circulatory), (3) chronic obstructive pulmonary disease or asthma in older adults, (4) hypertension, (5) congestive heart failure, (6) angina without procedure, (7) uncontrolled diabetes, (8) asthma in younger adults, and (9) lower-extremity amputation among patients with diabetes. Inpatient readmissions are measured as 30-day hospital-wide unplanned readmissions. Total Medicare expenditures include inpatient, outpatient, skilled nursing facility, home health, hospice, durable medical equipment, and Part B expenditures. All expenditures are millions of US\$ per year.

Among non-ambulatory care utilization measures, NCQA- and TJC-recognized sites were associated with reductions in all-cause inpatient admissions. These changes are unlikely to be driven by trends in hospitalizations for ACSCs, where we observed no significant differences between recognized and nonrecognized sites. Instead, these reductions in rates of all-cause admissions may be related to improved primary care utilization or enhanced coordination within FQHCs or between FQHCs and outside specialists, which may lead to better management of patients with complex

conditions or lower rates of specialty referrals. These factors might also explain TJC-recognized sites’ larger reductions in ED utilization over time. Large relative increases in ED utilization among AAHC-recognized sites, along with reductions in FQHC visits and increases in non-FQHC visits, raise some concern about unintended consequences of MH implementation in these sites. However, a small number of AAHC sites were included in this study, and with a future larger study, current null or small differences might become statistically significant.

Across all recognition programs, quality of care was more likely to improve relative to trends among nonrecognized sites. In year 3, we observed many statistically significant improvements for NCQA Level 3 sites and in the composite diabetes measure for AAAHC sites. Small sample sizes for TJC- and AAAHC-recognized sites may limit the ability to detect statistically significant associations and may explain results for Medicare expenditures, where we observed statistically significant changes only for NCQA Level 3 sites.

Some of the observed heterogeneity in associations with patient outcomes may be due to the specific recognition program criteria, which vary with respect to their content and specificity, as well as the evaluation process and required documentation. One major difference related to the content and specificity of criteria is that NCQA places a heavier emphasis on the use of electronic health records (EHRs) that incorporate meaningful use criteria.^{19,35} Requirements that focus on the utilization of EHRs can enhance primary care delivery and strengthen population health management. In comparison, TJC scoring criteria are weighted fairly consistently across multiple domains, rather than heavily emphasizing any one content area.¹⁹ Sites pursuing AAAHC recognition have to implement internal policies, but they receive limited guidance on the specificity of these policies. This may lead sites to implement practice changes that are not associated with patient outcomes measured in this analysis. Nevertheless, there may be unmeasured beneficial or adverse effects of these changes at the clinic or patient level.

Additionally, differences in the evaluation process and the associated documentation requirements may contribute to heterogeneity in patient outcomes. For example, sites pursuing NCQA recognition are responsible for completing worksheets, responding to follow-up questions, and providing documentation, a process that takes approximately 40 to 80 hours to complete and upload online.¹⁹ In comparison, TJC and AAAHC use external surveyors to perform on-site evaluations without requiring additional time to upload documentation materials. Sites pursuing AAAHC recognition provide supplemental documentation to the external surveyors for recognition, but sites seeking TJC recognition are only required to provide documentation to receive ambulatory care accreditation, a prerequisite for MH recognition. These required tasks add an administrative burden to staff who also are involved in the implementation of PCMH strategies and daily operational activities.

Limitations

This analysis had several limitations. First, the small number of sites achieving AAAHC recognition limited our ability to identify statistically significant associations with many outcome measures. Second, we were unable to randomize sites to recognition programs. Accordingly, we used DID analyses to control for patient- and site-level differences. Nevertheless, it is possible that unmeasured confounders could bias the effects of recognition types, including self-selection of sites to recognition programs. For example, heterogeneity in the criteria and evaluation process among recognition programs, and how those align with a site's existing practice structure, may influence

sites' decisions to pursue one recognition type over another. Sites' self-selection to recognition programs may explain differences by program if these factors are correlated with beneficiary outcomes.

Third, a large proportion of sites achieving NCQA Level 3 recognition participated in the CMS FQHC ACP Demonstration and received support to pursue NCQA recognition. Despite our DID design, including examination of parallel trends (eAppendix), this group may differ from sites receiving other types of recognition. This may explain the strong associations with many outcomes for NCQA-recognized sites. To estimate the effect of recognition on outcomes independent of the effect of the demonstration, we conducted a sensitivity analysis replicating these with 687 comparison sites. We found fewer statistically significant results, although they were consistent with outcomes reported in this analysis (eAppendix).

Fourth, we measured associations between MH recognition and beneficiary outcomes over a 3-year period, but many sites obtained recognition toward the end of the study period. A longer duration of follow-up after achieving recognition may be needed to observe effects on outcomes.³⁶ Fifth, our analyses were limited to claims-based outcomes as our sample sizes for patient experience measures were inadequate to support comparisons across the 3 recognition groups. Sixth, we achieved high levels of balance by using propensity score weights, but it is possible that unobserved differences among groups could bias the results if these unobserved factors changed over time. Lastly, we examined the effects of these recognition programs among FQHCs but do not know the extent to which these findings may generalize to non-safety-net clinics. Nevertheless, our findings suggest value in additional examination of how specific components of recognition programs affect patient outcomes across settings.

Despite these limitations, this analysis is the first to compare beneficiary outcomes across recognition programs, document heterogeneity in the association among recognition programs with beneficiary outcomes, and provide insight into the reasons for these differences. We note that our analyses pertain to recognition programs at a particular point in time, and all 3 programs have evolved over time.³⁷⁻³⁹ Given the extensive resources required by organizations to support the development and maintenance of recognition programs, and by sites to use them, this empirical evidence may help future studies focus on how changes in recognition criteria, evaluation processes, or documentation requirements may additionally affect patient outcomes.

CONCLUSIONS

As practices continue to pursue MH recognition, it is important to understand how components of each recognition program influence the types of changes that sites pursue and the degree to which they translate to changes in patient outcomes. NCQA Level 3 sites were associated with improvements across a greater number of outcomes, and there were fewer improved outcomes among sites with TJC recognition over a 3-year period. AAAHC-recognized sites were associated

with limited improvements, primarily due to a small sample size. Although this analysis of variation in outcomes contributes to the literature on the effectiveness of recognition programs, there is a need for additional comparative analyses of types and components of recognition programs to better understand the associations among specific program requirements and patient outcomes. ■

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Examining Differential Performance of Three Medical Home Recognition Programs

Appendix

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1. Overview of the FQHC APCP Demonstration

Demonstration sites that participated in the Centers for Medicare and Medicaid (CMS) Advanced Primary Care Practice (APCP) Demonstration received care management payments, technical assistance, feedback on readiness for recognition, and feedback through performance reports. A total of 1014 FQHCs applied and CMS selected 503 sites to participate. The evaluation team identified 827 comparison sites based on geographic data and site- and patient-level characteristics.

We used Medicare claims data from 2010-2014 to attribute beneficiaries to recognized and non-recognized federally qualified health centers (FQHCs). Medicare beneficiaries were eligible for the evaluation if they were continuously enrolled in Parts A and B, not enrolled in Medicare Advantage, and did not have end-stage renal disease in the year prior to the demonstration. Beneficiaries were attributed to the site where they received the plurality of their primary care services during the year prior to the demonstration. Attribution was repeated on a quarterly basis, and beneficiaries attributed for the first time after the demonstration began were also included in all claims analyses because of the large percentage of the overall cohort they represented. Medical home recognition status for FQHCs included in the analysis was obtained through data made available by the Health Resources and Services Administration and a CMS contractor.

2. Beneficiary Characteristics and Balance Assessments

This section summarizes the comparison of beneficiary characteristics based on recognition type in unweighted and propensity score-weighted analyses. We calculated the standardized mean difference between groups for each characteristic to assess the balance in characteristics between groups of beneficiaries attributed to recognized sites and not recognized. Using a benchmark of 20% of one standard deviation between groups to define a “small” level of imbalance between groups, we identified the number of characteristics that exhibited imbalance both before and after application of propensity score weights. If the propensity score weights balance the characteristics across both groups, we should observe few standardized mean differences greater than 20%.

Appendix Table 2.1 reports the characteristics of beneficiaries attributed to sites that achieved National Committee of Quality Assurance (NCQA) patient-centered medical home (PCMH) Level 3, The Joint Commission (TJC), or Accreditation Association for Ambulatory Health Care (AAAHC) recognition, or no medical home recognition by the end of a three year period. These results are not weighted using propensity scores to balance beneficiary characteristics in each of the four groups.

Appendix Table 2.1: Characteristics of Medicare Beneficiaries Attributed to Sites with No Medical Home Recognition, or with NCQA PCMH, TJC, or AAAHC Recognition ^a

Characteristics	No Recognition	NCQA Level-3 Recognition	TJC	AAAHC
	n=601 sites, 302,480 beneficiaries	n=393 sites, 232,990 beneficiaries	n=100 sites, 55,471 beneficiaries	n=14 sites, 14,020 beneficiaries
Age as of first attribution quarter, mean	43.1	44.7	44.6	33.2
Female, %	55.6	54.8	55.2	55.7
Race/Ethnicity: White, %	67.6	70.8	62.6	86.2
Black	21.5	15.3	17.8	6.5
Asian	2.3	4.1	1.7	0.3
Hispanic	5.8	6.7	14.0	4.4
Other/Unknown	2.8	3.1	3.9	2.7
Disabled, %	52.3	53.3	52.9	43.1
Dual eligible, %	45.9	47.5	49.8	35.6
Hierarchical Condition Category score, mean	1.1	1.1	1.1	1.2
Location of attributed site: Metropolitan area, %	64.8	68.7	83.9	52.5
Non-metropolitan urban	21.0	16.5	8.0	47.5
Non-metropolitan rural	14.2	14.8	8.1	---
Household poverty in census tract of attributed site, mean %	23.4	20.8	24.7	19.7
Years in operation of attributed site, mean	20.0	18.5	21.6	21.5
Number of service delivery sites of attributed FQHC, mean	8.4	11.0	14.3	7.3
Number of primary care providers at attributed	6.5	7.5	9.5	10.4

Characteristics	No Recognition	NCQA Level-3 Recognition	TJC	AAHC
	n=601 sites, 302,480 beneficiaries	n=393 sites, 232,990 beneficiaries	n=100 sites, 55,471 beneficiaries	n=14 sites, 14,020 beneficiaries
site, mean				
Number of specialists at attributed site, mean	1.1	1.2	1.8	0.2
Number of Medicare beneficiaries at attributed site, mean	548.7	523.2	552.0	1,530.2
Total revenue of attributed site in millions, mean	2.1	2.6	2.6	2.5
HRSA PCMH supplemental funding in FY 2011 at attributed site ^b , %	64.0	91.7	82.5	100.0
HRSA PCMH Recognition Program participation at attributed site ^c , %	28.4	62.2	35.1	2.8

^a Beneficiaries are included in the exhibit if the plurality of their primary care visits were to a site that achieved NCQA Level-1, Level-2, or Level-3 PCMH recognition, or no recognition by the end of the demonstration). Beneficiaries were eligible for the analysis if they were attributed to one of these sites in either the year prior to the demonstration, demonstration Year 1, or demonstration Year 2. Beneficiaries first attributed in the third (final) year of the demonstration were excluded from all analyses. Results are presented without the use of propensity score weights.

^b HRSA PCMH-related supplemental funding was a one-time-only grant given to FQHCs that were pursuing PCMH transformation in fiscal year 2011.

^c HRSA's PCMH Recognition program covers the cost of applying for PCMH recognition. FQHCs began filing notices of their intent to pursue PCMH recognition on a rolling basis beginning in 2011; the information presented in the table reflects participation as of 2012.

Appendix Table 2.2 shows characteristics of beneficiaries who were attributed to sites that achieved NCQA PCMH Level 3, TJC, or AAAHC recognition, or no medical home recognition, and that were included in all analyses of cost and utilization measures. For the unweighted analyses, we found a number of characteristics that did not exhibit adequate balance, and this was most prevalent among beneficiaries attributed to AAAHC-recognized sites.

After applying the propensity score weights, we found only three characteristics that remained imbalanced by exceeding the 20% threshold. This included race and rural/urban for beneficiaries attributed to TJC, and these two characteristics as well as percent household poverty for beneficiaries attributed to AAAHC. We did not find any imbalance among other types of outcome measures (readmissions, diabetes process measures, and ischemic vascular disease).

Appendix Table 2.2. Characteristics of Beneficiaries Attributed to FQHCs by Medical Home Recognition and FQHCs with No Recognition, and Balance Assessment

Characteristic	Levels	Sample Size	Unweighted proportion or mean (std dev)				Standardized Mean Difference (%)			Propensity-Score Weighted proportion or mean (std dev)				Weighted Standardized Mean Differences (%)		
			NCQA Level 3	TJC	AAAHC	No recognition	NCQA Level 3	TJC	AAAHC	NCQA Level 3	TJC	AAAHC	No recognition	NCQA Level 3	TJC	AAAHC
Beneficiary age as of 2010	<65 years	341,528	53.92	54.85	41.12	52.50	2.85	4.70	22.96	53.15	54.64	43.26	53.02	0.27	3.26	19.63
	65-74 years	187,401	28.77	29.49	32.48	29.78	2.24	0.65	5.83	29.39	29.04	34.17	29.45	0.13	0.92	10.14
	75-84 years	84,346	13.18	12.22	18.64	13.48	0.86	3.74	14.10	13.28	12.54	17.19	13.34	0.17	2.38	10.71
	85+ years	26,449	4.13	3.44	7.76	4.24	0.55	4.14	14.88	4.17	3.78	5.38	4.19	0.08	2.10	5.60
Beneficiary age as of 2010	Mean (std)	639,724	60.86 (15.15)	60.61 (14.86)	65.24 (14.64)	61.40 (14.94)	3.61	5.29	25.97	61.11 (24.83)	60.70 (40.08)	64.20 (30.80)	61.21 (21.65)	0.43	9.80	1.57
Race	White	438,609	70.83	62.62	86.16	67.58	7.04	10.42	45.16	68.91	64.59	79.68	68.73	0.40	34.14	8.79
	Black	116,974	15.26	17.83	6.48	21.54	16.24	9.32	44.45	17.57	17.75	11.98	19.56	5.12	16.29	4.64
	Asian	18,333	4.09	1.67	0.29	2.30	10.24	4.48	17.80	3.65	1.57	0.39	2.44	7.05	11.98	6.22
	Hispanic	46,323	6.70	14.01	4.37	5.82	3.63	27.66	6.63	6.63	12.07	3.69	6.56	0.29	31.48	19.03
	No Am Native	6,604	0.92	1.75	1.50	0.96	0.45	6.87	4.89	1.02	2.03	2.97	0.86	1.70	5.99	9.89
	Other/Unknown	12,881	2.20	2.11	1.21	1.81	2.77	2.20	4.89	2.22	1.99	1.30	1.86	2.53	5.46	0.99
Beneficiary gender	Female	353,001	54.83	55.19	55.67	55.64	1.63	0.91	0.07	55.24	54.80	54.70	55.10	0.26	0.62	0.82
	Male	286,723	45.17	44.81	44.33	44.36	1.63	0.91	0.07	44.76	45.20	45.30	44.90	0.26	0.62	0.82
Beneficiary dual eligibility status	Dual eligible	300,983	47.51	49.84	35.56	45.89	3.26	7.91	21.13	46.70	48.34	39.57	46.47	0.45	3.74	13.98
	Not dual eligible	338,741	52.49	50.16	64.44	54.11	3.26	7.91	21.13	53.30	51.66	60.43	53.53	0.45	3.74	13.98
Beneficiary disability status	Disabled	337,993	53.28	52.87	43.07	52.28	2.01	1.20	18.52	52.69	53.08	44.75	52.46	0.47	1.24	15.48
	Not disabled	301,731	46.72	47.13	56.93	47.72	2.01	1.20	18.52	47.31	46.92	55.25	47.54	0.47	1.24	15.48
Beneficiary Institutionalization status	Institutionalized	11,602	1.57	1.56	4.49	1.98	3.14	3.16	14.24	1.80	1.72	2.27	1.77	0.25	0.37	3.51
	Not institutionalized	628,122	98.43	98.44	95.51	98.02	3.14	3.16	14.24	98.20	98.28	97.73	98.23	0.25	0.37	3.51
Beneficiary's first attribution quarter	5	374,600	58.07	55.41	66.17	59.73	3.38	8.76	13.36	58.59	56.64	62.60	58.82	0.48	4.42	7.75
	6	43,019	6.60	6.77	6.31	6.77	0.68	0.03	1.83	6.68	6.90	6.68	6.69	0.07	0.82	0.06
	7	36,433	5.81	5.71	5.15	5.49	1.40	0.98	1.50	5.65	5.85	5.99	5.65	0.00	0.85	1.45
	8	35,197	5.65	6.09	4.38	5.25	1.78	3.64	4.07	5.49	5.77	5.19	5.47	0.06	1.29	1.25
	9	32,831	5.14	5.75	4.10	4.97	0.79	3.48	4.16	5.12	5.37	4.37	5.09	0.16	1.27	3.41
	10	31,466	4.82	5.77	4.12	4.81	0.04	4.28	3.34	4.94	5.26	4.54	4.85	0.39	1.84	1.50

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Characteristic	Levels	Sample Size	Unweighted proportion or mean (std dev)				Standardized Mean Difference (%)			Propensity-Score Weighted proportion or mean (std dev)				Weighted Standardized Mean Differences (%)		
			NCQA Level 3	TJC	AAAHHC	No recognition	NCQA Level 3	TJC	AAAHHC	NCQA Level 3	TJC	AAAHHC	No recognition	NCQA Level 3	TJC	AAAHHC
	11	28,386	4.52	4.74	3.22	4.31	1.02	2.07	5.71	4.47	4.62	3.65	4.42	0.26	0.96	3.92
	12	30,027	4.84	5.16	3.17	4.51	1.54	2.99	6.98	4.72	5.06	3.39	4.69	0.14	1.72	6.62
	13	27,765	4.55	4.60	3.37	4.16	1.92	2.14	4.16	4.34	4.54	3.60	4.31	0.17	1.11	3.64
Beneficiary Comorbidity index	Mean (std)	639,724	1.13 (1.03)	1.10 (1.00)	1.23 (1.11)	1.15 (1.05)	1.24	4.79	7.45	1.14 (1.71)	1.11 (2.72)	1.16 (2.29)	1.14 (1.49)	0.18	1.08	1.19
Total Medicare expenditures (baseline year)	Mean (std)	639,724	7812.79 (18748.06)	7519.93 (18868.01)	9781.12 (23037.19)	8117.59 (19693.41)	1.59	3.10	7.76	8011.72 (31980.93)	7741.19 (50654.81)	8581.51 (44874.96)	7937.83 (27873.75)	0.25	0.48	1.72
Number of inpatient admissions (baseline year)	Mean (std)	639,724	0.29 (0.89)	0.27 (0.83)	0.35 (0.95)	0.30 (0.91)	1.08	3.90	5.26	0.30 (1.48)	0.28 (2.30)	0.33 (1.98)	0.30 (1.31)	0.17	0.88	1.77
Number of ER visits (baseline year)	Mean (std)	639,724	1.13 (2.89)	1.04 (2.51)	1.05 (2.53)	1.07 (2.62)	2.16	1.17	0.75	1.10 (4.38)	1.07 (6.85)	0.94 (5.44)	1.09 (4.16)	0.25	0.40	3.01
Number of ACSC admissions (baseline year)	Mean (std)	639,724	0.04 (0.31)	0.03 (0.28)	0.05 (0.35)	0.04 (0.32)	0.30	1.75	3.57	0.04 (0.50)	0.04 (0.78)	0.05 (0.78)	0.04 (0.48)	0.01	0.50	2.12
Number of primary care visits (baseline year)	Mean (std)	639,724	4.43 (3.95)	4.02 (3.74)	4.86 (4.46)	4.46 (4.04)	0.64	11.17	9.58	4.41 (6.46)	4.16 (10.60)	4.50 (9.08)	4.44 (5.93)	0.46	3.22	0.86
Number of specialist visits (baseline year)	Mean (std)	639,724	2.83 (4.21)	2.89 (4.25)	3.05 (4.36)	2.95 (4.36)	2.95	1.36	2.17	2.91 (7.17)	2.89 (11.13)	3.09 (9.73)	2.88 (6.11)	0.43	0.16	2.66
Number of readmissions (baseline year)	Mean (std)	639,724	0.04 (0.35)	0.04 (0.31)	0.05 (0.32)	0.04 (0.34)	0.15	2.03	1.17	0.04 (0.57)	0.04 (0.87)	0.04 (0.67)	0.04 (0.50)	0.01	0.57	0.06
In diabetes denominator (baseline year)	In diabetes denominator	140,234	20.96	23.45	17.89	22.46	3.63	2.36	11.40	21.81	22.40	19.22	21.86	0.13	1.29	6.54
	Not in diabetes denominator	499,490	79.04	76.55	82.11	77.54	3.63	2.36	11.40	78.19	77.60	80.78	78.14	0.13	1.29	6.54
HbA1c test (baseline year)	HbA1c test	118,262	17.89	19.12	15.36	18.89	2.59	0.59	9.39	18.38	18.68	16.26	18.43	0.13	0.65	5.74
	No HbA1c test	521,462	82.11	80.88	84.64	81.11	2.59	0.59	9.39	81.62	81.32	83.74	81.57	0.13	0.65	5.74
Nephropathy test (baseline year)	Nephropathy test	76,741	12.03	12.60	8.54	11.90	0.43	2.15	11.08	11.99	12.13	9.66	11.94	0.16	0.59	7.33
	No nephropathy test	562,983	87.97	87.40	91.46	88.10	0.43	2.15	11.08	88.01	87.87	90.34	88.06	0.16	0.59	7.33
Eye exam (baseline year)	Eye exam	55,842	8.70	9.04	7.61	8.80	0.34	0.87	4.33	8.69	8.63	7.71	8.68	0.06	0.16	3.53
	No eye exam	583,882	91.30	90.96	92.39	91.20	0.34	0.87	4.33	91.31	91.37	92.29	91.32	0.06	0.16	3.53
LDL test - diabetes (baseline)	LDL test - diabetes	109,221	16.41	17.99	13.54	17.47	2.82	1.35	10.88	17.01	17.37	14.72	17.10	0.23	0.71	6.49

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Characteristic	Levels	Sample Size	Unweighted proportion or mean (std dev)				Standardized Mean Difference (%)			Propensity-Score Weighted proportion or mean (std dev)				Weighted Standardized Mean Differences (%)		
			NCQA Level 3	TJC	AAAHHC	No recognition	NCQA Level 3	TJC	AAAHHC	NCQA Level 3	TJC	AAAHHC	No recognition	NCQA Level 3	TJC	AAAHHC
year)	No LDL test - diabetes	530,503	83.59	82.01	86.46	82.53	2.82	1.35	10.88	82.99	82.63	85.28	82.90	0.23	0.71	6.49
In IVD denominator (baseline year)	In IVD denominator	80,727	12.01	11.76	13.50	13.35	4.04	4.80	0.43	12.69	11.60	15.78	12.73	0.12	3.46	8.73
	Not in IVD denominator	558,997	87.99	88.24	86.50	86.65	4.04	4.80	0.43	87.31	88.40	84.22	87.27	0.12	3.46	8.73
Lipid test - IVD (baseline year)	LDL test - IVD	60,271	8.97	8.71	9.58	10.00	3.55	4.45	1.43	9.50	8.69	11.23	9.55	0.17	2.98	5.51
	No LDL test - IVD	579,453	91.03	91.29	90.42	90.00	3.55	4.45	1.43	90.50	91.31	88.77	90.45	0.17	2.98	5.51
Number of beneficiaries per site (2010)	Mean (std)	639,724	523.17 (449.14)	551.98 (371.42)	1530.19 (1097.09)	548.71 (454.37)	5.65	0.79	116.89	528.17 (710.46)	524.19 (999.33)	711.12 (1556.65)	540.26 (626.56)	1.81	1.93	14.40
Total revenue per site (millions)	Mean (std)	639,724	2.63 (2.42)	2.61 (1.34)	2.54 (1.54)	2.11 (1.62)	25.05	33.32	27.45	2.37 (3.25)	2.43 (3.67)	1.88 (3.83)	2.30 (2.55)	2.56	14.74	4.27
Years FQHC has been operating	Mean (std)	639,724	18.55 (13.42)	21.62 (12.79)	21.46 (14.69)	19.95 (13.96)	10.26	12.50	10.55	19.40 (22.56)	20.36 (34.96)	22.32 (27.10)	19.54 (19.60)	0.70	2.88	11.74
Number of primary care physicians per site	Mean (std)	639,724	7.45 (8.86)	9.55 (6.17)	10.42 (6.58)	6.47 (6.54)	12.63	48.43	60.24	6.99 (12.40)	8.22 (14.76)	5.35 (9.76)	7.06 (9.88)	0.66	9.18	17.42
Number of service delivery sites affiliated with site's FQHC	Mean (std)	639,724	11.01 (10.34)	14.34 (12.36)	7.33 (4.13)	8.42 (8.19)	27.81	56.55	16.71	10.31 (15.88)	12.66 (28.96)	9.77 (9.12)	10.20 (14.04)	0.71	10.81	3.69
Rural urban continuum	Metro	440,507	68.68	83.91	52.50	64.84	8.15	44.78	25.27	69.33	78.53	54.45	67.55	3.84	52.76	24.96
	Non-metro rural	83,337	14.82	8.12	0.00	14.17	1.84	19.34	57.47	15.48	10.87	0.00	11.93	10.36	49.39	3.32
	Non-metro urban	115,880	16.50	7.97	47.50	20.99	11.51	37.64	58.20	15.19	10.59	45.55	20.53	13.98	84.43	27.67
Percent household poverty in census tract	Mean (std)	639,724	20.80 (12.39)	24.73 (15.37)	19.72 (4.07)	23.38 (12.51)	20.72	9.67	39.30	22.33 (20.57)	23.23 (38.49)	19.05 (12.19)	22.75 (18.31)	2.18	1.58	23.79

Note: Red highlighting indicates a standardized mean difference that exceed the 0.2 cutoff used to indicate lack of balance.

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Additionally, we used inverse probability weighting for the average treatment effect in all analyses to ensure balance between the four groups on observable characteristics. Standard errors were adjusted using the Huber-White “sandwich” estimator to account for clustering of outcomes within beneficiaries, which explained 34% of the total variance in expenditure outcomes; the additional variance explained at the site was only 0.6%. For non-linear models, we used Puhani’s difference-in-differences estimator to obtain estimates on each outcome’s natural measurement scale (e.g., percentage points and rates per 1000 beneficiaries).ⁱ

ⁱ Puhani PA. The treatment effect, the cross difference, and the interaction term in nonlinear "difference-in-differences" models. *Economics Letters*. 2012:85-87.

3. Comparison Sites Difference-in-Differences Results

We conducted a sensitivity analysis restricted to comparisons sites to explore the heterogeneity in outcomes associated with recognition, independent of the demonstration. We observed a greater number of significant findings in the cohort consisting of both demonstration and comparison sites relative to this comparison-only analysis. Overall, the comparison-only results that we report in Appendix Table 3 are consistent in direction with those outcomes of the combined demonstration and comparison analysis shown in manuscript Table 3.

NCQA Level-3 sites were associated with significant changes in ambulatory utilization; specifically, an increase in FQHC visits (152 greater visits per 1000 beneficiaries), 120 fewer non-FQHC primary care visits, and 94 fewer specialist visits per 1000 beneficiaries relative to sites without recognition in Year 3 ($p < 0.001$). We found an increased rate in eye exams and the composite diabetes measure (2.4 and 1.4, respectively) in Year 3 among NCQA Level-3 sites relative to non-recognized sites. Lastly, similar to combined demonstration and comparison sites results, these FQHCs were associated with a decrease in inpatient (\$241), Part B (\$119), and total Medicare (\$5) expenditures ($p < 0.01$).

TJC were associated with a decrease in FQHC visits (112 fewer visits per 1000 beneficiaries), ED visits (43 fewer visits per 1000 beneficiaries), and inpatient admissions (21 fewer admissions per 1000 beneficiaries) in Year 3 relative to non-recognized sites ($p < 0.05$). We found a decrease in HbA1c and nephropathy test (-1.5 and -1.8, respectively) in Year 3 compared to sites without recognition, and no significant changes in expenditures.

AAHC sites were associated with a decrease in FQHC visits (141 fewer visits per 1000 beneficiaries), and an increase in non-FQHC primary care visits (126 greater visits per 100 beneficiaries) and ED visits (63 greater visits per 1000 beneficiaries) in Year 3 relative to non-recognized sites ($p < 0.05$). We did not observe any significant changes in process quality or expenditure measures.

Despite the smaller sample size associated with the comparison only difference-in-differences analysis (N=79 NCQA Level 3-sites, 76 TJC sites, 13 AAHC sites, and 519 without recognition), the comparison only analysis is fairly consistent with the larger cohort including both demonstration and comparison FQHCs.

Appendix Table 3: Measures of Utilization, Process and Medicare Expenditures Among Comparison-Only Sites, by Recognition Type Across Three Years

Measure ^a	NCQA Level-3 (n=79)						TJC (n=76)						AAHC (n=13)					
	Estimate			P Value			Estimate			P Value			Estimate			P Value		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Utilization, per 1000 beneficiaries per year^a																		
FQHC visits	67.9	103.0	151.9	0.001	<0.001	<0.001	-137.5	-68.2	-111.9	<0.001	0.004	<0.001	-34.2	-103.9	-141.5	0.449	0.028	0.001
Non-FQHC primary care visits	-12.1	-39.0	-119.1	0.517	0.074	<0.001	-3.0	-29.3	-47.6	0.902	0.296	0.092	-27.3	84.6	126.5	0.542	0.121	0.031
Specialist visits	-4.9	-61.9	-94.1	0.835	0.014	<0.001	-8.9	-44.0	0.3	0.742	0.134	0.993	95.1	-20.8	4.9	0.107	0.757	0.942
ED visits	-19.8	-20.4	-28.7	0.216	0.192	0.058	-28.5	-67.3	-43.2	0.105	<0.001	0.014	27.2	103.2	62.6	0.393	0.001	0.039
Inpatient admissions	-1.7	-3.4	-7.2	0.774	0.532	0.168	-3.5	-12.8	-20.8	0.604	0.043	0.001	-2.6	20.5	15.7	0.841	0.083	0.180
Inpatient ACSC admissions	-2.0	-2.2	-0.6	0.345	0.293	0.744	1.2	-2.5	-3.2	0.602	0.283	0.176	4.7	1.6	6.9	0.251	0.749	0.103
Inpatient Readmission, percentage points	0.2	0.0	-0.1	0.817	0.948	0.901	0.6	0.9	-0.3	0.528	0.293	0.770	1.4	0.5	1.5	0.356	0.739	0.303
Process, percentage points																		
All four recommended diabetes tests	1.3	1.7	1.4	0.033	0.003	0.007	0.1	0.8	0.3	0.854	0.176	0.607	-0.7	0.7	2.0	0.634	0.552	0.077
HbA1c test	0.3	-0.8	-1.1	0.638	0.221	0.079	3.1	1.4	-1.5	<0.001	0.067	0.040	-2.4	-3.3	-2.5	0.084	0.023	0.099
LDL test	-1.7	-0.9	0.1	0.019	0.201	0.860	0.6	1.3	1.0	0.517	0.122	0.223	1.8	0.7	-2.2	0.397	0.730	0.258
Eye exam	1.9	3.0	2.4	0.015	0.000	0.001	-0.1	-0.2	0.0	0.917	0.794	0.955	-2.0	2.1	-0.6	0.349	0.281	0.760
Nephropathy test	-0.1	0.9	0.2	0.924	0.259	0.782	-3.2	-1.4	-1.8	0.001	0.115	0.040	-4.4	-4.5	-1.0	0.043	0.029	0.641
Lipid test for patients with ischemic vascular disease	-1.1	0.1	1.6	0.315	0.907	0.151	3.0	1.8	0.9	0.025	0.155	0.493	0.6	2.1	-2.4	0.801	0.390	0.280
Expenditures, dollars per beneficiary per year^b																		
Total Medicare expenditures	-304	-369.85	-5	0.040	0.009	<0.001	123	-47	-140	0.512	0.786	0.404	-357	543	47	0.322	0.140	0.899
Inpatient expenditures	-113	-167.37	-241	0.265	0.076	0.008	102	-97	-166	0.433	0.374	0.115	-165	88	-234	0.499	0.659	0.281
Part B expenditures	-85	-114	-119	0.004	<0.001	<0.001	22	3	-36	0.608	0.930	0.242	5.58	162	20	0.948	0.115	0.803

^a FQHC visits include any visit to an FQHC regardless of provider specialty. Non-FQHC primary care visits include visits to primary care physicians, nurse practitioners, and physician assistants who practice in rural health clinics or office settings. Total specialist visits include visits to specialists who practice at FQHCs, rural health clinics, or primary care clinics. ED visits include both outpatient-only ED visits that did not lead to a hospitalization and ED visits that were followed by hospital admission, and observation stays. Inpatient ACSC admissions are based on the Agency for Healthcare Research and Quality's (AHRQ) Prevention Quality Indicators and include hospitalizations with a primary diagnosis of one of nine

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chronic ACSCs: (1) diabetes short-term complications (ketoacidosis, hyperosmolarity, coma); (2) diabetes long-term complications (renal, eye, neurological, or circulatory); (3) chronic obstructive pulmonary disease or asthma in older adults; (4) hypertension; (5) congestive heart failure; (6) angina without procedure; (7) uncontrolled diabetes; (8) asthma in younger adults; (9) lower-extremity amputation among patients with diabetes. Inpatient readmissions are measured as 30-day hospital-wide unplanned readmissions. Total Medicare expenditures include inpatient, outpatient, skilled nursing facility, home health, hospice, durable medical equipment, and Part B expenditures.

4. Assessment of Parallel Trends

We assumed that the three groups of recognized sites would have parallel trends in beneficiary outcomes regardless of their recognition status. To assess this assumption, we examined differences in beneficiary outcomes between various groups of beneficiaries using eight quarters of data prior to the three-year study period. Differences in outcomes between groups within each pre-demonstration quarter were compared to differences in outcomes during the 8th quarter leading up to the study period. We examined these trends for three non-ED ambulatory utilization measures, inpatient admissions, ED visits, and three measures of expenditures.

Table 4 shows the results of the parallel trends tests that we used to assess if beneficiaries attributed to one of the three recognized sites or non-recognized sites had similar or divergent trends prior to the demonstration period. We modeled time using a linear specification and interacted time with an indicator of whether the beneficiary was attributed to one of the three recognized sites. The magnitude and statistical significance of this term (a pre-demonstration difference-in-differences parameter) describe whether the difference in trends before the demonstration was large and whether it was statistically significant.

The test for parallel trends one year prior to the demonstration shows that the parallel trends assumption is confirmed for all but 1 of the 10 measures for NCQA Level-3 and TJC. There were no differences in trends in the remaining utilization or expenditures measures, and the parallel trends assumption is confirmed for all 10 measures for AAAHC. We also conducted a sensitivity analysis to examine any divergence in trends two years before the demonstration. While there are more significant differences for recognized sites in this longer time frame, there is very limited divergence in trends in the most recent year prior to the demonstration.

These findings are consistent with Figures 4.1 to 4.9 that illustrate the results of our parallel trends assessments for difference-in-difference estimates of differences in outcomes between sites of each recognition type and sites with no recognition. These figures suggest that there is no distinct divergence in trends over time and that there is volatility in the estimates across the pre-demonstration period. While we noticed a decrease in non-FQHC primary care visits and an increase in specialist visits among TJC sites, these differences were not significant. Overall, we did not observe any clear trends that would suggest a major divergence between any of the recognition groups during this two-year period.

Appendix Table 4: Parallel Trends Tests of Differences in Trends between Recognized and Non-Recognized Sites the One Year or Two Years Before the Demonstration

Measure	One-year Linear Trend						Two-year Linear Trend					
	Difference-in-Differences Estimate			P Value			Difference-in-Differences Estimate			P Value		
	NCQA Level-3	TJC	AAHC	NCQA Level-3	TJC	AAHC	NCQA Level-3	TJC	AAHC	NCQA Level-3	TJC	AAHC
Utilization, log rate ratio (vs. sites with no PCMH recognition)												
FQHC visits	0.005	0.014	-0.005	0.003	<0.001	0.475	-0.009	0.009	0.007	<0.001	<0.001	0.022
Non-FQHC primary care visits	0.005	-0.018	-0.011	0.438	0.123	0.658	-0.0005	-0.015	-0.049	0.849	0.001	<0.001
Specialist visits	0.002	0.002	0.022	0.374	0.571	0.014	0.002	0.009	0.008	0.119	<0.001	0.055
ED visits	-0.005	-0.002	-0.027	0.286	0.805	0.103	-0.005	0.005	0.005	0.015	0.110	0.535
Inpatient admissions	-0.010	-0.008	-0.034	0.164	0.528	0.175	0.00003	0.021	0.004	0.993	<0.001	0.697
Inpatient ACSC admissions	-0.010	-0.052	-0.026	0.611	0.139	0.683	-0.005	0.001	0.004	0.598	0.924	0.884
Inpatient readmissions	-0.011	-0.036	-0.138	0.614	0.338	0.094	0.010	0.035	-0.039	0.238	0.020	0.169
Medicare Expenditures, dollars per beneficiary per year												
Total Medicare expenditures	-2.56	22.23	-12.52	0.800	0.200	0.730	4.03	20.90	-2.56	0.261	0.001	0.850
Inpatient expenditures	-6.65	0.10	-20.02	0.384	0.994	0.434	1.81	9.89	-4.26	0.491	0.023	0.648
Part B expenditures	-1.30	3.55	2.36	0.499	0.307	0.811	0.66	3.70	6.97	0.383	0.007	0.075

Notes: ACSC=Ambulatory Care Sensitive Conditions

Figure 4.1: Trends in Difference-in-Differences Estimates on Non-ED Ambulatory Utilization Measures (NCQA Level-3 Sites vs. Non-recognized Sites)

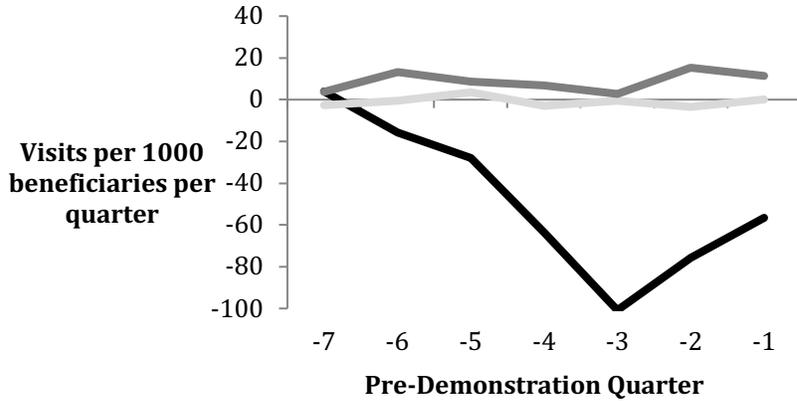


Figure 4.2: Trends in Difference-in-Differences Estimates on Inpatient and ED Utilization Measures (NCQA Level-3 Sites vs. Non-recognized Sites)

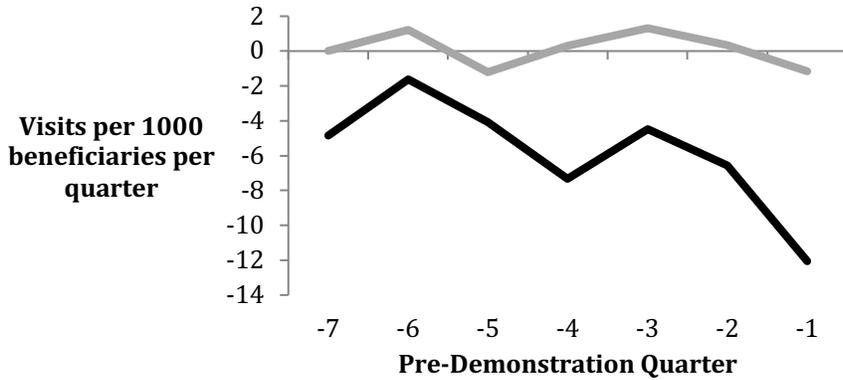


Figure 4.3: Trends in Difference-in-Differences Estimates on Expenditures (NCQA Level-3 Sites vs. Non-recognized Sites)

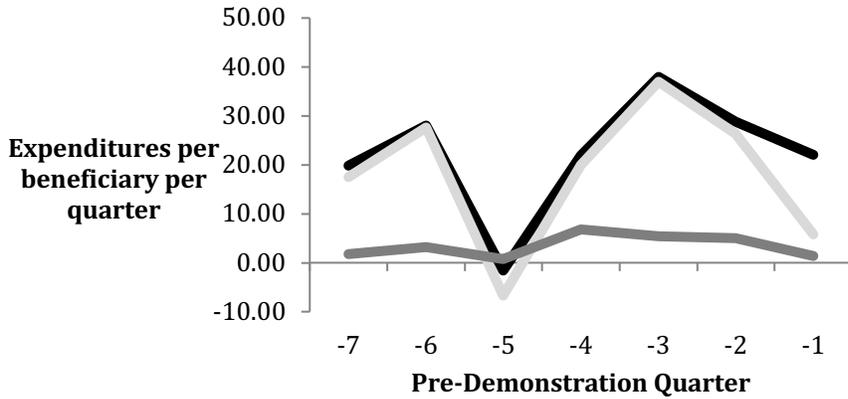


Figure 4.4: Trends in Difference-in-Differences Estimates on Non-ED Ambulatory Utilization Measures (TJC Sites vs. Non-recognized Sites)

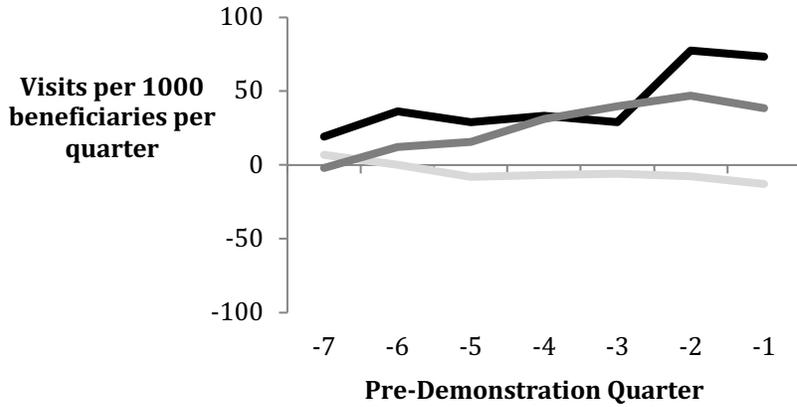


Figure 4.5: Trends in Difference-in-Differences Estimates on Inpatient and ED Utilization Measures (TJC Sites vs. Non-recognized Sites)

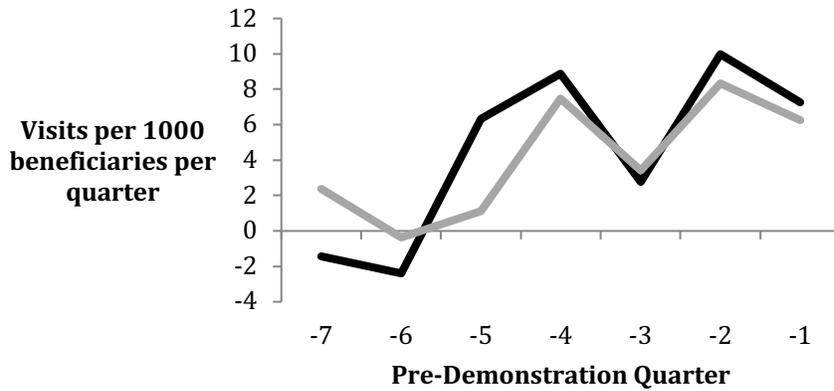


Figure 4.6: Trends in Difference-in-Differences Estimates on Expenditures (TJC Sites vs. Non-recognized Sites)

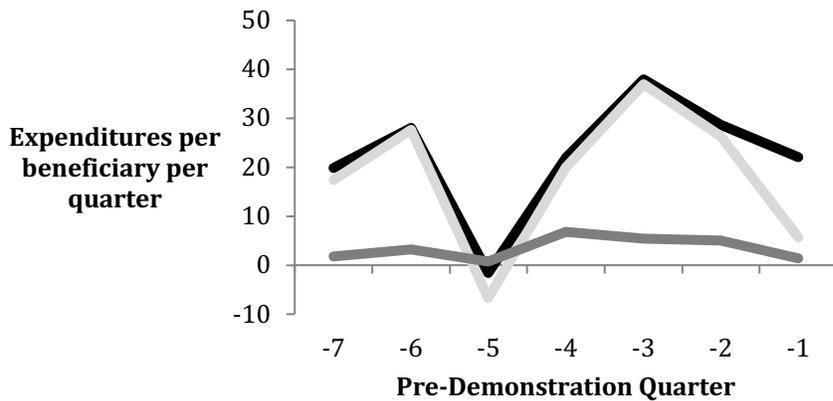


Figure 4.7: Trends in Difference-in-Differences Estimates on Non-ED Ambulatory Utilization Measures (AAAHC Sites vs. Non-recognized Sites)

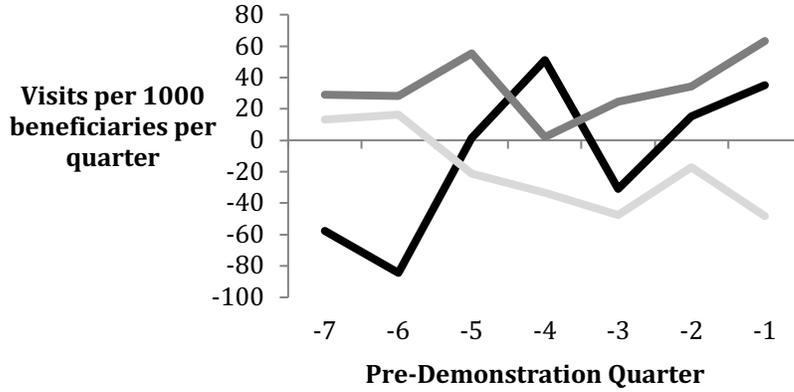


Figure 4.8: Trends in Difference-in-Differences Estimates on Inpatient and ED Utilization Measures (AAAHC Sites vs. Non-recognized Sites)

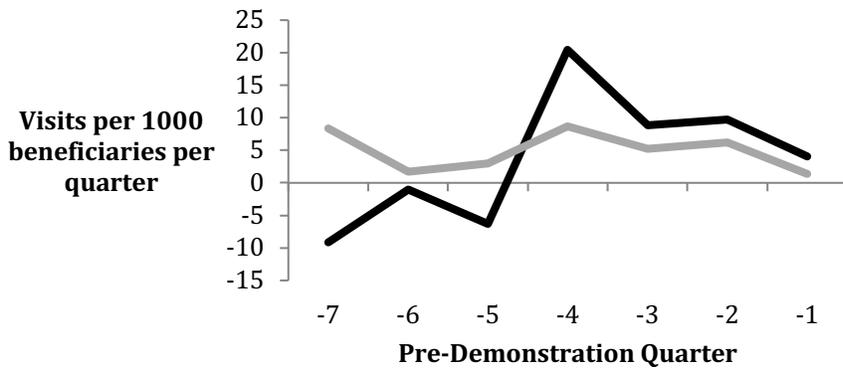


Figure 4.9: Trends in Difference-in-Differences Estimates on Expenditures (AAAHC Sites vs. Non-recognized Sites)

