

Maryland Multipayor Patient-centered Medical Home Program

A 4-Year Quasiexperimental Evaluation of Quality, Utilization, Patient Satisfaction, and Provider Perceptions

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Objective: To evaluate impact of the Maryland Multipayor Patient-centered Medical Home Program (MMPP) on: (1) quality, utilization, and costs of care; (2) beneficiaries' experiences and satisfaction with care; and (3) perceptions of providers.

Design: 4-year quasiexperimental design with a difference-in-differences analytic approach to compare changes in outcomes between MMPP practices and propensity score-matched comparisons; pre-post design for patient-reported outcomes among MMPP beneficiaries.

Subjects: Beneficiaries (Medicaid-insured and privately insured) and providers in 52 MMPP practices and 104 matched comparisons in Maryland.

Intervention: Participating practices received unconditional financial support and coaching to facilitate functioning as medical homes, membership in a learning collaborative to promote education and dissemination of best practices, and performance-based payments.

Measures: Sixteen quality, 20 utilization, and 13 cost measures from administrative data; patient-reported outcomes on care delivery, trust in provider, access to care, and chronic illness management; and

provider perceptions of team operation, team culture, satisfaction with care provided, and patient-centered medical home transformation.

Results: The MMPP had mixed impact on site-level quality and utilization measures. Participation was significantly associated with lower inpatient and outpatient payments in the first year among privately insured beneficiaries, and for the entire duration among Medicaid beneficiaries. There was indication that MMPP practices shifted responsibility for certain administrative tasks from clinicians to medical assistants or care managers. The program had limited effect on measures of patient satisfaction (although response rates were low) and on provider perceptions.

Conclusions: The MMPP demonstrated mixed results of its impact and indicated differential program effects for privately insured and Medicaid beneficiaries.

Key Words: patient-centered medical home, multipayor model, quality improvement, primary care

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The patient-centered medical home (PCMH) is widely promoted as a promising innovation of health services delivery, with potential to advance the triple aim of improving population health, enhancing patients' experiences, and lowering costs.¹ National penetration of this primary care model increased from 28 sites recognized as medical homes by the National Committee on Quality Assurance (NCQA) in 2008 to 6762 sites in 2013.² Over the past decade, more than half of US states have incorporated PCMH for care delivered to Medicaid beneficiaries and individuals with complex chronic conditions.³ Commercial payors also have joined the movement, raising the population served by PCMHs to over 20 million individuals in 2013.⁴

In early evaluations, PCMH interventions demonstrated positive but modest impact on patients' satisfaction, providers' experiences, preventive care delivery, and emergency department (ED) use.⁵ Recent evidence from national, statewide, and health-system initiatives suggests the PCMH reduces ED utilization and expenditures,^{6–8} imaging tests,⁹ hospitalizations,^{8,10,11} specialist

visits,^{8,10,12} prescription drug spending,⁹ and total costs of care.^{11,13,14} One recent synthesis found that major PCMH initiatives collectively yielded 1.5% reduction in specialty care visits, but no significant impact on other aspects of utilization or total expenditures.¹⁵

Despite extensive research efforts, the effects of PCMH care on disparities and the role of payor structure in effectiveness of PCMH initiatives have not been well explored.^{7,16–18} Studies typically evaluate all beneficiaries served by the PCMH as a single group, with few conducting subgroup analyses to explore differential impact. Studies contrasting outcomes for low-income beneficiaries relative to counterparts with greater resources would help us understand the effect of PCMH on disparities^{19,20} and inform future spread.¹⁹

The common payor structures of PCMH initiatives include single commercial payor, Medicaid-only, and multiple payors. Single commercial payor and Medicaid-only PCMH initiatives apply only to beneficiaries of the specific carrier attributed to participating practices, while multipayor initiatives standardize requirements and benefits across all providers serving beneficiaries covered by a group of participating carriers.⁴ Compared with other payor structures, the multipayor PCMH model has the potential to minimize providers' administrative difficulties with single-payor initiatives. Differing requirements across payors, especially where the single-payor enrollees represent only a small portion of a provider's panel, may impair uptake or hamper implementation.²¹ Most multipayor initiatives are statewide efforts and usually time-limited. One exception was the Centers for Medicare and Medicaid Services' (CMS) Multipayer Advanced Primary Care Practice (MAPCP), a cross-regional PCMH demonstration from 2011 to 2016. This program extended 8 existing statewide multipayor PCMH initiatives to service Medicare beneficiaries.²²

Among 25 statewide PCMH payment initiatives in operation in 2012, the Maryland Multipayor Patient-centered Medical Home Program (MMPP) was 1 of 3 characterized by multipayor involvement, national standards for PCMH certification, care management, and fee-for-service payments from insurers, performance-based payments, financial, and technical transformation support for participating practices.³ This study evaluates the impact of the MMPP on beneficiary and provider experience, quality, utilization, and cost outcomes, and reports subgroup findings for privately and Medicaid-insured beneficiaries.

METHODS

Study Setting and Participants

Launched on April 11, 2011, the MMPP defined the PCMH as “a model of practice in which a team of health professionals, guided by a primary care provider, provides continuous, comprehensive, and coordinated care in a culturally and linguistically sensitive manner to patients throughout their lives.”²³ From among 178 applicants, the Maryland Health Care Commission (MHCC) purposely selected 53 primary care practices to participate, based on practice type and geographic location.²⁴ Concurrently, the

MHCC created the Maryland Learning Collaborative to provide education and customized coaching to help practices achieve advanced NCQA certification as PCMHs. IMPAQ International LLC, Johns Hopkins Bloomberg School of Public Health, and the University of Maryland School of Pharmacy commenced evaluation of the program on October 1, 2011. One practice withdrew because of competing priorities; therefore, 52 practices were evaluated (Fig. 1).

Participating practices had to achieve NCQA certification as medical homes by meeting minimum requirements for: access during extended hours and same-day appointments; use of data for population management; care management of patients with certain chronic conditions; support for self-care processes; follow-up of patients and tracking of referrals; and, implementation of continuous quality improvement.²⁵ Practices were encouraged to deploy existing staff with retraining as care managers and realized shared savings bonuses for achieving quality measurement and utilization reduction criteria. Maryland required its 4 largest private insurers and Medicaid to participate in the MMPP, and other payors voluntarily joined. Payors awarded practices fixed transformation payments based on practice size and level of PCMH certification (ranging between \$3.51 and \$11.54/member/mo) and required that one third of the payment be applied toward care management.

Comparison Practices

The evaluation team selected comparison practices using the 2011–2012 Maryland Board of Physicians Licensure (MBPL) database, from which we identified 1977 non-MMPP primary care practices. We generated propensity scores using 22 variables (including practice characteristics, geographic characteristics, and aggregated provider characteristics) to identify 2:1 matches for each MMPP practice from among participants in a competing statewide single-payor PCMH program (CareFirst Blue Cross Blue Shield PCMH Program)^{26,27} and “low-exposure” practices not participating in any known PCMH program. For MMPP practices that did not have close matches in the full propensity model, we used stripped-down models with fewer variables to identify comparisons. Three MMPP practices that could not be identified in the MBPL database were matched on similarities in setting, ownership, practice type, number of providers, and rural/urban location. In total, 57 CareFirst PCMH practices and 47 low-exposure practices comprised the comparison group (Table 1).

Administrative Data and Survey Data

Measures assessed in the evaluation include: (1) quality, utilization, and cost outcomes from administrative data; (2) beneficiaries' experiences and satisfaction from patient surveys; and (3) providers' perceptions from surveys of clinicians and staff. Although we collected administrative data and provider surveys for the comparison group, patients in comparison practices were not surveyed.

The administrative data sources were: (1) the Maryland Medical Care Database, an all-payor administrative repository of institutional and outpatient medical service claims for privately insured beneficiaries; and (2) Maryland Medicaid

claims data. We included beneficiaries who were continuously enrolled in a participating health plan in 2010, 2011, 2012, or 2013 for ≥ 11 months in each calendar year. Beneficiaries aged 65 years and above were excluded because Medicare did not participate in the MMPP. In each year, we assessed between 166,102 and 205,386 beneficiaries (90,673–120,303 among MMPP sites and 75,429–85,083 among comparison sites). In the MMPP, Medicaid-insured beneficiaries were attributed to practices by MHCC based on their Medicaid-assigned primary care provider, and privately insured beneficiaries based on plurality of primary

care visits. For comparison sites, we assigned a beneficiary to a practice based on the most commonly visited provider. If a beneficiary could be attributed to multiple practices by this criterion, she was assigned to the practice closest to her residence.

We selected a priori a set of standardized, validated quality measures endorsed by the PCMH Evaluator’s Collaborative, the Agency for Healthcare Research and Quality (AHRQ), the National Quality Forum (NQF), the NCQA, and the Healthcare Effectiveness Data and Information Set (HEDIS).²⁸ The selected utilization and cost measures included

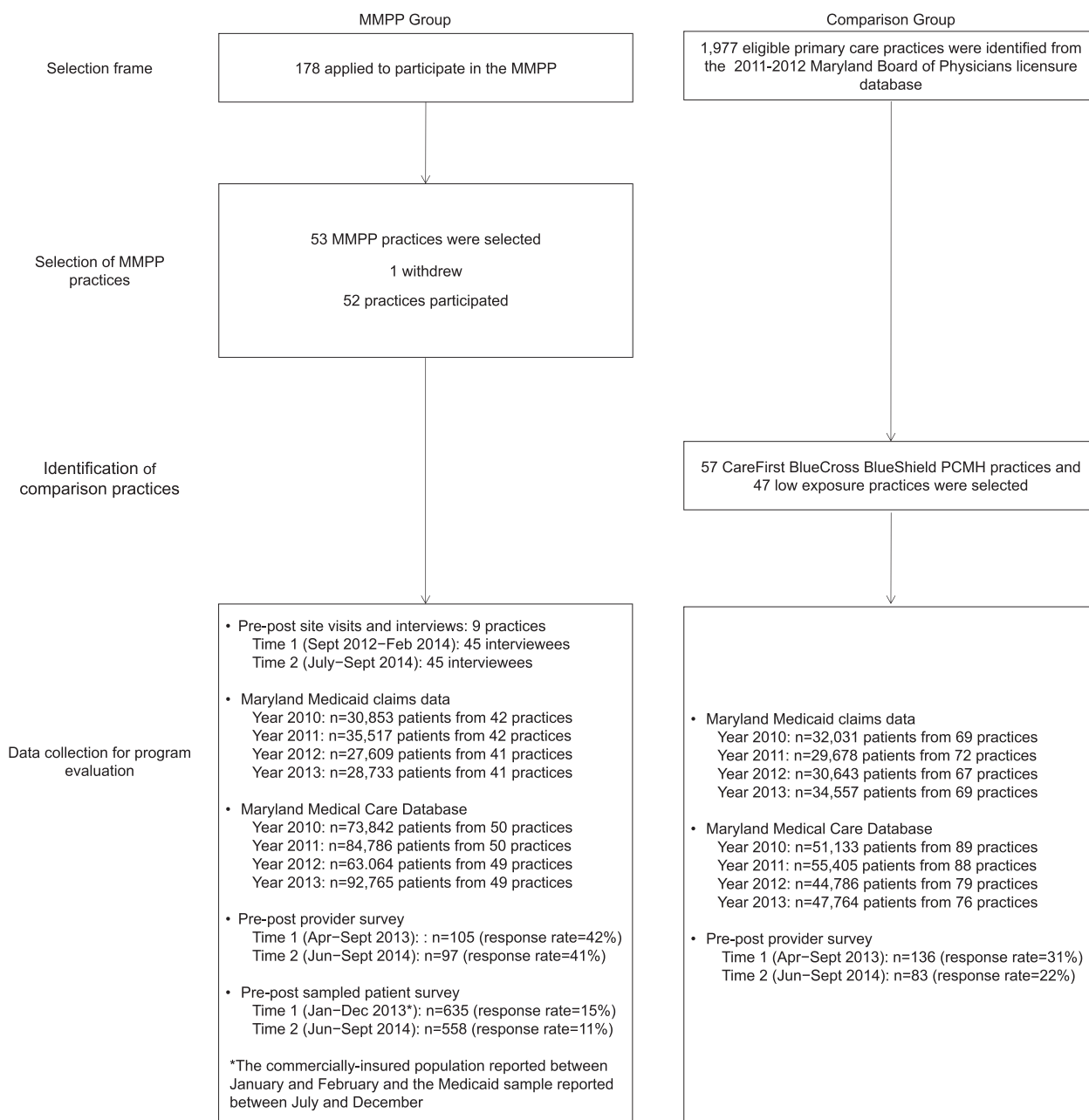


FIGURE 1. Study flow chart. MMPP indicates Maryland Multipayor Patient-Centered Medical Home Program; PCMH, patient-centered medical home.

TABLE 1. Baseline Characteristics of MMPP and Matched Comparison Practices

	MMPP (52 Practices)	Comparison (104 Practices)	P*
Setting (n)			
Freestanding	47	96	0.80
Hospital	2	2	—
FQHC	2	5	—
Other	1	1	—
Ownership (n)			
Private	50	104	0.11
Public	2	0	—
Practice type (n)			
Solo provider	9	29	0.43
Single specialty	20	42	—
Multispecialty	20	29	—
Hospital	1	2	—
Other	2	2	—
No. (attributed) MHIP beneficiaries (n) [†]			
0–0.1	15	28	0.77
0.1–0.25	15	36	—
≥ 0.25	22	40	—
No. (attributed) CF beneficiaries (n) [†]			
0–10	24	46	0.72
10–25	17	30	—
≥ 25	11	28	—
Practice has an EMR (n) [‡]			
No	9	20	0.93
Yes, all electronic	31	60	—
Yes, part-electronic and part-paper	12	22	—
Urban influence status of practice’s county (n)			
MeSA—large	44	88	0.77
MeSA—small	3	8	—
MeSA adjacent to large metro area	2	1	—
MiSA adjacent to small metro area	2	3	—
Noncore adjacent to small metro area	1	4	—
Characteristics of attributed beneficiaries in 2010			
Average age [mean across practices (SD)]	36.4 (17.9)	36.6 (19.0)	0.04
Proportion of female beneficiaries [mean across practices (SD)]	0.59 (0.11)	0.54 (0.10)	0.008

*P-values from the Pearson χ^2 tests or the Fisher exact tests for categorical variables and *t* tests for continuous variables. All variables were calculated at the practice level.

[†]Measures were normalized by physicians’ patient care hours, that is, number of patients per physician’s patient care hour in a practice.

[‡]Data do not include 2 nurse practitioner-led comparison practices.

CF indicates CareFirst Blue Cross Blue Shield; EMR, electronic medical record; FQHC, federally qualified health center; MeSA, metropolitan statistical area; MHIP, Maryland Health Insurance Program; MiSA, micropolitan statistical area; MMPP, Maryland Multipayor Patient-Centered Medical Home Program.

ED visits, potentially avoidable hospitalizations for ambulatory care-sensitive conditions (ACSCs), utilization of primary care and preventive services, and total health expenditure (see Table, Supplemental Digital Content 1, <http://links.lww.com/MLR/B536>, for definitions of these measures).

We administered surveys to assess care provided to adults and children, with the latter reported by their parents or guardians. Both the adult and child instruments included items from the Consumer Assessment of Healthcare Providers and Systems (CAHPS) PCMH Survey, the CAHPS supplemental

domains, and the Patient Assessment of Chronic Illness Care (PACIC). The PACIC items were answered only by respondents with chronic conditions. Survey domains included delivery of health care, trust in provider, access to care, and chronic illness management. Using stratified sampling, patients were sampled from each MMPP practice, separately for Medicaid-insured and privately insured patients. Children, African Americans, and chronically ill patients were oversampled by increasing sampling from practices with pediatricians, practices located in areas with a high concentration of African Americans, and practices with greater number of enrollees from the Maryland Health Insurance Plan—a state-funded high-risk pool that closed in December 2014. The research team collected 2 waves of cross-sectional telephone surveys, in 2013 and 2014 (response rates were 15% and 11%, respectively). We sought to obtain 500 respondents in each wave.

The research team surveyed providers’ experiences and satisfaction using domains from survey instruments recommended by the PCMH Evaluators’ Collaborative.²⁹ Domains included intrapractice team operations, team culture, perceptions of the PCMH model, satisfaction with chronic care and, for participating providers, satisfaction with the MMPP. We administered the survey electronically and by paper in 2013 and 2014. The response rates ranged between 22% and 42% across the study groups.

Statistical Analyses

Analyses examining program impact on quality, utilization, and costs were conducted at the practice level separately for privately insured and Medicaid-insured beneficiaries. Using the difference-in-differences (DID) approach, we estimated average annual changes in outcome measures from the baseline year (2010) to follow-up years (2011–2013) for MMPP sites accounting for concurrent changes in outcome measures among comparison sites. We constructed grouped logistic regression models for binary outcome measures and generalized linear regression models for continuous measures. Data from each follow-up year were compared with the baseline data separately. Models also adjusted for practice location (proximity to large/small metropolitan area), practice type (solo vs. other), and practice case mix assessed using the Johns Hopkins Adjusted Clinical Groups (ACG) system.³⁰ We accounted for repeated measures within practices using generalized estimating equations. Adjusted estimates were weighted by the number of attributed beneficiaries per practice. We report the DID estimate with its SE for continuous outcome measures and the ratio of odds ratios (ROR) with its 95% confidence interval (CI) for binary outcome measures. The ROR is the odds ratio for interaction terms of intervention groups and time periods, statistically representing the DID estimates from logistic regression models.

We analyzed provider survey data at the individual level using a DID approach and ordinal logistic regression, adjusting for age, sex, race, profession (medical doctor vs. physician assistant/nurse practitioner), time in profession, practice type, and use of an electronic health record system in practice. We applied robust clustering to account for shared variation among providers in the same practice.

We analyzed patient survey responses for care of adults and children separately, assessing MMPP impact by comparing the 2 waves of responses using ordinal logistic regression for ordinal outcomes and logistic regression for binary outcomes. Models adjusted for respondents' demographic characteristics and practice type and took the design strata into account by using sample weights to reflect the accessible population. For models of child survey items, we also adjusted for characteristics of the responding parent or guardian.

All analyses were conducted using Stata version 12.1 (StataCorp, College Station, TX) or SAS version 9.2 (SAS Institute, Cary, NC).

RESULTS

MMPP and Matched Comparison Practices

The majority of MMPP and comparison practices were freestanding (92%), privately owned (99%), and located in a large metropolitan statistical area (85%). There were no statistical differences between the 2 groups on baseline practice-level characteristics used in propensity score matching (Table 1). MMPP practices, however, had more female beneficiaries (59% vs. 54%) and a slightly younger beneficiary population (mean age, 36.4 vs. 36.6 y).

Utilization, Quality, and Cost

MMPP participation was significantly associated with annual changes in 12 of 16 quality measures, 12 of 20 utilization measures, and 5 of 13 cost measures. Table 2 provides annual results throughout the study period for select outcomes that showed consistent and significant associations with MMPP participation (see Table, Supplemental Digital Content 1, <http://links.lww.com/MLR/B536>, for results of all outcomes evaluated). Results discussed below focus on the final year of MMPP implementation (2013).

Outcomes for Medicaid-insured Beneficiaries

Regarding chronic disease management, the MMPP reduced hospitalizations among Medicaid beneficiaries with asthma (Q08 in Table 2; ROR = 0.49; 95% CI, 0.30–0.82), whereas hospitalizations for diabetes increased [Q12 in Table (Supplemental Digital Content 1, <http://links.lww.com/MLR/B536>); ROR = 6.28; 95% CI, 3.18–12.38]. The program was associated with decreased dependence on medication therapy for both conditions (Q04 and Q05 in Table 2) but had a null effect on HbA1c testing [Q13 and Q14 in Table (Supplemental Digital Content 1, <http://links.lww.com/MLR/B536>)]. On measures of women's health, the MMPP was associated with decreased screening for breast (Q01 in Table 2; ROR = 0.78; 95% CI, 0.68–0.90) and cervical cancer (Q02 in Table 2; ROR = 0.76; 95% CI, 0.65–0.88). Well-care visits remained unchanged or decreased among young MMPP beneficiaries (Q06 and Q07 in Table 2).

Utilization measures that decreased among Medicaid beneficiaries of MMPP practices include ED visits and inpatient stays for ACSCs [U02 and U04 in Table 2; U15 and U18 in Table (Supplemental Digital Content 1, <http://links.lww.com/MLR/B536>)], and average count of home health

care visits [U10 in Table (Supplemental Digital Content 1, <http://links.lww.com/MLR/B536>); DID = -40.9, SE = 11.0, $P < 0.001$]. Conversely, the program was significantly associated with increased proportions of patients with inpatient stays (U03 in Table 2; ROR = 1.34; 95% CI, 1.17–1.55) and 30-day readmissions (U06 in Table 2; ROR = 1.51; 95% CI, 1.17–1.95).

Overall, MMPP participation was associated with reduction in mean inpatient and outpatient payments among Medicaid patients. Both measures declined substantially through the final year of the program (inpatient: DID = -\$6447, SE = \$2423, $P = 0.008$; outpatient: DID = -\$737, SE = \$273, $P = 0.007$).

Outcomes for Privately Insured Beneficiaries

Among this population, the MMPP was associated with greater uptake of cervical cancer screening (Q02; ROR = 1.08; 95% CI, 1.02–1.16) and increase in adolescent well-care visits (Q07; DID = 0.05, SE = 0.02, $P = 0.03$). There was greater ED utilization for ACSCs (U02; U15 in SDC1), and total calendar days spent in hospitalization increased under the MMPP (U05; DID = 0.71, SE = 0.29, $P = 0.01$). The program was also associated with reduced utilization of postpartum care (Q03; ROR = 0.37; 95% CI, 0.21–0.63). Regarding health expenditure, privately insured MMPP beneficiaries experienced slower increase in mean outpatient payments in the first year of the program (Q02; DID = -\$146, SE = \$68, $P = 0.03$). However, this trend was not statistically significant in subsequent years.

Patient Experience and Satisfaction

Adult respondents reported high scores for provider communication, politeness, and identification of a backup person to access their medical information in their absence (>70% positive responses). They cited room for improvement in other measures of PCMH and family engagement, ranging from 17% to 67% favorability, including timely appointments for the chronically ill (Table 3). Although most scale scores increased or maintained a similar level from 2013 to 2014, only the improvement in 1 domain—provider communication—reached statistical significance (odds ratio = 1.69; 95% CI, 1.12–2.56). Respondents for children were highly satisfied with the child's MMPP provider, with >70% of responses in the positive categories. We found no statistical differences in the scores on child survey items between 2013 and 2014.

Provider Perceptions

Regarding staff's tasks, MMPP and comparison practices gave primary responsibility for certain tasks to different job roles. In 2014, 3 years into implementation of the MMPP, medical assistants in MMPP practices were statistically more likely to be responsible for some tasks that were primarily performed by clinicians in the comparison practices, including asking patients whether they smoke and obtaining immunization histories from patients (Table 4).

We compared provider perceptions over time between MMPP and comparison groups using the DID approach. MMPP providers maintained or increased inclusion of medical

TABLE 2. Differences in Select Measures of Quality of Care, Utilization, and Cost Between Beneficiaries of MMPP and Matched Comparison Practices, by Insurance Type

Label	Insurance Type	Intervention Group	Unadjusted Means				Adjusted DID Estimate: MMPP vs. Matched Comparison Group			
			Baseline (2010)	Year 1 (2011)	Year 2 (2012)	Year 3 (2013)	Ratio of Odds Ratio (95% CI) or DID Estimate (SE) [‡]			
							Year 1 vs. Baseline	Year 2 vs. Baseline	Year 3 vs. Baseline	
Quality-of-care measures										
Q01	Breast cancer screening [% (SD)]	Medicaid	MMPP	0.25 (0.66)	0.29 (0.71)	0.28 (0.58)	0.28 (0.66)	1.13 (1.01–1.26)	0.72 (0.62–0.85) [†]	0.78 (0.68–0.90) [†]
		Private	Comparison	0.25 (0.67)	0.26 (0.59)	0.29 (0.81)	0.28 (0.66)	—	—	—
			MMPP	0.45 (1.15)	0.46 (1.09)	0.46 (0.93)	0.47 (0.89)	0.97 (0.92–1.02)	0.95 (0.89–1.02)	0.92 (0.84–1.00)
Q02	Cervical cancer screening [% (SD)]	Medicaid	MMPP	0.47 (0.97)	0.48 (0.92)	0.48 (1.06)	0.49 (1.03)	—	—	—
		Private	Comparison	0.38 (0.94)	0.37 (1.18)	0.35 (1.39)	0.31 (1.45)	0.91 (0.80–1.03)	0.67 (0.57–0.80) [†]	0.76 (0.65–0.88) [†]
			MMPP	0.39 (0.80)	0.39 (0.86)	0.40 (0.97)	0.35 (0.90)	—	—	—
			MMPP	0.42 (1.37)	0.39 (1.37)	0.43 (1.39)	0.39 (1.84)	1.04 (1.00–1.09)	1.08 (1.03–1.13) [*]	1.08 (1.02–1.16) [*]
Q03	Postpartum care visit following live birth [% (SD)]	Medicaid	MMPP	0.43 (1.04)	0.38 (1.07)	0.42 (1.10)	0.38 (1.00)	—	—	—
		Private	Comparison	0.49 (0.77)	0.46 (0.60)	0.47 (0.99)	0.47 (1.00)	0.88 (0.68–1.15)	0.40 (0.13–1.21)	0.82 (0.42–1.61)
			MMPP	0.46 (0.86)	0.44 (0.85)	0.52 (0.86)	0.47 (0.82)	—	—	—
			MMPP	0.23 (0.57)	0.18 (0.66)	0.19 (0.65)	0.19 (0.57)	0.80 (0.54–1.18)	0.67 (0.35–1.28)	0.37 (0.21–0.63) [†]
Q04	Prescription of long-term drug therapy for asthma [% (SD)]	Medicaid	MMPP	0.20 (0.52)	0.19 (0.47)	0.20 (0.51)	0.24 (0.54)	—	—	—
		Private	Comparison	0.76 (0.73)	0.63 (0.91)	0.54 (0.81)	0.44 (0.65)	0.81 (0.74–0.89) [†]	0.56 (0.41–0.76) [†]	0.60 (0.50–0.71) [†]
			MMPP	0.68 (0.70)	0.58 (0.59)	0.57 (0.73)	0.47 (0.71)	—	—	—
Q05	Persistence with ACE inhibitor or ARB therapy for diabetes [% (SD)]	Medicaid	MMPP	0.24 (0.45)	0.23 (0.43)	0.20 (0.42)	0.17 (0.38)	1.12 (0.94–1.33)	0.95 (0.82–1.11)	0.73 (0.61–0.86) [†]
		Private	Comparison	0.17 (0.41)	0.18 (0.38)	0.17 (0.45)	0.17 (0.37)	—	—	—
			MMPP	0.53 (2.94)	0.55 (3.19)	0.56 (1.50)	0.56 (1.66)	–0.02 (0.02)	—	–0.05 (0.02) [*]
Q06	Well-care visits for children [mean (SD)]	Medicaid	MMPP	0.57 (0.66)	0.58 (0.59)	0.60 (0.82)	0.62 (0.88)	—	—	—
		Private	Comparison	0.61 (0.69)	0.60 (0.76)	0.61 (0.68)	0.63 (0.75)	0.00 (0.02)	0.02 (0.03)	0.01 (0.02)
			MMPP	0.65 (0.83)	0.65 (0.87)	0.63 (0.66)	0.66 (0.67)	—	—	—
Q07	Well-care visits for adolescents and young adults [mean (SD)]	Medicaid	MMPP	0.44 (2.57)	0.45 (2.86)	0.40 (2.03)	0.42 (1.77)	–0.03 (0.02)	–0.08 (0.03) [†]	–0.09 (0.03) [†]
		Private	Comparison	0.40 (0.95)	0.44 (0.99)	0.43 (1.04)	0.46 (1.27)	—	—	—
			MMPP	0.46 (1.44)	0.45 (1.59)	0.45 (1.22)	0.50 (1.62)	0.03 (0.01) [*]	0.02 (0.01)	0.05 (0.02) [*]
			Comparison	0.53 (1.51)	0.57 (1.53)	0.53 (1.40)	0.54 (1.65)	—	—	—

(Continued)

TABLE 2. Differences in Select Measures of Quality of Care, Utilization, and Cost Between Beneficiaries of MMPP and Matched Comparison Practices, by Insurance Type (continued)

Label	Insurance Type	Intervention Group	Unadjusted Means				Adjusted DID Estimate: MMPP vs. Matched Comparison Group			
			Baseline (2010)	Year 1 (2011)	Year 2 (2012)	Year 3 (2013)	Ratio of Odds Ratio (95% CI) or DID Estimate (SE) [‡]			
							Year 1 vs. Baseline	Year 2 vs. Baseline	Year 3 vs. Baseline	
Q08	Asthma admissions (< 40 y) [% (SD)]	Medicaid	MMPP	0.024 (0.17)	0.017 (0.16)	0.016 (0.11)	0.015 (0.18)	1.28 (0.95–1.73)	0.78 (0.53–1.14)	0.49 (0.30–0.82) [*]
			Comparison	0.029 (0.21)	0.019 (0.12)	0.023 (0.16)	0.030 (0.25)	—	—	—
Utilization measures U01	Proportion with ED visit [% (SD)]	Medicaid	MMPP	0.40 (2.02)	0.41 (2.19)	0.42 (2.41)	0.40 (2.50)	1.04 (0.94–1.13)	0.92 (0.85–1.00)	0.91 (0.84–0.99)
		Private	MMPP	0.56 (1.25)	0.57 (1.47)	0.60 (1.60)	0.58 (1.47)	—	—	—
U02	Proportion of asthma, CHF, or diabetes patients with ED visit [% (SD)]	Private	MMPP	0.18 (1.63)	0.18 (1.76)	0.18 (1.43)	0.17 (1.46)	0.99 (0.96–1.03)	1.07 (1.00–1.15)	1.03 (0.94–1.13)
			Comparison	0.16 (0.90)	0.17 (1.02)	0.16 (1.10)	0.16 (1.18)	—	—	—
U03	Proportion with inpatient stay [% (SD)]	Medicaid	MMPP	0.11 (0.61)	0.10 (0.60)	0.08 (0.39)	0.08 (0.38)	0.89 (0.82–0.96) [*]	0.86 (0.72–1.04)	0.81 (0.70–0.94) [*]
		Private	MMPP	0.11 (0.51)	0.11 (0.52)	0.10 (0.43)	0.11 (0.45)	—	—	—
U04	Proportion of asthma, CHF, or diabetes patients with inpatient stay [% (SD)]	Private	MMPP	0.02 (0.27)	0.02 (0.28)	0.02 (0.27)	0.03 (0.25)	1.17 (0.90–1.50)	0.98 (0.70–1.35)	1.51 (1.09–2.10) [*]
			Comparison	0.021 (0.19)	0.016 (0.18)	0.019 (0.25)	0.017 (0.23)	—	—	—
U05	Total inpatient days among hospitalized patients [mean (SD)]	Medicaid	MMPP	0.08 (0.93)	0.08 (0.95)	0.10 (1.16)	0.09 (1.04)	1.15 (1.03–1.30) [*]	1.37 (1.17–1.61) [†]	1.34 (1.17–1.55) [†]
		Private	MMPP	0.17 (1.27)	0.14 (0.97)	0.16 (1.21)	0.14 (1.02)	—	—	—
U04	Proportion of asthma, CHF, or diabetes patients with inpatient stay [% (SD)]	Private	MMPP	0.06 (0.54)	0.05 (0.51)	0.05 (0.48)	0.05 (0.45)	1.02 (0.93–1.11)	0.98 (0.93–1.04)	0.97 (0.90–1.05)
			Comparison	0.05 (0.50)	0.05 (0.48)	0.05 (0.45)	0.05 (0.48)	—	—	—
U05	Total inpatient days among hospitalized patients [mean (SD)]	Private	MMPP	0.03 (0.18)	0.02 (0.19)	0.02 (0.15)	0.02 (0.16)	1.03 (0.93–1.15)	1.02 (0.84–1.24)	0.68 (0.52–0.88) [*]
		Private	MMPP	0.04 (0.25)	0.03 (0.16)	0.03 (0.19)	0.04 (0.18)	—	—	—
U05	Total inpatient days among hospitalized patients [mean (SD)]	Private	MMPP	0.01 (0.12)	0.01 (0.12)	0.01 (0.12)	0.01 (0.11)	1.02 (0.73–1.43)	0.82 (0.62–1.09)	0.95 (0.67–1.35)
			Comparison	0.01 (0.09)	0.01 (0.16)	0.01 (0.13)	0.01 (0.09)	—	—	—
U05	Total inpatient days among hospitalized patients [mean (SD)]	Medicaid	MMPP	5.6 (11.0)	5.8 (11.1)	6.3 (20.6)	6.4 (14.5)	0.34 (0.30)	0.92 (0.40) [*]	0.24 (0.37)

U06	30-d readmission following hospitalization [% (SD)]	Private	Comparison	6.80 (17.31)	6.57 (15.31)	6.71 (15.92)	7.32 (20.96)	—	—	—
			MMPP	4.3 (8.2)	4.7 (10.7)	4.4 (9.6)	—	0.24 (0.28)	-0.03 (0.29)	0.71 (0.29)*
U07	Total nursing home days among patients with nursing home stays [mean (SD)]	Medicaid	Comparison	4.6 (9.7)	4.6 (11.7)	4.6 (8.2)	4.4 (8.0)	—	—	—
			MMPP	0.23 (0.89)	0.21 (0.84)	0.21 (0.95)	0.22 (1.05)	0.93 (0.78-1.11)	1.51 (1.22-1.86)†	1.51 (1.17-1.95)†
U07	Total nursing home days among patients with nursing home stays [mean (SD)]	Private	Comparison	0.30 (2.16)	0.28 (1.31)	0.23 (1.19)	0.22 (1.50)	—	—	—
			MMPP	0.12 (0.56)	0.12 (0.74)	0.11 (0.61)	0.14 (0.59)	1.12 (0.79-1.58)	0.96 (0.71-1.31)	1.30 (1.01-1.68)
U07	Total nursing home days among patients with nursing home stays [mean (SD)]	Medicaid	Comparison	0.12 (0.46)	0.11 (0.62)	0.11 (0.50)	0.12 (0.43)	—	—	—
			MMPP	34.8 (102.0)	24.5 (44.9)	52.0 (107.2)	35.2 (71.0)	5.8 (7.8)	32.4 (10.7)†	23.4 (11.3)*
Cost measures	C01	Private	Comparison	50.0 (84.8)	33.0 (74.3)	35.3 (74.6)	28.8 (77.1)	—	—	—
			MMPP	18.3 (16.0)	23.6 (24.2)	21.1 (22.0)	23.3 (28.8)	0.6 (3.9)	1.3 (4.3)	0.0 (5.1)
C01	Mean inpatient expenditure for hospitalized patients [mean (SD)] (US\$)	Medicaid	Comparison	15.8 (19.7)	19.9 (21.4)	23.8 (21.1)	19.5 (22.6)	—	—	—
			MMPP	21,178 (104,402)	12,962 (53,581)	14,670 (55,397)	15,616 (47,097)	-6242 (2577)*	-5873 (2315)*	-6447 (2423)*
C02	Outpatient payments among patients with outpatient utilization [mean (SD)] (US\$)	Private	Comparison	15,334 (42,485)	13,228 (32,618)	14,419 (38,242)	15,735 (46,077)	—	—	—
			MMPP	17,250 (26,172)	18,651 (44,017)	17,491 (32,228)	19,758 (39,302)	6 (1061)	-525 (973)	1040 (931)
C02	Outpatient payments among patients with outpatient utilization [mean (SD)] (US\$)	Medicaid	Comparison	17,803 (31,026)	19,082 (48,262)	18,189 (30,379)	18,955 (25,908)	—	—	—
			MMPP	2694 (34,187)	1800 (15,508)	2325 (18,213)	2450 (18,100)	-701 (263)†	-789 (271)†	-737 (273)*
C02	Outpatient payments among patients with outpatient utilization [mean (SD)] (US\$)	Private	Comparison	2291 (19,569)	2103 (14,153)	2372 (18,892)	2382 (15,742)	—	—	—
			MMPP	1974 (11,942)	2068 (12,712)	2377 (12,454)	2557 (13,412)	-146 (68)*	-41 (80)	33 (105)
C02	Outpatient payments among patients with outpatient utilization [mean (SD)] (US\$)	Medicaid	Comparison	1951 (26,677)	2162 (12,311)	2338 (10,381)	2490 (10,615)	—	—	—
			MMPP	—	—	—	—	—	—	—

Quality of care, utilization, and cost measures were evaluated at the practice level among attributed beneficiaries meeting numerator/denominator criteria during each measurement year. The computed measures were subsequently aggregated at the payor level to obtain the summary estimates above. Details on operationalization of measures are presented in Table (Supplemental Digital Content 1, <http://links.lww.com/MLR/B536>).

†DID estimates from logistic regression models adjusting for practice location (proximity to large/small metropolitan area), practice type (solo vs. other), practice use of electronic medical records, proportion of white practitioners in the practice and patient case mix.

ACE indicates angiotensin-converting enzyme; ARB, angiotensin receptor blocker; CHF, congestive heart failure; CI, confidence interval; DID, difference-in-differences; ED, emergency department; MMPP, Maryland Multipayer Patient-Centered Medical Home Program.

* $P < 0.05$.

† $P < 0.01$.

TABLE 3. Assessment of Changes in Patient Care Experience in MMPP Practices

Adult Survey						
	MMPP Adult Patient Sample		National CAHPS Adult Sample		Change in Assessments Among MMPP Adult Patient Sample	
	Time 1 (2013)	Time 2 (2014)	Time 1 (2013)	Time 2 (2014)	Time 2 vs. Time 1	
CAHPS Scales (Adult Patients)	% Positive*		% Positive†		Odds Ratio (95% CI)	P
Access to care items						
Timeliness of appointments, care, and information (5-item scale)	47	50	60	62	1.08 (0.72 to -1.63)	0.70
Provider communication (6-item scale)	78	86	82	84	1.69 (1.12 to -2.56)	0.01
Overall provider rating	64	69	76	80	1.15 (0.69 to -1.90)	0.60
Cultural competency items						
Provider is polite and considerate (3-item scale)	92	94	—	—	1.67 (0.94 to -2.97)	0.08
Provider gives advice on staying healthy (4-item scale)	58	58	—	—	0.90 (0.58 to -1.41)	0.65
Trust in provider	69	78	—	—	1.53 (0.88 to -2.65)	0.13
Patient-centered medical home items						
Provider pays attention to mental or emotional health (3-item scale)	34	37	46	51	0.98 (0.64 to -1.52)	0.95
Provider supports you in taking care of your own health (2-item scale)	36	35	52	51	0.91 (0.56 to -1.47)	0.69
Provider discusses medication decisions (3-item scale)	57	67	66	67	1.83 (0.96 to -3.50)	0.07
Engagement of family						
Provider talks about how your family can help you maintain a healthy diet and healthy eating habits	17	25	—	—	1.50 (0.85 to -2.65)	0.16
Provider talks about how your family can help you with exercise and physical activity	17	20	—	—	1.02 (0.54 to -1.90)	0.96
Provider ever discusses how you might engage a family member or trusted friend to help you in following your treatment plan	22	22	—	—	0.84 (0.46 to -1.52)	0.57
Provider's office asks for name and contact information of a family member or trusted friend to whom you would like to provide access to your medical information in the event that you are not available	74	79	—	—	1.60 (0.95 to -2.70)	0.08
PACIC Scales (chronically ill patients only)						
	Mean (SE)‡				Odds ratio (95% CI)‡	P
Patient activation	3.4 (0.1)	3.50 (0.13)	—	—	1.36 (0.86 to -2.14)	0.19
Delivery system design/decision support	3.66 (0.10)	3.70 (0.10)	—	—	0.99 (0.59 to -1.66)	0.96
Goal setting	2.77 (0.12)	2.95 (0.13)	—	—	1.29 (0.79 to -2.10)	0.30
Problem solving/contextual counseling	3.62 (0.12)	3.61 (0.12)	—	—	1.01 (0.65 to -1.57)	0.97
Follow-up/coordination	2.24 (0.11)	2.46 (0.12)	—	—	1.38 (0.86 to -2.21)	0.18
Child Survey[§]						
	MMPP Child Patient Sample		National CAHPS Child Sample		Change in Assessments Among MMPP Child Patient Sample	
	Time 1 (2013)	Time 2 (2014)	Time 1 (2013)	Time 2 (2014)	Time 2 vs. Time 1	
CAHPS Scales (Pediatric Patients)	% Positive*		% Positive†		Odds Ratio (95% CI)†	P
Access to care items						
Getting timely appointments, care, and information (5-item scale)	52	50	65	66	0.70 (0.44 to -1.12)	0.13
How well providers communicate with patients (6-item scale)	86	81	86	87	0.64 (0.35 to -1.18)	0.16
Patient's overall rating of the provider	78	75	78	82	0.64 (0.34 to -1.20)	0.16
Cultural competency items						
Provider gives advice on staying healthy (2-item scale)	79	74	—	—	0.75 (0.42 to -1.36)	0.34
Trust in provider	82	81	—	—	0.62 (0.28 to -1.40)	0.25
Patient-centered medical home items						
Provider supports you in taking care of your own health (2-item scale)	43	46	39	37	0.94 (0.55 to -1.60)	0.82
PACIC Scales (chronically ill patients only)						
	Mean (SE)‡				Odds ratio (95% CI)‡	P
Patient activation	3.77 (0.20)	3.84 (0.19)	—	—	0.89 (0.28 to -2.86)	0.85

(Continued)

TABLE 3. Assessment of Changes in Patient Care Experience in MMPP Practices (*continued*)

Adult Survey	MMPP Adult Patient Sample		National CAHPS Adult Sample		Change in Assessments Among MMPP Adult Patient Sample	
	Time 1 (2013)	Time 2 (2014)	Time 1 (2013)	Time 2 (2014)	Time 2 vs. Time 1	
CAHPS Scales (Adult Patients)	% Positive*		% Positive [†]		Odds Ratio (95% CI)	P
Delivery system design/decision support	3.94 (0.19)	3.88 (0.23)	—	—	0.56 (0.19 to -1.67)	0.30
Goal setting	3.29 (0.18)	3.45 (0.19)	—	—	0.90 (0.25 to -3.25)	0.87
Problem solving/contextual counseling	3.91 (0.17)	4.04 (0.16)	—	—	0.73 (0.22 to -2.38)	0.60
Follow-up/coordination	2.62 (0.20)	2.49 (0.20)	—	—	0.48 (0.14 to -1.62)	0.23

*Proportion of MMPP patient sample respondents choosing most positive response categories for survey items, defined as: the “Always” response category in a 4-point response set ranging from “Never” to “Always”; the “A lot” response category in a 4-point response set ranging from “Not at all” to “A lot”; points 9 and 10 combined when rating scale ranges from 0 indicating the worst to 10 indicating the best experience; the “Yes” response category for yes/no questions; and the “Yes, definitely” response category in a 3-point response set of “No,” “Yes, somewhat,” and “Yes, definitely.”

[†]For comparison, proportion of respondents selecting the most positive survey response (top-box scores) among sampled adult or child respondents to the national CAHPS Clinician and Group 12-month Adult/PCMH 2.0 Core Survey and 12-month Child/PCMH 2.0 Core Survey in 2013 or 2014.^{31,32}

[‡]Estimates of odds ratio of positive response or mean increase in measure from time 1 (2013) to time 2 (2014), using logistic regression models for binary outcomes (top-box score for a single item) and ordinal logistic regression models for ordered outcomes (PACIC Scales). Measures from the adult survey are adjusted for respondent’s age, sex, education level, whether the respondent lives with others, self-rated overall health, self-rated mental health, length of experience with the provider, Medicaid, or commercial insurance status, and practice type. For measures in the child survey, results adjust for child’s age, sex, guardian-rated overall health, length of experience with the provider, Medicaid or commercial insurance status, practice type, and characteristics of the respondent or guardian (ie, age, sex, education level, and relationship to the child).

[§]Administered to child’s caregiver.

^{||}Average of individual item scores for the given PACIC Scale. The maximum score for each scale is 5.

CAHPS indicates Consumer Assessment of Healthcare Providers and Systems; CI, confidence interval; MMPP, Maryland Multipayor Patient-Centered Medical Home Program; PACIC, Patient Assessment of Chronic Illness Care; PCMH, patient-centered medical home.

assistants on care teams, relative to comparison practices (ROR = 4.34; 95% CI, 1.00–18.90). Over time, providers in MMPP practices became less likely than counterparts in comparison practices to report that care team members depend on one another to accomplish tasks (ROR = 0.16; 95% CI, 0.05–0.50) and less likely to report that different people were constantly joining and leaving their care team (ROR = 0.41; 95% CI, 0.21–0.82). Differences between responses of MMPP and comparison providers to other provider survey items were not statistically significant.

DISCUSSION

This study evaluated a unique multipayor statewide PCMH model and reported impact on all dimensions of the Triple Aim. The findings provide evidence that the financial and technical support provided for PCMHs in the MMPP facilitated practice-level improvements on some targeted quality, utilization, and cost measures in addition to enhancing satisfaction of beneficiaries with provider communication. These positive findings were aligned with elements of the intervention targeting increased coordination of care, dedicated care management, and incentives for cost savings and performance improvement. Our findings are consistent with studies of other PCMH programs across the country showing reduced ED expenditure,^{6,7} hospitalizations,^{8,10,11} and total costs of care.^{11,13,14}

Although we emphasized final outcomes here (for brevity), there was also apparent variation in the trends of outcomes over

the period of MMPP implementation. The lack of a consistent pattern in these outcomes from the first to third year of PCMH implementation may indicate continuing adjustment to the demands and structure of the intervention by practices, and emergence of local challenges and barriers to fully operationalizing the model. Transformation is a gradual and continuing process, with varying pace among sites, given the complexity of the PCMH.^{33,34} The absence of a clear trend may also be indicative of the varying impact interventions may have on different measures of a population’s health. This is consistent with recent systematic reviews concluding that the impact of PCMH interventions may be mixed.^{5,33,35,36}

The differential effects by payor type observed in our findings provide an opportunity to further investigate possible tradeoffs, the translation of gains from one payor type to the other, and barriers to PCMH effectiveness in specific patient populations. We found differential program effects between Medicaid and private insurance, notably the positive association between MMPP participation and cervical cancer screening among privately insured beneficiaries, in contrast to the negative association with cervical and breast cancer screening among Medicaid enrollees. We also found substantial reductions in inpatient and outpatient payments for Medicaid-insured beneficiaries in all 3 years of the program, but only for outpatient payments in the first year among the privately insured. The results may not be surprising given the differences in patient characteristics of the 2 groups. Guideline changes for cervical and breast cancer screening during

TABLE 4. Changes in Practice Job Role and Work Content in MMPP and Matched Comparison Practices

	MMPP				Comparison				Differences Between MMPP and Comparison Practices*	
	Time 1 (95–98 Respondents)		Time 2 (93–96 Respondents)		Time 1 (110–116 Respondents)		Time 2 (73–78 Respondents)		Time 1 (P)	Time 2 (P)
	Majority Job Role	%	Majority Job Role	%	Majority Job Role	%	Majority Job Role	%		
Checking in and orienting patient	Administrative staff	61	Administrative staff	67	Administrative staff	61	Administrative staff	51	0.56	0.04
Taking vital signs	Medical assistant	89	Medical assistant	89	Medical assistant	79	Medical assistant	79	0.67	0.45
Screening patients for diseases	Clinician	60	Clinician	60	Clinician	76	Clinician	76	0.38	0.14
Asking patients whether they smoke	Medical assistant	57	Medical assistant	58	Clinician	57	Clinician	53	0.05	0.03
Obtaining immunization histories from patient	Medical assistant	49	Medical assistant	57	Clinician	59	Clinician	52	0.08	0.03
Gathering information on screening	Clinician	46	Clinician	56	Clinician	81	Clinician	78	0.002	0.12
Gathering information on chronic disease management	Clinician	66	Clinician	68	Clinician	87	Clinician	87	0.09	0.004
Deciding how soon patients who call for an appointment will be seen	Administrative staff	35	Administrative staff	45	Administrative staff	36	Clinician	36	0.60	0.04
Obtaining medical records from other providers outside the practice	Administrative staff	47	Administrative staff	47	Administrative staff	56	Administrative staff	52	0.04	0.06
Communicating with insurance companies	Administrative staff	42	Administrative staff	50	Administrative staff	53	Administrative staff	55	0.002	0.43
Communicating with pharmacies	Medical assistant	34	Clinician	33	Clinician	35	Clinician	34	0.12	0.52
Calling patients who are due for a visit	Administrative staff	48	Administrative staff	54	Administrative staff	57	Administrative staff	63	0.51	0.03
Calling patients to provide them laboratory results	Clinician	32	Clinician	37	Clinician	48	Clinician	51	0.68	0.63
Answering phone calls from patient	Administrative staff	35	Administrative staff	41	Administrative staff	43	Administrative staff	41	0.34	0.43
Advising patients on how to care for their health conditions	Clinician	76	Clinician	85	Clinician	87	Clinician	82	0.30	0.17
Evaluating patients and making treatment decisions	Clinician	93	Clinician	97	Clinician	98	Clinician	99	0.83	0.92
Completing different kinds of forms upon patients' arrival at the facility	Clinician	33	Administrative staff	36	Clinician	40	Administrative staff	45	0.18	0.23

The majority job role reflects the practice personnel type indicated for the specific job role by the highest frequency (%) of respondents in time 1 (2013) or time 2 (2014) within MMPP or within comparison practices.

*P-values from the Pearson χ^2 tests of differences between MMPP and comparison practices in distribution of all practice personnel types indicated for a specific job role, weighted by clustering of practices.

MMPP indicates Maryland Multipayor Patient-Centered Medical Home Program.

the project period may also have contributed to less frequent screening in Medicaid. However, these changes may not fully explain the differential associations by payor type of MMPP participation with cancer-screening rates.

Most patient experience measures were rated high and did not change over time, which may be because of the first survey being administered in the middle of the program, rather than before implementation. Nevertheless, these results can inform program implementers and providers on specific areas of patient experience that could be improved. Particularly, timely appointments are critical to preventing ED and hospital use for ACSCs. Stakeholders may consider partnering with patient representatives to understand their perspectives, as very few PCMH practices engage patients and families in quality improvement planning.³⁷

Results from our provider survey suggest that MMPP practices expanded the roles of medical assistants and integrated them closely in the care team, relative to comparison practices. Similar role expansions were reported in other recognized medical homes following transformation.³⁸ We

believe these findings are positive and appropriate outcomes under the MMPP. Such structural changes may lead to both improved attention to preventive care and cost savings, which align with the goals of MMPP. Although the program did not improve provider satisfaction over and above the trend observed in comparison practices, measures of satisfaction did not decline either.

The findings should be interpreted in view of the following limitations. First, administrative claims data are not specifically designed for evaluation, and interpretation must be cautious. Second, some observed results may be spurious because of unobserved confounding factors, such as quality improvement initiatives within practices concurrent with implementation of the MMPP. Third, we had limited statistical power for comparing some quality, utilization, and cost measures between MMPP and comparison sites. The numbers of patients eligible for some measures at the site level were small. Finally, the survey response rates were low, raising the possibility that opinions may differ among non-respondents.

Nevertheless, a relevant strength of our study is its use of a quasiexperimental design to isolate the association of MMPP participation with observed outcomes. Although practices were not randomly selected to participate in the MMPP, we applied propensity score matching to create a statistically equivalent comparison group. Moreover, our study draws inferences from various stakeholders' perspectives using data derived from administrative, clinical, and survey sources. This triangulated approach is uncommon among PCMH evaluations but is crucial to supplement findings from claims or electronic medical records data alone.³⁹

In conclusion, the MMPP showed some positive and few unfavorable effects on care for Marylanders. In light of these findings, the next phase for this program becomes preserving and sustaining the improvements participating practices achieved. Although the multipayer feature likely streamlined the administrative burden for providers and extended the intervention to a plurality of each practice's population, the state ultimately sunsetted the MMPP because of the effort of administering the program. However, the new Maryland All-Payer model emphasizes ambulatory primary care as a pillar for new value-based models of delivery system reform.⁴⁰ The proposed Maryland Comprehensive Primary Care Redesign will build upon the work of the MMPP in practice transformation.⁴¹ Insights gained from the MMPP can provide a basis for expanding the adoption of innovative models of primary care delivery by more providers and health systems.

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