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 quasi-experimental 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 and indicated differential program effects for privately insured and Medicaid beneficiaries.

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, prescription drug spending, and total costs of care. One recent synthesis found that major PCMH initiatives collectively yielded a 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 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 multipayer initiatives standardize requirements and benefits across all providers serving beneficiaries covered by a group of participating carriers.4 Compared with other payor structures, the multipayer 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 multipayer initiatives are statewide efforts and usually time-limited. One exception was the Centers for Medicare and Medicaid Services’ (CMS) Multi-payer Advanced Primary Care Practice (MAPCP), a cross-regional PCMH demonstration from 2011 to 2016. This program extended 8 existing statewide multipayer PCMH initiatives to service Medicare beneficiaries.

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 multipayer 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. 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

![Study flow chart](image)

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

| Setting (n)              | MMPP (52 Practices) | Comparison (104 Practices) | P*  |
|--------------------------|---------------------|----------------------------|-----|
| 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 | 12                  | 22                         | —   |
| part-paper               |                     |                            |     |
| Urban influence status of practice’s county (n) | |                       |     |
| MeSA—large               | 44                  | 88                         | 0.77|
| MeSA—small               | 3                   | 8                          | —   |
| MeSA adjacent to large   | 2                   | 1                          | —   |
| metro area               |                     |                            |     |
| MiSA adjacent to small   | 2                   | 3                          | —   |
| metro area               |                     |                            |     |
| Noncore adjacent to small| 1                   | 4                          | —   |
| metro area               |                     |                            |     |
| Characteristics of attributed beneficiaries in 2010 | |                       |     |
| Average age [mean across | 36.4 (17.9)         | 36.6 (19.0)                | 0.04|
| practices (SD)]          |                     |                            |     |
| Proportion of female     | 0.59 (0.11)         | 0.54 (0.10)                | 0.008|
| beneficiaries [mean      |                     |                            |     |
| across practices (SD)]   |                     |                            |     |

*P*-values from the Pearson χ² 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; 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.20 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 (Q06 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 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 Medicaid 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 = $927, 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 |Quality-of-care measures |Label |Well-care visits for children [mean (SD)] |Label |Well-care visits for adolescents and young adults [mean (SD)] |
|-------|-------------------------|-------|----------------------------------------|-------|----------------------------------------------------------|
|       |                         |       |                                        |       |                                                          |
| Q01   | Breast cancer screening | Q04   | Prescription of long-term drug therapy for asthma [% (SD)] | Q05   | Persistence with ACE inhibitor or ARB therapy for diabetes [% (SD)] |
| Medicaid | MMPP                   | Medicaid | MMPP                                | Medicaid | MMPP                                              |
| Q02   | Cervical cancer screening | Medicaid | MMPP                                | Medicaid | MMPP                                              |
| Q03   | Postpartum care visit following live birth [% (SD)] | Q06   | Well-care visits for children [mean (SD)] | Q07   | Well-care visits for adolescents and young adults [mean (SD)] |
| Medicaid | MMPP                   | Medicaid | MMPP                                | Medicaid | MMPP                                              |
| Q04   | Prescription of long-term drug therapy for asthma [% (SD)] | Q05   | Persistence with ACE inhibitor or ARB therapy for diabetes [% (SD)] | Q06   | Well-care visits for children [mean (SD)] | Q07   | Well-care visits for adolescents and young adults [mean (SD)] |
| Medicaid | MMPP                   | Medicaid | MMPP                                | Medicaid | MMPP                                              |
| Q05   | Persistence with ACE inhibitor or ARB therapy for diabetes [% (SD)] | Q06   | Well-care visits for children [mean (SD)] | Q07   | Well-care visits for adolescents and young adults [mean (SD)] |
| Medicaid | MMPP                   | Medicaid | MMPP                                | Medicaid | MMPP                                              |
| Q06   | Well-care visits for children [mean (SD)] | Q07   | Well-care visits for adolescents and young adults [mean (SD)] | Medicaid | MMPP                                              |
| Medicaid | MMPP                   | Medicaid | MMPP                                | Medicaid | MMPP                                              |
| Q07   | Well-care visits for adolescents and young adults [mean (SD)] | Medicaid | MMPP                                | Medicaid | MMPP                                              |

Unadjusted Means

| label | Year 1 (2011) | Year 2 (2012) | Year 3 (2013) |
|-------|---------------|---------------|---------------|
| 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 | MMPP | 0.25 (0.67) | 0.26 (0.59) | 0.29 (0.81) | 0.28 (0.66) | 0.97 (0.92–1.02) | 0.95 (0.89–1.02) | 0.92 (0.84–1.00) |
| Medicaid | MMPP | 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) |
| Private | MMPP | 0.39 (0.80) | 0.39 (0.86) | 0.40 (0.97) | 0.35 (0.90) | 1.04 (1.00–1.09) | 1.08 (1.03–1.13) | 1.08 (1.02–1.16) |
| Medicaid | MMPP | 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) |
| Private | MMPP | 0.46 (0.86) | 0.44 (0.85) | 0.52 (0.86) | 0.47 (0.82) | 0.80 (0.54–1.18) | 0.67 (0.35–1.28) | 0.37 (0.21–0.63) |
| Medicaid | MMPP | 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) |
| Private | MMPP | 0.68 (0.70) | 0.58 (0.59) | 0.57 (0.73) | 0.47 (0.71) | 1.12 (0.94–1.33) | 0.95 (0.82–1.11) | 0.73 (0.61–0.86) |
| Medicaid | MMPP | 0.24 (0.45) | 0.23 (0.43) | 0.20 (0.42) | 0.17 (0.38) | 0.02 (0.02) | 0.02 (0.01) | 0.05 (0.02) |
| Private | MMPP | 0.57 (0.66) | 0.58 (0.59) | 0.60 (0.82) | 0.62 (0.88) | 0.00 (0.02) | 0.02 (0.03) | 0.01 (0.02) |
| 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) |

Adjusted DID Estimate: MMPP vs. Matched Comparison Group

| label | Year 1 vs. Baseline | Year 2 vs. Baseline | Year 3 vs. Baseline |
|-------|---------------------|---------------------|---------------------|
| Medicaid | MMPP | 1.13 (1.01–1.26) | 0.72 (0.62–0.85) | 0.78 (0.68–0.90) |
| Private | MMPP | 0.97 (0.92–1.02) | 0.95 (0.89–1.02) | 0.92 (0.84–1.00) |
| Medicaid | MMPP | 0.91 (0.80–1.03) | 0.67 (0.57–0.80) | 0.76 (0.65–0.88) |
| Private | MMPP | 1.04 (1.00–1.09) | 1.08 (1.03–1.13) | 1.08 (1.02–1.16) |
| Medicaid | MMPP | 0.88 (0.68–1.15) | 0.40 (0.13–1.21) | 0.82 (0.42–1.61) |
| Private | MMPP | 0.80 (0.54–1.18) | 0.67 (0.35–1.28) | 0.37 (0.21–0.63) |
| Medicaid | MMPP | 0.81 (0.74–0.89) | 0.56 (0.41–0.76) | 0.60 (0.50–0.71) |
| Private | MMPP | 1.12 (0.94–1.33) | 0.95 (0.82–1.11) | 0.73 (0.61–0.86) |
| Medicaid | MMPP | 0.02 (0.02) | 0.02 (0.01) | 0.05 (0.02) |
| Private | MMPP | 0.00 (0.02) | 0.02 (0.03) | 0.01 (0.02) |
| Medicaid | MMPP | -0.03 (0.02) | -0.08 (0.03) | -0.09 (0.03) |

Ratio of Odds Ratio (95% CI) or DID Estimate (SE)
| Label | Insurance Type | Intervention Group | Baseline (2010) | Year 1 (2011) | Year 2 (2012) | Year 3 (2013) | Year 1 vs. Baseline | Year 2 vs. Baseline | Year 3 vs. Baseline |
|-------|----------------|-------------------|----------------|--------------|--------------|--------------|-------------------|-------------------|-------------------|
| Q08   | 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) |                   |                   |                   |
| 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)  |
|       |                |                   |                |              |              |              |                   |                   |                   |
|       | Comparison     |                   | 0.56 (1.25)    | 0.57 (1.47)  | 0.60 (1.60)  | 0.58 (1.47)  |                   |                   |                   |
|       | 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)  |                   |                   |                   |
| U02   | Proportion of asthma, CHF, or diabetes patients with ED visit [% (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)† |
|       |                |                   |                |              |              |              |                   |                   |                   |
|       | Comparison     |                   | 0.11 (0.51)    | 0.11 (0.52)  | 0.10 (0.43)  | 0.11 (0.45)  |                   |                   |                   |
|       | 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) |                   |                   |                   |
| U03   | Proportion with inpatient stay [% (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)† |
|       |                |                   |                |              |              |              |                   |                   |                   |
|       | Comparison     |                   | 0.17 (1.27)    | 0.14 (0.97)  | 0.16 (1.21)  | 0.14 (1.02)  |                   |                   |                   |
|       | 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)  |                   |                   |                   |
| U04   | Proportion of asthma, CHF, or diabetes patients with inpatient stay [% (SD)] | Medicaid | 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)† |
|       |                |                   |                |              |              |              |                   |                   |                   |
|       | Comparison     |                   | 0.04 (0.25)    | 0.03 (0.16)  | 0.03 (0.19)  | 0.04 (0.18)  |                   |                   |                   |
|       | 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)   |
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).

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 Multipayor Patient-Centered Medical Home Program.

*P < 0.05.
†P < 0.01.
‡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.

| Comparison | Medicaid-MMPP | Comparison | Medicaid-MMPP | Comparison | Medicaid-MMPP |
|------------|---------------|------------|---------------|------------|---------------|
| **C01** Mean inpatient expenditure for hospitalized patients [mean (SD)] (US$) | **Comparison** | **MMPP** | **Comparison** | **MMPP** | **Comparison** | **MMPP** |
| **U06** 30-d readmission following hospitalization [% (SD)] | Comparison | 6.80 (17.31) | 6.57 (15.31) | 6.71 (15.92) | 7.32 (20.96) | — | — | — | 0.24 (0.28) | — | 0.03 (0.29) | 0.71 (0.29) |
| Private | 4.3 (8.2) | 4.7 (10.7) | 4.4 (9.6) | 4.4 (8.0) | — | — | — | 0.24 (0.28) | — | 0.03 (0.29) | 0.71 (0.29) |
| Private | 4.6 (9.7) | 4.6 (11.7) | 4.6 (8.2) | 0.22 (1.05) | 0.93 (0.78–1.11) | 1.51 (1.22–1.86)† | 1.51 (1.17–1.95)† |
| **U07** Total nursing home days among patients with nursing home stays [mean (SD)] | Medicaid | 34.8 (102.0) | 24.5 (44.9) | 52.0 (107.2) | 35.2 (71.0) | 5.8 (7.8) | 32.4 (10.7)† | 23.4 (11.3)† |
| Medicaid | 50.0 (84.8) | 33.0 (74.3) | 35.3 (74.6) | 28.8 (77.1) | — | — | — | — | 0.6 (3.9) | 1.3 (4.3) | 0.0 (5.1) |
| Medicaid | 15.8 (19.7) | 19.9 (21.4) | 23.8 (21.1) | 19.5 (22.6) | — | — | — | — | — | — | — |
| **C02** Outpatient payments among patients with outpatient utilization [mean (SD)] (US$) | **Comparison** | **MMPP** | **Comparison** | **MMPP** | **Comparison** | **MMPP** |
| **U06** 30-d readmission following hospitalization [% (SD)] | Medicaid | 21,178 (104,402) | 12,962 (53,581) | 14,670 (55,397) | 15,616 (47,097) | −6242 (2577)‡ | −5873 (2315)‡ | −6447 (2423)‡ |
| Medicaid | 15,334 (42,485) | 13,228 (32,618) | 14,419 (38,242) | 15,735 (46,077) | — | — | — | — | — | — | — |
| Medicaid | 17,250 (26,172) | 18,651 (44,017) | 17,491 (32,228) | 19,758 (39,302) | 6 (1061) | — | — | — | 0.6 (3.9) | 1.3 (4.3) | 0.0 (5.1) |
| Medicaid | 2694 (34,187) | 1800 (15,508) | 2325 (18,213) | 2450 (18,100) | −701 (263)† | −789 (271)† | −737 (273)† |
| Private | 2291 (19,569) | 2103 (14,153) | 2372 (18,892) | 2382 (15,742) | — | — | — | — | — | — | — |
| Private | 1974 (11,942) | 2068 (12,712) | 2377 (12,454) | 2557 (13,412) | −146 (68)‡ | −41 (80) | — | — | 33 (105) | — | — |

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

#### Adult Survey

| CAHPS Scales (Adult Patients) | 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 |
| Access to care items           | % Positive*   | % Positive†   | % Positive*   | % Positive†   | Odds Ratio (95% CI) | P     |
| 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      | % Positive*   | % Positive†   | % Positive*   | % Positive†   | Odds Ratio (95% CI) | P     |
| 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 | 1.83 (0.96 to −3.50) | 0.07 |
| 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 | — | — |
| Engagement of family           | % Positive*   | % Positive†   | % Positive*   | % Positive†   | Odds Ratio (95% CI) | P     |
| 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)

| PACIC Scales (chronically ill patients only) | Mean (SE) | Odds ratio (95% CI) | P     |
|---------------------------------------------|-----------|---------------------|-------|
| Patient activation                          | 3.4 (0.1) | 3.50                 | 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

| PACIC Scales (chronically ill patients only) | 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 |
|                                             | % Positive*   | % Positive†   | % Positive*   | % Positive†   | Odds Ratio (95% CI) | P     |
| Access to care items                        | % Positive*   | % Positive†   | % Positive*   | % Positive†   | Odds Ratio (95% CI) | P     |
| 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                   | % Positive*   | % Positive†   | % Positive*   | % Positive†   | Odds Ratio (95% CI) | P     |
| 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         | % Positive*   | % Positive†   | % Positive*   | % Positive†   | Odds Ratio (95% CI) | P     |
| 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)

| 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)
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.31,32 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.33,34

The differential effects by payer type observed in our findings provide an opportunity to further investigate possible tradeoffs, the translation of gains from one payer 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


discussion

This study evaluated a unique multipayer 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 hospitalizations8,10,11 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

| CAHPS Scales (Adult Patients) | MMPP Adult Patient Sample | National CAHPS Adult Sample | Change in Assessments Among MMPP Adult Patient Sample |
|------------------------------|---------------------------|-----------------------------|-------------------------------------------------------|
| % Positive*                  | % Positive†               | % Positive‡                 | Odds Ratio (95% CI) P                                  |
| Time 1 (2013)                | Time 2 (2014)             | Time 1 (2013)               | Time 2 (2014)                                         | Time 2 vs. Time 1                                      |
| 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 range; improvement in the “Better” category in a 5-point response range; and the “Yes, definitely” response category in a 3-point response range from “No,” “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.

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Completing different kinds of forms upon
Advising patients on how to care for their
Answering phone calls from patient Administrative
Calling patients to provide them laboratory
Calling patients who are due for a visit Administrative
Communicating with insurance companies Administrative
Deciding how soon patients who call
Gathering information on chronic disease management
Gathering information on screening
Screening patients for diseases
Obtaining immunization histories from
Asking patients whether they smoke Medical assistant
Screening patients for diseases Clinician
Obtaining medical records from other
Taking vital signs Medical assistant
Checking in and orienting patient Administrative
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 χ² 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.

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. 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 quasi-experimental 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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