JAMA | Original Investigation

Association Between the Implementation of a Population-Based Primary Care Payment System and Achievement on Quality Measures in Hawaii

Amol S. Navathe, MD, PhD; Ezekiel J. Emanuel, MD, PhD; Amelia Bond, PhD; Kristin Linn, PhD; Kristen Caldarella, MHA; Andrea Troxel, PhD; Jingsan Zhu, MS, MBA; Lin Yang, MS; Shireen E. Matloubieh, MPH; Elizabeth Drye, MD, SM; Susannah Bernheim, MD, MHS; Emily Oshima Lee, MA; Mark Mugiishi, MD; Kimberly Takata Endo, MPH; Justin Yoshimoto, MS; Isaac Yuen, BBA; Sheryl Okamura, MPH; Michael Stollar, MA; Jeffrey Tom, MD, MS; Michael Gold, ScD; Kevin G. Volpp, MD, PhD

Editorial page 35

Supplemental content

IMPORTANCE Hawaii Medical Service Association (HMSA), the Blue Cross Blue Shield of Hawaii, introduced Population-based Payments for Primary Care (3PC), a new capitation-based primary care payment system, in 2016. The effect of this system on quality measures has not been evaluated.

OBJECTIVE To evaluate whether the 3PC system was associated with changes in quality, utilization, or spending in its first year.

DESIGN, SETTING, AND PARTICIPANTS Observational study using HMSA claims and clinical registry data from January 1, 2012, to December 31, 2016, and a propensity-weighted difference-in-differences method to compare 77 225 HMSA members in Hawaii attributed to 107 primary care physicians (PCPs) and 4 physician organizations participating in the first wave of the 3PC and 222 233 members attributed to 312 PCPs and 14 physician organizations that continued in a fee-for-service model in 2016 but had 3PC start dates thereafter.

EXPOSURES Participation in the 3PC system.

MAIN OUTCOMES AND MEASURES The primary outcome was the change in a composite measure score reflecting the probability that a member achieved an eligible measure out of 13 pooled Healthcare Effectiveness Data and Information Set quality measures. Primary care visits and total cost of care were among 15 secondary outcomes.

RESULTS In total, the study included 299 458 HMSA members (mean age, 42.1 years; 51.5% women) and 419 primary care physicians (mean age, 54.9 years; 34.8% women). The risk-standardized composite measure scores for 2012 to 2016 changed from 75.1% to 86.6% (+11.5 percentage points) in the 3PC group and 74.3% to 83.5% (+9.2 percentage points) in the non-3PC group (differential change, 2.3 percentage points [95% CI, 2.1 to 2.6 percentage points]; $P < .001$). Of 15 prespecified secondary end points for utilization and spending, 11 showed no significant difference. Compared with the non-3PC group, the 3PC system was associated with a significant reduction in the mean number of primary care visits (3.3 to 3.0 visits vs 3.3 to 3.1 visits; adjusted differential change, −3.9 percentage points [95% CI, −4.6 to −3.2 percentage points]; $P < .001$), but there was no significant difference in mean total cost of care ($3344 to $4087 vs $2977 to $3564; adjusted differential change, 1.0% [95% CI, −1.3% to 3.4%]; $P = .39$).

CONCLUSIONS AND RELEVANCE In its first year, the 3PC population-based primary care payment system in Hawaii was associated with small improvements in quality and a reduction in PCP visits but no significant difference in the total cost of care. Additional research is needed to assess longer-term outcomes as the program is more fully implemented and to determine whether results are generalizable to other health care markets.

JAMA. 2019;322(1):57-68. doi:10.1001/jama.2019.8113

Author Affiliations: Author affiliations are listed at the end of this article.

Corresponding Author: Amol S. Navathe, MD, PhD, University of Pennsylvania, 423 Guardian Dr, 1108 Blockley Hall, Philadelphia, PA 19104 (amol@wharton.upenn.edu).

Like Medicare, commercial health insurers have launched new alternative payment models (APMs) to increase health care value among their members.[1-5] Many APMs focus on primary care, and 3 programs have served as foundational models—the Alternative Quality Contract (AQC) of Blue Cross Blue Shield of Massachusetts, the Medicare Shared Savings Program (MSSP), and the Medicare Comprehensive Primary Care (CPC) initiative.[1,3,6] Evaluations of the AQC and MSSP programs, which used global budget shared savings incentives with fee-for-service (FFS) payments, demonstrated associated savings that increased up to 5% to 7% over several years, with small improvements in quality.[7-10] The CPC model further added per-beneficiary care management fees and demonstrated an associated 3% reduction in primary care visits but no savings or overall quality improvements at 2 or 4 years.

However, these programs have important limitations. First, they all pay using FFS, which may inhibit practice redesign.[11] Second, models like the AQC may not effectively scale to the majority of US health care markets in which primary care is typically delivered by small, independent primary care practices with little managed care experience. Third, these models were not implemented across patients with commercial, Medicare, and Medicaid coverage.

In 2016, Hawaii Medical Service Association (HMSA), the Blue Cross Blue Shield of Hawaii, launched the Population-based Payments for Primary Care (3PC) system. 3PC was a new population-based primary care payment model with quality bonuses and a global budget shared savings incentive. HMSA would eventually shift 550 primary care practitioners (PCPs) statewide to 3PC.[12] The 3PC needed to be feasible within a primary care market with large numbers of independent PCPs and across all HMSA member types (commercial, Medicare Advantage, and Managed Medicaid).

This study evaluated the association between the 3PC system and changes in the primary outcome of quality and secondary outcomes of utilization and cost of care in its first year.

Key Points

Question Was the Blue Cross Blue Shield of Hawaii capitation-based primary care payment system, Population-based Payments for Primary Care (3PC), associated with improvement in quality measures in its first year?

Findings In this observational study of 299 458 members and 419 primary care physicians, the 3PC system was significantly associated with a 2.3–percentage point increase in the risk-standardized probability of meeting an eligible quality measure over the first year.

Meaning In its first year, the 3PC capitation-based primary care payment system in Hawaii was associated with small improvements in quality, but additional research is needed to assess longer-term outcomes as the program is more fully implemented and to determine whether results are generalizable to other health care markets.

Methods

The study protocol was approved by the institutional review boards at the University of Pennsylvania, including a waiver of informed consent for patients and physicians.

The 3PC System

HMSA and University of Pennsylvania researchers designed the 3PC system to achieve shared goals that were defined together with PCPs and physician organizations through collaborative meetings, many of which were facilitated by University of Pennsylvania researchers (A.S.N., E.J.E., K.G.V.) (eMethods 1 in the Supplement). Although improving care and managing costs for all populations were goals for both HMSA and clinicians, there was also a particular focus on populations with chronic disease. A particularly important goal for clinicians was reducing the pressure for a high number of office visits to generate revenue, to allow greater flexibility for PCPs to deliver care aimed at population health and quality, not numbers of visits. This may have differentiated the 3PC goals from those of other primary care initiatives.

Before the 3PC system, HMSA used a traditional primary care payment system—FFS supplemented by payments for patient-centered medical home capabilities (on average, $1-3 per member per month [PMPM]) and bonuses for exceeding national benchmarks on more than 30 quality measures (approximately equivalent to 10% of FFS payments) (eTables 1 and 2 in the Supplement). The 3PC system introduced 2 fundamental changes. First, FFS payments were replaced with a risk-adjusted PMPM payment for attributed members. The PMPM payment varied from $8 to $70 based on patient resource utilization (ie, risk) and plan type and also included the dollars previously paid for patient-centered medical home status. In total, this represented about 80% to 90% of PCP revenue. Second, 3PC introduced a new incentive for physician organizations of up to 40% of shared savings if average risk-adjusted total member spending for a physician organization was below a benchmark based on historic spend adjusted by the overall HMSA network growth rate. Receipt of shared saving bonuses also required quality to be stable or improved.

In addition to these 2 fundamental changes, the 3PC system included 3 additional features. First, the pay-for-quality bonuses continued with the same overall bonus sizes, although the number of measures was reduced with enhanced rewards for improvement to complement previous attainment thresholds. The reduced set of measures in 3PC included 13 quality measures and 1 measure of data documentation from the previous quality program and 8 newly added measures, which included 3 adult and 4 pediatric quality measures and 1 social determinants of health screening measure. Second, to encourage reliable engagement on key activities, such as meeting with HMSA to review performance data, and investment in capabilities, such as 24/7 access and same-day appointments, PCPs and physician organizations would lose 20% of the PMPM payments if they did not meet a small number of "PCP engagement" measures. Third, PCPs and physician organizations were shown a dashboard with performance feedback from the system used to enter and track quality

data. The full 3PC design, including a description of behavioral economic principles used, is available in eMethods 1 in the Supplement.

In an effort to transition the PCPs and physician organizations without prior experience with risk-based contracts to financial risk, HMSA also introduced the 3PC system in 2016 with key prespecified future changes. First, the total cost of care incentive would change from upside only in the first year of participation to 2-sided risk based on the same benchmark. Second, the initial risk-adjusted PMPM payments would subsequently include adjustments for panel risk and prior-year performance on quality and total cost of care to reward PCPs with high quality, low total cost of care, or both, because they have less opportunity for improvement (actual $1-2 PMPM adjustments were determined later). Overall, the 3PC system was designed to incentivize shifts away from the prior FFS system based on office visits toward payment emphasizing practice efficiency, PCP autonomy, and a focus on quality rather than volume of care.

The 3PC was rolled out statewide in a staggered fashion starting in 2016. In January 2016, HMSA started a transition period in which data and program materials were disseminated to prepare for the initiation of payment changes in April 2016. The physician organizations and PCPs that started in the first wave of the 3PC model were selected using 4 criteria: (1) inclusion of PCPs caring for adults and children, (2) ensuring geographic representation across islands, (3) diversity of historical quality performance to include both low and high performers, and (4) willingness to provide feedback and participate in collaborative meetings. PCPs and physician organizations knew they would eventually be required to participate to receive fee schedule increases; hence, staggered participation adhering to these initial criteria was feasible. The program was officially considered voluntary, and some rural and specialty practices (that also provided primary care) opted to not participate or delay participation initiation; however, they were not thereby eligible for fee increases because they did not participate in 3PC (or not eligible until they did so).

Study Design

A difference-in-differences design was used to evaluate the association between the 3PC system and changes in quality, utilization, and cost. The 2012-2015 and 2016 years served as the preintervention and postintervention periods, respectively. We attributed members using logic commonly used by health plans nationwide in which member designation of a PCP takes priority over logic that uses the PCP most visited or most recently visited. Our study population included members enrolled in an HMSA plan for at least 9 months in a year, which was the criterion for attribution to a PCP and inclusion in the 3PC or preceding quality programs. The intervention group consisted of all HMSA members attributed to the PCPs and physician organizations that started in 3PC in January 2016, and the comparison group consisted of members attributed to PCPs and physician organizations slated to participate in future staggered waves of the 3PC contract but who continued in FFS throughout the study period. Attribution to these groups based on 2014 and 2015 data was fixed throughout the study to mitigate the chances that compositional changes in the groups could confound results and ensure that PCPs cared for members long enough to influence outcomes (eFigure 1 in the Supplement).

Outcomes

The primary outcome variable was the change in a composite measure score that indicated the probability of achieving a quality measure for which a patient was eligible in a given year, with a range between 0% and 100%, with higher percentages indicating achievement of higher quality. The composite measure score was computed by taking the mean of the number of measures achieved divided by the number of eligible measures by patient, weighted by a patient's number of eligible measures. It included 13 pooled individual Healthcare Effectiveness Data and Information Set-based quality measures that were also incentivized in the prior pay-for-quality program and thus had preintervention and postintervention data available: body mass index assessment, advance care planning, breast cancer screening, cervical cancer screening, diabetes care-blood pressure control, diabetes care-eye examination, diabetes care-glycated hemoglobin in control, diabetes care-medical attention for nephropathy, childhood immunization status, colorectal cancer screening, immunizations for adolescents, well-child visits in the first 15 months of life, and well-child visits in the third, fourth, fifth, and sixth years of life. An improvement in quality would require the mean probability of achievement to increase across all eligible measures, not just a single measure.

Eight newly added measures (influenza vaccine, patient experience, tobacco cessation and follow-up, social determinants of health assessment, adolescent well-care visits, developmental screening in the first 3 years of life, screening for symptoms of clinical depression, and weight assessment and counseling for nutrition and physical activity for children/adolescents) lacked preintervention and non-3PC group data, and 1 measure (review of chronic conditions) was excluded because it is a measure of documentation, not quality (eTable 3 in the Supplement).

Performance on each of the individual quality measures (secondary outcomes) was assessed by a dichotomous indicator of whether a patient achieved the measure, if the patient was eligible for it. Eligibility was defined by member characteristics and diagnosis. For example, diabetes measures were restricted to members with diabetes.

We examined secondary outcomes for cost and utilization. To analyze changes in primary care costs, we examined primary care spending per member per year based on primary care evaluation and management claims. Thus, for the 3PC group we calculated the primary care costs as if PCPs were paid FFS for these members, and for the non-3PC group we calculated the actual payments to PCPs. We used this approach to quantify changes in practice patterns in primary care spending dollars, since the change to population-based PMPM payments in the 3PC group did not reflect clinical practice changes. We used aggregate medical spending per member per year (combining HMSA spending and member cost sharing) as the overall total cost of care. Because changes in cost can be driven

by unit price or changes in utilization (for commercial insurers in particular), we also analyzed changes in utilization directly. Cost and utilization were decomposed into primary care, inpatient and outpatient hospital, emergency department, and specialist visit categories as well as laboratory tests and prescription drugs (see eMethods 2 in the Supplement for more details on cost computation).

Covariates

Variables controlled for in the analyses included factors related to PCP (age, sex, urban status, specialty, physician organization size, Hawaii vs other US residency training, Hawaii vs other US vs international medical school), PCP panel (plan type mix, sex mix, number of attributed members, and average panel age and the Episode Risk Groups [ERG] risk score), and patient (age, sex, ERG risk score, HMSA plan type, residence in urban or low-education or low-income zip codes, and interactions between age and sex). ERG is a commercially available continuous risk score intended to stratify individuals based on predicted health care utilization and spending, with scores greater than 1.0 indicating higher-than-average risk (eg, a risk score of 1.10 indicates risk 10% higher than average).[13]

Statistical Analysis

All analyses were conducted at the member-year level. We used a difference-in-differences method to compute the change in the primary outcome for members attributed to PCPs in the initial wave of participants in the 3PC system vs the change for those attributed to PCPs who continued in FFS.[14] The primary analysis used a linear probability model (ordinary least squares) to estimate the probability of achieving quality measures for which each patient was eligible (of the 13 included in the study), with fixed effects for each quality measure and propensity weights to mitigate differences on individual patient characteristics across new payment system and comparison group patients.[15] The propensity weights were calculated using data on age, sex, and ERG risk scores. This design follows the previous AQC evaluations.[7,8,16] Model parameters included the main intervention group effect, year effects, and interaction of intervention group and year 2016 for the effect of interest, with additional adjustments for PCP and patient characteristics described in the previous section.

We estimated the risk-standardized probability of achieving the primary outcome, which indicated no significant difference between the groups in trends before intervention (eFigures 2-4 in the Supplement).

Analysis of secondary cost outcomes used propensity-weighted generalized linear models with a log link and gamma distribution.[17] Utilization outcomes were analyzed using propensity-weighted unconditional negative binomial models to account for overdispersion.

There were no missing data for the study population. Standard errors were clustered to account for repeated measures at the member level and used the Huber-White correction with an independent working correlation structure.[15,18,19] We performed several sensitivity analyses, including clustering at the PCP level, adding PCP fixed effects, using an exchangeable correlation structure, and testing different cost transformations including capping outlier values at the 99th percentile.

All hypothesis tests were 2-sided, with $P < .05$ indicating statistical significance. The primary outcome analysis did not require adjustment for multiple testing; Holm-Bonferroni adjustments were made for secondary analyses. Analyses were conducted using SAS version 9.4 (SAS Institute Inc).

Results

Sample Characteristics

The study population included 299 458 HMSA members (mean age, 42.1 years; 51.5% women) who were attributed to a PCP in 2014 and 2015 (baseline years) across commercial (n = 234 775), Medicare (n = 20 294), and Medicaid (n = 44 389) plans (eFigure 1 in the Supplement). There were 77 225 members attributed to 107 PCPs in 4 physician organizations in the intervention group and 222 233 members attributed to 312 PCPs in 14 physician organizations in the comparison group who met attribution criteria. At baseline, compared with the non-3PC group, the 3PC group had older patients (26% vs 20% of patients aged ≥65 years) and more Medicare Advantage members (8.4% vs 6.2%) and commercial members (82% vs 77%) but fewer Medicaid members (9.3% vs 17%), and higher ERG risk scores (0.89 vs 0.64 for adult and pediatric patients) (all $P < .001$) (**Table 1**). Propensity-weighted differences were smaller (eTable 4 in the Supplement). The 3PC and non-3PC groups exhibited few significant differences in characteristics of attributed PCPs, mainly in island of practice (89% vs 73% on the island of Oahu, $P < .001$), number of physicians in the physician organization (42 vs 62 physicians, $P < .001$), and panel mix by health plan type (15% vs 21% Medicaid, $P = .002$) (**Table 2**).

Quality

In unadjusted analysis, the primary composite outcome measuring the probability of achieving any eligible quality measure increased from 76.4% to 84.6% in the 3PC group and from 76.8% to 83.4% in the non-3PC group (absolute differential change, 1.5 percentage points; $P < .001$) (**Table 3**). Adjusted analysis indicated that the risk-standardized primary outcomes for 2012 to 2016 changed from 75.1% to 86.6% (+11.5 percentage points) in the 3PC group and from 74.3% to 83.5% (+9.2 percentage points) in the non-3PC group, an absolute differential change of 2.3 percentage points (95% CI, 2.1 to 2.6 percentage points; $P < .001$) for the 3PC group vs non-3PC group (eFigures 5 and 6 in the Supplement).

Secondary analysis of dichotomous individual measures indicated 3PC group differential increases in meeting the advanced care planning (40.9% to 75.7% in the 3PC group vs 37.0% to 67.2% in the non-3PC group; adjusted differential increase, 5.5 percentage points [95% CI, 4.3 to 6.7 percentage points]; $P < .001$), body mass index assessment (72.1% to 88.1% in the 3PC group vs 74.9% to 85.5% in the non-3PC group; adjusted differential increase, 4.5 percentage points [95% CI, 4.1 to 5.0 percentage points]; $P < .001$), and diabetes care–blood pressure control (63.7% to 87.2% in the 3PC group vs 64.2%

Table 1. Baseline Characteristics of Patients in the Population-Based Payments for Primary Care (3PC) and Non-3PC (Fee-for-Service Comparison) Groups, 2012-2015

Characteristic	No. (%)		Absolute Difference, % (95% CI)[a]
	3PC (n = 77 225)	Non-3PC (n = 222 233)	
Patient age, y			
<18	11 174 (15)	64 117 (29)	−14 (−15 to −14)
18-34	10 184 (13)	33 365 (15)	−2 (−2 to −2)
35-49	15 296 (20)	34 013 (15)	5 (4 to 5)
50-64	20 717 (27)	46 903 (21)	6 (5 to 6)
≥65	19 854 (26)	43 835 (20)	6 (6 to 6)
Sex			
Men	37 241 (48)	108 141 (49)	−0.4 (−0.8 to 0)
Women	39 984 (52)	114 092 (51)	0.4 (0 to 0.8)
Health plan type, mean (SD), %			
Medicaid	7220 (10)	37 169 (17)	−7 (−8 to −7)
Medicare Advantage	6522 (8)	13 772 (6)	2 (2 to 3)
Commercial	63 483 (82)	171 292 (77)	5 (5 to 5)
ERG risk score, median (IQR)[b]			
Pediatric	0.27 (0.10 to 0.58)	0.25 (0.08 to 0.54)	NA
Adult	1.09 (0.40 to 2.39)	1.00 (0.34 to 2.27)	NA
Combined	0.89 (0.30 to 2.11)	0.64 (0.20 to 1.71)	NA
Top 3 comorbidities for adults			
Hypertension	31 486 (48)	68 879 (44)	4 (4 to 5)
Diabetes	13 037 (20)	27 690 (18)	2 (2 to 3)
Obesity	11 040 (17)	21 800 (14)	3 (3 to 3)
Residence in an urban zip code	69 472 (91)	168 603 (77)	14 (14 to 15)
Median household income by zip, mean (SD), $	78 494 (15 492)	74 974 (17 485)	
Residence in zip code with low education (greater than median of population with less than a high school diploma)[c]	32 394 (42)	116 157 (52)	−10 (−11 to −10)
Island of residence			
Oahu	69 471 (91)	168 596 (77)	14.1 (13.8 to 14.4)
Maui	6290 (8)	8959 (4)	4.1 (3.9 to 4.3)
Hawaii Island	280 (0.4)	26 578 (12)	−11.6 (−11.7 to −11.5)
Outer Islands	139 (0.2)	15 243 (7)	−6.7 (−6.8 to −6.6)
PCP visits per member in 2015			
0	13 611 (18)	47 433 (21)	−4 (−4 to −3)
1	11 510 (15)	37 284 (17)	−2 (−2 to −2)
2	12 732 (17)	36 184 (16)	0 (0 to 1)
3	11 856 (15)	30 045 (14)	2 (2 to 2)
4-6	19581 (25)	49 819 (22)	3 (3 to 3)
7-10	6102 (8)	16 137 (7)	1 (0 to 1)
≥11	1833 (2)	5331 (2)	0 (0 to 0)
Mid-level practitioner visit in 2015[d]	2488 (3)	7694 (4)	0 (0 to 0)

Abbreviations: ERG, Episode Risk Groups; IQR, interquartile range; NA, not applicable; PCP, primary care practitioner.

[a] All comparisons significant at $P < .001$ except women ($P = .04$) and mid-level practitioner visit in 2015 ($P = .002$).

[b] A commercially available risk score intended to stratify individuals based on predicted health care utilization and spending, with scores greater than 1.0 indicating higher-than-average risk (eg, a risk score of 1.10 indicates risk 10% higher than average).

[c] Median, 8.05%.

[d] Includes advanced nurse practitioners and physician assistants.

to 84.6% in the non-3PC group; adjusted differential increase, 2.7 percentage points [95% CI, 1.6 to 3.8 percentage points]; $P < .001$) measures after adjusting for multiple testing. However, 2 measures decreased in performance: cervical cancer screening (82.2% to 82.2% in the 3PC group vs 81.1% to 82.0% in the non-3PC group; adjusted differential change, −1.1 percentage points [95% CI, −1.8 to −0.5 percentage points]; $P = .01$) and well-child visits in the third through sixth years of life (90.7% to 91.4% in the 3PC group vs 87.9% to 90.2% in the non-3PC group; adjusted differential change, −2.9 percentage points [95% CI, −4.4 to −1.5 percentage points]; $P < .001$). The remaining 8 measures did not exhibit significant differential changes.

Cost

Secondary adjusted analyses of cost suggested that participation in the 3PC system was not associated with differential changes in the total cost of care after 12 months (**Table 4**; eFigure 7 in the Supplement). The mean total cost of care did not change significantly ($3344 to $4087 in the 3PC group vsa $2977

Table 2. Baseline Characteristics of Primary Care Practitioners in the Population-Based Payments for Primary Care (3PC) and Non-3PC (Fee-for-Service Comparison) Groups, 2012-2015

Characteristic	No. (%) 3PC (n = 107)	Non-3PC (n = 312)	*P* Value
Physician age, median (IQR), y	57 (47-63)	56 (46-64)	.91
Sex			
Men	75 (70)	198 (63)	.21
Women	32 (30)	114 (37)	
Specialty			
Internal medicine	57 (53)	142 (46)	.10
Family medicine	26 (24)	67 (22)	
Pediatrics	17 (16)	87 (28)	
General practitioner	7 (6.5)	16 (5.1)	
Residency training program location			
Hawaii	55 (51)	123 (39)	.03
United States (excluding Hawaii)	52 (49)	189 (61)	
Medical school: Hawaii vs other			
Hawaii	59 (55)	131 (42)	.05
United States (excluding Hawaii)	33 (31)	117 (38)	
International	15 (14)	64 (21)	
Panel size of unique members, median (IQR)	842 (546-1215)	833 (571-1143)	.74
Health plan type, mean (SD), %			
Medicaid	11.2 (15)	18.1 (21)	.002
Medicare Advantage	8.0 (6.9)	6.2 (6.3)	.01
Commercial	80.8 (14)	75.8 (19)	.01
Patient panel risk score, mean (SD)[a]			
Pediatric	0.60 (0.31)	0.70 (1.0)	.43
Adult	1.85 (0.75)	1.66 (0.85)	.04
Combined	1.86 (0.68)	1.70 (0.76)	.06
Island of practice site			
Oahu	95 (89)	227 (73)	<.001
Maui	12 (11)	20 (6.4)	
Hawaii island	0	41 (13)	
Outer islands	0	24 (7.7)	
Practice site in urban zip code	95 (89)	227 (73)	<.001
No. of physicians in physician organization, mean (SD)	42.1 (21)	61.6 (38)	<.001
Quality composite score, mean (SD), %	80 (12)	79 (13)	.54
Total cost of care for patient panel, median (IQR), $	3960 (3154-4812)	3678 (1869-4461)	.05

Abbreviations: IQR, interquartile range.

[a] Patient panel risk score is the mean Episode Risk Groups (ERG) risk score for patients attributed to a primary care practitioner. The ERG risk score is a commercially available risk score intended to stratify individuals based on predicted health care utilization and spending, with scores greater than 1.0 indicating higher-than-average risk (eg, a risk score of 1.10 indicates risk 10% higher than average).

to $3564 in the non-3PC group; adjusted differential change, 1.0% [95% CI, −1.3% to 3.4%]; *P* = .39). However, the 3PC system was associated with a 3.9% adjusted differential decrease in primary care cost if it were paid under FFS ($262 to $244 in the 3PC group vs $269 to $255 in the non-3PC group [95% CI, −4.8% to −2.9%]; *P* < .001). Costs for prescription drugs increased significantly in the 3PC group ($20 to $42) relative to the non-3PC group ($12 to $27), with an adjusted differential increase of 20.9% (95% CI, 10.2% to 32.5%; *P* < .001), while other cost components such as inpatient hospital ($970 to $1309 in the 3C group vs $823 to $1085 in the non-3PC group; adjusted differential change, 12.2%; adjusted *P* > .99), outpatient hospital ($542 to $646 in the 3PC group vs $565 to $652 in the non-3PC group; adjusted differential change, 2.2%; adjusted *P* > .99), emergency department ($56 to $74 in the 3PC group vs $65 to $82 in the non-3PC group; adjusted differential change, 2.5%; adjusted *P* > .99), and laboratory test costs ($202 to $213 in the 3PC group vs $170 to $181 in the non-3PC group; adjusted differential change, −0.7%; adjusted *P* > .99) did not exhibit differential changes between groups.

Utilization

The 3PC system was associated with a decrease in mean primary care visits (3.3 to 3.0 visits in the 3PC group vs 3.3 to 3.1 visits in the non-3PC group; adjusted differential change, −3.9 percentage points [95% CI, −4.6 to −3.2 percentage points]; *P* < .001), consistent with the changes in primary care costs (eFigure 8 in the Supplement). It was also associated with an increase in the use of prescription drugs (0.15 to 0.32 prescriptions in the 3PC group vs 0.12 to 0.24 prescriptions in the non-3PC group; adjusted differential change, 15.6 percentage points [95% CI, 12.9 to 18.3 percentage

Table 3. Differential Changes in Quality Measures in the Population-Based Payments for Primary Care (3PC) and Non-3PC (Fee-for-Service Comparison) Groups in the Preintervention (2012-2015) and Postintervention (2016) Periods

	3PC, %			Non-3PC, %			Unadjusted		Adjusted	
	2012-2015	2016	Difference	2012-2015	2016	Difference	Differential Change, Percentage Points	*P* Value	Differential Change, Percentage Points (95% CI)	*P* Value[a]
Quality										
No. of unique patients	74 371	58 270	NA	207 159	140 772	NA	NA	NA	NA	NA
No. of PCPs	107	107	NA	312	312	NA	NA	NA	NA	NA
Composite measure score (n = 284 544)[b]	76.4	84.6	8.2	76.8	83.4	6.7	1.5	<.001	2.3 (2.1 to 2.6)	<.001
Advance care planning (n = 42 102)	40.9	75.7	34.8	37.0	67.2	30.1	4.7	<.001	5.5 (4.3 to 6.7)[c]	<.001
Body mass index assessment (n = 245 415)	72.1	88.1	16.0	74.9	85.5	10.6	5.4	<.001	4.5 (4.1 to 5.0)[d]	<.001
Breast cancer screening (n = 62 230)	82.8	85.7	2.9	84.7	86.7	2.0	0.9	.03	0.9 (0.2 to 1.5)	.07
Cervical cancer screening (n = 74 426)	82.2	82.2	0.0	81.1	82.0	0.9	−0.9	.02	−1.1 (−1.8 to −0.5)[e]	.01
Diabetes care										
Blood pressure control (<140/90 mm Hg) (n = 31 683)	63.7	87.2	23.5	64.2	84.6	20.5	3.0	<.001	2.7 (1.6 to 3.8)[f]	<.001
Eye examination (n = 32 072)	74.8	79.3	4.6	73.8	76.8	3.0	1.6	.02	1.4 (0.2 to 2.6)	.14
HbA_{1c} in control (≤9.0%) (n = 29 581)	77.1	84.9	7.8	76.6	84.4	7.8	0.1	.92	0.0 (−1.1 to 1.1)[g]	>.99
Medical attention for nephropathy (n = 32 072)	92.4	96.0	3.6	91.1	95.3	4.2	−0.6	.13	−0.5 (−1.2 to 0.2)	.73
Childhood immunization status (n = 12 636)	87.2	94.2	6.9	84.7	89.0	4.3	2.6	.45	0.31 (−4.8 to 5.4)[h]	>.99
Colorectal cancer screening (n = 106 150)	79.4	83.3	3.8	77.8	81.6	3.7	0.2	.62	0.2 (−0.3 to 0.7)	>.99
Immunizations for adolescents (n = 16 380)	73.2	84.3	11.1	71.6	78.5	6.9	4.1	.07	1.3 (−2.5 to 5.2)[i]	>.99
Well-child visits										
First 15 mo of life (n = 9757)	92.8	NA	NA	88.8	NA	NA	NA	NA	NA[j]	NA
Third, fourth, fifth, and sixth years of life (n = 29 743)	90.7	91.4	0.8	87.9	90.2	2.3	−1.6	.05	−2.9 (−4.4 to −1.5)[k]	<.001

Abbreviations: HbA_{1c}, glycated hemoglobin; NA, not applicable; PCP, primary care practitioner.

[a] Reported *P* values are adjusted for Holm-Bonferroni correction except for the primary outcome of the Composite Measure Score.

[b] The composite measure score indicates the probability of achieving a quality measure for which a patient was eligible in a given year, with a range between 0% and 100% (with higher percentages indicating higher quality achievement). The score was computed by taking the mean of the number of measures achieved divided by the number of eligible measures by patient, weighted by a patient's number of eligible measures. It included the 13 pooled individual Healthcare Effectiveness Data and Information Set–based quality measures in this table that were also incentivized in the prior pay-for-quality program and thus had preintervention and postintervention data available. An improvement in quality would require the mean probability of achievement to increase across all eligible measures, not just a single measure.

[c] Data only available for 2014-2016.

[d] Data only available for 2014-2016.

[e] Data only available for 2013-2016.

[f] Data only available for 2013-2016.

[g] Data only available for 2014-2016.

[h] Status only available for 2013-2016.

[i] Data only available for 2013-2016.

[j] Data only available for 2013-2015 and therefore cannot be represented in this data set.

[k] Data only available in 2013-2016. Of the pediatric members who did not meet the well-child visit measure, 72.8% in the 3PC group had at least 1 PCP visit, with a mean of 2.4 visits, and 73.2% in the non-3PC group had at least 1 PCP visit, with a mean of 2.5 visits. This likely suggests that the differences in access or follow-up were quite small between the groups.

points]; *P* < .001). There were no associated changes in use of inpatient hospital visits (0.07 to 0.10 in the 3PC group vs 0.06 to 0.08 in the non-3PC group; adjusted differential change, −4.7 percentage points [95% CI, −9.7 to 0.6 percentage points]; *P* = .20), outpatient hospital visits (1.0 to 1.1 in the 3PC group vs 1.3 to 1.4 in the non-3PC group; adjusted differential change, −0.3 percentage points [95% CI, −1.7 to 1.2 percentage points]; *P* = .72), or specialist visits (5.4 to 6.1 in the 3PC group vs 4.3 to 4.8 in the non-3PC group; adjusted differential change, 1.3 percentage points [95% CI, −0.1 to 2.8 percentage points]; *P* = .20). There was an associated increase in emergency department visits (0.26 to 0.33 in the 3PC group vs 0.29 to 0.34 in the non-3PC group; adjusted differential change, 2.8 percentage points [95% CI, 0.7 to 5.1 percentage points]; *P* = .05).

Sensitivity analyses and robustness checks, including clustering at the PCP level, an exchangeable covariance structure, different cost transformations and capping outliers, and testing models with PCP fixed effects, yielded similar results (eTable 5 in the Supplement).

Table 4. Differential Changes in Spending and Utilization in the Population-Based Payments for Primary Care (3PC) and Non-3PC (Fee-for-Service Comparison) Groups in the Preintervention (2012-2015) and Postintervention (2016) Periods

	3PC			Non-3PC			Unadjusted		Adjusted	
	2012-2015	2016	Difference	2012-2015	2016	Difference	Differential Change, Mean (%)	*P* Value	Differential Change, % (95% CI)	*P* Value[a]
Utilization per member (n = 266 186)										
No. of unique patients	71 942	70 284	−1658	197 634	195 902	−1732	NA	NA	NA	NA
No. of PCPs	107	107	0	312	312	0	NA	NA	NA	NA
No. of PCP visits										
Mean	3.3	3.0	−0.3	3.3	3.1	−0.2	−0.05 (−1.5)	.002	−3.9 (−4.6 to −3.2)	<.001
Median, upper quartile, maximum	3, 5, 53	2, 4, 128		3, 5, 299	2, 4, 144					
Per member per year, No. (%)										
0	5276 (7.3)	11 632 (17)	6356	15 421 (7.8)	34 373 (18)	18 952	NA	NA	NA	NA
1	11 625 (16)	11 005 (16)	−620	33 572 (17)	32 864 (17)	−708	NA	NA	NA	NA
2	13 221 (18)	12 513 (18)	−708	37 790 (19)	33 665 (17)	−4125	NA	NA	NA	NA
3	12 922 (18)	11 237 (16)	−1685	33 321 (17)	28 330 (15)	−4991	NA	NA	NA	NA
4-6	22 052 (31)	17 552 (25)	−4500	57 233 (29)	46 831 (24)	−10 402	NA	NA	NA	NA
7-10	5589 (7.8)	4950 (7.0)	−639	16 154 (8.2)	14 801 (7.6)	−1353	NA	NA	NA	NA
No. of hospital inpatient visits										
Mean	0.07	0.10	0.03	0.06	0.08	0.02	0.01 (14)	<.001	−4.7 (−9.7 to 0.6)	.20
Median, upper quartile, maximum	0, 0, 22	0, 0, 43		0, 0, 23	0, 0, 18					
No. of hospital outpatient visits										
Mean	1.0	1.1	0.1	1.3	1.4	0.1	0.03 (3.0)	.06	−0.3 (−1.7 to 1.2)	.72
Median, upper quartile, maximum	0, 1, 116	0, 1, 91		0, 1, 157	0, 1, 76					
No. of laboratory orders										
Mean	2.7	2.8	0.1	2.2	2.3	0.1	−0.01 (−0.4)	.46	1.1 (0.2 to 2.0)	.08
Median, upper quartile, maximum	2, 4, 102	2, 4, 110		1, 3, 206	1, 3, 111					
No. of emergency department visits										
Mean	0.26	0.33	0.07	0.29	0.34	0.05	0.02 (7.7)	<.001	2.8 (0.7 to 5.1)	.05
Median, upper quartile, maximum	0, 0, 37	0, 0, 49		0, 0, 85	0, 0, 54					
No. of drug prescriptions										
Mean	0.15	0.32	0.17	0.12	0.24	0.12	0.05 (33)	<.001	15.6 (12.9 to 18.3)	<.001
Median, upper quartile, maximum	0, 0, 34	0, 0, 27		0, 0, 68	0, 0, 48					
No. of other non-primary care professional visits										
Mean	5.4	6.1	0.7	4.3	4.8	0.5	0.20 (3.7)	.01	1.3 (−0.1 to 2.8)	.20
Median, upper quartile, maximum	3, 7, 142	3, 8, 144		2, 5, 131	2, 6, 148					

(continued)

Table 4. Differential Changes in Spending and Utilization in the Population-Based Payments for Primary Care (3PC) and Non-3PC (Fee-for-Service Comparison) Groups in the Preintervention (2012-2015) and Postintervention (2016) Periods (continued)

	3PC			Non-3PC			Unadjusted		Adjusted	
	2012-2015	2016	Difference	2012-2015	2016	Difference	Differential Change, Mean (%)	*P* Value	Differential Change, % (95% CI)	*P* Value[a]
Spending per member, $ (n = 266 186)										
No. of unique patients	71 942	70 284	NA	197 634	195 902	NA	NA	NA	NA	NA
No. of PCPs	107	107	NA	312	312	NA	NA	NA	NA	NA
Total cost of care										
Mean	3344	4087	743	2977	3564	587	156 (4.7)	.03	1.0 (−1.3 to 3.4)	.39
Median, upper quartile, maximum	968, 2556, 2 136 587	1028, 2793, 1 132 952		809, 2160, 3 435 497	856. 2316, 2 386 462					
Primary care										
Mean	262	244	−18	269	255	−14	−4 (−1.5)	.02	−3.9 (−4.8 to −2.9)	<.001
Median, upper quartile, maximum	198, 362, 5748	184, 336, 19 348		196, 371, 43 310	186, 352, 16 828					
Hospital inpatient										
Mean	970	1309	339	823	1085	262	78 (8.0)	.18	12.2 (−7.0 to 35.3)	>.99
Median, upper quartile, maximum	0, 0, 2 115 179	0, 0, 810 503		0, 0, 3 378 880	0, 0, 2 378 060					
Hospital outpatient[b]										
Mean	542	646	104	565	652	87	17 (3.1)	.33	2.2 (−1.4 to 6.0)	>.99
Median, upper quartile, maximum	0, 363, 289 190	0, 354, 508 818		0, 356, 612 902	0, 339, 775 787					
Laboratory										
Mean	202	213	11	170	181	11	0 (0.0)	.89	−0.7 (−3.9 to 2.5)	>.99
Median, upper quartile, maximum	80, 257, 78 354	81, 263, 56 119		35, 205, 183 444	38, 215, 150 975					
Emergency department										
Mean	56	74	18	65	82	17	1 (1.8)	.53	2.5 (−1.8 to 7.0)	>.99
Median, upper quartile, maximum	0, 0, 43 399	0, 0, 25 386		0, 0, 59 788	0, 0, 31 439					
Prescription drug										
Mean	20	42	22	12	27	15	7 (40)	.36	20.9 (10.2 to 32.5)	<.001
Median, upper quartile, maximum	0, 0, 1 042 259	0, 0, 943 123		0, 0, 557 355	0, 0, 354 854					
Other non-primary care professional fees[c]										
Mean	1242	1467	225	1016	1186	170	55 (4.4)	.006	−0.5 (−3.2 to 2.2)	>.99
Median, upper quartile, maximum	332, 1071, 1 020 198	373, 1193, 200 463		240, 791, 442 376	274, 894, 184 082					

Abbreviations: NA, not applicable; PCP, primary care practitioner.

[a] Reported *P* values are adjusted for Holm-Bonferroni correction except for the primary outcome of total cost of care.

[b] Refers to non–emergency department hospital services that did not require inpatient admission, such as day surgery, ambulatory surgery centers, and infusion centers, but does not include ambulatory office or clinic visits.

[c] Refers to all professional visits that were not to a primary care physician. This category is predominantly specialty physician outpatient visits but also includes nonphysician professional visits such as physical therapy and occupational therapy.

Discussion

The HMSA 3PC system was associated with a small improvement in overall quality in year 1 after implementation (although all measures did not uniformly improve). Reductions in primary care visits and increases in prescription drug use and costs were observed, although they represent a small proportion of total spending. There was not a statistically significant differential change in the total cost of care.

The differential changes seemed to be driven more by changes in utilization rather than changes in unit prices of the utilized services. This study has 4 important implications.

First, this study underscores the feasibility and improvement in quality of shifting PCPs and physician organizations from FFS to a population-based primary care system that includes a capitated, risk-adjusted base payment. This was accomplished in a fragmented market with large numbers of independent practitioners and across commercial, Medicare, and Medicaid beneficiaries. Because most markets nationwide have similar features including a lack of large, highly organized primary care and little experience with financial risk, the success of the initial rollout provides critical evidence regarding the broader potential of primary care APMs. This is particularly relevant to the recent announcement by Medicare of the Primary Care First and Direct Contracting primary care models, which will use capitated payments.[20] HMSA was also informed by the Center for Medicare & Medicaid Services that the 3PC will count as an Other Payer Advanced APM in the CMS Merit Incentive Payment System, which supports the validity of the model and creates further incentive and alignment for participating PCPs.

The 3PC system differed from other APMs focused on primary care. First and foremost, it was a fundamental shift away from FFS to a PMPM population-based payment for primary care services. Thus, primary care revenue was not based on visits, and the intent was to reduce unnecessary utilization, increase remote care (eg, telephone or e-visits), and improve quality. Other programs, such as the AQC, MSSP, and CPC, continued to pay FFS. Second, the 3PC system provided large incentives for investment in practice capability by placing 20% of the base PMPM at risk if a limited set of activities were not accomplished. Third, the incentive design for quality bonuses was substantially changed using insights from behavioral economics (eg, enhancing rewards for improvement), making it distinctive from other pay-for-quality programs, although the sizes of financial incentives were similar to those in the prior HMSA quality program and other programs nationwide. Fourth, the 3PC system was unique in that the same program design was used for members in Medicare Advantage, Managed Medicaid, commercial health maintenance organization (HMO), and non-HMO plans.

The second main implication is that HMSA seems to have achieved a key goal with the 3PC in catalyzing early changes away from office visit–based primary care practice in the state of Hawaii. An explicit objective of the 3PC design was to give PCPs greater flexibility in clinical practice. While not definitive, the improvements in quality in the setting of reductions in primary care visits and costs are highly suggestive that PCPs responded by changing practice patterns to shift care outside the office without sacrificing quality. These results align with those from the CPC model, which demonstrated a 3-percentage point reduction in primary care visits (although without improvements in quality), as perhaps the model closest in design to 3PC, given its care management PMPM payments. Since FFS payments are the basis for most, if not all, commercial and Medicare primary care–focused APMs including CPC, the change to a capitation-based model offers a glimpse into a truer population-based payment system that allows practices to more systematically change the way they practice. Because of the importance of this goal in assessing any benefits on clinician work satisfaction or burnout, a qualitative evaluation is also under way.

Third, the 3PC was associated with a differential improvement in quality of care. The improvement was similar in magnitude to those seen in the AQC and larger than those in the MSSP or CPC.[7,10,16,21] Secondary analysis suggested that this quality improvement was concentrated in process measures for advanced care planning, diabetes care–blood pressure control, and body mass index assessment. While the differential improvements were small, they were likely important for eligible patients. For example, a differential 5.5-percentage point (95% CI, 4.3 to 6.7 percentage points) increase in meeting the advanced care planning measure corresponded to approximately 1092 additional members older than 65 years newly completing an advanced care plan compared with the non-3PC group. The 2.7-percentage point (95% CI, 1.6 to 3.8 percentage points) increase in meeting the diabetes care–blood pressure control measure corresponded to an additional 352 members with diabetes achieving blood pressure control. It is also important to note these were differential improvements over a sizeable increase in performance in the non-3PC group on several measures. Further, the overall quality improvements were also organizationally important to HMSA. For example, an increase in the HMSA Medicare Advantage STAR rating from 3.5 to 4 Stars after the 3PC system was implemented will lead to substantial future revenue gains. It is important to note, however, that 2 of 13 measures demonstrated a differential decrease in achievement in the 3PC group. While understanding the reasons for the decrement in performance requires further investigation, it may be because preintervention achievement was already at high levels, particularly in the 3PC group.

Fourth, while changes were restricted to primary care and total cost of care did not change, and while HMSA made a net investment in year 1 of 3PC, 2 of the 4 physician organizations earned shared savings in the first year. Notably, PCP organizations in other APMs with upside-only contracts (eg, the MSSP) frequently took several years before achieving savings.[22] Further, while the first wave of PCPs and physician organizations were not selected randomly, they were among a larger group of physician organizations that would be required to migrate to the 3PC system over time and so were deliberately not selected based on historical spend or HMSA assessments of likelihood of success in the first year. This may have yielded less self-selection than in the voluntary AQC, MSSP, and CPC mod-

els and may increase confidence in the generalizability of the 3PC results across Hawaii.

Limitations

This study has several limitations. First, there may be confounding because of a lack of randomization. This is an observational study with 1 year of follow-up. Participants in later waves were used as a comparison group to the initial wave of participants, and there was no difference in quality and spending trends before 3PC between the comparison group and first wave. HMSA deliberately did not select participants based on likelihood of success because of its planned statewide rollout and desire for generalizable information. In addition, contract terms did not allow selection of any particular PCP or physician organization. Second, the results may not be generalizable. This study involved 1 insurer in 1 state. While the results may not generalize to all health care markets, they may be important for the many markets that share characteristics with Hawaii, such as large numbers of small independent primary care practices rather than highly organized delivery systems. Third, the 3PC by design included a smaller number of quality metrics, which certainly did not provide a complete picture of quality. Additional analyses to examine overall quality, including measures not incentivized directly, are needed. Fourth, this study was unable to assess the 2-sided risk incentives because it focused only on the first year of 3PC implementation.

Conclusions

In its first year, the 3PC capitation-based primary care payment system in Hawaii was associated with small improvements in quality and a reduction in PCP visits but no significant difference in the total cost of care. Additional research is needed to assess longer-term outcomes as the program is more fully implemented and to determine whether results are generalizable to other health care markets.

ARTICLE INFORMATION

Accepted for Publication: May 22, 2019.

Author Affiliations: Corporal Michael J. Crescenz VA Medical Center, Philadelphia, Pennsylvania (Navathe, Volpp); Department of Medical Ethics and Health Policy, Perelman School of Medicine, University of Pennsylvania, Philadelphia (Navathe, Emanuel, Caldarella, Zhu, Yang, Matloubieh, Volpp); Center for Health Incentives and Behavioral Economics, Leonard Davis Institute of Health Economics, University of Pennsylvania, Philadelphia (Navathe, Emanuel, Volpp); Department of Medicine, Perelman School of Medicine, University of Pennsylvania, Philadelphia (Navathe, Volpp); Healthcare Transformation Institute, University of Pennsylvania, Philadelphia (Navathe, Caldarella); Weill Cornell Medicine, Cornell University, New York, New York (Bond); Department of Biostatistics, Epidemiology, and Informatics, University of Pennsylvania, Philadelphia (Linn); New York University School of Medicine, New York, New York (Troxel); Yale University School of Medicine, Yale University, New Haven, Connecticut (Drye, Bernheim); Hawaii Medical Service Association, Honolulu (Lee, Mugiishi, Endo, Yoshimoto, Yuen, Okamura, Stollar, Tom, Gold).

Author Contributions: Dr Navathe had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Concept and design: Navathe, Emanuel, Bond, Caldarella, Drye, Oshima Lee, Mugiishi, Takata Endo, Yoshimoto, Stollar, Gold, Volpp.
Acquisition, analysis, or interpretation of data: Navathe, Emanuel, Bond, Linn, Caldarella, Troxel, Zhu, Yang, Matloubieh, Bernheim, Yuen, Okamura, Tom, Volpp.
Drafting of the manuscript: Navathe, Caldarella, Yoshimoto, Yuen.
Critical revision of the manuscript for important intellectual content: Navathe, Emanuel, Bond, Linn, Troxel, Zhu, Yang, Matloubieh, Drye, Bernheim, Oshima Lee, Mugiishi, Takata Endo, Okamura, Stollar, Tom, Gold, Volpp.
Statistical analysis: Navathe, Bond, Linn, Troxel, Zhu, Yang, Matloubieh.
Obtained funding: Navathe, Emanuel, Mugiishi, Volpp.
Administrative, technical, or material support: Navathe, Caldarella, Matloubieh, Drye, Oshima Lee, Mugiishi, Takata Endo, Yuen, Okamura, Tom, Gold, Volpp.
Supervision: Navathe, Emanuel, Linn, Mugiishi, Stollar, Volpp.

Conflict of Interest Disclosures: Dr Navathe reported receiving grants from The Commonwealth Foundation, The Robert Wood Johnson Foundation, Anthem Public Policy Institute, Oscar Health, CIGNA Corporation, and Healthcare Research and Education Trust; receiving personal fees from Navvis and Company, Elsevier Press, Navahealth, Cleveland Clinic, Agathos Inc, Navigant Inc, Lynx Medical, Indegene Inc, Sutherland Global Services, and National University Health System of Singapore; receiving personal fees and equity from Navahealth and Embedded Healthcare; and serving as an uncompensated board member of Integrated Services Inc (a subsidiary of Hawaii Medical Services Association [HMSA]). Dr Emanuel reported receiving personal fees from Tanner Healthcare System, Mid-Atlantic Permanente Group, American College of Radiology, Marcus Evans, Loyola University, Oncology Society of New Jersey, Good Shepherd Community Care, Remedy Partners, Medzel, Kaiser Permanente Virtual Medicine, Wallace H. Coulter Foundation, Lake Nona Institute, Allocation, Partners Chicago, Pepperdine University, Huron, American Case Management Association, Philadelphia Chamber of Commerce, Blue Cross Blue Shield Minnesota, Futures Without Violence, Children's Hospital of Philadelphia, Washington State Hospital Association, Association of Academic Health Centers, Blue Cross Blue Shield of Massachusetts, American Academy of Opthalmology, Lumeris, Roivant Sciences Inc, Medical Specialties Distributors LLC, Vizient University Healthcare System, Center for Neuro-Degenerative Research, Colorado State University, Genentech Oncology Inc, Council of Insurance Agents and Brokers, Grifols Foundation, America's Health Insurance Plans, Montefiore Physician Leadership Academy, Greenwall Foundation, Medical Home Network, Healthcare Financial Management Association, Ecumenical Center–UT Health, American Society of Optometry, Associação Nacional de Hospitais Privados, National Alliance of Healthcare Purchaser Coalitions, Optum, Massachusetts Association of Health Plans, District of Columbia Hospital Association, Washington University, and UnitedHealth Group; being a venture partner with Oak HC/FT; and having investments in Gilead, Amgen, Allergan, Baxter, and UnitedHealth Group. Dr Bond reported receiving grants from Blue Cross Blue Shield of Louisiana. Dr Troxel reported receiving personal fees from VAL Health. Dr Drye reported contracts with the University of Pennsylvania and the Centers for Medicare & Medicaid Services (CMS) and that she receives salary support through her institution under a contract with CMS to develop and maintain quality measures. Dr Mugiishi reported that he is chief health officer and chief medical officer of HMSA. Dr Volpp reported receiving grants from CVS Health, Humana, Merck, Weight Watchers, and Oscar Health Insurance; receiving personal fees from VAL Health; and that he is part owner of VAL Health.

Funding/Support: This work was funded by a grant from the Hawaii Medical Service Association (HMSA).

Role of the Funder/Sponsor: HMSA had no role in the design and conduct of the study; analysis and interpretation of the data; preparation or approval of the manuscript; and decision to submit the manuscript for publication. HMSA participated in the collection of the data and review of the manuscript but had no right to veto publication or to control the decision regarding to which journal the manuscript was submitted.

Additional Contributions: We would like to thank Stuart Baker, MD (Navvis Healthcare Inc), for programmatic guidance and support. Dr Baker received no compensation for his contributions.

REFERENCES

1. US Centers for Medicare & Medicaid Services (CMS). Medicare Shared Savings Program. CMS website. https://www.cms.gov/Medicare/Medicare-

Fee-for-Service-Payment/sharedsavingsprogram/index.html. 2018. Accessed January 9, 2019.

2. US Centers for Medicare & Medicaid Services (CMS). Next Generation ACO Model. CMS website. https://innovation.cms.gov/initiatives/next-generation-aco-model/. 2018. Accessed January 9, 2019.

3. US Centers for Medicare & Medicaid Services (CMS). Pioneer ACO Model. CMS website. https://innovation.cms.gov/initiatives/Pioneer-aco-model/. 2018. Accessed January 9, 2019.

4. US Centers for Medicare & Medicaid Services (CMS). Bundled Payments for Care Improvement (BPCI) initiative: general information. CMS website. https://innovation.cms.gov/initiatives/bundled-payments/. 2018. Accessed January 9, 2019.

5. US Centers for Medicare & Medicaid Services (CMS). Comprehensive Care for Joint Replacement model. CMS website. https://innovation.cms.gov/initiatives/cjr. 2018. Accessed January 9, 2019.

6. Blue Cross Blue Shield of Massachusetts. Alternative Quality Contract. Blue Cross Blue Shield of Massachusetts website. https://home.bluecrossma.com/. 2019. Accessed January 9, 2019.

7. Song Z, Safran DG, Landon BE, et al. Health care spending and quality in year 1 of the alternative quality contract. *N Engl J Med*. 2011;365(10):909-918. doi:10.1056/NEJMsa1101416

8. Song Z, Rose S, Safran DG, Landon BE, Day MP, Chernew ME. Changes in health care spending and quality 4 years into global payment. *N Engl J Med*. 2014;371(18):1704-1714. doi:10.1056/NEJMsa1404026

9. McWilliams JM, Hatfield LA, Chernew ME, Landon BE, Schwartz AL. Early performance of accountable care organizations in Medicare. *N Engl J Med*. 2016;374(24):2357-2366. doi:10.1056/NEJMsa1600142

10. McWilliams JM, Hatfield LA, Landon BE, Hamed P, Chernew ME. Medicare spending after 3 years of the Medicare shared savings program. *N Engl J Med*. 2018;379(12):1139-1149. doi:10.1056/NEJMsa1803388

11. Goroll AH. Emerging from EHR purgatory—moving from process to outcomes. *N Engl J Med*. 2017;376(21):2004-2006. doi:10.1056/NEJMp1700601

12. Volpp KG, Navathe A, Lee EO, et al. Redesigning provider payment: opportunities and challenges from the Hawaii experience. *Healthc (Amst)*. 2018;6(3):168-174. doi:10.1016/j.hjdsi.2018.06.004

13. Optum Inc. Symmetry® Episode Risk Groups® (ERG®): predict future health care utilization. Optum website. https://www.optum.com/content/dam/optum3/optum/en/resources/sell-sheet/symmetry-episode-risk-groups-erg-sell-sheet.pdf. 2018. Accessed April 4, 2019.

14. Meyer BD. Natural and quasi-experiments in economics. *J Bus Econ Stat*. 1995;13(2):151-161.

15. Joffe MM, Have TRT, Feldman HI, Kimmel SE. Model selection, confounder control, and marginal structural models: review and new applications. *Am Stat*. 2004;58(4):272-279. doi:10.1198/000313004X5824

16. Song Z, Safran DG, Landon BE, et al. The "Alternative Quality Contract," based on a global budget, lowered medical spending and improved quality. *Health Aff (Millwood)*. 2012;31(8):1885-1894. doi:10.1377/hlthaff.2012.0327

17. Buntin MB, Zaslavsky AM. Too much ado about two-part models and transformation? comparing methods of modeling Medicare expenditures. *J Health Econ*. 2004;23(3):525-542. doi:10.1016/j.jhealeco.2003.10.005

18. Kauermann G, Carroll RJ. A note on the efficiency of sandwich covariance matrix estimation. *J Am Stat Assoc*. 2001;96(456):1387-1396. doi:10.1198/016214501753382309

19. Angrist JD, Pischke S Jr. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton, NJ: Princeton University Press; 2009.

20. HHS News: HHS to deliver value-based transformation in primary care [press release]. Centers for Medicare & Medicaid Services website. https://www.cms.gov/newsroom/press-releases/hhs-news-hhs-deliver-value-based-transformation-primary-care. April 22 2019. Accessed May 7, 2019.

21. Peikes D, Dale S, Ghosh A, et al. The Comprehensive Primary Care Initiative: effects on spending, quality, patients, and physicians. *Health Aff (Millwood)*. 2018;37(6):890-899. doi:10.1377/hlthaff.2017.1678

22. Bleser WK, Muhlestein D, Saunders RS, McClellan MB. Half a decade in, Medicare accountable care organizations are generating net savings: part 1. Health Affairs Blog. https://www.healthaffairs.org. 2018. Accessed May 31, 2019.