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Patient-Centered Medical Homes in Community Oncology Practices: Changes in Spending and Care Quality Associated With the COME HOME Experience

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QUESTION ASKED: Given that the patient-centered medical home model of health care delivery has enjoyed widespread support among provider specialty groups, could the Community Oncology Medical Home (COME HOME) model be used to improve quality of patient care, improve health outcomes, and/or reduce Medicare spending during the first 6 months of treatment of elderly oncology patients in community oncology practices?

SUMMARY ANSWER: Compared with propensity score-matched concurrent controls from similar geographic areas, postintervention medical spending was reduced by a modest but statistically significant 8.1% per patient. Quality of care, as measured by number of emergency department visits per patient, was also improved by a statistically significant amount.

WHAT WE DID: We used difference-in-differences comparison to evaluate outcomes of elderly Medicare beneficiaries diagnosed with breast, lung, colorectal, lymphoma, thyroid, melanoma, or pancreatic cancer between 2011 and 2015 who were served by COME HOME practices before and after program implementation versus concurrent comparable beneficiaries, using propensity score matching and regression methods to adjust for clinical and sociodemographic differences.

WHAT WE FOUND: Six-month medical spending was reduced by a statistically significant \$2,657 per Medicare beneficiary, and emergency department visits were reduced by 10.2 percentage points per

1,000 patients over the same time period. However, other outcome indicators, including 6-month out-of-pocket spending, inpatient and ambulatory care-sensitive hospitalizations, readmissions, length of stay, and evaluation and management visits, were unchanged.

BIAS, CONFOUNDING FACTOR(S), REAL-LIFE IMPLICATIONS: Statistical power for comparing study outcomes before and after implementation of the COME HOME program was limited by practice size, number of Medicare fee-for-service patients meeting study criteria, inability to randomly assign practices or patients to study conditions, and length of the study period. Differential changes in unobserved patient case mix could have contributed to our findings, but differences in observed patient characteristics between COME HOME participants and controls were not significant. Although cost savings and care improvements were related to implementation of the COME HOME model, participating practices could have concurrently implemented unrelated interventions to account for these changes; however, during our site visits to these practices, we were not aware of any other major changes at these sites. Finally, the results were not uniform across the seven sites in the study.

Our results suggest potential for this model to offer cost savings and care improvements more widely. Broader evaluation is necessary to include other populations, such as those with relapsing disease, who may also benefit from the program.

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Patient-Centered Medical Homes in Community Oncology Practices: Changes in Spending and Care Quality Associated With the COME HOME Experience

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abstract

PURPOSE We examined whether the Community Oncology Medical Home (COME HOME) program, a medical home program implemented in seven community oncology practices, was associated with changes in spending and care quality.

PATIENTS AND METHODS We compared outcomes from elderly fee-for-service Medicare beneficiaries diagnosed between 2011 and 2015 with breast, lung, colorectal, thyroid, or pancreatic cancer, lymphoma, or melanoma and served by COME HOME practices before and after program implementation versus similar beneficiaries served by other geographically proximate oncologists. Difference-in-differences analysis compared changes in outcomes for COME HOME patients versus concurrent controls. Propensity score matching and regression methods were adjusted for clinical and sociodemographic differences. Our primary outcome was 6-month medical spending per beneficiary. Secondary outcomes included 6-month out-of-pocket spending, inpatient and ambulatory care-sensitive hospitalizations, readmissions, length of stay, and emergency department and evaluation and management visits.

RESULTS Before COME HOME, 6-month medical spending was \$2,975 higher for the study group compared with controls (95% CI, \$1,635 to \$4,315; $P < .001$) and increasing at a similar rate. After intervention, this difference was reduced to \$318 (95% CI, $-\$1,105$ to $\$1,741$; $P = .661$), a significant change of $-\$2,657$ (95% CI, $-\$4,631$ to $-\$683$; $P = .008$) or 8.1% savings relative to 6-month average spending (\$32,866). COME HOME was also associated with significantly reduced (10.2%) emergency department visits per 1,000 patients per 6-month period ($P = .024$). There were no statistically significant differences in other outcomes.

CONCLUSION COME HOME was associated with reduced Medicare spending and improved emergency department use. The patient-centered medical home model holds promise for oncology practices, but improvements were not uniform.

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INTRODUCTION

The patient-centered medical home (PCMH) model of health care delivery has enjoyed widespread support across multiple payers and provider specialty groups. PCMH combines concepts of primary care (eg, personal physician, comprehensive care) with a commitment to systematic improvements in population health, using technology, tracking, and communication. The PCMH framework was developed by the American College of Physicians, the American Academy of Family Physicians, the American Academy of Pediatrics, and the American Osteopathic Association¹ and subsequently endorsed by the American Medical Association and multiple medical

specialty associations.² PCMH was also featured prominently in the Patient Protection and Affordable Care Act, establishing the Center for Medicare and Medicaid Innovation (CMMI) and piloting a broad range of payment and practice reforms.³

There is some evidence that the PCMH model of care can improve patient care quality and health outcomes and reduce health care utilization, although results have been somewhat mixed and derived mostly in primary care settings, with effect sizes generally being small to moderate.⁴ In primary care settings, PCMH has been associated with modest improvements in patient satisfaction and perceived care coordination.^{5,6} Current evidence also suggests that

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PCMH is associated with modest reductions in emergency department (ED) visits, particularly for older adults, and reductions in ambulatory care–sensitive hospital admissions. There is still limited evidence on the effect of PCMH on overall hospital admission or costs of care.⁷

As payers and providers pursue new payment and delivery models in specialty care, seeking to increase value by improving outcomes and quality and lowering costs, there has been growing interest in the PCMH model. To date, however, adaptation of the model to specialty providers has been relatively limited, and evidence of its effect is lacking. Oncology medical homes are of particular interest as a result of care fragmentation, significant practice variation, and high costs of care.⁸ One medical oncology practice achieving National Committee for Quality Assurance level III certification as a primary care PCMH reported significant reductions in both ED and inpatient admissions.⁹ A UnitedHealthcare bundled payments pilot in five oncology practices also reported significantly reduced inpatient and ED use and cost savings.¹⁰ There is some evidence to suggest that PCMH may be particularly well suited to patients with high costs, complex care needs, and multiple care transitions.^{11,12} In addition, the benefits of PCMH are likely to accrue more rapidly in the oncology patient population because treatment and symptom management occur in a relatively compressed time frame relative to other chronic conditions.¹³

In 2016, Medicare partnered with 16 commercial payers to launch the Oncology Care Model (OCM) program, selecting 190 oncology practices across the country to participate in an alternative payment model that emphasizes PCMH principles.^{14–16} We report on outcomes associated with a prequel to the OCM program, a Centers for Medicare and Medicaid Services (CMS)–funded innovation program guided by PCMH principles, called the Community Oncology Medical Home (COME HOME) program, that was implemented in seven community oncology practices between 2013 and 2015. To our knowledge, this study represents the first outcome evaluation of a specialty medical home in medical oncology.

PATIENTS AND METHODS

Setting

COME HOME was implemented in seven community oncology practices located in seven metropolitan areas in six different states between September 2012 and June 2015.⁸ These practices were selected for inclusion after meeting initial screening criteria related to minimum number of Medicare patients, meaningful use of electronic health records, and noncompeting locations and facilities, and after agreeing to implement the program and support study-related monitoring and reporting.

Program Design

The COME HOME model built on the original PCMH framework¹ to ensure safe, efficient, and high-quality care.

Each COME HOME program offered patients a triage phone line (open 24 hours a day, 7 days a week) that was staffed during regular hours by first responders (trained telephone operators) and nurses and during after regular business hours by physicians with access to the patients' electronic health records. Practices offered same-day appointments and evening and weekend hours to ensure patient access and early intervention for developing problems. When possible, direct hospital admitting by on-call oncologists was also used to limit patient hand-offs; however, some health plans required use of a hospitalist, and this has become more prevalent over time. On-site or near-site laboratory, pharmacy, and imaging capabilities allowed practices to diagnose and treat many emerging conditions rapidly.

Structured triage pathways offered through a Web-enabled decision support tool were used by first responders and triage nurses to ensure that all patients received a level of care appropriate to their situation. Practice physicians worked collaboratively to develop clinical pathways for diagnosis and treatment of the seven cancer types included in the study (breast, lung, colorectal, lymphoma, thyroid, melanoma, or pancreatic cancer), using the National Comprehensive Cancer Network guidelines as a starting point and incorporating biomarker testing and imaging. Implementation of pathways was driven by computerized physician order entry and dynamically tracked on the basis of patient progress. Additional program details are published elsewhere.^{8,17}

Study Design and Outcomes

To evaluate the effect of the COME HOME program on health care spending and utilization-based quality-of-care measures, we conducted a prepost, propensity score–matched (PSM) retrospective cohort study (Fig 1). Although the COME HOME program was open to all oncology patients at most practice sites, we limited our outcomes evaluation to Medicare patients with one of seven main cancer types (breast, lung, colorectal, lymphoma, thyroid, melanoma, or pancreatic cancer). Because of programmatic support from CMS, these patients were of particular interest, and their claims were available to us as part of program monitoring.

All seven oncology practices were asked to identify their newly diagnosed Medicare patients for possible study inclusion. Patients in relapse were excluded to increase comparability of patients. Claims-based criteria were used to refine the study samples to facilitate construction of a claims-based comparison group. Practices identified 4,932 Medicare patients receiving COME HOME services between 2013 and 2015. From this population, we excluded patients who did not meet claims-based criteria for being newly diagnosed or having newly relapsed disease, defined as one inpatient or two outpatient claims with an International Classification of Diseases, Ninth Revision, code

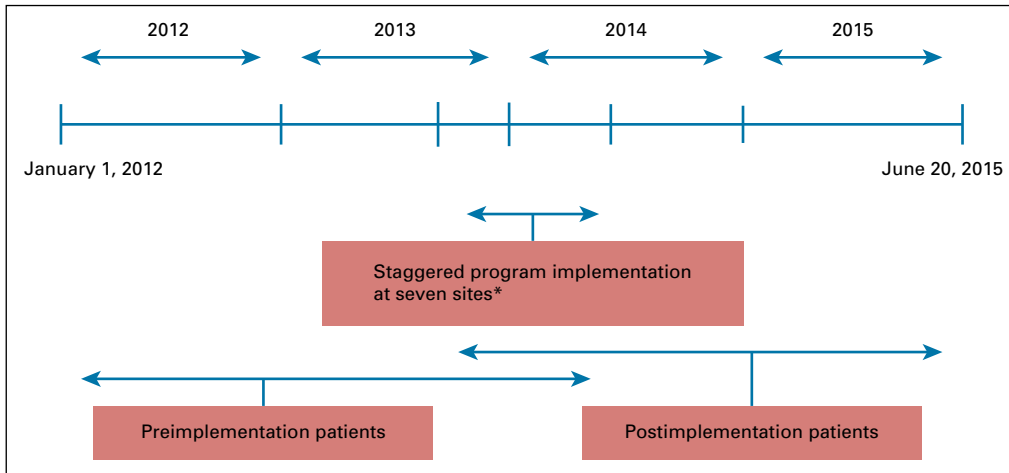


FIG 1. Community Oncology Medical Home (COME HOME) model program and evaluation timeline. (*) Staggered implementation of COME HOME program; beta site began enrollment in September of 2013, three additional practices began enrollment in December of 2013, and the final three practices began enrollment in March of 2014.

of a specific cancer and eliminating individuals with a cancer claim in the prior 12 months; patients with a diagnosis date before practice implementation of the COME HOME program; patients with less than 6 months of postdiagnosis follow-up in claims; and patients with no evaluation and management (EM) claim with a COME HOME provider in the 6 months after diagnosis (Medicare Advantage beneficiaries).

A comparison group of preintervention patients who received care at the seven practices was identified using Medicare fee-for-service (FFS) claims. Similar to the postintervention group, we eliminated beneficiaries who had no cancer claim in the study period, those with less than 6 months of postdiagnosis follow-up in claims, and those with no EM claim with a COME HOME provider in the 6 months after diagnosis. For our preintervention sample, we also excluded beneficiaries with a 2011 diagnosis because these individuals did not have a full year of data for calculating comorbidity scores. Our final sample sizes were 2,578 patients at COME HOME practices for the preintervention period and 2,290 COME HOME patients at COME HOME practices for the postintervention period (Fig 2).

Using Medicare claims, we identified a pool of potential control patients that include all Medicare enrollees with a newly diagnosed or newly relapsed cancer diagnosis who saw a non-COME HOME oncologist in the 6 months after diagnosis in the same states (Florida, Georgia, Maine, New Mexico, Ohio, and Texas). Patients with newly diagnosed or newly relapsed cancer were identified using one inpatient or two outpatient claims with an International Classification of Diseases, Ninth Revision, code of a specific cancer; individuals with a cancer claim in the prior 12 months were eliminated. The same exclusion criteria applied to the COME HOME samples (Fig 2) were used to refine the pool of potential controls. To ensure best possible matches between intervention and control groups, all control patients served as possible matches for the postintervention sample, whereas all control patients diagnosed before 2014 served as possible matches for the preintervention

sample. Thus, it is possible that some control patients were matched to patients in both the pre- and postintervention samples ($n = 301$).

Nearest neighbor PSM method was used to match three control patients to each COME HOME patient from the pre- and postintervention samples for final analyses. Our PSM models matched on diagnosis month and year, age at diagnosis, sex, race, concurrent hierarchical classification category score, treatment (surgery, chemotherapy, and/or radiation), metastatic cancer, years of Medicare enrollment, county-level socioeconomic variables (median family income, education, and urban indicator), state, death in follow-up period, original reason for Medicare entitlement (age, disability or end-stage renal disease, or both), and dual eligibility (Medicare and Medicaid) indicator.

This project was viewed and approved by the University of Tennessee Health Science Center Institutional Review Board before any investigation and in accordance with assurances filed with and approved by the US Department of Health and Human Services. Because our evaluation constituted evaluation of a public program, informed consent was not required.

Statistical Analysis

Changes between preintervention and postintervention periods in the intervention and control patients were compared using a PSM difference-in-differences analysis. After matching, we calculated the difference in study outcomes between the COME HOME patient and the mean of the three matched controls. We then adjusted for practice site-specific differences in outcome levels using a linear regression, regressing the calculated difference on an indicator for the postintervention period and practice site indicators. The coefficient on the postintervention period from this regression is the difference-in-difference estimate. To show the pre- and postintervention differences between COME HOME patients and controls, we calculated the average adjusted mean differences by inserting the mean values of the practice site indicators (ie, the

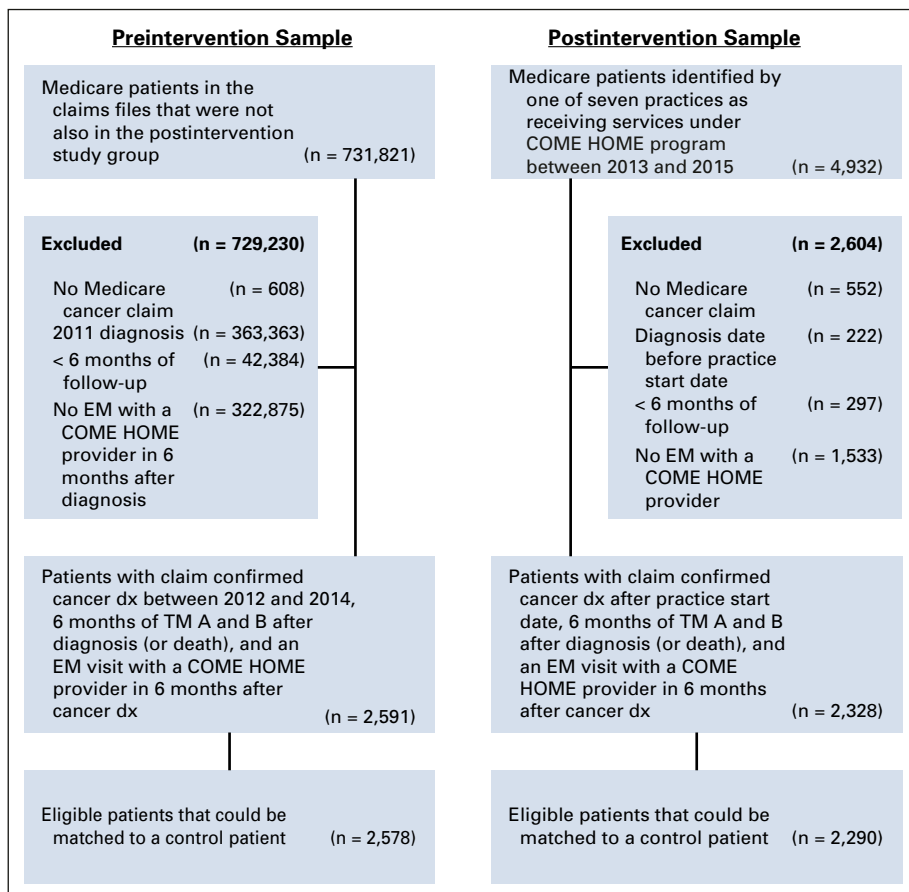


FIG 2. Identification of pre- and postintervention study samples and inclusion and exclusion criteria. COME HOME, Community Oncology Medical Home; dx, diagnosis; EM, evaluation and management; TM A and B, enrolled in traditional Medicare with both parts A and B.

proportion of patients in each practice) in our regression equation. We report two-sided P values with a significance threshold of $P < .05$. All analyses were conducted with STATA version 13.1 (STATA, College Station, TX).

RESULTS

During the 21 months of the COME HOME program, seven participating clinics provided medical home services to 4,932 Medicare patients (Fig 2). After exclusions, our analysis focused on 2,290 eligible patients with breast, lung, colorectal, thyroid, or pancreatic cancer, lymphoma, or melanoma who received services and 2,578 similar, preintervention patients who received care at these participating clinics, identified through claims review. PSM matching yielded 7,734 preintervention patients and 6,870 postintervention controls with similar characteristics at other oncology practices in the same geographic areas (Table 1).

The changes in patient health care spending and utilization comparing COME HOME practice patients and controls before and after the intervention are listed in Table 2. Before implementation of the COME HOME model, 6-month, per-beneficiary Medicare spending for the study group was \$2,975 higher than for the control group (95% CI, \$1,635 to \$4,315; $P < .001$) and increasing at a similar rate. In the postintervention period, this difference was reduced to \$318 (95% CI, $-\$1,105$ to

\$1,741; $P = .661$), constituting a significant change of $-\$2,657$ (95% CI, $-\$4,631$ to $-\$683$; $P = .008$) or an 8.1% savings relative to the 6-month mean baseline spending of \$32,866 for the treatment group. We also found that COME HOME was associated with a significant reduction (10.2%) in ED visits per 1,000 patients per 6-month period after introduction of the program ($P = .024$). Although the difference-in-differences point estimates for out-of-pocket costs, inpatient and ACS admissions, length of stay, and inpatient days were negative, we were unable to detect statistically significant effects in the overall sample (Table 2). We expected to find increased EM visits and decreased hospital readmissions, consistent with the model of care, but were also unable to detect these changes.

DISCUSSION

Although the PCMH model of care delivery has enjoyed widespread support, there is relatively modest evidence that it has a measurable effect on health outcomes, quality of care, and cost savings.^{18,19} The evidence of effect is even more limited for medical homes adapted to specialty care, although programs addressing the needs of individuals with severe mental illness²⁰ and high-risk pediatric populations^{11,21} have yielded promising results. Our findings are consistent with two previous, but more limited

TABLE 1. Characteristics of Study and Control Patients, Preintervention and Postintervention

Characteristic	Preintervention			Postintervention		
	Study Patients (n = 2,578)	Control Patients (n = 7,734)	P	Study Patients (n = 2,290)	Control Patients (n = 6,870)	P
Mean age, years	72.6	72.6	.795	72.3	72.5	.254
Female sex, %	64.12	63.4	.508	66.72	66.49	.838
Race or ethnicity, %			.985			.986
Black	5.31	5.34		6.29	6.39	
Hispanic	3.14	3.3		4.45	4.43	
White	89.49	89.29		86.46	86.26	
Other	2.06	2.07		2.79	2.93	
Cancer diagnosis, %			.704			.964
Breast	34.33	34.43		39.74	39.68	
Lung	29.33	30.22		26.55	26.1	
Colorectal	17.34	16.47		16.33	16.49	
Other	19.01	18.88		17.38	17.73	

studies of oncology medical homes, which found cost savings associated with reduced ED visits and inpatient admissions.^{12,13} A CMS-funded external evaluation of the COME HOME program, using a different methodology, also found significant reductions in ED visits and total costs of care.^{22,23}

Why did we not see more effect of the program on outcomes across the board? With the care fragmentation and high costs of care that are characteristic of oncology care, some may be disappointed. We suggest that adaptation of the medical home model to oncology care engenders some particularly unique challenges. First, and perhaps most importantly, each type of cancer is not one disease, but many, requiring the clinical team to consider a myriad of diagnostic tests and treatment options at multiple points along the patient's treatment journey. The sheer complexity of decision making in oncology makes the concepts of best practices and patient-centered care much more complicated and multifaceted. This complexity, combined with significant clinical variation not under the control of the clinician, leads to wide variation in treatment costs,^{24,25} which has several important implications in the context of PCMH. It means that large patient pools will be required to determine whether the program is actually having an effect. Thus, it is possible that our evaluation was still underpowered to detect the full effect of the COME HOME program on study outcomes.

Second, the wide variation in treatment costs implies that physician practices may have great difficulty bearing the financial risk associated with oncology care. Many standard models currently under consideration for primary care specialties set financial targets for episodes of care.²⁶ Although these have demonstrated promising results, they may place too much financial risk on oncologists. The OCM, rolled out by CMS to 190 practices in 2016, tries to account for this significant concern by limiting provider risk while still

incentivizing performance.^{14,15} Under OCM, physicians are paid on a FFS basis and receive prospective Monthly Enhanced Oncology Services payments; they are also eligible for retrospective performance-based incentives that focus on quality of care for higher volume cancers where CMS believes that accurate benchmarks can be calculated. Interestingly, providers who fail to meet utilization targets during initial OCM program years will be eliminated from the program; given the highly variable nature of costs in oncology care, at least some of the eliminated practices were likely as efficient as some of the practices that remain in the OCM program.

To understand whether per-patient cost savings generated by COME HOME (\$2,657) were significant in light of program costs, we estimated per-patient program costs (\$2,527) using CMMI support for the program (\$17,432,432) and the number of unique patients served (6,930; all patients, all payers, including Medicare FFS and Advantage). Because these program costs may have been artificially inflated as a result of the tracking and quarterly reporting required by CMMI, we also calculated a practice-only average program cost per patient (\$1,823) by dividing CMMI support for the seven community oncology practices (\$12,633,771) by unique patients served (n = 6,930). The resulting net savings (\$130 to \$834) were somewhat modest relative to the average 6-month spending for this population (\$32,866; 0.4% to 2.54%). Although these savings were modest relative to program costs, a subsequent iteration of the COME HOME model has already made model adjustments to boost efficiency by trimming evening and weekend clinics to focus on peak use times, updating information technology interfaces to improve functionality and efficient patient management, and enhancing reporting through increased frequency and more actionable formats.

TABLE 2. Differences in Patient Health Care Spending and Use: COME HOME Practices Compared With Controls, Before and After Program Implementation

Outcome*	All COME HOME Practices: Patients and Controls							P
	Preintervention Patients†	Preintervention Controls†	Preintervention Difference (95% CI)	Postintervention Patients†	Postintervention Controls†	Postintervention Difference (95% CI)	Difference in Differences (95% CI)	
Total spending, \$	35,786	32,866	2,975 (1,635 to 4,315)	19,563	19,183	318 (−1,105 to 1,741)	−2,657 (−4,631 to −683)	.008
OOP costs, \$	4,965	4,644	332 (142 to 523)	3,040	2,867	160 (−43 to 362)	−173 (−453 to 108)	.227
ED visits per 1,000 patients, No.	906	817	89 (29 to 149)	769	781	−13 (−76 to 51)	−102 (−190 to −13)	.024
Inpatient admissions per 1,000 patients, No.	643	633	7 (−36 to 51)	640	664	−22 (−68 to 24)	−29 (−93 to 35)	.375
Inpatient days per 1,000 patients, No.	3,642	3,510	130 (−190 to 440)	3,455	3,719	−260 (−590 to 80)	−380 (−850 to 80)	.108
Readmissions per 1,000 patients, No.‡	455	492	−45 (−106 to 16)	452	462	−1 (−66 to 64)	44 (−46 to 134)	.342
Inpatient LOS, days‡	8.69	8.79	−0.17 (−0.79 to 0.44)	8.29	8.78	−0.42 (−1.07 to 0.24)	−0.25 (−1.15 to 0.66)	.597
EM visits per 1,000 patients, No.	10,799	9,647	1,188 (892 to 1,484)	11,877	10,475	1,361 (1,047 to 1,675)	173 (−262 to 609)	.435
ACS admissions per 1,000 patients, No.	54	51	3 (−8 to 13)	50	55	−5 (−16 to 7)	−7 (−23 to 9)	.373

Abbreviations: ACS, ambulatory care sensitive; COME HOME, Community Oncology Medical Home; ED, emergency department; EM, evaluation and management; LOS, length of stay; OOP, out of pocket.

*Per 6-month observation period.

†Not adjusted for practice-level controls.

‡Among patients and controls with at least one hospitalization.

Our findings have several implications for payment and delivery reforms. Even in the absence of strong payment incentives, community oncology practices were able to implement PCMH infrastructure on a relatively aggressive timeline in a manner that resulted in meaningful reductions in Medicare expenditures per patient as well as an overall reduction in ED visits. Our results also suggest that the current nature of oncology diagnosis and treatment yields highly variable cost structures that may impede program evaluation and, potentially, payment reforms. With our study sample (N = 19,472, including 2,290 COME HOME patients, 2,578 pre-intervention patients at seven practices, and 14,604 controls), we were able to detect statistically significant and, arguably, clinically meaningful differences in total spending (\$2,975) and ED visits per 1,000 patients (102 fewer visits). Comparing point estimates and SEs for other study outcomes, we estimate that sample size increases ranging from 32% (inpatient days) to 290% (inpatient length of stay) would be necessary to detect significant changes in these areas. Alternatively, although our analyses of claims data did not identify any homogeneous patient subgroups in the data (eg, by tumor type), this could change with better patient-specific data or new discoveries that alter patterns of diagnosis and treatment. More homogeneous subgroups would lower SEs and decrease required sample sizes to detect differences or changes.

Our study had several limitations. Several factors limited statistical power for comparing study outcomes before and after implementation of the COME HOME program, including practice size, number of Medicare FFS patients meeting study criteria, inability to randomly assign practices or patients to study conditions, and length of the study period. Differential changes in unobserved patient case mix could have contributed to our findings, but differences in observed patient characteristics between COME HOME participants and controls were not significant. Although our results suggest that cost savings and care improvements were related to implementation of the COME HOME model, participating practices could have concurrently implemented unrelated interventions to account for these changes; however, during our site visits to these practices, we were not aware of any other major changes at these sites.

Nevertheless, our study suggests that community oncology practices were capable of making the organizational changes necessary to support modest reductions (8.1%) in spending for Medicare beneficiaries. Although implementation of the COME HOME model in other practices and settings may differ, our results suggest potential for this model to offer cost savings and care improvements more widely, even in the absence of strong financial incentives. Broader evaluation is necessary to include non-Medicare populations, such as those with relapsing disease, who may also benefit from the program.

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST AND DATA AVAILABILITY STATEMENT

Disclosures provided by the authors and data availability statement (if applicable) are available with this article at DOI <https://doi.org/10.1200/JOP.18.00479>.

AUTHOR CONTRIBUTIONS

Conception and design: Teresa M. Waters, Cameron M. Kaplan, Laura A. Stevens, Barbara L. McAneny

Financial support: Barbara L. McAneny

Administrative support: Barbara L. McAneny

Provision of study material or patients: Barbara L. McAneny

Collection and assembly of data: Cameron M. Kaplan, Mary M. Price, Laura A. Stevens, Barbara L. McAneny

Data analysis and interpretation: Teresa M. Waters, Cameron M. Kaplan, Ilana Graetz, Mary M. Price, Barbara L. McAneny

Manuscript writing: All authors

Final approval of manuscript: All authors

Accountable for all aspects of the work: All authors

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST**Patient-Centered Medical Homes in Community Oncology Practices: Changes in Spending and Care Quality Associated With the COME HOME Experience**

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