

Changes in Specialty Care Use and Leakage in Medicare Accountable Care Organizations

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In Medicare accountable care organization (ACO) programs, provider organizations have incentives to reduce spending and improve quality of care.¹ Specifically, providers share in savings with Medicare if they keep spending for an attributed population of beneficiaries sufficiently below a financial benchmark, with greater shares given to providers performing better on a set of quality measures. Initial evidence examining savings in ACO programs has found modest overall spending reductions, with larger reductions achieved in areas where spending is thought to be wasteful, such as postacute care, and where savings can be achieved by steering patients toward lower-priced settings, such as independent office settings instead of hospital outpatient departments.^{2,3} With the exception of meaningful improvements in patient experiences,⁴ the Medicare ACO programs have been associated with only minimal improvement in performance on quality measures, including medication adherence, readmissions, and admissions for ambulatory care-sensitive conditions.^{2,3,5-9}

Although ACOs have incentives to lower spending by any means, and despite the lack of evidence of savings from quality improvement, ACO descriptions and efforts have largely focused on care coordination and management as primary strategies to achieve savings.^{1,10-17} Accordingly, many ACOs have tried to establish control over the full continuum of patients' care by leveraging ownership structures that encompass primary, specialty, and inpatient care and by minimizing the proportion of care that their patients receive from other providers, commonly called leakage.

A sizable industry has grown offering products specifically to help ACOs reduce leakage, particularly by controlling specialty referrals,¹⁸⁻²⁰ and many ACOs in the Medicare Shared Savings Program (MSSP) have cited leakage reduction as the key to ACO success.^{21,22} Limiting leakage may be challenging in the Medicare ACO model because ACO-attributed beneficiaries continue to have unrestricted choice of providers. Whether specialty care leakage has been reduced in Medicare ACOs has not been described.

ACOs that consist mostly or entirely of primary care providers (PCPs) leak all or almost all specialty care by construction but have

ABSTRACT

OBJECTIVES: Reducing leakage to outside specialists has been promoted as a key strategy for accountable care organizations (ACOs). We sought to examine changes in specialty care leakage and use associated with the Medicare Shared Savings Program (MSSP).

STUDY DESIGN: Analyses of trends in ACOs from 2010 to 2014 and quasi-experimental difference-in-differences analyses comparing changes for ACOs versus local non-ACO providers from before until after the start of ACO contracts, stratified by ACO specialty composition and year of MSSP entry.

METHODS: We used Medicare claims for a 20% sample of beneficiaries attributed to ACOs or non-ACO providers. The main beneficiary-level outcome was the annual count of new specialist visits. ACO-level outcomes included the proportion of visits for ACO-attributed patients outside of the ACO (leakage) and proportion of ACO Medicare outpatient revenue devoted to ACO-attributed patients (contract penetration).

RESULTS: Leakage of specialist visits decreased minimally from 2010 to 2014 among ACOs. Contract penetration also changed minimally but differed substantially by specialty composition (85% for the most primary care-oriented quartile vs 47% for the most specialty-oriented quartile). For the most primary care-oriented quartile of ACOs in 2 of 3 entry cohorts, MSSP participation was associated with differential reductions in new specialist visits (−0.04 visits/beneficiary in 2014 for the 2012 cohort; −5.4%; $P < .001$). For more specialty-oriented ACOs, differential changes in specialist visits were not statistically significant.

CONCLUSIONS: Leakage of specialty care changed minimally in the MSSP, suggesting ineffective efforts to reduce leakage. MSSP participation was associated with decreases in new specialty visits among primary care-oriented ACOs.

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TAKEAWAY POINTS

In this study, we examined how patterns of specialty care use changed in Medicare accountable care organizations (ACOs). We found that:

- ▶ Patient use of specialists outside of specialty-oriented ACOs (leakage) decreased only slightly over time.
- ▶ Primary care-oriented ACOs achieved up to a 5% reduction in new specialist visits after 3 years of Medicare Shared Savings Program participation.
- ▶ Meanwhile, changes in specialist visits were minimal for more specialty-oriented ACOs.

These findings suggest that there has been limited internalization of specialty care in Medicare ACOs and challenge the notion that providing the full spectrum of care and containing leakage are keys to more efficient use of specialty care.

successfully lowered Medicare spending as much as or more than other ACOs have, on average.^{2,23} Although these primary care-oriented ACOs cannot provide the full continuum of care, they have stronger incentives than other ACOs to reduce the use of specialty care, because shared savings bonuses from reducing use of specialty services are not offset by foregone fee-for-service (FFS) profits from providing less specialty care. Because many specialty referrals are thought to be unnecessary and lead to significant downstream spending, they may be a natural focus for cost-cutting efforts by primary care-oriented ACOs.²⁴⁻²⁶ Primary care-oriented ACOs also have stronger incentives than more specialty-oriented ACOs to implement system changes that affect all their patients, because higher shares of their revenue are covered by ACO contracts (ie, they have higher ACO “contract penetration”).²⁷⁻²⁹

In contrast, large multispecialty ACOs provide specialty care to many patients who are not covered by the organization’s ACO contracts and would incur substantial FFS losses from systematically reducing referrals to specialists. Likewise, specialty-oriented ACOs may seek to contain leakage to boost FFS revenue for specialty services, rather than to coordinate care, particularly as competing organizations seek to internalize their own referrals or steer patients to lower-priced specialists.

Thus, an ACO’s specialty composition is likely a major determinant of the incentives it faces and the strategies it employs to lower spending. Using Medicare claims from 2010 to 2014, we examined trends in leakage of specialty care and contract penetration among ACOs in the MSSP, with a focus on specialty-oriented ACOs, to determine if their efforts to redirect patient referrals have been associated with changes in patient care patterns and contract incentives. We also assessed changes in the use of specialist visits associated with MSSP participation, comparing these changes between primary care-oriented and more specialty-oriented ACOs.

METHODS

Study Data and Population

We analyzed Medicare claims and enrollment data from 2010 to 2014 for a random 20% sample of FFS Medicare beneficiaries. For

each year, we included beneficiaries who were continuously enrolled in Part A and Part B of FFS Medicare in that year (while alive for decedents) and in the prior year.

To examine ACOs entering the MSSP in 2012, 2013, and 2014 (335 ACOs in total), we used the ACO provider-level research identifiable files from CMS, which define ACOs as collections of provider taxpayer identification numbers (TINs) and CMS certification numbers (for safety-net providers), and list national provider identifiers for participating physicians, as well. Using

previously described methods, we attributed each beneficiary in each study year to the ACO or non-ACO TIN accounting for the most allowed charges for qualifying outpatient evaluation and management services delivered to the beneficiary by a PCP during the year.² We limited qualifying services to office visits with PCPs because many ACOs include no or few specialty practices.² Beneficiaries with no office visits with a PCP were excluded.

Study Variables

ACO specialty mix. We assessed the proportion of physicians in each ACO’s set of contract participants (contracting network) that were in primary care specialties (internal medicine, family medicine, general practice, and geriatrics) versus all other specialties (specialists). We assessed physicians’ primary specialty from specialty codes in Medicare claims. We categorized ACOs into quartiles based on the proportion of ACO physicians who were specialists.

Outpatient specialty visits and associated diagnoses. For each beneficiary in each year, we assessed the total number of outpatient specialist visits, defined as Current Procedural Terminology codes 99201-99205 (new patient visits) or 99211-99215 (established visits) with physicians in non-primary care specialties. As our primary outcome, we focused specifically on new specialist visits because ACOs may be able to curtail use of specialty care or steer patients to different practices more easily when specialty care is initiated. For ACO-attributed patients, we additionally categorized specialist visits as occurring inside the patient’s ACO if provided by the ACO’s contracting network versus outside the ACO if not. We also examined the most common primary diagnoses for new specialist visits among ACOs in 2014 to examine patterns of specialty care needs for ACOs.

Contract penetration. We defined contract penetration as the proportion of an ACO’s outpatient Medicare revenue that is devoted to its attributed population. To measure contract penetration for each ACO annually, we first summed annual spending, including coinsurance amounts, for all services delivered in outpatient settings that were billed by an ACO’s set of participating practices. We then calculated the proportion of this spending that was devoted to beneficiaries assigned to the ACO, as opposed to other beneficiaries receiving outpatient care from the ACO.

Leakage of specialty visits. For each ACO in each year, we calculated the percentage of all outpatient specialty visits provided to beneficiaries attributed to the ACO that were not provided by the ACO's contracting network. Our assessments overestimate leakage for ACOs whose parent organization included specialty practices that were not included as participants in the ACO contract, as we could observe only participating practices.²⁷

Stability of beneficiary attribution. Because ACO efforts to contain leakage and engage patients may result in attributed populations that are more stable over time, for each year we also assessed the proportion of beneficiaries attributed to each ACO who had been attributed to the same ACO in the previous year.

Patient covariates. From Medicare Master Beneficiary Summary Files, we assessed the age, sex, racial or ethnic group, and Medicaid coverage of beneficiaries, as well as whether disability was the original reason for their Medicare eligibility and whether they had end-stage renal disease.³⁰ From the Chronic Conditions Data Warehouse (CCW), which draws from diagnoses since 1999 to describe beneficiaries' accumulated disease burden, we assessed whether beneficiaries had any of 27 conditions in the CCW by the start of each study year.³¹ From diagnoses in the preceding year of claims, we also calculated a Hierarchical Condition Category risk score for each beneficiary in each study year.³² We determined whether beneficiaries were long-term nursing home residents using a validated claims-based algorithm.³³ Finally, from US Census data, we assessed area-level sociodemographic characteristics.³⁴

Statistical Analysis

We conducted 2 sets of analyses, one a set of descriptive analyses among ACO-attributed beneficiaries and the other a set of quasi-experimental analyses that also included beneficiaries attributed to non-ACO providers as a control group. The purpose of the descriptive analyses was to characterize trends in leakage, contract penetration, and stability of attribution from 2010 to 2014 among ACO-attributed beneficiaries. These analyses lacked a control group because we could only identify collections of practices forming ACOs for ACOs, as claims data do not include indicators of organization above the level of a TIN, which may refer to an individual physician, a practice site, a multisite practice, or a large provider group or health system. For analyses of leakage, we focused on the most specialty-oriented ACOs (those with proportions of specialists in the top quartile among ACOs) to characterize levels and trends among ACOs with the greatest opportunity for limiting leakage. In the extreme, ACOs composed entirely of PCPs leak 100% of specialty care. Therefore, examining trends in leakage for such ACOs would be uninformative. We conducted complementary analyses of trends in use of specialist visits inside versus outside ACOs to describe the source of any changes in leakage.

For contract penetration, we stratified ACOs by quartile of specialty orientation to describe how levels and trends varied across the full spectrum of specialty mix. To determine if changes in care patterns

might be due to changes in population of beneficiaries attributed to ACOs, we examined the characteristics of ACO-attributed patients over time.

In our second set of analyses, we used linear regression and a difference-in-differences (DID) approach to estimate changes in use of specialist office visits from the precontract to postcontract period that differed from concurrent changes in the control group of beneficiaries attributed to non-ACO practices. The regression models adjusted for all patient characteristics and fixed effects for each hospital referral region (HRR) by year combination to compare ACO-attributed beneficiaries with beneficiaries in the control group living in the same area, and to adjust for concurrent regional changes in use of specialist visits occurring in the control group. Models also included fixed effects for each ACO to adjust for precontract differences between ACOs and the control group and for any changes in the distribution of ACO-attributed beneficiaries across ACOs over the study period. Thus, this analysis compared utilization in the postcontract period for ACO-attributed patients with utilization that would be expected in the absence of ACO contracts, using local changes in a similar population to establish that counterfactual scenario.

We estimated effects separately for each entry cohort of ACOs, allowing each cohort to have a different precontract period (2010-2011 for the 2012 entry cohort, 2010-2012 for the 2013 cohort, and 2010-2013 for the 2014 cohort). Because ACOs with the fewest specialists have the strongest financial incentives to reduce use of specialty care by their attributed beneficiaries, we estimated effects of MSSP participation separately for ACOs in the lowest quartile of specialty orientation (the most primary care-oriented) versus all other ACOs by adding interaction terms to DID models.

We used robust variance estimators to account for clustering of beneficiaries within ACOs (for the ACO group) or HRRs (for the control group). In sensitivity analyses, we fit generalized linear models with a log link and proportional to mean variance function, as well as 2-part models separately modeling any specialty use among all beneficiaries and the number of specialist visits conditional on some use.

To assess for potential selection bias in our DID analyses, we compared trends in use of specialist visits between the ACO and control groups during the precontract period to check if trends were already diverging or converging. We also tested whether patients' sociodemographic and clinical characteristics differentially changed from the precontract to postcontract period in the ACO group relative to the control group.

RESULTS

Patterns of Outpatient Care Among ACOs

The characteristics of patients attributed to ACOs were stable over the study period, with minimal changes in each MSSP cohort from before to after the start of ACO contracts (Table 1).³⁵ The

TABLE 1. Characteristics of ACO Patients in Year Before MSSP Entry and in 2014, by MSSP Cohort^a

Patient Characteristic	MSSP 2012 Cohort		MSSP 2013 Cohort		MSSP 2014 Cohort	
	Pre-MSSP Year (2011)	2014	Pre-MSSP Year (2012)	2014	Pre-MSSP Year (2013)	2014
Mean age, years	71.7	71.6	71.8	71.8	70.9	70.9
Female sex, %	58.4	57.6	57.3	56.7	57.9	57.6
Race/ethnicity, %						
White	82.2	81.4	81.5	80.9	82.2	82.0
Black	8.2	8.3	8.1	8.2	9.3	9.1
Hispanic	5.1	5.3	6.2	6.2	5.1	5.1
Other	4.4	5.0	4.2	4.7	3.4	3.7
Medicaid, full or partial dual, ^b %	21.3	20.6	19.6	18.6	21.4	20.9
Disabled, ^c %	23.2	23.7	22.4	22.2	25.8	25.6
End-stage renal disease, %	1.1	1.2	1.0	1.1	1.2	1.2
Nursing home resident, prior year, %	1.7	1.4	1.4	1.3	1.6	1.6
ZCTA-level characteristics, mean						
% below FPL	9.1	9.1	9.2	9.1	8.8	8.7
% with high school degree	75.7	75.8	75.6	75.7	76.0	76.1
% with college degree	19.2	19.2	18.7	18.9	19.1	19.2
CCW conditions ^d						
Total n, mean	5.81	5.94	5.90	5.97	5.87	5.87
≥6 conditions, %	50.2	51.5	51.1	51.8	49.9	49.8
≥9 conditions, %	20.9	22.7	21.5	22.5	22.2	22.4
HCC risk score, ^e mean	1.25	1.26	1.25	1.26	1.27	1.27

ACO indicates accountable care organization; CCW, Chronic Conditions Data Warehouse; FPL, federal poverty level; HCC, Hierarchical Condition Categories; HRR, hospital referral region; MSSP, Medicare Shared Savings Program; ZCTA, zip code tabulation area.

^aMeans were adjusted for the beneficiary's HRR of residence and for the ACO to which the beneficiary was attributed, in order to hold constant, over time, the distribution of ACO-attributed beneficiaries across areas and ACOs.

^bMedicare and Medicaid dual eligibility defined as full or partial dual status using the dual status variable values 1-5, 6, and 8 as defined by CMS.³⁵

^cIndicates that disability was the original reason for Medicare eligibility.

^dChronic conditions from the CCW included 27 conditions: acute myocardial infarction, Alzheimer disease, Alzheimer disease and related disorders or senile dementia, anemia, asthma, atrial fibrillation, benign prostatic hyperplasia, chronic kidney disease, chronic obstructive pulmonary disease, depression, diabetes, heart failure, hip/pelvic fracture, hyperlipidemia, hypertension, hypothyroidism, ischemic heart disease, osteoporosis, rheumatoid arthritis/osteoarthritis, stroke/transient ischemic attack, breast cancer, colorectal cancer, endometrial cancer, lung cancer, prostate cancer, cataracts, and glaucoma. Indicators for all 27 conditions were included in models. Counts of conditions included all conditions except cataracts and glaucoma.

^eHCC risk scores are derived from demographic and diagnostic data in Medicare enrollment and claims files, with higher scores indicating higher predicted spending in the subsequent year. For each beneficiary in each study year, we assessed the HCC score based on enrollment and claims data in the prior year.

25 most common primary diagnoses for new specialist visits in all MSSP cohorts in 2014 prominently featured musculoskeletal problems (limb, joint, and back pain), common skin conditions (nail dermatophytosis, seborrheic keratosis), and diagnoses often managed primarily by PCPs (hypertension, diabetes) (**eAppendix Table 1** [eAppendix available at ajmc.com]).

Contract penetration varied widely by ACO specialty orientation but changed minimally over time (**Figure 1**). In the 2012 MSSP entry cohort of ACOs, for example, contract penetration ranged from 47% in 2014 for the most specialty-oriented quartile of ACOs to 85% for the least specialty-oriented quartile. Thus, for ACOs composed entirely or almost entirely of PCPs, MSSP contracts covered a high proportion of Medicare revenue for outpatient care.

From 2010 to 2014, leakage decreased slightly in 2 MSSP cohorts, from 70% to 68% in the 2012 entrants and from 64% to 61% in the 2013

entrants (**Figure 2**). These changes were driven primarily by rising use of specialist visits within ACOs without concurrent decreases in use of specialist visits outside of ACOs, such that total use of specialist visits rose slightly for ACO-attributed patients over the study period (**Figure 2**).

For new specialist visits, trends in leakage were similar, except that modest reductions in leakage occurred in all 3 MSSP cohorts (**Figure 3**). The largest decline in leakage of new specialist visits occurred in the 2013 cohort, from 66% in 2010 to 62% in 2014. As with total specialist visits, reductions in leakage of new specialist visits were largely driven by increased use inside of ACOs.

For both overall specialist visit use and new specialist visit use, the modest reductions in leakage began prior to entry into the MSSP, without clear acceleration after entry (**Figure 2**). Rates of leakage were higher for ACOs with lower proportions of specialists, but trends were generally similar (**eAppendix Figures 1-4**).

Stability of beneficiary attribution to ACOs changed minimally across all 3 MSSP cohorts (eAppendix Table 2). For example, in the 2012 cohort of ACOs, the average proportion of beneficiaries who were assigned to the same ACO as in the previous year was 77.2% in 2010 and 75.3% in 2014.

Association Between MSSP Participation and Changes in Use of Specialist Visits

Tests of key assumptions supported inferences from DID analyses. For each MSSP cohort, the characteristics of attributed patients changed minimally relative to the control group (eAppendix Tables 3-5). In the precontract period, rates of specialist visit use were generally similar among the MSSP ACO cohorts and the control group, with some small statistically significant differences, and precontract annual trends in specialist visit use differed minimally among the ACO and control groups (eAppendix Table 6).

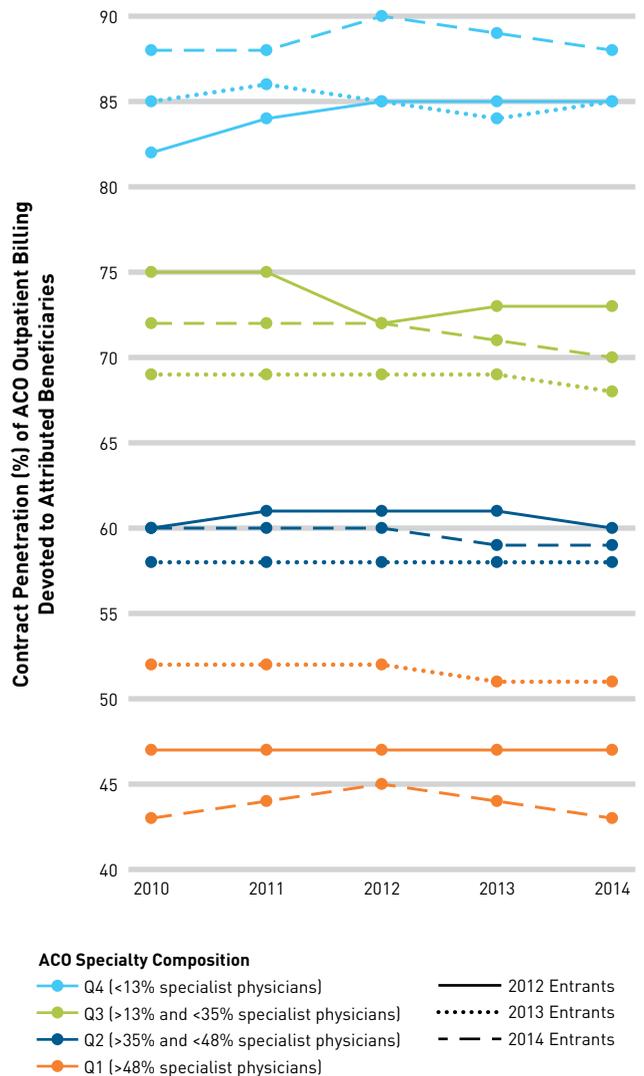
For the most primary care-oriented quartile of ACOs in the 2012 entry cohort (<13% specialists), MSSP participation was associated with a significant reduction in overall annual use of specialist visits (differential change: -0.10 visits/beneficiary or -2.1% of the precontract mean of 4.77 visits/beneficiary; $P = .002$) and a more prominent differential reduction in annual use of new specialist visits (-0.037 visits/beneficiary or -5.0% of the precontract mean of 0.746 visits/beneficiary; $P < .001$) (Table 2). These reductions grew over time from 2013 to 2014 (eAppendix Table 7). In contrast, differential changes in use of specialist visits were small and not statistically significant in the 2012 cohort for other ACOs with more specialists.

In the 2014 cohort, MSSP participation was similarly associated with a differential reduction in use of new specialty visits for primary care-oriented ACOs (-0.023 visits/beneficiary or -3.1% of the precontract mean; $P < .001$) but not for other, more specialty-oriented ACOs (Table 2). In the 2013 cohort, MSSP participation was associated with modest differential decreases in use of new specialist visits and all specialist visits for primary care-oriented ACOs and with modest differential increases in use for other ACOs, but these differential changes were not statistically significant. Estimates from generalized linear models with a log link and 2-part models were consistent with our main results.

DISCUSSION

In this study of ACOs in the MSSP, leakage of outpatient specialty care decreased slightly in specialty-oriented ACOs over the 2010-2014 period. These small reductions began prior to MSSP entry, however, suggesting that efforts to internalize specialty referrals may have been initiated to increase FFS revenue rather than to better coordinate care in response to ACO contract incentives, although we could not rule out anticipatory positioning by providers expecting to enter the MSSP. Lower rates of leakage could have also

FIGURE 1. Trends in Contract Penetration, by ACO Specialty Orientation and MSSP Entry Cohort*

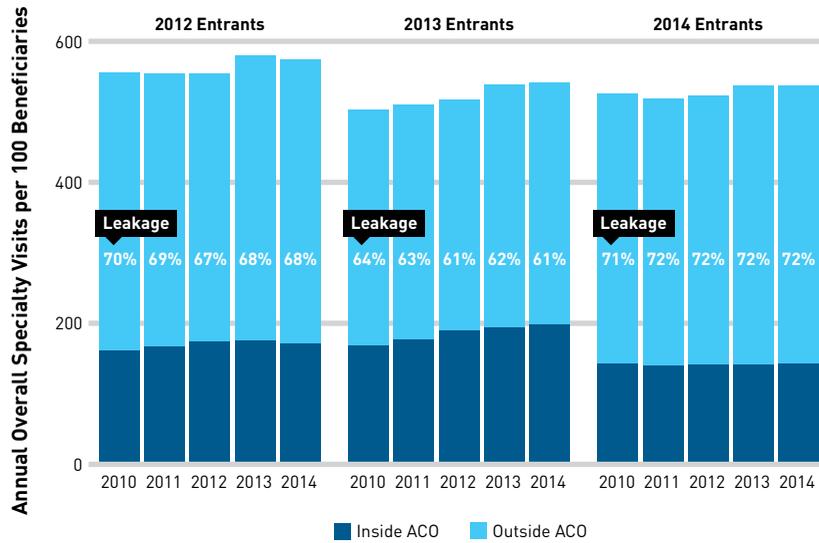


ACO indicates accountable care organization; MSSP, Medicare Shared Savings Program; Q, quartile.
 *Contract penetration is defined as the proportion of an ACO's spending that is devoted to its attributed population. Trends in contract penetration in each MSSP cohort (2012 entrants, solid line; 2013 entrants, dotted line; 2014 entrants, dashed line) are shown for ACOs stratified by their quartile of specialty orientation [quartile 1 [highest specialty orientation] in orange, quartile 2 in dark blue, quartile 3 in green, and quartile 4 [lowest specialty orientation] in light blue].

been due to expanding specialty capacity among organizations entering the MSSP.³⁶ Regardless of their cause, the reductions were minimal, particularly during years of MSSP participation, suggesting limited effectiveness of efforts to contain specialty care within ACOs.

For specialty-oriented ACOs, this study found somewhat higher levels of leakage than did prior research in which the data accounted

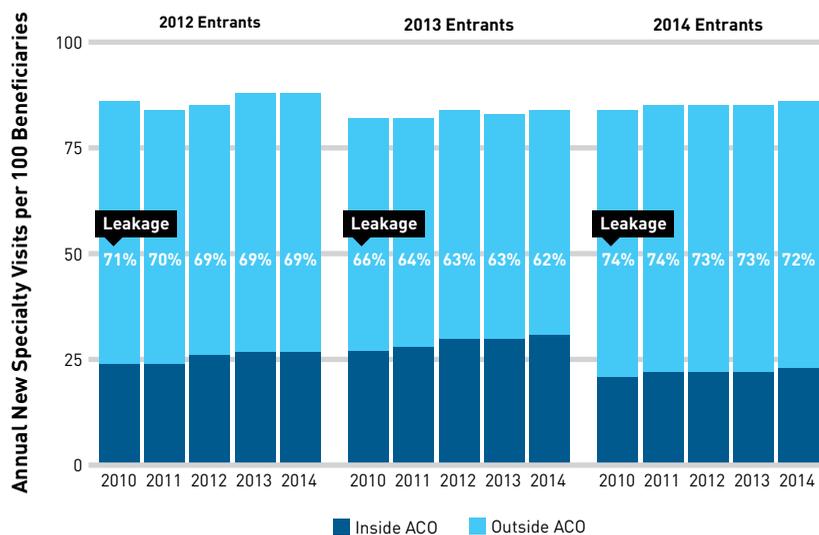
FIGURE 2. Unadjusted Rates and Leakage of Overall Specialty Visit Use Among the Most Specialty-Oriented ACOs^a



ACO indicates accountable care organization; MSSP, Medicare Shared Savings Program.

^aTrends in unadjusted new specialist visit rates per 100 beneficiaries in each MSSP cohort are shown for ACOs with the highest specialty orientation with more than 48% specialist physicians in their contract (first [highest] quartile of specialty orientation), broken down into inside-ACO visits (dark blue) and outside-ACO visits (light blue). Leakage is defined as the proportion of inside-ACO visits over all new specialty visits in a given year.

FIGURE 3. Unadjusted Rates and Leakage of New Specialty Visits Among the Most Specialty-Oriented ACOs^a



ACO indicates accountable care organization; MSSP, Medicare Shared Savings Program.

^aTrends in unadjusted overall specialist visit rates per 100 beneficiaries in each MSSP cohort are shown for ACOs with the highest specialty orientation with more than 48% specialist physicians in their contract (first [highest] quartile of specialty orientation), broken down into inside-ACO visits (dark blue) and outside-ACO visits (light blue). "Leakage" is defined as the proportion of inside-ACO visits over all specialty visits in a given year.

for organizations' specialty practices that were not included as participants in ACO contracts.²⁷ We would not expect this source of overestimation of leakage in our analysis to change over time, however, and we would expect that efforts by specialty-oriented ACOs to reduce leakage would result in greater proportions of specialty care provided by participating specialty practices. Thus, although our analysis may not accurately measure levels of leakage, it should support conclusions about the trends in leakage over time.

For primary care-oriented ACOs, which by definition leak all or almost all specialty care, MSSP participation was consistently associated with decreases in use of specialist visits. These reductions ranged from small and statistically insignificant to as large as 5% by 2014 for new specialist visits for patients of the earliest MSSP entrants. In contrast, MSSP participation was not associated with changes in total use of specialist visits or rates of new specialist visits for patients in ACOs with more specialists. These findings are consistent with the stronger incentives that primary care groups have to reduce use of specialty care. They are also consistent with expectations that the effects of ACO efforts to curb use would be greater for new specialist visits than for established care with specialists. The greater reductions in specialist visit use among primary care-oriented ACOs challenge the notion that providing the full spectrum of care and containing leakage are keys to achieving more efficient care.

We also found that contract penetration was much lower for specialty-oriented ACOs than for primary care-oriented ACOs and did not change with exposure to ACO incentives. In isolation, reducing leakage should increase the proportion of ACOs' outpatient revenue devoted to attributed patients, but the decreases in leakage were likely too small to have a measurable impact on contract penetration. The much lower contract penetration among specialty-oriented ACOs makes for much weaker incentives to implement system changes that affect all patients served, particularly when ACO contracts are not established with all payers.^{27,28} A lack of such systemic strategies

TABLE 2. Differential Changes in Annual Specialty Visit Rates From the Pre- to Postcontract Periods for ACOs Versus Control Group, by ACO Specialty Orientation^a

Utilization Measure	Unadjusted Precontract Control Group Mean ^b	Precontract Difference Between ACO and Control Group Means ^b		Differential Change From Precontract Period to 2014 for ACO vs Control Group	
		Average Difference	P	Average Change (95% CI)	P
2012 MSSP Cohort					
All specialist visits					
Primary care-oriented ACOs (<13% specialists)	4.78	-0.76	<.001	-0.10 (-0.16 to -0.04)	.002
Other ACOs (13%-76% specialists)		0.18	.02	-0.05 (-0.12 to 0.01)	.11
New specialist visits					
Primary care-oriented ACOs (<13% specialists)	0.75	-0.07	<.001	-0.037 (-0.051 to -0.024)	<.001
Other ACOs (13%-76% specialists)		0.012	.48	-0.007 (-0.015 to 0.001)	.09
2013 MSSP Cohort					
All specialist visits					
Primary care-oriented ACOs (<13% specialists)	4.79	-0.23	<.001	-0.03 (-0.09 to 0.03)	.36
Other ACOs (13%-76% specialists)		-0.03	.48	0.05 (0.00-0.11)	.07
New specialist visits					
Primary care-oriented ACOs (<13% specialists)	0.75	0.015	<.001	0.009 (-0.019 to 0.002)	.12
Other ACOs (13%-76% specialists)		0.051	<.001	0.002 (-0.010 to 0.014)	.73
2014 MSSP Cohort					
All specialist visits					
Primary care-oriented ACOs (<13% specialists)	4.83	0.14	.04	0.00 (-0.06 to 0.06)	.97
Other ACOs (13%-76% specialists)		0.03	.33	-0.01 (-0.05 to 0.03)	.65
New specialist visits					
Primary care-oriented ACOs (<13% specialists)	0.75	-0.035	<.001	-0.023 (-0.032 to -0.013)	<.001
Other ACOs (13%-76% specialists)		0.025	<.001	0.004 (-0.004 to 0.012)]	.31

ACO indicates accountable care organization; HRR, hospital referral region; MSSP, Medicare Shared Savings Program.

^aDifferences in ACO versus control group trends were estimated using linear regression adjusting for all characteristics in Table 1, HRR by year, and ACO fixed effects and year fixed effects. All standard errors are clustered at the ACO organization level for ACO-assigned beneficiaries and at the HRR level for the control group.

^bPrecontract means are shown for all groups (2010-2011 for the 2012 entry cohort, 2010-2012 for the 2013 cohort, and 2010-2013 for the 2014 cohort).

may have contributed to the minimal reductions in specialist visits observed among more specialty-oriented ACOs, although we could not observe specific strategies taken by ACOs. Examples of systemic strategies that ACOs might pursue to limit specialty referrals include physician profiling with feedback on referral patterns, training PCPs to accommodate more of patients' needs without referral, decision support systems requiring justification for referrals, and creating eConsult systems to obviate the need for some referrals.

For specialty-oriented organizations with a Medicare ACO contract but no or few commercial ACO contracts, serious investment in such strategies would not be financially attractive because they could substantially erode FFS revenue from specialty care for non-ACO commercially insured patients, whereas primary care-oriented

organizations would not incur losses from such spillover effects.^{28,37} Even when specialty-oriented organizations risk contract with all payers, their low contract penetration means they would still have weak incentives to implement changes that would systematically reduce the intensity of specialty care for patients referred by other providers. The lack of change in contract penetration suggests that weak incentives for systemic reductions in specialty services may be an intractable feature of many specialty-oriented organizations, the most specialty-heavy of which provide more than half of their outpatient care in Medicare to non-ACO patients, our findings suggest.

Finally, we found that ACO efforts to engage patients in ACO objectives (eg, through care management programs) have not been associated with more stable attribution of beneficiaries to

ACOs. Thus, churn in ACOs' attributed population—with nearly 25% of an ACO's attributed patients entering or exiting in a given year—continues to diminish possible returns from patient-specific investments, such as improving blood pressure control, teaching self-management of glycemic control, or correcting inappropriately costly care-seeking behavior.

Limitations

Our study has several limitations. First, we were unable to assess the clinical appropriateness of specialty visits from claims data. However, the primary diagnoses associated with new specialist visits included many conditions that could be managed without the involvement of a specialist.

Second, our analyses of leakage, contract penetration, and stability of attribution do not support causal inferences about the effects of the MSSP because they were limited to ACOs. Nevertheless, trends in these measures are important because they characterize the direction in which ACOs' incentives and provision of specialty care are moving.

Third, because the ACO programs are voluntary, participating providers might differ from other providers in ways related to trends in specialty care, thereby offering alternative explanations for findings from our DID analyses that are unrelated to MSSP incentives. However, trends in specialist visit use differed minimally between ACO-attributed beneficiaries and the control group in the precontract period.

CONCLUSIONS

Our study has important implications for ACO policy in Medicare and delivery system transformation more generally. First, the Medicare ACO model—in which attributed patients have unrestricted choice of providers—likely needs additional features to support patient engagement and control over where patients receive care,³⁸ such as Medigap plans with networks focused on ACO providers and higher co-pays for non-ACO providers.³⁹ Fostering patient engagement with a specific ACO may also require a mechanism to share ACO savings with patients.⁴⁰

Second, our findings suggest that continued provider consolidation into larger multispecialty organizations may need to be slowed or reversed to better align incentives under ACO models with system changes by providers. The wide gulf in contract penetration between primary care-oriented and specialty-oriented ACOs suggests that efforts to engage patients and limit leakage would need to have an enormous impact on care patterns to achieve the same change in incentives as a change in organizational structure.

Many strategies that have been promoted as keys to ACO success take the structure of the delivery system as a given, whereas reorganization of the delivery system may be necessary to achieve the goals of ACO-like payment models. A need to redesign the delivery

system to support new payment models may not be surprising given that the structure of the current delivery system has evolved in response to FFS payment. ■

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eAppendix for “Changes in Outpatient Care Patterns in Medicare Accountable Care Organizations”

Table of Contents

eAppendix Table 1. Top 25 Most Common Primary Diagnosis for New Specialist Visits in all MSSP Cohorts, 2014

eAppendix Table 2. Assignment Stability from 2010-2014, by MSSP Cohort

eAppendix Tables 3-5. Change in beneficiary characteristics in ACOs and control group before vs after start of ACO contracts, overall and by ACO specialty orientation (2010-2014)

eAppendix Table 6. Differential changes in utilization for MSSP ACOs vs control group (2010-2014)

eAppendix Table 7. Differential Changes in Annual Specialty Visit Rates from the Pre- to Post-Contract Periods for ACOs in 2013 vs Control Group, by ACO Specialty Orientation

eAppendix Figures 1-4. Unadjusted Rates and Leakage of New and Overall Specialty Visit Use Among 2nd and 3rd Quartiles of Most Specialty-Oriented ACOs

eAppendix Table 1. Top 25 Most Common Primary Diagnoses for New Specialist Visits in all MSSP Cohorts, 2014

Primary Diagnosis (ICD-9 Code)	Number of New Specialist Visits, 2014	Code description
729.5	60,333	Pain in limb
724.2	59,997	Lumbago
110.1	53,697	Dermatophytosis of nail
366.16	51,681	Senile nuclear sclerosis
719.46	50,136	Pain in joint, lower leg
715.16	47,592	Osteoarthritis, localized, primary, lower leg
238.2	43,920	Neoplasm of uncertain behavior of skin
702.19	40,553	Other seborrheic keratosis
724.4	38,565	Thoracic or lumbosacral neuritis or radiculitis, unspecified
739.3	36,502	Non-allopathic lesions, lumbar region
702.0	36,462	Actinic keratosis
786.5	34,812	Chest pain, unspecified
427.31	34,265	Atrial fibrillation
250.00	33,453	Diabetes mellitus without mention of complication, type II or unspecified type
719.41	30,028	Pain in joint, shoulder region
327.23	28,770	Obstructive sleep apnea
692.9	28,505	Contact dermatitis and other eczema, unspecified cause
380.4	28,137	Impacted cerumen
722.52	27,791	Degeneration of lumbar or lumbosacral intervertebral disc
530.81	27,223	Esophageal reflux
401.9	26,917	Unspecified essential hypertension
786.05	26,880	Shortness of breath
715.96	26,845	Osteoarthritis, unspecified whether generalized or localized, lower leg
72402	25,995	Spinal stenosis, lumbar region, without neurogenic claudication

Abbreviations: International Statistical Classification of Diseases and Related Health Version 9 (ICD-9), Medicare Shared Savings Program (MSSP)

eAppendix Table 2. Assignment Stability from 2010-2014, by MSSP Cohort*

	2010	2011	2012	2013	2014
2012 MSSP Cohort					
Number of assigned beneficiaries	142,681	154,206	161,844	166,325	167,853
Assignment stability, %	77.2	78.5	77.9	76.9	75.3
2013 MSSP Cohort					
Number of assigned beneficiaries	148,651	159,583	169,168	173,855	177,340
Assignment stability, %	78.1	77.9	78.2	77.6	76.5
2014 MSSP Cohort					
Number of assigned beneficiaries	90,477	95,963	102,237	106,856	108,480
Assignment stability, %	77.7	77.9	77.8	77.8	74.9

Abbreviations: Medicare Shared Savings Program (MSSP)

*Assignment stability is defined as the proportion of beneficiaries assigned to an ACO in a year who were assigned to the same ACO in the subsequent year.

eAppendix Table 3. Change in beneficiary characteristics in ACOs and control group before vs after start of ACO contracts for all ACOs (2010-2014)

	Unadjusted pre-contract control group mean (2010-2011)	Differential change for ACO vs control group in post-contract period (2014)		
		2012 MSSP	2013 MSSP	2014 MSSP
Mean age, y	72.1	0.1	0.1*	0.0
Female sex, %	58.7	-0.3*	-0.1	-0.1
Race/ethnicity, %				
White	83.3	0.0	-0.4*	-0.2
Black	8.6	-0.1	0.3	0.0
Hispanic	4.8	0.1	0.1	0.1
Other	3.3	0.0	0.1	0.1
Medicaid, full or partial dual ¹ , %	20.4	-0.3	-0.1	0.2
Disabled, ² %	22.3	-0.2	-0.4*	-0.1
End-stage renal disease, %	1.0	0.1*	0.0	0.0
Nursing-home resident, t - 1, %	1.4	-0.4	0.0	0.0
ZCTA-level characteristics, mean				
% below FPL	9.3	0.0	0.0	0.0
% with high school degree	75.2	-0.2*	-0.1	0.0
% with college degree	19.2	-0.3*	0.0	0.0
CCW conditions ³				
Total no., mean	5.76	0.00	0.03*	-0.02
≥6 conditions, %	49.5	0.2	0.5*	-0.2
≥9 conditions, %	20.2	-0.1	0.2	-0.2
HCC risk score ⁴ , mean	1.240	0.004	0.012*	-0.001

Abbreviations: Accountable care organization (ACO), Chronic Condition Warehouse (CCW), Hierarchical Condition Categories (HCC), Medicare Shared Savings Program (MSSP), ZIP Code tabulation area (ZCTA)

This table is for all MSSP ACOs included in the study cohort, see Appendix Tables 4 and 5 broken down by primary care vs more specialty oriented ACOs. Means and percentages were adjusted for geography with hospital referral region and ACO fixed effects to reflect comparisons within hospital referral regions.

* Statistically different from zero at a $P < 0.05$ level

¹ Medicare and Medicaid dual eligibility defined as “full” or “partial” dual status using the “dual status” variable values 1-5, 6 and 8 as defined by CMS (<https://www.resdac.org/cms-data/variables/Dual-Status-Code-occurs-12-times>)

² Indicates that disability was the original reason for Medicare eligibility

³ Chronic conditions from the Chronic Conditions Data Warehouse (CCW) included 27 conditions: acute myocardial infarction, Alzheimer's disease, Alzheimer's disease and related disorders or senile dementia, anemia, asthma, atrial fibrillation, benign prostatic hyperplasia, chronic kidney disease, chronic obstructive pulmonary disease, depression, diabetes, heart failure, hip/pelvic fracture, hyperlipidemia, hypertension, hypothyroidism, ischemic heart disease, osteoporosis, rheumatoid arthritis/osteoarthritis, stroke/transient ischemic attack, breast cancer, colorectal cancer, endometrial cancer, lung cancer, prostate cancer, cataracts, and glaucoma. Indicators for all 27 conditions were included in models. Counts of conditions included all conditions except cataracts and glaucoma.

⁴ Hierarchical Condition Categories (HCC) risk scores are derived from demographic and diagnostic data in Medicare enrollment and claims files, with higher scores indicating higher predicted spending in the subsequent year. For each beneficiary in each study year, we assessed the HCC score based on enrollment and claims data in the prior year.

eAppendix Table 4. Change in beneficiary characteristics in ACOs and control group before vs after start of ACO contracts for primary care oriented ACOs *with <13% specialist physicians* (2010-2014)

	Unadjusted pre-contract control group mean (2010-2011)	Differential change for ACO vs control group in post-contract period (2014)		
		2012 MSSP	2013 MSSP	2014 MSSP
Mean age, y	72.1	0.0	0.070	0.1
Female sex, %	58.7	-0.429	-0.2	0.1
Race/ethnicity, %				
White	83.3	-0.3	0.073	-0.6*
Black	8.6	0.0	-0.1	0.0
Hispanic	4.8	0.1	0.0	0.4
Other	3.3	0.2	0.0	0.2
Medicaid, full or partial dual ¹ , %	20.4	0.4	-0.3	0.9*
Disabled, ² %	22.3	0.3	-0.155	0.1
End-stage renal disease, %	1.0	0.103	0.1	-0.1*
Nursing-home resident, t - 1, %	1.4	0.1	0.2	0.0
ZCTA-level characteristics, mean				
% below FPL	9.3	0.2	0.0	0.0
% with high school degree	75.2	-0.309	0.2	-0.1
% with college degree	19.2	-0.5*	0.4	0.0
CCW conditions ³				
Total no., mean	5.76	0.05	0.024	-0.01
≥6 conditions, %	49.5	0.3	0.249	-0.1
≥9 conditions, %	20.2	0.1	0.2	0.1
HCC risk score ⁴ , mean	1.240	0.014*	0.008	0.010

Abbreviations: Accountable care organization (ACO), Chronic Condition Warehouse (CCW), Hierarchical Condition Categories (HCC), Medicare Shared Savings Program (MSSP), ZIP Code tabulation area (ZCTA)

This table only includes primary-care oriented ACOs with <13% specialist physicians as defined in the main manuscript. Means and percentages were adjusted for geography with hospital referral region and ACO fixed effects to reflect comparisons within hospital referral regions.

* Statistically different from zero at a $P < 0.05$ level

¹ Medicare and Medicaid dual eligibility defined as “full” or “partial” dual status using the “dual status” variable values 1-5, 6 and 8 as defined by CMS (<https://www.resdac.org/cms-data/variables/Dual-Status-Code-occurs-12-times>)

² Indicates that disability was the original reason for Medicare eligibility

³ Chronic conditions from the Chronic Conditions Data Warehouse (CCW) included 27 conditions: acute myocardial infarction, Alzheimer's disease, Alzheimer's disease and related disorders or senile dementia, anemia, asthma, atrial fibrillation, benign prostatic hyperplasia, chronic kidney disease, chronic obstructive pulmonary disease, depression, diabetes, heart failure, hip/pelvic fracture, hyperlipidemia, hypertension, hypothyroidism, ischemic heart disease, osteoporosis, rheumatoid arthritis/osteoarthritis, stroke/transient ischemic attack, breast cancer, colorectal cancer, endometrial cancer, lung cancer, prostate cancer, cataracts, and glaucoma. Indicators for all 27 conditions were included in models. Counts of conditions included all conditions except cataracts and glaucoma.

⁴ Hierarchical Condition Categories (HCC) risk scores are derived from demographic and diagnostic data in Medicare enrollment and claims files, with higher scores indicating higher predicted spending in the subsequent year. For each beneficiary in each study year, we assessed the HCC score based on enrollment and claims data in the prior year.

eAppendix Table 5. Change in beneficiary characteristics in ACOs and control group before vs after start of ACO contracts for specialty-oriented ACOs with 13-76% specialist physicians (2010-2014)

	Unadjusted pre-contract control group mean (2010-2011)	Differential change for ACO vs control group in post-contract period (2014)		
		2012 MSSP	2013 MSSP	2014 MSSP
Mean age, y	72.1	0.1	0.1*	0.0
Female sex, %	58.7	-0.243	-0.1	-0.1
Race/ethnicity, %				
White	83.3	0.0	-0.6*	-0.1
Black	8.6	-0.1	0.4*	0.0
Hispanic	4.8	0.1	0.1	0.0
Other	3.3	0.0	0.1	0.1
Medicaid, full or partial dual ¹ , %	20.4	-0.4	0.0	0.0
Disabled, ² %	22.3	-0.3	-0.4*	-0.1
End-stage renal disease, %	1.0	0.1*	0.0	0.0
Nursing-home resident, t - 1, %	1.4	-0.5	0.0	0.0
ZCTA-level characteristics, mean				
% below FPL	9.3	0.0	0.0	0.0
% with high school degree	75.2	-0.2*	-0.1	0.0
% with college degree	19.2	-0.2*	-0.1	-0.1
CCW conditions ³				
Total no., mean	5.76	-0.01	0.03*	-0.02
≥6 conditions, %	49.5	0.1	0.5*	-0.3
≥9 conditions, %	20.2	-0.1	0.2	-0.2*
HCC risk score ⁴ , mean	1.240	0.002	0.013*	-0.003

Abbreviations: Accountable care organization (ACO), Chronic Condition Warehouse (CCW), Hierarchical Condition Categories (HCC), Medicare Shared Savings Program (MSSP), ZIP Code tabulation area (ZCTA)

This table only includes more specialty-oriented ACOs with 13-76% specialist physicians as defined in the main manuscript. Means and percentages were adjusted for geography with

hospital referral region and ACO fixed effects to reflect comparisons within hospital referral regions.

* Statistically different from zero at a $P < 0.05$ level

¹ Medicare and Medicaid dual eligibility defined as “full” or “partial” dual status using the “dual status” variable values 1-5, 6 and 8 as defined by CMS (<https://www.resdac.org/cms-data/variables/Dual-Status-Code-occurs-12-times>)

² Indicates that disability was the original reason for Medicare eligibility

³ Chronic conditions from the Chronic Conditions Data Warehouse (CCW) included 27 conditions: acute myocardial infarction, Alzheimer's disease, Alzheimer's disease and related disorders or senile dementia, anemia, asthma, atrial fibrillation, benign prostatic hyperplasia, chronic kidney disease, chronic obstructive pulmonary disease, depression, diabetes, heart failure, hip/pelvic fracture, hyperlipidemia, hypertension, hypothyroidism, ischemic heart disease, osteoporosis, rheumatoid arthritis/osteoarthritis, stroke/transient ischemic attack, breast cancer, colorectal cancer, endometrial cancer, lung cancer, prostate cancer, cataracts, and glaucoma. Indicators for all 27 conditions were included in models. Counts of conditions included all conditions except cataracts and glaucoma.

⁴ Hierarchical Condition Categories (HCC) risk scores are derived from demographic and diagnostic data in Medicare enrollment and claims files, with higher scores indicating higher predicted spending in the subsequent year. For each beneficiary in each study year, we assessed the HCC score based on enrollment and claims data in the prior year.

eAppendix Table 6. Differential changes in utilization for MSSP ACOs vs control group (2010-2014)

Utilization measure	Unadjusted mean in pre-contract period ⁺	Difference between ACO and control group in pre-contract period ⁺	Difference in annual trend in pre-contract period
2012 MSSP Cohort			
All specialist visits, no.	4.81	0.156*	0.012
New specialist visits, no.	0.752	0.020	-0.001
2013 MSSP Cohort			
All specialist visits, no.	4.80	0.060	0.021
New specialist visits, no.	0.752	0.014	0.004
2014 MSSP Cohort			
All specialist visits, no.	4.85	0.113*	0.020*
New specialist visits, no.	0.755	0.016*	0.005*

Abbreviations: Accountable care organization (ACO), hospital referral region (HRR), Medicare Shared Savings Program (MSSP)

* Statistically different from zero at a P<0.05 level

⁺Pre-contract means are shown for all groups (2010-2011 for the 2012 entry cohort, 2010-2012 for the 2013 cohort, and 2010-2013 for the 2014 cohort).

Differences in pre-contract means and annual trends estimated adjusting for all characteristics in Table 1 in the main manuscript, HRR by year and ACO fixed effects and year fixed effects. All standard errors are clustered at the ACO organization level for ACO-assigned beneficiaries and at the HRR level for the control group.

eAppendix Table 7.e Differential Changes in Annual Specialty Visit Rates from the Pre- to Post-Contract Periods for ACOs in 2013 vs Control Group, by ACO Specialty Orientation

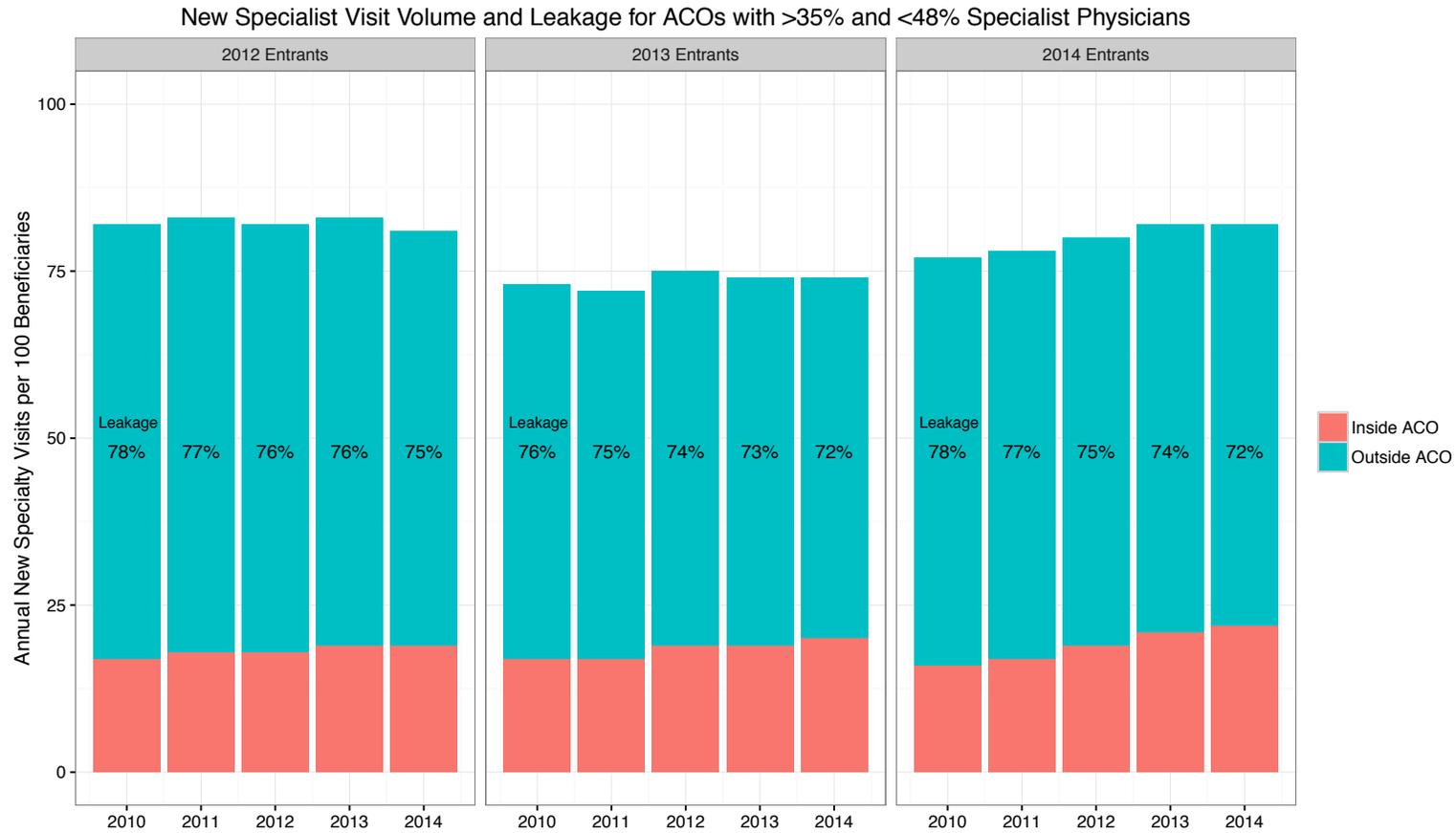
Utilization measure	Mean annual rates of specialist visits per beneficiary		
	Unadjusted pre-contract mean	Differential change from pre-contract period to 2013 for ACO vs control group	Difference in differential changes
2012 MSSP Cohort			
All specialist visits, no.			
Primary care oriented ACOs (<13% specialists)	4.77	0.01	0.08
Other ACOs (13-76% specialists)	5.31	-0.07	--
New specialist visits, no.			
Primary care oriented ACOs (<13% specialists)	0.746	0.003	0.022**
Other ACOs (13-76% specialists)	0.807	-0.019**	--
2013 MSSP Cohort			
All specialist visits, no.			
Primary care oriented ACOs (<13% specialists)	5.15	0.05*	0.06
Other ACOs (13-76% specialists)	4.95	-0.01	--
New specialist visits, no.			
Primary care oriented ACOs (<13% specialists)	0.777	0.002	0.008
Other ACOs (13-76% specialists)	0.781	-0.006	--

Abbreviations: Accountable care organization (ACO), hospital referral region (HRR), Medicare Shared Savings Program (MSSP)

* P<0.05, **P<0.01, ***P<0.001

The 2014 MSSP cohort not shown because 2013 was the pre-contract period for this group. Pre-contract means are shown for 2010-2011 period for all groups. Differences in ACO vs control group trends estimated using linear regression adjusting for all characteristics in Table 1 in the main manuscript, HRR by year and ACO fixed effects and year fixed effects. All standard errors are clustered at the ACO organization level for ACO-assigned beneficiaries and at the HRR level for the control group. Difference in differential trends estimate the difference-in-difference estimates between primary-care oriented and specialty-oriented ACOs.

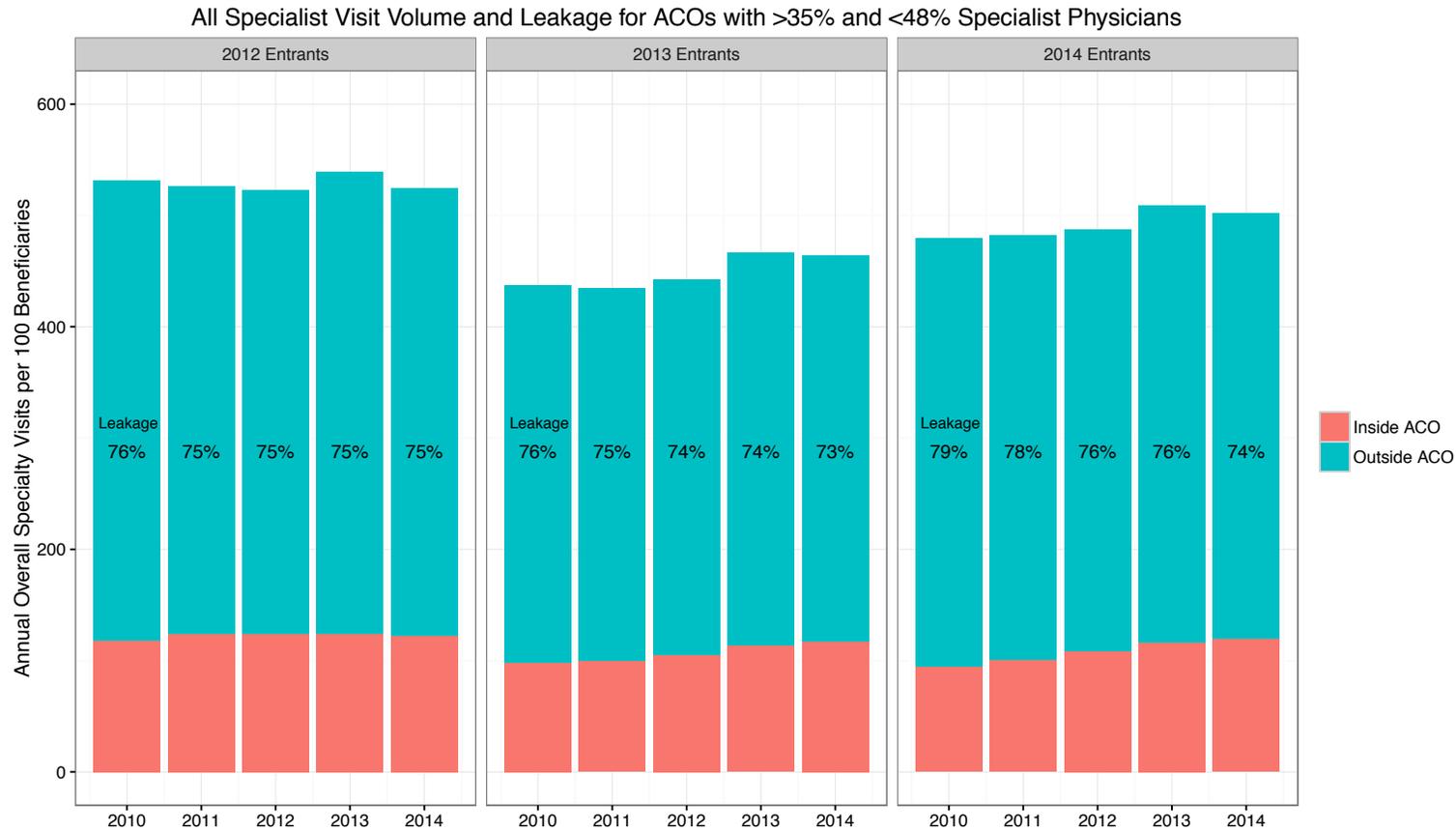
eAppendix Figure 1. Unadjusted Rates and Leakage of New Specialty Visit Use Among 2nd Quartile of Most Specialty-Oriented ACOs (Figure)



Abbreviations: Accountable care organization (ACO), Medicare Shared Savings Program (MSSP)

Trends in unadjusted new specialist visit rates per 100 beneficiaries in each MSSP cohort are shown for ACOs with >35% and <48% specialist physicians in their contract (2nd quartile of specialty orientation), broken down into inside ACO visits (orange) and outside ACO visits (blue). “Leakage” is defined as the proportion of inside ACO visits over all new specialty visits in a given year.

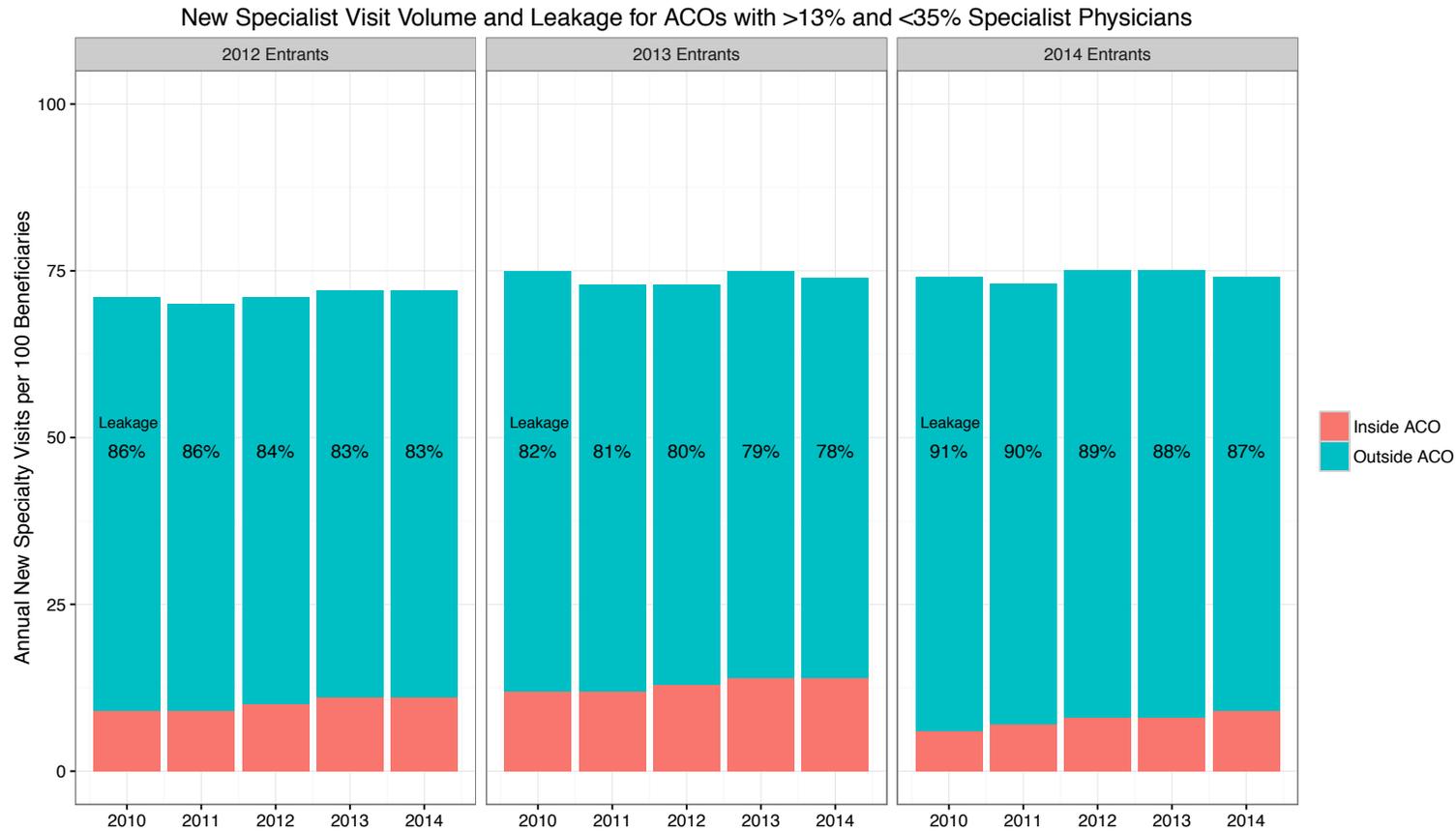
eAppendix Figure 2. Unadjusted Rates and Leakage of Overall Specialty Visit Use Among 2nd Quartile of Most Specialty-Oriented ACOs (Figure)



Abbreviations: Accountable care organization (ACO), Medicare Shared Savings Program (MSSP)

Trends in unadjusted overall specialist visit rates per 100 beneficiaries in each MSSP cohort are shown for ACOs with >35% and <48% specialist physicians in their contract (2nd quartile of specialty orientation), broken down into inside ACO visits (orange) and outside ACO visits (blue). “Leakage” is defined as the proportion of inside ACO visits over all overall specialty visits in a given year.

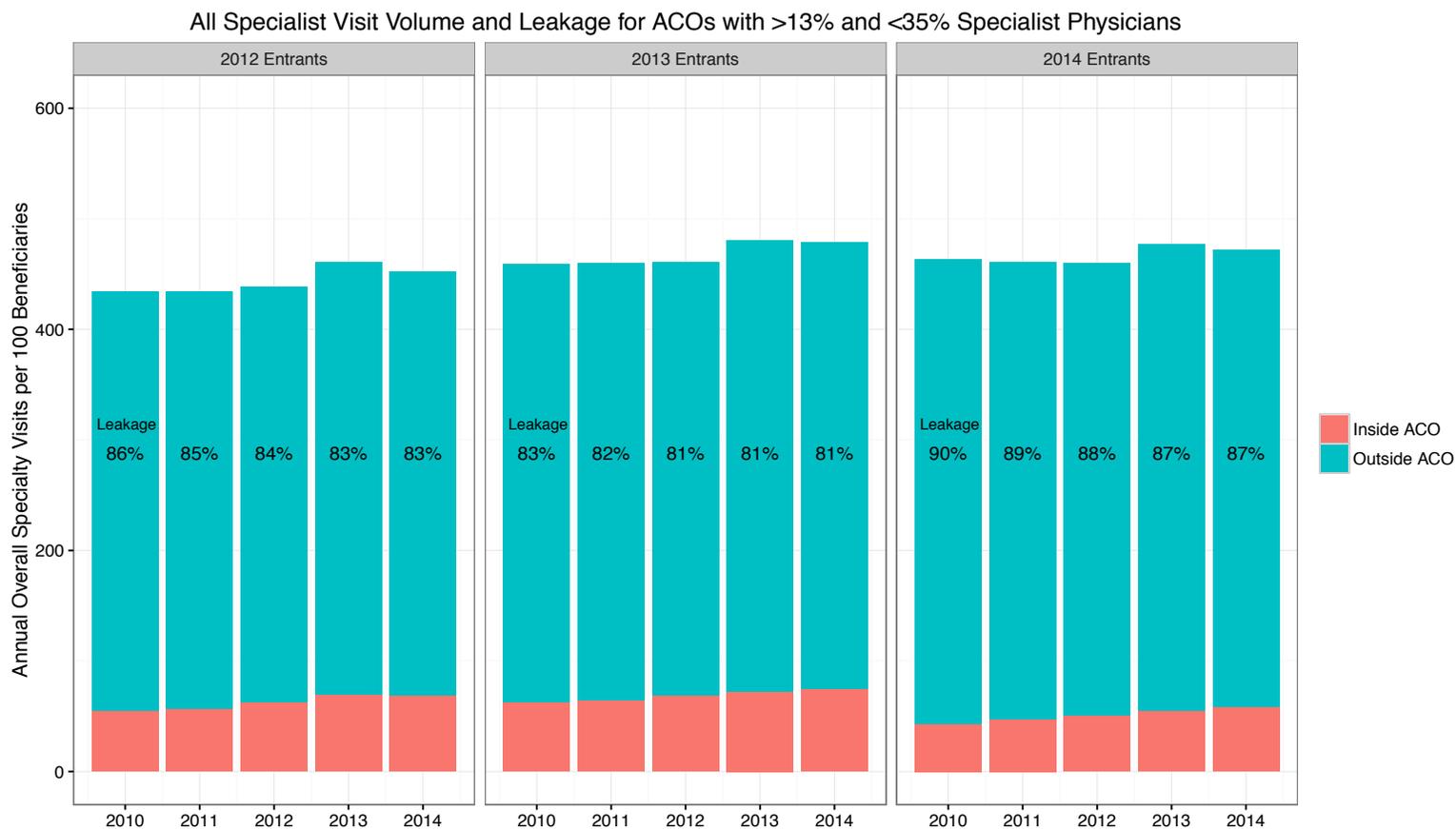
eAppendix Figure 3. Unadjusted Rates and Leakage of New Specialty Visit Use Among 3rd Quartile of Most Specialty-Oriented ACOs (Figure)



Abbreviations: Accountable care organization (ACO), Medicare Shared Savings Program (MSSP)

Trends in unadjusted new specialist visit rates per 100 beneficiaries in each MSSP cohort are shown for ACOs with >13% and <35% specialist physicians in their contract (2nd quartile of specialty orientation), broken down into inside ACO visits (orange) and outside ACO visits (blue). “Leakage” is defined as the proportion of inside ACO visits over all new specialty visits in a given year.

eAppendix Figure 4. Unadjusted Rates and Leakage of Overall Specialty Visit Use Among 3rd Quartile of Most Specialty-Oriented ACOs (Figure)



Abbreviations: Accountable care organization (ACO), Medicare Shared Savings Program (MSSP)

Trends in unadjusted overall specialist visit rates per 100 beneficiaries in each MSSP cohort are shown for ACOs with >13% and <35% specialist physicians in their contract (2nd quartile of specialty orientation), broken down into inside ACO visits (orange) and outside ACO visits (blue). “Leakage” is defined as the proportion of inside ACO visits over all overall specialty visits in a given year.