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Changes in End-of-life Care in the Medicare Shared Savings Program

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Abstract

End-of-life care is often overly aggressive and inconsistent with patients' preferences. Although end-of-life care could therefore be a natural target for accountable care organizations (ACOs) to reduce spending, identifying and curbing wasteful care for patients at high risk of death may be challenging. To date, the impact of ACOs on end-of-life care has not been quantified. Using fee-for-service Medicare claims through 2015 and a difference-in-differences approach, we found evidence of some changes in end-of-life care associated with provider participation in the Medicare Shared Savings Program (MSSP) among both decedents and patients at high risk of death. Although generally suggestive of less aggressive care, most effects were small and inconsistent across cohorts of ACOs entering the MSSP in different years, suggesting that ACOs have not yet substantially altered end-of-life care patterns and that additional incentives and/or time may be needed. Alternatively, curbing wasteful end-of-life care may not be a viable source of substantial savings under population-based payment models.

Accountable care organization (ACO) payment models, of which the Medicare Shared Savings Program (MSSP) is the largest, establish incentives to lower spending for a population of attributed patients while improving quality.(1) Early evaluations suggest that

ACOs have been successful at reducing Medicare spending,(2–4) including post-acute care spending,(5, 6) a leading source of wasteful Medicare spending.

Prior research has documented high rates of aggressive care at the end of life, including hospital and intensive care unit use, transitions and burdensome procedures.(7) These services can have detrimental effects on patients and families and are often misaligned with patients' previously stated goals of care.(8) Other research has found variation in end-of-life spending that is unrelated to patient preferences.(9) Accordingly, strategies focused on end-of-life care, including earlier introduction of hospice services for patients with poor prognoses, have been advanced as potential sources of savings that may often better align care with patients' goals.(10) The case for earlier integration of palliative and end-of-life care services has become stronger as some innovative payment and delivery models have been associated with reduced hospitalizations, improved care and in some cases, lower costs. (11) End-of-life care, therefore, might be a natural target for ACO efforts.

However, ACOs face a number of implementation challenges. In addition to the costs of hiring or partnering with palliative and end-of-life specialists, targeting resources effectively may be difficult because death is unpredictable. Patients with a high predicted risk of death account for only a small proportion of end-of-life spending.(12) Implementing end-of-life interventions among a small group of patients who are clearly dying may have a limited impact because it affects few patients or occurs too close to death, whereas implementing an intervention among a broader group may produce limited savings because of the costs of applying it to patients later determined not to be at the end of life. Moreover, failure to confine limitations on aggressive care to those who will not benefit could result in worse patient outcomes.

In addition, an ACO that provides acute or post-acute care may incur losses in fee-for-service profits from efforts to limit aggressive end-of-life care, particularly if they cannot be targeted effectively to ACO patients. These may be among some of the reasons why many ACOs have not implemented end-of-life care planning processes in response to MSSP incentives.(1)

Thus, although incentives to reduce end-of-life spending are stronger in the MSSP than in traditional fee-for-service Medicare (because ACO budgets include all medical spending), it is unclear whether they are sufficiently strong for ACOs to incur the costs of changing end-of-life care patterns. At present, the extent to which ACOs have impacted end-of-life care remains an empirical question. We used Medicare data from 2009–2015 and a difference-in-differences approach to assess the effects of ACO contracts on end-of-life care patterns. We focused on measures that reflect efforts to reduce aggressive or fragmented end-of-life care. Although our analyses cannot distinguish appropriate from inappropriate care, our study addresses the question of whether ACOs have responded to the change in incentives.

METHODS

Study Overview

Using Medicare claims from January 1, 2009 to December 31, 2015, we conducted difference-in-differences analyses to estimate changes in end-of-life care associated with participation in the MSSP. Following previously described methods,(2) in each year of the 2009–2015 study period we attributed each beneficiary to the ACO (defined as a collection of taxpayer identification numbers (TINs) or Centers for Medicare & Medicaid Services (CMS) certification numbers (CCNs) for safety-net providers) or to the non-ACO TIN or CCN accounting for the plurality of the beneficiary's office visits with a primary care physician.(3) Then, we compared beneficiaries served by an ACO in the MSSP with beneficiaries served by non-participating providers living in the same area (control group) before versus after entering the MSSP. Because prior studies have suggested differences in savings by year of entry,(2, 3) we examined cohorts of ACOs separately based on MSSP entry year, allowing the pre-entry period to differ for ACOs entering the MSSP in 2012 (pre-period: 2009–2011), 2013 (pre-period: 2009–2012) and 2014 (pre-period: 2009–2013). For the 2012 cohort, which entered in April or July of 2012, we pre-specified 2012 to be a transition year that contributed neither to the pre-entry or post-entry period.

Study Population

For each study year from 2009–2015, we analyzed data from Medicare claims and enrollment files for a random 20% sample of fee-for-service beneficiaries continuously enrolled in Parts A and B in that year (while alive for decedents) and in the previous year. Although the MSSP uses the concurrent year of claims to attribute beneficiaries to ACO or non-ACO providers (retrospective attribution), for this study we used claims from the year preceding each study year (i.e., prospective attribution) because acute illness, death, or hospice referral may sever a beneficiary's ACO attribution in the last calendar year of life (due to a lack of office visits with primary care physicians). This ensured that our analysis did not miss the effects of advance care planning or hospice referrals, for example, that affected end-of-life care when patients were no longer using primary care. We used the CMS ACO Provider-level Research Identifiable File to identify the TINs and CCNs included in each ACO contract. We excluded beneficiaries without a visit to a primary care physician, as they could not be attributed to a TIN.

Following an approach used by many studies of end-of-life care, our main analysis focused on beneficiaries who died during the study year (decedents). In addition, because efforts to modify end-of-life care also affect acutely ill patients who survive a calendar year and because ACO efforts may have affected survival, we conducted an additional analysis for beneficiaries with a high probability of dying in a given study year. To create this high-risk group, we fit a model of death during the study year as a function of patient characteristics assessed from the Master Beneficiary Summary Files and U.S. Census data (details in the Supplementary Appendix).(13, 14) For our analysis of high-risk patients, we included only those in the top decile for risk of death predicted by this model. These beneficiaries had an average mortality rate of 22.3% and accounted for 47.2% of all deaths across study years (Appendix Exhibit 1).(14)

We confirmed that prospective attribution instead of retrospective attribution retained substantial proportions of hospice users and decedents in our study sample. When assessed over a two-year span, hospice stays were sufficiently long among high-risk patients (mean: 88 days) and decedents (mean: 53 days) to cause 40.9% of hospice users among high-risk patients and 37.1% of hospice users among decedents to be prospectively attributable but not retrospectively attributable to a provider. That is, of beneficiaries who had at least one office visit with a primary care physician in the year prior to a study year (prospectively attributable) and enrolled in hospice in the prior year or study year, 37.1–40.9% did not have an office visit with a primary care physician in the study year (retrospectively attributable). Moreover, 34.0% of decedents had no primary care visits in the year of death and would be excluded with retrospective attribution. Thus, retrospective attribution could cause our analysis to miss the full effects of ACO efforts to limit the intensity of end-of-life care. Of decedents in our sample who were prospectively assigned to an ACO and had at least one primary care visit in the year of death (retrospectively attributable to a provider in the study year), 87.9% would have been retrospectively attributed to the same ACO.

Study Variables

Patient Characteristics—We used the same patient characteristics used to identify high-risk patients as covariates in our main analyses (Exhibit 1 and Appendix)(14). In addition to these variables, we identified beneficiaries who were long-term residents of a nursing home using a validated claims-based algorithm.(15)

Outcomes—We created several measures related to hospice use in the last 30 days of life: any use of hospice, number of days of hospice use, and late hospice use (defined as hospice initiation within 3 days of death). We also assessed care transitions in the last 30 days of life and in the last 3 days of life, specifically the number of transitions from home to a facility (including acute, post-acute, and long-term care facilities) or between facilities (excluding transfers between two acute care hospitals).(16) We also assessed the number of days at home (defined as days not in a facility) in the last 30 days of life and death in a facility (as opposed to at home). Finally, we assessed the use of intensive care and specific procedures in the last 30 days of life that were consistent with more aggressive care: any intensive care unit (ICU) use, number of days in an ICU, and placement of breathing or feeding tubes (tracheostomy, gastrostomy, or jejunostomy).(7) We created analogous measures of annual utilization for our analysis of high-risk patients.

Statistical Analysis—We fit a linear regression model predicting each dependent variable as a function of ACO fixed effects (omitting the control group as the reference group), fixed effects for the hospital referral region (HRR) in which beneficiaries resided, year fixed effects, interactions between HRR and year fixed effects, the patient characteristics described above, and indicators for each ACO cohort in each post-entry year. The last set of indicators estimated changes from the pre-entry period to each post-entry year for beneficiaries attributed to ACOs that differed from local concurrent changes for beneficiaries attributed to non-ACO providers (the differential change, or the change attributable to participation in the MSSP). This differential change is equivalent to the difference between ACOs and the control group in the post-entry period minus the difference in the pre-period,

adjusted for covariates in the model. The ACO fixed effects adjusted for pre-entry differences between each ACO and the control group, as well as for changes in the distribution of beneficiaries across ACOs. The fixed effects for HRR-by-year combinations adjusted for geographic differences between the ACO and control groups and for HRR-specific changes in the dependent variables in the control group. Because effects of the MSSP may have evolved over time, and to limit the number of statistical tests conducted, we pre-specified the differential changes from the pre-entry period to 2015 as our primary results. We used robust variance estimation to account for clustering within the ACO (for the ACO group) or HRR (for the control group).

We conducted additional analyses to assess potential sources of bias. During the pre-entry period, we compared trends in each outcome between ACOs and the control group. Similar pre-entry trends would support the assumption that changes from pre to post-entry periods would have been similar for ACOs and control group in the absence of the MSSP. We also tested whether the characteristics of patients attributed to ACOs differentially changed from the pre to post-entry period relative to the control group. Finally, we tested whether MSSP participation was associated with a differential change in mortality rates among all beneficiaries to determine if our analysis of decedents could be biased from compositional changes (see Supplementary Appendix).

Limitations—Our study has several limitations. First, the MSSP is voluntary. Providers and institutions that participate may differ from those that do not and those that do not participate may have engaged in efforts to improve end-of-life care without MSSP incentives. We would expect, however, that such differences would not systematically coincide with MSSP entry and would manifest as differences in pre-entry trends. Second, we were limited to claims data in our assessment of end-of-life care. We could not directly measure patient and family engagement in shared decision making, the use of non-hospice palliative care, alignment of care with patients' goals or symptom control. We would expect, however, that major changes in end-of-life care processes by ACOs would manifest as detectable differential changes in the utilization measures that we could assess. Third, we lacked data on strategies employed by ACOs to lower spending and thus could not compare ACOs that have focused on end-of-life care with those that have not. Finally, because we examined multiple outcomes, we would expect some differential changes to meet thresholds for statistical significance due to random chance. The number of tests we report, however, exceeded the number of outcomes we effectively tested, because several measures were highly correlated (e.g., use of intensive care and number of days in an intensive care unit). Moreover, we also assessed the consistency of the direction of any significant findings. While the probability of finding at least one P value <0.05 due to random chance was high, the probability of finding our set of results due to chance was low, as 11 estimates were significant at a <0.05 level, with all but two in the direction of less aggressive care.

RESULTS

For decedents, the 2012 MSSP entry cohort included 13,880 beneficiaries, the 2013 cohort 12,125 beneficiaries and the 2014 cohort 12,078 beneficiaries. For beneficiaries at a high risk of death, the 2012 entry cohort included 32,696 beneficiaries, the 2013 cohort 28,969

beneficiaries and the 2014 cohort 28,030 beneficiaries. Differential changes in patient characteristics from the pre-entry period to 2015 were consistently small for each entry cohort relative to the control group, both in analyses of decedents (Exhibit 1) and patients at high-risk of death (Appendix Exhibit 2).(14)

Primary Analysis (Decedents)

In the pre-entry period, differences in trends between ACOs and the control group were consistently minimal across outcomes and entry cohorts (Exhibit 2).(14) By 2015, we observed six significant differential changes in end-of-life care for decedents attributed to ACOs when compared with controls (Exhibit 2).(14) Five of six suggested less aggressive care. Four were observed in the 2012 entry cohort and two in the 2014 entry cohort.

In the 2012 entry cohort, these differential changes included a differential reduction in the number of transitions in the last 30 days of life (differential change for ACOs vs. control group: -0.03 transitions or -4.7% of the pre-entry mean; $p<0.001$), a differential increase in days at home in the last 30 days of life (0.3 days or 1.4% ; $p=0.001$), a differential reduction in the percentage of decedents who received intensive care unit (ICU) care in the last 30 days of life (-0.9 percentage points or -7.9% ; $p=0.02$) and a differential reduction in ICU days (-0.05 days or -7.1% , $p=0.04$). In the 2014 entry cohort, there was a significant differential reduction in the percentage of patients with a late hospice referral (-0.7 percentage points or -6.6% ; $p=0.03$). There was also an increase in the number of transitions in the last 30 days of life ($+0.02$ transitions or $+2.6\%$; $p=0.04$) – the only change suggestive of more aggressive care.

Supplemental Analysis (High-Risk Group)

By 2015, we observed five significant differential changes in analogous measures for ACO patients at high risk of death (Exhibit 3).(14) Four of the five changes suggested less aggressive care. Four changes were observed in the 2012 MSSP entry cohort and one in the 2014 MSSP entry cohort.

In the 2012 entry cohort, these differential changes included a differential reduction in the annual number of transitions, a decrease in the annual number of days spent in the ICU and a decrease in the placement of breathing or feeding tubes. We also observed a differential decrease in days spent at home during year (as opposed to a facility) – the only change observed suggestive of more aggressive care. In the 2014 entry cohort, there was also a significant differential increase in days at home during the year.

DISCUSSION

In assessing several dimensions of end-of-life care, we found some evidence of changes associated with participation in the MSSP. Although all but two of these changes were in the direction of less aggressive care, these differences were not consistently present across measures and were concentrated in the earliest of the 3 entry-year cohorts. We did not observe consistent, differential increases in hospice use — the measure arguably most specific to end-of-life care — associated with MSSP participation. Because increased hospice use would seem to be a particularly effective lever for ACOs to earn savings by

reducing overly aggressive care, this observation raises the important question of why more consistent changes in end-of-life care, specifically hospice use, were not observed after MSSP entry.

There are several potential explanations for our findings. The identified effects could represent the beginning of meaningful improvements, evidence that substantial changes to end-of-life care may be challenging for population-based payment models alone to foster, or a signal that stronger incentives are needed. We consider the implications of each of these explanations in the context of our findings and prior research.

First, ACOs may need more time, experience, or capabilities before they demonstrate significant progress. Influencing end-of-life care may be more challenging or costly than other strategies to lower wasteful spending. In the early years of MSSP participation, ACOs may be more inclined to pursue lower-cost, less complex strategies to reduce spending. As evidence, three-quarters of ACO networks did not include hospice and palliative care providers in 2014, highlighting an apparent lack of engagement with end-of-life care providers.⁽¹⁷⁾ That most of the end-of-life care changes we observed occurred in the earliest entry cohort may also suggest that ACOs are taking longer to turn their attention to end-of-life care.

Alternatively, ACOs in the first-entry cohort may have been structured to more easily integrate hospice, palliative care, and other end-of-life services. However, physician group ACOs that do not provide full spectrum care have achieved savings in at least 2 of the first 3 cohorts,⁽³⁾ including reductions in spending on care they do not provide, such as acute care, post-acute care and outpatient care in hospital-owned facilities.^(5, 18) If the changes we observed among ACOs in the first entry cohort represent early progress, the evidence suggests that ACOs may be able to adopt successful strategies once they are identified.

Second, because end-of-life care may be challenging and resource-intensive to modify, the MSSP may need stronger incentives to elicit a vigorous response. In particular, hospital-based ACOs may have weak incentives to encourage hospice or palliative care because such care could substitute for inpatient and outpatient care that would generate fee-for-service profits for ACO hospitals.

Current rules for attributing beneficiaries to ACOs may further weaken the incentives for ACOs to refer patients to palliative care and hospice. At present, patients are attributed to ACOs in a given year based on which provider accounts for the plurality of their primary care services in that year. Yet, we found that a substantial proportion of decedents and patients enrolled in hospice had no primary care visits to support ACO attribution, thus potentially limiting the savings that ACOs could achieve.

Third, efforts to limit aggressive end-of-life care that is not aligned with patient preferences could face substantial challenges because death is challenging to predict.⁽¹²⁾ Offering palliative and hospice services to seriously ill patients at a high risk of death, for example, may increase total spending because these services may only substitute for more costly end-of-life care among a small subset of decedents.⁽¹⁹⁾ Nevertheless, given evidence of underuse of palliative care and hospice services⁽²⁰⁾ and the lack of changes in hospice use

associated with MSSP in our study, policies that strengthen incentives for ACOs to address end-of-life care may be worth pursuing before dismissing end-of-life care as outside the scope of population-based payment models.

Policy Implications

To strengthen ACOs' incentives to limit aggressive end-of-life care that is inconsistent with patient preferences, one option might be to add end-of-life specific quality measures to ACO contracts since current MSSP contracts do not include any quality measures focused on end-of-life care. However, utilization-based metrics that would encourage less aggressive care should already be influenced by the global budget part of ACO contracts. Moreover, when contracts include numerous quality metrics, the incentive to change performance on any one metric is weak. Therefore, to the extent that they are utilization-focused, adding end-of-life quality measures may not strengthen incentives substantially beyond ACOs' broader incentives to lower spending.(21) Survey measures assessing alignment of care with patients' goals and preferences, such as those proposed in other serious illness-focused payment models, might be useful for monitoring for inappropriate reductions in care intensity or for encouraging valuable care that increases spending. Our study, however, provides no empirical evidence on the need for such measures or the effectiveness of initiatives employing them.(22)

Another strategy to strengthen incentives would be to change ACO attribution rules to maintain attribution of decedents and hospice patients even in years when patients at the end of life no longer use primary care. Doing so might strengthen the incentive for ACOs to refer appropriate patients to hospice care. One could also argue that ACOs already have an incentive under current attribution rules to refer costly and complex end-of-life patients to hospice to remove some of them from their attributed population in the following year and thereby lower total spending. ACOs, however, would have to know the duration of hospice use ex ante to engage effectively in such risk selection.

Finally, measures that strengthen incentives for ACOs to lower overall spending may encourage ACOs to focus on wasteful spending that is more challenging to reduce. Such measures might include higher shared-savings rates and financial benchmarks that are not reduced when ACOs lower spending.(23) Careful monitoring with quality metrics such as the survey measures discussed above could assess whether stronger incentives elicit undesirable stinting on beneficial care.

Conclusion

Our study suggests that ACOs have not yet had a significant or consistent impact on end-of-life care. This may be because ACOs have not yet devoted much attention to end-of-life care or have implemented strategies that have not been effective. To the extent that our findings are explained by weak incentives for ACOs to reduce inappropriately aggressive care at the end of life, there are several policy directions that could spur more effective and widespread efforts.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Exhibit 1:

Differential Changes in Patient Characteristics from the Pre-Entry Period to 2015 among ACO Decedents Compared with Controls¹

	Unadjusted Pre-Entry ² Mean	2012 MSSP Entry Year Group Differential Change from pre-entry period to 2015 for ACOs vs. control group ³	2013 MSSP Entry Year Group Differential Change from pre-entry period to 2015 for ACOs vs. control group ³	2014 MSSP Entry Year Group Differential Change from pre-entry period to 2015 for ACOs vs. control group ³
Mean age, y	79.7	0.0	0.1	0.3 ^{**}
Female sex, %	54.2	−0.5	0.1	0.1
Race/ethnicity, %				
Non-Hispanic white	86.0	0.2	0.0	−0.2
Non-Hispanic black	7.7	−0.4	0.3	−0.2
Hispanic	3.7	0.2	−0.1	0.2
Other	2.3	0.0	−0.3	0.2
Medicaid enrollment, %	25.7	−0.2	−0.5	−0.5
Disabled, ⁴ %	16.2	0.3	−0.5	0.4
End-stage renal disease, %	4.1	−0.1	0.0	0.0
Nursing-home resident, ⁵ %	8.8	−0.6	0.1	−0.2
ZCTA Characteristics				
% below FPL	9.3	0.0	0.0	0.0
% with high school degree	75.1	0.0	−0.1	0.0
% with college degree	18.9	−0.1	0.1	0.0
Comorbidities				
Total Number of CCW Comorbidities, mean no. ⁶	8.71	0.00	0.07	0.01
HCC Risk Score, mean no. ⁷	2.72	−0.01	0.03	0.02

Source: Medicare fee-for-service data, 2009–2015.

Note: ZCTA is Zip code tabulation area, FPL is federal poverty level; CCW is Chronic Condition Warehouse, HCC is Hierarchical Condition Category; No. is number.

¹The control group consisted of decedent patients attributed to providers that did not enter into an ACO Entry during the study year.

²The pre-entry period was 2009–2011 for the 2012 MSSP Entry Group, 2010–2012 for the 2013 MSSP Entry Group and 2011–2013 for the 2014 Entry Group.

³MSSP Entry Year group sizes by year: 2012 MSSP entry n=13,880; 2013 MSSP entry n=12,125; 2014 MSSP entry n=12,078.

⁴Indicates that disability was the original reason for Medicare eligibility.

⁵Nursing home resident status based on prior year data.

Number of conditions diagnosed prior to January 1 of current year. Chronic conditions from the CCW include: 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.

^{6,7} Risk scores are based on prior year diagnoses.

*
 $p < 0.05$,

**
 $p < 0.01$,

 $p < 0.001$

Exhibit 2:

Differential Changes in End-of-Life Care Patterns from the Pre-Entry Period to 2015 for ACO Decedents Compared with Controls¹

		2012 MSSP Entry Year Cohort ³		2013 MSSP Entry Year Cohort ³		2014 MSSP Entry Year Cohort ³	
	Unadjusted Pre-Entry ² Mean	Difference in Annual Trend in Pre-Entry ² Period	Differential Change from the Pre-Entry Period to 2015	Difference in Annual Trend in Pre-Entry ² Period	Differential Change from the Pre-Entry Period to 2015	Difference in Annual Trend in Pre-Entry ² Period	Differential Change from the Pre-Entry Period to 2015
End-of-Life Measure							
<i>Hospice Use</i>							
Hospice use in last 30 days of life, %	43.9	-0.6	-0.4	-0.2	-0.2	-0.1	0.1
Hospice days in last 30 days, no.	6.8	-0.1	0.1	0.0	0.0	0.0	0.1
Late hospice referral (during the last 3 days of life), ⁴ %	10.6	-0.2	-0.2	-0.1	0.0	0.0	-0.7*
<i>Transitions</i>							
Transitions in last 30 days of life, no.	0.78	0.01	-0.03***	0.00	0.00	0.00	0.02*
Transitions in last 3 days of life, no.	0.14	0.00	0.00	0.00	0.00	0.00	0.00
<i>Site of End of Life Care</i>							
Days at home during the last 30 days of life, no.	21.5	0.0	0.3**	0.0	-0.1	-0.1*	-0.1
In facility at death, ⁵ %	36.4	0.7*	-0.4	-0.1	-0.4	0.0	0.4
<i>Aggressiveness of Care</i>							
Any Intensive Care Use (ICU) use in last 30 days of life, %	11.4	-0.2	-0.9*	0.1	-0.4	0.2	0.1
Days spent in ICU in last 30 days of life, no.	0.70	-0.02	-0.05*	0.00	-0.01	0.00	-0.01
Breathing or feeding tube	3.6	0.0	-0.3	0.2	-0.3	0.0	-0.1

		2012 MSSP Entry Year Cohort ³		2013 MSSP Entry Year Cohort ³		2014 MSSP Entry Year Cohort ³	
	Unadjusted Pre-Entry ² Mean	Difference in Annual Trend in Pre-Entry ² Period	Differential Change from the Pre-Entry Period to 2015	Difference in Annual Trend in Pre-Entry ² Period	Differential Change from the Pre-Entry Period to 2015	Difference in Annual Trend in Pre-Entry ² Period	Differential Change from the Pre-Entry Period to 2015
placement during the last 30 days of life, ⁶ %							

Source: Medicare fee-for-service data, 2009–2015.

¹ The control group consisted of decedent patients attributed to providers that did not enter into an ACO contract during the study year.

² The pre-entry period was 2009–2011 for the 2012 MSSP Entry Group, 2010–2012 for the 2013 MSSP Entry Group and 2011–2013 for the 2014 Entry Group.

³ MSSP Entry Year group sizes by year: 2012 MSSP entry n=13,880; 2013 MSSP entry n=12,125; 2014 MSSP entry n=12,078.

⁴ Late hospice referral is defined as referral to hospice within last 3 days of life

⁵ Facility is defined as acute care hospital, post-acute care hospital, rehabilitation facility or skilled nursing facility

⁶ Any tube placement includes any procedure to place a tracheostomy, gastrostomy and/or jejunostomy tube

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$

Exhibit 3:

Differential Changes in End-of-Life Care Patterns from the Pre-Entry Period to 2015 for High-Risk ACO Patients Compared with High-Risk Controls¹

		2012 MSSP Entry Year Cohort ³		2013 MSSP Entry Year Cohort ³		2014 MSSP Entry Year Cohort ³	
	Unadjusted Pre-Entry ² Mean	Difference in Annual Trend in Pre-Entry ² Period	Differential Change from the Pre-Entry Period to 2015	Difference in Annual Trend in Pre-Entry ² Period	Differential Change from the Pre-Entry Period to 2015	Difference in Annual Trend in Pre-Entry ² Period	Differential Change from the Pre-Entry Period to 2015
Annual Measure							
<i>Hospice Use</i>							
Any Hospice use, %	14.2	−0.3 *	−0.1	0.1	−0.4	0.1	−0.3
Hospice days, no.	9.2	−0.3 *	0.1	0.3 *	−0.4	0.3 **	0.1
<i>Transitions</i>							
Transitions, no.	2.06	0.00	−0.05 *	−0.01	0.01	0.00	0.01
Days at home, ¹ no.	173.5	−0.6	−2.0 *	0.3	0.4	0.4	2.6 *
<i>End of Year Status</i>							
Deceased, %	22.3	−0.2	−0.1	−0.1	−0.5	0.2	0.0
Alive, in facility, ² %	5.7	−0.1	0.2	0.0	0.0	0.0	−0.1
<i>Aggressiveness of Care</i>							
Any intensive care unit (ICU) use, %	5.1	−0.1	−0.2	0.0	−0.2	0.1 **	−0.1
Days spent in ICU, no.	0.33	−0.01	−0.03 *	−0.01	0.00	0.00	−0.01
Any tube placement, ³ %	2.5	0.0	−0.2 *	−0.1	−0.1	0.0	0.1

Source: Medicare fee-for-service data, 2009–2015.

Note: All metrics are calculated during the year in which the patient is predicted to die, unless otherwise specified.

¹The control group consisted of high-risk patients attributed to providers that did not enter into an ACO contract during the study year.

²The pre-entry period was 2009–2011 for the 2012 MSSP Entry Group, 2010–2012 for the 2013 MSSP Entry Group and 2011–2013 for the 2014 Entry Group.

³MSSP Entry Year group sizes by year: 2012 MSSP entry n=32,696; 2013 MSSP entry n=28,969; 2014 MSSP entry n=28,030.

⁴Days at home are defined as any days not in a facility (hospital, post-acute facility, rehabilitation hospital or skilled nursing facility)

⁵Facility is defined as acute care hospital, post-acute care hospital, rehabilitation facility or skilled nursing facility

⁶Any tube placement includes any procedure to place a tracheostomy, gastrostomy and/or jejunostomy tube

* $p < 0.05$,

^{**}
 $p < 0.01$,
^{***}
 $p < 0.001$

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