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ACO-Affiliated Hospitals Reduced Rehospitalizations From Skilled Nursing Facilities Faster Than Other Hospitals

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Abstract

Medicare's more than 420 accountable care organizations (ACOs) provide care for a considerable percentage of the elderly in the United States. One goal of ACOs is to improve care coordination and thereby decrease rates of rehospitalization. We examined whether ACO-affiliated hospitals were more effective than other hospitals in reducing rehospitalizations from skilled nursing facilities. We found a general reduction in rehospitalizations from 2007 to 2013, which suggests that all hospitals made efforts to reduce rehospitalizations. The ACO-affiliated hospitals, however, were able to reduce rehospitalizations more quickly than other hospitals. The reductions suggest that ACO-affiliated hospitals are either discharging to the nursing facilities more effectively compared to other hospitals or targeting at-risk patients better, or enhancing information sharing and communication between hospitals and skilled nursing facilities. Policy makers expect that reducing readmissions to hospitals will generate major savings and improve the quality of life for the frail elderly. However, further work is needed to investigate the precise mechanisms that underlie the reduction of readmissions among ACO-affiliated hospitals.

The frail elderly often require multiple health care services, which are often fragmented and poorly coordinated. This is most noticeable in transitions between different care levels and facilities.^{1,2} Inadequate integration of care could lead to adverse outcomes such as increased hospital readmissions from skilled nursing facilities (SNFs), the most common setting for postacute care in the United States.³ Many of the elderly patients discharged to SNFs are later readmitted to hospitals; in 2006 the average thirty-day rehospitalization rate for fee-for-service (FFS) Medicare patients who had been discharged previously to SNFs was nearly 25

percent.⁴ Medical errors and adverse events, prompted by the previous hospitalization, could lead to unplanned readmissions, which in turn could have detrimental effects on the health and well-being of frail elderly people.^{5–7}

Following the passage of the Affordable Care Act (ACA), many health care systems in the United States have developed new models for integrated care, such as accountable care organizations (ACOs). These are voluntary networks of physicians, hospitals, and occasionally post-acute care providers that are held accountable for the quality and costs for all care delivered to a given population.^{8,9} Today there are more than 700 ACOs in the United States.¹⁰ More than 420 of these are noncommercial and funded by Medicare.¹¹ Recent studies have shown that commercial and noncommercial ACOs are increasing in number; half are led by physician groups; and included hospitals are more likely to be nonprofit, mid-size and large hospitals in the Northeast and Midwest.^{10,12–14}

In this study we concentrated on the noncommercial ACOs funded by Medicare: the Shared Savings Program and the Pioneer ACO model. The Medicare Shared Savings Program was introduced in July 2012; in that program, ACOs are awarded a “shared payment” based on the difference between a predetermined benchmark and their actual costs for a group of patients receiving most of their care from these providers. The Pioneer ACO model, introduced in January 2012, applied the same principles but included larger financial risks for providers.¹⁵

Although progress has been made toward creating integrated care models such as ACOs, evidence of the effects of Medicare ACOs on health care spending and quality is limited and mixed. Some studies on performance show cost savings relative to expected costs, slightly improved patient experience, and unchanged or slightly improved performance quality.^{12,13,16–18} Still, the evidence is far from conclusive, and more research—particularly on clinical outcomes at the individual level—is needed to establish the effects on health care spending and quality.

One outcome measure that is often used in the literature is the thirty-day rehospitalization rate, defined as whether a patient is readmitted to a hospital within thirty days after being discharged to a skilled nursing home or to another community-based postacute care provider.¹⁹ Two former studies show no substantial difference between ACO-affiliated and other hospitals regarding rehospitalizations. One study included only three conditions (acute myocardial infarction, congestive heart failure, and pneumonia) in the readmission measure,¹³ and the other investigated only the Pioneer hospitals and their overall readmission rate.¹⁷ In contrast, our study focused on a broad spectrum of diagnoses (7,952 different diagnoses, based on *International Classification of Diseases*, Ninth Revision [ICD-9], codes) for Shared Savings and Pioneer hospitals and concentrated on care transitions between hospitals and postacute care providers. Specifically, we investigated whether ACO-affiliated hospitals improved rehospitalization rates for FFS Medicare beneficiaries discharged to SNFs as compared to other hospitals.

Study Data And Methods

The study compared rehospitalization rates for beneficiaries served by hospitals in metropolitan areas that were part of Medicare's Pioneer or Shared Savings ACOs with beneficiaries served by hospitals in the same areas that were not.

DATA

Information on which hospitals belonged to which type of ACO was obtained from Centers for Medicare and Medicaid Services (CMS) lists published in 2014.²⁰ This information was linked to a provider name and the ID of the individual hospital belonging to either the Pioneer model or the Shared Savings Program. For physician-led ACOs, hospitals that were not themselves a part of the program were classified as non-ACO-affiliated hospitals.

We used three sources of individual-level data. Our analyses were based mainly on Medicare Part A claims and Medicare enrollment files for the period 2007–13. We also used the Minimum Data Sets (MDS) 2.0 and 3.0 to identify Medicare beneficiaries' prior nursing home residence.

POPULATION

Since there are few ACO-affiliated hospitals in rural areas,^{13,14} we chose to include only hospitals located in metropolitan areas, to make the groups comparable. The study included both general hospitals located in metropolitan areas that belonged to Medicare's Pioneer ($n = 64$) or Shared Savings ($n = 162$) programs and general hospitals not participating in the programs ($n = 1,844$).

All FFS Medicare beneficiaries discharged directly from the studied hospitals to a SNF for postacute care between January and November for the years 2007–13 were included in the study. To ensure that we focused on postacute care patients, not ongoing nursing home residents, beneficiaries with any nursing home stay in the one-year period before the qualifying hospitalization were excluded. MDS data were used to identify people with prior nursing homes stays.

MEASURES

Our main outcome variable was an indicator variable of thirty-day rehospitalization. We used "all-cause" rehospitalizations, both unplanned and planned, within the thirty-day period.

Our descriptive analysis compared the rehospitalization rates of non-ACO, Shared Savings, and Pioneer hospitals. The rehospitalization rate is the fraction of patients readmitted to a hospital within thirty days who had been originally discharged to SNFs from a hospital. The denominator is the number of patients discharged to SNFs. The numerator is the number of these patients who were readmitted to a hospital within thirty days. The patient was counted as readmitted regardless of whether he or she had already left the SNF within the thirty-day period.

In addition to the overall thirty-day readmission variable, we also created rehospitalization variables for shorter time periods. We did this to better understand the role of ACOs, following recent work on the topic.^{19,21} We created rehospitalization measures for two mutually exclusive periods: 1–3 days, suggesting premature discharge or inappropriate placement; and 4–30 days, a possible sign of poor communication of clinical or treatment information between the hospital and the SNF. The readmission also potentially indicated that care at the SNF or other resources were inadequate to prevent a complication requiring acute hospital-level care.

The independent variable in the study was the ACO affiliation of hospitals. We used two indicators: whether the hospital participated in the Pioneer model or whether the hospital participated in the Shared Savings Program. “No ACO affiliation” was the reference group.

Patient demographic characteristics included age, sex, and race. Clinical characteristics included hospital length-of-stay, days in the intensive care unit (ICU), days in the cardiac/coronary care unit, diagnosis-related groups (DRGs), and Deyo comorbidity index.²²

ANALYTIC APPROACH

The study compared the rehospitalization rates of hospitals that were part of ACOs with similar hospitals that were not part of any ACO.

First, we described how thirty-day rehospitalization rates varied across years and across hospitals as a function of ACO affiliation. Second, we used a patient-level difference-in-differences model to estimate the changes in rehospitalization rates in the 2009–11 and 2012–13 periods relative to 2007–08 in Pioneer and Shared Savings hospitals relative to non-ACO-affiliated hospitals. Here, the outcome variable was an indicator of whether or not the patient was re-hospitalized. A typical difference-in-differences specification has two treatment options (with and without treatment) and two time options (before and after). In our case, we had three treatment options: Pioneer hospitals, Shared Savings hospitals, and non-ACO-affiliated hospitals (reference group). A typical difference-in-differences involves two time periods: before ACOs (2007–11) and after ACOs (2012–13). This design, however, cannot test whether the differential trend after the introduction of ACOs started during or before the ACO period. So we split the before-ACO period into two periods, 2007–08 and 2009–11. Thus, we grouped the entire seven years of this study period into three groups: two pre-ACO periods (2007–08 and 2009–11) and one post-ACO period (2012–13). We used 2007–08 as the reference period. Thus, we have four difference-in-differences estimates: an interaction of Pioneer hospital indicator and a year 2009–11 indicator, an interaction of Pioneer hospital indicator and a year 2012–13 indicator, an interaction of Shared Savings hospital indicator and a year 2009–11 indicator, and an interaction of Shared Savings hospital indicator and a year 2012–13 indicator. Here, interactions of the indicators with 2009–11 serve as a falsification test of whether differences in rehospitalization rates between ACO-affiliated and non-ACO-affiliated hospitals started to expand before the ACOs came into effect and hospitals were financially at risk for rehospitalizations.

Besides the interaction terms, our difference-in-differences model included patients' demographic and clinical characteristics and year, hospital, and DRG fixed effects. We did

not include year 2009–11 and year 2012–13 indicators because they are perfectly collinear with year fixed effects. Similarly, we did not include hospital-type dummies because we included hospital fixed effects. Following prior literature,^{21,23} we estimated an ordinary least squares model that is more suitable in the presence of multidimensional fixed effects and easier to interpret than nonlinear models. We reported test statistics based on standard error clustered at the hospital level.

LIMITATIONS

Our analysis had some limitations. First, the Shared Savings and Pioneer programs were introduced in 2012, and our study included data for only the first two years of the programs (2012 and 2013). More recent data were not available to academic researchers at the time we submitted this article. By including readmission data from the years 2007–13, however, we have a unique opportunity to examine how hospitals adjusted to the initiative over time and the role that ACOs played in this change. We assume that trends seen in 2012 and 2013 continued for 2014, 2015, and beyond.

Second, it would have been interesting to know the share of the overall population in the ACO-affiliated hospitals that were ACO patients. Unfortunately, we lacked information about individual patients' ACO participation. We did attempt to determine whether higher proportions of ACO-attributed FFS Medicare patients at the county level were associated with greater reductions in rehospitalization rates within the hospitals in the county, but the level of aggregation was too great to reveal an effect, so we did not include these results. This was consistent with our a priori hypothesis that any changes in discharge processes applied to all Medicare patients. Furthermore, retrospective attribution of ACO patients in the Shared Savings Program limits hospitals' ability to know which patients were included in the ACO at the time of discharge to a SNF. Additionally, it is unlikely that a care manager or discharge planner would be able to differentiate between ACO- and non-ACO-attributed patients at the time of discharge. Therefore, our a priori hypothesis was that any new discharge procedures, as stated above, would be applied to all Medicare patients.

Third, we were not able to identify the exact mechanisms underlying differences in performance of ACO-affiliated and other hospitals in terms of reduction of rehospitalization rates from SNFs. Organizationally, ACO-affiliated hospitals might be different from other hospitals, and their subsequent response to readmission penalties might therefore vary. The reasons a hospital might or might not invest in readmission reduction strategies and the specific strategies employed at different hospitals are outside the scope of this analysis.

Study Results

Exhibit 1 compares the patient population served by ACO-affiliated and non-ACO-affiliated hospitals in 2007, 2010, and 2013. The proportion of patients discharged to SNFs was slightly higher in ACO-affiliated hospitals and increased over time at a higher rate among Pioneer hospitals. Overall, the population characteristics were relatively stable over time. The average age and sex distribution was about the same in all groups, but Pioneer hospitals had fewer black patients than hospitals in the Shared Savings program and non-ACO-affiliated hospitals. Length of hospital stay was about the same during the years, but it was

somewhat lower for the Pioneer hospitals. ICU and cardiac/coronary care unit days were, however, considerably lower for the Pioneer hospitals compared to the other hospitals in all three years of measurement. The Deyo comorbidity index,²² which was relatively unchanged between 2007 and 2010, increased across all groups, signifying higher levels of comorbidity between 2010 and 2013 (Exhibit 1).

CHANGING REHOSPITALIZATION RATES

Pioneer hospitals had a lower rehospitalization rate compared to non-ACO-affiliated and Shared Savings hospitals (Exhibit 2). All three types of hospitals experienced declining rehospitalization rates after 2010. The Pioneer hospitals reduced rehospitalizations within thirty days by 3.1 percentage points, the Shared Savings Program hospitals by 4.0 percentage points, and the non-ACO-affiliated hospitals by 2.9 percentage points in the period 2007–13.

The relative reduction in rehospitalizations from SNFs was larger for Shared Savings hospitals (17.7 percent) and for Pioneer hospitals (14.9 percent) than for non-ACO-affiliated hospitals 13.1 percent (Exhibit 3). Thus, both types of ACO-affiliated hospitals demonstrated a larger decrease in rehospitalization rates from SNFs within thirty days than non-ACO-affiliated hospitals.

The relative reduction in rehospitalizations from SNFs within the first three days was even greater among ACO-affiliated hospitals: 19.1 percent in both Shared Savings and Pioneer hospitals compared to 14.3 percent in non-ACO-affiliated hospitals (Exhibit 3). Rehospitization rates within the first days of discharge might be more strongly related to the clinical practices of the hospital (that is, early discharge planning, comprehensive information transfer to the discharge site, and so forth), whereas later re-hospitalizations might be more attributable to practices at the skilled nursing facility. The ACO-affiliated hospitals might have greater incentive to improve overall clinical practices, resulting in greater relative reduction in patients who return immediately to hospitals (known as bounce backs). Between four and thirty days, the relative reduction in rehospitalization rate was 17.4 percent in Shared Savings hospitals, 14.1 percent in Pioneer hospitals, and 12.9 percent in non-ACO-affiliated hospitals (Exhibit 3).

DIFFERENCE-IN-DIFFERENCES

The difference-in-differences analysis exhibited similar trends to the changing rehospitalization rate analysis (Exhibit 4). The difference-in-differences estimate for the thirty-day overall adjusted rehospitalization rate in Pioneer hospitals relative to non-ACO-affiliated hospitals was –0.559 percentage point (95% confidence interval: –0.15, –0.97), and in Shared Savings hospitals relative to non-ACO-affiliated hospitals the difference-in-difference estimate was –0.994 percentage point (95% CI: –0.75, –1.24) from 2007–08 to 2012–13. The falsification test, comparing 2009–11 to 2007–08, suggests that Shared Savings hospitals experienced a reduction in rehospitalization rates during the pre-ACO period. The difference-in-differences estimate in Shared Savings hospitals relative to non-ACO-affiliated hospitals from the 2007–08 to the 2009–11 period was –0.279 percentage point (95% CI: –0.06, –0.50). This could be a response to the passage of the ACA in March

2010, even before the hospitals were financially at risk following implementation of the Medicare Shared Savings Program (ACA section 3022) in 2012. Comparisons of Pioneer hospitals to non-ACO-affiliated hospitals during the same time frame did not reach conventional levels of significance.

Discussion

We compared the pattern of rehospitalization from SNFs to ACO-affiliated hospitals and non-ACO-affiliated hospitals. We found that all types of hospitals decreased their rehospitalization rates in the period 2007–13 from about 21–23 percent to 18–19 percent. However, rates fell more rapidly for ACOs, and especially for Shared Savings Program hospitals, than for non-ACO-affiliated hospitals, after patient characteristics were controlled for. Additional difference-in-differences analysis largely confirmed this result. The same analysis revealed, however, that Shared Savings hospitals had a significantly higher rate of improvement already in the years before the ACO program started in 2012, which implies that organizations may have responded to the announcement of rehospitalization penalties prior to exposure to financial risk—that is, they already had begun implementing changes or had other ways of coordinating care with SNFs. Still, the rate of decline was even greater for the Shared Savings hospitals after the ACO initiative began in July 2012, indicating an additional response to the financial risk of the ACO.

The general reduction in rehospitalizations from SNFs implies that all hospitals have made changes in discharge processes or that most SNFs have focused more on treating patients in the facility instead of sending them to the hospital. The Medicare Hospital Readmissions Reduction Program, which penalizes hospitals with relatively higher rates of Medicare readmissions, is most likely the most important factor behind this trend, incentivizing all hospitals to reduce readmissions. Even though this program did not start until fiscal year 2013, hospitals likely responded to the announcement of penalties with the ACA in FY 2010 and started introducing interventions prior to the program since CMS uses three full years of previous data to determine hospital performance.²⁴

As we demonstrated, the ACO-affiliated hospitals were able to reduce rehospitalizations relatively more quickly than were other hospitals. This suggests that they were changing their discharge practices or improving communication with SNFs. It could be argued that most rehospitalizations within the first days of discharge could be attributed to what happens at hospitals. The fact that the relative change in rehospitalization rates is greater in the first few days after hospital discharge suggests that it is probably an effect of improved hospital discharge planning or more effective information exchange between hospital and SNF. Furthermore, ACO-affiliated hospitals have additional incentives beyond the readmissions reduction program, such as keeping Medicare spending per beneficiary low, and therefore might be using improved discharge practices targeted at higher-risk SNF-bound patients, resulting in greater relative reduction in bounce backs.

As rehospitalization rates continue to decline as the ACO programs progress, hospitals focused on reducing rehospitalizations from SNFs may begin to establish preferred provider networks in which they would institute efforts to improve communication through

mechanisms such as open electronic health records, shared clinical care pathways, or even shared staffing.²⁵ The fact that ACO-affiliated hospitals exhibited faster reductions in readmission rates from SNFs than other hospitals is promising and suggests that further improvements are possible.

Implications

Hospitals discharge some 20 percent of their patients to SNFs. Understanding the ways in which the Pioneer hospitals and others have been able to reduce the rehospitalization rate from SNFs will be an important area of future research. More information is needed about which mechanisms are effective in reducing readmissions from SNFs. Whether ACO-affiliated hospitals are interested in more long-lasting efforts to improve communication or to integrate care paths across treatment settings with established partners, or both, remains to be seen.

Future research could focus on whether a prospective versus a retrospective approach to identifying patients as under an ACO alters hospitals' behavior, such as discharge processes, specifically to SNFs. Additionally, hospital systems are now developing more networks of SNFs that act as "preferred providers," and understanding what effect this could have in the future will be important.

So far, we have examined differences between Shared Savings hospitals, Pioneer hospitals, and non-ACO-affiliated hospitals. However, the considerable variation within each ACO program also needs to be examined, particularly how ACOs create provider networks.

A final policy issue needing examination is the formal role SNFs have in ACOs today. A recent study shows that SNFs are included in only a small proportion of ACOs.⁸ Instead, ACOs seem to contract with SNFs by including them in their "preferred" networks.²⁵ Participating in a network means receiving admissions from the hospitals but lacking influence at the level of ACO governance. Including preferred SNFs as partners in ACOs with joint investments in quality could, in the long run, lead to better health outcomes and more sustainable solutions for both patients and SNFs. The challenges will be to develop shared goals and to integrate professional norms and social identities that work for both parties.^{10,26}

Conclusion

This study is unique in demonstrating that by using rehospitalization rates, adjusted for clinical and demographic characteristics, we are able to show that ACO-affiliated hospitals were able to reduce rehospitalizations from SNFs relatively more quickly than other types of hospitals were. Most of the difference in rehospitalization occurs zero to three days after discharge—that is, in the period when primary responsibility falls on care provided in the hospital. Further studies are warranted to examine the exact mechanisms that brought about this improvement and what roles ACOs play in continued decreasing rates of rehospitalizations to hospitals.

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EXHIBIT 2. Unadjusted rehospitalization rates within thirty days for ACO-affiliated hospitals and non-ACO-affiliated hospitals, 2007–13

SOURCES Medicare Part A claims and Medicare enrollment files for 2007–13; authors' calculations; and Centers for Medicare and Medicaid Services. 2015 Medicare Shared Savings Program accountable care organizations—participants (see Note 20 in text). **NOTE** ACO is accountable care organization.

EXHIBIT 1

Characteristics of hospital stays and patients in ACO-affiliated and non-ACO-affiliated hospitals, selected years 2007–13

Variable	2007			2010			2013		
	Non-ACO	Pioneer	Shared Savings	Non-ACO	Pioneer	Shared Savings	Non-ACO	Pioneer	Shared Savings
Number of discharges to SNFs	1,087,890	43,339	130,034	1,129,948	43,288	132,753	1,027,732	39,201	119,399
Proportion of discharges to SNFs	21.6%	24.6%	24.7%	22.8%	25.2%	25.2%	23.3%	27.0%	26.0%
Demographic characteristics									
Age, years (average)	81.5	81.9	81.6	81.3	81.9	81.5	81.2	81.6	81.4
Female	65.8%	65.1%	65.9%	64.6%	64.5%	64.9%	64.0%	63.9%	64.0%
Black	10.8%	3.1%	9.0%	11.1%	3.8%	10.0%	11.0%	3.6%	10.2%
Other race	3.8%	2.2%	2.8%	4.4%	2.6%	3.5%	4.6%	2.8%	3.9%
Deyo comorbidity index ^a	2.6	2.5	2.6	2.5	2.5	2.5	3.8	3.6	3.8
Intensive care unit days (avg.)	1.4	0.8	1.6	1.6	0.9	1.8	1.6	1.0	1.8
Cardiac/coronary unit days (avg.)	0.7	0.3	0.6	0.7	0.2	0.6	0.7	0.3	0.6
Hospital length-of-stay, days (avg.)	7.2	6.5	7.2	7.0	6.2	6.9	6.7	6.1	6.6

SOURCES Medicare Part A claims and Medicare enrollment files for 2007–13; authors' calculations; and Centers for Medicare and Medicaid Services. 2015 Medicare Shared Savings Program accountable care organizations—participants (see Note 20 in text). **NOTES** ACO is accountable care organization. SNF is skilled nursing facility.

^aHigher scores indicate greater severity of illness; see Note 22 in text.

EXHIBIT 3

Percentage of patients rehospitalized from skilled nursing facilities within thirty days in different types of hospitals, 2007–13

	Non-ACO			Pioneer			Shared Savings		
	0–3 days	4–30 days	30 days	0–3 days	4–30 days	30 days	0–3 days	4–30 days	30 days
2007	3.2%	19.0%	22.3%	3.1%	17.8%	21.0%	3.3%	19.4%	22.7%
2013	2.8%	16.6%	19.3%	2.5%	15.3%	17.9%	2.6%	16.0%	18.7%
Change, 2007 to 2013 (percentage points)	–0.5	–2.5	–2.9	–0.6	–2.5	–3.1	–0.6	–3.4	–4.0
Relative change	–14.3%	–12.9%	–13.1%	–19.1%	–14.1%	–14.9%	–19.1%	–17.4%	–17.7%

SOURCES Medicare Part A claims and Medicare enrollment files for 2007–13; authors' calculations; and Centers for Medicare and Medicaid Services. 2015 Medicare Shared Savings Program accountable care organizations—participants (see Note 20 in text). **NOTE** ACO is accountable care organization.

EXHIBIT 4

Difference-in-differences estimates of rehospitalizations before and after ACO policy implementation

	Rehospitalization within:		
	30 days	0–3 days	4–30 days
PIONEER			
2009–11	–0.136	0.0279	–0.144
2012–13	–0.559 ***	–0.161 *	–0.384 *
SHARED SAVINGS			
2009–11	–0.279 **	–0.0942 *	–0.191 *
2012–13	–0.994 ***	–0.158 ***	–0.836 ***

SOURCE Authors' calculations. **NOTE** These estimates show changes in rehospitalization rates (percentage points) in 2009–11 and 2012–13 relative to 2007–08 in Pioneer and Shared Savings hospitals relative to non-ACO-affiliated hospitals, controlled for year fixed effects, hospital fixed effects, and diagnosis-related group fixed effects. ACO is accountable care organization.

*
 $p < 0.10$

**
 $p < 0.05$

 $p < 0.01$