Early impact of Medicare Accountable Care Organizations on cancer surgery outcomes

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Precis: Early hospital participation in the MSSP ACO program was not associated with greater reductions in adverse perioperative outcomes for patients undergoing a major cancer surgery compared to control hospitals. The longitudinal improvements in perioperative outcomes identified during the study interval may reflect the impact of concurrent policies more directly applicable to surgical patients.

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Abstract

Background: Accountable Care Organizations (ACOs) were established to improve care and outcomes for beneficiaries requiring highly coordinated, complex care. Our objective was to evaluate the association between hospital ACO participation and outcomes of major surgical oncology procedures.

Methods: We performed a retrospective cohort study of Medicare beneficiaries >65 years old undergoing a major surgical resection for colorectal, bladder, esophageal, kidney, liver, ovarian, pancreatic, lung or prostate cancer from 2011 through 2013. We implemented a difference-in-differences analysis comparing the post-implementation period (January 2013 through December 2013) to the baseline period (January 2011 through December 2012), to assess the impact of hospital ACO participation on 30-day mortality, complications, readmissions and length of stay.

Results: Among 384,519 patients undergoing major cancer surgery at 106 ACO hospitals and 2,561 control hospitals, we identified a 30-day mortality rate of 3.4%, readmission rate of 12.5%, complication rate of 43.8% and prolonged LOS rate of 10.0% in control hospitals, with similar rates in ACO hospitals. We noted secular trends, with reductions in perioperative adverse events in control hospitals between the baseline and post-implementation periods: mortality (0.1% percentage point reduction, p=0.19), readmissions (0.4%, p=0.001), complications (1.0%, p<0.001) and prolonged LOS (1.1%, p<0.001). After accounting for these secular trends, we identified no significant effect of hospital participation in an ACO on the frequency of perioperative outcomes (difference-in-differences estimator p-values 0.24-0.72).

Conclusions: Early hospital participation in the MSSP ACO program was not associated with greater reductions in adverse perioperative outcomes for patients undergoing major cancer surgery compared to control hospitals.

Introduction

Accountable care organizations (ACOs) are a signature reform of the Affordable Care Act intended to create highly integrated delivery systems that improve population health and reduce costs through increased accountability and care coordination.[1] Architects of ACO policies envisioned that physicians and other healthcare workers would come together as multidisciplinary teams to coordinate and optimize care for complex and expensive patients.[2] Precursors to ACOs, such as the Physician Group Practice (PGP) demonstration, provided proof-of-principle that similar models can achieve gains in the quality and cost of care provided to medical patients with multiple comorbidities.[3]

Despite this evidence from primary care, it remains unknown whether ACO participation will have similar benefits for delivery of more technically complex, specialist-oriented services. Given its organization around multidisciplinary provider teams, cancer care represents an important clinical domain for evaluating this question. It is possible, for instance, that hospital ACO participation serves as a catalyst for developing integrated teams that collaborate to improve care processes and outcomes for patients undergoing cancer treatment. In this scenario, one group that may derive early benefits from the ACO model is patients undergoing major cancer surgery. For these patients with cancer, the heightened focus on quality and care coordination that accompanies ACO participation might translate quickly into improved perioperative outcomes.

In this context, we used national Medicare data to examine the early impact of hospital ACO participation on outcomes with major cancer surgery. We specifically performed a difference-in-differences analysis to examine the association between hospital participation in a Medicare Shared Savings Program (MSSP) ACO and length

of stay, 30-day mortality, major complications, and readmissions after major oncological surgery. We hypothesize that benefits from ACO implementation would most likely occur in the form of decreased rates of readmission and complications and shorter length of stay that would result from improvements in processes of care that are at the forefront of ACO quality improvement and cost savings policies.

Methods

Data Sources

We used three datasets to perform these analyses. First, we used the Medicare Shared Savings Program (MSSP) ACO Provider-level Research Identifiable File (available from the Centers for Medicare and Medicaid Services (CMS)) to identify hospitals that formally participated in the MSSP during the first performance period from April 2012 through December 2013. Next, we used the American Hospital Association Annual Survey to evaluate hospital characteristics including region, number of beds, hospital profit status, hospital teaching status, number of operating rooms and electronic health record use. Finally, we used the 100% Medicare Provider Analysis and Review (MEDPAR) file from 2011 through 2013 to identify patient cohorts, demographic and clinical information, and the occurrence of our outcomes of interest.

Identification of ACO participating and nonparticipating hospitals

Using the MSSP ACO Provider-level dataset, we identified acute care and critical access hospitals that enrolled in an MSSP ACO during the first performance period. These hospitals are referred to as ACO hospitals throughout the manuscript; conversely, hospitals that were not formal MSSP ACO participants are referred to as

control hospitals. Hospitals with fewer than 10 oncologic procedures overall performed during the period of interest were excluded.

Identification of study population

We used diagnosis and procedures codes from the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* to identify patients aged 66 to 99 years that underwent major cancer surgery during the study interval for the following nine solid organ cancers: colorectal, bladder, esophageal, kidney, liver, ovarian, pancreatic, lung or prostate cancer (Supplemental Material 1). We included only those patients who had a procedure and were discharged between January 1, 2011 and November 30, 2013 to ensure adequate follow-up for ascertainment of post-operative outcomes. We excluded patients who had two or more different oncologic procedures on the same day or ≤180 days apart.

Outcome measures

We measured four post-operative outcomes: mortality, complications, prolonged length of stay (LOS) and readmissions. Mortality, complications, and readmissions were identified within 30 days of the index cancer operation. Complications were identified using established methods based on the Complication Screening Program.[4–6] Using this method, we identified events including infectious, bleeding, pulmonary, renal, cardiac, neurologic, gastrointestinal and other complications occurring during the index hospitalization or within 30 days of surgery. Prolonged LOS was defined as a LOS that exceeded 90th percentile on a procedure specific basis.

Statistical analysis

We used Student's t-test and chi-square tests where appropriate to compare characteristics of hospitals that participated in an MSSP ACO versus those that did not. We also compared demographic characteristics for patients treated in MSSP ACO hospitals versus control hospitals.

Next, we implemented a difference-in-differences analysis to evaluate the association between hospital participation in an MSSP ACO and changes in perioperative outcomes over time compared to control hospitals.[3,7] To do this, we first specified whether each hospital in our sample was an ACO hospital versus a control hospital. We then specified a time variable that reflects the period before and after MSSP ACO policy implementation. ACO hospital cases were included in the post-implementation time period starting on the specific date of ACO enrollment for that hospital (April 1, 2012, July 1, 2012 or January 1, 2013). Control hospital cases were included in the post-implementation era beginning on January 1, 2013 because the majority of ACO participating hospitals entered their contracts on this date. We refer to the time period before ACO policy implementation as baseline, and the time period after as post-implementation.

We initially fit logistic regression models for each outcome across all cancer procedures combined. For each model, we included an interaction term between hospital ACO participation and time to evaluate the effect of the ACO policy. The interaction term allows the predicted outcome to differ between patients treated in ACO hospitals and non-ACO hospitals in both the pre- and post-periods. The difference-in-differences of the predicted outcomes is then the causal effect of ACO on each outcome, controlling for trends in the control group.[8–10] We adjusted our regression models for the type of surgery (e.g., colectomy, prostatectomy); patient characteristics including age, gender, race, and comorbidities (using the Elixhauser method); and

hospital characteristics including, geographic region, profit status, teaching status, rural versus urban location, and cancer procedure volume.[11] For each of these models, we implemented robust standard errors to account for clustering of patient outcomes within hospitals.

In addition to the overall models, we also fit similar cancer procedure-specific models for each of the perioperative outcomes. Finally, we performed three sensitivity analyses. First, we evaluated the effect of setting the post-implementation time point for control hospital cases at July 1, 2012, rather than January 1, 2013. Second, we adjusted our overall model for three covariates that may act as markers of integration within a hospital delivery system including electronic health record use, familiarity with managed care contracts (Medicare Advantage penetration) and participation in a hospital network. Last, we evaluated outcomes only in hospital referral regions containing both an ACO hospital and a control hospital. All statistical analyses were performed using Stata version 14 (StataCorp LP, College Station, Texas); p-values <0.05 were considered statistically significant. The University of Michigan Institutional Review Board deemed this study exempt from review.

Results

We identified more than 380,000 patients that underwent major cancer surgery at 106 ACO hospitals and 2,561 control hospitals from 2011 through 2013. ACO hospitals were concentrated in the Northeast and Midwest regions, were more often non-profit, urban, and teaching hospitals, and had a greater number of hospital beds compared to control hospitals (Table 1).

We observed small but statistically significant differences in the populations served by these two hospital groups. For instance, patients treated at ACO hospitals

were more often white, and had a higher prevalence of measured comorbid conditions (Table 2). Although statistically significant, differences in the mix of oncological procedures between ACO hospitals and control hospitals were small, with ACO hospitals performing more prostate and ovarian cancer surgeries, and control hospitals performing more bladder, lung and liver cancer procedures.

In the baseline study interval, unadjusted rates of 30-day mortality (3.3% vs. 3.4%, p=0.54), 30-day readmission (12.5% vs. 12.4%, p=0.69), complications (43.6% vs. 43.4% p=0.65), and prolonged LOS (10.1% vs. 10.2% p=0.56) were similar between ACO hospitals and control hospitals. The adjusted rates for these events were also comparable at baseline between ACO participants and control hospitals (Table 3).

We found ACO hospitals did not improve at a significantly accelerated rate compared to control hospitals. We noted secular trends, with reductions in perioperative adverse events in control hospitals between the baseline and post-implementation periods: mortality (0.1% percentage point reduction, p=0.19), readmissions (0.4%, p=0.001), complications (1.0%, p<0.001) and prolonged LOS (1.1%, p<0.001). After accounting for these secular trends, we identified no significant effect of hospital participation in an ACO on the frequency of any perioperative outcomes (p-values for difference-in-differences estimator 0.24-0.72, Figure 1).

Finally, when we examined the association between hospital ACO participation and perioperative outcomes for individual cancers we noted similar patterns, with no greater improvements in perioperative outcomes for ACO hospitals (Supplemental Material 2). Table 4 presents site-specific outcomes for several cancers comparing post-implementation outcomes to baseline. We noted no substantive changes in our results in sensitivity analyses where the post-implementation date for control hospitals was changed from January 1, 2013 to July 1, 2012, when controlling for additional

measures of health system integration or when limiting our analyses to only markets containing both an ACO hospital and a control hospital.

Discussion

Our study has two principal findings. First, early hospital participation in the MSSP ACO program did not accelerate improvements in several adverse events (i.e., 30-day mortality, readmissions, major complications, and prolonged LOS) after major cancer surgery compared to control hospitals. Second, with the exception of mortality, rates of these adverse perioperative outcomes are improving across hospitals over time, with 0.1-1.6% percentage point reductions in the frequency of observed adverse events from baseline to post-implementation of ACO policies.

Our findings showing no greater benefits with mortality or length of stay for patients undergoing cancer surgery in ACO hospitals is consistent with prior work evaluating outcomes for beneficiaries with cancer during the Physician Group Practice (PGP) demonstration project.[12] Namely, cancer patients treated at facilities participating in PGP had rates of in-hospital mortality that were equivalent to those for a similar patient cohort treated in non-PGP hospitals. Likewise, there was no effect of PGP participation on the number of days that patients with cancer spent in the hospital.

Although not attributable to ACO participation, there are several potential explanations for the observed decline in readmissions and complications over the study interval. For instance, work by others has demonstrated similar trends associated with concurrent CMS pay-for-performance initiatives including the Hospital Readmission Reduction Program (HRRP), Value Based Purchasing (VBP) program, and the Hospital-Acquired Conditions Reduction program (HAC).[13–16] While not directed specifically at patients undergoing cancer surgery, processes developed to reduce readmissions in

response to the HRRP, particularly those directed at surgical admissions, may well have spillover benefits for other surgical patients. Likewise, improvements in care processes and patient safety in response to VBP and HAC metrics may have the collateral benefit of shortening length of stay and reducing readmissions for patients undergoing major cancer surgery.[17] Accordingly, the observed longitudinal improvements in cancer surgical outcomes are likely related to a combination of initiatives implemented during the same time period as the MSSP ACO program.

Our study has several limitations. First, most ACO quality metrics are not specifically focused on improving cancer care. Accordingly, further improvements in care delivery may require policies directed at cancer care specifically, rather than more general initiatives like ACOs. However, while these specific surgical outcome measures may not map directly to MSSP ACO quality measures, improvements in perioperative outcomes should translate into lower costs of care, which is highly relevant for ACO performance. It is also conceivable that incremental improvements in cancer care may be more difficult to achieve through the ACO model since there has long been a focus on care coordination and quality measurement in this patient population. Moreover, organizational change may require more than one or two years and effects derived from ACO policies may become stronger over time and as more organizations form. Second, we did not evaluate for improvements in cancer screening, surveillance and end of life care. In many ways, these domains of cancer care may be more responsive to the ACO model than surgical outcomes, from both a cost and quality perspective. As a result, future evaluations of cancer care and outcomes in ACOs are needed to define the impact of this model on these distinct phases of cancer care.[18] Third, our study assumes there were no inherent differences between control hospitals and hospitals that ultimately joined an ACO. While, ACO hospitals and control

hospitals are not identical, they have similar patient populations and had equivalent outcome rates at baseline. Additionally, our study design assumes that outcome trends during the baseline period were similar among ACO hospitals and control hospitals. As more data becomes available, evaluating time trends across the baseline and post-implementation periods will be important to consider. Finally, hospital affiliation with an ACO represents one mechanism for ACO participation. Additionally, physicians can align with an ACO independent of hospital participation. While our study does not examine the role of physician ACO participation, control hospitals with a large number of ACO participating physicians may be influenced by ACO policies.

These limitations notwithstanding our findings have important implications for ACO leadership and policymakers. For ACO leadership, simply committing to the framework, measures, and payment changes that come with ACO participation will not necessarily translate into short-term improvements in perioperative outcomes for cancer patients. Nonetheless, our findings showing improvements in care regardless of hospital ACO status suggests that ACOs may benefit from other ongoing quality improvement programs that are impacting care at hospitals nationwide. For instance, reducing surgical site infections after colectomy will positively impact hospital performance with both the VBP and HAC programs, while also reducing costs for the ACO.

For policymakers, our findings suggest that, at least in this early period, innovative policies based on ACO principles (e.g., primary care focus) may have limited impact on inpatient surgical care. Programs directed specifically at improving surgical and cancer specific outcomes—such as surgical quality improvement collaboratives or initiatives through oncology groups such as the American Society of Clinical Oncology's Institute for Quality—may offer alternative and more direct ways for physicians, patients

and health systems to partner to improve outcomes and reduce costs with major cancer surgery.[19,20]

Although longer follow-up is needed, early hospital participation in the MSSP ACO program was not associated with greater reductions in adverse perioperative outcomes for patients undergoing a major cancer surgery compared to nonparticipating hospitals. The longitudinal improvements in perioperative outcomes identified during the study interval may reflect the impact of concurrent policies more directly applicable to surgical patients. Moving forward, studies that inform the impact of ACOs at other points in the cancer care continuum (e.g., early detection, end-of-life care) will further clarify the relevance and impact of this model in oncology.

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interventions to reduce surgical site infection in colorectal surgery. *Surgery*. 2014;155(4):602-606.

Figure Legend.
Figure 1. Change in rates of perioperative outcomes after ACO implementation.

Tables

Table 1. Characteristics of ACO hospitals versus control hospitals

Mean (SD)	ACO hospitals (n=106)	Control hospitals (n=2,561)	p-value
Annual oncologic surgical volume, median (IQR)	31.3 (10.7-90.3)	23.3 (9-58.7)	0.06
Geographic region (%)			<0.001
Northeast	25.5	17.1	
Midwest	48.1	25.0	
South	23.6	37.9	
West	2.8	20.2	
Number of beds			0.02
<200	42.5	52.5	
200-349	24.5	27.0	
350-499	19.8	11.3	
≥500	13.2	9.3	
Hospital profit status (%)			<0.001
For-profit	4.7	17.6	
Non-profit	86.8	69.0	
Public	8.5	13.4	
Other characteristics			
Teaching hospital (%)	48.1	34.1	0.002
Urban location (%)	84.0	72.4	0.01
Number of operating rooms, median (IQR)	11 (5-19)	9 (5-14)	0.09
Electronic health record implemented (%)	95.7	98.1	0.24
Medicare Advantage penetration (%)*	25.9	25.7	0.90
Network participant	51.4%	40.7%	0.03

*Medicare Advantage penetration is reported at the county level

Table 2. Characteristics of beneficiaries treated at ACO hospitals versus control hospitals

	Baseline		Post-implementation			
Mean	ACO hospitals (n=10,347)	Control hospitals (n=252,627)	ACO hospitals (n=9,092)	Control hospitals (n=112,453)	Differential change for ACO versus control hospitals	p-value
Age	74.44	74.49	74.15	74.39	-0.20	0.002
Female (%)	42.27	41.87	42.19	42.11	-0.32	0.42
Race (%)						<0.001
White	87.63	86.58	87.25	86.04	0.16	
Black	8.74	8.17	8.69	8.14	-0.02	
Other	3.63	5.25	4.06	5.83	-0.15	
Cancer Surgery (%)						
Bladder	4.09	4.27	3.86	4.45	-0.41	0.02
Prostate	18.37	17.40	17.21	16.21	0.03	0.004
Esophageal	0.98	1.12	1.12	1.20	0.06	0.19
Pancreas	2.95	3.04	3.28	3.21	0.16	0.93
Lung	17.19	17.55	17.69	18.21	-0.16	0.24
Liver	0.74	1.04	1.03	1.16	0.17	0.01
Kidney	11.82	12.11	12.23	12.69	-0.17	0.25
Colorectal	39.03	39.00	38.35	38.26	0.06	0.86
Ovarian	4.83	4.47	5.22	4.60	0.26	0.001
Comorbid diseases (%)						
Congestive heart failure	8.80	7.74	8.36	7.39	-0.09	<0.001
Valvular disease	5.99	5.77	5.55	5.89	-0.56	0.91
Pulmonary hypertension	2.37	1.94	2.42	1.96	0.04	<0.001
Peripheral vascular disease	7.40	6.89	6.74	7.25	-1.02	0.62
Paralysis	1.10	0.93	0.87	0.90	-0.20	0.33
Other neurological disorders	3.63	3.17	3.10	3.24	-0.59	0.14
Chronic pulmonary disease	24.81	22.92	23.90	22.92	-0.90	<0.001
Diabetes w/o complication	23.54	22.45	24.42	22.77	0.56	<0.001
Diabetes with complication	2.50	2.72	3.32	2.94	0.60	0.43
Hypothyroidism	11.48	12.21	12.65	13.02	0.35	0.08
Renal failure	0.80	0.84	0.83	0.87	0.00	0.56
Liver disease	0.74	1.04	1.03	1.16	0.17	0.01
Lymphoma	0.67	0.74	0.70	0.75	0.03	0.38
Metastatic cancer	18.14	19.06	18.98	18.48	1.43	0.23
Solid tumor without mets (other than primary)	9.43	9.53	9.76	9.65	0.20	0.94
Rhematologic disorder	2.27	2.27	2.62	2.46	0.16	0.34
Coagulopathy	3.73	3.48	4.26	3.67	0.34	0.001
Obese	9.67	8.91	10.67	10.33	-0.42	<0.001
Weight loss	9.23	8.72	9.56	8.69	0.37	0.001
Electrolyte disorders	22.54	21.86	23.44	22.18	0.58	0.001
Blood loss anemia	3.88	3.51	3.56	3.19	0.01	0.02
Deficiency anemias	21.45	20.92	21.01	20.12	0.36	0.06
Psychoses	1.96	1.87	1.88	1.96	-0.17	0.79

Depression	7.95	7.43	8.69	7.95	0.21	<0.001
Hypertension	66.17	65.29	66.97	65.65	0.44	0.001

*gastrointestinal bleed, AIDS, alcohol use, drug use excluded due to small numbers or redacted data

Table 3. Adjusted rates of adverse perioperative outcomes for patients undergoing cancer surgery at hospitals before and after ACO policy implementation.

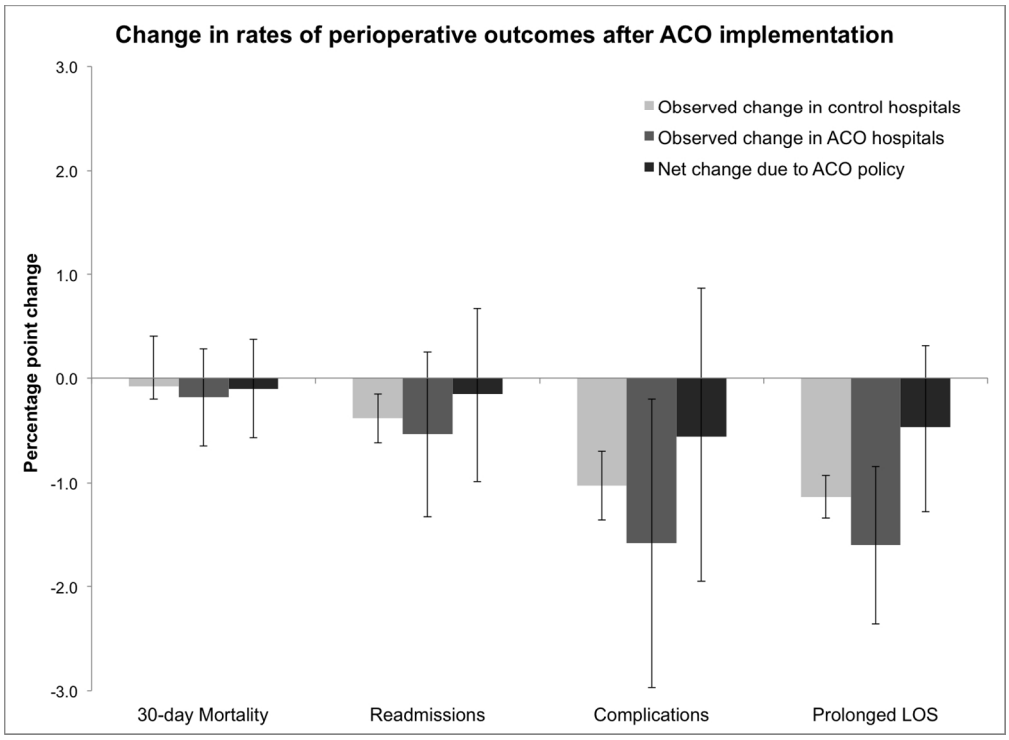
	Control hospitals		ACO hospitals	
	Baseline	Post-implementation	Baseline	Post-implementation
30-day Mortality	3.4%	3.3%	3.4%	3.2%
Readmissions	12.5%	12.1%*	12.6%	12.0%
Complications	43.8%	42.7%*	44.0%	42.5%
Prolonged LOS	10.0%	8.9%*	10.0%	8.4%

Adjusted for surgery type, age, gender, race, region, bed size, hospital profit status, teaching status, rural/urban location, cancer procedure volume and comorbidities
*Change from baseline (p≤0.001)

Legend: Statistically significant decline in readmissions, complications and prolonged LOS for patients undergoing a major cancer surgery at control hospitals with parallel trends in perioperative outcomes at ACO hospitals.

Table 4. Relative risk of adverse perioperative outcomes in control hospitals during the post-implementation versus baseline time periods (*p<0.05).

	Mortality	Readmissions	Complications	Prolonged LOS
Prostate	0.84 (0.57-1.24)	1.03 (0.95-1.11)	0.97 (0.93-1.02)	0.89 (0.83-0.94)*
Bladder	1.14 (0.93-1.41)	1.01 (0.95-1.07)	0.98 (0.96-1.00)	0.89 (0.79-1.00)
Esophagus	0.83 (0.55-1.24)	1.06 (0.90-1.24)	0.92 (0.86-0.99)*	0.73 (0.55-0.97)*
Pancreas	0.95 (0.75-1.20)	1.01 (0.93-1.10)	0.95 (0.91-0.99)*	0.86 (0.74-0.99)*
Lung	0.98 (0.89-1.07)	0.91 (0.87-0.95)*	0.92 (0.90-0.95)*	0.88 (0.84-0.92)*
Liver	0.86 (0.59-1.26)	0.92 (0.76-1.11)	0.96 (0.88-1.04)	0.74 (0.60-0.92)*
Kidney	1.11 (0.98-1.30)	0.97 (0.91-1.03)	0.99 (0.97-1.01)	0.92 (0.87-0.98)*
Colorectal	1.00 (0.95-1.04)	0.96 (0.94-0.99)*	0.99 (0.98-1.00)	0.89 (0.86-0.92)*
Ovary	0.71 (0.59-0.86)	0.98 (0.90-1.06)	0.98 (0.95-1.01)	0.92 (0.84-1.02)
All cancers	0.97 (0.94-1.01)	0.97 (0.95-0.99)*	0.98 (0.97-0.98)*	0.88 (0.87-0.90)*



Change in rates of perioperative outcomes after ACO implementation.
268x195mm (150 x 150 DPI)

Supplemental Material 1. Cohort selection.

Cancer type	Diagnosis codes (ICD-9)	Procedure codes (ICD-9)
Prostate	185	603 604 605 6061 6062 6069
Bladder	188 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889	576 577 5771 5779
Esophagus	150 1500 1501 1502 1503 1504 1505 1508 1509	424 4240 4241 4242 4399
Pancreas	157 1570 1571 1572 1573 1574 1575 1576 1577 1578 1579	5252 5251 5253 525 526 527 5259 5222
Lung	162 1620 1621 1622 1623 1624 1625 1626 1627 1628 1629	322 3220 329 3229 3230 3239 324 3241 3249 3250 3529 325
Liver	155 1550 1551 1552	5022 503 504 5059 502 5029
Kidney	189 1890 18900 18901 1898 1891 23691	554 5551 5552 5554 5534 5532 555
Colorectal	1530 1531 1532 1533 1534 1535 1536 1537 1538 1539 1540 1541	457 4571 4572 4573 4574 4575 4576 4579 4849 4581 4582 4583 458 4861 4865 4869 4862 4863 4864 4850 4851 4852 4859 4840 4841 4842 4843 485 486 484 1732 1733 1734 1735 1736 1739
Ovarian	1830	652 6531 6539 6551 6552 6553 6554 6541 6549 6561 6562 6563 6564 664 665 654 656 688 683 6831 6839 684 6841 6849 685 6851 6859 686 6861 6869 687 6871 6879 689 541 5411 5421 544

Supplemental Material 2. Percentage point change in adverse perioperative outcomes attributable to ACO policy (difference-in-differences estimator) by cancer type (*p<0.05)

	Mortality	Readmissions	Complications	Prolonged LOS
Prostate	0.01 (-0.21-0.22)	-1.44 (-2.93-0.08)	0.43 (-1.75-2.61)	0.38 (-0.94-1.63)
Bladder	-1.59 (-4.75-1.50)	-3.51 (-9.61-2.48)	-4.15 (-10.05-2.31)	-0.03 (-4.23-3.96)
Esophagus	2.19 (-2.13-7.67)	-8.67 (-21.88-2.52)	-10.19 (-26.33-5.30)	2.73 (-8.12-13.63)
Pancreas	2.39 (-0.68-5.43)	3.70 (-2.10-9.23)	-3.92 (-12.43-4.39)	-0.28 (-3.41-3.15)
Lung	-0.16 (-1.21-0.87)	1.21 (-1.14-3.57)	-0.22 (-3.63-3.09)	0.40 (-1.61-2.31)
Liver	-2.06 (-4.37-1.10)	3.80 (-10.98-18.78)	-13.3 (-25.69- -3.24)*	0.05 (-19.12-19.30)
Kidney	-0.19 (-1.28-0.90)	0.98 (-1.20-3.16)	-2.17 (-6.07-1.76)	-0.56 (-3.08-1.95)
Colorectal	-0.08 (-1.08-0.92)	-0.32 (-1.97-1.30)	0.45 (-1.93-2.84)	-0.90 (-2.30-0.49)
Ovary	0.25 (-2.30-2.76)	0.87 (-4.18-6.53)	-1.63 (-8.83-5.56)	-0.33 (-3.35-2.74)

Legend: Negative values indicate further decline in adverse events attributable to ACO policies (benefit beyond change seen in control hospitals).