Supplemental Online Content

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eAppendix A. Comparison Group Selection

The comparison group was selected using propensity score matching (PSM) techniques. The objective of PSM is to identify a comparison group that is statistically similar to the treatment group based on observable factors. The key advantage of PSM over other methods is that by using a combination of covariates to compute a single score, it balances the treatment and comparison groups on a large number of covariates without eliminating practices (identified based on Tax Identification Numbers) that may be good matches (i.e., similar), on average, to OCM practices. To estimate the propensity score for each practice, we fitted a logistic regression model to account for episode, practice, and market factors that were conceptually and empirically related to the likelihood that a practice volunteered for OCM. Episode factors included beneficiary Hierarchical Condition Category score, Medicaid dual eligibility status, demographics (race/ethnicity, gender), and cancer type. Race/ethnicity (White, Black, Hispanic, other) was obtained from the Medicare RTI race code variable. This variable is created by taking the original Medicare race code, which is based on beneficiary self-reported race data from the Social Security Administration and applying an algorithm that identifies more beneficiaries as Hispanic or Asian. Additional details are available at https://resdac.org/cms-data/variables/research-triangle-institute-rti-race-code. Practice factors included number of physicians based on unique National Provider Identifiers billing under the TIN, number of episodes, provider specialty mix, whether the practice operated in multiple sites, whether the practice participated in other value-based payment models, and whether the practice was affiliated with an academic medical center. Market factors included market-level Medicare Advantage penetration, median household income, and practice market share. We aggregated each of these factors to the practice-level before including them in the PSM model.

We used nearest neighbor matching, where each OCM practice was matched to one or more (up to ten) non-OCM practices with the nearest propensity score values, and we constrained matches to be within a caliper of 0.33 in terms of their propensity score from the OCM practice. We used matching “with replacement” where a comparison practice could be used as a match for more than one OCM practice. After fitting the model and estimating propensity scores, there were several OCM practices with extremely high propensity scores, driven by episode counts (three very large OCM practices), As a result, we censored episode count to the 99th percentile of the distribution to limit the effect very high episode count had on the PSM model, while keeping all other characteristics the same. In order to ensure similarity between the selected comparison group and the OCM practices, we calculated standardized differences for each variable included in the PSM model, as well as the average standardized difference across all variables. This process provided evidence that the selected comparison group was statistically similar to the OCM practices overall, and on most key characteristics. The average standardized difference was 0.1, indicating good balance overall (eTable 1). Only a handful of variables had a standardized difference greater than 0.2, indicating potential imbalance; these variables were primarily related to practice size (e.g., episode count, number of physicians, multi-site practice).

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eTable 1. Standardized Differences for Comparisons of Oncology Practice Characteristics Before and After Propensity Matching

	All non-OCM practices in comparison pool before matching	All matched comparison practices
Average standardized difference	0.184	0.123
Characteristics		
Mean age	-0.18	-0.15
% Male	-0.21	-0.11
% Black	-0.08	-0.04
% Hispanic	-0.08	0.03
% Medicaid dual eligible	-0.30	-0.10
% Benes in other CMMI initiatives	0.32	0.29
Mean hierarchical condition category score	-0.13	-0.05
Mortality rate among attributed practices	0.06	-0.01
% Low-risk breast cancer	0.14	0.05
% High-risk breast cancer	0.33	0.19
% Low-risk prostate cancer	-0.24	-0.12
% Lung cancer	0.14	0.09
% Lymphoma	0.21	0.11
% Colorectal cancer	0.00	0.05
% Multiple ,myeloma	0.00	-0.04
% Non-reconciliation eligible cancers	-0.14	-0.16
% High-risk prostate cancer	-0.08	-0.06
% Chronic leukemia	-0.08	-0.09
Episode count	0.51	0.39
NPI count	0.57	0.36
Episodes per oncology NPI	-0.07	-0.17
% Attributed	0.17	-0.03
% NPIs with oncology specialty	0.14	0.15
% Oncology NPIs with radiation specialty	-0.03	-0.01
% Oncology NPIs with surgery specialty	0.07	0.11
% Oncology NPIs with gynecology specialty	-0.04	0.04
% Nurse practitioner/physician assistant NPIs	0.29	0.19
Affiliation with academic medical center	0.35	0.22
Multi-site practice	0.53	0.32
Population in county	0.08	0.10
% of population aged 65+	-0.09	-0.09
% in county living below poverty level	0.01	0.02
Medicare Advantage penetration	0.14	0.05
Primary care providers per 10,000	0.18	0.07
Specialist per primary care provider	0.27	0.26
Total number of markets	0.36	0.21
Practice market share	0.21	0.04

CMMI=Centers for Medicare and Medicaid Innovation; NPI=National provider identifier; reflects billing clinicians

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eAppendix B1. Measures of Episode Spending

Medicare spending was measured as total episode payments (TEP), defined as the sum of Medicare Parts A, B, and D payments (using geographically standardized payments for Parts A and B). Part D spending was calculated as the sum of the Low Income Cost Sharing Subsidy Amount + 80% of the Gross Drug Cost Above Out-of-Pocket Threshold (GDCA).

In addition to measuring Total Episode Spending and Part A, Part B and Part D spending, we additionally measured specified sub-components of these Parts. Part A component measures included payments for acute care hospitalizations, post-acute care, and hospice care. Part B component measures included spending for physician E&M visits, radiation therapy, imaging and laboratory testing, chemotherapy drugs, and non-chemotherapy drugs (including supportive care drugs).

eAppendix B2. Initial Chemotherapy Regimens for Lung, Colorectal, High-Risk Breast, and High-Intensity Prostate Cancer Episodes

For lung cancer, colorectal cancer, high-risk breast cancer, and high-intensity prostate cancer episodes, we identified all chemotherapy agents (other than hormonal therapies) received within eight days after the episode-trigger date to identify the episode-initiating treatment regimen. For regimens that can be given at either standard or “dose-dense” intervals, we identified dose-dense regimens by counting the days until the second treatment cycle (since these regimens have different costs and clinical outcomes compared with regimens that are not dose-dense).

eAppendix B3. Chemotherapy-Associated ED Visits and Hospitalizations

We adapted the CMS measure of chemotherapy-associated hospitalizations and ED visits, originally developed and tested among patients receiving chemotherapy in hospital outpatient departments, to also include chemotherapy delivered in physicians’ offices or for patients receiving oral chemotherapy (not including hormonal therapy) covered under Part D. The measure is described in detail here https://cmit.cms.gov/CMIT_public/ViewMeasure?MeasureId=2929. Specifically, we first identified all chemotherapy with dates between the episode trigger start and end dates, including outpatient claims, carrier claims, and Part D claims with a cancer diagnosis on the chemotherapy claim. We assessed ED visits and hospitalizations that occurred within 30 days after Part B chemotherapy infusions or 30 days after the end of a Part D drug prescription (following the last available dose based on fill date plus the number of days dispensed). As specified by the CMS measure, we included ED and hospital claims with a primary discharge diagnosis for one of the following diagnoses (or a secondary diagnosis if the primary diagnosis was “cancer”): anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, or sepsis. We focused on higher-risk episodes because hospitalizations and ED visits are rarely associated with hormonal therapies for breast or prostate cancer or intravesical therapy for bladder cancer.

eAppendix B4. Timeliness of Chemotherapy for Breast Cancer and Colorectal Cancer

We adapted measures from the ASCO Quality Oncology Practice Initiative to assess timeliness of adjuvant chemotherapy, defined as chemotherapy initiation within two months of surgery for stage III colon cancer patients (QOPI measure 58) and early-stage breast cancer. Although we lacked information on stage, we identified chemotherapy treatment episodes with a qualifying cancer surgery (presumed curative-intent) in the 180 days before the start of the episode. We calculated the proportion of episodes in which the patient received their first dose of chemotherapy within 60 days after surgery (numerator) among all with surgeries in the 180 days before the episode (denominator). Presumed curative cancer surgeries were identified with the codes in eTable 2. We also examined timeliness of lung cancer surgery; however, we found evidence for differential trends in the baseline period and therefore these analyses are not reported.

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eTable 2. Surgical Codes for Ascertaining Presumed Curative Surgery for Breast Cancer and Colorectal Cancer

Type	Code	Definition
Breast Cancer Surgery		
ICD9	8521	Local excision of lesion of breast
	8522	Resection of quadrant of breast
	8523	Subtotal mastectomy
	8541	Unilateral simple mastectomy
	8542	Bilateral simple mastectomy
	8543	Unilateral extended simple mastectomy
	8544	Bilateral extended simple mastectomy
	8545	Unilateral radical mastectomy
	8546	Bilateral radical mastectomy
	8547	Unilateral extended radical mastectomy
	8548	Bilateral extended radical mastectomy
ICD10	0HTT0ZZ	Resection of Right Breast, Open Approach
	0HTU0ZZ	Resection of Left Breast, Open Approach
	0HTV0ZZ	Resection of Bilateral Breast, Open Approach
	0HBT0ZZ	Excision of Right Breast, Open Approach
	0HBT3ZZ	Excision of Right Breast, Percutaneous Approach
	0HBT7ZZ	Excision of Right Breast, Via Natural or Artificial Opening
	0HBT8ZZ	Excision of Right Breast, Via Natural or Artificial Opening Endoscopic
	0HBTXZZ	Excision of Right Breast, External Approach
	0HBU0ZZ	Excision of Left Breast, Open Approach
	0HBU3ZZ	Excision of Left Breast, Percutaneous Approach
	0HBU7ZZ	Excision of Left Breast, Via Natural or Artificial Opening
	0HBU8ZZ	Excision of Left Breast, Via Natural or Artificial Opening Endoscopic
	0HBUXZZ	Excision of Left Breast, External Approach
	0HBV0ZZ	Excision of Bilateral Breast, Open Approach
	0HBV3ZZ	Excision of Bilateral Breast, Percutaneous Approach
	0HBV7ZZ	Excision of Bilateral Breast, Via Natural or Artificial Opening
	0HBV8ZZ	Excision of Bilateral Breast, Via Natural or Artificial Opening Endoscopic
	0HBVXZZ	Excision of Bilateral Breast, External Approach
CPT	19120	Excision of cyst, fibroadenoma, or other benign or malignant tumor, aberrant breast tissue, duct lesion, nipple or areolar lesion
	19125	Excision of breast lesion identified by preoperative placement of radiological marker, open; single lesion
	19126	Excision of breast lesion identified by preoperative placement of radiological marker, open; each additional lesion separately identified by a preoperative radiological marker
	19160	Mastectomy, partial (eg, lumpectomy, tylectomy, quadrantectomy, segmentectomy)
	19162	Mastectomy, partial (eg, lumpectomy, tylectomy, quadrantectomy, segmentectomy); with axillary lymphadenectomy
	19180	Mastectomy, simple, complete
	19182	Mastectomy, subcutaneous
	19200	Mastectomy, radical, including pectoral muscles, axillary lymph nodes
	19220	Mastectomy, radical, including pectoral muscles, axillary and internal mammary lymph nodes (Urban type operation)
	19240	Mastectomy, modified radical, including axillary lymph nodes, with or without pectoralis minor muscle, but excluding pectoralis major muscle
	19301	Mastectomy, partial (eg, lumpectomy, tylectomy, quadrantectomy, segmentectomy)
	19302	Mastectomy, partial (eg, lumpectomy, tylectomy, quadrantectomy, segmentectomy); with axillary lymphadenectomy
	19303	Mastectomy, simple, complete
	19304	Mastectomy, subcutaneous
	19305	Mastectomy, radical, including pectoral muscles, axillary lymph nodes
	19306	Mastectomy, radical, including pectoral muscles, axillary and internal mammary lymph nodes (Urban type operation)
	19307	Mastectomy, modified radical, including axillary lymph nodes, with or without pectoralis minor muscle, but excluding pectoralis major muscle

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Type	Code	Definition
Colorectal Cancer Surgery		
ICD9	1731	Laparoscopic multiple segmental resection of large intestine
	1732	Laparoscopic cecectomy
	1733	Laparoscopic right hemicolectomy
	1734	Laparoscopic resection of transverse colon
	1735	Laparoscopic left hemicolectomy
	1736	Laparoscopic sigmoidectomy
	1739	Other laparoscopic partial excision of large intestine
	4571	Open and other multiple segmental resection of large intestine
	4572	Open and other cecectomy
	4573	Open and other right hemicolectomy
	4574	Open and other resection of transverse colon
	4575	Open and other left hemicolectomy
	4576	Open and other sigmoidectomy
	4579	Other and unspecified partial excision of large intestine
	4581	Laparoscopic total intra-abdominal colectomy
	4582	Open total intra-abdominal colectomy
	4583	Other and unspecified total intra-abdominal colectomy
	4604	Resection of exteriorized segment of large intestine
	4840	Pull-through resection of rectum, not otherwise specified
	4841	Soave submucosal resection of rectum
	4842	Laparoscopic pull-through resection of rectum
	4843	Open pull-through resection of rectum
	4849	Other pull-through resection of rectum
	4850	Abdominoperineal resection of the rectum, not otherwise specified
	4851	Laparoscopic abdominoperineal resection of the rectum
	4852	Open abdominoperineal resection of the rectum
	4859	Other abdominoperineal resection of the rectum
	4861	Transsacral rectosigmoidectomy
	4862	Anterior resection of rectum with synchronous colostomy
	4863	Other anterior resection of rectum
	4864	Posterior resection of rectum
	4865	Duhamel resection of rectum
	4869	Other resection of rectum
ICD10	0DBE0ZZ	Excision of Large Intestine, Open Approach
	0DBE3ZZ	Excision of Large Intestine, Percutaneous Approach
	0DBE4ZZ	Excision of Large Intestine, Percutaneous Endoscopic Approach
	0DBE7ZZ	Excision of Large Intestine, Via Natural or Artificial Opening
	0DBE8ZZ	Excision of Large Intestine, Via Natural or Artificial Opening Endoscopic
	0DBF0ZZ	Excision of Right Large Intestine, Open Approach
	0DBG0ZZ	Excision of Left Large Intestine, Open Approach
	0DBGFZZ	Excision of Left Large Intestine, Via Natural or Artificial Opening With Percutaneous Endoscopic Assistance
	0DBK0ZZ	Excision of Ascending Colon, Open Approach
	0DBL0ZZ	Excision of Transverse Colon, Open Approach
	0DBLFZZ	Excision of Transverse Colon, Via Natural or Artificial Opening With Percutaneous Endoscopic Assistance
	0DBM0ZZ	Excision of Descending Colon, Open Approach
	0DBMFZZ	Excision of Descending Colon, Via Natural or Artificial Opening With Percutaneous Endoscopic Assistance
	0DBN0ZZ	Excision of Sigmoid Colon, Open Approach
	0DBNFZZ	Excision of Sigmoid Colon, Via Natural or Artificial Opening With Percutaneous Endoscopic Assistance
	0DBP0ZZ	Excision of Rectum, Open Approach
	0DBP4ZZ	Excision of Rectum, Percutaneous Endoscopic Approach
	0DTE0ZZ	Resection of Large Intestine, Open Approach
	0DTE4ZZ	Resection of Large Intestine, Percutaneous Endoscopic Approach

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Type	Code	Definition
	0DTE7ZZ	Resection of Large Intestine, Via Natural or Artificial Opening
	0DTE8ZZ	Resection of Large Intestine, Via Natural or Artificial Opening Endoscopic
	0DTF0ZZ	Resection of Right Large Intestine, Open Approach
	0DTF4ZZ	Resection of Right Large Intestine, Percutaneous Endoscopic Approach
	0DTF7ZZ	Resection of Right Large Intestine, Via Natural or Artificial Opening
	0DTF8ZZ	Resection of Right Large Intestine, Via Natural or Artificial Opening Endoscopic
	0DTG0ZZ	Resection of Left Large Intestine, Open Approach
	0DTG4ZZ	Resection of Left Large Intestine, Percutaneous Endoscopic Approach
	0DTG7ZZ	Resection of Left Large Intestine, Via Natural or Artificial Opening
	0DTG8ZZ	Resection of Left Large Intestine, Via Natural or Artificial Opening Endoscopic
	0DTGFZZ	Resection of Left Large Intestine, Via Natural or Artificial Opening With Percutaneous Endoscopic Assistance
	0DTH0ZZ	Resection of Cecum, Open Approach
	0DTH4ZZ	Resection of Cecum, Percutaneous Endoscopic Approach
	0DTH7ZZ	Resection of Cecum, Via Natural or Artificial Opening
	0DTH8ZZ	Resection of Cecum, Via Natural or Artificial Opening Endoscopic
	0DTK0ZZ	Resection of Ascending Colon, Open Approach
	0DTL0ZZ	Resection of Transverse Colon, Open Approach
	0DTL4ZZ	Resection of Transverse Colon, Percutaneous Endoscopic Approach
	0DTL7ZZ	Resection of Transverse Colon, Via Natural or Artificial Opening
	0DTL8ZZ	Resection of Transverse Colon, Via Natural or Artificial Opening Endoscopic
	0DTLFZZ	Resection of Transverse Colon, Via Natural or Artificial Opening With Percutaneous Endoscopic Assistance
	0DTMFZZ	Resection of Descending Colon, Via Natural or Artificial Opening With Percutaneous Endoscopic Assistance
	0DTN0ZZ	Resection of Sigmoid Colon, Open Approach
	0DTN4ZZ	Resection of Sigmoid Colon, Percutaneous Endoscopic Approach
	0DTN7ZZ	Resection of Sigmoid Colon, Via Natural or Artificial Opening
	0DTN8ZZ	Resection of Sigmoid Colon, Via Natural or Artificial Opening Endoscopic
	0DTNFZZ	Resection of Sigmoid Colon, Via Natural or Artificial Opening With Percutaneous Endoscopic Assistance
	0DTP0ZZ	Resection of Rectum, Open Approach
	0DTP4ZZ	Resection of Rectum, Percutaneous Endoscopic Approach
	0DTP7ZZ	Resection of Rectum, Via Natural or Artificial Opening
	0DTP8ZZ	Resection of Rectum, Via Natural or Artificial Opening Endoscopic
CPT	44140	Colectomy, partial; with anastomosis
	44141	Colectomy, partial; with skin level cecostomy or colostomy
	44143	Colectomy, partial; with end colostomy and closure of distal segment (Hartmann type procedure)
	44144	Colectomy, partial; with resection, with colostomy or ileostomy and creation of mucofistula
	44145	Colectomy, partial; with coloproctostomy (low pelvic anastomosis)
	44146	Colectomy, partial; with coloproctostomy (low pelvic anastomosis), with colostomy
	44147	Colectomy, partial; abdominal and transanal approach
	44150	Colectomy, total, abdominal, without proctectomy; with ileostomy or ileoproctostomy
	44151	Colectomy, total, abdominal, without proctectomy; with continent ileostomy
	44155	Colectomy, total, abdominal, with proctectomy; with ileostomy
	44156	Colectomy, total, abdominal, with proctectomy; with continent ileostomy
	44157	Colectomy, total, abdominal, with proctectomy; with ileoanal anastomosis, includes loop ileostomy, and rectal mucosectomy, when performed
	44158	Colectomy, total, abdominal, with proctectomy; with ileoanal anastomosis, creation of ileal reservoir (S or J), includes loop ileostomy, and rectal mucosectomy, when performed
	44160	Colectomy, partial, with removal of terminal ileum with ileocolostomy
	44204	Laparoscopy, surgical; colectomy, partial, with anastomosis
	44205	Laparoscopy, surgical; colectomy, partial, with removal of terminal ileum with ileocolostomy

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Type	Code	Definition
	44206	Laparoscopy, surgical; colectomy, partial, with end colostomy and closure of distal segment (Hartmann type procedure)
	44207	Laparoscopy, surgical; colectomy, partial, with anastomosis, with coloproctostomy (low pelvic anastomosis)
	44208	Laparoscopy, surgical; colectomy, partial, with anastomosis, with coloproctostomy (low pelvic anastomosis) with colostomy
	44210	Laparoscopy, surgical; colectomy, total, abdominal, without proctectomy, with ileostomy or ileoproctostomy
	44211	Laparoscopy, surgical; colectomy, total, abdominal, with proctectomy, with ileoanal anastomosis, creation of ileal reservoir (S or J), with loop ileostomy, includes rectal mucosectomy, when performed
	44212	Laparoscopy, surgical; colectomy, total, abdominal, with proctectomy, with ileostomy
	44213	Laparoscopy, surgical, mobilization (take-down) of splenic flexure performed in conjunction with partial colectomy
	45110	Proctectomy; complete, combined abdominoperineal, with colostomy
	45111	Proctectomy; partial resection of rectum, transabdominal approach
	45112	Proctectomy, combined abdominoperineal, pull-through procedure (eg, colo-anal anastomosis)
	45113	Proctectomy, partial, with rectal mucosectomy, ileoanal anastomosis, creation of ileal reservoir (S or J), with or without loop ileostomy
	45114	Proctectomy, partial, with anastomosis; abdominal and transsacral approach
	45116	Proctectomy, partial, with anastomosis; transsacral approach only (Kraske type)
	45119	Proctectomy, combined abdominoperineal pull-through procedure (eg, colo-anal anastomosis), with creation of colonic reservoir (eg, J-pouch), with diverting enterostomy when performed
	45120	Proctectomy, complete (for congenital megacolon), abdominal and perineal approach; with pull-through procedure and anastomosis (eg, Swenson, Duhamel, or Soave type operation)
	45121	Proctectomy, complete (for congenital megacolon), abdominal and perineal approach; with subtotal or total colectomy, with multiple biopsies
	45123	Proctectomy, partial, without anastomosis, perineal approach
	45126	Pelvic exenteration for colorectal malignancy, with proctectomy (with or without colostomy), with removal of bladder and ureteral transplantations, and/or hysterectomy, or cervicectomy, with or without removal of tube(s), with or without removal of ovary(s), or any combination thereof

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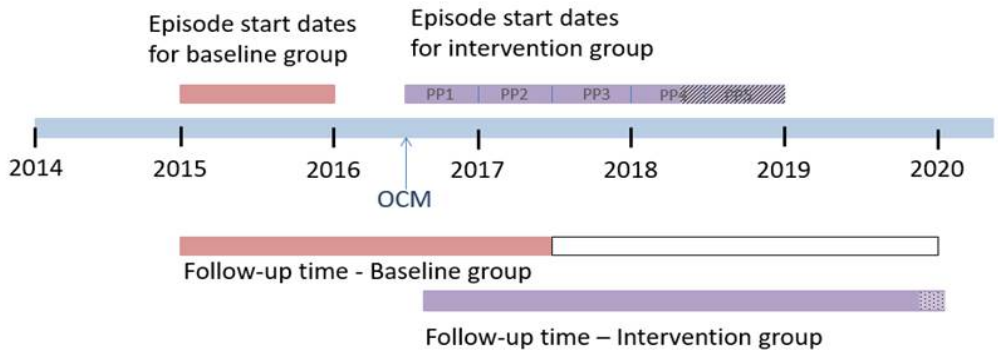
eAppendix B5. Survival

For this beneficiary-level analysis, we identified OCM-defined cancer episodes for beneficiaries who had no episode in the prior 12 months. We assigned beneficiaries to the OCM or comparison group based on that episode, measuring survival time from the start of that episode. Beneficiaries could have more than one episode if they had another 12-month period without chemotherapy (2.1% of beneficiaries had more than one episode and thus were included in the survival analysis twice). We compared restricted mean survival time (RMST) in days through 18 months for beneficiaries in OCM and comparison groups. We studied survival through 18 months to allow for similar follow up in baseline and intervention periods while also limiting crossover of observations from the baseline period into the intervention period. RMST has several advantages over assessing survival at a single point in time or using proportional hazards models. First, it provides a single estimate with clinically meaningful results, for example, survival differences in number of days, weeks, or months. Second, it provides a more precise estimate than the median survival time. Third, it allows use of all data to a time *t* during follow-up time (rather than arbitrary cut-points like six months, 12 months). Finally, it does not rely on the proportional hazards assumption (which preliminary analyses of survival curves suggested was not held for some cancer types).

We conducted analyses among all beneficiaries with one of seven cancer types that have high prevalence and at least moderately high mortality (acute leukemia, chronic leukemia, lymphoma, lung cancer, pancreatic cancer, colorectal cancer, high-risk breast cancer). We did not examine survival for beneficiaries receiving only hormonal therapies for breast cancer or prostate cancer because cancer-related mortality in these beneficiaries is very low. We also assessed survival separately for each of the seven included cancer types, since the individual cancers have very different survival probabilities and because there could be heterogeneity in treatment effects.

Survival differences of 30 days or less are not generally considered to be clinically significant (e.g., for randomized clinical trials of new drug therapies). We therefore considered survival in the two groups to be clinically equivalent if the DID point estimate and 90 percent confidence limits for the OCM group are within +/-30 days of the 18-month RMST for the comparison group. We examined survival through 18 months, starting with a beneficiary's first episode in the baseline or intervention period (with no episode in the prior 12 months). Baseline episodes began in January 2015–December 2015 and were followed through July 2017. Intervention episodes began July 2016–April 30, 2018 with follow-up through October 31, 2019. Death data (from Medicare/SSA records) are ≥98.8 percent complete after three months. Therefore, although the first 30-months of OCM included episodes that started on or before January 1, 2019, we limited analyses to those that began by April 30, 2018, to allow for complete death data for all patients through 18 months (see eFigure 1). We conducted DID analyses to assess the impact of OCM on survival. Models included all patient- and practice-level variables described previously. The model that included all cancers combined also adjusted for cancer type.

eFigure 1. Timing of Episodes and Follow-Up Time in Baseline and Intervention Episodes



Areas in episode start date with diagonal lines reflects episodes with <18 months of follow up data.
Dotted area in follow up time reflects data that are not fully complete as of end of 2019.

Because our 18-month follow-up period for baseline episodes that started before the end of 2015 extended into the intervention period (see eFigure 1), we conducted sensitivity analyses restricting to the beneficiaries whose baseline episode ended before the start of 2017 (to minimize overlap with the start of OCM in July 2016), and those whose intervention episode began before the start of 2018, with follow-up through June 30, 2018. This allowed for similar duration of follow-up in both groups. The results of these sensitivity analyses were similar to the primary analyses and are not presented.

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eAppendix B6. Patient Survey

Patient experiences were assessed using a survey instrument adapted from the CAHPS Cancer Survey, developed by investigators at the American Institutes for Research and the Mayo Clinic with support from the Agency for Healthcare Research and Quality and the California Health Care foundation. Additional details about the CAHPS Cancer Survey development are included at https://www.ahrq.gov/cahps/surveys-guidance/cancer/develop-cancer-surveys.html.
The CAPHS Cancer Survey was designed to measure patient experiences in eight domains of cancer care, including access, communication, shared decision making, symptoms, patient self-management, and patient safety. We adapted the survey, which was still in development at the time we developed the OCM patient survey, to address all types of systemic treatment included in OCM (chemotherapy, biologic therapy, and hormonal therapy). We also augmented the instrument to add items that are of interest to OCM, including symptoms (e.g., nausea, neutropenia, constipation) and management of these symptoms, quality of life, health status, understanding of the purpose of treatment. In addition, we sought to collect information from patients who died during or soon after an episode. We thus developed a slightly reworded "alternative" survey for family members of patients who died before we mailed the survey, and sent this "alternative" survey with a different mailing label and cover letter addressed to "family of" the beneficiary. We further developed a decedent questionnaire that was mailed to family of beneficiaries who died within 12 months of their episode initiation. Additional details of these latter versions of the survey can be obtained in two previously published papers: Gu Q, Hassol A, Creel A, Keating NL. Tailored strategies to enhance survey response among proxies of deceased patients. Health Serv Res. 2018;53(5):3825-3835 and Christian TJ, Hassol A, Brooks GA, Gu Q, Kim S, Landrum MB, Keating NL. How do claims-based measures of end-of-life care compare to family ratings of care quality? J Am Geriatr Soc 2021 Apr;69(4):900-907. We conducted cognitive testing on new questions with a small convenience sample of Medicare beneficiaries with recent chemotherapy experience.

The overall rating item and items comprising key domains are included in eTable 3. These domains were based on the domains from the Cancer CAHPS draft surveys (current versions described here https://www.ahrq.gov/cahps/surveys-guidance/cancer/survey-measures.html) and principal components analyses conducted by our team. Items were summed and scaled 0 to 10. Patients also were asked how much about their out-of-pocket spending in the past year. Responses were <$100, $100-$499, $500-999, $1000-$1999, $2000-$4999, $5000 or more.

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eTable 3. Patient Experience Composites and Overall Rating

Composite	Questions
Overall rating	Number from 0 (worst possible) to 10 (best possible) the patient rates cancer therapy team
Access (Range 0-10)	Encouraged contact between visits once drug therapy was decided[a] Told patient to call immediately about side effects once drug therapy was decided[a] Gave patient clear instructions on how to contact after-hours once drug therapy was decided[a] Visits scheduled at convenient times[b] Tests and procedures scheduled as soon as needed[b] Waited longer than expected for test results[b]
Effective communication (Range 0-10)	Showed respect for patient[b] Listened carefully to patient[b] Was straightforward when talking to patient about therapy[b] Spent enough time with patient[b]
Enabling patient self-management (Range 0-10)	Talked with patient about pain[c] Helped patient deal with pain (if a problem)[a] Talked with patient about changes in energy[c] Helped patient deal with changes in energy (if a problem)[a] Talked with patient about emotional problems, such as anxiety or depression[c] Helped patient deal with emotional problems (if a problem)[a] Talked with patient about additional services to manage cancer care at home[a] Talked with patient about things to do to maintain health during treatment[a]
Exchanging information (Range 0-10)	Clearly explained how cancer and drug therapy would affect normal activities[a] Told patient what the next steps in treatment would be[a] Explained test results in a way that was easy to understand[b] Explained medications in a way that was easy to understand[a]
Shared decision making (Range 0-10)	Talked with patient about reasons to have drug therapy[a] Talked with patient about reasons to not have drug therapy[a] Asked for patient opinion on whether or not to have drug therapy[a] Involved patient in decisions about treatment as much as they wanted[a]
Symptom Management (Range 0-10)	Helped patient deal with pain (if a problem)[a] Helped patient deal with changes in energy levels (if a problem)[a] Helped patient deal with emotional problems (if a problem)[a] Helped patient deal with nausea/vomiting (if a problem)[a] Helped patient deal with difficulty breathing (if a problem)[a] Helped patient deal with coughing (if a problem)[a] Helped patient deal with constipation/diarrhea (if a problem)[a] Helped patient deal with neuropathy (if a problem)[a]

Notes: [a] Responses are "Yes, definitely"; "Yes, somewhat"; and "No." [b] Responses are "Never," "Sometimes," "Usually," and "Always." [c] Responses are "Yes" and "No."

We surveyed a sample of beneficiaries in OCM practices by mail each quarter because patient experiences contributed to the OCM Performance Based Payment Quality Score. Surveys for beneficiaries with episodes April 2016-September 2016 were fielded in January through March 2017; this allowed time for the 6-months episodes to complete so that when patients are asked about care in the past 6 months their responses do not include periods before their OCM episode began. Additional waves were conducted every 3 months. We additionally surveyed patients in comparison practices at baseline January through March 2017 for episodes beginning in April 2016 through September 2016 and in Year 3 surveys fielded in February 2018 through June 2019 for episodes beginning in July 2018 through December 2018. We used surveys from OCM beneficiaries in comparable time periods for the DID analyses (see eAppendix C).

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In each survey wave, we sampled patients who received OCM-defined chemotherapy in the previous six months, and we assigned each to the practice that billed the most evaluation and management (E&M) visits for that beneficiary between the episode triggering and the date that the patient was identified for the survey. Specifically, we drew a proportionate sample of patients treated by each oncology practice participating in OCM (or comparison practice for the relevant waves), stratified by patient age, race/ethnicity, and cancer type.

For beneficiaries who had died by the time of the survey, a tailored alternative questionnaire was sent to family proxies that included the same care experience questions as the main survey except current health status, and also asked about end-of-lifecare (see Gu Q, Hassol A, Creel A, Keating NL. Tailored strategies to enhance survey response among proxies of deceased patients. Health Serv Res. 2018;53(5):3825-3835). For cancer patients who were alive for the initial survey mailing but who died during the subsequent year, a decedent questionnaire was sent to the proxy family members asking about the patient's care experiences, including care at the end-of-life. Average response rates were similar between OCM and comparison patients. For the main survey, the response rate was 47.1% for both OCM and comparison patients. For the tailored alternative survey, the response rate was 35.4% for the OCM group and 39.3% for the comparison group. For the decedent survey, the response rate was 39.2% for the OCM group and 39.7% for the comparison group. Comparisons of survey respondents and non-respondents in the OCM and comparison groups are included in eTable 4.

The survey administration followed a protocol similar to that for the Consumer Assessment of Healthcare Providers and Systems, with an initial survey mailing, a thank–you/reminder postcard 1 week later, and a second survey mailing to nonrespondents 3 weeks after the first. The survey packets included an invitation cover letter, the 12-page paper questionnaire, and a prepaid envelope to return the survey.

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eTable 4. Comparison of Survey Respondents and Nonrespondents in the OCM and Comparison Groups

	OCM				Comparison			
Characteristic	N	Respondents, %	Nonrespondents ,%	Standardized difference	N	Respondents, %	Nonrespondents ,%	Standardized difference
Age				0.197				0.198
<65	4738	7.31	12.77		3706	7.28	12.79	
65-74	22746	51.54	47.11		17730	51.09	47.08	
75-84	14620	33.10	30.31		11420	33.24	30.03	
85+	4161	8.05	9.81		3374	8.39	10.11	
Sex				0.018				0.035
Male	19802	43.27	42.40		16694	47.01	45.27	
Female	26462	56.73	57.60		19536	52.99	54.73	
Dual eligibility				0.314				0.319
Dually eligible	7422	9.86	21.38		5983	10.16	22.01	
Not dually eligible	38169	88.52	77.30		29732	88.38	76.60	
Missing	674	1.62	1.32		515	1.46	1.39	
Race/ethnicity				0.235				0.263
Non-Hispanic White	37744	86.06	77.72		29486	86.48	76.97	
Non-Hispanic Black	4385	7.13	11.51		3419	6.66	11.84	
Asian/Pacific Islander	849	1.35	2.25		837	1.58	2.94	
Hispanic	2094	2.85	5.97		1586	2.75	5.78	
American Indian/Alaska Native	241	0.48	0.56		89	0.21	0.28	
Other	311	0.65	0.69		252	0.63	0.75	
Missing	640	1.48	1.30		561	1.68	1.44	
Cancer type				0.130				0.118
Breast cancer	13606	28.88	29.86		9376	25.40	26.30	
Prostate cancer	6030	12.77	13.26		5868	15.86	16.49	
Lung cancer	5006	10.60	11.01		3896	10.32	11.13	
Lymphoma	2964	7.52	5.45		2157	6.79	5.23	
Multiple myeloma	2748	6.44	5.51		2298	7.09	5.69	
Colorectal/intestinal cancer	2652	5.42	6.00		2051	5.32	5.95	
Chronic leukemia	1343	3.24	2.61		1013	3.02	2.61	

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	OCM				Comparison			
Characteristic	N	Respondents, %	Nonrespondents ,%	Standardized difference	N	Respondents, %	Nonrespondents ,%	Standardized difference
Pancreatic cancer	1224	2.65	2.64		892	2.36	2.55	
Bladder cancer	1172	2.35	2.70		907	2.45	2.55	
Gastric/esophageal cancer	874	1.81	1.96		658	1.84	1.79	
Head and neck cancer	842	1.68	1.94		597	1.45	1.82	
Ovarian cancer	794	1.94	1.52		711	1.87	2.04	
Female genitourinary non-ovarian	665	1.43	1.45		526	1.40	1.49	
Myelodysplastic syndrome	631	1.39	1.34		494	1.42	1.31	
Kidney cancer	613	1.43	1.24		498	1.44	1.32	
Liver cancer	585	1.11	1.39		436	1.09	1.30	
Malignant melanoma	523	1.27	1.01		450	1.52	1.00	
Endocrine tumor	491	1.04	1.08		432	1.16	1.22	
Central nervous system tumor	386	0.62	1.02		279	0.71	0.82	
Acute leukemia	361	0.78	0.78		343	0.89	1.00	
Anal cancer	144	0.27	0.35		126	0.38	0.32	
Other cancer	2611	5.37	5.88		2222	6.22	6.06	
Practice characteristics								
Number of oncology NPIs				0.009				0.032
3 or fewer	1796	3.88	3.88		2920	7.67	8.40	
4-12	13296	28.95	28.55		8418	23.74	22.79	
12+	31173	67.17	67.56		24892	68.59	68.81	
Number of OCM episodes				0.023				0.044
First quartile	31427	68.50	67.51		25610	70.60	70.80	
Second quartile	11242	23.84	24.72		6279	17.78	16.95	
Third quartile	2827	6.03	6.19		3223	8.92	8.88	
Fourth quartile	742	1.63	1.58		1110	2.70	3.38	
Specialty mix				0.031				0.008
Multispecialty	34166	73.15	74.53		27791	76.55	76.90	
Oncology only	12071	26.85	25.47		8423	23.45	23.10	
Ownership				0.056				0.021

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	OCM				Comparison			
Characteristic	N	Respondents, %	Nonrespondents ,%	Standardized difference	N	Respondents, %	Nonrespondents ,%	Standardized difference
Independent	25875	57.44	54.68		12362	33.71	34.68	
Hospital or system affiliated	20363	42.56	45.32		23751	66.29	65.32	
Academic medical center				0.066				0.050
Non-academic	36565	80.52	77.84		28403	79.51	77.47	
Academic	9673	19.48	22.16		7819	20.49	22.53	

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eAppendix C. Analyses

Claims-based analyses used a DID approach as described in the main text of the Article to compare care in episodes in the 201 OCM practices with episodes in the 534 comparison practices. Although the original number of practices that were reported to enter OCM contracts was 190, there were some practices for which overlap in physicians billing under more than one practice required participation in OCM, resulting in 201 practices in the OCM group.

DID models generally took the form of

$$Y = \beta_0 + \beta_1 OCM + \beta_2 POST + \beta_3 OCM*POST + \beta_4 COVARIATES$$

where OCM reflects OCM episodes and post reflects episodes in the intervention period. The goal of this model is to assess differences in changes over time between the OCM and comparison practices. The variable of interest is B_3 reflecting the impact of OCM in the intervention period.
For the measures of spending and utilization, we used a dynamic version of the model, where a set of performance period quarter dummy variables was included instead of the single POST variable. To get a single cumulative effect fo OCM, we summed up DID estimates for individual quarters and weighted them by the proportion of episodes in that quarter.

DID models adjusted for episode, practice, and market-level covariates. Episode-level covariates included cancer type, demographics (age, race/ethnicity, gender), hierarchical condition category (HCC) risk score, Medicaid dual eligibility, and alignment to other CMS initiatives. Practice-level covariates include measures of practice size, provider specialty mix, hospital ownership and health system affiliation, and academic medical center affiliation. County-level market covariates include market population, market demographic factors, market healthcare provider supply, and market-level exposure to Medicare Advantage. Adjustment variables were categorized as in Table 1 and eTable 3. We also included state fixed effects to adjust for state-level characteristics (e.g., regulations, policies) not otherwise captured by the market-level covariates. Because multiple episodes were attributed to the same practice, we adjusted standard errors for clustering at the practice level. In addition to testing for main effects, for our primary analyses of total episode spending, we additionally tested the triple interaction to assess if the association of OCM with total episode payments differed for higher-risk versus lower-risk episodes. Twenty-six practices left OCM during the first three years of the model; these practices were analyzed according to their original group (OCM group).

The DID models rely on the assumption that trends in the pre-period are similar. For all measures reported, we assessed for evidence of differential trends. Specifically, we hypothesized that trends were not different using linear regression with an indicator for OCM vs. comparison, and indicator for time trend (6 quarters in the baseline period) and the interaction. We considered evidence of differential trends if the p value for the interaction term was <0.05. These tests of non-differential trends have been described in prior reports, but we have summarized them in eTable 5, where we have also summarized all measures assessed using DID analyses. We observed evidence of differential trends for 5 measures. For two (Part B payments and immunotherapy use for melanoma episodes, results were robust to analyses assessing the sensitivity of findings to these differential trends. For three other measures (Other Part B payments, Number of intensive care unit stays, and timeliness of lung cancer chemotherapy, the measures were deemed non-important and/or findings were not robust to analyses accounting for differential trends, and these were not presented (except for Other Part B payments, because it is part of the Part B payment components—we have suppressed the DID estimate for this measure. Tests for differential trends were not possible for the survey measures because we had data for only one point in time during the baseline period.

The vast majority of covariates included in the DID models had no missing data. There were two cases where data were missing. Specifically, there were a small number of practices for which we could not assign health system affiliation or hospital ownership. As a result, we coded affiliation/ownership with a categorical variable, with one of the values indicating missing data so that episodes would not get dropped from the model. In addition, there was one practice located in a county that had a missing specialist per PCP ratio calculated from the AHRF data. We imputed the value for this variable based on the other attributes of the county to prevent all of the practice's episodes from being dropped from the model.

Several analyses differed from the primary DID approach. Analyses of initial chemotherapy regimens were descriptive due to the many permutations of chemotherapy regimens. For analyses of

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immunotherapy use, we conducted DID analyses when immunotherapy was used for at least 5% of episodes in the baseline period (lung cancer, kidney cancer, melanoma); for cancer types with no or minimal use in the baseline period, we assessed trends in use in the intervention period.

For survey analyses, we conducted DID analyses, with adjustment for patient and practice characteristics. Patient characteristics included: age group; gender; race/ethnicity; Medicare and Medicaid dual-eligibility; self-reported education level; overall health and mental health; whether another person helped complete the survey (i.e., proxy respondent); cancer type; comorbidity indicators (represented by aggregate groups of hierarchical condition category indicators); duration between the start of current chemotherapy and the end of the most recent prior chemotherapy; breast/prostate cancer with long-term oral hormonal therapy only (no other chemotherapy); cancer-related surgery or radiation therapy during the episode; and the calendar month when the episode was triggered. Practice characteristics included: practice size categories (based on the number of oncologist NPIs), academic medical center affiliation, oncology versus multi-specialty practice, practice affiliation with a health system, and hospital ownership. We adjusted all analyses with sampling and nonresponse weights, and we clustered the standard errors at the practice level.

To assess the potential of bias from survey nonresponse, we compared the characteristics of respondents and nonrespondents among the OCM and comparison groups (eTable 4; see Johnson TP, Wisler JS. Response rates and nonresponse errors in surveys. JAMA 2012; 307: 1805-6). Standardized differences for nearly all patient and practice characteristics were within accepted ranges (less than 0.25; see Garrido MM, Kelley AS, Paris J, et al. Methods for constructing and assessing propensity scores. Health Serv Res. 2014;49(5): 1701-1720). In both the intervention and comparison groups, patients with dual eligibility and non-White patients were less likely than other patients to respond to the survey. However, differences in patient and practice characteristics between respondents and nonrespondents were similar between the intervention and comparison groups. While differential response propensities across patient subgroups may indicate a risk of bias from survey non-response, we adjusted all analyses using survey non-response weights. Additionally, given the focus of this study in evaluating the effect of OCM, and so long as response rate patterns were similar between the intervention and comparison groups, estimates of the OCM impact will be unbiased by survey nonresponse.

As noted above, there were not good comparison practices for two very large practices that participated in OCM. Thus, all analyses were repeated after excluding these two large practices. Results were similar and are not presented. Two exceptions were for analyses of immunotherapy, where the DID analyses demonstrated greater increases in use of immunotherapy for OCM vs. comparison episodes for lung cancer and melanoma (Table 4). After excluding these two large practices, these differences were not statistically significantly different (lung cancer DID=0.9 percentage points, 90% CI -1.1, 2.8; melanoma DID=1.9 percentage points, 90% CI -0.2, 3.9).

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eTable 5. Measures and Assessments of Differential Baseline Trends

Measure	N quarters in baseline period	Beta	Lower 95% CI	Upper 95% CI	P value
Change in Total Episode Payments (without MEOS)					
Overall	6	40.97	-112.95	47.65	0.43
Higher-risk episodes	6	58.14	-195.00	32.90	0.16
Lower-risk episodes	6	25.28	-16.68	82.42	0.19
Total Episode Payment Components					
Part A Payments	6	20.87	-65.89	15.92	0.23
Part B Payments	6	29.91	-36.98	80.28	0.47
Part D Payments[a]	6	17.05	-68.31	-1.48	0.04
Part B Payment Sub-Components					
Chemotherapy drugs	6	21.84	-41.92	43.69	0.97
Chemotherapy administration	6	2.06	-2.51	5.58	0.46
Cancer E&M visits	6	0.95	-2.95	0.79	0.26
Non-cancer E&M visits	6	2.36	-7.38	1.86	0.24
Radiation therapy	6	4.03	-3.21	12.61	0.24
Imaging	6	2.19	-6.47	2.11	0.32
Non-chemotherapy drugs	6	12.40	-13.32	35.27	0.38
Subset of non-chemotherapy drugs: supportive care drugs	6	10.07	-18.03	21.43	0.87
Laboratory tests	6	1.43	-2.09	3.50	0.62
Other (not including MEOS)[b]	6	2.89	0.22	11.57	0.04
Association of OCM with Health Care Utilization per Six-Month Episode					
Hospitalizations and Emergency Department Visits					
% with acute care hospital inpatient stay	6	0.004	-0.007	0.007	0.93
Number of acute care hospital stays	6	0.003	-0.006	0.006	0.98
% with ED visit not resulting in an inpatient stay	6	0.003	-0.006	0.007	0.82
Number of ED visits not resulting in an inpatient stay	6	0.003	-0.007	0.006	0.87
Evaluation & Management (E&M) Visits					
Number of E&M visits per episode	6	0.003	-0.007	0.006	0.86
Number of cancer-related E&M visits per episode	6	0.002	-0.006	0.002	0.27
Imaging Services					
Number of standard and other Imaging services per episode	6	0.002	-0.004	0.004	0.96

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Measure	N quarters in baseline period	Beta	Lower 95% CI	Upper 95% CI	P value
Number of advanced imaging services per episode	6	0.002	-0.003	0.006	0.47
Association of OCM with Additional Health Care Utilization Measures					
% with intensive care unit stay	6	-0.009	0.006	-0.022	0.15
Number of intensive care unit stays[c]	6	-0.012	0.006	-0.023	0.04
% with 30-day unplanned readmission	6	0.000	0.001	-0.002	0.96
Number of 30-day unplanned readmissions	6	0.000	0.006	-0.013	0.95
Occurrence of outpatient rehabilitation therapy service	6	-0.001	0.005	-0.012	0.83
Number of outpatient rehabilitation therapy services per episode	6	-0.002	0.009	-0.020	0.79
Association of OCM with Chemotherapy					
Number of Part B Novel Therapy Drug Services per Episode					
High-risk breast cancer	6	0.025	-0.046	0.051	0.93
Lung cancer	6	0.036	-0.115	0.026	0.22
Lymphoma	6	0.047	-0.121	0.064	0.54
Colorectal cancer	6	0.011	-0.032	0.010	0.29
Chronic leukemia	6	0.052	-0.141	0.063	0.46
Proportion of Episodes with Any Immunotherapy Use for…					
Lung cancer	6	-0.001	-0.004	0.003	0.66
Kidney cancer	6	0.007	-0.001	0.016	0.09
Melanoma[a]	6	-0.117	-0.031	-0.003	0.02
Association of OCM with Quality of Care and Outcomes					
Proportion with chemotherapy-associated hospitalizations and ED visits					
Chemotherapy-associated hospitalization	6	0.01	-0.01	0.02	0.42
Chemotherapy-associated ED visit	6	0.00	0.01	0.01	0.91
Proportion receiving adjuvant chemotherapy within 60 days of surgery for…					
Breast cancer	6	-0.006	-0.015	-0.002	0.14
Colorectal cancer	6	-0.002	-0.013	-0.010	0.80
Lung cancer[c]	6	-0.032	-0.050	0.013	0.001
Proportion with specific care at the end of life					

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Measure	N quarters in baseline period	Beta	Lower 95% CI	Upper 95% CI	P value
Part B Chemotherapy in last 14 days of life	6	0.02	-0.01	0.05	0.26
Any hospitalization in the last 30 days of life	6	-0.01	-0.03	0.00	0.15
ED use (2+ visits) in last 30 days of life	6	-0.01	-0.03	0.02	0.60
Hospice enrollment ≥3 days before death	6	0.01	-0.01	0.03	0.47
Restricted mean survival time through 18 months in days					
All cancers	4	0.001	-0.005	0.007	0.70
Acute leukemia	4	-0.011	-0.057	0.036	0.65
Lung cancer	4	-0.000	-0.011	0.01-	0.93
Chronic leukemia	4	-0.004	-0.011	-0.020	0.60
Colorectal cancer	4	0.008	-0.004	0.020	0.18
Pancreas cancer	4	-0.006	-0.028	0.023	0.11
Lymphoma	4	0.000	-0.010	0.011	0.95
High-risk breast cancer	4	0.002	-0.006	0.010	0.62
Association of OCM with Patient Experiences[d]					
Overall rating of care	n/a	-	-	-	-
Shared decision making	n/a	-	-	-	-
Access	n/a	-	-	-	-
Affective communication	n/a	-	-	-	-
Exchanging information	n/a	-	-	-	-
Enabling patient self–management	n/a	-	-	-	-
Symptom management	n/a	-	-	-	-
Out of pocket costs	n/a	-	-	-	-

[a]Analyses were robust to testing the sensitivity of our findings to differential trends.

[b]Other payments include payments for services such as ambulance, chiropractor, physical therapy, occupational therapy, vision, hearing and speech services, durable medical equipment, ambulatory surgical care facility fees, anesthesia; included in Table to account for all parts of Part B payments but noted that evidence for differential trends noted.

[c]Analyses were not robust to testing the sensitivity of our findings to differential trends or measure was not considered of primary importance and thus results are not presented.

[d]Tests for differential trends were not conducted for survey measures because baseline data were only available at one point in time.

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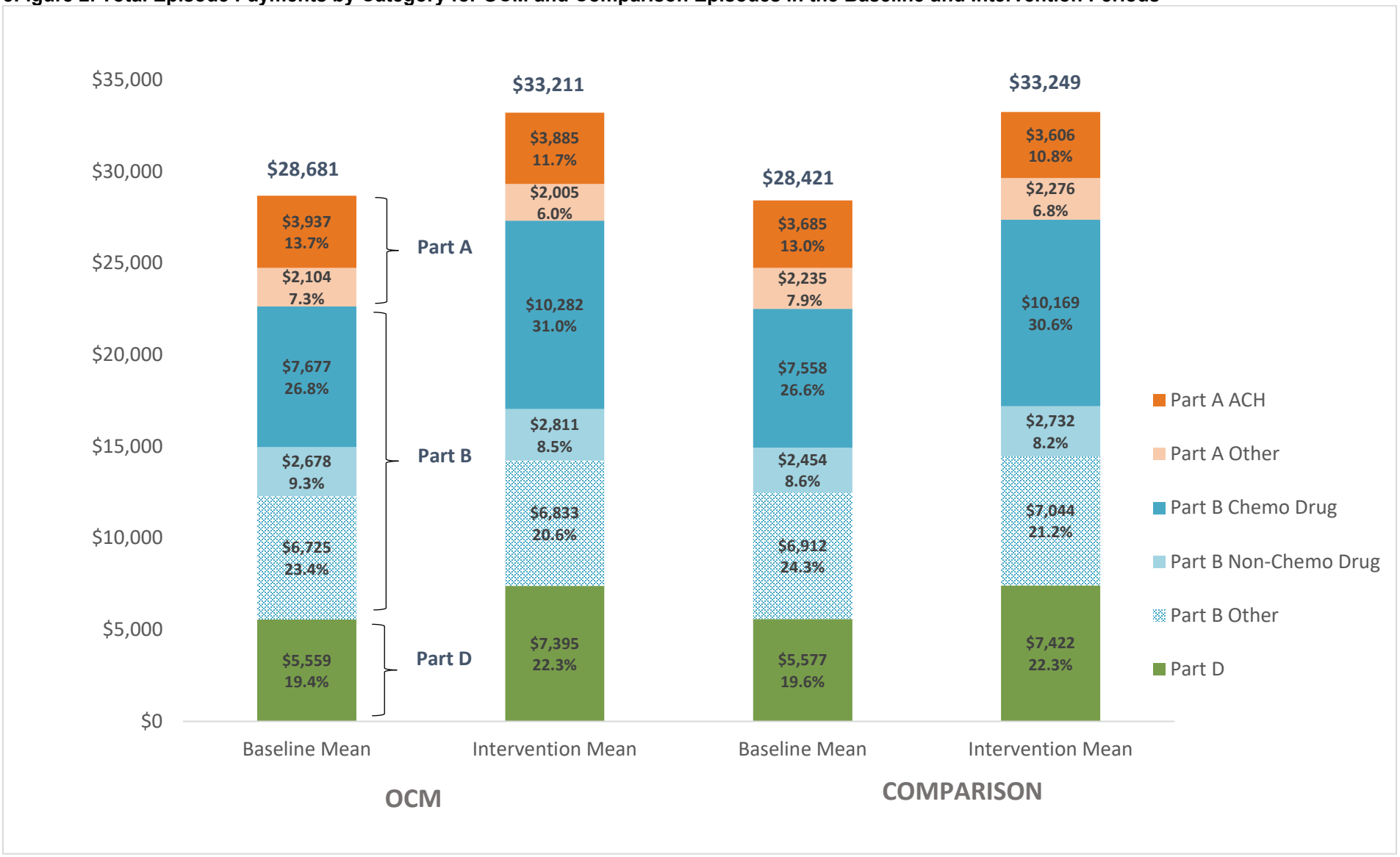
eFigure 2. Total Episode Payments by Category for OCM and Comparison Episodes in the Baseline and Intervention Periods



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eTable 6. Additional Beneficiary, Practice and Market Characteristics of OCM and Comparison Episodes

	OCM Baseline	OCM Intervention	Comparison Baseline	Comparison Intervention
N episodes	345,881	641,451	405,605	716,992
Additional Beneficiary Characteristics				
Source of chemotherapy during episode (%)				
Part B Only	54.1	52.0	53.7	52.9
Part D Only	34.6	36.1	34.2	34.4
Parts B and D	11.3	11.9	12.1	12.6
Beneficiary alignment to other value-based models (%)				
Yes	30.4	43.5	25.6	39.5
No	69.6	56.5	74.4	60.5
Previous episode in last period (%)				
Yes	51.9	52.0	51.6	50.9
No	48.1	48.0	48.4	49.1
Enrolled in Part D for all months of episode (%)				
Yes	80.5	83.2	81.3	83.6
No	19.5	16.8	18.7	16.4
Practice Characteristics				
Affiliated with academic medical center (%)				
Yes	18.4	20.0	16.7	20.2
No	81.6	80.0	83.3	79.8
Affiliated with health system (%)				
Yes	31.7	36.0	57.5	60.8
No	68.2	63.8	42.3	38.7
Missing	0.1	0.2	0.2	0.5
Owned by a hospital (%)				
Yes	27.7	16.3	50.2	32.3
No	72.3	83.5	49.6	67.2
Missing	0.1	0.2	0.2	0.5
Total episode quartile (%)				
Q1	1.0	0.7	5.0	3.9
Q2	3.4	3.2	15.7	12.1
Q3	14.5	10.1	25.5	22.3
Q4	81.2	85.9	53.8	61.6
Oncology specialty practice (%)				
Yes	21.1	18.6	27.1	23.8
No	78.9	81.4	72.9	76.2
Practice has < 4 oncologists (%)				
Yes	2.8	2.0	14.6	11.2
No	97.2	98.0	85.4	88.8
Practice has ≥ 1 radiation oncologist (%)				
Yes	70.4	70.9	47.9	53.6
No	29.6	29.1	52.1	46.4
Practice has ≥ 1 gynecologic oncologist (%)				
Yes	54.3	63.3	35.9	42.0
No	45.7	36.7	64.1	58.0
Practice has ≥ 1 surgical oncologist (%)				
Yes	42.6	48.2	26.9	36.6
No	57.4	51.8	73.1	63.4

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	OCM Baseline	OCM Intervention	Comparison Baseline	Comparison Intervention
Percent NP/PA quartile (%)				
Q1	24.4	11.6	26.3	19.3
Q2	17.0	15.7	9.4	6.2
Q3	29.4	20.5	33.3	26.4
Q4	29.2	52.3	31.0	48.1
Market Characteristics				
Population quartile (%)				
Q1	1.2	1.5	5.3	4.7
Q2	8.3	8.5	15.6	14.2
Q3	15.1	14.6	25.9	25.1
Q4	75.3	75.4	53.2	56.0
Percent 65 and older quartile (%)				
Q1	38.0	22.3	39.4	26.1
Q2	30.1	37.4	31.2	35.9
Q3	17.6	21.4	18.8	24.3
Q4	14.2	18.9	10.6	13.8
Percent poverty quartile (%)				
Q1	20.5	26.6	19.3	31.2
Q2	34.0	33.7	23.1	28.1
Q3	27.9	31.9	36.5	28.2
Q4	17.6	7.8	21.1	12.4
Medicare Advantage penetration quartile (%)				
Q1	10.2	5.3	13.0	6.7
Q2	28.8	19.0	30.7	25.4
Q3	34.0	41.6	30.1	31.5
Q4	26.9	34.2	26.1	36.4
Specialist per PCP ratio quartile (%)				
Q1	1.9	1.8	5.0	5.0
Q2	7.2	8.0	14.5	10.8
Q3	13.3	12.1	24.9	23.8
Q4	77.5	78.0	55.6	60.4
Market inpatient ER visits quartile (%)				
Q1	8.6	8.8	15.1	15.9
Q2	26.7	28.0	26.3	26.9
Q3	36.0	33.2	26.9	27.5
Q4	28.7	29.9	31.7	29.7
Primary care health professional shortage area category (%)				
0	30.5	35.4	42.7	42.7
> 0 to 20	68.1	62.9	56.2	56.0
> 20 to 100	1.4	1.7	1.0	1.3

Note: The practice and market characteristics are presented at the episode level, which is the unit of analyses for DID models. However, the propensity score matching considered these variables at the practice level. There were not good comparison practices for two very large practices that participated in OCM; DID findings were robust to sensitivity analyses excluding these two very large practices.

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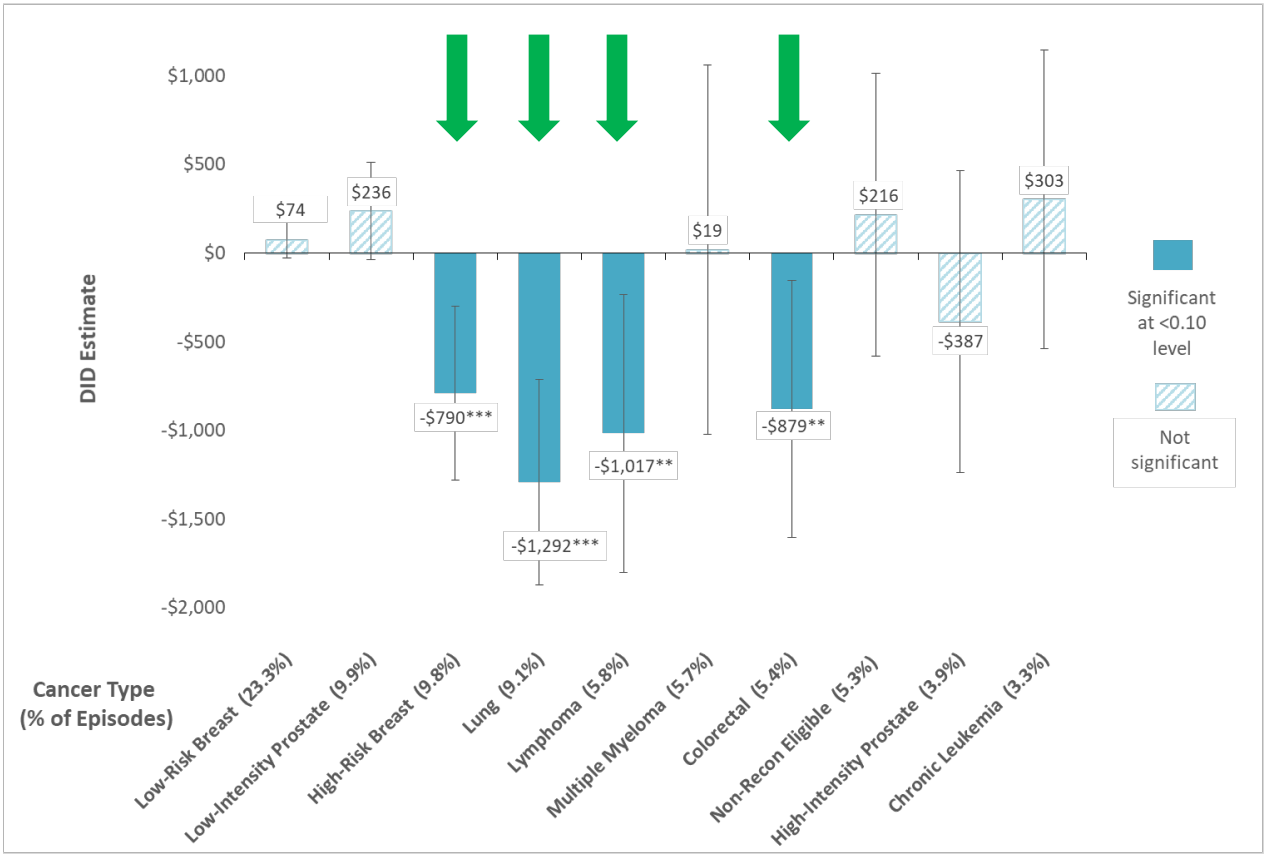
eFigure 3. Association of OCM With Total Episode Payments by Cancer Type



DID: difference-in-differences.

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eTable 7. Association of OCM With Additional Health Care Utilization Measures Per Six-Month Episode

Measure	OCM		Comparison		DID Estimates			
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change
Intensive Care Use								
% with intensive care unit stay	10.0%	9.5%	9.3%	9.0%	-0.2%	-0.5%	0.1%	-2.2%
Hospital Readmission								
% with 30-day unplanned readmission	20.9%	20.3%	20.3%	20.0%	-0.3%	-0.7%	0.2%	-1.2%
Number of 30-day unplanned readmissions	0.095	0.086	0.087	0.079	-0.001	-0.004	0.001	-1.5%
Outpatient Rehabilitation Therapy Services								
Occurrence of Outpatient Rehabilitation Therapy Services	8.6%	9.0%	8.8%	9.5%	-0.2%*	-0.5%	-0.0%	-2.8%
Number of Outpatient Rehabilitation Therapy Services per episode	1.748	1.850	1.779	1.879	0.003	-0.061	0.067	0.2%

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
DID: difference-in-differences. Int.: intervention period. OCM: OCM intervention group. LCL: lower confidence limit. UCL: upper confidence limit.

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Note: eFigures 4-7 show the specific initial regimens used for lung cancer, colorectal cancer, high-risk hormonal breast cancer, and high-intensity prostate cancer episodes for which at least 2% of episodes were treated with a particular regimen in at least one time period. Episode-initiating chemotherapy regimens were similar for OCM and comparison patients, both at baseline and during the intervention period.

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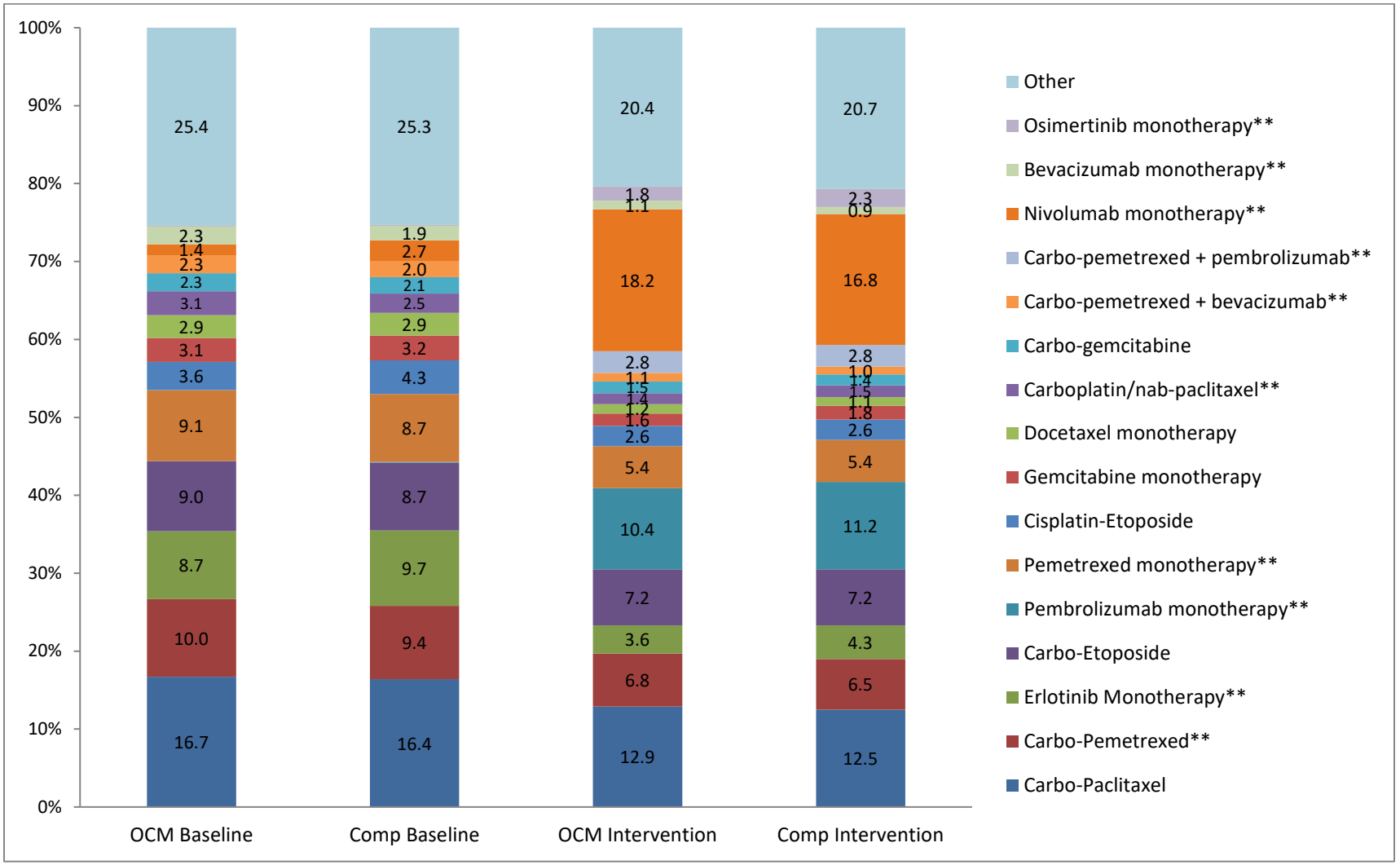
eFigure 4. Similar Changes in Lung Cancer Chemotherapy Regimens in OCM and Comparison Episodes



Source: Medicare claims 2014–2019.

Notes: OCM: OCM intervention group. Comp: Comparison group. Intervention: Intervention period. Figures include all regimens identified ≥ 2% of all episodes in the baseline and/or intervention period. * Indicates regimen monthly cost between $500 and $4,999; ** indicates monthly regimen cost ≥ $5,000. Estimated costs of Part B medications are based on Medicare payment limits from the April 2018 Medicare Part B ASP file (https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Part-B-Drugs/McrPartBDrugAvgSalesPrice/2018ASPFiles). Estimated costs of Part D medications are from Dusetzina SB, Huskamp HA, Keating NL. Specialty Drug Pricing and Out-of-Pocket Spending on Orally Administered Anticancer Drugs in Medicare Part D, 2010 to 2019. JAMA. 2019;321(20):2025–2028. doi:10.1001/jama.2019.4492. Calculations are based on a patient with a weight of 70kg and a body surface area of 1.8 square meters.

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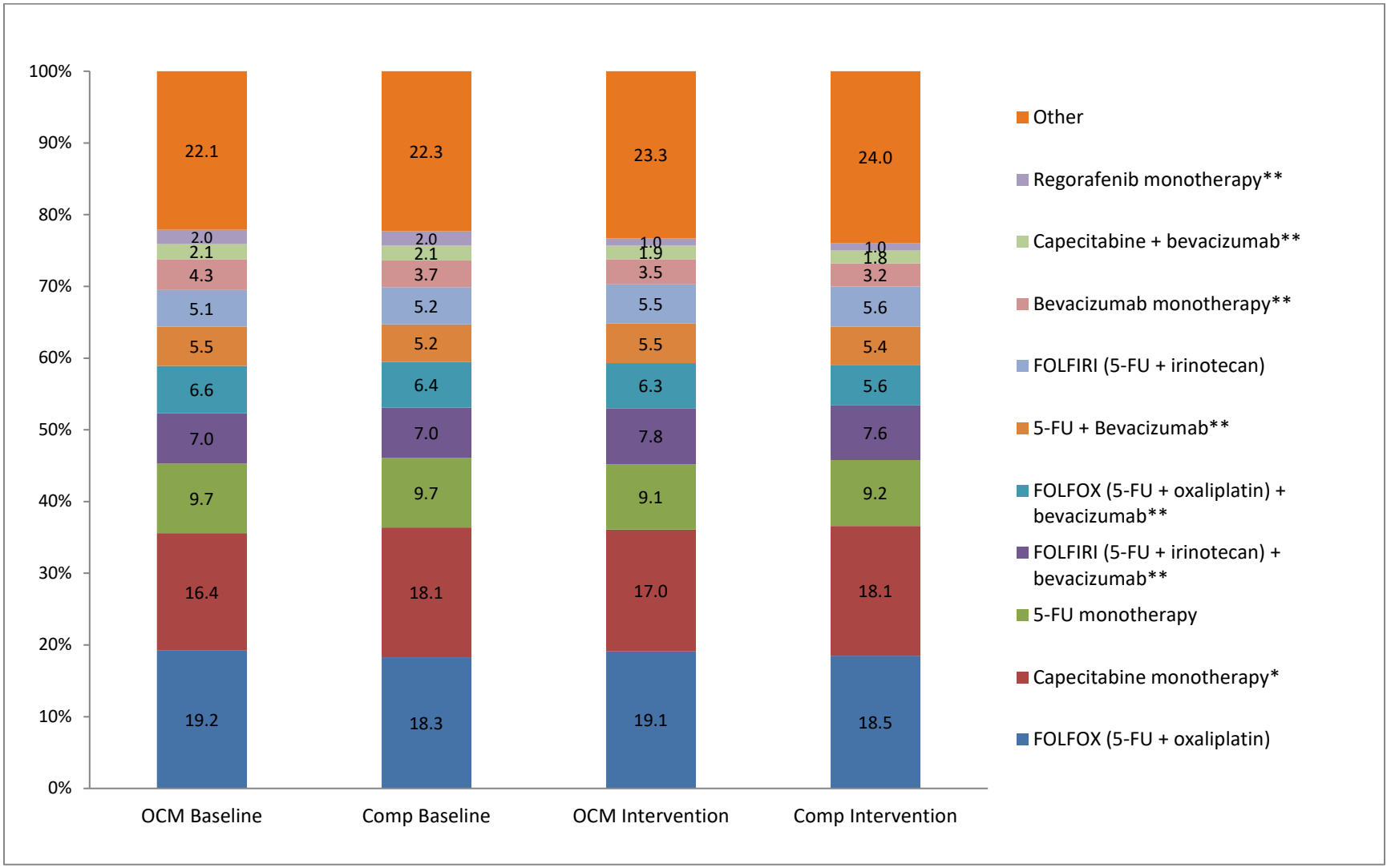
eFigure 5. Similar Changes in Colorectal Cancer Chemotherapy Regimens in OCM and Comparison Episodes



Source: Medicare claims 2014–2019.

Notes: OCM: OCM intervention group. Comp: Comparison group. Intervention: Intervention period. Figures include all regimens identified ≥ 2% of all episodes in the baseline and/or intervention period. * Indicates regimen monthly cost between $500 and $4,999; ** indicates monthly regimen cost ≥ $5,000. Estimated costs of Part B medications are based on Medicare payment limits from the April 2018 Medicare Part B ASP file (https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Part-B-Drugs/McrPartBDrugAvgSalesPrice/2018ASPFiles). Estimated costs of Part D medications are from Dusetzina SB, Huskamp HA, Keating NL. Specialty Drug Pricing and Out-of-Pocket Spending on Orally Administered Anticancer Drugs in Medicare Part D, 2010 to 2019. JAMA. 2019;321(20):2025–2028. doi:10.1001/jama.2019.4492. Calculations are based on a patient with a weight of 70kg and a body surface area of 1.8 square meters.

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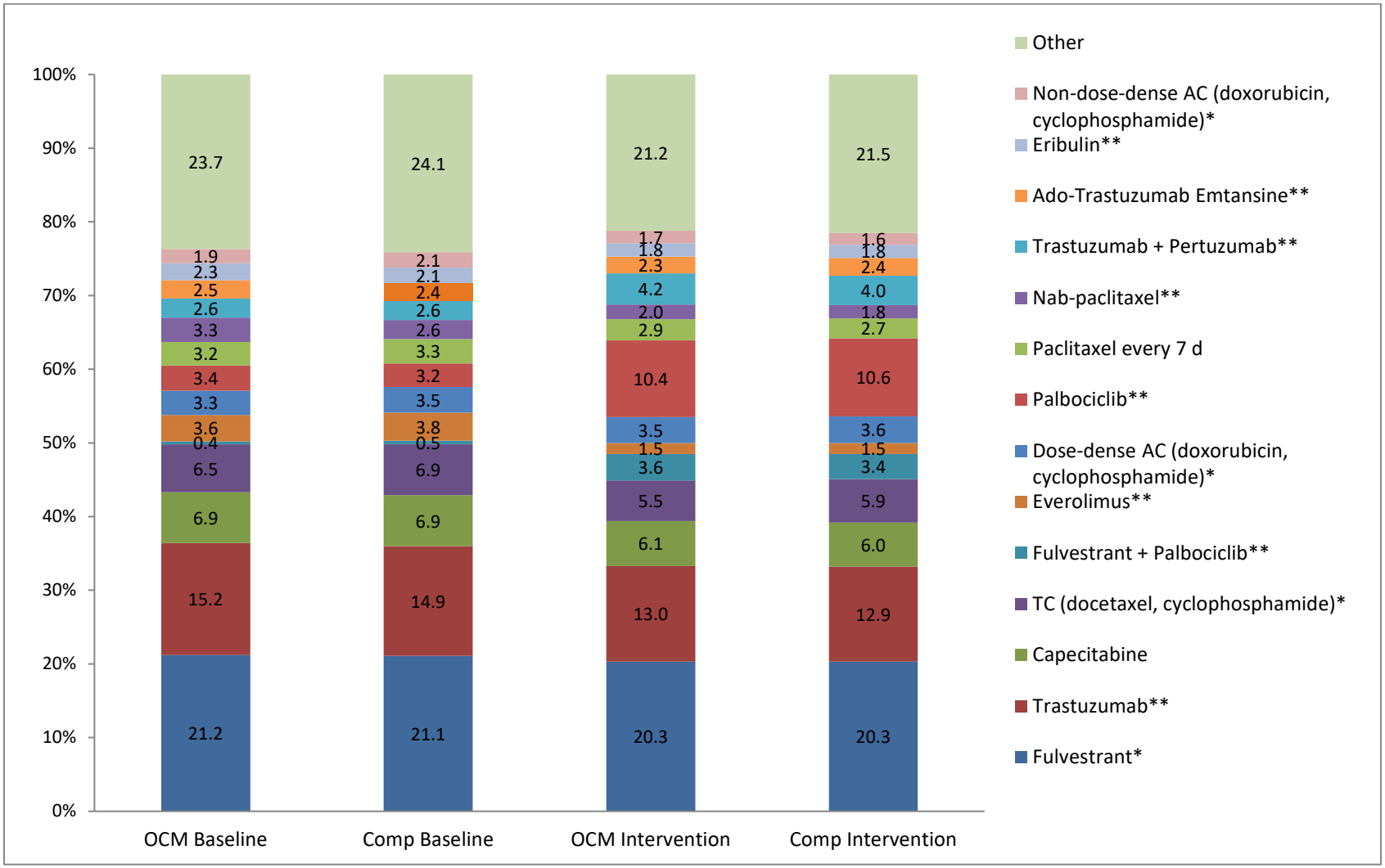
eFigure 6. Similar Changes in High-Risk Breast Cancer Chemotherapy Regimens in OCM and Comparison Episodes



Source: Medicare claims 2014–2019.

Notes: OCM: OCM intervention group. Comp: Comparison group. Intervention: Intervention period. Figures include all regimens identified ≥ 2% of all episodes in the baseline and/or intervention period. * Indicates regimen monthly cost between $500 and $4,999; ** indicates monthly regimen cost ≥ $5,000. Estimated costs of Part B medications are based on Medicare payment limits from the April 2018 Medicare Part B ASP file (https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Part-B-Drugs/McrPartBDrugAvgSalesPrice/2018ASPFiles). Estimated costs of Part D medications are from Dusetzina SB, Huskamp HA, Keating NL. Specialty Drug Pricing and Out-of-Pocket Spending on Orally Administered Anticancer Drugs in Medicare Part D, 2010 to 2019. JAMA. 2019;321(20):2025–2028. doi:10.1001/jama.2019.4492. Calculations are based on a patient with a weight of 70kg and a body surface area of 1.8 square meters.

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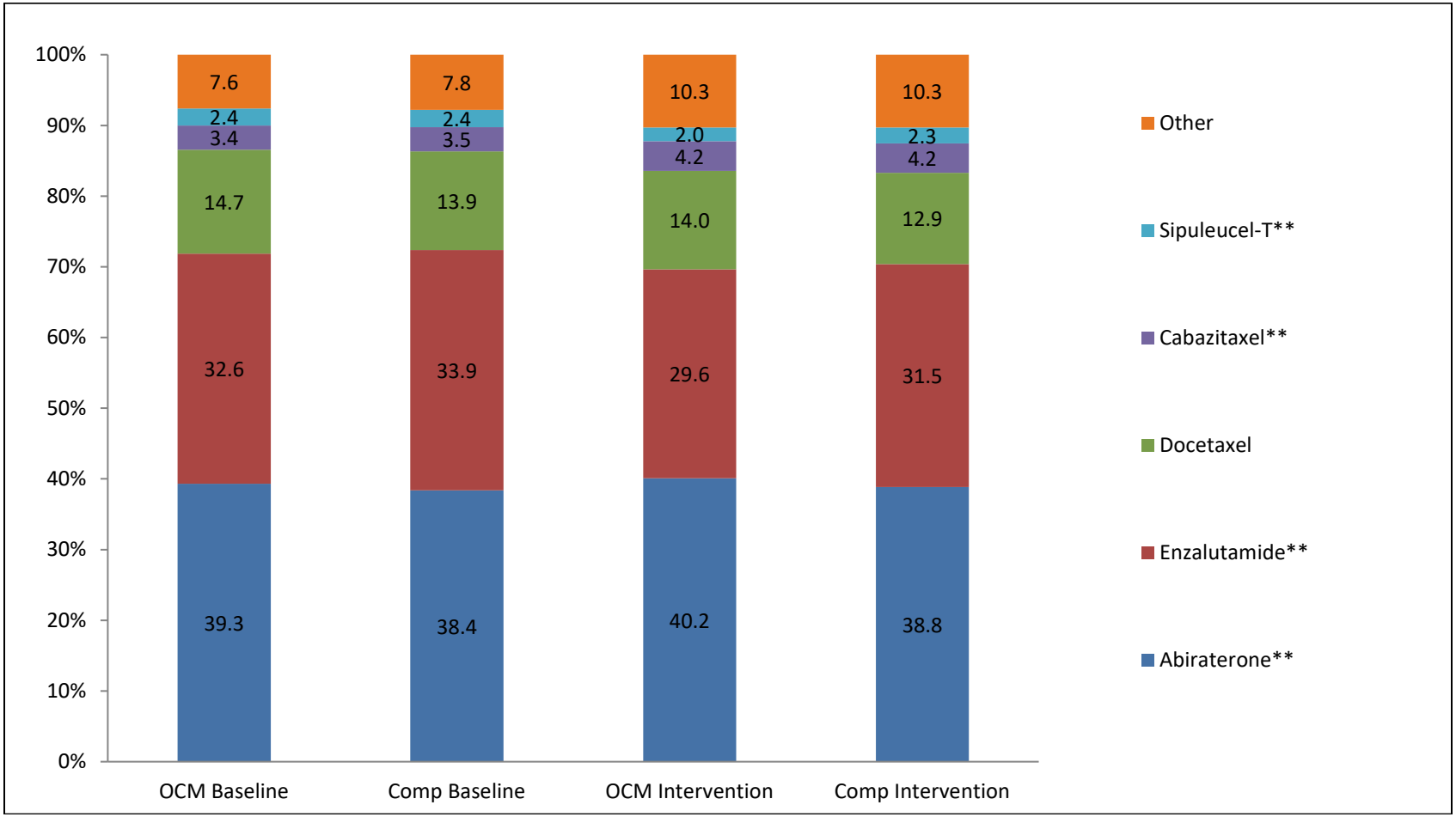
eFigure 7. Similar Changes in High-Intensity Prostate Cancer Chemotherapy Regimens in OCM and Comparison Episodes



Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. Comp: Comparison group. Intervention: Intervention period. Figures include all regimens identified ≥ 2% of all episodes in the baseline and/or intervention period. * Indicates regimen monthly cost between $500 and $4,999; ** indicates monthly regimen cost ≥ $5,000. Estimated costs of Part B medications are based on Medicare payment limits from the April 2018 Medicare Part B ASP file (https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Part-B-Drugs/McrPartBDrugAvgSalesPrice/2018ASPFiles). Estimated costs of Part D medications are from Dusetzina SB, Huskamp HA, Keating NL. Specialty Drug Pricing and Out-of-Pocket Spending on Orally Administered Anticancer Drugs in Medicare Part D, 2010 to 2019. JAMA. 2019;321(20):2025–2028. doi:10.1001/jama.2019.4492. Calculations are based on a patient with a weight of 70kg and a body surface area of 1.8 square meters.

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eTable 8. For Cancers With Low Baseline Use of Immunotherapy, OCM Was Associated With Small Relative Increases in Use for Some Cancer Types, and Not for Others

Use of Immunotherapy	# of Episodes in Int. Period (PP1–5)		Intervention Mean		Intervention Trend	90% UCL	90% LCL
	OCM	Comparison	OCM	Comparison			
Head and neck cancer	9,639	10,142	28.1%	28.3%	0.4%*	0.03%	0.8%
High-risk bladder cancer	8,990	9,732	33.8%	31.4%	1.2%***	0.7%	1.6%
Gastroesophageal cancer	9,534	10,596	7.1%	7.0%	-0.1%	-0.3%	0.2%
Liver cancer	6,667	7,839	12.9%	11.0%	0.4%*	0.03%	0.8%
Anal cancer	1,928	1,944	6.6%	9.7%	-0.3%	-0.7%	0.2%
Non-reconciliation-eligible	31,737	44,947	12.0%	11.2%	-0.1%	-0.3%	0.1%
All other higher-risk episodes	283,322	300,706	1.1%	1.2%	0.0%	0.0%	0.0%

Asterisks denote statistically significant impact estimates at *p≤0.10, **p≤0.05, ***p≤0.01. Source: Medicare claims 2014–2019.
Notes: Models compared use in the intervention period only (rather than DID analyses) because use in the baseline period was minimal. COMP: comparison group. Int.: intervention period. LCL: lower confidence limit. OCM: OCM intervention group. PP: performance period. UCL: upper confidence limit.

eTable 9. No Clinically Significant Association of OCM With Survival, for Seven Cancer Types

Cancer Type	# of Beneficiaries		OCM		Comparison		DID Estimate	
	OCM	Comparison	Baseline RMST (days)	Int. RSMT (days)	Baseline RMST (days)	Int. RSMT (days)	DID (days)	90% CL (days)
Restricted Mean Survival Time in Days through 18 Months								
Acute leukemia	2,340	2,666	325.9	338.5	332.0	335.9	8.7	-12.5, 29.9
High-risk breast cancer	23,935	24,774	496.4	499.5	495.3	501.1	-2.7	-6.6, 1.1
Chronic leukemia	7,484	8,269	498.4	502.8	503.1	507.8	-0.2	-6.9, 6.5
Colorectal cancer	17,889	19,259	458.3	455.6	462.6	460.8	-0.9	-6.8, 5.1
Lung cancer	34,819	38,488	358.2	368.7	359.2	376.4	-6.7**	-11.6, -1.8
Lymphoma	21,294	22,116	475.3	483.3	479.6	483.6	3.9	-1.1, 8.9
Pancreas cancer	8,472	9,614	315.7	321.4	322.2	330.4	-2.5	-12.0, 7.0

Asterisks denote statistically significant impact estimates at *p≤0.10, **p≤0.05, ***p≤0.01.
Although the lung cancer estimate of -6.7 days is statistically significant, we do not judge this 6.7-day decrease (relative to the comparison group) to be clinically meaningful.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. RMST: Restricted mean survival time. Int.: Intervention period. DID: Difference-in-differences. CL: Confidence limit.

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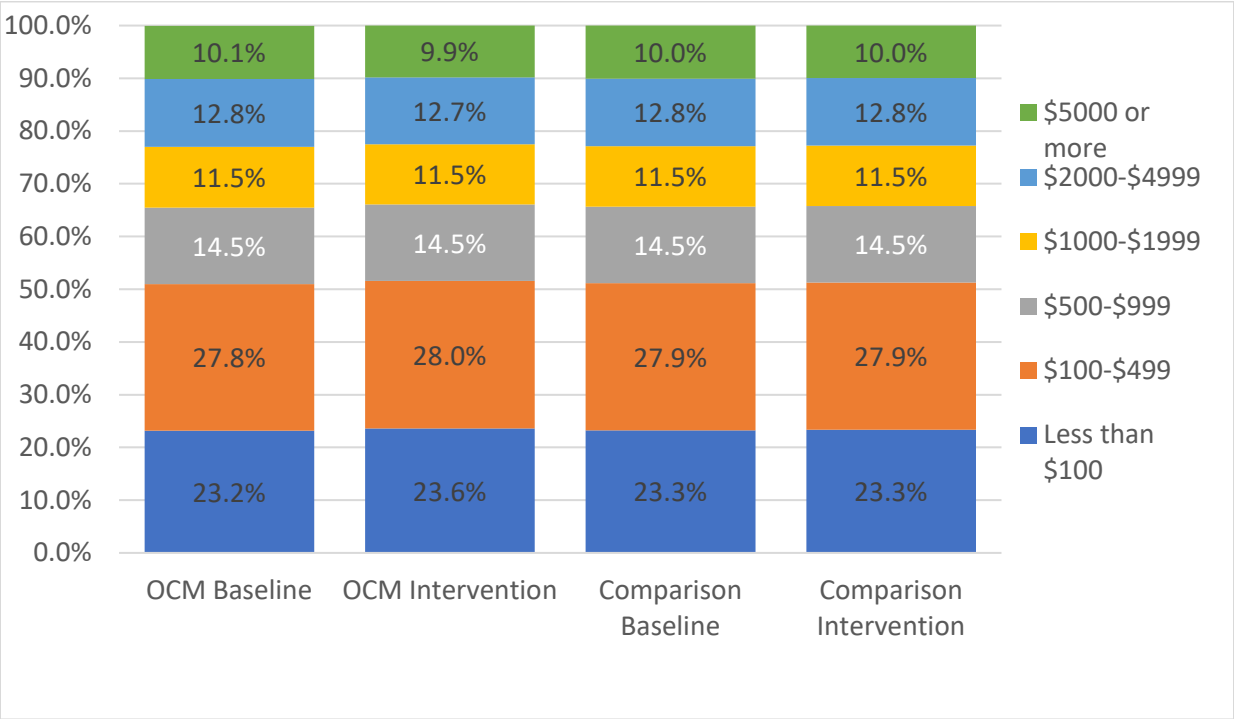
eFigure 8. Association of OCM With Beneficiary-Reported Out-of-Pocket Spending



Source: Patient Surveys, Alternative Surveys, and End-of-Life Surveys at baseline (April–September 2016) and intervention period (July–December 2018).

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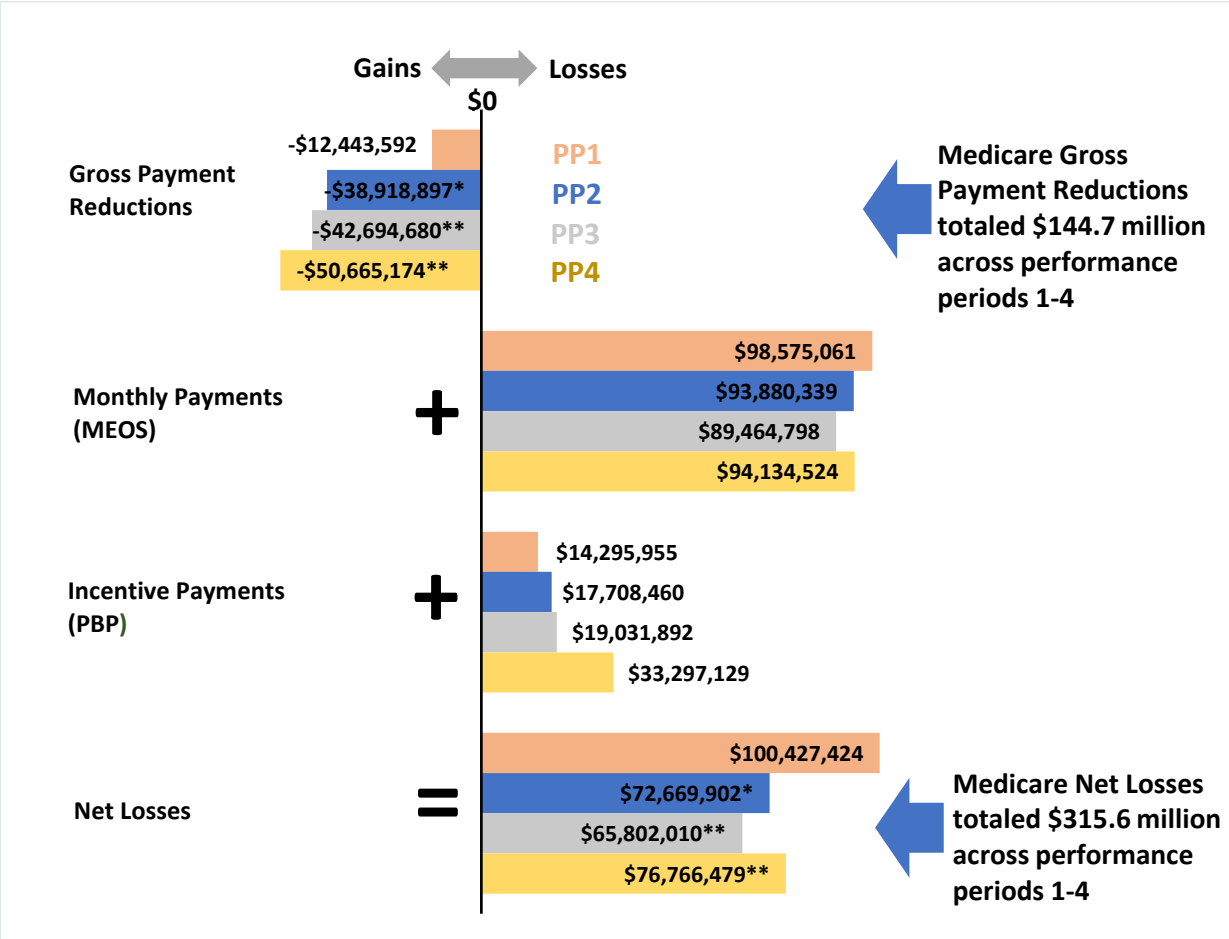
eFigure 9. OCM Resulted in Net Losses to Medicare of $315M Over Four Performance Periods



MEOS: Monthly Enhanced Oncology Services payment. PBP: performance-based payments. PP: Performance Period
Asterisks denote statistically significant impact estimates at *p<0.10 and**p<0.05.
Source: Medicare claims 2014–2018. OCM first true-up reconciliation reports, PP1–PP4.

As described in the methods, we estimated the overall net financial effects of OCM incorporating Monthly Enhanced Oncology Service payments and Performance-Based Payments, along with the relative reductions in total episode payments, through the first four performance periods. Data for the fifth performance period was not yet available because practices often bill for the monthly payments after an episode ends and because performance-based payments are calculated several months after each performance period ends.

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