Evaluation of the Oncology Care Model:

Performance Period 1-5 – Appendices

January 2021

Contract #HHSM-500-2014-000261 T0003

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A. Methods

A.1. Data and Methods for Analysis of Medicare Claims and Administrative Data

This appendix section contains information about the data and methods we used to construct utilization, payment, and end-of-life (EOL) outcome measures from Medicare claims, for the Oncology Care Model (OCM) evaluation. The primary data sources used to measure OCM impacts on utilization, payments, clinical care, and EOL outcomes include the Common Medicare Environment and Enrollment Database files, 100 percent of the Medicare Parts A and B claims files, and 100 percent of the Part D Prescription Drug Event (PDE) files.

This appendix describes how claims and other data sources were used to construct outcome measures, the performance periods (PPs) included in this report; how chemotherapy episodes were identified for analysis; how the comparison group was constructed and validated; and the analytic approaches used to quantify the impacts of the Model.

A.1.1 Secondary Data Sources

The data sources and how they were used to construct the analytic files are summarized below in **Exhibit A-1**.

Exhibit A-1: Data Sources Used in the Claims Analysis

Data Source	Purpose
2014–2019 Part B Claims (VRDC)	• Identify Part B chemotherapy episode triggers for episode identification and cancer-related evaluation and management (E&M) services for episode attribution. • Determine the presence of cancer diagnosis within 59 days prior to and including the service date of a Part D chemotherapy claim to identify Part D chemotherapy episodes. • Identify cancer-related E&M services from Carrier claims during episodes. • Calculate episode-level utilization and payment measures for Part B services. • Construct Hierarchical Condition Category (HCC) scores. • Identify supportive care drug use including antiemetics, radiation, and surgery use.
2014–2019 PDE Tap Files (VRDC)	• Identify Part D chemotherapy triggers for episode identification. • Calculate episode-level Part D drug utilization and payment measures. • Identify supportive care drug use.
2014–2019 Part A Claims (VRDC)	• Calculate episode-level utilization and payment measures for Part A services. • Construct HCC scores. • Identify use of radiation and surgery.
2014–2019 Integrated Data Repository System	• Determine standardized Part A and B payments.
2014–2019 Common Medicare Environment Master Beneficiary Summary Files (VRDC)	• Determine Part A and B enrollment for beneficiary eligibility criteria for episode identification. • Determine: ▪ Beneficiary characteristics including age, race, and gender ▪ Beneficiary ZIP code of residence ▪ Monthly Part D enrollment and dual eligibility ▪ County-level Medicare Advantage Penetration ▪ County-level emergency department (ED) visits among fee-for-service (FFS) population

Data Source	Purpose
2014–2019 Enrollment Database Files (VRDC)	• Determine Medicare Secondary Payer information for beneficiary eligibility criteria for episode identification.
2014–2019 Common Medicare Environment Files (VRDC)	• Determine end-stage renal disease coverage for episode identification.
2016–2019 FDA National Drug Code (NDC) Directory	• Identify PDEs that are for drugs, excluding vaccines.
2016–2019 Medicare Part B Drug Average Sales Price	• Identify Part B claims that are indicative of drugs.
2014–2018 CMS Health Professional Shortage Area (HPSA) Files	• Identify proportion of the population within a county residing in a HPSA.
2014–2018 National Plan and Provider Enumeration System (NPPES; VRDC)	• Supplement provider specialty information in Part B Claims data.
2014–2018 Master Data Management Beneficiary Extracts (VRDC)	• Identify beneficiary alignment to the following CMS initiatives: Pioneer Accountable Care Organization (ACO), Medicare Shared Savings Program (MSSP), Next Generation ACO, Comprehensive Primary Care (CPC), and CPC Plus.
July 2015, August 2016, August 2017, and August 2018 SK&A[1] Office-Based Physician File	• Link practice sites to Tax Identification Numbers (TINs) to construct practice's affiliation with health system and hospital ownership.
2014–2018 Area Health Resource Files	• Construct county-level sociodemographic and market supply characteristics.
Welch and Bindman 2016[2], list of Association of American Medical Colleges (AAMC) medical schools,[3] and websites of medical school oncology/hematology departments, divisions, and institutes	• Identify TINs that are affiliated with a medical school's academic medical group.
NCCN and ASCO clinical guidelines	• Identify emetogenic chemotherapy treatment regimens, and guideline-recommended prophylactic antiemetic supportive therapies.
OCM program data	• Identify OCM practice participation. • Identify legacy TINs for OCM practices in baseline period. • Identify reconciliation episodes in each PP and associated expenditures. • Identify total amount paid by Medicare for performance-based payment (PBP) and Monthly Enhanced Oncology Services (MEOS).

[1] http://www.skainfo.com/databases/physician-data

[2] Welch, P. and Bindman, A.B. (2016). Town and gown differences among the largest medical groups in the US. Journal of Academic Medicine, July, 91(7):1007–14.

[3] AAMC Medical School Members. Available at: https://members.aamc.org/eweb/DynamicPage.aspx?site=AAMC&webcode=AAMCOrgSearchResult&orgtype=Medical%20School

The Medicare claims used in this report were retrieved in November 2019, and three months of claims run-out was applied uniformly. A report on Medicare claims maturity[4] estimates that over 90 percent of Part A and B claims and PDEs are received within three months of service, and approximately 90 percent of Part B claims are finalized within three months. This timing does not apply to claims for the per-beneficiary $160 MEOS payment that practices may bill to cover the provision of enhanced services and care coordination.

A.1.2 Observation Period for This Report

OCM began July 1, 2016 and focuses on six-month episodes of care triggered by chemotherapy FFS Medicare beneficiaries with continuous Parts A and B enrollment. OCM is organized into six-month PPs, for which CMS retrospectively assesses the performance of participating practices and reconciles payments. The six-year Model has a total of 11 PPs. The first PP included episodes that started between July 1, 2016 and January 1, 2017 and ended by June 30, 2017. The last PP will include episodes starting between July 2, 2020 and January 1, 2021, all of which will end by June 30, 2022.

Exhibit A-2 summarizes the observation period for this report, which covers OCM impacts through PP5. The baseline period includes six-month episodes that began July 2, 2014 through January 1, 2016 and ended between January 1, 2015 and June 30, 2016. The intervention period covered in this report includes six-month episodes that began during the Model's first five PPs (PP1–PP5), between July 1, 2016 and January 1, 2019, and ended between December 31, 2016 and June 30, 2019. The baseline period began in July 2014 to align with the calendar start of the Model, which started in July 2016. This alignment by calendar month addresses seasonality in Part D payments,[5] which must be studied symmetrically in both time periods.

Practice applications to participate in OCM were due to CMS on June 30, 2015, and CMS notified practices of acceptance into the model in April 2016. CMS anticipated that accepted practices would make changes in staffing, resources, and care delivery in preparation for Model start. As a result, we apply a "hold-out" period so that early anticipatory practice changes do not contaminate the baseline period. Specifically, we do not include in the baseline episodes that began between January 2, 2016 and June 30, 2016 and ended between July 1, 2016 and December 29, 2016. Episodes that began during this period ended early in the first PP, which would have contaminated the baseline and intervention periods.

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4 Chronic Condition Data Warehouse. (2017). CCW white paper: Medicare claims maturity. October. Version 2.0. Available from https://www.ccwdata.org/web/guest/ccw-medicare-data-white-papers.

5 As a consequence of the Medicare Part D benefit structure, Medicare payments are not observed on individual Prescription Drug Event (PDE) records until a beneficiary enters catastrophic coverage (unless the beneficiary qualifies for low-income subsidy). As a result, most beneficiaries will not have PDEs with positive Medicare payments recorded until entry into the catastrophic phase, which on average occurs later in the calendar year. Previous analyses showed that among the six-month episodes of care used in the OCM evaluation, episodes that begin during the third quarter of the year tend to have the highest Part D payments, on average.

Exhibit A-2: Observation Period for the Report Covering PP1–5

Period	Performance Period	Episodes Triggering	Episodes Ending	Time Periods Specified for DID Analyses
Baseline -3	-3	7/2/14–1/1/15	1/1/15–6/30/15	Baseline period
Baseline -2	-2	1/2/15–7/1/15	7/1/15–12/31/15	
Baseline -1	-1	7/2/15–1/1/16	1/1/16–6/30/16	
Hold-out	0	1/2/16–6/30/16	7/1/16–12/29/16	Hold-out period
PP 1	1	7/1/16–1/1/17	12/31/16–6/30/17	Intervention period for report covering PP1–5
PP2	2	1/2/17–7/1/17	7/1/17–12/31/17	
PP3	3	7/2/17–1/1/18	1/1/18–6/30/18	
PP4	4	1/2/18–7/1/18	7/1/18–12/31/18	
PP 5	5	7/2/18–1/1/19	1/1/19–6/30/19	
PP 6	6	1/2/19–7/1/19	7/1/19–12/31/19	Intervention periods for future evaluation reports
PP 7	7	7/2/19–1/1/20	1/1/20–6/30/20	
PP 8	8	1/2/20–7/1/20	7/1/220–12/31/20	
PP 9	9	7/2/20–1/1/21	1/1/21–6/30/21	
PP 10	10	1/2/21–7/1/21	7/1/21–12/31/21	
PP 11	11	7/2/21–1/1/22	1/1/22–6/30/22	

Notes: PP: Performance period. DID: Difference-in-difference.

A.1.3 Episode Identification

We identified all eligible cancer episodes nationwide that occurred during the baseline period, and, separately, during the intervention period, following the OCM methodology.[6] **Exhibit A-3** shows the number of episodes used in this report, for the OCM and comparison groups, doe each period.

First, we identified a Part B or Part D chemotherapy trigger event, defined as the first date of a Part B chemotherapy drug claim or Part D chemotherapy drug claim with a corresponding Part B claim for cancer within 59 days of the Part D claim, in each PP, assuming this date is not included in a previous episode. Then, among beneficiaries with a trigger chemotherapy event, we used Part B carrier claims to determine whether the beneficiary had had at least one cancer-related E&M service during the six months following the chemotherapy trigger event, billed under a TIN that has at least one oncology provider (National Provider Identifier (NPI)).[7]

Exhibit A-3: Number of Episodes by PP

Period	Number of Episodes	
(Episodes Initiating)	OCM	Comparison Group
Baseline-3 (7/2/14–1/1/15)	113,552	134,074
Baseline-2 (1/2/15–7/1/15)	117,335	138,560
Baseline-1 (7/2/15–1/1/16)	114,994	132,971
Hold-Out Period (1/2/16–6/30/16)		
PP1 (7/1/16–1/1/17)	126,654	145,234
PP2 (1/2/17–7/1/17)	128,238	146,648
PP3 (7/2/17–1/1/18)	124,327	138,790
PP4 (1/2/18–7/1/18)	132,814	145,987
PP5 (7/2/18–1/1/19)	129,418	140,333
Total All Periods	987,332	1,122,597

Source: Medicare Claims 2014-2019.

[6] RTI International. (2018). OCM performance-based payment methodology. Version 5.1. Prepared for the Centers for Medicare and Medicaid Services in partnership with Actuarial Research Corporation. Research Triangle Park, NC: RTI International; December 17. Available from https://innovation.cms.gov/initiatives/oncology-care/

[7] The requirement that a TIN has at least one oncology provider was applied to all baseline and intervention PPs.

Finally, we required that the beneficiary meet the additional OCM inclusion criteria during the entire episode: continuous Medicare Parts A and B enrollment; coverage under Medicare FFS (not Medicare HMO, Medicare Advantage, or the United Mine Workers of America program); Medicare as the primary payer; and no Medicare benefit due to end-stage renal disease. An episode could end earlier than six months following the trigger event only if the beneficiary died.

A.1.4 Attribution of Episodes to Practices

After identifying all eligible episodes, per the OCM attribution methodology, we assigned episodes to the practice that provided the plurality of cancer-related E&M services during the episode.[8] A practice is defined as a TIN with at least one oncology provider. A TIN is a billing unit for tax purposes, and it may or may not represent the structure of a physician group organization; some oncology groups use multiple TINs, and some oncology groups share a single TIN with a larger multi-specialty organization. For OCM, CMS requires that participating practices each use a single TIN, and that all clinicians in the practice submit oncology claims under that TIN. Participating OCM practices that experienced billing or business changes during the baseline or intervention period provided CMS with any "legacy" (i.e., older) TINs to capture billing for the entire practice. We used these legacy TINs to attribute episodes to OCM practices in the baseline period. Because legacy TINs are not available for groups not participating in OCM (i.e., comparison TINs used for this evaluation), we were unable to track such organizational changes, and instead attributed episodes to individual comparison TINs. We therefore define a comparison practice as a TIN with at least one oncology provider.

A.1.5 Sample of OCM and Comparison Practices

OCM practices volunteered to participate in the Model and may differ from non-OCM practices. In the first five PPs, we included 201 practices participating in OCM.[9] In selecting a comparison group, we sought to identify non-OCM TINs that, as a group, were similar to the group of OCM practices in the period prior to CMS's announcement of OCM. Comparison practices were selected using propensity score matching (PSM). The objective of PSM is to identify a comparison group that is statistically similar to the treatment group, based on observable factors.

First, starting from the universe of non-participating physician practices, we identified a subset of practices that were relevant for OCM and eligible to participate in OCM based on Model rules. From this subset we used PSM to identify comparison practices based on patterns of billing for OCM services and similarity to OCM practices in terms of key practice, beneficiary, and market characteristics. The PSM yielded 538 practices for the comparison group. Detailed information about the comparison group selection and PSM methodology is provided in the ***Performance Period One Report***. The PP1–PP5 intervention period as a whole had 521 comparison practices with attributed episodes; this number declined to 473 practices with episodes in PP5. This attrition was anticipated, and the comparison group was deliberately constructed to be large enough to accommodate a modest reduction over time. Attrition is due to a variety of reasons including practice closures, mergers with or acquisitions by other practices or hospitals, or that the TIN no longer had attributed episodes.

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[8] RTI International. (2018). OCM performance-based payment methodology. Version 5.1. Prepared for the Centers for Medicare and Medicaid Services in partnership with Actuarial Research Corporation. Research Triangle Park, NC: RTI International; December 17. Available from https://innovation.cms.gov/initiatives/oncology-care/.

[9] During PP4-5, two OCM practices were brought into mandatory pools with existing OCM practices and two OCM practices underwent ownership changes and rejoined as new OCM practices. The addition of the late entrants into the baseline data did not have an effect on overall balance between the OCM and comparison groups.

A.1.6 Claims-Based Utilization, Payment and EOL Outcome Measures

Exhibits A-4, A-5, and A-6 define each of the utilization, payment, and EOL outcome measures evaluated in this report.

Exhibit A-4: Definition of Utilization Outcome Measures

Outcome Measure	Definition
Inpatient Utilization	
Acute Care Hospital (ACH) Hospitalizations	**Occurrence** and **number** of Part A hospitalizations at ACHs, per episode (claim type 60, 61). ACHs are paid under the inpatient prospective payment system. The measure includes hospitalizations that originated during the episode (i.e., claim from date on the hospitalization occurred within the episode start and end dates). Multiple claims that were part of the same stay were collapsed into a single hospitalization.
ACH Days	**Number** of ACH days per episode among ACH hospitalizations that originated during the episode. The entire length of a hospitalization was allocated to the episode, even if the hospitalization extended beyond the end of the episode.
ACH Intensive Care Unit (ICU) Admissions	**Occurrence and number** of ACH hospitalizations with an ICU stay, per episode. Claims for ICU were identified using revenue center codes 0200–0209.
30-Day Unplanned Readmissions	**Occurrence** and **number** of 30-day ACH unplanned readmissions per episode. Only readmissions associated with an index ACH hospitalization (a stay during which the beneficiary survives the hospitalization) that originated during the episode were included. A 30-day unplanned readmission that occurred after the end of the episode, but was tied to an index hospitalization that occurred during the episode, was counted in the measure.
ED Utilization	
Outpatient ED Visits	**Occurrence** and **number** of ED visits not resulting in a hospitalization at the same facility, per episode. This measure includes ED visits that did not ultimately lead to an admission to the same facility (based on the same revenue center codes above). Observation stays that originated in the ED were also counted in this measure. However, this measure does not reflect observation stays that did not originate in the ED.
Post-Acute and Outpatient Service Utilization	
Skilled Nursing Facility (SNF) Stays	**Occurrence** and **number** of all SNF stays during an episode (claim type 20, 23).
SNF Days	**Number** of Medicare-covered SNF days per episode. All covered SNF days of the stay were allocated to the episode even if the stay extended past the end of the episode.
Home Health Agency Services	**Occurrence** of home health agency service per episode (claim type 10).
60-Day Home Health Agency Spells	**Number** of 60-day home health agency spells per episode.
Hospice Services	**Occurrence** of hospice service per episode (claim type 50).
Hospice Days	**Number** of days spent in hospice care per episode.

Outcome Measure	Definition
Part B Outpatient Service Utilization	
E&M Services	**Number** of E&M services per episode.
Cancer-Related E&M Services	**Number** of cancer-related E&M services per episode. A cancer-related E&M service was defined as an E&M service in a non-institutional setting with a cancer diagnosis on the same line (per OCM Model specifications for episode identification and attribution).
Imaging Services	**Occurrence** of any imaging service (standard, advanced, other) per episode. **Number** of standard and other imaging services per episode. Standard and other imaging included x-ray, echography, and cardiac catheterization. **Number** of advanced imaging services per episode. Advanced imaging included computerized axial tomography scans, magnetic resonance imaging, and nuclear medicine (e.g., positron emission tomography).
Radiation Therapy Service	**Occurrence** and **number** of radiation therapy services per episode. Procedure codes for radiation therapy were identified per OCM Model specifications.
Outpatient Therapy Services	**Occurrence** and **number** of outpatient rehabilitation therapy (i.e., physical therapy, occupational therapy and speech-language pathology) services per episode. Outpatient rehabilitation therapy services were identified according to procedure codes found in CMS's annual therapy update.[10]
Chemotherapy and Drug Utilization	
Part B Chemotherapy Services	**Occurrence** and **Number** of Part B chemotherapy services per episode. Part B chemotherapy drugs were identified using the HCPCS codes found within the chemotherapy trigger list, per OCM Model specifications.
Part B Novel Therapy Drug Use	**Occurrence** and **Number** of Part B novel therapy drug use per episode. Episodes were classified as having novel therapy use if a chemotherapy drug used during the episode was a novel therapy at the time, for a specific cancer type.
Occurrence of Chemotherapy-Associated Hospitalizations	**Occurrence** of Part A hospitalizations within 30 days after Part B chemotherapy infusions or 30 days after filling a Part D drug prescription, per episode**.**
Occurrence of Any Chemotherapy-Associated ED Visits	**Occurrence** of any ED visits within 30 days after Part B chemotherapy infusions or 30 days after filling a Part D drug prescription, per episode.
Occurrence of Chemotherapy-Associated ED Visits Resulting in a Hospital Admission	**Occurrence** of any ED visits within 30 days after Part B chemotherapy infusions or 30 days after filling a Part D drug prescription, resulting in a hospitalization, per episode.
Occurrence of Chemotherapy-Associated ED Visits without a Hospital Admission	**Occurrence** of any ED visits within 30 days after Part B chemotherapy infusions or 30 days after filling a Part D drug prescription, leading to a hospitalization, per episode.

[10] Centers for Medicare and Medicaid Services. (2019). Annual therapy update [Internet homepage]. Last modified 11/26/2019. Available at: https://www.cms.gov/Medicare/Billing/TherapyServices/AnnualTherapyUpdate.html

Exhibit A-5: Definition of Medicare Payment Outcome Measures

Outcome Measure	Definition
Overall Payments	
Total Episode Payments (TEP) – Part A, B, and D Payments	Total Part A, B, and D Medicare payments, not including MEOS payments, per episode. Part A and B payments are standardized. In other words, geographic differences in Medicare payment rates (e.g., due to variations in local wages or input prices) as well as payment variation resulting from CMS program reductions/additions (e.g., for programs including bundled payment) were removed. Part D payments are not standardized and were measured as the sum of low-income cost-sharing amount and 80 percent gross drug cost above the out-of-pocket threshold. All payments reflect the Medicare payment, not allowed payments.
Part A Payments	Total Part A Medicare payments per episode.
Part B Payments (without MEOS)	Total Part B Medicare payments, excluding MEOS payments, per episode.
Part D Payments	Total Part D Medicare payments per episode. This measure was restricted to episodes for beneficiaries enrolled in Part D for all months of the episode, while alive.
Part D Gross Drug Costs	Total Part D gross drug costs per episode. A prescription's Gross Drug Costs reflected payments made by all parties (beneficiary, plan, Medicare), and was calculated as the sum of ingredient cost, dispensing fee, sales tax, and vaccine administration fee. This measure was restricted to episodes for beneficiaries enrolled in Part D for all months of the episode, while alive.
Part A Payments Components	
ACH Payments	Payments for ACH hospitalization(s) per episode. The full payment of the hospitalization was allocated to the episode, even if the hospitalization extended beyond the end of the episode.
30-Day Unplanned Readmission Payments	Payments for 30-day unplanned readmissions per episode.
SNF Payments	Payments for post-acute SNF stays per episode. The full payment of the SNF stay was allocated to the episode, even if the stay extended beyond the end of the episode.
Home Health Agency Payments	Payments for post-acute home health agency services per episode.
Hospice Payments	Payments for hospice services per episode (claim type 50).
Inpatient Rehabilitation Facility Payments	Payments for post-acute services at an inpatient rehabilitation facility per episode (claim types 60, 61).
Long-Term Care Hospital Payments	Payments for post-acute services at a long-term care hospital per episode (claim types 60, 61).
Part B Payments Components	
Imaging Payments	Payments for standard, advanced, and other imaging services per episode.
Laboratory Payments	Payments for laboratory services per episode.
E&M Payments	Payments for E&M services per episode.
Chemotherapy, Cancer-Related, and Drug Payments	
Part B Chemotherapy Payments	Part B chemotherapy payments per episode.
Part B Novel Therapy Payments	Payments for Part B novel therapy drugs per episode.
Part B Non-Chemotherapy Drug Payments	Payments for Part B non-chemotherapy drugs per episode
Part B Supportive Care Drug Payments	Payments for Part B supportive care drugs per episode. These drugs are used in support of cancer treatment, and include antiemetic (i.e., anti-

Outcome Measure	Definition
	nausea) medications; white blood cell, red blood cell, and platelet growth factors; and bone modifying agents.
Radiation Therapy Payments	Payments for Part B radiation therapy services per episode.
Cancer-Related E&M Payments	Payments for Part B cancer-related E&M services per episode.
Beneficiary Cost Sharing	
Part A Beneficiary Cost Sharing	Standardized Part A beneficiary costs (deductible plus coinsurance) per episode. (Note that this is often paid by supplemental insurance.)
Part B Beneficiary Cost Sharing	Standardized Part B beneficiary costs (deductible plus coinsurance) per episode. (Note that this is often paid by supplemental insurance.)
Part D Beneficiary Cost Sharing	Part D beneficiary costs per episode. Part D beneficiary cost-sharing was computed as the sum of the patient pay amount and the other True Out of Pocket amount, and does not include low-income cost-sharing amounts. This measure was restricted to episodes for beneficiaries enrolled in Part D for all months of the episode, while alive.

Exhibit A-6: Definition of End-of-Life Outcome Measures

Outcome Measure	Definition
Aggressive Care	
Part B Chemotherapy during the Last 14 Days of Life	**Occurrence** of any Part B chemotherapy dates of service within 14 days of the beneficiary's date of death.
Any Hospitalization in the Last 30 Days of Life	**Occurrence** of any hospitalization within 30 days of the beneficiary's date of death.
ED Use (2+ Visits) in the Last 30 Days of Life	**Occurrence** of two or more ED visits within 30 days of the beneficiary's date of death.
Hospice Care Utilization and Timing	
Never Admitted to Hospice Care	**Occurrence** of a beneficiary dying with no previously recorded hospice care use (specifically, no hospice care claims ending within the six months prior to the date of death).
Being in Hospice Care 1–2 Days before Death	**Occurrence** of a beneficiary discharged to death from hospice care (discharge codes 40, 41, or 42) and previously using hospice care continuously 1–2 days before death.
Hospice Care 3–180 Days before Death	**Occurrence** of a beneficiary discharged to death from hospice care (discharge codes 40, 41, or 42) and previously using hospice care continuously 3–180 days before death.

A.1.7 Sample Characteristics Analyzed

Exhibits A-7, A-8 and A-9 contain definitions of the beneficiary-, episode-, and practice-level characteristics used in analyses in this report.

Exhibit A-7: Definition of Beneficiary-Level Characteristics

Characteristic	Definition
HCC Risk Score	Used to quantify beneficiary severity of illness for their cancer and non-cancer comorbidities and predict plan payments in Medicare Advantage risk adjustment. HCC scores are based on beneficiary demographics and diagnostic history, including cancer and non-cancer codes. Each episode was assigned a HCC score based on the beneficiary's diagnosis information during the 12 months prior to the episode start date. For example, the HCC score for an episode that started on July 1, 2015 was constructed using diagnoses from July 1, 2014–June 30, 2015 claims.
Age group	Beneficiaries were divided into the following groupings: 0–64, 65–69, 70–74, 75–79, 80–84, and 85+.
Dual eligibility status	Beneficiaries were flagged as dual eligible if they were either Medicaid full-dual or partial-dual eligible.
Race/ethnicity	Beneficiaries were categorized as Non-Hispanic White; Black (or African-American); Hispanic; or Other (Asian/Pacific Islander, American Indian, Other, Unknown). Race/ethnicity was determined using the RTI race code methodology.[11]

Exhibit A-8: Definition of Episode-Level Characteristics

Characteristic	Definition
Cancer type	The 24 cancer types of interest were derived from the cancer types assigned to each episode per the OCM methodology. Each episode was assigned a cancer type using the plurality of cancer diagnoses on E&M services in the carrier file that occurred during the episode. The 21 reconciliation-eligible cancer types in the original OCM methodology were expanded to 24, with breast cancer divided into low- versus high-risk episodes, prostate cancer divided into low- versus high-intensity episodes,[12] and bladder cancer divided into low- versus high-risk episodes.[13] We also analyze all non-reconciliation eligible cancer types combined together.
Episodes triggered by Part D chemotherapy	Episodes were coded as being triggered by Part D chemotherapy if the initial episode claim for chemotherapy was a Part D claim.
Use of immunotherapy	Episodes were classified as using an immunotherapy if one of the following drugs was taken during the episode: atezolizumab, avelumab, cemiplimab-rwlc, durvalumab, ipilmumab, nivolumab, or pembrolizumab.

[11] Race coding explained here: https://www.resdac.org/cms-data/variables/research-triangle-institute-rti-race-code

[12] Low- and high-intensity designations for prostate cancer follow the methodology used in the OCM performance-based payment (PBP) prediction model. Low-intensity prostate cancer episodes are defined as episodes in which the primary cancer type is prostate cancer and the patient is treated with androgen deprivation and/or an anti-androgen therapy, without any other chemotherapy during the episode. High-intensity prostate cancer episodes do not meet the above criteria.

[13] Low- and high-risk designations for bladder cancer episodes follow the methodology used in the OCM PBP prediction model. Specifically, low-risk bladder cancer episodes are defined as episodes in which the primary cancer type is bladder cancer and the patient is treated with intravesicular Bacillus Calmette-Guérin (BCG) therapy and/or intravesicular mitomycin, without any other chemotherapy during the episode. High-risk bladder cancer episodes do not meet the above criteria.

Exhibit A-9: Definition of Practice-Level Characteristics

Characteristic	Definition
Practice size	Practice size was measured in two ways: average number of episodes per practice and average number of NPIs per practice. NPIs were identified if they billed a Part B cancer-related E&M service and/or non-institutional Part B chemotherapy through the TIN and also submitted at least one E&M claim for at least one episode attributed to the TIN.
Provider specialty mix	A practice's NPIs were classified into the following provider specialties: • Oncology specialty (hematology/medical oncology, surgical oncology, radiation oncology, gynecologic oncology) • Urology specialty • Nurse Practitioner (NP)/Physician Assistant (PA) specialty • Other specialties providing care (e.g., internal medicine) We assigned the provider specialty by first using the specialty reported in the Part B claims data; if that was not reported or was less specific, we augmented it using the specialty that mapped to the NPI's primary taxonomy in the NPPES data. We computed practice-level proportions of oncology, urology, and NP/PA specialties among all NPIs, along with the proportion of oncology sub-specialties among oncologist NPIs.
Oncology-specialty practices	Oncology specialty practices were classified as those with only oncologist NPIs and/or NP/PA NPIs. The oncology specialty included any of the following specialties: hematology/oncology, medical oncology, surgical oncology, radiation oncology, or gynecologic oncology.
Affiliation with health system or hospital ownership	Practices were identified as affiliated with a health system or as hospital-owned based on information constructed from the July 2015, August 2016–2018 SK&A Office-Based Physician File for the baseline and intervention periods, respectively. The SK&A data are collected on a rolling basis via a telephone survey of physician practice sites.

A.1.8 Approach for Claims-Based Analyses

In this section, we describe the claims-based descriptive and impact analyses conducted for this Annual Report. Analyses were conducted in CMS's VRDC environment using SAS Enterprise Guide v7.1 and Stata/MP v14.2 and v15 statistical software.

Descriptive Analyses

We conducted descriptive analyses to compare OCM and comparison practices along a number of episode- and practice-level characteristics. We calculated comparisons for the baseline period, for the cumulative intervention period (PP1–PP5), and for individual intervention PPs (PP1, PP2, PP3, PP4, and PP5). We conducted z-tests and t-tests of statistical significance for differences in proportions and mean values, respectively, to show significant changes from the baseline period to the intervention period, separately for OCM and comparison practices. Statistical significance was determined at the 10 percent level.

Impact Analyses

Given the quasi-experimental design of OCM, we use difference-in-differences (DID) regression analyses to estimate Model impact on important payment, utilization and EOL outcomes. DID is a statistical technique that quantifies the impact of an intervention by comparing changes in outcomes of treatment cases (in this case, OCM episodes) to changes in outcomes in a matched comparison group (comparison episodes), from before to after Model implementation. The DID results describe the average effect of OCM over the entire duration of the intervention period, and for each of the first five PPs individually.

We performed all DID analyses at the episode level (except EOL and survival DID analyses, which are at the beneficiary level). We used ordinary least squares regression models for payment outcome

measures,[14] logit models for binary utilization outcomes measures, and negative binomial models for utilization count measures. The models were specified to derive estimates of the impact of OCM for each PP quarter. Using a weighted average, [15] we then combined PP quarter estimates into a single cumulative impact estimate and individual PP estimates (two quarters per PP). Because multiple episodes are attributed to the same practice, provider patterns or actions that affect all episodes attributed to a practice will result in errors that are correlated. As a result, we adjusted standard errors to reflect the fact that episodes were clustered at the practice level. Our models also include state fixed effects to adjust for state-level characteristics (e.g., regulations, policies) not otherwise captured by the covariates included in the models (see below).[16]

DID Specification

The growth rate of many payment outcome measures varied considerably by cancer type, over time. For example, in PP4 and PP5, there was a sharp increase in TEP for lung cancer that was not present in PP1 to PP3; in contrast, for colorectal cancer, the change in TEP (relative to baseline) was the same in all PPs. These differences by cancer type were likely due to the availability of new, more expensive cancer treatments used for specific cancer types in more recent PPs. To account for these varied trajectories by cancer type, we incorporated cancer interactions in the DID specification used to assess payment measures (except EOL payments) and chemotherapy utilization measures. Including these interaction terms in the specification improved model fit. We did not include the interaction terms in the DID specification for utilization outcomes (e.g., hospitalizations, ED visits), because these do not measure chemotherapy, and because utilization outcomes did not have similarly varied trajectories by cancer type.

The form of the DID specification used for assessing non-EOL payment outcomes, and for measuring chemotherapy utilization, was as follows:

$$Y = \beta_0 + \beta_1 OCM + \sum_{q=1}^{N} \gamma_q PPQ_q + \sum_{c=1}^{G} \partial_c Can_c + \sum_{q=1}^{N} \alpha_q OCM \cdot PPQ_q + \sum_{c=1}^{G} \theta_c OCM \cdot Can_c + \sum_{q=1}^{N}\left(\sum_{c=1}^{G} \delta_{qc} Can_c \cdot PPQ_q\right) + \sum_{q=1}^{N}\left(\sum_{c=1}^{G} \beta_{qc} OCM \cdot Can_c \cdot PPQ_q\right) + \beta' X + \varepsilon, \quad \textbf{(1)}$$

where ***Y*** is an outcome for each episode originating in quarter q; ***OCM*** is an indicator distinguishing OCM practices from comparison practices; ***PPQ*** is an indicator distinguishing each quarter of intervention data from the baseline data; **Can** is an indicator distinguishing the 24 cancer types and the group of non-reconciliation eligible cancer types; and **X** is a vector of pre-determined covariates for each episode. The indicators for OCM, PP quarter and cancer type are interacted to account for cancer-specific trajectories in payments and use between the baseline and intervention periods, as described above.

The coefficient β_{qc} in model (1) captures the incremental, or marginal, impact of the OCM intervention on outcome ***Y,*** for cancer type ***c.*** The β_{qc} coefficients are aggregated across all cancer types to estimate the impact of OCM in each PP quarter, relative to changes over the same time period in episodes of comparison practices. This interpretation is valid only in linear models. In non-linear models, the outcome of interest is modeled using a nonlinear functional form. In order to unify interpretation across linear and

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[14] Two-part models used for select payment outcomes in previous reports were replaced with ordinary least squares models. This was due to changes in the distribution of outcome measures based on two additional PPs, interpretability of aggregate outcome measures, and differences between episodes with zero and non-zero values and the assumptions of two-part models.

[15] Calculating cumulative and PP-level estimates from weighted quarterly averages accounts for changing distributions and number of episodes over time.

[16] State fixed effects were added to cancer type-specific models. State fixed effects were excluded from these models in previous reports due to sample size limitations.

non-linear models, we use the estimated coefficients to generate predicted values of the outcome measures. We compare two predictions to calculate the marginal effect. The marginal effect is equal to the average marginal effect for each observation, which is calculated as the difference between the predicted treatment outcome and a predicted counterfactual outcome where the impact of OCM is assumed to be zero.[17] Using this model, we constructed estimates of the overall impact of OCM, and impact of specific PPs by taking linear combinations of the estimates of the appropriate PP quarters. We weighted the PP quarter estimates by the number of episodes in each PP quarter to obtain the average cumulative and PP-level impacts, and used the delta method to assign significance to combined estimates.

The form of the DID specification for assessing utilization outcomes not measuring chemotherapy use was:

$$Y = \beta_0 + \beta_1 OCM + \sum_{q=1}^{N} \gamma_q PPQ_q + \sum_{c=1}^{G} \partial_c Can_c + \sum_{q=1}^{N} \alpha_q (PPQ_q \cdot OCM) + \beta' X + \varepsilon, \textbf{(2)}$$

where $\mathbf{PPQ_q}$ indicates episodes that originate in quarter q of the intervention period. This DID is similar to the model specified in equation (1), but without the cancer interactions. The coefficients α_q in model (2) capture the incremental, or marginal, impact of the OCM intervention on outcome $\boldsymbol{Y}$ in PP quarter q, relative to changes from baseline to the same quarters among comparison episodes. Again, this interpretation is valid for linear models. We applied the same marginal effect calculation described in equation (1) to non-linear models. We estimated cumulative and PP-level impacts from the quarterly estimates using the same approach described for equation (1).[18]

In addition to the DID estimates, we present regression-adjusted means of the outcome measures for OCM and comparison episodes during the baseline and intervention periods, and examine trends across the two periods. We also present the DID estimate as a percentage of the OCM baseline mean to provide context (scale) and quantify the relative percentage change associated with OCM.

Covariate Selection

The DID model controls for time-varying changes/influences that affect both the comparison and OCM groups, as long as model assumptions are met, **Exhibit A-10** shows the beneficiary-, practice-, and market-level factors we controlled for in DID analyses. The covariates included in DID models were informed by the broader research literature on oncology outcomes, a review of National Quality Forum measures,[19] discussions with clinical experts, and extensive statistical testing of alternative specifications using baseline period data. We identified 27 covariates for inclusion in all DID impact analyses. For a small group of outcomes, we excluded redundant covariates to achieve model convergence. For example, for all Part D-related outcome measures that apply to beneficiaries enrolled in Part D, the covariate indicating Part D enrollment was excluded.

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[17] Puhani, P. A. (2012). The treatment effect, the cross difference, and the interaction term in nonlinear "difference-in-differences" models. *Economics Letters* 115(1):85–87.

[18] Note that end-of-life DID outcome estimates employ the simple DID approach used in our previous annual reports (specified below) for assessing the impacts of OCM. We employed specification testing to determine if using models (1) or (2) affected our calculations. Our numeric findings were largely unchanged, and therefore the results displayed used the simpler, previous methodology.

[19] National Quality Form. (2018). National Quality Forum [Internet homepage]. [Updated March 23, 2003; cited November 9, 2003]. Available from http://www.qualityforum.org/Home.aspx.

Exhibit A-10: Covariates Included in DID Models

Domain	Model Covariate	Definition
Beneficiary-Level		
Beneficiary characteristics	Sex	Beneficiaries were categorized as male or female based on documented sex.
	Race/ethnicity	Beneficiaries were categorized as non-Hispanic White, Black, Hispanic, or Other based on RTI race code methodology.
	Age	Beneficiaries were categorized as under 65, 65–69, 70–74, 75–79, 80–84, and 85+ years of age.
	Medicaid dual eligibility	Beneficiaries were categorized as having full/partial Medicaid benefits or having no benefits.
	Part D enrollee	Beneficiaries were coded as a Part D enrollee if enrolled in Part D for all months of the episode, while alive.
CMS Program alignment	Beneficiary alignment to other CMS programs	Beneficiaries were coded as aligned if they were involved in at least one of the following CMS initiatives during their episode: Pioneer ACO, Medicare Shared Savings Program, Next Generation ACO, CPC, or CPC+.
Beneficiary clinical characteristics	Cancer type	Depending on the model, this covariate was based on all 24 cancer types (along with the group of non-reconciliation eligible cancers) or a subset of cancers that are relevant to the outcome/subgroup.
	Previous episode	If beneficiaries with a current episode had an episode in the immediately preceding PP, they were flagged as having a previous episode.
	Chemotherapy source	Episodes were categorized based on the type(s) of chemotherapy the beneficiary used during the episode: Part B chemotherapy only, Part D chemotherapy only, or Part B and D chemotherapy.
	CMS HCC risk score	A beneficiary's HCC risk score for the episode was categorized based on quartiles. Quartile cut-points were derived from the episode-level distribution during the baseline period.
Practice-Level		
Practice organization and affiliations	Affiliation with an academic medical center	A practice was coded as affiliated if it was affiliated with an academic medical center.
	Affiliation with a health system	A practice was coded as affiliated if it was affiliated with at least one health system.
	Hospital ownership	A practice was coded as owned if it was owned by at least one hospital.
Practice size and volume	Episode count	A practice's total number of episodes was categorized based on quartiles. Quartile cut-points were derived from the practice-level distribution during the baseline period.
	Practice size	Practices were coded as having 1–3 or 4+ oncology NPIs to distinguish between small and other practices.
Practice specialty type	Oncology-only specialty	Practices were coded as oncology-only if all NPIs within the practice had either an oncology specialty or an NP/PA specialty.
	Presence of radiation oncology NPIs	A practice was flagged if it had at least one radiation oncology NPI.
	Presence of surgical oncology NPIs	A practice was flagged if it had a least one surgical oncology NPI.
	Presence of gynecologic oncology NPIs	A practice was flagged if it had a least one gynecologic oncology NPI.

Domain	Model Covariate	Definition
	Percentage NP/PA NPIs	A practice's share of NPIs who is/are an NP/PA was categorized based on quartiles. Quartile cut-points were derived from the practice-level distribution during the baseline period.
Market-Level		
Market size	County population	The population size of the practice's county was categorized based on quartiles. For practices with multiple counties, this market characteristic and all others listed below were weighted according to the number of cancer E&M services the practice billed through each county. Quartile cut-points were derived from the market-level distribution during the baseline period.
Market demographics, income, and poverty	Percentage of population 65+	The percentage of population over age 65 in the practice's county was categorized based on quartiles. Quartile cut-points were derived from the market-level distribution during the baseline period.
	Percentage in poverty	The percentage of population living in poverty in the practice's county was categorized based on quartiles. Quartile cut-points were derived from the market-level distribution during the baseline period.
Market exposure to Medicare Alternative Models	Medicare Advantage penetration	The percentage of Medicare Advantage penetration in the practice's county was categorized based on quartiles. Quartile cut-points were derived from the market-level distribution during the baseline period.
Market provider supply	Percentage of population designated as a Primary Care HPSA	The practice's percentage of county population residing in a HPSA was categorized as 0 percent, >0–20 percent, or >20 percent. Cut-points were derived from the 2015 distribution of the HPSA proportion among markets with at least one OCM practice or comparison practice.
	Ratio of specialists to primary care providers	A ratio was calculated from the number of specialists divided by the number of primary care physicians in the practice's county. Each practice's ratio was categorized based on quartiles. Quartile cut-points were derived from the market-level distribution during the baseline period.
Market health services utilization	Total IP ED visits among FFS population	The practice's county-level IP ED visits per 10,000 FFS population was categorized based on quartiles. Quartile cut-points were derived from the market-level distribution during the baseline period (composite score averaging 2014 and 2015 values).

Subgroup Analyses

We conducted subgroup analyses for a select group of outcome measures to examine differential impacts of OCM by cancer type or beneficiary characteristics. The subgroup analyses served several purposes: (1) to inform the generalizability of OCM, (2) to identify underlying drivers of success in OCM, and (3) to measure whether OCM leads to unintended consequences for particular groups of beneficiaries

We identified three subgroup categories, and multiple subgroups within each category, including: cancer type, cancer treatment intensity, and beneficiary race/ethnicity. The specific subgroups are shown in **Exhibit A-11** below. We ran DID analyses for the specific subgroup samples, and compared results across each subgroup category. Outcome measures for which we conducted subgroup analyses included: TEP, Part A payments, Part B payments, Part D payments, Part B chemotherapy payments, Part B novel therapy use and payments, Part B non-chemotherapy drug payments, Part B supportive care drug payments, Part B imaging payments, ACH hospitalizations, outpatient ED visits, and 30-day unplanned readmissions. DID analyses were not run for every outcome measure and subgroup combination.

Exhibit A-11: Subgroups Evaluated in the Report Covering PP1–5

Subgroup Category	Episode Subgroups
Cancer	Low-Risk Breast Cancer Low-Intensity Prostate Cancer High-Risk Breast Cancer Lung Cancer Lymphoma Colorectal/Small Intestine Cancer Multiple Myeloma Non-Reconciliation Eligible Cancers High-Intensity Prostate Cancer Chronic Leukemia
Treatment Intensity	Lower-Risk Episodes[20] Higher-Risk Episodes[21]
Race	Episodes for White Beneficiaries[22] Episodes for Black Beneficiaries Episodes for Hispanic Beneficiaries Episodes for Beneficiaries with Other Races[23]

Parallel Trends Assumption

DID analysis assumes that trends for outcome measures in the baseline period were similar for OCM and comparison episodes, and would have remained so in the absence of OCM. Thus, DID accounts for unobserved variables affecting both groups equally, which are assumed to remain equally relevant for both groups over time. Failure of the baseline (pre-OCM) parallel trends assumption results in biased DID estimates.

For each outcome measure, we tested the null hypothesis that episodes attributed to OCM practices and comparison practices had parallel trends during the baseline period. We compared baseline trends on a quarterly basis instead of a PP basis. For each measure, we estimated a DID regression model using the same functional form and covariates as the main impact analyses, including an indicator for OCM versus comparison, a linear trend, and an OCM-specific trend. We rejected the null hypothesis that there were parallel trends in the baseline (i.e., cannot conclude that trends were parallel) at the 5 percent level of significance. For outcome measures assessed for a subpopulation of the data (e.g., cancer type), we limited the episode sample to the subgroup of interest and ran an analogous parallel trends test.

Among outcome measures for which we rejected the null hypothesis, we further reviewed the data to determine whether OCM and comparison baseline trends appeared visually parallel, and also assessed whether the removal of a handful of extreme values would result in the outcome measure passing the parallel trends test (i.e., we cannot reject the null hypothesis). Using this combination of criteria, we identified the set of outcome measures (and relevant subgroups, where applicable) that we deemed could

[20] Lower-risk cancer episodes include low-risk breast cancer, low-intensity prostate cancer and low-risk bladder cancer.

[21] Higher-risk cancer episodes include the 21 cancer types and non-reconciliation eligible cancers not included in the lower-risk cancer type subgroup.

[22] Race/ethnicity was determined using the RTI race code methodology.

[23] The "Other" category includes Asian/Pacific Islander, and American Indian/Alaska Native beneficiaries, as well as beneficiaries with multiple races reported or no race reported.

not be reliably reported due to a potential bias in the DID estimate. Results for these outcome measures and subgroup combinations are not included in this report. The exceptions are a few clinical measures where results were consistent after sensitivity analyses accounting for baseline trend differences.

Sensitivity Tests

We performed several sensitivity tests to understand whether the reported impact estimates were robust with respect to the model specification and the episode sample used. Sensitivity testing was performed on 12 outcome measures: TEP, Part A payments, Part B payments without MEOS, Part D payments, Part B chemotherapy payments, ACH payments, and EOL outcome measures including any Part B chemotherapy during the last 14 days of life, any inpatient admission in the last 30 days of life, ED use (two or more visits) in the last 30 days of life, admission to hospice care, being in hospice care 1–2 days before death, and being in hospice care 3–180 days before death. These measures were selected because they are important for understanding the impact of OCM, and because they rely on different types of data and have different functional forms.

The tests examined sensitivity of the results to the following:

- Choice of model functional form
- Selection of covariates included in the model
- Exclusion of episodes with extreme large payment values (top 5 and 10 percent of TEP)
- Exclusion of episodes for the two largest OCM practices and practices that are part of the U.S. Oncology Network
- Exclusion of episodes for beneficiaries without Part D enrollment in all months
- Exclusion of episodes for specific cancer types, or with specific treatment timing (e.g., new versus ongoing chemotherapy treatment)

Estimation of Net Impact to Medicare

A reduction in per-episode payments (TEP) implies that OCM is reducing episode-level spending, but this does not necessarily translate into net savings for Medicare because TEP does not include the MEOS payment or Performance-Based Payment (PBP that Medicare pays to participating practices. To assess the net impact of OCM, we must include the MEOS payments and PBP made to participating practices to determine whether OCM is achieving sufficient savings to cover its costs. To calculate the net impact to Medicare in PP1 to PP4, we added total MEOS and PBP amounts paid by Medicare to the gross reduction in episode payments measured by TEP, as follows:

$$Net\ Impact = (Gross\ Impact\ on\ TEP) + (MEOS + PBP)$$

Using our DID estimates for TEP in each PP, we multiplied TEP by the number of OCM episodes in that PP to estimate the gross impact on TEP. We then summed MEOS payments and PBP with the gross impact on TEP, to estimate the net impact for Medicare.

For PP3 and PP4, we also calculated the impact on Medicare spending separately among episodes for lower-risk and higher-risk episodes. Since PBP is paid to practices and not defined for each episode, we only included MEOS payments and did not include PBP in the savings/losses estimates by higher- and lower-risk episodes. **Exhibit A-12** defines the measures used in this analysis.

Exhibit A-12: Definition of Measures Used in the Estimation of the Net Impact to Medicare

Measure	Description
Episode-level DID estimate of TEP, by PP	A per episode estimate of the impact on TEP attributable to the OCM model. Estimated for each PP.
Total number of episodes attributed to OCM participants, by PP	The number of episodes attributed to OCM participants for each PP separately. This count includes reconciliation and non-reconciliation eligible episodes.
Gross Impact on TEP, by PP	The product of the DID estimate of TEP by the total number of episodes, calculated for each PP separately.
MEOS + PBP, by PP	Sum of MEOS and PBP paid amounts for each PP separately (first true-up reconciliation results).
Net impact to Medicare, by PP	Gross impact on TEP + total MEOS + PBP, calculated for each PP separately.

Notes: DID: Difference-in-difference, TEP: Total episode payments, PP: Performance period, MEOS: Monthly enhanced oncology services, PBP: Performance based payment

Chemotherapy-Associated Hospital Utilization

We adapted the CMS measure of chemotherapy-associated hospitalizations and ED visits, which was originally developed and tested among patients receiving chemotherapy in hospital outpatient departments. Our revised measure examines chemotherapy-associated utilization that occurs during six-month episodes in OCM practices and comparison practices, regardless of the location where the beneficiary received chemotherapy.

Specifically, we first identified all chemotherapy for each episode with dates between the episode start and end dates. We included Part D claims and Part B outpatient claims, and carrier claims that had a cancer diagnosis on the chemotherapy claim (as per the CMS specifications for OCM episode initiation[24]). We assessed ED visits and hospitalizations that occurred within 30 days after Part B chemotherapy infusions or 30 days after taking a Part D chemotherapy drug (through the last available dose based on fill date plus the number of days dispensed).

As specified by the CMS measure, we identified hospitalizations and ED visits that occurred within 30 days after a claim for chemotherapy, if the hospital/ED claim contained one of the following diagnoses: anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, or sepsis.

We then used logistic regression models to assess the DID impact of OCM. In addition to the covariates in our standard models, we also adjusted for the number of days receiving infused chemotherapy (Part B claims) or days of oral chemotherapy (Part D claims) during the six-month episode, to adjust for differences in exposure to chemotherapy and time at risk for an associated ED visit or hospitalization.

In this report covering PP1–5, we present results for chemotherapy-related hospitalizations and ED visits. Because beneficiaries who go to the ED and are admitted will be counted in both measures, we also show results for ED visits that led and did not lead to a hospitalization.

[24] https://innovation.cms.gov/Files/x/ocm-pp3beyond-pymmeth.pdf

A.2. Patient Survey Methods

A.2.1 Survey Analytic Methods

For this report covering PP1 and PP5, we examined the impact of OCM on care experiences collected from the OCM patient surveys, using DID analysis. The DID analysis includes data from the baseline survey (April 2016–September 2016)[25] and the latest intervention survey (July 2018–December 2018), collected from both OCM and comparison group patients. The DID analysis used the following regression model:

$$y_i = \beta_0 + \beta_1 OCM_i + \beta_2 Time_i + \beta_3 (OCM_i * Time_i) + X_i' \beta_2 + \varepsilon_i$$

where y_i is a survey outcome for patient i, $\mathbf{OCM}_i$ is the treatment indicator where 1 signifies that the respondent i is treated by an OCM practice, $\mathbf{Time}_i$ is an indicator where 1 signifies the intervention period, $(\mathbf{OCM}_i * \mathbf{Time}_i)$ represents the interaction of treatment and time, and X_i represents a set of patient- and practice-level covariates for patient i. The coefficient of the interaction term estimates the risk-adjusted OCM impact.

We used an ordinary least squares regression if the outcome measure was a continuous variable and a logistic regression if the outcome measure was a dichotomous variable. Respondents reported their annual out-of-pocket expenses related to cancer care in six expense categories, and we used an ordered logit regression to estimate the risk-adjusted share of respondents reporting each expense category. We report the 90 percent confidence intervals for all estimates of interest.

We combined responses to the main and alternative surveys (described in the table below) to understand care received by patients who survived and those who did not, except for EOL care questions. The EOL questions are not asked in the survey sent to living patients. For the analysis of EOL care, we used the EOL items on the alternative and decedent surveys.

We weighted the main and alternative surveys using sampling and nonresponse weights, and clustered the standard errors at the practice level. For the EOL analyses, which combined the alternative and decedent surveys, we used nonresponse weights and clustered the standard errors at the practice level.

Risk Adjustment

For all patient, caregiver, and decedent survey analyses, we included both patient and practice characteristics in risk adjustment for composite scores and for individual questions. Patient characteristics included: age group; gender; race; Medicare and Medicaid dual-eligibility; self-reported education level; overall health and mental health (not available for decedents); whether another person helped complete the survey (i.e., proxy respondent); cancer type; comorbidity indicators (represented by aggregate groups of HCC 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. Patients with lower-risk episodes were receiving only hormonal therapy, higher-risk episodes included all other patients. 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.

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[25] Note that the baseline period for claims analysis ends a year before OCM began; that year is "held out" to ensure that any changes in preparation for OCM do not affect the baseline. The baseline survey, in contrast, took place just as OCM began, because it was not possible to collect data a year earlier.

A.2.2 Patient Survey Instruments and Response Rates

Exhibit A-13: Three Patient Survey Instruments and Timing

	Main Survey	Alternative Survey	Decedent Survey
Target patient population	Patients who were alive at the time of sampling (based on latest death records)	Mailed to families of patients who had already died at the time of the survey mailing (based on latest death records)	Mailed to families of patients who were alive at the time of sampling and died within six months after sampling.
Survey questions	Complete set of survey questions except EOL care, including items for composite scoring and current health status	Same questions as main survey, but (1) no current health status questions (because patient is deceased), and (2) with EOL care questions	EOL care questions only.
Survey addressee	Patient	"To the Family of…."	"To the Family of…."
Frequency	Every quarterly wave	Every quarterly wave	Baseline wave 1 (PP1) and intervention wave 9 (PP5)
Role in scoring for payment purpose	Responses from the same items on the main and alternative surveys were combined to calculate practice composite scores for payment adjustment. No EOL questions are used in scoring or payment adjustment.		No EOL questions are used in scoring or payment adjustment.

Exhibit A-14: 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	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	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	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]

Composite	Questions
Exchanging information	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	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	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."

Exhibit A-15: Patient Survey Response Rates

Survey Wave	Main Patient Survey		Alternative Survey		Decedent Surveys	
	Surveys Sent	Response Rate	Surveys Sent	Response Rate	Surveys Sent	Response Rate
Baseline wave (4/16–9/16)	39,057	48.2%	3,308	38.9%	4,791	39.8%
Intervention wave 1 (7/16–12/16)	21,679	47.1%	1,957	37.1%	N/A	N/A
Intervention wave 2 (10/16–3/17)	21,042	46.3%	1,688	33.2%	N/A	N/A
Intervention wave 3 (1/17–6/17)	22,169	45.0%	1,756	33.8%	N/A	N/A
Intervention wave 4 (4/17–9/17)	22,048	45.8%	1,674	36.4%	N/A	N/A
Intervention wave 5 (7/17–12/17)	22,052	47.3%	1,727	35.1%	N/A	N/A
Intervention wave 6 (10/17–3/18)	21,825	48.6%	1,727	35.1%	N/A	N/A
Intervention wave 7 (1/18–6/18)	23,043	44.9%	2,015	32.6%	N/A	N/A
Intervention wave 8 (4/18–9/18)	22,195	46.5%	1,933	36.1%	N/A	N/A
Intervention wave 9 (7/18–12/18)	37,247	45.9%	2,833	35.2%	4,326	36.8%

Notes: N/A: No decedent survey fielded in this wave.

A.3. Practice Leader Survey Methods

A.3.1 Data collection

We surveyed administrators in participating OCM practices to collect information not available through other data sources, including changing cancer care delivery, performance feedback to physicians, and use of compensation-based performance incentives. We conducted the survey twice, to measure changes over time during the model: Wave 1 was collected from October 2016 through February 2017, during the first

year of OCM, and Wave 2 was collected roughly two and a half years later, in May through June 2019, at the end of the third year of OCM.

In both waves, the survey was available by paper, online, and by phone on request. Invitations to participate in the survey and follow-up reminders were sent by mail and by email, with phone reminders to non-respondents. In Wave 1, a $75 non-conditional incentive check was offered to all practices included in the survey sample in the first survey invitation mailing, regardless of whether they returned the survey. In Wave 2, responding to this survey was considered an OCM participation requirement under section XIX in the OCM Participation Agreement, and no incentive was offered for survey completion. The response rate for both waves was over 90 percent (**Exhibit A-16**), with 150 practices responding to both waves of the survey.

Exhibit A-16: Nearly All OCM Practices Responded to Both Waves of the Practice Leader Survey

Wave	OCM Year	Data Collection Period	N OCM Practices Invited	N Responses	Response Rate
Wave 1	1	October 2016–February 2017	190	174	91.6
Wave 2	3	May–June 2019	176	173	98.3

A.3.2 Analytic Approach

Since survey response rates were very high (above 90 percent) we did not use nonresponse weights.

Wave 2 responses. For binary and categorical measures, we calculated percentages of practices responding affirmatively; for continuous measures, we calculated means and standard deviations.

Change over time between Waves 1 and 2. We compared differences in responses between Wave 1 and Wave 2, for OCM practices responding to both surveys. For binary or categorical measures, we used chi-squared tests to compare the percentage of practices responding affirmatively in both Wave 1 and Wave 2. For continuous measures, we used t-tests to detect statistically significant differences between responses in Wave 1 and Wave 2.

Subgroup differences. We compared responses to the Wave 2 survey by practice characteristics, including practice size and practice ownership. For binary or categorical measures, we used chi-squared tests to compare the percentage of respondents with a positive response across groups defined by practice characteristics. For continuous measures, we calculated means and standard deviations, and used t-tests to detect statistically significant differences between respondents by practice characteristics.

A.4. Case Study Methods

We conducted 12 in-person case studies with participating practices during Model Year Three (approximately PP5–6), averaging one per month starting in July 2018. We selected practices with a range of attributes including size, ownership, and geographic location. We iteratively updated both the interview protocols and the accompanying codebook based on the findings from case studies. Depending on the practice size and staffing structure, interviewees for each case study included some or all of the following (and often more than one of each):

- Clinical and administrative leaders
- Medical oncologists and specialty oncologists
- Palliative medicine specialists
- Physician assistants and nurse practitioners
- Nurses

- Patient navigators and care coordinators
- Medical assistants
- Business/finance directors
- Patient financial advocates/counselors
- Directors of performance improvement
- IT staff (e.g., electronic health records)
- Pharmacists
- Staff involved in data management and analytics

Exhibit A-17 shows characteristics of the 12 OCM practices we visited during Year Three.

Cross-Case Analysis. After each case study visit, the team coded themes using NVivo software and updated the codebook to include new themes as appropriate. We identified themes found in at least two of the 12 case studies, and important insights that emerged from one case study in contrast with the others.

In reporting the findings from the cross-case analysis, we note practice characteristics that appear to be associated with an observed theme, where applicable.

Exhibit A-17: Over Half of Practices Visited in Year Three Are Independent and All Are of Medium or Large Size

Characteristic		Number
Ownership[a]	Health system/hospital	7 (3 AMCs)
	Independent	5
Size[b]	Small	0
	Medium	7
	Large	5
Geographic Location	Northeast	4
	Midwest	2
	West	4
	South	2

Notes: [a] Hospital-owned or health system affiliated, based on SK&A data.
[b] Size based on number of episodes in the PP1 second true-up: Small ≤ 245 episodes, Medium = 246–820 episodes, Large ≥ 821 episodes.

A.5. OCM Data Practice Registry and Aggregate Quality Score Methods

A.5.1 Data

OCM practices are required to submit data to the OCM Data Registry for each PP. Among the practice-reported measures are pain assessment and management as needed, and depression screening with follow-up plans as needed (**Exhibit A-18**). We used these practice-reported data to assess trends over time in quality of care.

Exhibit A-18: OCM Quality Measures Submitted to the OCM Data Registry

Measure	Measure Name	Measure Description
OCM-4	Pain Assessment and Management Composite	This measure reflects the percentage of OCM episodes in each PP for which beneficiaries were monitored for pain and, if pain was reported, were provided a documented plan of care to address pain. The Pain Assessment and Management Composite measure comprises two measures: OCM-4a, Oncology: Medical and Radiation – Pain Intensity Quantified (PQRS 143, NQF 0384), and OCM-4b, Oncology: Medical and Radiation – Plan of Care for Pain (PQRS 144, NQF 0383).
OCM-5	Screening for Depression and Follow-Up Plan	This measure reflects the percentage of OCM episodes in each PP for which beneficiaries were screened for depression using a standardized depression screening tool and, if positive, were provided a follow-up plan on the date of the positive screen. The measure is based on the NQF-approved measure of Screening for Depression and Follow-Up Plan (CMS 2v6.3, NQF 0418)

Additionally, OCM practices receive an Aggregate Quality Score (AQS), ranging from 0 to 100 percent for each PP, based on their performance on several claims-based and practice-reported quality measures. The ***OCM Performance-Based Payment Methodology*** provides a more comprehensive summary of how the AQS was calculated in each PP.

A.5.2 Analytic Approach

For the two OCM practice-reported quality measures that CMS used consistently throughout PP1–5, we report the mean across the OCM practices that submitted quality measure data to CMS; for the AQS we report percent of practices in each AQS quartile.

Differences across PPs and by practice characteristics. To assess for differences in the practice-reported quality measures and in the AQS across PPs, and by practice characteristics, we used longitudinal linear regressions with practice random effects. Explanatory measures included indicators for each performance period (or a linear PP trend), number of oncologists per practice, ownership, number of practice sites, specialty mix, and share of dual-eligible patients. Interaction effects between PPs and practice characteristics were also assessed. Standard errors were clustered by practice.

B. Payment and Utilization Outcome Analyses

B.1. Impact on Total Episode Payments and Payment Components

Exhibit B-1: OCM Reduced TEP, Driven by Relative Decreases in Part A and Part B Payments

Measure	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
TEP without MEOS	$28,681	$33,211	$28,421	$33,249	-$297**	-$504	-$91	-1.0%	-$89	-$293*	-$332**	-$380**	-$392*
Part A Payments	$6,042	$5,890	$5,920	$5,882	-$114**	-$203	-$25	-1.9%	-$68	-$130*	-$158**	-$133*	-$81
Part B Payments	$17,080	$19,926	$16,924	$19,945	-$175*	-$340	-$9	-1.0%	-$56	-$174	-$158	-$277**	-$205
Part D Payments	$6,664	$8,924	$6,716	$8,939	$36	-$97	$169	0.5%	$63	$59	$24	$114	-$83

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01. TEP: Total episode payments
Source: Medicare claims 2014–2019. **Notes:** [a] Part D payments are calculated as the sum of low-income cost-sharing and reinsurance amounts, as reflected on the PDE.. MEOS: Monthly Enhanced Oncology Services payment. OCM: OCM intervention group; COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-2: Part A Payments Declined Slightly More For OCM Episodes than for Comparison Episodes

Measure	% of Part A Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
		Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
All Part A Payments	**100%**	**$6,042**	**$5,890**	**$5,920**	**$5,882**	**-$114****	**-$203**	**-$25**	**-1.9%**	**-$68**	**-$130***	**-$158****	**-$133***	**-$81**
ACH Payments	65.2%	$3,937	$3,885	$3,685	$3,606	$27	-$50	$105	0.7%	$45	-$2	-$21	$36	$78
SNF Payments	11.1%	$669	$621	$633	$598	-$13	-$35	$10	-1.9%	$8	-$12	-$21	-$16	-$23
HHA Payments	10.9%	$661	$613	$652	$616	-$11	-$32	$10	-1.7%	-$16	-$1	-$16	-$22	-$1
Hospice Payments	7.7%	$466	$454	$426	$413	-$1	-$15	$14	-0.1%	$8	-$0	$11	-$16	-$5
IRF Payments	3.5%	$214	$230	$189	$205	$0	-$12	$12	0.0%	-$2	$5	$2	-$8	$3
LTCH Payments	2.0%	$121	$91	$117	$83	$4	-$13	$21	3.1%	$10	$9	$6	$6	-$12

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: ACH: Acute care hospital. SNF: Skilled nursing facility. HHA: Home health agency. IRF: Inpatient rehabilitation facility. LTCH: Long term care hospital. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-3: The OCM Reduction in Part B Payments was Primarily Due to Declining Payments for Non-Chemotherapy Drugs

Measure	% of Part B Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
		Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
All Part B Payments	**100%**	**$17,080**	**$19,926**	**$16,924**	**$19,945**	**-$175***	**-$340**	**-$9**	**-1.0%**	**-$56**	**-$174**	**-$158**	**-$277****	**-$205**
Chemo Payments	44.9%	$7,677	$10,282	$7,558	$10,169	-$6	-$141	$129	-0.1%	$61	-$60	$53	-$85	$4
Other Payments without MEOS	15.9%	$2,710	$2,761	$2,832	$2,904	-$21	-$63	$21	-0.8%	-$15	-$26	-$37	-$23	-$4
Non-Chemo Drug Payments	15.7%	$2,678	$2,811	$2,454	$2,732	-$145***	-$218	-$72	-5.4%	-$89*	-$113**	-$160***	-$154**	-$208***
Non-Cancer E&M Payments	5.3%	$897	$893	$877	$881	-$7	-$21	$6	-0.8%	-$10	-$1	-$8	-$13	-$3
Imaging Payments	4.8%	$812	$824	$813	$843	-$18***	-$29	-$8	-2.2%	-$11	-$11	-$19**	-$27***	-$23***
Radiation Therapy Payments	4.7%	$807	$809	$904	$891	$15	-$7	$37	1.8%	$0	$22	$14	$21	$16
Chemo Administration Payments	3.7%	$628	$666	$667	$696	$9	-$5	$22	1.4%	$6	$12	$9	$7	$10
Labs Payments	2.6%	$452	$472	$415	$435	-$0	-$12	$11	-0.1%	$4	$5	-$3	-$7	$0
Cancer E&M Payments	2.3%	$389	$375	$353	$335	$3	-$5	$12	0.9%	-$0	$5	$2	$7	$4

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes:. E&M: Evaluation and management. MEOS=Medicare Enhanced Oncology Service payment. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance Period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-4: OCM had No Overall Impact on Part D Payments

Measure	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Part D Payments [a]	$6,664	$8,924	$6,716	$8,939	$36	-$97	$169	0.5%	$63	$59	$24	$114	-$83
Part D GDC [b]	$10,351	$13,443	$10,446	$13,494	$43	-$124	$210	0.4%	$66	$113	$20	$147	-$137

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: [a] Part D payments are calculated as the sum of low income cost-sharing and reinsurance amounts paid by Medicare, as reflected on the PDE. [b] Part D Gross Drugs Costs (GDC) is calculated as the sum of ingredient cost, dispensing fee, vaccine administration fee, and sales tax, as shown on the PDE, reflecting the total spending on the prescription fill from all parties. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

B.2. Differential Impacts by Cancer Type and Episode Risk Grouping

Exhibit B-5: OCM Reduced TEP for Higher-Risk Episodes and for Several Individual Cancers, but Increased for TEP Lower-Risk Episodes

TEP	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Episode Risk Group													
Lower-Risk Episodes	$7,226	$7,510	$7,329	$7,461	$151**	$39	$264	2.1%	$83	$221*	$217**	$166*	$67
Higher-Risk Episodes	$39,934	$46,697	$39,441	$46,707	-$503***	-$802	-$204	-1.3%	-$149	-$524**	-$599***	-$648**	-$593**
Cancer Type													
Low-Risk Breast Cancer	$5,372	$5,508	$5,465	$5,527	$74	-$28	$176	1.4%	$11	$117	$159*	$102	-$21
Low-Intensity Prostate Cancer	$11,346	$11,930	$11,282	$11,629	$236	-$38	$510	2.1%	$125	$413	$195	$306	$129
High-Risk Breast Cancer	$35,533	$40,907	$34,418	$40,582	-$790***	-$1,279	-$302	-2.2%	-$776**	-$632	-$583	-$1,153***	-$804*
Lung Cancer	$39,918	$51,285	$39,215	$51,874	-$1,292***	-$1,870	-$714	-3.2%	-$651	-$1,061**	-$1,218***	-$1,537***	-$1,984***
Lymphoma	$43,357	$47,990	$44,035	$49,685	-$1,017**	-$1,803	-$232	-2.3%	-$620	-$452	-$1,228*	-$1,307	-$1,565**
Colorectal/Small Intestine Cancer	$36,022	$35,971	$35,103	$35,931	-$879**	-$1,605	-$153	-2.4%	-$369	-$533	-$1,502***	-$909	-$1,172*
Multiple Myeloma	$53,547	$69,762	$53,270	$69,467	$19	-$1,024	$1,061	0.0%	$494	-$468	-$129	$307	-$123
Non-Reconciliation Eligible Cancers	$37,521	$45,090	$35,811	$43,163	$216	-$583	$1,015	0.6%	-$217	$794	-$93	$291	$265
High-Intensity Prostate Cancer	$42,199	$46,324	$42,053	$46,565	-$387	-$1,237	$464	-0.9%	$259	-$250	-$315	-$1,055	-$503
Chronic Leukemia	$44,178	$48,710	$43,948	$48,177	$303	-$539	$1,145	0.7%	-$187	-$632	$65	$863	$1,812**

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01 **Source**: Medicare claims 2014–2019.
Notes: TEP: Total Episode Payments.. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-6: OCM Reduced Part A Payments for Higher-Risk Episodes, but had No Impact on Episodes for Most of the Common Cancers

Part A Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Episode Risk Group													
Lower-Risk Episodes	$2,292	$2,235	$2,248	$2,136	$55	-$22	$133	2.4%	$20	$67	$153**	$21	$20
Higher-Risk Episodes	$7,987	$7,802	$7,817	$7,845	-$212***	-$339	-$85	-2.7%	-$105	-$224**	-$342***	-$240**	-$153
Cancer Type													
Low-Risk Breast Cancer	$1,677	$1,651	$1,671	$1,608	$37	-$36	$110	2.2%	-$16	$100	$123**	$53	-$78
Low-Intensity Prostate Cancer	$3,612	$3,462	$3,459	$3,196	$113	-$68	$294	3.1%	$59	$35	$214	$23	$248
High-Risk Breast Cancer	$4,982	$4,772	$4,925	$4,634	$81	-$97	$260	1.6%	$137	-$23	$211	-$11	$97
Lung Cancer	$9,411	$9,065	$9,107	$9,020	-$259*	-$507	-$10	-2.7%	-$109	-$56	-$405*	-$271	-$458*
Lymphoma	$7,534	$7,404	$7,451	$7,726	-$405	-$844	$34	-5.4%	-$370	-$194	-$789**	-$402	-$285
Multiple Myeloma	$7,633	$7,083	$7,821	$7,565	-$293	-$683	$97	-3.8%	-$158	-$364	-$491	-$117	-$344
Non-Reconciliation Eligible Cancers	$7,460	$7,178	$7,148	$7,185	-$319	-$694	$55	-4.3%	-$528	$111	-$758**	-$102	-$357
High-Intensity Prostate Cancer	$6,378	$5,857	$5,988	$5,735	-$268	-$632	$97	-4.2%	-$26	-$71	-$137	-$890***	-$156
Chronic Leukemia	$5,181	$5,102	$5,307	$4,951	$276	-$130	$681	5.3%	-$162	$279	$260	$453	$647

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01

Source: Medicare claims 2014–2019.

Notes:. OCM: OCM intervention group; COMP: Comparison group. Int.: Intervention period. PP=Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit. Colorectal cancer/small intestine is not included in this table because the Part A Payments impact estimate could not be reliably reported due to failure of the parallel trends assumption.

Exhibit B-7: OCM Reduced Part B Payments for Higher-Risk Episodes, Including High-Risk Breast, Lung, Colorectal, and High-Intensity Prostate Cancers; OCM Slightly Increased Part B Payments for Lower-Risk Episodes

Part B Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Episode Risk Group													
Lower-Risk Episodes	$4,459	$4,768	$4,581	$4,811	$80*	$7	$152	1.8%	$37	$126	$50	$136**	$45
Higher-Risk Episodes	$23,565	$27,841	$23,370	$27,933	-$287**	-$526	-$49	-1.2%	-$77	-$328*	-$273	-$460**	-$294
Cancer Type													
Low-Risk Breast Cancer	$3,138	$3,264	$3,202	$3,321	$7	-$41	$55	0.2%	-$12	-$14	$16	$14	$32
Low-Intensity Prostate Cancer	$7,421	$8,116	$7,530	$8,093	$133	-$61	$327	1.8%	$59	$341	-$18	$316**	-$58
High-Risk Breast Cancer	$24,977	$27,336	$24,305	$27,434	-$769***	-$1,167	-$371	-3.1%	-$834***	-$640**	-$673**	-$1,015***	-$674*
Lung Cancer	$27,058	$37,459	$26,621	$37,855	-$833**	-$1,398	-$268	-3.1%	-$271	-$708	-$712	-$1,136**	-$1,326***
Lymphoma	$30,963	$35,251	$31,623	$36,247	-$336	-$915	$242	-1.1%	$119	-$110	-$258	-$960*	-$530
Colorectal/Small Intestine Cancer	$25,977	$25,713	$25,256	$25,769	-$777**	-$1,351	-$202	-3.0%	-$296	-$654	-$1,123**	-$791	-$1,085**
Multiple Myeloma	$21,892	$27,259	$21,466	$26,899	-$67	-$657	$523	-0.3%	$52	-$337	$66	-$60	-$59
High-Intensity Prostate Cancer	$18,136	$19,110	$17,686	$19,363	-$703*	-$1,379	-$27	-3.9%	-$309	-$1,273**	-$573	-$812	-$572
Chronic Leukemia	$13,061	$14,370	$12,986	$14,220	$74	-$324	$472	0.6%	-$116	-$282	$155	$55	$683**

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.

Source: Medicare claims 2014–2019.

Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit. Non-reconciliation eligible cancers are not included in this table because the Part B payments impact estimate could not be reliably reported due to failure of the baseline parallel trends assumption.

Exhibit B-8: OCM Increased Part D Payments for High-Intensity Prostate Cancer, but had No Impact on Episodes for Other Common Cancers

Part D Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Episode Risk Group													
Lower-Risk Cancer Types	$534	$570	$558	$576	$18	-$18	$54	3.3%	$31	$32	$14	$11	-$0
Higher-Risk Cancer Types	$10,490	$13,920	$10,371	$13,740	$61	-$132	$255	0.6%	$66	$91	$84	$181	-$117
Cancer Type													
Low-Risk Breast Cancer	$558	$593	$593	$599	$30	-$12	$72	5.4%	$38	$32	$21	$35	$23
Low-Intensity Prostate Cancer	$472	$525	$440	$512	-$20	-$87	$47	-4.2%	$11	$47	-$14	-$51	-$98*
High-Risk Breast Cancer	$6,866	$10,982	$6,447	$10,595	-$32	-$334	$270	-0.5%	-$40	$120	-$64	-$9	-$176
Lung Cancer	$4,525	$6,295	$4,601	$6,591	-$221	-$625	$183	-4.9%	-$324	-$336	-$108	-$107	-$228
Lymphoma	$6,475	$7,140	$6,633	$7,600	-$301	-$787	$185	-4.7%	-$429	-$127	-$167	$102	-$903**
Colorectal/Small Intestine Cancer	$2,608	$2,952	$2,515	$2,675	$185	-$47	$417	7.1%	$142	$473**	$62	$224	-$9
Multiple Myeloma	$27,923	$41,379	$27,953	$40,825	$583	-$136	$1,302	2.1%	$732	$349	$488	$868	$472
Non-Reconciliation Eligible Cancers	$15,221	$19,247	$14,141	$17,513	$655*	$55	$1,255	4.3%	$344	$650	$767	$1,024**	$471
High-Intensity Prostate Cancer	$19,856	$24,058	$20,637	$24,140	$699**	$165	$1,233	3.5%	$786**	$1,194***	$427	$792	$341
Chronic Leukemia	$28,296	$31,897	$27,960	$31,590	-$29	-$759	$701	-0.1%	$110	-$652	-$367	$396	$568

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01. OCM: OCM intervention group.
Source: Medicare claims 2014–2019.
Notes: Part D payments are calculated as the sum of low-income cost-sharing and reinsurance amounts, as reflected on the PDE. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

B.3. Impact on Beneficiary Cost-Sharing

Exhibit B-9: OCM Reduced Beneficiary Cost-Sharing for Part B Services, but Increased Cost-Sharing for Part D Drugs (Cost-Sharing Does Not Account for Payments from Supplemental Insurance)

Measure	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Total Beneficiary Cost-Sharing	$5,587	$6,216	$5,535	$6,209	-$45	-$93	$3	-0.8%	-$20	-$48	-$33	-$71*	-$54
Part A Beneficiary Cost-Sharing	$461	$441	$446	$429	-$3	-$10	$4	-0.7%	-$2	-$3	$1	-$2	-$10
Part B Beneficiary Cost-Sharing	$4,509	$5,085	$4,463	$5,096	-$56**	-$102	-$11	-1.2%	-$32	-$55*	-$46	-$82**	-$64*
Part D Beneficiary Cost-Sharing[a]	$739	$830	$751	$821	$20**	$6	$33	2.7%	$20**	$14*	$19**	$19*	$27**

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01. OCM: OCM intervention group.
Source: Medicare claims 2014–2019.
Notes: [a] Part D beneficiary cost-sharing is calculated as the sum of patient paid amount and other TrOOP amount, as reflected on the PDE. Part A and Part B cost-sharing (deductibles and co-insurance) are often covered by supplemental insurance and may not reflect out-of-pocket costs.
COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

B.4. Net Impact of OCM

Exhibit B-10: OCM Resulted in Net Losses to Medicare of $315.6M over Four PPs; Losses Declined Between PP1 and PP3, but Grew in PP4

PP	Total Program Episodes	Gross Impact on TEP			+ PBP Payments	+ MEOS Payments	= Net Impact (Losses to Medicare)		
		Estimate	LCL	UCL			Estimate	LCL	UCL
PP1	139,667	-$12,443,592	-$42,676,508	$17,789,323	$14,295,955	$98,575,061	$100,427,424	$70,194,509	$130,660,340
PP2	132,629	-$38,918,897*	-$71,792,359	-$6,045,434	$17,708,460	$93,880,339	$72,669,902*	$39,796,440	$105,543,365
PP3	128,724	-$42,694,680**	-$74,803,108	-$10,586,258	$19,031,892	$89,464,798	$65,802,010**	$33,693,582	$97,910,433
PP4	133,202	-$50,665,174**	-$90,704,310	-$10,626,040	$33,297,129	$94,134,524	$76,766,478**	$36,727,342	$116,805,612

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2018; OCM first true-up reconciliation reports, PP1–PP4.
Notes:. PP: Performance period. LCL: Lower confidence limit. UCL: Upper confidence limit.

B.5. Impact on Utilization of ACH, Post-Acute Care, and Outpatient Services

Exhibit B-11: OCM had No Overall Impact on Measures of Acute Care Hospitalization

Measure	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Occurrence of an ACH Hospitalization	27.5%	25.6%	26.1%	24.1%	0.2%	-0.2%	0.5%	0.6%	0.2%	0.1%	0.3%	0.1%	0.1%
Number of ACH Hospitalizations	0.433	0.400	0.407	0.374	0.001	-0.007	0.008	0.2%	0.001	0.000	0.000	-0.000	0.002
Number of ACH Days	8.576	8.300	8.465	8.225	-0.038	-0.138	0.063	-0.4%	-0.009	0.019	-0.183**	-0.062	0.044
ACH Payments	$3,937	$3,885	$3,685	$3,606	$27	-$50	$105	0.7%	$45	-$2	-$21	$36	$78
Occurrence of 30-day Unplanned Readmission	20.9%	20.3%	20.3%	20.0%	-0.3%	-0.7%	0.2%	-1.2%	-0.5%	-0.1%	-0.3%	-0.3%	-0.1%
Number of 30-day Unplanned Readmissions	0.095	0.086	0.087	0.079	-0.001	-0.004	0.001	-1.5%	-0.002	-0.000	-0.003	-0.001	-0.000
30-day Unplanned Readmission Payments	$889	$847	$813	$778	-$8	-$38	$22	-0.9%	-$15	-$13	-$21	-$11	$20
Occurrence of ACH ICU Admissions	10.0%	9.5%	9.3%	9.0%	-0.2%	-0.5%	0.1%	-2.2%	-0.2%	-0.1%	-0.2%	-0.3%	-0.3%
Number of ACH ICU Admissions	0.124	0.118	0.114	0.112	-0.003	-0.008	0.001	-2.6%	-0.004	-0.000	-0.005	-0.004	-0.004

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: ACH: Acute Care Hospital. ICU: Intensive Care Unit. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-12: OCM Increased ACH Hospitalizations for Lower-Risk Episodes, Driven by Low-Risk Breast Cancer

ACH Hospitalizations	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Episode Risk Group													
Lower-Risk Episodes	0.153	0.144	0.149	0.134	0.006**	0.002	0.010	3.7%	-0.000	0.006	0.010***	0.006	0.006*
Higher-Risk Episodes	0.577	0.533	0.539	0.497	-0.002	-0.013	0.008	-0.4%	0.003	-0.004	-0.006	-0.004	-0.000
Cancer Episode Type													
Low-Risk Breast Cancer	0.113	0.108	0.112	0.102	0.005**	0.001	0.009	4.4%	-0.002	0.004	0.009**	0.007**	0.006*
Low-Intensity Prostate Cancer	0.234	0.216	0.223	0.197	0.007	-0.003	0.016	2.8%	0.004	0.008	0.011	0.006	0.005
High-Risk Breast Cancer	0.381	0.344	0.367	0.321	0.010	-0.002	0.022	2.5%	0.007	-0.006	0.021*	0.010	0.016
Lung Cancer	0.727	0.658	0.684	0.626	-0.011	-0.030	0.008	-1.5%	-0.016	-0.000	-0.017	0.004	-0.025
Lymphoma	0.545	0.498	0.516	0.491	-0.022	-0.046	0.001	-4.1%	-0.008	-0.015	-0.043**	-0.035*	-0.012
Colorectal/Small Intestine Cancer	0.593	0.568	0.553	0.532	-0.004	-0.026	0.018	-0.7%	-0.004	-0.006	-0.018	0.003	0.005
Multiple Myeloma	0.525	0.455	0.499	0.450	-0.020	-0.042	0.002	-3.9%	-0.010	-0.023	-0.035*	-0.024	-0.010
Non-Reconciliation Eligible Cancers	0.540	0.490	0.485	0.436	-0.001	-0.023	0.021	-0.3%	0.022	0.012	-0.026	0.002	-0.015
High-Intensity Prostate Cancer	0.453	0.406	0.425	0.378	0.000	-0.024	0.024	0.0%	0.023	0.016	0.009	-0.043*	-0.000
Chronic Leukemia	0.375	0.349	0.373	0.328	0.019	-0.001	0.039	5.0%	0.004	0.031*	0.018	0.027	0.013

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019. **Notes**: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-13: OCM had No Impact on Outpatient Emergency Department Use or Related Payments

Measure	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Occurrence of Outpatient ED Visit	23.6%	23.5%	24.3%	24.2%	0.0%	-0.3%	0.3%	0.0%	-0.1%	0.1%	-0.0%	-0.1%	0.2%
Number of Outpatient ED Visits	0.358	0.356	0.374	0.372	0.000	-0.006	0.007	0.1%	-0.003	0.002	0.001	-0.002	0.004
Payments for Outpatient ED Visits	$128	$165	$132	$171	-$2	-$5	$1	-1.4%	-$3	-$1	-$2	-$2	-$1

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019. **Notes**: ED: Emergency Department. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-14: OCM Increased Outpatient ED Visits for Chronic Leukemia, but had No Impact on Other Common Cancers

Outpatient ED Visits	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Episode Risk Group													
Lower-Risk Episodes	0.224	0.229	0.229	0.228	0.006	-0.000	0.011	2.5%	0.002	0.004	0.009*	0.006	0.008
Higher-Risk Episodes	0.426	0.422	0.449	0.447	-0.003	-0.011	0.006	-0.6%	-0.005	0.000	-0.004	-0.006	0.001
Cancer Episode Type													
Low-Risk Breast Cancer	0.192	0.197	0.199	0.199	0.005	-0.001	0.012	2.9%	-0.001	0.005	0.008	0.008	0.008
Low-Intensity Prostate Cancer	0.290	0.290	0.296	0.289	0.007	-0.004	0.018	2.3%	0.011	-0.003	0.010	0.007	0.009
High-Risk Breast Cancer	0.352	0.342	0.365	0.360	-0.005	-0.019	0.009	-1.5%	-0.008	-0.021	0.005	-0.002	-0.000
Lung Cancer	0.496	0.478	0.523	0.511	-0.006	-0.023	0.011	-1.2%	-0.012	-0.006	-0.007	0.003	-0.008
Lymphoma	0.352	0.354	0.365	0.371	-0.005	-0.021	0.012	-1.3%	-0.003	0.010	-0.002	-0.021	-0.008
Colorectal/Small Intestine Cancer	0.433	0.422	0.449	0.457	-0.019	-0.040	0.001	-4.5%	-0.020	-0.010	-0.029	-0.020	-0.018
Multiple Myeloma	0.394	0.375	0.400	0.396	-0.015	-0.034	0.003	-3.9%	-0.020	0.000	-0.026*	-0.012	-0.021
Non-Reconciliation Eligible Cancers	0.411	0.409	0.440	0.421	0.016	-0.005	0.037	3.8%	0.001	0.028	0.019	0.017	0.012
High-Intensity Prostate Cancer	0.426	0.407	0.447	0.432	-0.004	-0.025	0.018	-0.9%	0.049**	-0.017	-0.028	-0.006	-0.016
Chronic Leukemia	0.348	0.368	0.385	0.359	0.046***	0.026	0.065	13.1%	0.028	0.058***	0.034**	0.057***	0.055**

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-15: OCM had No Overall Impact on Chemotherapy-Related Hospital-Based Services

Measure	Number of Episodes		OCM		COMP		Impact Estimates Through PP5			
	OCM	COMP	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change
Occurrence of Chemotherapy-Associated Hospitalizations	658,102	727,671	13.5%	12.4%	12.9%	11.9%	-0.1%	-0.3%	0.2%	-0.4%
Occurrence of Any Chemotherapy-Associated ED Visits	658,102	727,671	17.7%	16.8%	17.6%	17.0%	-0.3%*	-0.6%-	0.0%	-1.9%
Occurrence of Chemotherapy-Associated ED Visits Resulting in a Hospital Admission	658,102	727,671	10.7%	10.1%	10.1%	9.8%	-0.2%	-0.5%	0.0%	-2.3%
Occurrence of Chemotherapy-Associated ED Visits without a Hospital Admission	658,102	727,671	8.6%	8.2%	9.1%	8.8%	-0.1%	-0.4%	0.1%	-1.6%

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01
Source: Medicare claims 2014-2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period.. LCL: Lower confidence limit. UCL: Upper confidence limits.

Exhibit B-16: There was No Difference in OCM Impacts on Chemotherapy-Related, Hospital-Based Services Between Early versus Later Performance Periods

Measure	Early Impact Estimates PP1 – PP3				Late Impact Estimates PP4 – PP5				Is the early impact significantly different from the later impact?
	DID	90% LCL	90% UCL	Percent Change	Percent Change	90% LCL	90% UCL	Percent Change	
Occurrence of Chemotherapy-Associated Hospitalizations	-0.1%	-0.4%	0.2%	-0.5%	0.0%	-0.4%	0.4%	-0.1%	No
Occurrence of Any Chemotherapy-Associated ED Visits	-0.3%*	-0.6%	0.0%	-1.8%	-0.3%	-0.7%	0.0%	-1.9%	No
Occurrence of Chemotherapy-Associated ED Visits Resulting in a Hospital Admission	-0.2%	-0.5%	0.0%	-2.2%	-0.3%	-0.6%	0.1%	-2.4%	No
Occurrence of Chemotherapy-Associated ED Visits without a Hospital Admission	-0.1%	-0.3%	0.1%	-1.5%	-0.1%	-0.4%	0.1%	-1.6%	No

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014-2019
Notes:. PP1-3: Performance periods 1 through 3; PP4-5: Performance periods 4 through 5; LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-17: OCM had No Impact on the Utilization of Post-Acute Care Services or Hospice Care

Measure	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Occurrence of a SNF Stay	5.2%	4.7%	5.0%	4.6%	-0.0%	-0.2%	0.1%	-0.4%	0.0%	-0.0%	-0.1%	0.0%	-0.0%
Number of SNF Stays	0.068	0.061	0.066	0.060	-0.000	-0.002	0.002	-0.6%	-0.000	-0.001	-0.001	0.001	-0.001
Number of SNF Days	27.95	26.13	27.24	25.56	-0.15	-0.62	0.34	-0.5%	0.14	-0.04	-0.37	-0.11	-0.36
Occurrence of a HHA Service	15.5%	14.2%	15.3%	14.1%	-0.1%	-0.4%	0.2%	-0.5%	-0.2%	0.0%	-0.1%	-0.2%	0.1%
Number of 60-day HHA Spells	0.295	0.267	0.288	0.262	-0.001	-0.009	0.006	-0.5%	-0.006	0.002	-0.003	-0.004	0.003
Occurrence of a Hospice Service	8.5%	7.6%	8.0%	7.1%	0.0%	-0.1%	0.2%	0.5%	0.0%	-0.0%	0.2%	-0.0%	0.0%
Number of Days Spent in Hospice	27.514	27.374	27.490	27.341	0.009	-0.687	0.705	0.0%	0.335	0.146	0.119	-0.639	0.083

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: SNF: Skilled Nursing Facility; HHA: Home Health Agency. OCM: OCM intervention group; COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-18: OCM's Impact on Outpatient Services Varied by Type of Service; OCM Led to Small Reductions in Imaging Use and the Occurrence of Outpatient Therapy Services

Measure	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
E&M Services													
Number of E&M Services	21.013	19.526	20.200	18.845	-0.133	-0.594	0.328	-0.6%	-0.631**	-0.134	-0.046	-0.063	0.215
E&M Payments	$1,285	$1,267	$1,230	$1,216	-$4	-$22	$14	-0.3%	-$11	$3	-$7	-$6	$1
Number of Cancer-Related E&M Services	5.284	5.082	5.038	4.797	0.039	-0.058	0.137	0.7%	-0.035	0.036	0.035	0.087	0.073
Cancer E&M Payments	$389	$375	$353	$335	$3	-$5	$12	0.9%	-$0	$5	$2	$7	$4
Imaging Services													
Number of Standard and Other Imaging Services	4.441	3.953	4.400	3.958	-0.046*	-0.086	-0.006	-1.0%	-0.007	-0.029	-0.082***	-0.070**	-0.044
Number of Advanced Imaging Services	3.491	3.532	3.523	3.599	-0.035	-0.084	0.014	-1.0%	-0.021	-0.037	-0.028	-0.061	-0.028
All Imaging Payments	$812	$824	$813	$843	-$18***	-$29	-$8	-2.2%	-$11	-$11	-$19**	-$27***	-$23***
Standard and Other Imaging Payments	$206	$204	$199	$201	-$4	-$9	$0	-2.1%	-$2	-$1	-$7*	-$7*	-$4
Advanced Imaging Payments	$606	$621	$614	$642	-$14**	-$23	-$5	-2.3%	-$9	-$9	-$12*	-$20***	-$19**
Outpatient Therapy Services													
Occurrence of Outpatient Therapy Services	8.6%	9.0%	8.8%	9.5%	-0.2%*	-0.5%	-0.0%	-2.8%	-0.2%	-0.2%	-0.3%	-0.4%*	-0.2%
Number of Outpatient Therapy Services	1.748	1.850	1.779	1.879	0.003	-0.061	0.067	0.2%	0.041	-0.046	0.025	0.023	-0.029

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: E&M: Evaluation and Management. OCM: OCM intervention group; COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-19: OCM Reduced Imaging Payments for High-Risk Breast Cancer, Lung Cancer, Lymphoma, and Colorectal Cancer

Imaging Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Episode Risk Group													
Lower-Risk Episodes	$378	$382	$381	$386	-$1	-$7	$5	-0.2%	$1	-$0	$2	-$5	-$1
Higher-Risk Episodes	$1,039	$1,056	$1,039	$1,082	-$26***	-$41	-$11	-2.5%	-$16	-$14	-$30***	-$37***	-$33***
Cancer Type													
Low-Risk Breast Cancer	$357	$356	$364	$364	-$1	-$7	$5	-0.2%	$0	-$3	$3	-$2	-$2
Low-Intensity Prostate Cancer	$425	$445	$419	$440	-$1	-$15	$13	-0.3%	-$2	$0	-$4	-$4	$5
High-Risk Breast Cancer	$1,148	$1,142	$1,139	$1,171	-$38**	-$63	-$13	-3.3%	-$30	-$43**	-$29	-$51**	-$37*
Lung Cancer	$1,364	$1,374	$1,345	$1,404	-$49***	-$75	-$22	-3.6%	-$20	-$28	-$54***	-$59***	-$85***
Lymphoma	$1,067	$1,097	$1,060	$1,116	-$25*	-$50	-$1	-2.4%	$3	-$23	-$20	-$41*	-$48**
Colorectal/Small Intestine Cancer	$1,194	$1,221	$1,125	$1,237	-$84***	-$128	-$40	-7.0%	-$82**	-$47	-$94**	-$86*	-$114***
Multiple Myeloma	$559	$553	$599	$560	$33	-$24	$90	5.9%	$19	$37	$22	$40	$46
Non-Reconciliation Eligible Cancers	$981	$983	$977	$1,028	-$50**	-$88	-$12	-5.1%	-$35	-$35	-$41	-$70**	-$64**
High-Intensity Prostate Cancer	$782	$817	$820	$871	-$17	-$44	$11	-2.1%	-$29	-$7	-$32	-$27	$12
Chronic Leukemia	$411	$431	$425	$430	$15	-$2	$32	3.6%	$17	$19	$6	$20	$13

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-20: OCM had No Impact on Payment or Utilization of Radiation Therapy Services

Measure	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Occurrence of Radiation Therapy Services	13.3%	12.9%	13.9%	13.4%	0.1%	-0.1%	0.3%	0.4%	-0.1%	0.1%	-0.1%	0.1%	0.2%
Number of Radiation Therapy Services	4.395	4.188	4.801	4.487	0.107	-0.029	0.243	2.4%	0.041	-0.009	0.057	0.140	0.307**
Radiation Therapy Payments	$807	$809	$904	$891	$15	-$7	$37	1.8%	$0	$22	$14	$21	$16

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01. OCM: OCM intervention group.
Source: Medicare claims 2014–2019.
Notes: COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

B.6. Impact on Chemotherapy and Other Drug Utilization and Payments

Exhibit B-21: OCM had No Overall Impact on the Utilization or Payments Related to Part B Chemotherapy Services

Measure	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Occurrence of Part B Chemo Use	65.4%	65.1%	65.1%	64.8%	-0.0%	-0.3%	0.2%	-0.1%	0.2%	-0.1%	-0.1%	-0.2%	-0.0%
Number of Part B Chemo Services	7.020	7.942	6.953	7.939	-0.064	-0.306	0.179	-0.9%	-0.050	-0.087	-0.117	-0.048	-0.018
Part B Chemo Drug Payments	$7,677	$10,282	$7,558	$10,169	-$6	-$141	$129	-0.1%	$61	-$60	$53	-$85	$4

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-22: OCM had No Overall Impact on Part B Chemotherapy Payments for Episode Risk Groups or Common Cancers, With the Exception of High-Risk Breast Cancer; Impacts for Other Common Cancers were Inconsistent

Part B Chemotherapy Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Episode Risk Group													
Lower-Risk Episodes	$349	$348	$350	$349	-$0	-$7	$7	-0.1%	$4	$1	$0	-$2	-$4
Higher-Risk Episodes	$11,458	$15,478	$11,340	$15,341	$20	-$180	$220	0.2%	$113	-$78	$92	-$79	$57
Cancer Type													
Low-Intensity Prostate Cancer	$1,143	$1,132	$1,148	$1,141	-$4	-$27	$20	-0.3%	$11	-$0	-$6	-$11	-$12
High-Risk Breast Cancer	$13,130	$14,909	$12,476	$14,723	-$468**	-$791	-$145	-3.6%	-$520**	-$312	-$458*	-$722**	-$319
Lung Cancer	$12,647	$23,565	$12,297	$23,633	-$417	-$929	$95	-3.3%	-$116	-$478	$9	-$727	-$751*
Lymphoma	$19,797	$22,531	$20,222	$23,387	-$430	-$918	$57	-2.2%	-$55	-$228	-$327	-$1,027**	-$563
Colorectal/Small Intestine Cancer	$12,029	$12,043	$11,934	$11,919	$29	-$403	$462	0.2%	-$79	-$283	-$23	$311	$248
Multiple Myeloma	$13,034	$18,313	$12,678	$17,976	-$19	-$582	$545	-0.1%	$78	-$395	$165	$21	$29
High-Intensity Prostate Cancer	$6,436	$6,890	$6,244	$7,004	-$306	-$848	$235	-4.8%	-$266	-$826	-$322	$46	-$221
Chronic Leukemia	$6,751	$7,371	$6,471	$7,270	-$179	-$466	$108	-2.7%	-$399*	-$496*	-$103	-$5	$223

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit. Non-reconciliation eligible cancers are not included in this table because the Part B Chemotherapy Payments impact estimate could not be reliably reported due to failure of the baseline parallel trends assumption.

Exhibit B-23: OCM had No Impact on the Use of Part B Novel Therapies during Episodes for Relevant Cancer Types

Part B Novel Drug Services	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Cancer Type													
High-Risk Breast Cancer	0.260	0.458	0.224	0.447	-0.025	-0.077	0.026	-9.7%	.	-0.002	-0.022	-0.034	-0.045
Lung Cancer	0.855	3.195	0.814	3.229	-0.075	-0.425	0.275	-8.8%	0.049	-0.121	0.016	-0.255	-0.058
Lymphoma	0.324	0.354	0.342	0.352	0.020	-0.057	0.097	6.2%	-0.020	0.017	0.024	0.006	0.080
Colorectal/Small Intestine Cancer	2.591	0.158	2.497	0.088	-0.024	-0.059	0.011	-0.9%	0.000	-0.031	-0.018	-0.031	-0.039
Chronic Leukemia	0.320	0.047	0.283	-0.001	0.010	-0.005	0.025	3.2%	0.001	-0.001	0.026**	0.024*	0.003

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit. Multiple myeloma is not included in this table because the Part B Novel Therapy Drug Services impact estimate could not be reliably reported due to failure of the baseline parallel trends assumption. High-risk breast cancer did not have any Part B novel therapies approved in PP1.

Exhibit B-24: OCM had No Impact on Payments for Part B Novel Therapies during Episodes for Relevant Cancer Types

Part B Novel Drug Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Cancer Type													
High-Risk Breast Cancer	$1,278	$1,680	$1,162	$1,634	-$70	-$219	$79	-5.5%	.	-$91	-$81	-$104	-$0
Lung Cancer	$2,674	$16,183	$2,889	$16,205	$193	-$340	$725	7.2%	$738**	$242	$702	-$563	-$124
Lymphoma	$288	$2,025	$383	$2,109	$11	-$223	$244	3.7%	$10	$48	-$61	-$268	$331
Colorectal/Small Intestine Cancer	$5,747	$904	$5,708	$998	-$133	-$469	$204	-2.3%	-$148	-$186	-$74	-$74	-$179
Chronic Leukemia	$1,317	$289	$1,012	$215	-$232*	-$442	-$22	-17.6%	-$235	-$211	-$214	-$201	-$306**

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit. Multiple myeloma is not included in this table because the Part B Novel Therapy Drug Payments impact estimate could not be reliably reported due to failure of the baseline parallel trends assumption. High-risk breast cancer did not have any Part B novel therapies approved in PP1.

Exhibit B-25: OCM Reduced Part B Non-Chemotherapy Drug Payments for Higher-Risk Episodes, With Reductions Concentrated in High-Risk Breast, Lung, Colorectal, and High-Intensity Prostate Cancers

Part B Non-Chemotherapy Drug Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Part B non-Chemo Drug Payments	$2,678	$2,811	$2,454	$2,732	-$145***	-$218	-$72	-5.4%	-$89*	-$113**	-$160***	-$154**	-$208***
Episode Risk Group													
Lower-Risk Episodes	$625	$723	$546	$625	$20	-$24	$64	3.2%	$4	$80	-$14	$51	-$28
Higher-Risk Episodes	$3,698	$3,887	$3,447	$3,867	-$232***	-$338	-$126	-6.3%	-$136**	-$221***	-$240***	-$266***	-$299***
Cancer Type													
Low-Risk Breast Cancer	$323	$368	$329	$362	$12	-$13	$37	3.6%	$9	$3	$30	$23	-$6
Low-Intensity Prostate Cancer	$1,356	$1,535	$1,143	$1,278	$43	-$90	$176	3.1%	-$45	$242	-$101	$138	-$40
High-Risk Breast Cancer	$4,313	$4,748	$4,142	$4,826	-$250***	-$400	-$99	-5.8%	-$220**	-$255**	-$233**	-$194	-$353**
Lung Cancer	$4,261	$3,791	$3,850	$3,626	-$246**	-$438	-$53	-5.8%	-$104	-$224*	-$309**	-$199	-$394**
Lymphoma	$4,366	$5,724	$4,512	$5,701	$169	-$71	$409	3.9%	$128	$172	$99	$223	$228
Colorectal/Small Intestine Cancer	$4,617	$4,315	$4,025	$4,177	-$454*	-$837	-$70	-9.8%	$25	-$181	-$559*	-$749**	-$870***
Multiple Myeloma	$1,938	$2,081	$1,689	$1,932	-$100	-$273	$73	-5.2%	-$62	-$50	-$125	-$143	-$114
Non-Reconciliation Eligible Cancers	$3,084	$3,170	$2,887	$3,191	-$218*	-$421	-$15	-7.1%	-$311**	-$326*	-$144	-$287*	-$46
High-Intensity Prostate Cancer	$5,773	$6,179	$5,343	$6,103	-$354*	-$661	-$47	-6.1%	-$67	-$346	-$162	-$683***	-$477*
Chronic Leukemia	$1,618	$2,264	$1,711	$2,238	$118	-$54	$291	7.3%	$167	$46	$56	$97	$249

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-26: OCM Reduced Part B Supportive Care Drug Payments, Particularly Payments for White Blood Cell Growth Factors

Measure	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Part B Total Supportive Care Drug Payments	$2,215	$2,238	$2,054	$2,227	-$150***	-$216	-$84	-6.8%	-$101**	-$123***	-$154***	-$156***	-$216***
Part B Anti-Emetic Payments	$260	$250	$228	$235	-$17**	-$28	-$6	-6.6%	-$6	-$18**	-$31***	-$9	-$21**
Part B White Blood Cell Growth Factors Payments	$1,282	$1,319	$1,233	$1,356	-$86***	-$138	-$34	-6.7%	-$62**	-$70*	-$87**	-$93**	-$118***
Part B Red Blood Cell Growth Factors Payments	$155	$124	$126	$106	-$11	-$22	$0	-7.1%	-$11	-$12	-$7	-$12	-$12
Part B Platelet Growth Factors Payments	$11	$14	$9	$20	-$8***	-$12	-$3	-68.9%	-$6*	-$4	-$7*	-$8**	-$14***
Part B Bone Modifying Agents Payments	$506	$531	$457	$509	-$28**	-$50	-$5	-5.5%	-$15	-$19	-$22	-$34**	-$50**

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-27: OCM Reduced Part B Supportive Care Drug Payments for Higher-Risk Episodes, With Reductions Concentrated in High-Risk Breast, Lung, and High-Intensity Prostate Cancers

Part B Supportive Care Drug Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Episode Risk Group													
Lower-Risk Episodes	$411	$423	$341	$368	-$15	-$38	$9	-3.6%	-$5	-$8	-$23	$2	-$41**
Higher-Risk Episodes	$3,109	$3,176	$2,943	$3,234	-$223***	-$320	-$126	-7.2%	-$153***	-$186***	-$225***	-$245***	-$308***
Cancer Type													
Low-Risk Breast Cancer	$200	$207	$201	$213	-$4	-$20	$11	-2.2%	$3	-$2	-$6	$1	-$18
Low-Intensity Prostate Cancer	$926	$925	$757	$787	-$30	-$97	$37	-3.3%	-$30	-$19	-$45	$11	-$73
High-Risk Breast Cancer	$4,186	$4,479	$4,057	$4,646	-$296***	-$444	-$147	-7.1%	-$270***	-$309***	-$303***	-$201	-$402***
Lung Cancer	$3,956	$3,300	$3,618	$3,282	-$320***	-$501	-$140	-8.1%	-$193*	-$274**	-$419***	-$265*	-$456***
Lymphoma	$3,685	$4,325	$3,732	$4,417	-$45	-$226	$137	-1.2%	$0	$54	-$36	-$106	-$148
Colorectal/Small Intestine Cancer	$3,163	$3,724	$3,058	$3,623	-$4	-$252	$244	-0.1%	$281*	$181	$3	-$206	-$323
Multiple Myeloma	$1,061	$1,102	$960	$1,080	-$79	-$181	$22	-7.5%	-$53	-$58	-$82	-$104	-$95
Non-Reconciliation Eligible Cancers	$2,624	$2,453	$2,413	$2,484	-$242**	-$419	-$64	-9.2%	-$314***	-$213	-$290**	-$279**	-$133
High-Intensity Prostate Cancer	$4,758	$4,839	$4,310	$4,671	-$280*	-$530	-$31	-5.9%	-$21	-$165	-$186	-$559***	-$433**
Chronic Leukemia	$674	$809	$712	$878	-$31	-$139	$78	-4.5%	-$22	$9	-$33	-$61	-$57

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-28: OCM Reduced Part B White Blood Cell Growth Factor Payments for Higher-Risk Episodes, With Reductions Concentrated in High-Risk Breast Cancer, Lung Cancer, and Multiple Myeloma

Part B White Blood Cell Growth Factor Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Episode Risk Group													
Lower-Risk Episodes	$2	$3	$2	$2	$1	-$1	$3	53.6%	$1	$0	$0	$2*	$1
Higher-Risk Episodes	$1,916	$2,003	$1,864	$2,090	-$138***	-$216	-$61	-7.2%	-$100**	-$113**	-$138**	-$153***	-$187***
Cancer Type													
Low-Risk Breast Cancer	$1	$1	$1	$0	$0	-$0	$1	28.6%	$0	-$0	$0	$1	-$0
Low-Intensity Prostate Cancer	$4	$6	$5	$6	$2	-$4	$8	49.8%	$1	-$0	-$0	$6	$3
High-Risk Breast Cancer	$2,275	$2,557	$2,233	$2,671	-$156**	-$264	-$49	-6.9%	-$168**	-$209**	-$161*	-$85	-$159*
Lung Cancer	$2,645	$2,168	$2,420	$2,159	-$216**	-$369	-$63	-8.2%	-$128	-$150	-$304***	-$193	-$307**
Lymphoma	$3,223	$3,804	$3,285	$3,921	-$56	-$223	$111	-1.7%	-$3	$0	-$34	-$125	-$128
Colorectal/Small Intestine Cancer	$2,172	$2,624	$2,170	$2,620	$3	-$243	$249	0.1%	$235	$185	$37	-$172	-$305
Multiple Myeloma	$330	$233	$314	$278	-$60**	-$108	-$13	-18.2%	-$60*	-$74**	-$94***	-$43	-$33
Non-Reconciliation Eligible Cancers	$1,470	$1,347	$1,327	$1,370	-$166**	-$298	-$33	-11.3%	-$209**	-$90	-$241**	-$180*	-$119
High-Intensity Prostate Cancer	$2,034	$2,263	$1,885	$2,255	-$141	-$329	$47	-6.9%	$8	-$68	-$112	-$320**	-$192
Chronic Leukemia	$466	$575	$538	$612	$36	-$56	$127	7.7%	-$11	$25	$43	$56	$78

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

B.7. Differential Impacts by Beneficiary Race

Exhibit B-29: OCM Reduced TEP for White Beneficiaries' Episodes, but had No Impact on TEP for Black or Hispanic Beneficiaries' Episodes

TEP	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Race Subgroup													
Episodes for White Beneficiaries	$28,301	$32,775	$28,030	$32,760	-$256**	-$468	-$44	-0.9%	$52	-$169	-$340**	-$435**	-$388*
Episodes for Black Beneficiaries	$30,433	$35,420	$30,510	$35,542	-$45	-$594	$504	-0.1%	-$589	-$201	$285	-$136	$469
Episodes for Hispanic Beneficiaries	$30,562	$35,272	$30,861	$35,837	-$266	-$909	$376	-0.9%	-$410	-$488	$129	$201	-$773
Episodes for Beneficiaries of Other Races	$30,667	$35,429	$29,691	$35,146	-$692	-$1,494	$109	-2.3%	-$1,088**	-$1,599**	-$873	$466	-$495

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: The proportion of episodes by race/ethnicity break down as follows: White beneficiaries: 82.4%; Black beneficiaries: 8.8%; Hispanic beneficiaries: 4.6%; beneficiaries of other races: 4.2%. TEP: Total Episode Payments. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-30: OCM Reduced Part A Payments for White Beneficiaries' Episodes, but had No Impact on Black or Hispanic Beneficiaries' Episodes

Part A Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Race Subgroup													
Episodes for White Beneficiaries	$5,945	$5,801	$5,814	$5,777	-$107*	-$196	-$17	-1.8%	-$7	-$86	-$183**	-$133*	-$126
Episodes for Black Beneficiaries	$6,749	$6,515	$6,739	$6,630	-$124	-$377	$130	-1.8%	-$323	-$146	-$135	-$105	$105
Episodes for Hispanic Beneficiaries	$6,394	$6,402	$6,552	$6,391	$168	-$161	$498	2.6%	-$271	-$270	$460	$328	$613*
Episodes for Beneficiaries of Other Races	$6,042	$5,858	$5,578	$5,737	-$343	-$760	$74	-5.7%	-$466	-$513	-$250	-$462	-$45

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01. OCM: OCM intervention group. COMP
Source: Medicare claims 2014–2019.
Notes: The proportion of episodes by race/ethnicity break down as follows: White beneficiaries: 82.4%; Black beneficiaries: 8.8%; Hispanic beneficiaries: 4.6%; beneficiaries of other races: 4.2%.: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-31: OCM Reduced Part B Payments for White Beneficiaries' Episodes, but had No Impact on Payments for Black or Hispanic Beneficiaries' Episodes

Part B Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Race Subgroup													
Episodes for White Beneficiaries	$17,217	$20,132	$17,077	$20,181	-$190*	-$358	-$21	-1.1%	-$15	-$143	-$195	-$363***	-$229
Episodes for Black Beneficiaries	$16,351	$19,038	$16,230	$18,814	$103	-$279	$485	0.6%	-$256	-$71	$306	$82	$494
Episodes for Hispanic Beneficiaries	$16,154	$18,555	$16,099	$18,643	-$143	-$631	$346	-0.9%	$138	-$289	$153	$42	-$765*
Episodes for Beneficiaries of Other Races	$17,235	$19,416	$16,648	$19,157	-$327	-$777	$123	-1.9%	-$608*	-$791**	-$512	$435	-$240

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: The proportion of episodes by race/ethnicity break down as follows: White beneficiaries: 82.4%; Black beneficiaries: 8.8%; Hispanic beneficiaries: 4.6%; beneficiaries of other races: 4.2%. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-32: OCM had No Impact on Part D Episode Payments for any Race/Ethnicity Subgroup

Part D Payments	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Race Subgroup													
Episodes for White Beneficiaries	$6,193	$8,294	$6,215	$8,229	$88	-$36	$211	1.4%	$109	$109	$78	$140	$1
Episodes for Black Beneficiaries	$8,830	$11,983	$9,121	$12,203	$71	-$328	$470	0.8%	$44	$103	$258	$15	-$64
Episodes for Hispanic Beneficiaries	$9,147	$11,806	$9,347	$12,324	-$318	-$844	$209	-3.5%	-$308	$89	-$510	-$143	-$745
Episodes for Beneficiaries of Other Races	$8,464	$11,782	$8,665	$11,951	$31	-$574	$636	0.4%	$12	-$268	-$49	$654	-$227

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: The proportion of Part D episodes by race/ethnicity break down as follows: White beneficiaries: 82.0%; Black beneficiaries: 8.7%; Hispanic beneficiaries: 4.9%; beneficiaries of other races: 4.4%.. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-33: OCM Led to an Increase in 30-Day Unplanned Readmissions during Black Beneficiaries' Episodes

Number of 30-Day Unplanned Readmissions	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Race Subgroup													
Episodes for White Beneficiaries	0.091	0.082	0.083	0.076	-0.002	-0.005	0.001	-2.1%	-0.002	-0.000	-0.004	-0.003	-0.001
Episodes for Black Beneficiaries	0.121	0.115	0.121	0.106	0.009*	0.001	0.017	7.5%	0.008	0.004	0.000	0.021***	0.012
Episodes for Hispanic Beneficiaries	0.110	0.102	0.097	0.090	-0.001	-0.012	0.011	-0.5%	-0.008	-0.009	0.012	-0.003	0.006

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01. **Source**: Medicare claims 2014–2019.
Notes: The proportion of episodes by race/ethnicity break down as follows: White beneficiaries: 82.4%; Black beneficiaries: 8.8%; Hispanic beneficiaries: 4.6%; beneficiaries of other races: 4.2%.. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit. Episodes for beneficiaries of other races are not included in this table because the 30-Day Unplanned Readmissions impact estimate could not be reliably reported due to failure of the baseline parallel trends assumption.

Exhibit B-34: OCM had No Impact on Outpatient ED Visits during Episodes for Any Race/Ethnicity Subgroup

Number of Outpatient ED Visits	OCM		COMP		Impact Estimates Through PP5				Period by Period Impact Estimates				
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID
Race Subgroup													
Episodes for White Beneficiaries	0.344	0.342	0.359	0.357	-0.001	-0.007	0.006	-0.1%	-0.003	0.000	-0.000	-0.003	0.003
Episodes for Black Beneficiaries	0.491	0.483	0.521	0.497	0.016	-0.002	0.033	3.2%	0.002	0.024	0.021	0.012	0.019
Episodes for Hispanic Beneficiaries	0.416	0.425	0.424	0.454	-0.021	-0.044	0.002	-5.0%	-0.024	-0.028	-0.029	-0.008	-0.015
Episodes for Beneficiaries of Other Races	0.292	0.301	0.298	0.299	0.007	-0.011	0.026	2.6%	0.005	0.021	0.001	0.004	0.007

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Medicare claims 2014–2019.
Notes: The proportion of episodes by race/ethnicity break down as follows: White beneficiaries: 82.4%; Black beneficiaries: 8.8%; Hispanic beneficiaries: 4.6%; beneficiaries of other races: 4.2%.
OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

B.8. Results of Sensitivity Analyses

As discussed in Appendix A, we ran a number of sensitivity tests on key outcome measures to assess whether impact estimates were sensitive to changes in model specification and/or the types of practices and episodes in the sample. **Exhibit B-35** summarizes the sensitivity tests that were conducted for each of the outcome measures.

Exhibit B-35: Sensitivity Tests Conducted for Selected Payment Outcome Measures

Category	Sensitivity Test	Outcome Measures					
		TEP	Part A Pmts	Part B Pmts	Part D Pmts	Part B Chemo Pmts	Part A ACH Pmts
Model specification	Exclusion of all episode-, practice-, market-level covariates, state fixed effects	X	X	X	X	X	X
Model specification	Exclusion of episode-, practice-, and market-level covariates and state fixed effects, but includes cancer type covariates and interactions with cancer type	X	X	X	X	X	X
Model specification	Exclusion of practice- and market-level covariates and state fixed effects, but includes episode-level covariates	X	X	X	X	X	X
Sample criteria	Exclusion of episodes with payments in the top 5% of the distribution	X	X	X	X	X	X
Sample criteria	Exclusion of episodes with payments in the top 10% of the distribution	X	X	X	X	X	X
Sample criteria	Exclusion of the two largest OCM practices	X	X	X	X	X	X
Sample criteria	Exclusion of beneficiaries not enrolled in Part D for all months of the episode	X	X	X		X	X
Sample criteria	Inclusion of beneficiaries not enrolled in Part D for all months of the episode				X		
Sample criteria	Exclusion of episodes for which the beneficiary had an episode in the previous PP	X	X	X	X	X	X
Sample criteria	Exclusion of episodes with inpatient or outpatient CAR-T cell therapy	X	X	X			X
Sample criteria	Exclusion of practices that are part of the US Oncology Network	X	X	X	X		

The impact estimates were consistent across the different specifications and sample exclusions, with three minor exceptions. **Exhibit B-36** below displays three cases where outcome measures were sensitive to one of the sensitivity tests, along with considerations about the interpretability and reliability of the main impact estimate. We chose not to revise the main estimates as these three cases did not suggest a general pattern or bias in the main outcomes. Rather they highlight subgroups or drivers that might warrant attention in future reports.

Exhibit B-36: Outcome Measures that were Sensitive to Specific Robustness Checks

Sensitivity Test	Outcome Measure(s) that were Sensitive	Impact and Considerations on Interpretability of the Impact Estimate
Exclusion of episodes with payments in the top 5% of the distribution	Part A Payments	The impact estimate for Part A Payments was smaller in absolute magnitude and was no longer statistically significant in this sensitivity analysis. .
Exclusion of practices that are part of the US Oncology Network	TEP, Part B Payments	The outcome measures were no longer statistically significant but the new estimates were not statistically different from those for the full sample estimates (i.e., had overlapping confidence intervals) and were similar in magnitude.

B.9. Trends in Chemotherapy Use and Setting

Exhibit B-37: The Proportion of Episodes Triggered by Part D Chemotherapy Increased Slightly for Both OCM and Comparison Episodes

Measure	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM N=345,881	COMP N=405,605	OCM N=126,654	COMP N=145,234	OCM N=128,238	COMP N=146,648	OCM N=124,327	COMP N=138,790	OCM N=132,814	COMP N=145,987	OCM N=129,418	COMP N=140,333
Episodes Triggered by Part D Chemo	39.7%	39.7%	41.5%	40.8%	42.2%	40.6%	41.6%	40.2%	41.3%	39.7%	41.4%	40.1%

Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

Exhibit B-38: The Proportion of Part D Episodes with Part D Chemotherapy Use Remained Stable in Both OCM and Comparison Episodes

Measure	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM N=278,486	COMP N=329,768	OCM N=104,328	COMP N=120,533	OCM N=107,289	COMP N=122,737	OCM N=103,279	COMP N=116,024	OCM N=110,993	COMP N=122,515	OCM N=107,723	COMP N=117,424
Part D Episodes with Use of Part D Chemo	56.5%	56.5%	57.6%	56.8%	57.5%	56.0%	57.5%	56.1%	56.9%	55.2%	57.3%	55.8%

Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

Exhibit B-39: The Use of Novel Therapies Increased Similarly among OCM and Comparison Episodes

Proportion of Episodes with Novel Therapy Use	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM N= 345,881	COMP N=405,605	OCM N= 126,654	COMP N=145,234	OCM N= 128,238	COMP N=146,648	OCM N= 124,327	COMP N=138,790	OCM N= 132,814	COMP N=145,987	OCM N= 129,418	COMP N=140,333
Overall	**16.1%**	**15.8%**	**12.1%**	**11.8%**	**13.5%**	**13.1%**	**17.6%**	**17.0%**	**19.4%**	**19.4%**	**20.7%**	**20.3%**
Multiple Myeloma	55.1%	54.9%	68.3%	67.8%	70.1%	70.0%	74.8%	75.4%	77.7%	78.9%	72.9%	74.3%
Malignant Melanoma	43.0%	52.8%	86.8%	88.7%	88.9%	89.2%	89.2%	91.5%	90.6%	91.8%	74.0%	73.9%
High-Intensity Prostate Cancer	54.8%	56.9%	0.0%	0.0%	0.3%	0.4%	22.7%	23.8%	60.5%	61.0%	65.6%	67.8%
Lung Cancer	24.2%	26.2%	35.8%	37.1%	41.0%	41.5%	48.0%	47.7%	52.0%	55.5%	63.7%	64.1%
Kidney Cancer	13.2%	12.7%	55.3%	50.3%	58.7%	53.2%	68.1%	64.4%	71.3%	69.7%	44.1%	43.2%
High-Risk Bladder Cancer	0.0%	0.0%	5.1%	8.2%	15.9%	17.8%	41.9%	40.1%	47.3%	43.1%	46.1%	39.1%
Head and Neck Cancer	0.0%	0.0%	19.6%	21.6%	27.4%	28.4%	27.8%	27.4%	30.3%	28.0%	31.7%	32.0%
High-Risk Breast Cancer	14.6%	14.7%	17.8%	18.4%	19.7%	19.6%	27.1%	26.3%	21.7%	22.0%	21.4%	21.4%
Liver Cancer	0.0%	0.0%	0.1%	0.3%	3.4%	5.0%	11.7%	13.2%	19.2%	18.7%	25.0%	21.0%
Acute Leukemia	0.3%	0.5%	0.0%	0.0%	1.0%	1.0%	2.4%	3.8%	8.1%	7.1%	19.8%	20.6%
Ovarian Cancer	27.8%	28.4%	0.4%	0.6%	3.7%	4.3%	8.7%	9.0%	14.1%	14.9%	20.7%	19.6%
Gastro/Esophageal Cancer	5.7%	8.0%	0.0%	0.1%	0.9%	1.3%	5.6%	6.4%	9.7%	10.5%	10.7%	12.4%

Source: Medicare claims 2014–2019.
Notes: Cancer types are limited to those with at least 10 percent of episodes using novel therapy in PP5. OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

Exhibit B-40: The Use of Immunotherapies Increased Similarly among OCM and Comparison Episodes

Proportion of Episodes with Immunotherapy Use	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM N=345,881	COMP N=405,605	OCM N=126,654	COMP N=145,234	OCM N=128,238	COMP N=146,648	OCM N=124,327	COMP N=138,790	OCM N=132,814	COMP N=145,987	OCM N=129,418	COMP N=140,333
Overall	**1.3%**	**1.5%**	**5.4%**	**5.4%**	**6.2%**	**6.3%**	**7.7%**	**7.8%**	**8.7%**	**9.2%**	**8.1%**	**8.2%**
Malignant Melanoma	56.5%	65.0%	80.3%	82.6%	83.5%	85.7%	83.0%	86.0%	84.9%	85.8%	85.8%	86.7%
Kidney Cancer	9.9%	8.8%	49.3%	46.0%	47.5%	43.3%	48.2%	44.9%	47.2%	45.8%	52.5%	49.1%
High-Risk Bladder Cancer	0.9%	0.7%	7.6%	10.1%	16.2%	18.1%	41.9%	40.1%	47.3%	43.1%	47.1%	40.2%
Head and Neck Cancer	1.7%	2.1%	20.9%	23.2%	27.9%	28.6%	28.2%	27.7%	31.2%	28.5%	32.5%	32.4%
Liver Cancer	0.2%	0.2%	1.5%	2.0%	2.5%	5.4%	11.3%	13.5%	19.2%	19.2%	23.7%	19.0%
Non-Reconciliation Eligible Cancer	1.8%	2.4%	8.2%	8.1%	9.0%	9.7%	11.1%	12.3%	12.8%	14.0%	12.9%	14.5%
Gastro/ Esophageal Cancer	0.1%	0.3%	1.1%	1.6%	1.7%	3.2%	6.4%	8.2%	10.8%	11.9%	12.0%	13.4%
Anal Cancer	0.7%	1.7%	1.9%	3.5%	4.0%	6.4%	6.8%	9.5%	8.6%	15.1%	11.2%	13.7%
Female GU Cancer Other Than Ovary	0.3%	0.5%	0.9%	1.8%	2.2%	2.6%	4.5%	5.3%	6.4%	8.2%	9.3%	10.0%

Source: Medicare claims 2014–2019.
Notes: Cancer types are limited to those with at least 5 percent of episodes using immunotherapies in PP5. OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

B.10. Trends in Beneficiary Characteristics of Episodes

We found no evidence that OCM practices were altering case-mix by avoiding or attracting certain types of beneficiaries. Changes in the share of episodes for beneficiaries with different demographic characteristics (age, gender, race dual eligibility, mean hierarchical condition category [HCC] risk score) were similar for OCM and comparison episodes and consistent with national trends. Detailed results are shown below.

Exhibit B-41: Changes in Beneficiary Demographics were Similar for OCM and Comparison Episodes

Demographic Category	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM N=345,881	COMP N=405,605	OCM N=126,654	COMP N=145,234	OCM N=128,238	COMP N=146,648	OCM N=124,327	COMP N=138,790	OCM N=132,814	COMP N=145,987	OCM N=129,418	COMP N=140,333
Gender												
Female	60.3%	57.8%	60.2%	57.7%	60.5%	57.3%	60.1%	57.2%	60.0%	57.0%	59.3%	56.7%
Age Bracket												
< 65	9.9%	11.2%	9.5%	10.7%	9.3%	10.4%	8.8%	10.0%	8.7%	9.9%	8.4%	9.5%
65-69	25.1%	24.4%	25.4%	24.9%	24.9%	24.4%	24.6%	24.2%	24.4%	24.1%	24.2%	23.8%
70-74	23.6%	23.0%	23.9%	23.2%	24.8%	24.0%	25.2%	24.5%	25.0%	24.6%	25.0%	24.7%
75-79	19.2%	18.7%	19.4%	19.0%	19.3%	19.1%	19.6%	19.1%	20.1%	19.5%	20.3%	19.9%
80-84	12.6%	12.8%	12.5%	12.6%	12.4%	12.5%	12.7%	12.6%	12.6%	12.5%	12.9%	12.7%
85+	9.5%	9.9%	9.4%	9.8%	9.2%	9.6%	9.1%	9.6%	9.2%	9.4%	9.2%	9.5%
Race/ Ethnicity												
Non-Hispanic White	82.7%	82.6%	82.6%	82.3%	82.1%	82.1%	82.4%	82.0%	82.3%	82.1%	82.3%	82.4%
Non-Hispanic Black	9.0%	9.2%	8.7%	8.7%	9.0%	8.9%	8.7%	8.5%	8.7%	8.4%	8.5%	8.1%
Hispanic	4.8%	4.4%	4.8%	4.5%	4.9%	4.4%	4.9%	4.4%	4.8%	4.5%	4.8%	4.4%
Other	3.4%	3.8%	3.8%	4.5%	4.0%	4.7%	4.1%	5.0%	4.3%	5.0%	4.4%	5.1%
Dual Eligibility												
Dual Eligible	14.4%	16.8%	14.3%	16.4%	14.3%	16.0%	14.0%	16.0%	13.6%	15.5%	13.6%	15.3%

Source: Medicare claims 2014–2019; Medicare enrolment data 2014-2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

Exhibit B-42: The Mean HCC Risk Score Increased among Both OCM and Comparison Episodes, but Increased Slightly More for Comparison Episodes

HCC Risk Score	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM N= 345,881	COMP N=405,605	OCM N= 126,654	COMP N=145,234	OCM N=128,238	COMP N=146,648	OCM0 N=124,327	COMP N=138,790	OCM N= 132,814	COMP N=145,987	OCM N= 129,418	COMP N=140,333
Median	2.337	2.356	2.619	2.729	2.569	2.711	2.672	2.837	2.658	2.862	2.791	2.925
Mean	2.664	2.665	2.801	2.835	2.792	2.827	2.846	2.89	2.839	2.899	2.908	2.939
Standard Dev.	1.855	1.839	1.921	1.923	1.927	1.92	1.953	1.953	1.959	1.968	1.992	1.986

Source: Medicare claims 2014–2019; Medicare enrolment data 2014-2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

The mix of cancer types changed similarly among OCM and comparison episodes between the baseline and intervention periods, with the exception of low-risk breast cancer. The proportion of low-risk breast cancer episodes increased slightly among OCM episodes, but decreased among comparison episodes. This may reflect practices' attention to triggering episodes for beneficiaries on long-term hormone therapy for low-risk breast cancer. See detailed results below.

Exhibit B-43: The Proportion of Episodes by Cancer Type was Stable with the Exception of Low-Risk Breast Cancer; Low-Risk Breast Cancer Episodes Increased Slightly among OCM Episodes but Decreased among Comparison Episodes

Proportion of Episodes by Cancer Type	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM N=345,881	COMP N=405,605	OCM N=26,654	COMP N=145,234	OCM N=128,238	COMP N=146,648	OCM N=124,327	COMP N=138,790	OCM N=132,814	COMP N=145,987	OCM N=129,418	COMP N=140,333
Low-Risk Breast Cancer	23.8%	23.1%	24.1%	22.6%	24.8%	22.4%	24.4%	22.3%	24.7%	22.3%	24.0%	21.9%
Low-Intensity Prostate Cancer	8.3%	11.3%	8.5%	11.2%	8.5%	11.7%	8.3%	11.2%	8.6%	11.3%	8.4%	11.1%
High-Risk Breast Cancer	10.6%	9.5%	10.5%	9.6%	10.2%	9.2%	10.4%	9.3%	10.1%	9.0%	9.8%	8.8%
Lung Cancer	9.3%	8.8%	9.3%	9.0%	9.2%	9.0%	9.3%	9.0%	9.1%	9.1%	9.4%	9.1%
Lymphoma	6.7%	5.8%	6.3%	5.5%	6.0%	5.4%	5.9%	5.3%	5.6%	5.0%	5.6%	5.0%
Colorectal Cancer	6.1%	5.8%	5.4%	5.2%	5.4%	5.1%	5.1%	4.9%	5.1%	4.8%	4.9%	4.7%
Multiple Myeloma	5.5%	5.1%	5.9%	5.5%	5.8%	5.4%	6.2%	5.7%	6.1%	5.8%	6.3%	5.9%
Non-Recon Cancer	4.2%	4.9%	4.6%	5.7%	4.7%	5.8%	4.7%	6.0%	5.1%	6.6%	5.6%	7.2%
High-Intensity Prostate Cancer	3.8%	4.1%	3.8%	3.9%	3.5%	3.7%	3.9%	4.1%	4.0%	4.1%	4.0%	4.1%
Chronic Leukemia	3.4%	3.3%	3.6%	3.4%	3.7%	3.5%	3.7%	3.5%	3.0%	2.7%	3.1%	2.7%

Source: Medicare claims 2014–2019.
Notes: Cancer types are limited to most common based on episode volume. OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

Exhibit B-44: The Percent of New[26] Low-Risk Breast Cancer Beneficiaries Treated at OCM Practices over Time was Nearly Identical to the Rate for Comparison Practices

Practice Type	Baseline						Intervention									
	Baseline-3		Baseline-2		Baseline-1		PP1		PP2		PP3		PP4		PP5	
	Cumul #	% New	Cumul #	% New	Cumul #	% New	Cumul #	% New	Cumul #	% New	Cumul #	% New	Cumul #	% New	Cumul #	% New
OCM	26,704	100.0%	43,143	38.1%	53,708	19.7%	30,178	100.0%	48,326	37.6%	59,181	18.3%	69,711	15.1%	79,010	11.8%
COMP	30,832	100.0%	49,284	37.4%	61,225	19.5%	32,311	100.0%	51,723	37.5%	63,729	18.8%	75,072	15.1%	84,788	11.5%

Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Performance period. Cumul #: Cumulative Number.

[26] A low-risk breast cancer beneficiary was classified as "new" in a given PP in the baseline or intervention period if she had her first episode in that PP, with no low-risk breast cancer episode in a prior PP.

The exhibit below displays the average number of episodes per beneficiary over a rolling window of three PPs. The rolling window allows us to assess how many episodes beneficiaries had during a constant time period (multiple episodes for the same beneficiary) and whether that changed over time. Beneficiaries with an OCM or comparison episode in the earliest baseline period (Baseline -3) averaged the same number of subsequent episodes (1.74). In contrast, beneficiaries with an OCM episode in PP3 averaged 1.77 subsequent episodes, compared with 1.70 subsequent episodes for beneficiaries with a comparison episode..

Exhibit B-45: Over Time, Low-Risk Breast Cancer Beneficiaries Treated by OCM Practices Contributed More Episodes per Beneficiary Relative to Comparison Practices

Beneficiary Has Episode In:	Practice Type	Number of Beneficiaries	Number of Episodes per Beneficiary During Current and Subsequent Two PPs
Baseline-3	OCM	12,179	1.74
	COMP	13,928	1.74
Baseline-2	OCM	16,686	1.74
	COMP	18,339	1.71
PP1	OCM	14,108	1.77
	COMP	14,848	1.69
PP2	OCM	18,612	1.76
	COMP	19,337	1.69
PP3	OCM	17,920	1.77
	COMP	18,561	1.70

Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

B.11. Trends in Characteristics of Practices

Overall, OCM practices did not change their organizational structure as a result of Model incentives. Most practice characteristics either remained stable between the baseline and intervention periods (e.g., single versus multi-specialty) or changed similarly across both OCM and comparison practices (i.e., affiliation with health systems or academic medical centers). There was some attrition among the comparison group as about 11 percent of comparison practices stopped contributing episodes in the intervention period; in contrast, most OCM practices, regardless of whether they continued participation or terminated,[27] were still contributing episodes. Additionally, while OCM and comparison practices both grew in the number of episodes and NPI providers, the growth in OCM practices slightly outpaced the growth in comparison practices. The increase in the count of NPI providers among OCM practices was primarily driven by an increase in the number of advanced practice providers (APPs), particularly in earlier PPs of the intervention. Providers of other specialty types, including oncologist sub-specialties and urologists, remained fairly stable over time for both OCM and comparison practices. Detailed results are found below.

Exhibit B-46: The Number of OCM Practices was Stable over Time,[28] While the Number of Comparison Practices Declined Due to Consolidation and Attrition

Measure	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		Intervention Period Episodes Initiating: (7/1/16-1/1/19)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM	COMP	OCM	COMP	OCM	COMP	OCM	COMP	OCM	COMP	OCM	COMP	OCM	COMP
Number of Practices with Attributed Episodes	196	534	201	521	190	518	190	504	195	490	195	477	194	473

Source: Medicare claims 2014–2019.
Note: Practice counts reflect an intention-to-treat approach, where terminated OCM practices remain in the sample as long as they continue to contribute episodes. OCM practices could voluntarily terminate participation, and some joined OCM late through pooling arrangements with existing participants. OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

[27] Under the evaluation intention-to-treat (ITT) design, practices that terminate their participation in OCM are included in the analyses if they were still providing care that triggered episodes as defined for OCM (i.e., are still in business). There were 26 OCM practices that terminated participation between PP1 and PP5 and contributed episodes to our analysis for at least one PP during the intervention period.

[28] The number of OCM practices in the baseline period in this report differs from the practices included in the baseline in the Performance Period 1-3 Report. In PP4, two practices entered into pooling arrangements with existing OCM practices. We included these practices in the baseline sample as well as the intervention sample, once they joined the Model.

Exhibit B-47: Practice Size (Number of National Provider Identifiers (NPIs) and Number of Episodes) Increased Between the Baseline and Intervention Periods among OCM and Comparison Practices

Statistic	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM N= 196	COMP N=534	OCM N= 190	COMP N=518	OCM N= 190	COMP N=504	OCM N= 195	COMP N=490	OCM N= 195	COMP N=477	OCM N= 194	COMP N=473
Number of NPIs												
Median	18	9	23	10	22	10	23	10	22	11	25	11
Mean	36	201	41	23	42	24*	42	25*	44	27*	46	27*
Std Dev	53	31	60	37	62	39	63	41	66	43	68	43
Number of Episodes												
Median	329	158	396	172	397	185	391	173	414	185	414	183
Mean	588	253	667	280	675	291*	638	283	681	306*	667	297*
Std Dev	1,175	296	1,311	349	1340	362	1263	361	1,315	389	1,289	385

* Denotes a statistically significant difference from baseline to intervention estimates at p<0.10; Statistical significance not calculated for median values.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

Exhibit B-48: The Growth in NPIs was Mainly for APPs, Particularly among OCM Practices Early in the Intervention Period

Specialty Type	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM N= 196	COMP N=534	OCM N= 190	COMP N=518	OCM N= 190	COMP N=504	OCM N= 195	COMP N=490	OCM N= 195	COMP N=477	OCM N= 194	COMP N=473
Oncologists	63.7%	62.1%	62.1%	61.2%	61.6%	60.3%	61.4%	60.9%	60.0%	58.9%	60.1%	58.7%
APPs	12.4%	10.0%	14.5%	11.1%	15.8%*	12.0%*	16.8%*	12.0%*	17.2%	13.1%	17.3%	13.8%
Urologists	4.5%	6.5%	4.4%	6.5%	4.6%	6.5%	4.4%	6.6%	4.6%	6.3%	4.3%	6.2%
Hematology Onc./Medical Onc.	81.8%	82.9%	82.4%	82.8%	82.6%	82.0%	82.1%	82.2%	81.9%	81.3%	82.1%	81.6%
Surgical Onc.	2.7%	2.0%	2.6%	2.0%	2.5%	2.1%	2.5%	2.2%	2.7%	2.3%	2.7%	2.2%
Radiation Onc.	11.0%	11.2%	11.1%	11.6%	11.0%	12.2%	11.5%	12.1%	11.3%	12.5%	10.9%	12.6%
Gynecologic Onc.	4.0%	3.7%	3.8%	3.2%	3.9%	3.6%	3.9%	3.4%	4.1%	3.3%	4.4%	3.6%

* Denotes a statistically significant difference from baseline to intervention estimates at p<0.10.
Source: Medicare claims 2014–2019; PECOS and NPPES 2014-2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

Exhibit B-49: The Proportion of Oncology-Only Specialty Practices Remained Stable Over Time

Metric	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM N= 196	COMP N=534	OCM N= 190	COMP N=518	OCM N= 190	COMP N=504	OCM N= 195	COMP N=490	OCM N= 195	COMP N=477	OCM N= 194	COMP N=473
% of Onc-Specialty Practices	33.7%	42.5%	35.3%	44.2%	34.7%	43.8%	34.9%	44.5%	33.8%	43.0%	32.5%	43.6%

* Denotes a statistically significant difference from baseline to intervention estimates at p<0.10.
Source: Medicare claims 2014–2019; PECOS and NPPES 2014-2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

Exhibit B-50: Affiliation with an Academic Medical Center Increased Slightly Between the Baseline and Later PPs

Metric	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM N= 196	COMP N=534	OCM N= 190	COMP N=518	OCM N= 190	COMP N=504	OCM N= 195	COMP N=490	OCM N= 195	COMP N=477	OCM N= 194	COMP N=473
Proportion Affiliated with Academic Med Center	15.8%	8.6%	15.8%	8.7%	15.8%	8.9%	15.9%	9.2%	17.4%	10.5%	18.0%	10.6%

* Denotes a statistically significant difference from baseline to intervention estimates at p<0.10.
Source: Medicare claims 2014–2019; Welch and Bindman, 2016; various websites of medical school oncology/hematology departments, divisions, and institutes.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

Exhibit B-51: Ownership by a Hospital or Affiliation with Health System Increased Similarly among OCM and Comparison Practices

Metric	Baseline Period Episodes Initiating: (7/2/14-1/1/16)		PP1 Episodes Initiating: (7/1/16-1/1/17)		PP2 Episodes Initiating: (1/2/17-7/1/17)		PP3 Episodes Initiating: (7/2/17-1/1/18)		PP4 Episodes Initiating: (1/2/18-7/1/18)		PP5 Episodes Initiating: (7/2/18-1/1/19)	
	OCM N=191	COMP N=530	OCM N=190	COMP N=510	OCM N=190	COMP N=498	OCM N=195	COMP N=483	OCM N=195	COMP N=471	OCM N=193	COMP N=465
Proportion of Practices Owned by a Hospital or Affiliated with a Health System	44.0%	54.5%	50.0%	59.6%*	48.4%	57.6%	47.7%	60.5%*	48.2%	60.7%*	48.2%	61.5%*

* Denotes a statistically significant difference from baseline to intervention estimates at p<0.10.
Source: Medicare claims 2014–2019; 2015- 2018 SK&A Office-Based Physician Files.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Performance period.

B.12. Practice Leader Survey: Practice Staff Made Changes to Prevent ED Visits, As a Care Improvement Strategy

As described in Chapter 5, OCM practices continued to focus on preventing ED visits as their main care improvement strategy to reduce Medicare Part A spending. Many of these care process improvements required additional staff. In the first and third years of OCM, we surveyed participating practices and asked about staffing. On average, participating practices reported adding 11 oncologists ($p<0.05$), and adding physicians trained in palliative care to work with cancer patients (Year 1: 68 percent had palliative care physicians; Year 3: 76 percent; $p<0.10$). On average, OCM practices also reported hiring nearly two additional full-time equivalent advanced practice practitioners (nurse practitioners and physicians assistants) for every 10 medical oncologists in the practice ($p<0.05$), and an additional part-time pharmacist for every 10 medical oncologists ($p<0.10$). We asked whether these staffing changes were due specifically to OCM. By the third year of OCM, over 90 percent of practices reported hiring new staff because of OCM, with an average of 4.7 clinical staff added per 10 oncologists because of OCM (**Exhibit B-52**). Over three-quarters of practices reported hiring at least one care coordinator specifically because of OCM, nearly half hired at least one registered nurse, and more than a third hired advanced practice practitioners because of OCM.

Exhibit B-52: Most OCM Practices Hired Additional Clinical Staff Specifically Because of OCM

Clinician Type	Percent OCM Practices with Any Hiring Because of OCM	Among Practices that Hired Because of OCM, Number of Staff Added
Total, all clinicians	**90.1**	**4.7**
APPs: NPs or PAs	35.5	2.1
Pharmacists	12.7	1.0
Care coordinators	78.0	2.2
Registered Nurses	41.9	2.4
Social workers	29.5	0.8
Health coaches	5.8	2.8
Scribe	11.0	3.1

Source: OCM Evaluation Practice Leader Survey (Year 1: October 2016–February 2017; Year 3: May–June 2019).
Notes: N=150 OCM practices responding to both waves of the Practice Leader Survey. NPs: Nurse practitioners; Pas: Physicians assistants.

C. Patient and Caregiver Survey Analyses

Exhibit C-1: OCM had No Impact on Patient Experience of Care

Composite Measure	Number of Survey Responses		OCM		COMPARISON		Impact Estimates Baseline to Intervention Period			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact Estimate	90% LCL	90% UCL	Percent Change
Shared decision making	19954	15639	7.4	7.5	7.5	7.6	0.1	-0.1	0.2	1.1
Access	20213	15832	8.9	8.9	8.8	8.9	0.0	-0.1	0.1	-0.1
Affective communication	19995	15679	9.0	9.0	9.0	9.0	0.0	0.0	0.1	0.6
Exchanging information	19958	15639	8.5	8.4	8.5	8.5	-0.1	-0.2	0.0	-1.2
Enabling patient self–management	19829	15548	6.0	6.0	6.0	6.0	0.0	-0.1	0.1	0.6
Symptom management	10274	8150	7.3	7.1	7.3	7.1	0.0	-0.2	0.2	0.1
Overall Rating	19085	15049	9.3	9.3	9.3	9.3	0.0	-0.1	0.1	0.1

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01
Source: Patient Surveys, Alternate Surveys at baseline (April–September 2016) and intervention period (July–December 2018).
Notes: Composite measures vary from 0 to 10. OCM: OCM Intervention group. COMP: Comparison group. Int.: Intervention period; DID: Difference-in-difference; LCL: Lower confidence limit. UCL: Upper confidence limit. Means and DID impact estimates are regression-adjusted.

Exhibit C-2: OCM Led to Small Reductions in Patient Care Experience and Ratings of Care, Mainly for Hispanic Survey Respondents, Relative to Comparisons

Patient Experience Measure	Number of Survey Responses		OCM		COMP		Impact Estimates Baseline to Intervention Period			
	OCM	COMP	Base line Mean	Int. Mean	Base line Mean	Int. Mean	DID Impact Estimate	90% LCL	90% UCL	Percent Change
Overall Rating of Care										
White non-Hispanic	16352	12953	9.29	9.30	9.30	9.30	0.01	-0.08	0.10	0.001
Black non-Hispanic	1268	944	9.20	9.18	9.29	9.21	0.05	-0.18	0.29	0.006
Hispanic	605	450	9.38	9.11	9.28	9.40	-0.38*	-0.74	-0.01	-0.040
Other	512	404	9.03	8.72	9.07	9.18	-0.42**	-0.73	-0.10	-0.046
Shared decision making										
White non-Hispanic	16966	13440	7.52	7.58	7.59	7.60	0.05	-0.09	0.19	0.007
Black non-Hispanic	1364	978	7.13	7.14	7.29	6.84	0.47*	0.04	0.90	0.065
Hispanic	634	472	7.42	7.17	7.30	7.75	-0.71*	-1.35	-0.07	-0.096
Other	539	417	7.24	7.23	7.65	7.90	-0.26	-0.92	0.39	-0.036

Patient Experience Measure	Number of Survey Responses		OCM		COMP		Impact Estimates Baseline to Intervention Period			
	OCM	COMP	Base line Mean	Int. Mean	Base line Mean	Int. Mean	DID Impact Estimate	90% LCL	90% UCL	Percent Change
Access to care										
White non-Hispanic	17202	13604	8.90	8.90	8.85	8.88	-0.02	-0.09	0.05	-0.002
Black non-Hispanic	1398	1001	8.78	8.83	8.74	8.71	0.07	-0.16	0.31	0.008
Hispanic	649	480	9.14	8.62	8.99	8.95	-0.47**	-0.85	-0.10	-0.052
Other	552	422	8.54	8.72	8.83	8.61	0.39*	0.05	0.73	0.046
Affective communication										
White non-Hispanic	17018	13453	9.04	9.08	9.07	9.05	0.06	0.00	0.13	0.007
Black non-Hispanic	1378	1000	8.95	8.84	9.11	8.95	0.06	-0.22	0.34	0.007
Hispanic	641	478	9.26	8.38	8.84	8.97	-1.02***	-1.57	-0.46	-0.110
Other	549	423	8.48	8.32	8.69	8.50	0.02	-0.42	0.47	0.003
Exchange of information										
White non-Hispanic	17019	13451	8.55	8.43	8.53	8.51	-0.11	-0.24	0.03	-0.012
Black non-Hispanic	1385	995	8.42	8.21	8.28	8.25	-0.17	-0.49	0.15	-0.020
Hispanic	642	479	8.48	7.99	8.36	8.70	-0.84*	-1.38	-0.30	-0.099
Other	548	422	8.21	8.27	8.35	8.49	-0.08	-0.56	0.40	-0.009
Patient self-management										
White non-Hispanic	16940	13394	5.90	6.02	5.95	5.93	0.14*	0.02	0.26	0.024
Black non-Hispanic	1371	983	6.47	6.22	6.13	6.07	-0.19	-0.59	0.21	-0.029
Hispanic	645	473	6.62	5.73	6.37	6.38	-0.90***	-1.42	-0.37	-0.135
Other	536	416	5.79	5.60	6.39	6.17	0.04	-0.73	0.81	0.007
Symptom management										
White non-Hispanic	8726	6952	7.25	7.13	7.33	7.13	0.08	-0.09	0.24	0.010
Black non-Hispanic	729	534	7.57	6.65	7.47	7.07	-0.52	-1.22	0.18	-0.069
Hispanic	363	285	7.83	7.53	7.62	7.77	-0.44	-1.25	0.37	-0.056
Other	299	234	7.01	6.96	7.42	6.94	0.43	-0.45	1.32	0.062

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01
Source: Patient Main and Alternate Surveys at baseline (April–September 2016) and intervention period (July–December 2018).
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period; DID: Difference-in-difference; LCL: Lower confidence limit. UCL: Upper confidence limit. Means and DID impact estimates are regression-adjusted.

Exhibit C-3: The Shift Toward High-Value Supportive Care Did Not Lead to Greater Symptom Burden For Patients Bothered 'At All' By Symptoms

Symptoms	Higher-Risk OCM Episodes									
	Responses		OCM		COMP		Cumulative Impact Estimates			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
Pain	13,632	10,841	60.7%	59.8%	63.1%	60.5%	1.7%	-1.2%	4.6%	2.8%
Energy level	13,740	10,919	84.7%	84.9%	85.1%	84.1%	1.1%	-1.6%	3.9%	1.3%
Emotional problems	13,608	10,836	53.7%	54.2%	56.4%	54.3%	2.6%**	0.5%	4.7%	4.9%
Nausea	13,562	10,802	42.5%	40.3%	45.9%	42.1%	1.6%	-0.5%	3.7%	3.7%
Breathing	13,558	10,805	35.8%	34.2%	35.3%	34.8%	-1.1%	-3.3%	1.1%	-3.0%
Coughing	13,523	10,770	31.5%	30.0%	32.3%	31.2%	-0.4%	-3.4%	2.5%	-1.3%
Constipation	13,747	10,928	72.0%	69.5%	73.2%	70.8%	0.0%	-2.3%	2.3%	-0.1%
Neuropathy	13,633	10,862	54.2%	51.5%	54.5%	52.4%	-0.5%	-3.5%	2.4%	-1.0%
Symptoms	Lower-Risk OCM Episodes									
	Responses		OCM		COMP		Cumulative Impact Estimates			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
Pain	5,806	4,424	41.5%	36.3%	40.1%	39.3%	-4.3%*	-8.4%	-0.3%	-10.5%
Energy level	5,826	4,429	56.7%	57.0%	56.4%	60.8%	-4.1%	-9.3%	1.1%	-7.2%
Emotional problems	5,829	4,437	38.1%	35.7%	39.1%	41.1%	-4.4%**	-7.6%	-1.2%	-11.5%
Nausea	5,789	4,371	11.8%	11.6%	11.7%	13.1%	-1.6%	-4.9%	1.8%	-13.4%
Breathing	5,777	4,392	12.4%	12.1%	11.5%	12.5%	-1.3%	-4.1%	1.4%	-10.8%
Coughing	5,794	4,387	12.8%	12.5%	11.7%	12.7%	-1.2%	-3.9%	1.4%	-9.6%
Constipation	5,843	4,432	32.9%	34.2%	32.2%	34.9%	-1.4%	-5.1%	2.3%	-4.3%
Neuropathy	5,826	4,424	30.9%	29.9%	29.0%	29.8%	-1.7%	-7.0%	3.6%	-5.5%

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Patient Main and Alternate Surveys at baseline (April–September 2016) and intervention period (July–December 2018).
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period; DID: Difference-in-difference; LCL: Lower confidence limit. UCL: Upper confidence limit. Means and DID impact estimates are regression-adjusted.

Exhibit C-4: The Shift Toward High-Value Supportive Care Did Not Lead to Greater Symptom Burden For Patients Bothered 'Quite a Lot or Very Much' By Symptoms

Symptoms	Higher-Risk OCM Episodes									
	Responses		OCM		COMP		Cumulative Impact Estimates			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
Pain	13,632	10,841	28.4%	27.4%	27.8%	27.3%	-0.5%	-2.6%	1.5%	-1.8%
Energy level	13,740	10,919	51.4%	51.0%	53.1%	52.6%	0.0%	-3.9%	4.0%	0.1%
Emotional problems	13,608	10,836	17.9%	17.1%	18.5%	18.1%	-0.5%	-2.3%	1.3%	-2.7%
Nausea	13,562	10,802	13.4%	12.8%	14.9%	14.2%	0.2%	-2.1%	2.4%	1.3%
Breathing	13,558	10,805	14.0%	14.5%	13.9%	13.9%	0.4%	-1.4%	2.3%	3.2%
Coughing	13,523	10,770	10.4%	9.3%	11.2%	10.0%	0.1%	-2.0%	2.2%	0.8%
Constipation	13,747	10,928	38.5%	35.9%	39.7%	37.5%	-0.3%	-3.8%	3.1%	-0.8%
Neuropathy	13,633	10,862	29.4%	28.2%	29.3%	26.8%	1.2%	-1.2%	3.6%	4.1%
Symptoms	Lower-Risk OCM Episodes									
	Responses		OCM		COMP		Cumulative Impact Estimates			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
Pain	5,806	4,424	15.0%	13.0%	13.5%	15.0%	-3.5%**	-5.8%	-1.2%	-23.4%
Energy level	5,826	4,429	25.5%	27.8%	25.7%	29.8%	-1.7%	-6.0%	2.6%	-6.8%
Emotional problems	5,829	4,437	11.2%	11.6%	11.4%	12.0%	-0.1%	-2.4%	2.2%	-0.9%
Nausea	5,789	4,371	4.1%	3.8%	3.5%	4.5%	-1.3%	-3.1%	0.4%	-32.4%
Breathing	5,777	4,392	3.4%	4.2%	3.8%	3.4%	1.2%	-1.1%	3.4%	33.5%
Coughing	5,794	4,387	3.6%	2.7%	2.8%	3.4%	-1.4%	-3.2%	0.3%	-40.2%
Constipation	5,843	4,432	13.2%	11.3%	12.9%	13.5%	-2.5%	-5.4%	0.5%	-18.7%
Neuropathy	5,826	4,424	14.9%	12.9%	14.1%	14.1%	-1.9%	-4.5%	0.6%	-13.0%

Asterisks denote statistically significant impact estimates at *p<0.10, **p<0.05, and ***p<0.01.
Source: Patient Main and Alternate Surveys at baseline (April–September 2016) and intervention period (July–December 2018).
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period; DID: Difference-in-difference; LCL: Lower confidence limit. UCL: Upper confidence limit. Means and DID impact estimates are regression-adjusted.

D. Clinical Analyses

D.1. Overview of Methods for Clinical Analyses

Details about variable definitions for each of the clinical analyses are described in this appendix. Impact analyses used DID models, which included all adjustment variables as described previously. We also estimated early DID effects (PP1–3) and later effects (PP4–5). Where sample sizes allowed, and other evidence suggested the potential for differences by race/ethnicity, we conducted analyses stratified by race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic); we excluded episodes for beneficiaries of other races/ethnicities due to small sample sizes.

We examined trends in OCM and comparison episodes over the baseline period, to understand whether trends were parallel before the Model began. Specifically, we estimated linear probability models fit to baseline period episodes that included an indicator variable for OCM practices (an intercept) in addition to a linear interaction between quarter number and treatment group (a slope). When we observed differential trends (e.g., if a 95 percent confidence interval of the OCM slope effect did not contain zero), we performed sensitivity analyses to assess robustness of our DID estimates. These sensitivity analyses included all episodes (baseline and intervention) and allowed for differential linear baseline trends. We note whether our DID estimates and conclusions were robust to this relaxing of the parallel trend assumption. We also describe raw rates by quarter for all measures.

For a small number of outcomes, rates were too low in the baseline period to conduct DID models; for these (where baseline rates were < 5 percent among all episodes), we compared linear trends and rates of use for OCM and comparison episodes in the intervention period, adjusted for the same covariates as in the DID models.

D.2. Radiation Therapy

D.2.1 Adjuvant Radiation for Breast Cancer

Measures and Analytic Approach

As described in the main report, OCM could lead to more high-value use of post-operative radiation therapy among beneficiaries with episodes for breast cancer treatment. We examined use of any radiation following surgery as well as use of intensity-modulated radiation therapy (IMRT). (IMRT is lower-value care in this context).

Among beneficiaries with episodes for high-risk breast cancer, we identified receipt of breast cancer surgery (lumpectomy or mastectomy) from 180 days prior to the episode, through 180 days following the episode. We next identified radiotherapy codes during the episode. Because our goal in this analysis was to identify curative-intent, post-operative radiotherapy, we excluded any radiotherapy for which the initial radiation claim had an ICD9 or ICD10 code for distant metastatic cancers or for bone metastases. Specifically, we excluded those with metastatic cancer codes ICD9 197–197.9 (secondary neoplasm of respiratory/digestive system), ICD9 198–198.9 (secondary malignant neoplasm of other sites), and the corresponding ICD10 codes C78.00–C79.9. We also excluded diagnosis codes for bone metastases ICD9 code 198.5 (secondary malignant neoplasm of bone), ICD10 code C7951 (secondary malignant neoplasm of bone), and ICD10 code C7952 (secondary malignant neoplasm of bone marrow).

We examined receipt of post-operative radiation during the episode. Among patients who had radiation, we assessed whether IMRT was used rather than external beam radiation (we also assessed use of proton beam radiation, which occurred for less than 1 percent of episodes). We repeated analyses stratified by whether or not there was a radiation oncologist in the TIN, to evaluate whether the impact of OCM differed for practices that did or did not employ radiation oncologists. It is important to note that these

analyses primarily address changes in radiation therapy for beneficiaries treated with radiation therapy and does not reflect decisions by medical oncologists to refer beneficiaries for radiation therapy.

We also examined use of short course radiation. Shorter courses—fewer fractions—of post-operative radiation following lumpectomy for early stage breast cancer have outcomes that are equivalent to longer treatment courses and also lower the risk of toxicity.[29] Shorter courses of radiation therapy are more convenient for patients and less costly for payers and patients. As result, in 2013 the American Society for Radiation Oncology (ASTRO) made the following recommendation as part of the American Board of Internal Medicine (ABIM) ***Choosing Wisely*** campaign: *Do not initiate whole breast radiotherapy as a part of breast conservation therapy in women with early stage invasive breast cancer without considering shorter treatment schedules.*[30] For analyses examining number of fractions, we limited to beneficiaries who had lumpectomy, because short course radiation is not recommended for post-mastectomy radiation. We included radiation fractions through 30 days after the episode ended to capture all fractions when radiation therapy started towards the end of an episode. Short course radiation therapy (generally 15–20 fractions) was defined as no more than 21 fractions, while 22 fractions or more were classified as long course treatment. Analyses of baseline trends suggested potentially differential trends (95 percent confidence interval of the OCM slope effect did not contain zero). We thus performed sensitivity analyses to account for differential baseline trends. The primary DID analyses suggested no impact of OCM on u of short course radiation. However, the confidence intervals were large and sensitivity analyses yielded inconsistent results. We therefore did not include the short course radiation result in this report.

Results

As explained in the main report, we found no OCM impact on any post-operative use of radiation, or on use of IMRT, among beneficiaries treated with post-operative radiation therapy (**Exhibit D-1**). We also found no OCM impact on these outcomes after stratifying by the presence or absence of a radiation oncologist in the practice (TIN).

Exhibit D-1: No OCM Impact on Radiation for High-Risk Breast Cancer Overall or for Practices With or Without Radiation Oncologists

Measure	# of Episodes		OCM		COMP		Impact Estimates Through PP5			
	OCM	COMP	Base-line Mean	Int. Mean	Base-line Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
Post-Operative External Beam Radiation (EBRT) During Episode										
EBRT during episode – all episodes	101,576	104,100	11.1%	11.2%	11.4%	11.4%	0.1%	-0.4%	0.5%	0.8%
EBRT during episode for practices with a radiation oncologist	69,953	47,948	11.3%	11.4%	11.1%	11.3%	-0.1%	-0.8%	0.5%	-1.1%
EBRT during episode for practices without a radiation oncologist	31,623	56,152	11.1%	11.3%	11.3%	11.3%	0.2%	-0.4%	0.9%	2.1%

[29] Valle LF, Agarwal S, Bickel KE, Herchek HA, Nalepinski DC, Kapadia NS. Hypofractionated whole breast radiotherapy in breast conservation for early-stage breast cancer: a systematic review and meta-analysis of randomized trials. *Breast Cancer Res Treat*. Apr 2017;162(3):409–417.

[30] Choosing Wisely. American Society for Radiation Oncology: Ten Things Physicians and Patients Should Question. Last updated 06/18/2018. Available from: https://www.choosingwisely.org/societies/american-society-for-radiation-oncology/

Measure	# of Episodes		OCM		COMP		Impact Estimates Through PP5			
	OCM	COMP	Base-line Mean	Int. Mean	Base-line Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
Use of IMRT During Episode										
Use of IMRT – all episodes	11,209	12,020	15.6%	12.7%	17.4%	15.2%	-0.6%	-3.1%	1.9%	-4.0%
Use of IMRT for practices with a radiation oncologist	7,640	5,702	16.5%	14.9%	19.0%	16.2%	1.3%	-2.4%	4.9%	7.7%
Use of IMRT for practices without a radiation oncologist	3,569	6,318	14.6%	9.5%	15.7%	13.2%	-2.7%	-5.5%	0.04%	-18.5%

Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP5: Performance period 5. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit. EBRT=external beam radiation therapy, IMRT=intensity modulated radiation therapy

To understand if OCM impact increased over time, we separately analyzed PP1–3 versus PP4–5 and found no effect of OCM on use of radiation for breast cancer in either PP group (**Exhibit D-2**).

Exhibit D-2: No Impact of OCM on Post-Operative Radiation for Breast Cancer in PP 1–3 or PP 4–5

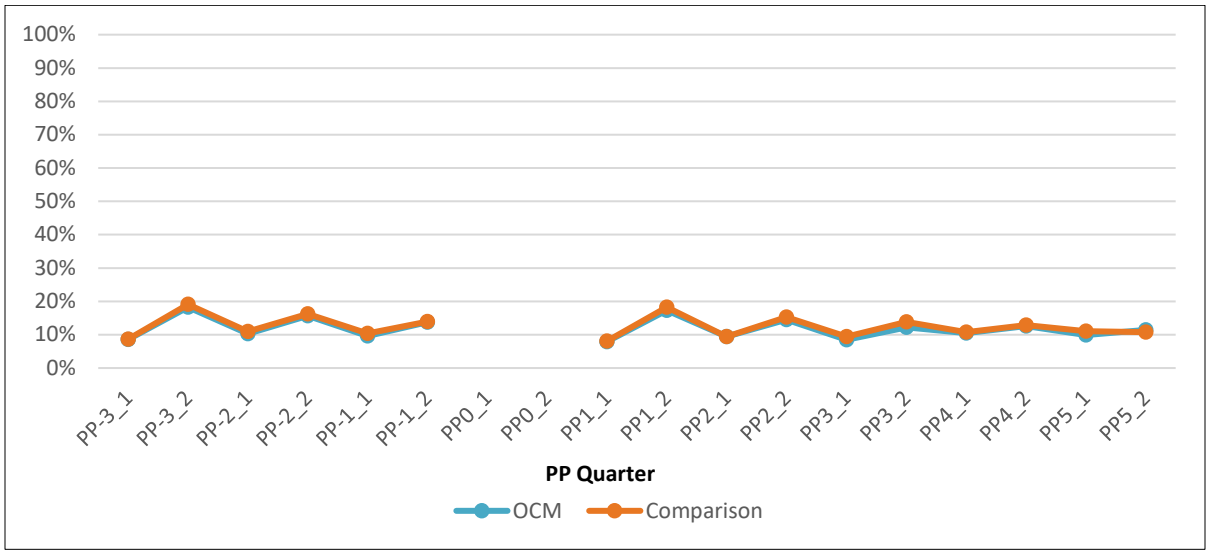
Adjuvant Radiation for Breast Cancer	DID Impact PP 1–5	90% CI	DID Impact PP1–3	90% CI	DID Impact PP4–5	90% CI
EBRT during episode	0.1%	-0.4%, 0.5%	0.0%	-0.5%, 0.5%	0.3%	-0.3%, 0.8%
Use of IMRT	-0.6%	-3.1%, 1.9%	-0.1%	-2.4%, 2.2%	-1.5%	-4.6%, 1.7%

Source: Medicare claims 2014–2019.
Notes: DID: Difference-in-difference. PP: Performance period. CI: Confidence Interval

Baseline and Intervention Trends

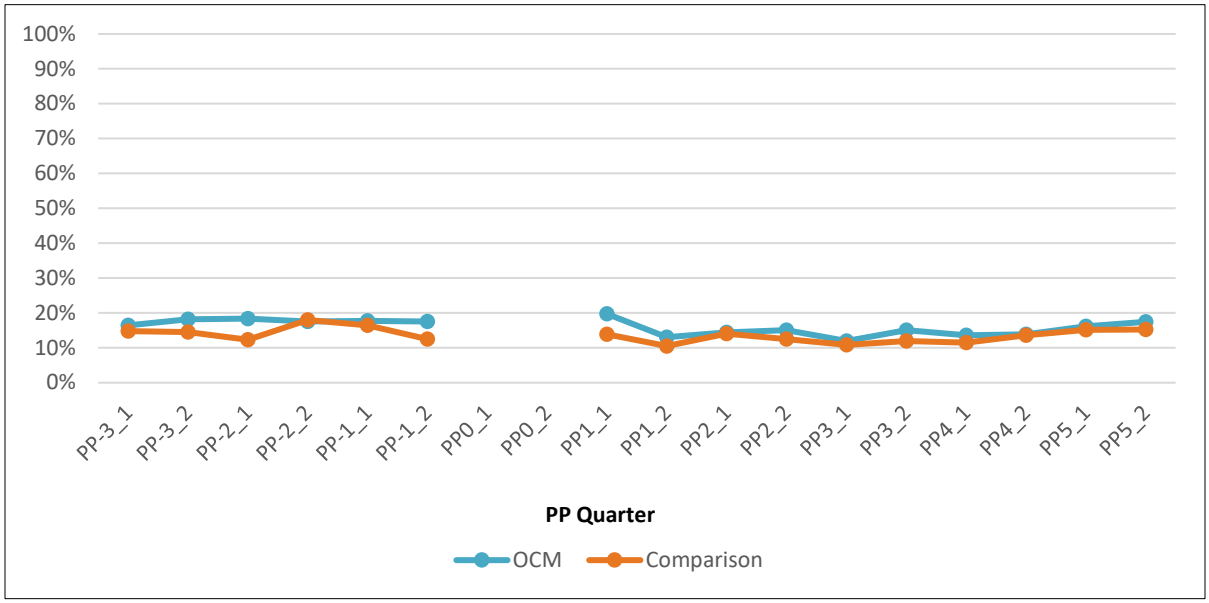
Exhibits D-3 and D-4 show the unadjusted proportion of episodes with post-operative radiation, and use of IMRT and short course radiation, among beneficiaries receiving radiation in the baseline and intervention periods. Baseline trends were similar in OCM and comparison episodes.

Exhibit D-3: Percent Receiving Post-Operative Breast Radiation by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: Quarter*OCM versus comparison group baseline trend: -0.1% (95% CI: -0.3%, 0.2%), P=0.623

Exhibit D-4: Percent Receiving IMRT by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: Quarter*OCM versus comparison group baseline trend: -0.2% (95% CI: -1.2%, 0.9%), P=0.763

D.2.2 Palliative Radiation for Bone Metastasis

Measures and Analytic Approach

As described in the main report, we examined use of 10 or fewer radiation fractions, and use of a single fraction, for beneficiaries receiving radiation for bone metastases, which may reflect higher-value care. We identified episodes for all beneficiaries (any cancer type) with an index claim for radiation therapy during an OCM-defined episode. The index radiation claim was defined as any radiation claim with no prior radiation claim in the preceding 30 days. Individual beneficiaries may have had more than one index radiation claim during an episode, or over multiple episodes if they had multiple sites of metastatic disease. From among episodes with at least one index radiation claim, we next assessed if the radiation was for treatment of bone metastases.[31,32] We identified E&M claims for physician office, inpatient, or outpatient visits in the 14 days preceding the index radiation claim, inclusive of the index date (99201–99215, 99241–99245, 99221–99239, 99291–99292, 99281–99285), and selected those with E&M claims having an ICD9 code of 198.5 or an ICD10 code of C79.51 (secondary malignant neoplasm of bone) or C79.52 (secondary malignant neoplasm of bone marrow). We summed the number of radiation billing codes (each code indicating a radiation treatment fraction), inclusive of the index date. We categorized radiation therapy as 10 or fewer fractions (versus >10), and as single fraction (versus >1 fraction).

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[31] McDougall JA, Bansal A, Goulart BH, et al. The Clinical and Economic Impacts of Skeletal-Related Events Among Medicare Enrollees with Prostate Cancer Metastatic to Bone. *Oncologist*. Mar 2016; 21(3):320-326.

[32] Robinson TJ, Dinan MA, Li Y, Lee WR, Reed SD. Longitudinal Trends in Costs of Palliative Radiation for Metastatic Prostate Cancer. *J Palliat Med*. Nov 2015; 18(11):933-939.

Results

As described in the main report, we found no impact of OCM on use of 10 or fewer radiation fractions for bone metastases (versus >10) or on use of single fraction radiation (**Exhibit D-5**). Moreover, as shown here, we found no difference in impact for practices that included a radiation oncologist and those that did not.

Exhibit D-5: No OCM Impact on Palliative Radiation for Bone Metastasis Overall or for Practices With or Without Radiation Oncologists

Measure	# of Episodes		OCM		COMP		Impact Estimates Through PP5			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
10 or Fewer Radiation Fractions										
10 or fewer radiation fractions – all episodes	9,090	10,276	84.0%	87.5%	81.6%	86.2%	-1.1%	-2.6%	0.4%	-1.3%
10 or fewer radiation fractions for practices with a radiation oncologist	6,451	5,410	84.4%	87.2%	81.8%	85.6%	-0.9%	-2.9%	1.1%	-1.1%
10 or fewer radiation fractions for practices without a radiation oncologist	2,639	4,866	84.8%	88.9%	80.7%	86.0%	-1.2%	-3.6%	1.1%	-1.4%
Single Radiation Fraction										
Single radiation fraction – all episodes	9,090	10,276	12.8%	11.4%	12.9%	11.6%	-0.2%	-1.9%	1.6%	-1.3%
Single radiation fraction for practices with a radiation oncologist	6,451	5,410	12.3%	12.0%	12.3%	12.2%	-0.2%	-2.5%	2.0%	-1.9%
Single radiation fraction for practices without a radiation oncologist	2,639	4,866	14.6%	9.7%	13.4%	10.7%	-2.2%	-4.9%	0.5%	-15.1%

Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP5: Performance period 5. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

To understand if OCM impact increased over time, we separately analyzed PP1–3 versus PP4–5. There was a statistically significant relative decrease in use of single fraction radiation during PP4–5, and more use of multiple fractions/sessions. This suggests that, contrary to the OCM incentives for more efficient care, in PP4–5 OCM episodes had less of the higher-value option of single fraction radiation therapy (relative to comparisons) (**Exhibit D-6**).

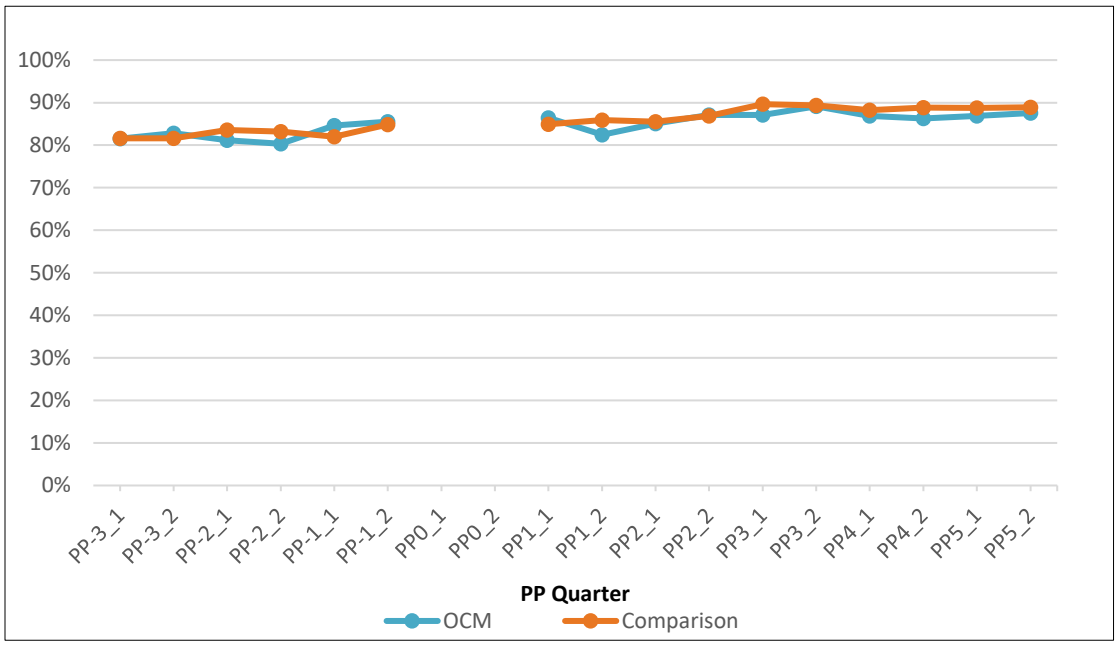
Exhibit D-6: No Impact of OCM on Palliative Radiation for Bone Metastasis in PP 1–3; Modest Decrease in Use of High-Value Single Fraction Radiation in PP 4–5

Palliative Radiation for Bone Metastasis	DID Impact PP 1–5	90% CI	DID Impact PP1-3	90% CI	DID Impact PP4–5	90% CI
10 or Fewer Radiation Fractions	-1.1%	-2.6%, 0.4%	-0.8%	-2.4%, 0.8%	-1.4%	-3.2%, 0.3%
Single Radiation Fraction	-0.2%	-1.9%, 1.6%	1.2%	-0.6%, 3.0%	-2.0%*	-4.0%, -0.04%

Source: Medicare claims 2014-2019.
Notes: DID: Difference-in-difference. PP: Performance period. CI: Confidence interval. *p≤0.10, **p≤0.05, ***p≤0.01.

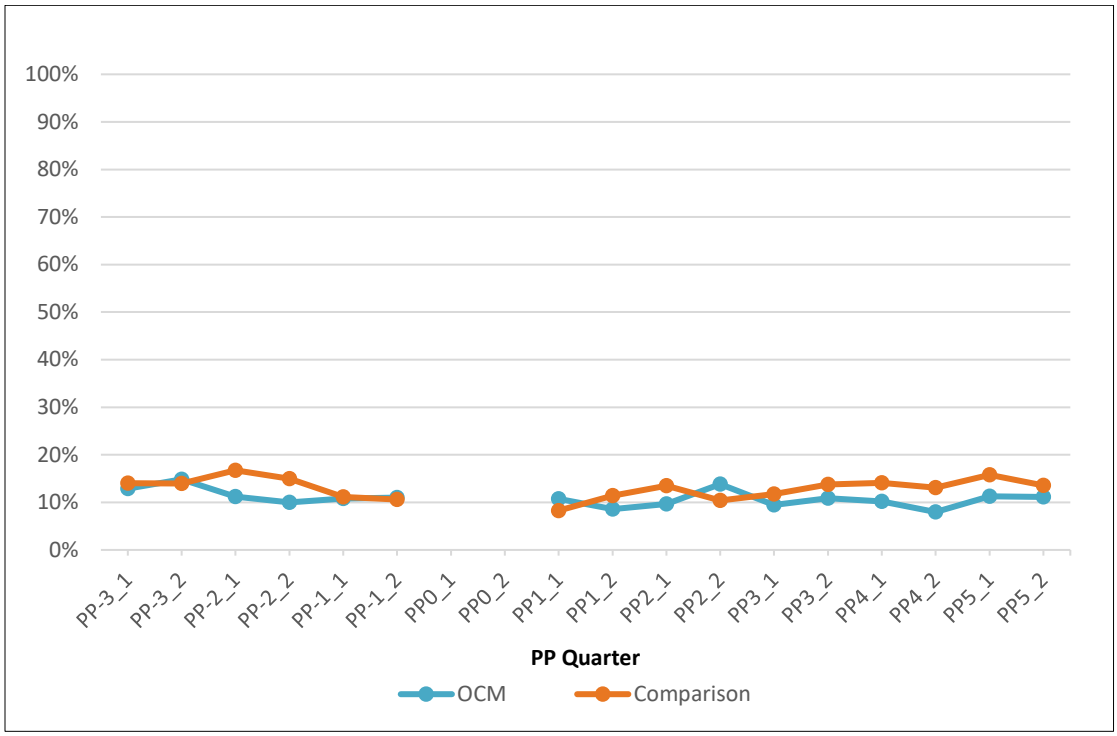
Exhibits D-7 and **D-8** show the proportion of beneficiaries receiving 10 or fewer radiation fractions (**Exhibit D-7**), and those receiving a single radiation fraction (**Exhibit D-8**) for relief of painful bone metastases, by quarter, for OCM and comparison episodes. Trends in the baseline period were similar in OCM and comparison episodes.

Exhibit D-7: Percent Receiving 10 or Fewer Radiation Fractions for Treatment of Bone Metastasis by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: Quarter*OCM versus comparison group baseline trend: 0.2% per quarter (95% CI: -1.0%, 1.4%), P=0.778

Exhibit D-8: Percent Receiving Single Radiation Fraction for Treatment of Bone Metastasis by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: Quarter*OCM versus comparison group baseline trend: 0.3% per quarter (95% CI: -0.7%, 1.2%), P=0.583

D.3. Treatment Patterns

D.3.1 Chemotherapy Regimens for Lung, Colorectal, Breast, and Prostate Cancer

We studied the initial chemotherapy regimens for lung cancer, colorectal cancer, high-risk breast cancer, and high-intensity prostate cancer, to understand if OCM influenced choice of chemotherapy and whether OCM practices were avoiding certain high-cost regimens.

Methods

We identified beneficiaries with episodes for lung cancer, colorectal cancer, high-risk breast cancer, or high-intensity prostate cancer. We identified all chemotherapy agents received within eight days after the episode-trigger date, and considered these drugs to be 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).[33] Chemotherapy regimens could include immunotherapy, but the analysis excluded oral endocrine therapies for breast cancer (e.g., tamoxifen and aromatase inhibitors) and luteinizing-hormone releasing hormone (LHRH) agonists for prostate cancer, in order to focus on more intensive categories of chemotherapy agents. We assessed the proportion of patients receiving distinct episode-initiating chemotherapy regimens in OCM and comparison episodes, during the baseline and intervention periods, and categorized chemotherapy regimens by common elements (e.g., use of immunotherapy agents) for each of the four cancer types

[33] Dose-dense chemotherapy is given more frequently than normally scheduled, with less time between doses.

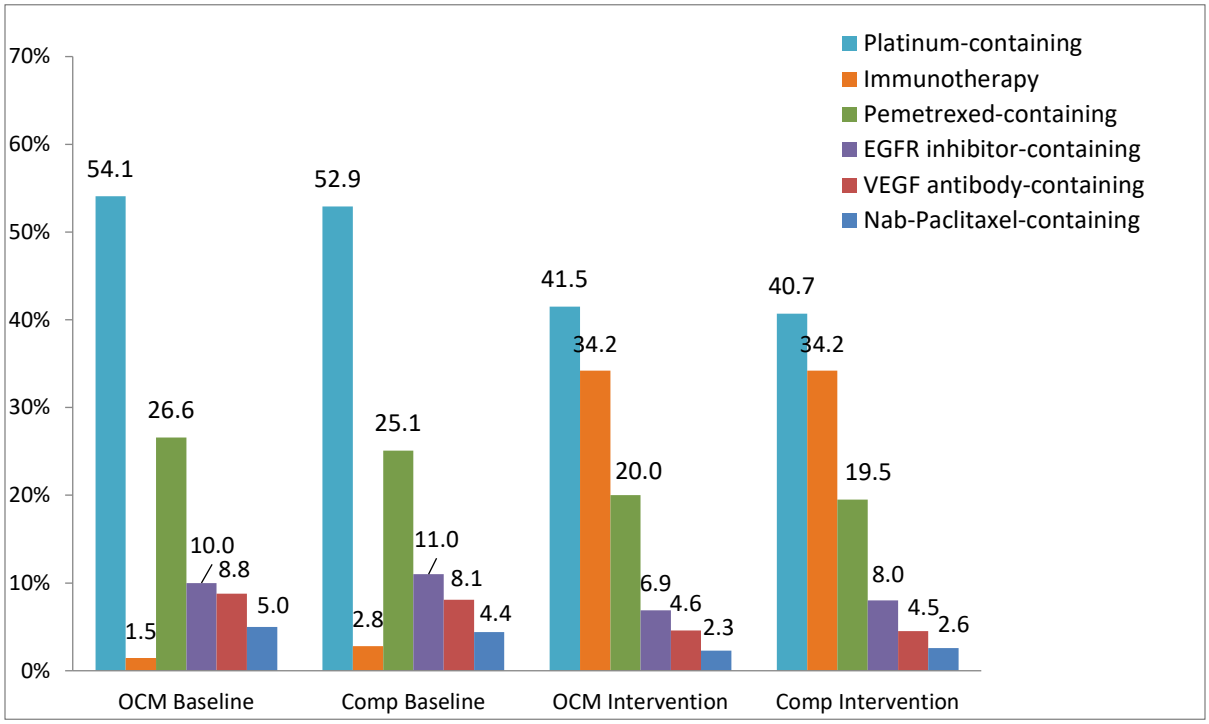
(**Exhibits D-9 through D-12**, described in more detail below). Due to the many permutations of chemotherapy regimens, we did not perform statistical testing. Additional exhibits showing the distribution of specific episode-initiating chemotherapy regimens are shown below (**Exhibits D-13 through D-15**).

Initial Regimens for Specific Cancers

Lung Cancer: There is a broad spectrum of guideline-recommended treatment approaches for lung cancer. OCM practices could therefore try to reduce episode payments by emphasizing use of lower-cost platinum doublets (e.g., carboplatin-paclitaxel) and/or limiting use of higher-cost treatments such as immunotherapy, anti-vascular endothelial growth factor (VEGF) antibodies (e.g., bevacizumab),[34] and patent-protected cytotoxic chemotherapies (e.g., pemetrexed and nab-paclitaxel).

Patterns of care were similar for lung cancer episodes attributed to OCM and comparison episodes. **Exhibit D-9 s**hows that initial treatment regimens in OCM and comparison episodes had very similar proportions of platinum-based regimens and immunotherapy-containing regimens in the baseline and intervention periods. While the distribution of regimens changed substantially from the baseline to the intervention period (primarily related to expanded use of immunotherapy), the distribution was very similar for OCM and comparison episodes in both periods. We conclude that OCM did not substantially affect selection of initial chemotherapy treatments for lung cancer.

Exhibit D-9: Similar Initial Treatment Components for Lung Cancer in OCM and Comparison Episodes



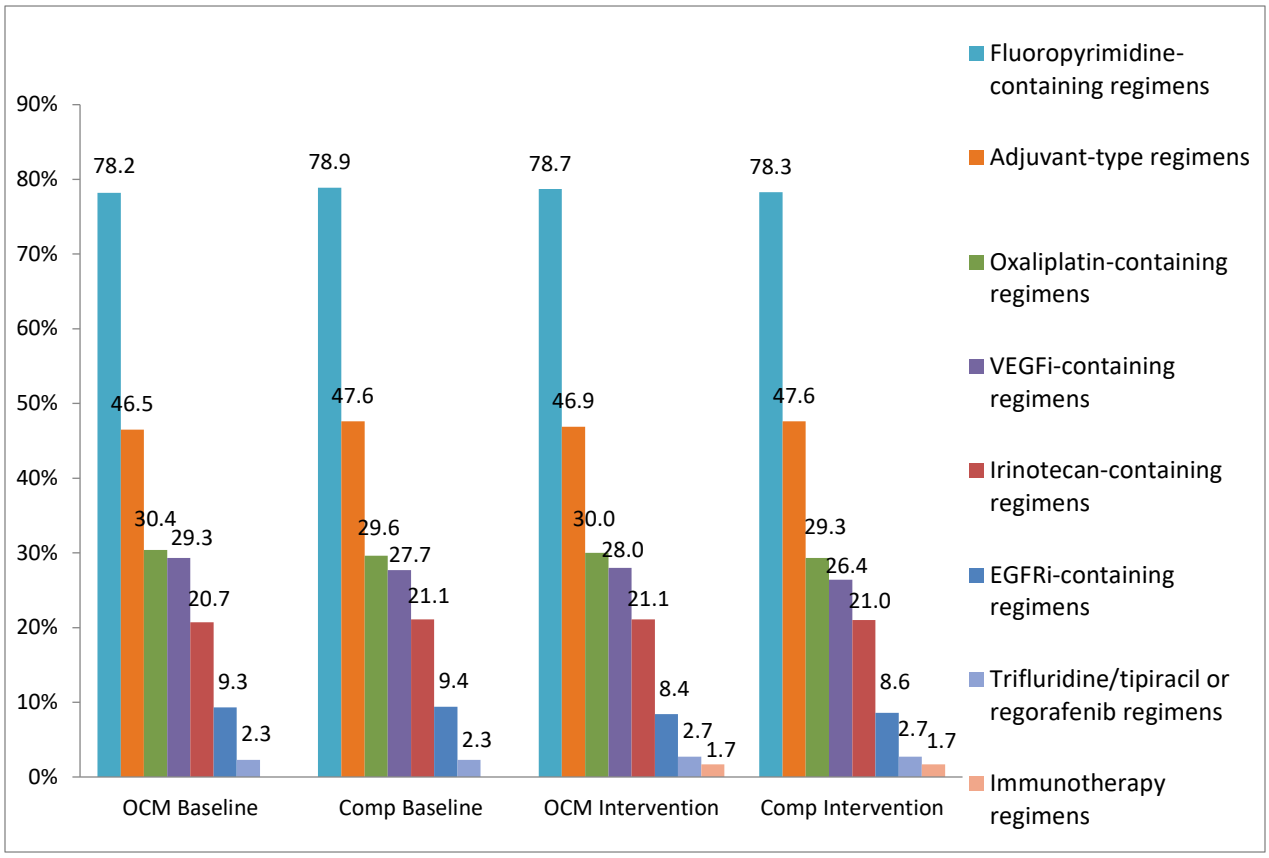
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. Comp: Comparison group. Intervention: Intervention period. EGFR: Epidermal growth factor receptor. VEGF: Vascular endothelial growth factor.

[34] Zhu J, Sharma DB, Gray SW, Chen AB, Weeks JC, Schrag D. Carboplatin and paclitaxel with versus without bevacizumab in older patients with advanced non-small cell lung cancer. *JAMA* 2012;307(15):1593-1601.

Colorectal Cancer: Patterns of initial chemotherapy regimens for colorectal cancer were very similar for OCM and comparison episodes in both the baseline and intervention periods, and there were only modest changes over time.

Exhibit D-10 groups colorectal cancer chemotherapy regimens into non-exclusive, descriptive categories. Older cytotoxic chemotherapy agents (including 5-fluorouracil, capecitabine, oxaliplatin, and irinotecan) were the predominant components of initial colorectal cancer treatment in OCM and comparison episodes. Newer, high-cost agents, such as monoclonal antibodies against VEGF and epidermal growth factor receptor (EGFR), were also commonly used. Two oral agents (regorafenib and trifluridine/tipiracil) that have shown modest clinical benefits for treatment of advanced, refractory colorectal cancer were used as episode-initiating treatments with similar frequency in OCM and comparison episodes (2.7 percent versus 2.7 percent of colorectal cancer episodes during the intervention period). Immunotherapy agents targeting PD-1/PD-L1 (e.g., pembrolizumab and nivolumab) were scarcely used in the baseline period, and show similar low-level use in OCM and comparison episodes in the intervention period. The distribution of specific episode-initiating regimens used in the baseline and intervention period is shown in **Exhibit-D-10**. We conclude that OCM did not substantially affect selection of initial chemotherapy treatments for colorectal cancer.

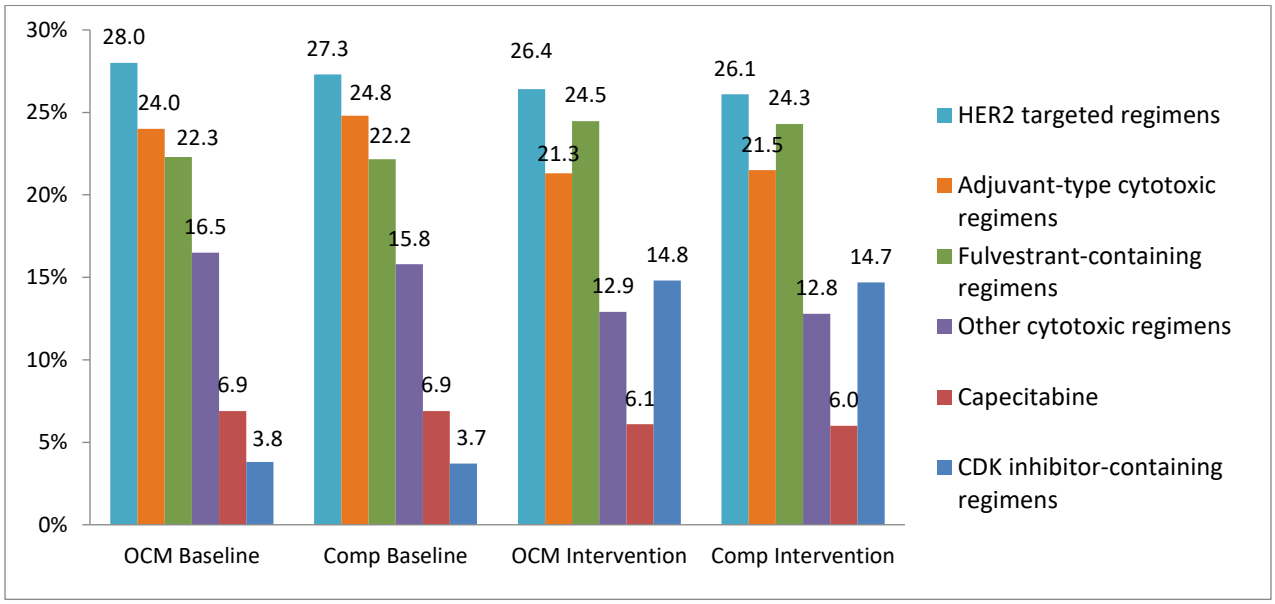
Exhibit D-10: Similar Initial Treatment Components for Colorectal Cancer in OCM and Comparison Episodes



Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. Comp: Comparison group. Intervention: Intervention period. EGFR: Epidermal growth factor receptor. VEGF: Vascular endothelial growth factor. Immunotherapy was used in less than 0.1 percent of OCM and comparison episodes during the baseline period. Adjuvant-type regimens: fluoropyrimidine +/- oxaliplatin only.

High-Risk Breast Cancer: High-risk breast cancer includes two primary groups of patients: those receiving adjuvant chemotherapy after breast cancer surgery, and those receiving palliative chemotherapy for metastatic breast cancer.[35] Patterns of initial treatment were nearly identical for OCM and comparison episodes during the baseline and intervention periods as shown in **Exhibit D-11**. For example, similar proportions of OCM and comparison episodes included initial adjuvant-type cytotoxic regimens, HER2 targeted regimens, and fulvestrant-containing regimens. OCM does not appear to have slowed the adoption of new and expensive drugs, such as CDK inhibitors (including palbociclib, ribociclib, and abemaciclib); use of regimens containing CDK inhibitors increased substantially from baseline to intervention periods in both OCM and comparison episodes. Although costs are substantially different for equally effective adjuvant chemotherapy regimens—opportunities to reduce episode spending—OCM did not lead to differential changes in initial chemotherapy regimens[36] (see **Exhibit D-11**).

Exhibit D-11: Similar Initial Treatment Components for Breast Cancer in OCM and Comparison Episodes



Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Intervention: Intervention period.

High-Intensity Prostate Cancer: Patterns of initial treatment regimens for prostate cancer were generally similar for OCM and comparison episodes. See **Exhibit D-12**. Abiraterone and enzalutamide were the most common initial prostate cancer treatment regimens for OCM and comparison episodes in both the baseline and interventions periods. OCM did not materially affect selection of initial treatment regimens for high-intensity prostate cancer.

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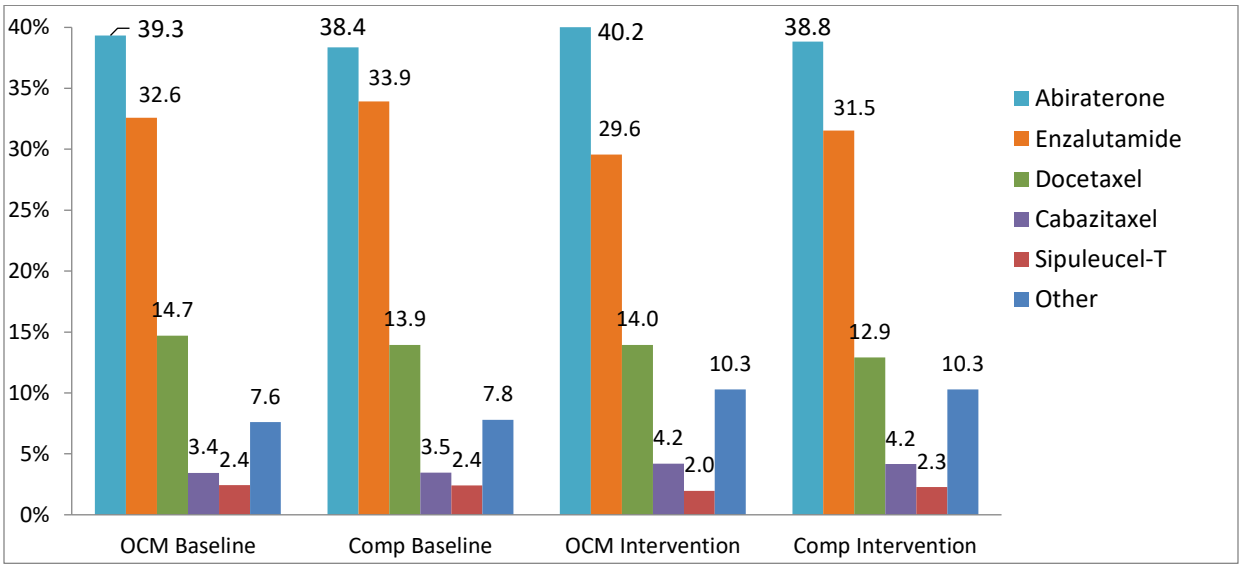
35 Regimens limited to tamoxifen or aromatase inhibitors are grouped for OCM as low-risk breast cancer.

36 Giordano SH, Niu J, Chavez-MacGregor M, Xhao H, Zorzi D, Shih YT, Smith BD, Shen C. Estimating regimen-specific costs of chemotherapy for breast cancer: Observational cohort study. Cancer. 2016;122(22):3447-3455.

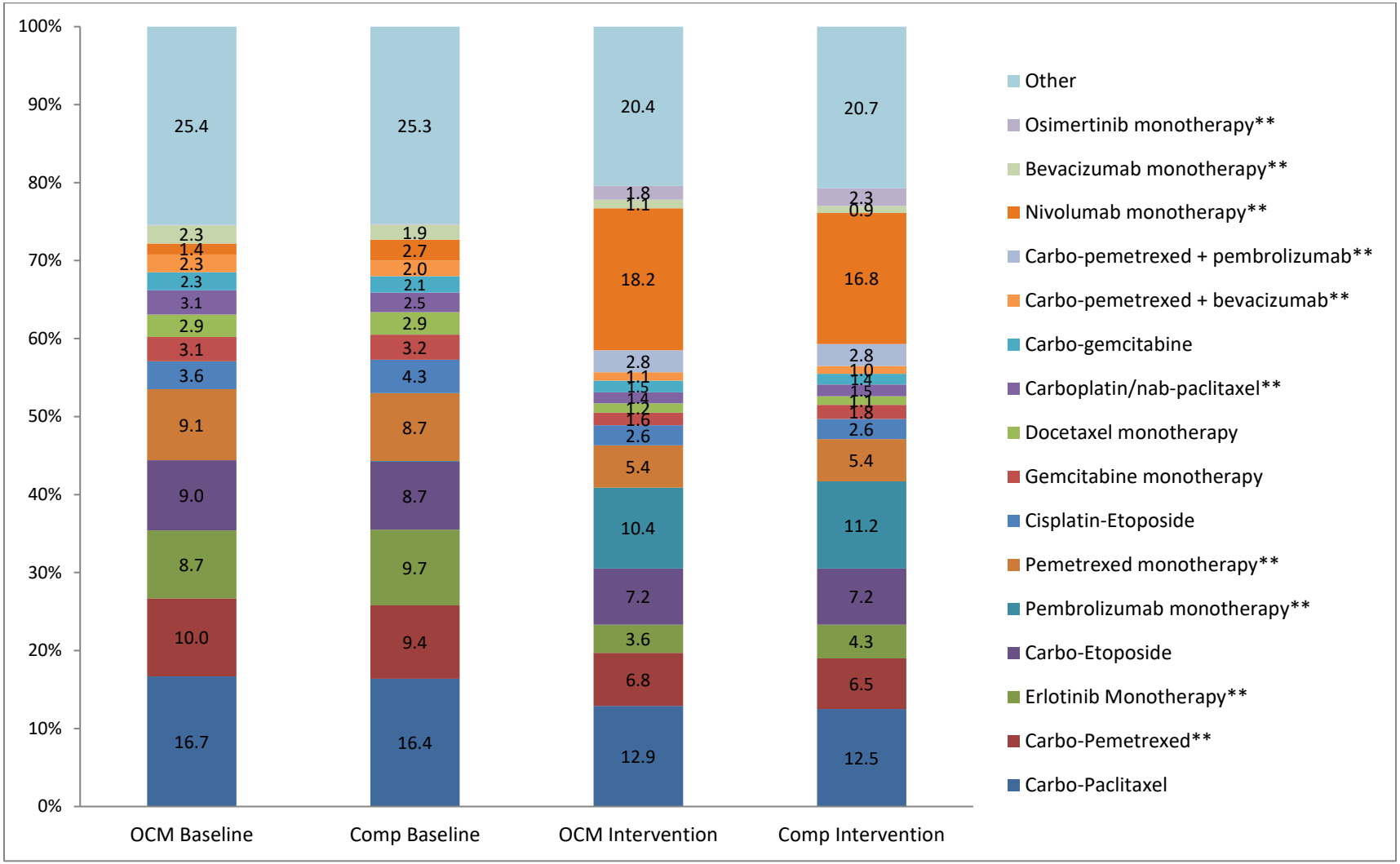
Exhibit D-12: Similar Initial Treatment Components for Prostate Cancer in OCM and Comparison Episodes



Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. Comp: Comparison group. Intervention: Intervention period. Prostate cancer regimens may include concurrent use of leuprolide or other hormonal therapy.

Exhibits D-13 through D-18 show the specific initial regimens used for lung cancer, colorectal cancer, and non-hormonal breast cancer episodes (the prostate cancer regimens are simpler and are summarized only in **Exhibit D-12** above). Overall, episode-initiating chemotherapy regimens were similar for OCM and comparison patients, both at baseline and during the intervention period, and OCM did not lead to increased use of lower-cost initial treatment regimens or avoidance specific of high-cost regimens.

Exhibit D-13: Similar Changes in Lung Cancer Chemotherapy Regimens in OCM and Comparison Episodes, with No Apparent Shift towards Lower-Cost Regimens



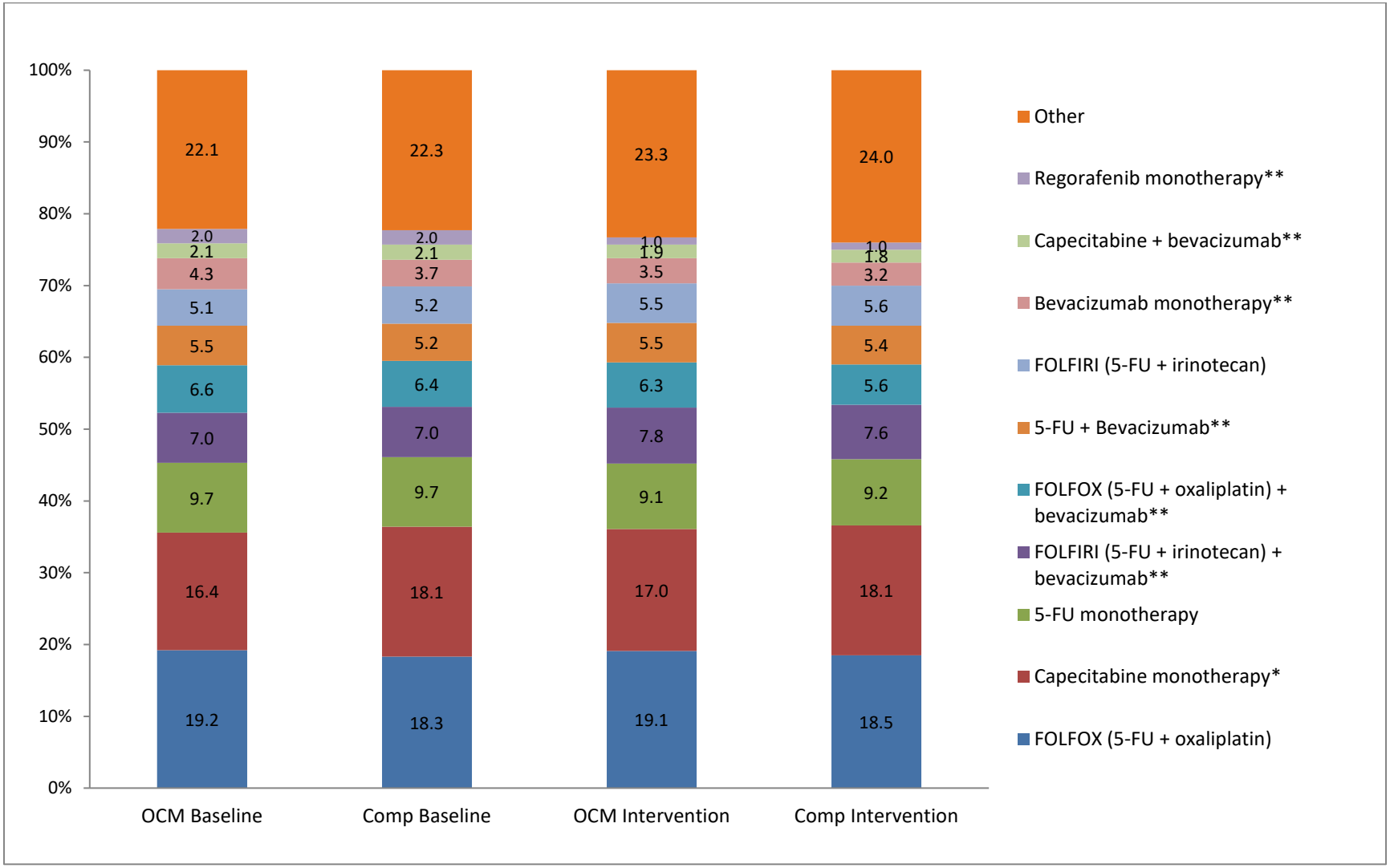
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. Comp: Comparison group. Intervention: Intervention period. Figures include all regimens identified ≥ 2% of all episodes in the baseline and/or intervention period. * Indicates regimen cost between $500 and $4,999; ** indicates regimen cost ≥ $5,000.

Exhibit D-14: Estimated Regimen Drug Prices per 28 Days – Lung Cancer Regimens

Regimen	28-day Cost/Price
Carboplatin-Paclitaxel	$93
Carboplatin-Pemetrexed	$7,981
Erlotinib	$8,655
Carbo-Etoposide	$104
Pembrolizumab	$12,988
Pemetrexed	$7,940
Cisplatin-Etoposide	$83
Gemcitabine	$177
Docetaxel	$224
Carboplatin/nab-Paclitaxel	$8,052
Carboplatin-Gemcitabine	$183
Carboplatin-Pemetrexed-Pembroluzimab	$20,969
Carboplatin-Pemetrexed-Bevacizumab	$18,785
Nivolumab	$13,033
Bevacizumab	$10,804
Osimertinib	$14,022

Notes: Estimated costs of Part B medications are based on Medicare ASP prices 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.

Exhibit D-15: Similar Changes in Colorectal Cancer Chemotherapy Regimens in OCM and Comparison Episodes),with No Apparent Shift towards Lower-Cost Regimens



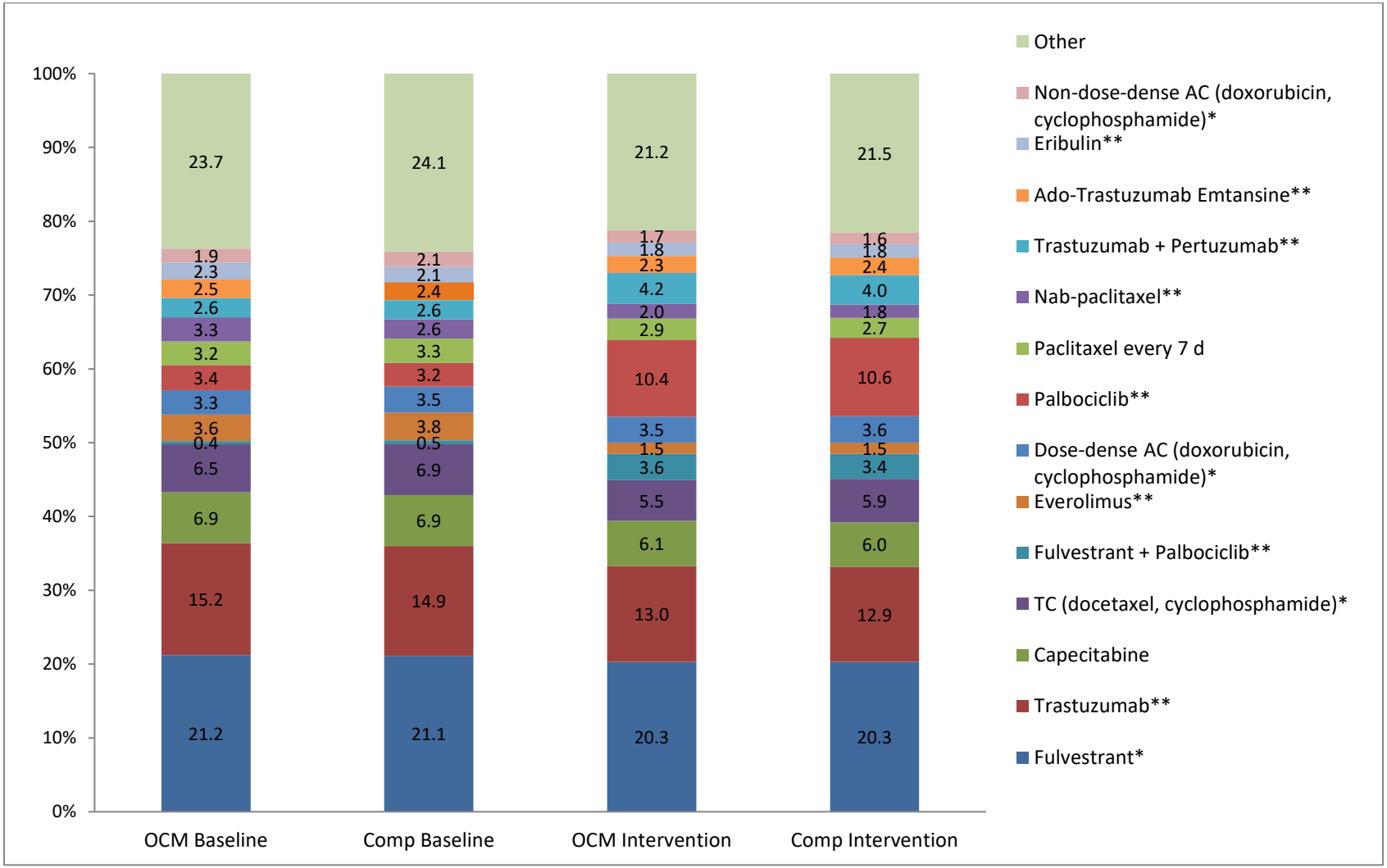
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. Comp: Comparison group. Intervention: Intervention period. Figures include all regimens identified ≥ 2% of all episodes in the baseline and/or intervention period. * indicates regimen cost between $500 and $4,999; ** indicates regimen cost ≥ $5,000.

Exhibit D-16: Estimated Regimen Drug Prices per 28 Days – Colorectal Cancer Regimens

Regimen	28-day Cost/Price
FOLFOX	$189
Capecitabine	$600
5-Fluorouracil	$18
FOLFIRI-Bevacizumab	$5,526
FOLFOX-Bevacizumab	$5,576
5-Fluorouracil-Bevacizumab	$5,420
FOLFIRI	$124
Bevacizumab	$5,402
Capecitabine-Bevacizumab	$6,002
Regorafenib	$16,132

Notes: 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.

Exhibit D-17: Similar Changes in Breast Cancer Chemotherapy Regimens in OCM and Comparison Episodes with No Apparent Shift towards Lower-Cost Regimens



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 cost between $500 and $4,999; ** indicates regimen cost ≥ $5,000.

Exhibit D-18: Estimated Regimen Drug Prices per 28 Days – Breast Cancer Regimens

Regimen	28-day cost/price
Fulvestrant	$1,938
Trastuzumab	$5,659
Capecitabine	$450
TC (docetaxel, cyclophosphamide)	$901
Fulvestrant and palbociclib	$17,374
Everolimus	$14,901
Dose-dense AC (doxorubicin, cyclophosphamide)	$962
Palbociclib	$15,436
Paclitaxel	$62
Nab-Paclitaxel	$5,002
Trastuzumab-Pertuzumab	$12,101
Ado-trastuzumab emtansine	$10,184
Eribulin	$6,410
AC (doxorubicin, cyclophosphamide)	$641

Notes: 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.

D.3.2 Use of Immunotherapy

Measures and Analytic Approach

Immunotherapy is relatively new, and costly, and we evaluated whether OCM could be slowing adoption of this new treatment. We focused on cancers for which FDA approvals or clinical guidelines supporting use of at least one immunotherapy agent were issued before the end of 2018.[37] We examined immunotherapy use for cancer types for which at least one immunotherapy drug was approved by the end of PP5, and also use for all other cancers (combined) where there was no site-specific FDA approval or guideline recommendation. We identified any use of immunotherapy (atezolizumab, ipilimumab, nivolumab, pembrolizumab, avelumab, durvalumab, and cemiplimab-rwlc) during an episode (not limited to the initial regimen in the episode).

Our primary approach used DID models to assess the impact of OCM on immunotherapy use. However, immunotherapy treatments had not yet been approved for many cancer indications in the baseline period, and thus use was quite low for most cancers at that time. For cancers with less than 5 percent use of immunotherapy in the baseline period, we compared the linear trend of immunotherapy use for OCM and comparison episodes during the intervention period.

We also assessed immunotherapy use for lung cancer episodes stratified by race/ethnicity; sample sizes for other cancer types were too small to support a similar analysis.

Results

As described in Section 7 of the main report, OCM was associated with a relative increase in the use of immunotherapy for some cancers (see main report). This increase was generally consistent in PP1–3 and PP4–5 (**Exhibit D-19**).

Exhibit D-19: OCM was Associated with a Relative Increase in Use of Immunotherapy for Lung Cancer and Melanoma, and This was Similar in PP1–3 and PP4–5

Use of Immunotherapy	DID Impact PP 1–5	90% CI	DID Impact PP1–3	90% CI	DID Impact PP4–5	90% CI
Lung cancer	2.5%*	0.4%, 4.7%	2.7%**	0.7%, 4.8%	1.3%	-0.6%, 3.3%
Kidney cancer	-0.1%	-1.8%, 1.5%	-0.1%	-1.9%, 1.6%	-0.2%	-1.9%, 1.5%
Malignant melanoma	2.9%**	0.9%, 4.9%	2.8%**	0.6%, 5.0%	2.8%**	0.7%, 5.0%

*p≤0.10, **p≤0.05, ***p≤0.01.
Source: Medicare claims 2014–2019.
Notes: DID: Difference-in-difference. PP: Performance period. DID: Difference-in-difference. CI: Confidence interval.

The relative increase in the use of immunotherapy for lung cancer was similar for White and Black beneficiaries (**Exhibit D-20**). Although the difference in use of immunotherapy between OCM and comparison episodes did not reach statistical significance among Black beneficiaries, this was likely due to the smaller sample size. There were not enough lung cancer episodes to draw conclusions about the effect of OCM on use of immunotherapy for Hispanic beneficiaries, as evidenced by the large confidence intervals (-8.1 percent, 4.9 percent).

[37] Pembrolizumab is approved by the FDA for use in patients with mismatch repair-deficient cancers of any primary site (approved May 2017), and these cancers occur infrequently in a variety of epithelial solid tumors. Immunotherapy agents were approved for additional cancers in 2019.

Exhibit D-20: OCM was Associated with a Relative Increase in Use of Immunotherapy for Lung Cancer for White Beneficiaries

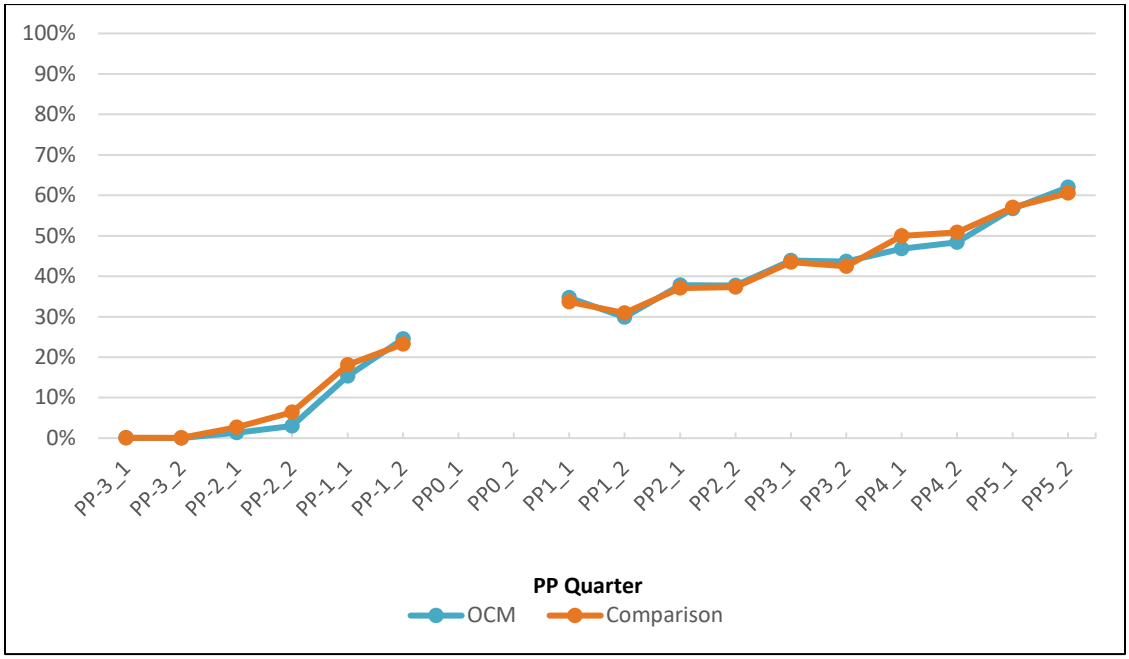
Lung Cancer Use of Immunotherapy	# of Episodes		OCM		COMP		Impact Estimates Through PP5			
	OCM	COMP	Baseline Percent	Int. Percent	Baseline Percent	Int. Percent	DID Impact	90% LCL	90% UCL	Percent Change
White	77,605	83,940	7.7%	43.5%	9.2%	42.4%	2.6%*	0.4%	4.8%	33.8%
Black	7,410	8,094	7.1%	43.0%	10.5%	44.3%	2.1%	-2.3%	6.5%	29.0%
Hispanic	3,076	3,151	10.1%	39.3%	10.4%	41.2%	-1.6%	-8.1%	4.9%	-15.5%

*p≤0.10, **p≤0.05, ***p≤0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP5: Performance period 5. Int.: Intervention period. LCL: Lower confidence limit. UCL: Upper confidence limit.

Baseline and Intervention Trends

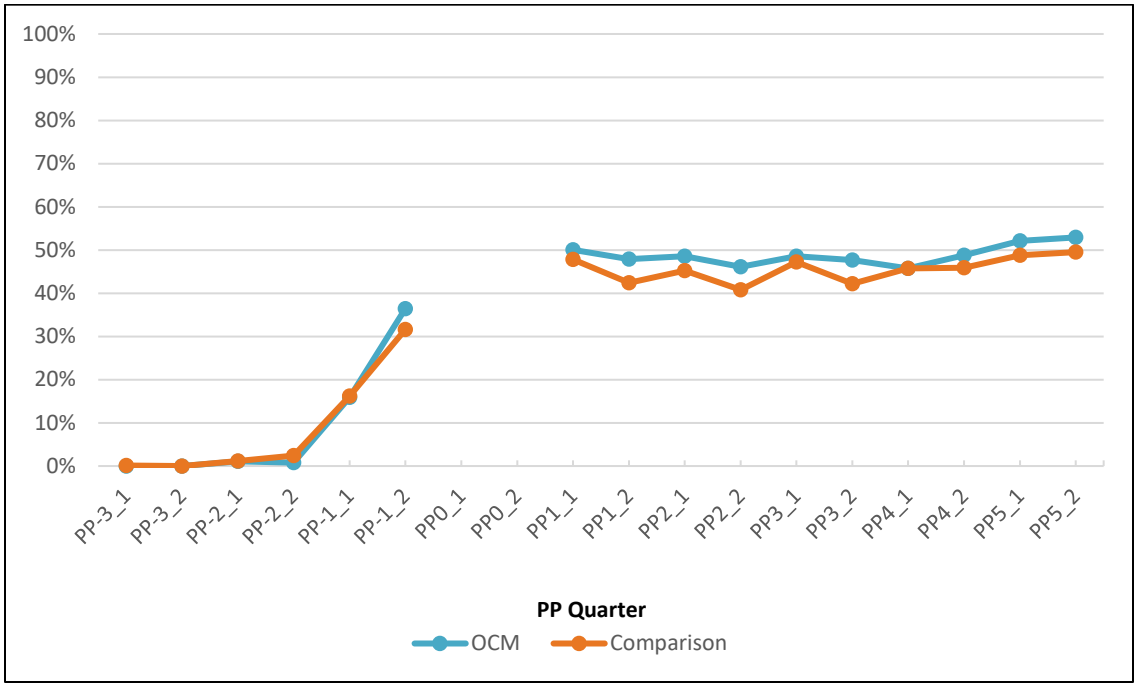
Exhibits D-21 through D-26 shows the quarterly trends in use of immunotherapy for OCM and comparison episodes from the baseline period through PP5, for the three cancer types with greater than 5 percent use of immunotherapy in the baseline period. Trends were similar in OCM and comparison episodes in the baseline period for lung cancer and kidney cancer but not for malignant melanoma. For malignant melanoma, we conducted additional analyses to assess the sensitivity of our DID findings to differential baseline trends and found that our results remained after addressing these differences.

Exhibit D-21: Use of Immunotherapy for Lung Cancer by Quarter, Unadjusted



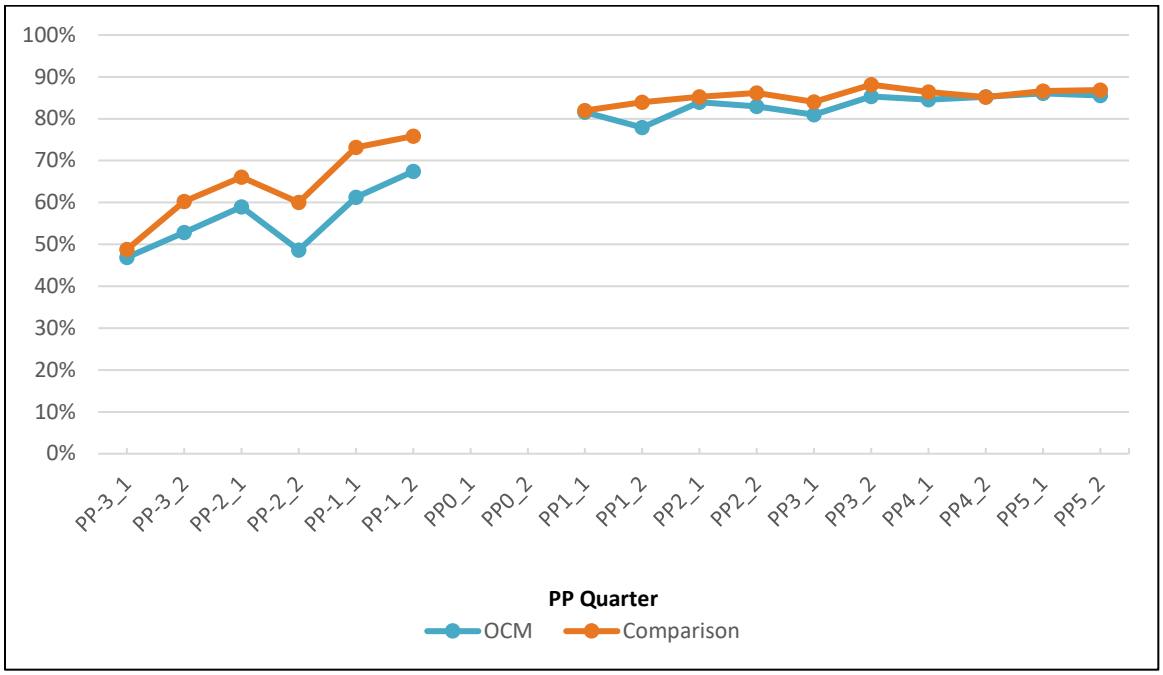
Source: Medicare claims 2014–2019.
Notes: Quarter*OCM versus comparison group baseline trend: -0.1% (95% CI: -0.4%, 0.3%), P=0.665. Immunotherapy approvals for lung cancer indications occurred during the period for episodes starting in PP-2_1, PP-1_2, PP1_2, PP2_2, PP4_1, PP5_1, and PP5_2.

Exhibit D-22: Use of Immunotherapy for Kidney Cancer by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: Quarter*OCM versus comparison group baseline trend: 0.7% (95% CI: -0.1%, 1.6%), P=0.091. Immunotherapy approvals for kidney cancer indications occurred during period for episodes starting in PP-1_2 and PP4_2.

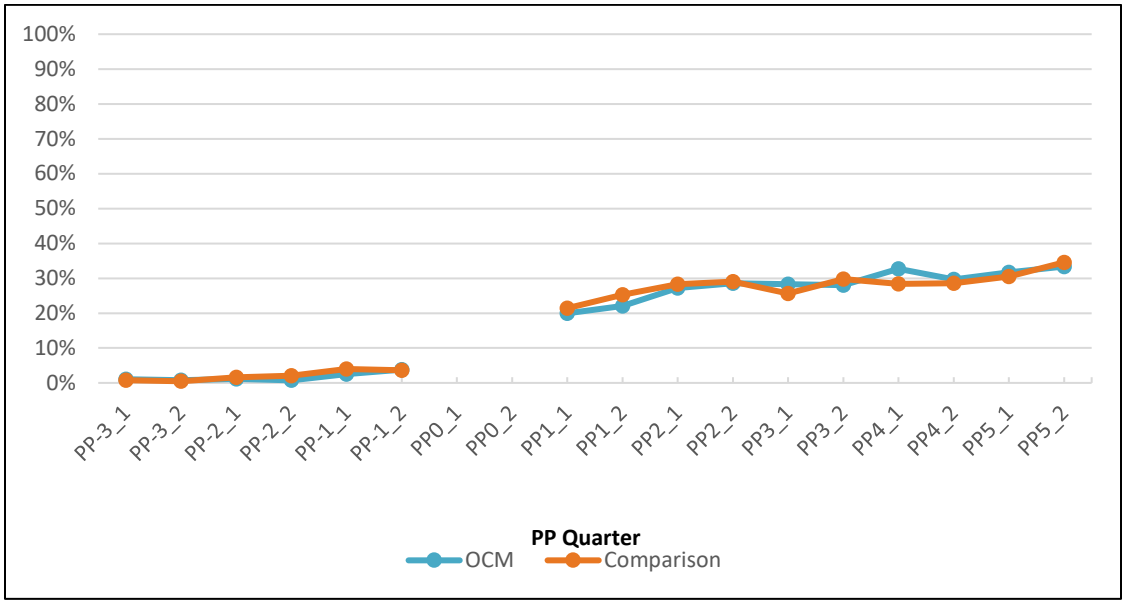
Exhibit D-23: Use of Immunotherapy for Malignant Melanoma by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: Quarter*OCM versus comparison group baseline trend: -1.7% (95% CI: -3.1%, -0.3%), P=0.017. Immunotherapy approvals for malignant melanoma indications occurred in before the start of OCM, as well as during the period for episodes starting in PP-3_1, PP-3_2, PP-1_1, PP-1_2, and PP3_2.

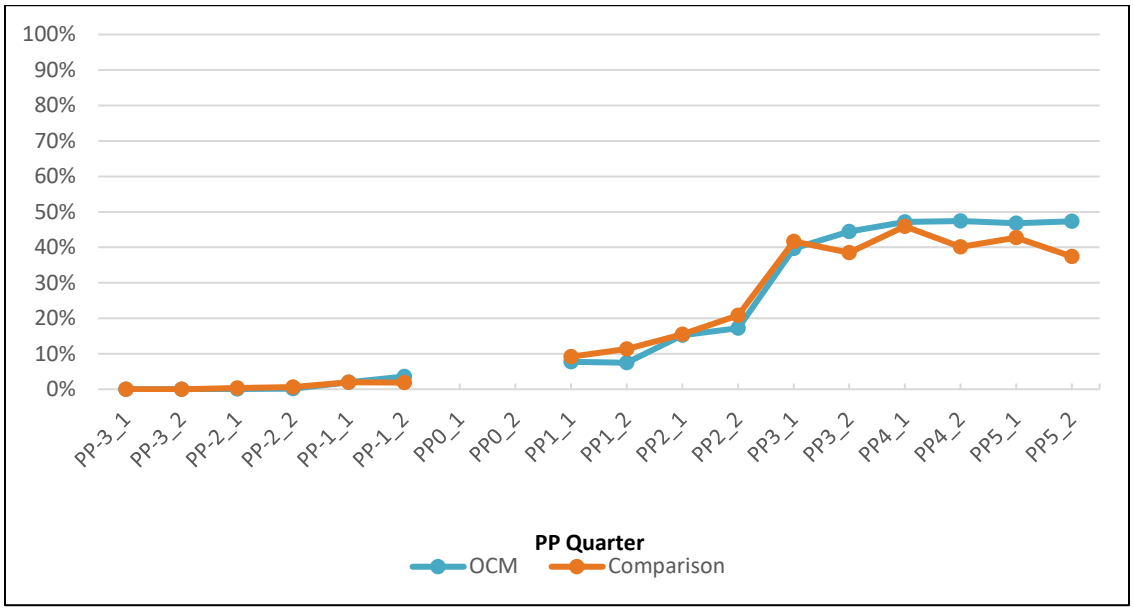
For other cancers, baseline use of immunotherapy was low (less than 5 percent) and thus we studied intervention trends (see **Exhibits D-24 through D-26**). Use in OCM episodes increased over time similarly to, or greater than, in comparison episodes.

Exhibit D-24: Use of Immunotherapy for Head and Neck Cancer by Quarter, Unadjusted



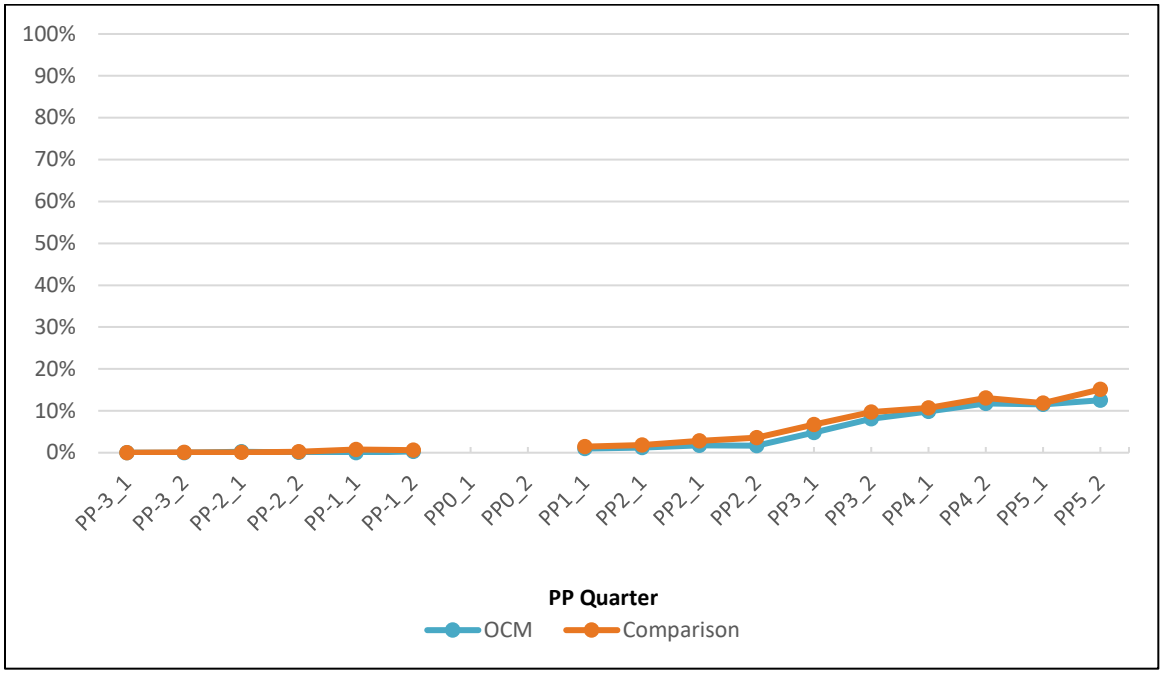
Source: Medicare claims 2014–2019.
Notes: Quarter*OCM versus comparison group intervention trend: 0.4% (90% CI: 0.03%, 0.8%), P=0.079. Immunotherapy approvals for head and neck cancer indications occurred during period for episodes starting in PP1_1 and PP1_2.

Exhibit D-25: Use of Immunotherapy for Bladder Cancer (High-Risk) by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: Quarter*OCM versus comparison group intervention trend: 1.2% (90% CI: 0.7%, 1.7%), P<0.001. Immunotherapy approvals for bladder cancer indications occurred during the period for episodes starting in PP0_1, PP0_2, PP2_1, PP2_2, and PP4_2.

Exhibit D-26: Use of Immunotherapy for Gastroesophageal Cancer by Quarter, Unadjusted



Source: Medicare claims 2014–2019. Quarter*OCM versus comparison group intervention trend: -0.1% (90% CI: -0.3%, 0.2%), P=0.642. Immunotherapy approvals for gastroesophageal cancer indications occurred during the period for episodes starting in PP3_1.

D.3.3 Use of First versus Second Generation TKIs and Use of Generic Imatinib for CML

Methods

The price of second generation tyrosine kinase inhibitors (TKIs, nilotinib/dasatinib/bosutinib) is notably higher than for imatinib, a first generation TKI, and guidelines recommend using first or second generation TKIs for most beneficiaries as first-line therapy for chronic myeloid leukemia (CML). Use of first generation TKIs is an opportunity for OCM practices to reduce Medicare spending, and we therefore evaluated use of first versus second generation TKIs for all CML episodes, and again after restricting to episodes with no prior TKI use (which we considered likely to indicate newly diagnosed CML). We also assessed differences in use of generic imatinib versus brand imatinib. Physicians can prescribe generic imatinib directly, or if they prescribe brand imatinib (Gleevec) and live in a state with automatic generic substitution laws, the generic drug will be substituted by the pharmacist, unless "no substitutions" or "dispense as written" is specified.

Results

As seen in **Exhibit D-27,** OCM led to reductions in use of imatinib (less costly first generation TKI) versus nilotinib/dasatinib/bosutinib (more costly second generation TKIs), relative to comparisons. Similar relative reductions were present after we restricted to beneficiaries with no prior TKI use that we could observe in our data (suggesting newly diagnosed CML), but this reduction was not statistically significant, likely due to smaller sample sizes.

Exhibit D-27: OCM was Associated with Less Use of Imatinib versus Nilotinib/Dasatinib/Bosutinib

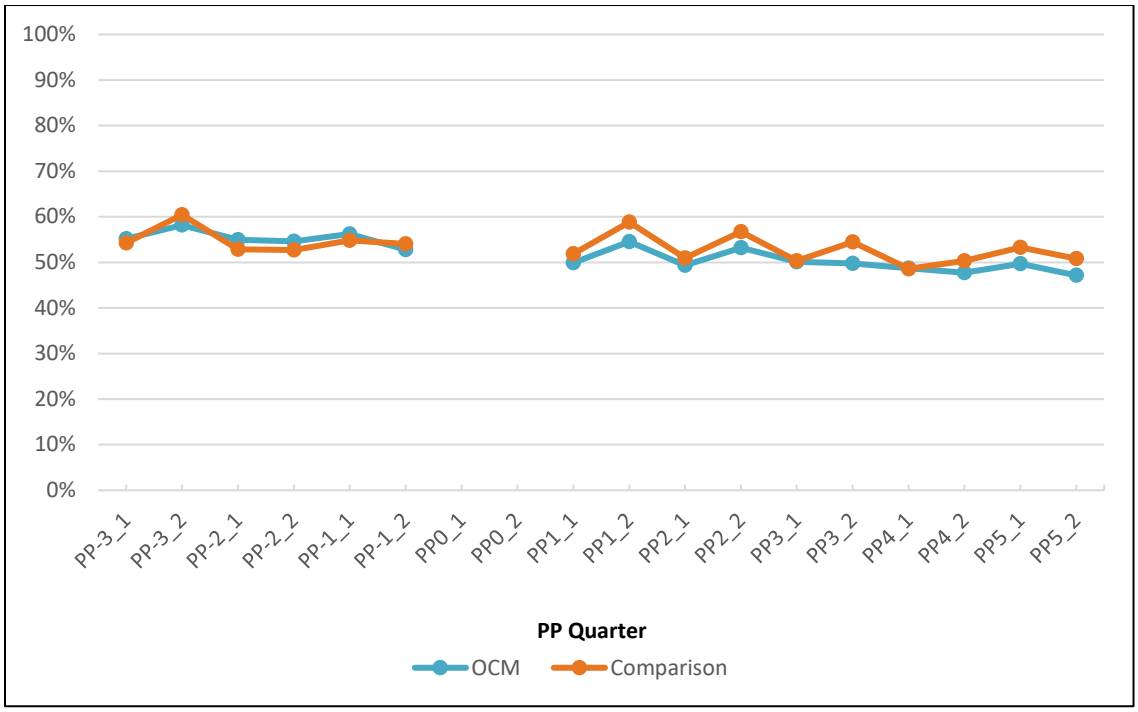
TKI Use	# of Episodes		OCM		COMP		Impact Estimates Through PP5			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
Use of imatinib vs. nilotinib/dasatinib/ bosutinib	11,970	13,154	55.6%	50.2%	54.3%	51.8%	-3.0%*	-5.6%	-0.3%	-5.3%
Use of imatinib vs. nilotinib/dasatanib/ bosutinib among beneficiaries with no prior TKI use	948	1,033	48.4%	49.7%	48.2%	52.9%	-3.4%	-11.1%	4.3%	-7.0%

*p≤0.10, **p≤0.05, ***p≤0.01. LCL: Lower confidence limit. UCL: Upper confidence limit.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP5: Performance period 5. Int.: Intervention. DID: Difference-in-difference.

In sensitivity analyses that excluded the two largest OCM practices, there was no longer a significant OCM impact for all beneficiaries (DID= -2.6 percent, p=0.14), and the impact for beneficiaries with no prior TKI use remained not statistically significant (DID= -3.4%, p=0.50 for beneficiaries with no prior TKI use).

Exhibit D-28 shows generally similar trends in use of imatinib versus nilotinib/dasatinib/bosutinib in the baseline period.

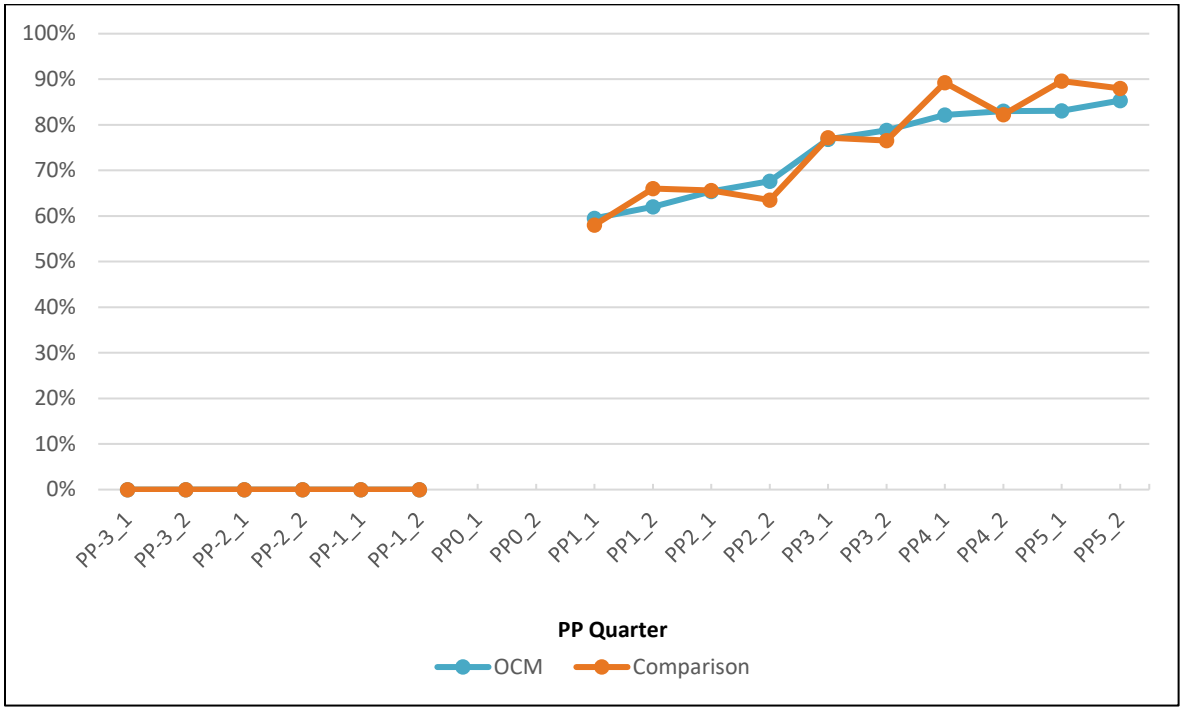
Exhibit D-28: Use of First Generation versus Second Generation TKIs



Source: Medicare claims 2014–2019.
Notes: Pre-trend estimate -0.1% per quarter in OCM relative to comparison episodes (95% CI: -1.0%, 0.7%), P=0.79

Generic Imatinib: Exhibit D-29 shows no use of generic imatinib in the baseline period (before generic formulations were approved in February 2016) and generally similar use during the intervention period in OCM and comparison episodes. DID analysis is not possible because there was no use in the baseline period; thus we compared the linear trend during the intervention period for OCM and comparison episodes and found no difference in the rate of adoption of generic imatinib over time for OCM and comparison episodes. The linear trend for adoption of generics was 0.5 percentage points lower per quarter in OCM relative to comparison episodes (90 percent CI for difference in linear trend -1.1 percent, 0.2 percent; p=0.21). Averaging over the intervention period, the adjusted average use of generics was 73.4 percent in OCM episodes and 74.8 percent in comparison episodes; difference -1.4 percentage points (90 percent CI= -4.8, 2.1). Among the subset of 589 beneficiaries with CML and no prior use of TKIs observed in our data, adoption of generics was 0.3 percentage points lower per quarter in OCM relative to comparison episodes (90 percent CI for difference in linear trend= -1.9 percent, 1.3 percent; p=0.79). Averaging over the intervention period, the adjusted average use of generics was 80.6 percent in OCM episodes and 86.0 percent in comparison episodes (difference = -5.5 percentage points, 90 percent CI= -11.9 percent, 1.0 percent); the wide confidence intervals reflect the relatively small sample sizes for this analysis.

Exhibit D-29: Use of Generic Imatinib



Source: Medicare claims 2014–2019.

D.3.4 Use of Exemestane versus Tamoxifen, Anastrozole, and Letrozole for Low-Risk Breast Cancer

Because the price of exemestane (which is available as a brand drug only) is notably higher than for other hormonal therapies (tamoxifen, anastrozole, and letrozole), we assessed whether use of exemestane differed for OCM versus comparison episodes. We found no difference in use, as shown in **Exhibit D-30**.

Exhibit D-30: OCM Episodes Did Not Differ from Comparison Episodes in Use of Exemestane versus Other Hormonal Therapies for Low-Risk Breast Cancer

	# of Episodes		OCM		COMP		Impact Estimates Through PP5			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
Use of exemestane vs. other hormonal therapies	237,803	252,554	8.4%	7.7%	7.8%	7.1%	0.1%	-0.3%	0.5%	1.0%

*p≤0.10, **p≤0.05, ***p≤0.01. LCL: Lower confidence limit. UCL: Upper confidence limit.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP5: Performance period 5. Int.: Intervention. DID: Difference-in-difference.

D.4. Adherence to Oral Cancer Treatment Regimens for Three Cancer Types

After learning about OCM practices' efforts to support patient adherence, we assessed whether OCM was associated with better adherence to oral cancer treatment regimens. We examined three cancer types for which adherence to oral drugs has a major role in treatment: high-intensity prostate cancer, low-risk breast cancer, and chronic leukemia. These analyses were limited to beneficiaries who had Part D coverage for all months of their cancer treatment episodes.

Measures and Analytic Approach

We focused on adherence to abiraterone or enzalutamide in high-intensity prostate cancer episodes, and adherence to hormonal therapy during low-risk breast cancer episodes[38]. For the analysis of adherence to TKIs, we selected episodes with a diagnosis of CML, including the following codes: ICD9 codes 205.10, 205.11, 205.12 or ICD10 codes C92.10, C92.11, C92.12. We then assessed for use of any of the TKIs (including imatinib, dasatinib, nilotinib, bosutinib, and ponatinib), and also looked at adherence individually for the three most frequently prescribed TKIs, imatinib, dasatinib, and nilotinib.

We calculated the proportion of days covered by summing the number of actual days' supply dispensed from the date of the first occurrence of a drug of interest until the last day of the episode or the day of death if the beneficiary died before the end of the episode, or until evidence of a switch to a different drug for treating that beneficiary's cancer. For high-intensity prostate cancer, we looked for a switch to enzalutamide (if on abiraterone), abiraterone (if on enzalutamide), or use of docetaxel, cabazitaxel, sipuleucel-T, or mitoxantrone, suggesting progression.

Results

As noted in the report, DID analysis showed no impact of OCM on improved adherence among beneficiaries taking TKIs for CML, enzalutamide, or abiraterone for prostate cancer, or hormonal therapy for breast cancer (**Exhibit D-31**).

[38] Breast cancer treatment episodes with use of intravenous chemotherapy at any time during the episode were excluded from the outset, as these treatments would have caused the episode to be classified as high-risk rather than low-risk.

Exhibit D-31: There was No Impact of OCM on Adherence (Proportion of Days Covered) to TKIs for CML, Enzalutamide, or Abiraterone for Prostate Cancer, or Hormonal Therapy for Breast Cancer

PDC	# of Episodes		OCM		COMP		Impact Estimates Through PP5			
	OCM	COMP	Baseline Mean PDC	Int. Mean PDC	Baseline Mean PDC	Int. Mean PDC	DID Impact	90% LCL	90% UCL	Percent Change
TKIs for CML	12,152	13,329	87.6%	86.1%	88.1%	86.8%	-0.3%	-1.2%	0.6%	-0.3%
Enzalutamide or abiraterone for high-intensity prostate cancer	23,050	28,126	88.6%	84.5%	89.1%	84.5%	0.4%	-0.3%	1.2%	0.5%
Hormonal therapy for low-risk breast cancer	237,803	252,554	90.4%	90.8%	90.7%	91.1%	0.0%	-0.2%	0.2%	0.0%

*p≤0.10, **p≤0.05, ***p≤0.01.
Source: Medicare claims 2014–2019.
Notes: PDC=Proportion of days covered. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. LCL: Lower confidence limit. UCL: Upper confidence limit. TKI=Tyrosine Kinase Inhibitor. CML=chronic myelogenous leukemia.

Results were similar after excluding the two largest OCM practices.

Exhibit D-32 shows that adherence improvements for TKIs for CML, abiraterone/enzalutamide for high-intensity prostate cancer, and hormonal therapy for low-risk breast cancer were similar for PP1-3 and PP4-5, indicating no increasing impact of OCM over time.

Exhibit D-32: Lack of Impact on Adherence (Proportion of Days Covered) was Similar for PP 1–3 and PP 4–5

PDC	DID PP 1–5	90% CI	DID PP1–3	90% CI	DID PP4–5	90% CI
TKIs for CML	-0.3%	-1.2, 0.6	0.0%	-0.8, 0.8	-0.7%	-2.0, 0.7
Enzalutamide or abiraterone for high-intensity prostate cancer	0.4%	-0.3, 1.2	0.2%	-0.6, 1.0	0.7%	-0.2, 1.7
Hormonal therapy for low-risk breast cancer	0.0%	-0.2, 0.2	0.0%	-0.2, 0.2	0.0%	-0.2, 0.2

*p≤0.10, **p≤0.05, ***p≤0.01.
Source: Medicare claims 2014–2019.
Notes: PDC: Proportion of days covered. DID: Difference-in-difference. PP: Performance period. CI: Confidence interval. TKI=Tyrosine Kinase Inhibitor; CML=chronic myelogenous leukemia.

Exhibit D-33 presents adherence to TKIs for CML, abiraterone or enzalutamide for high-intensity prostate cancer, and hormonal therapy for low-risk breast cancer by race/ethnicity. For TKIs for CML and abiraterone or enzalutamide for high-intensity prostate cancer, OCM improved adherence for Black beneficiaries but not for White or Hispanic beneficiaries. There were no differential impacts of OCM by race/ethnicity for adherence to hormonal therapy for low-risk breast cancer.

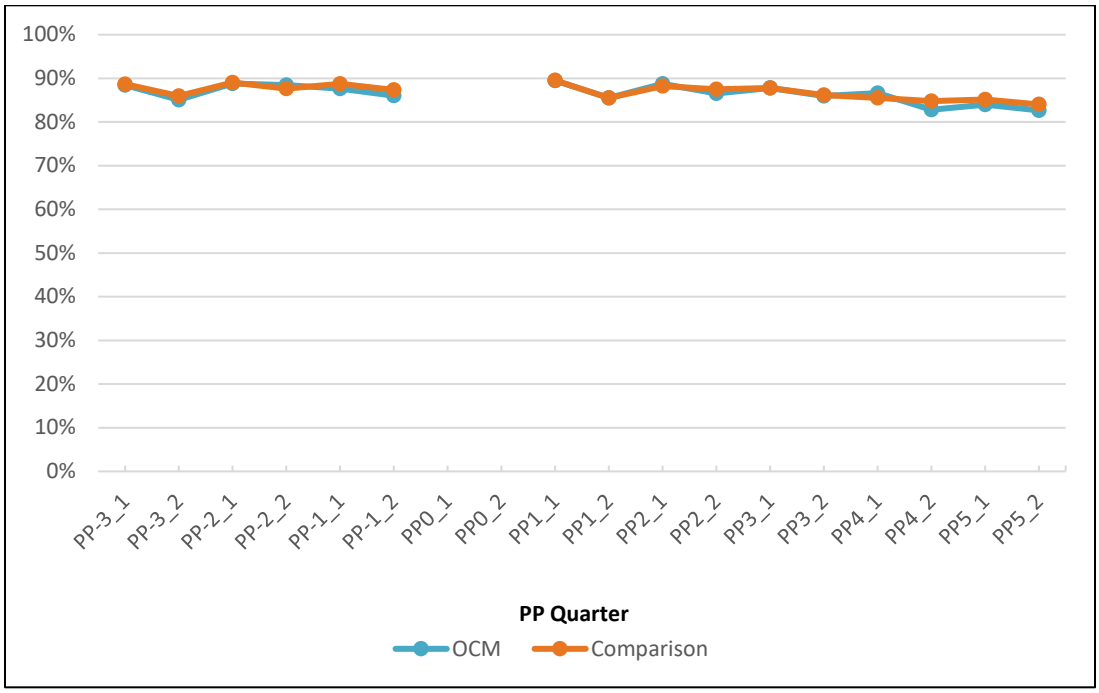
Exhibit D-33: OCM Improved Adherence (Proportion of Days Covered) to TKIs for CML and Abiraterone/Enzalutamide for Prostate Cancer for Black Beneficiaries but not White or Hispanic Beneficiaries; No Racial/Ethnic Differences in Adherence to Hormonal Therapy for Breast Cancer

Proportion of Days Covered (PDC)	# of Episodes		OCM		COMP		Impact Estimates Through PP5			
	OCM	COMP	Baseline Mean PDC	Int. Mean PDC	Baseline Mean PDC	Int. Mean PDC	DID Impact	90% LCL	90% UCL	Percent Change
TKIs for CML										
White	9,619	10,636	88.5%	86.4%	88.3%	86.8%	-0.6%	-1.6%	0.4%	-0.7%
Black	1,056	1,305	82.7%	85.1%	85.2%	84.7%	3.0%*†	0.2%	5.8%	3.6%
Hispanic	881	822	84.9%	84.2%	86.9%	88.9%	-2.7%	-6.5%	1.1%	-3.1%
Enzalutamide or abiraterone for high-intensity prostate cancer										
White	17,956	21,895	89.2%	84.3%	89.5%	84.7%	0.0%	-0.8%	0.9%	0.0%
Black	2,809	3,517	86.0%	84.4%	87.2%	83.3%	2.2%*	0.2%	4.3%	2.6%
Hispanic	1,315	1,407	87.0%	84.0%	88.3%	85.0%	0.3%	-2.6%	3.2%	0.3%
Hormonal therapy for low-risk breast cancer										
White	199,087	211,787	90.6%	91.0%	90.9%	91.3%	0.1%	-0.1%	0.3%	0.1%
Black	18,778	20,313	88.6%	89.2%	88.3%	89.2%	-0.3%	-1.0%	0.3%	-0.4%
Hispanic	11,377	10,551	89.4%	90.0%	89.8%	89.9%	0.6%	-0.2%	1.4%	0.7%

*p≤0.10, **p≤0.05, ***p≤0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. LCL: Lower confidence limit. UCL: Upper confidence limit, PDC=proportion of days covered; TKI=Tyrosine Kinase Inhibitor; CML=chronic myelogenous leukemia.
†There was some evidence for differential baseline trends for adherence to TKIs for CML for Black beneficiaries; however, the finding of improved adherence with OCM for Black beneficiaries remained in sensitivity analyses accounting for differential baseline trends.

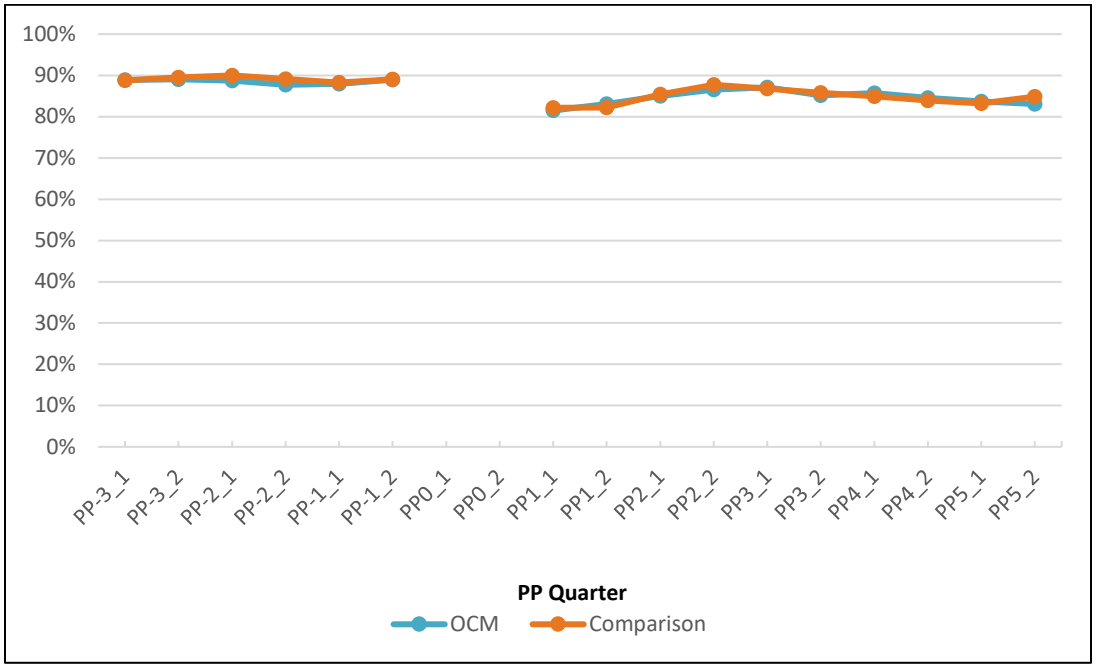
Exhibits D-34 through D-36 show quarterly trends in adherence to TKIs for beneficiaries with CML, abiraterone, and enzalutamide for high-intensity prostate cancer, and hormonal therapy for low-risk breast cancer by quarter in OCM and comparison episodes. These trends demonstrate similar patterns of adherence in the baseline period between OCM and comparison episodes.

Exhibit D-34: Adherence to TKIs for CML in OCM and Comparison Episodes by Quarter, Unadjusted



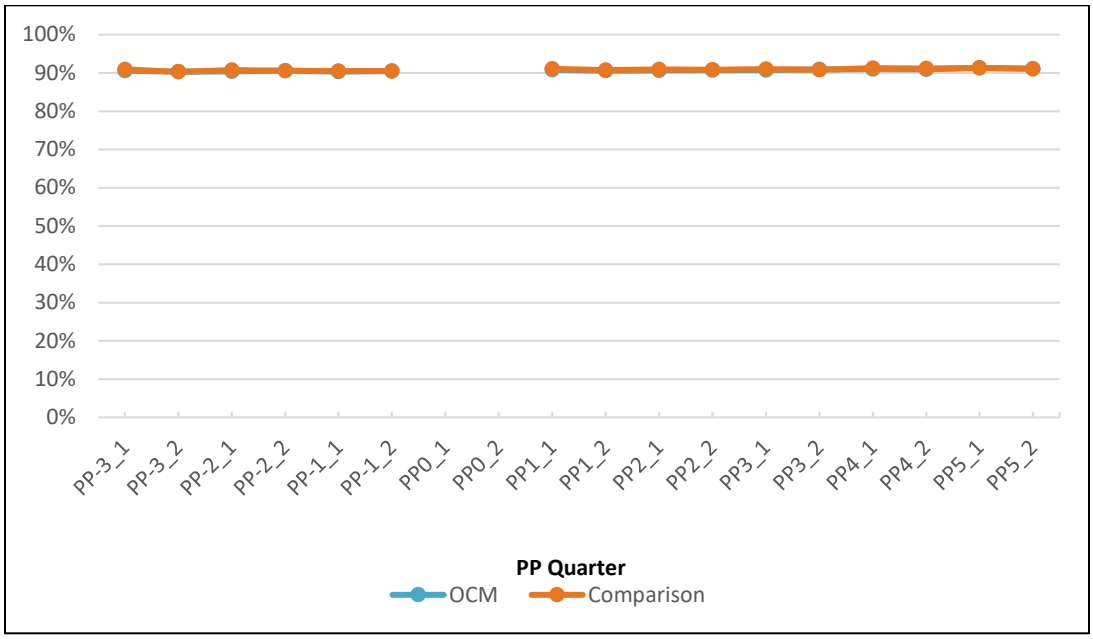
Source: Medicare claims 2014–2019.
Notes: Pre-trend estimate -0.2% per quarter in OCM relative to comparison episodes (95% CI: -0.6%, 0.2%), P=0.237

Exhibit D-35: Adherence to Abiraterone or Enzalutamide in OCM and Comparison Episodes by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: Pre-trend estimate 0.0% per quarter in OCM relative to comparison episodes (95% CI: -0.3%, 0.3%), P=0.968

Exhibit D-36: Adherence to Hormonal Therapy for Low-Risk Breast Cancer in OCM and Comparison Episodes by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: Pre-trend estimate 0.0% per quarter in OCM relative to comparison episodes (95% CI: -0.1%, 0.1%), P=0.496

D.5. Supportive Care Medications

D.5.1 Use of Bone-Modifying Medications for Patients with Bone Metastases

Methods

We evaluated the impact of OCM on the use of bone-modifying medications for the treatment of bone metastases in patients with breast cancer, prostate cancer, or lung cancer. We included episodes for breast cancer (high-risk or low-risk), prostate cancer (high-intensity or low-intensity), and lung cancer, where there was a Medicare Part A or Part B claim with a diagnosis code for bone metastases during the episode or within the 180 days before the start of that episode.

We assessed any use of a bone-modifying agent during the episode and then assigned episodes to the class of the first bone-modifying agent received during the episode: bisphosphonates (zoledronic acid or pamidronate) versus denosumab. First, we tested whether OCM affected the use of any bone-modifying medication during a six-month OCM episode. Second, we tested whether OCM affected the choice of Part B bone-modifying medication, among episodes with any bone-modifying agent.

We also examined receipt of bone-modifying medications during episodes for multiple myeloma, and use of denosumab versus bisphosphonates among episodes for multiple myeloma with any bone-modifying drugs.

Results

As noted in the main report, OCM led to reductions in value-sensitive use of bone modifying medications during episodes breast cancer, prostate cancer, or lung cancer with bone metastases.

We additionally assessed the use of bone-modifying medications in breast, prostate, and lung cancer episodes, stratified by PP1–3 versus PP4–5. OCM impacts on use of any bone-modifying medications were stable over time. However, OCM impacts on use of denosumab (versus bisphosphonate agents) increased from PP1–3 to PP4–5 (see **Exhibit D-37**), consistent with an OCM-related reduction in low-value use of denosumab over time.

Exhibit D-37: Estimated OCM Impacts on Low-Value Use of Bone-Modifying Medication Increased from PP1–3 to PP4–5

Measure	DID Impact PP 1–5	90% CI	DID Impact PP1–3	90% CI	DID Impact PP4–5	90% CI
Receiving any of the 3 agents						
Breast cancer and bone metastases	0.4%	-0.9%, 1.7%	0.6%	-0.8%, 2.0%	0.2%	-1.4%, 1.8%
Prostate cancer and bone metastases	0.3%	-1.5%, 2.1%	-0.2%	-2.0%, 1.6%	1.2%	-1.0%, 3.4%
Lung cancer and bone metastases	-0.4%	-2.5%, 1.8%	-0.3%	-2.4%, 1.8%	-0.4%	-3.1%, 2.3%
Receiving any denosumab						
Breast cancer and bone metastases	-5.0%***	-7.1%, -2.8%	-4.0%***	-6.0%, -2.0%	-6.1%***	-8.6%, -3.7%
Prostate cancer and bone metastases	-4.0%***	-5.9%, -2.2%	-2.8%***	-4.5%, -1.1%	-5.6%***	-7.9%, -3.4%
Lung cancer and bone metastases	-4.1%**	-7.4%, -0.9%	-3.4%*	-6.5%, -0.3%	-4.9%**	-8.7%, -1.1%

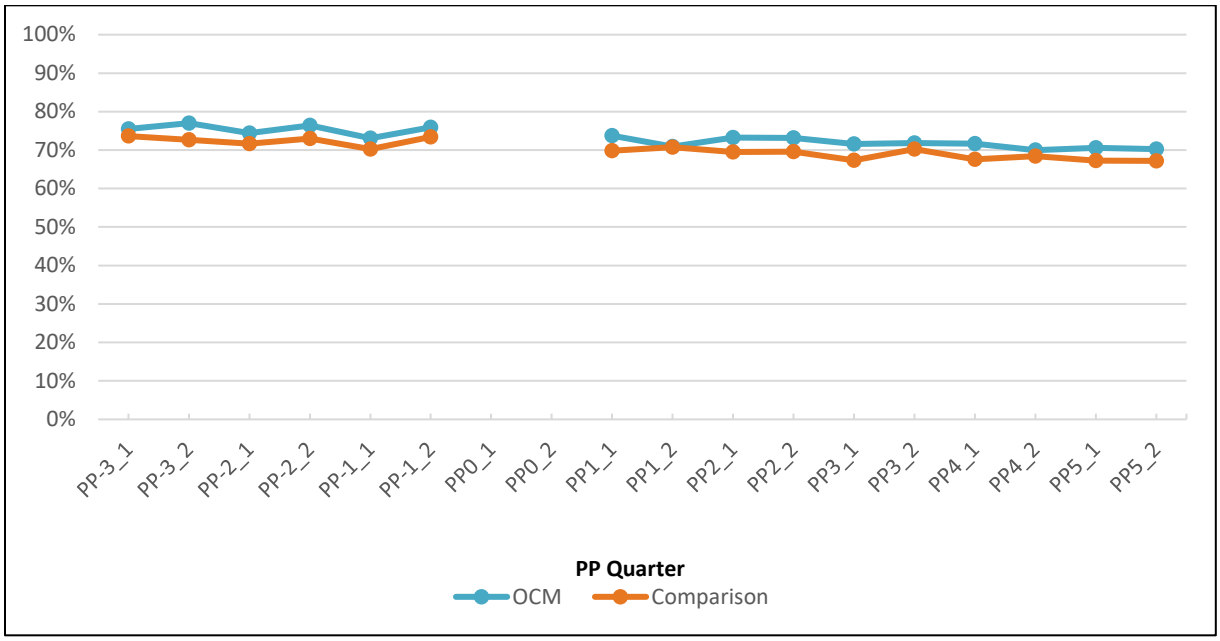
*p≤0.10, **p≤0.05, ***p≤0.01

Source: Medicare claims 2014–2019.

Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period.. LCL: Lower confidence limit. UCL: Upper confidence limit.

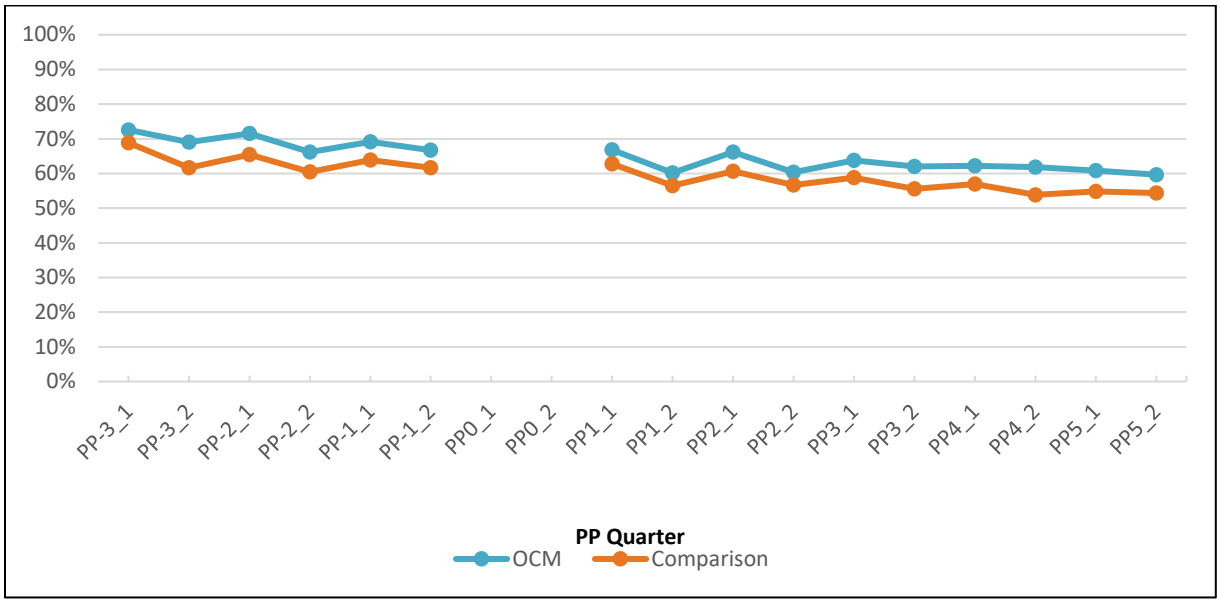
Exhibits D-38 through D-40 show similar quarterly trends in the use of any bone-modifying medication for OCM and comparison episodes for breast, prostate, and lung cancer, in patients with history of bone metastases, in the baseline and implementation periods. DID analyses confirmed that there was no evidence of an OCM impact on use of any bone-modifying agent during these episodes.

Exhibit D-38: Similar Quarterly Trends in Use of Any Bone-Modifying Medication among Patients with Breast Cancer, Unadjusted



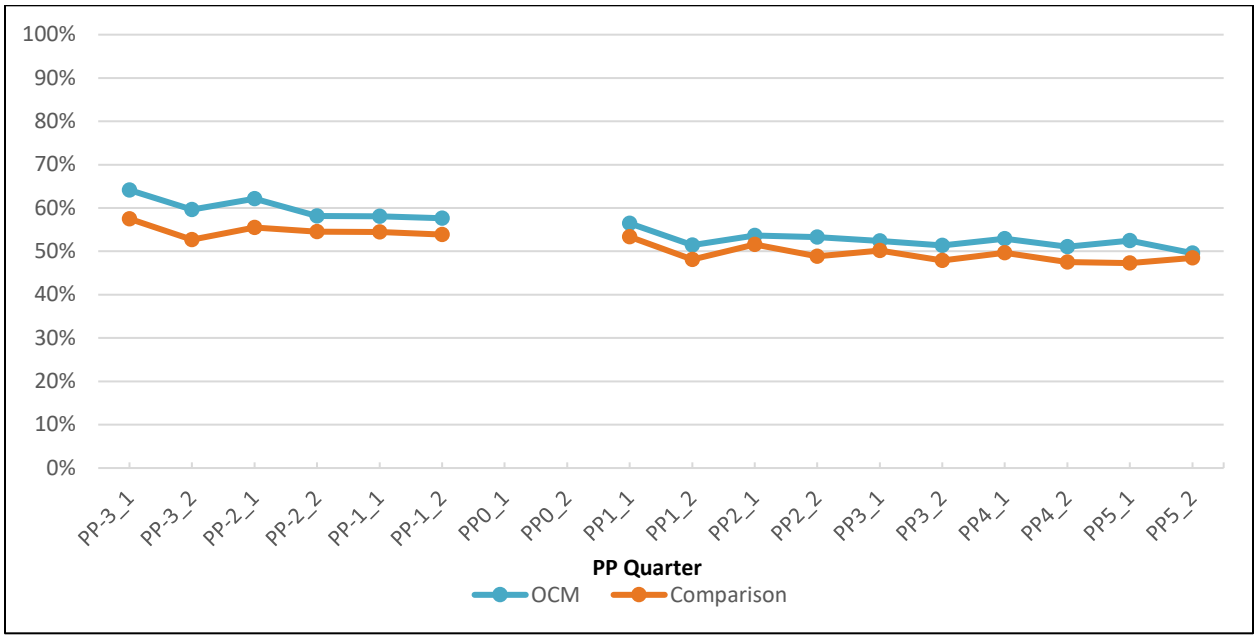
Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: 0.0% per quarter (95% CI: -0.4%, 0.5%), P= 0.861

Exhibit D-39: Similar Quarterly Trends in Use of Any Bone-Modifying Medication among Patients with Prostate Cancer, Unadjusted



Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: 0.1% per quarter (95% CI: -0.5%, 0.7%), P= 0.770

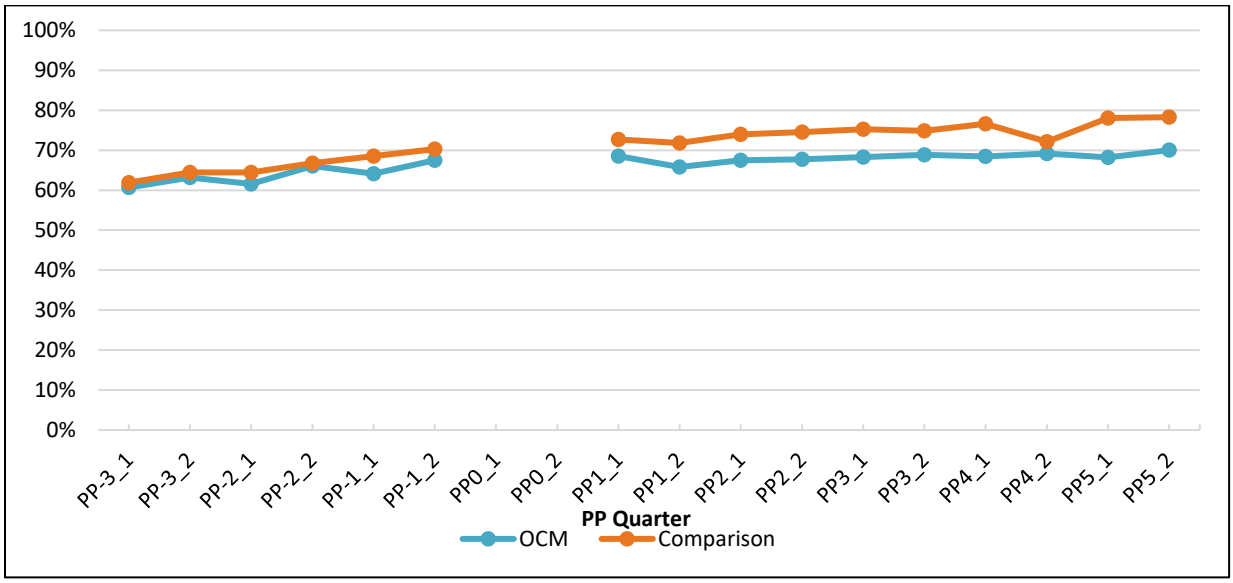
Exhibit D-40: Similar Quarterly Trends in Use of Any Bone-Modifying Medication among Patients with Lung Cancer, Unadjusted



Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: -0.7% per quarter (95% CI: -1.6%, 0.3%), P= 0.176

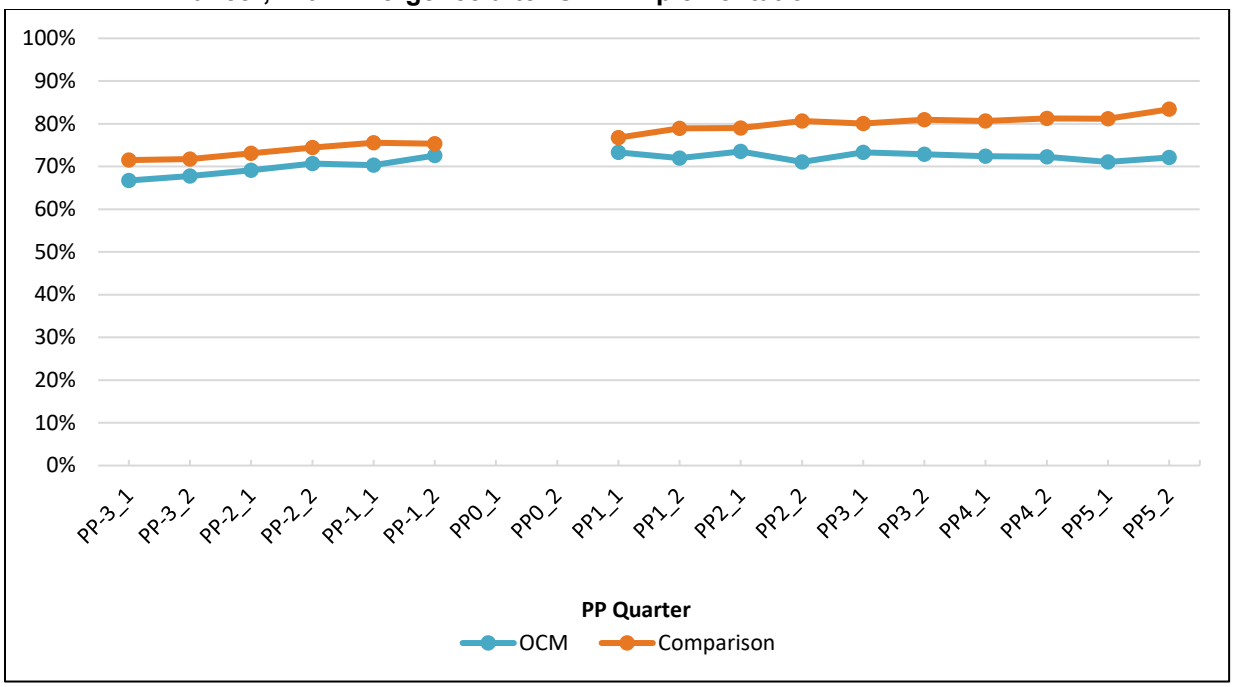
Exhibits D-41 through D-43 show that for breast, prostate, and lung cancer episodes in patients with a recent history of bone metastases, use of denosumab was generally similar for OCM and comparison episodes in the baseline period. However, trends in denosumab use diverged in the intervention period, with lower use of denosumab in OCM episodes. These findings illustrate an OCM-related reduction in low-value use of bone-modifying medications.

Exhibit D-41: Unadjusted Quarterly Trends in Use of Denosumab among Patients with Breast Cancer, with Divergence after OCM Implementation



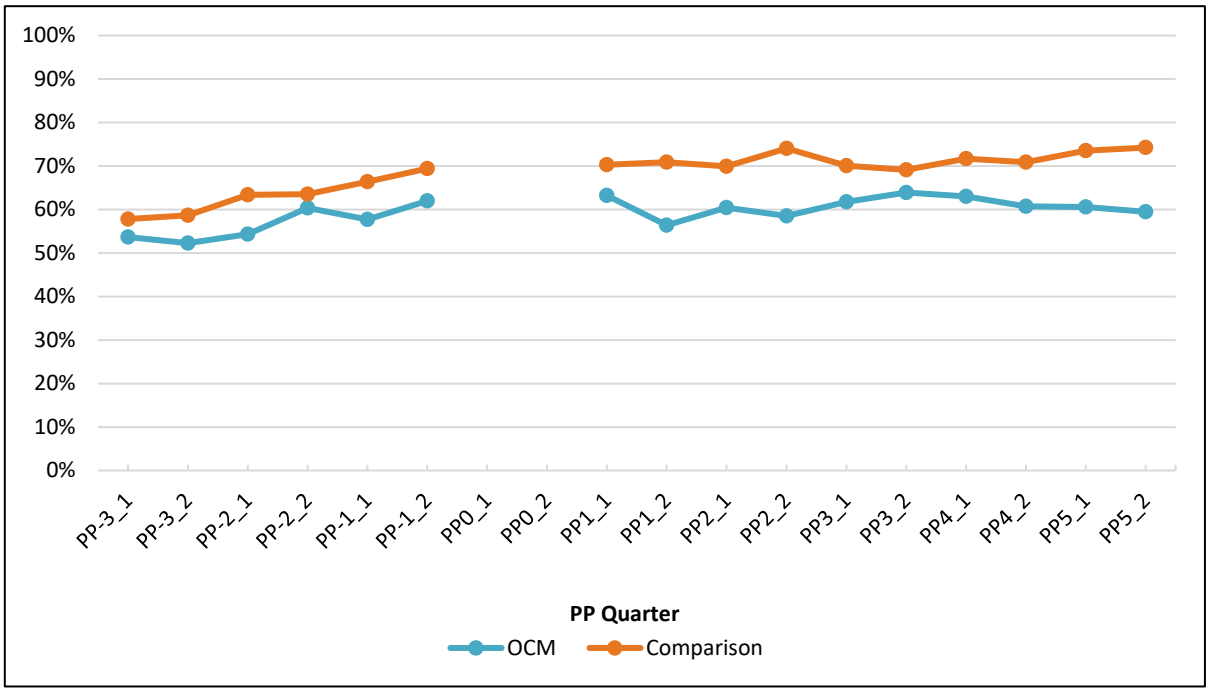
Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: -0.5% per quarter (95% CI: -1.2%, 0.2%), P=0.183

Exhibit D-42: Unadjusted Quarterly Trends in Use of Denosumab among Patients with Prostate Cancer, with Divergence after OCM Implementation



Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: 0.1% per quarter (95% CI: -0.6%, 0.8%), P=0.820

Exhibit D-43: Unadjusted Quarterly Trends in Use of Denosumab among Patients with Lung Cancer by Quarter, with Divergence after OCM Implementation



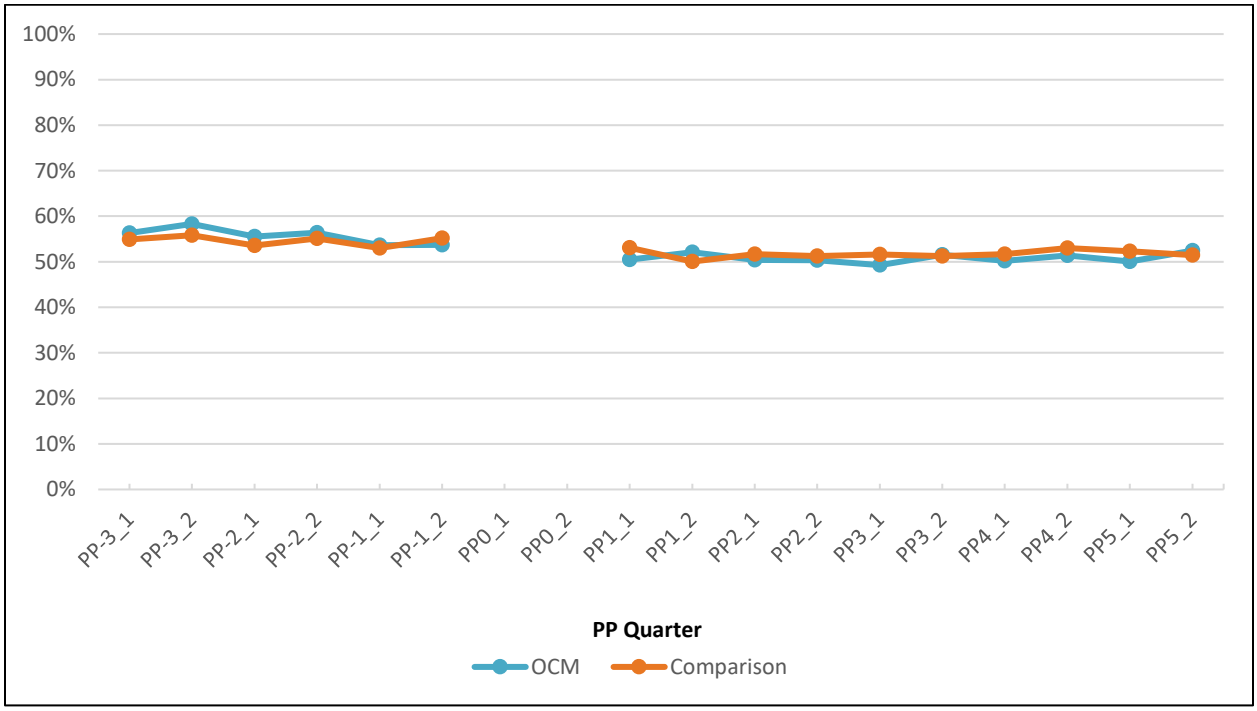
Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: -0.5% per quarter (95% CI: -1.8%, 0.8%), P=0.491

Exhibits D-44 and D-45 shows no meaningful OCM impact on use of any bone modifying agents during multiple myeloma episodes.

In multiple myeloma episodes, OCM led to a 2.1 percentage point decline in use of any bone-modifying agent during an episode (statistically significant at p<0.10). However, use of bone-modifying agents was declining in OCM versus comparison episodes in the baseline period (baseline trends were not parallel), and the significant impact of OCM on use of any bone-modifying agent was not present after sensitivity analyses that accounted for these differential baseline trends.

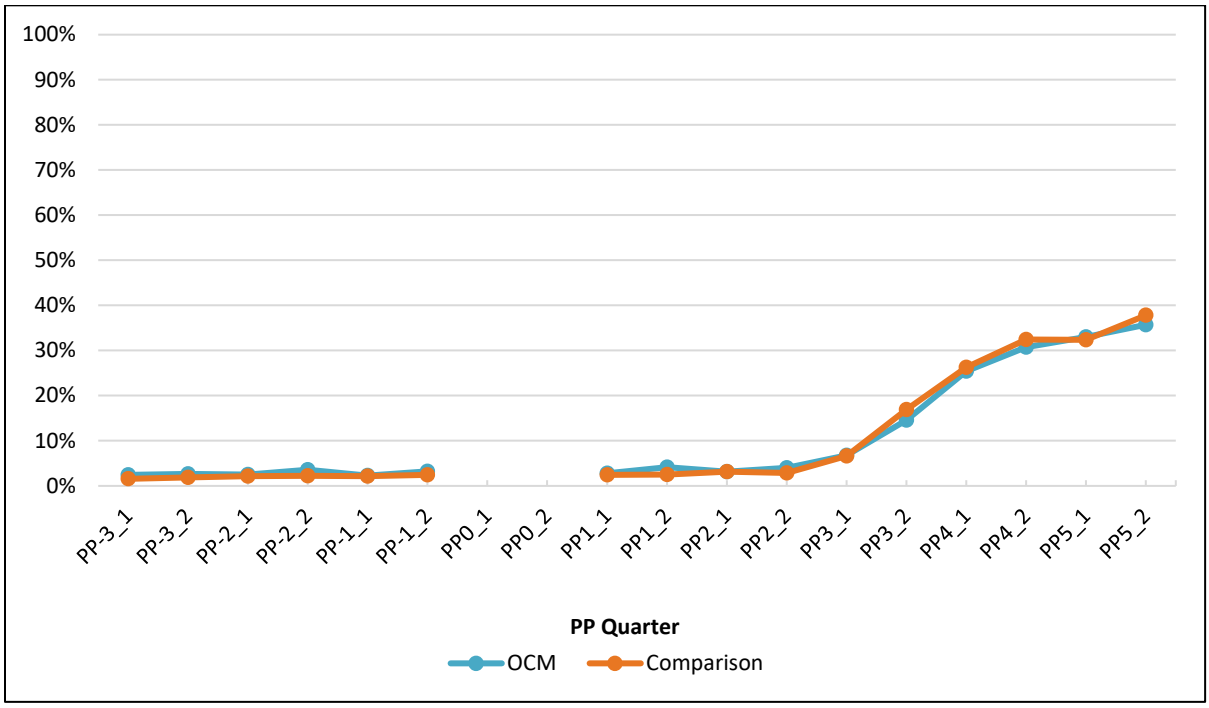
Use of denosumab during multiple myeloma episodes was very low during the baseline period (less than 5 percent for both OCM and comparison episodes), and we did not conduct DID analyses of denosumab use for multiple myeloma. We compared the linear trend during the intervention period for OCM and comparison episodes and found no difference in trends in the use of denosumab in multiple myeloma for OCM and comparison episodes. Increases in use of denosumab was 0.2 percentage points lower per quarter in OCM relative to comparison episodes (90 percent CI for difference in linear trend= -0.9%, 0.4 percent; p=0.55). The adjusted average use of denosumab over the intervention period was 16.1 percent in OCM episodes and 16.3 percent in comparison episodes (difference= -0.3 percentage points, 90 percent CI= -2.4%, 1.9 percent). We conclude that OCM did not substantially impact use of bone modifying agents for multiple myeloma across PP1-5.

Exhibit D-44: Differential Baseline Quarterly Trends in Use of Any Bone-Supportive Medication among Patients with Multiple Myeloma, Unadjusted



Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in the baseline period is -0.6% per quarter (95% CI: -1.1%, -0.03%), P=0.039

Exhibit D-45: Similar Quarterly Trends in Use of Any Denosumab among Patients with Multiple Myeloma, by Quarter



Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: 0.0% per quarter (95% CI: -0.3%, 0.2%), P=0.666

D.5.2 Use of GCSFs

We assessed guideline-recommended use of prophylactic white blood cell growth factors (GCSFs) for patients with colorectal, breast, and lung cancers, for regimens with varying risk of fever and neutropenia (high, intermediate, low). Prophylactic GCSFs should be given to all patients receiving chemotherapy regimens with high risk for fever and neutropenia, and generally should not be given to those receiving low-risk chemotherapy regimens. Patients receiving intermediate-risk chemotherapy may benefit from prophylactic GCSFs if patient characteristics indicate increased risk for fever and neutropenia, but in many cases such use may reflect low-value care.

We also assessed the OCM impact on use of other GCSF agents. First, we evaluated the use of filgrastim (which requires multiple subcutaneous injections per chemotherapy cycle), versus use of the more costly, but more convenient pegfilgrastim (which requires only a single injection per chemotherapy cycle). Second, we evaluated use of biosimilar filgrastim, versus use of the more costly originator filgrastim. Third, we assessed use of pegfilgrastim with the costly on-body injector.[39]

Measures and Analytic Approach

We identified patients with colorectal, breast, and lung cancer who were initiating new intravenous chemotherapy treatment episodes. We restricted the analysis to patients who had not received chemotherapy in the previous 12 months, to focus on patients who were candidates for *prophylactic* growth factors. Using the date of the first chemotherapy claim as the index date, we assigned patients to treatment regimens by identifying all chemotherapy agents received on the index date or in the seven days following the index date. For regimens that can be given at standard or "dose-dense" intervals, we identified dose-dense regimens by counting the days until the second treatment cycle. Patients receiving filgrastim, pegfilgrastim, or related biosimilars within eight days of the index date were classified as receiving prophylactic GCSF therapy. We assigned all chemotherapy regimens as high, intermediate, or low-risk for fever and neutropenia, using National Comprehensive Cancer Network (NCCN) guidelines; when a regimen was not specifically listed in the NCCN guideline, we used other published sources to classify the regimen's fever and neutropenia risk.

Chemotherapy regimens for breast cancer, lung cancer, and colorectal cancer are presented in **Exhibits D-46, D-47**, and **D-48**, stratified by risk of neutropenia.

[39] Per FDA labeling, pegfilgrastim should not be administered within 24 hours of chemotherapy administration. The on-body injector is an adhesive mechanical device with a timer that allows for pegfilgrastim administration 24 hours after a chemotherapy treatment, without requiring a return visit to clinic. The on-body injector was not available during the baseline period.

Exhibit D-46: Breast Cancer Regimens Classified by Neutropenia Risk

High-Risk Regimens	Intermediate-Risk Regimens	Low-Risk Regimens
Dose-dense AC (doxorubicin, cyclophosphamide) TAC (docetaxel, doxorubicin, cyclophosphamide) TC (docetaxel, cyclophosphamide) TC (docetaxel, cyclophosphamide) + trastuzumab TCH (docetaxel, carboplatin, trastuzumab) TCH (docetaxel, carboplatin, trastuzumab) + pertuzumab Docetaxel + carboplatin	Non-dose-dense AC (doxorubicin, cyclophosphamide) Docetaxel Docetaxel + trastuzumab Docetaxel + trastuzumab + pertuzumab Paclitaxel every 21 d Paclitaxel every 21 d + trastuzumab Paclitaxel every 21 d + trastuzumab + pertuzumab Paclitaxel + carboplatin Paclitaxel + carboplatin + trastuzumab Paclitaxel + carboplatin + trastuzumab + pertuzumab CMF Classic (cyclophosphamide, methotrexate*, fluorouracil) FEC (fluorouracil, epirubicin, cyclophosphamide)	All other regimens

Exhibit D-47: Lung Cancer Regimens Classified by Neutropenia Risk*

Intermediate-Risk Regimens	Low-Risk Regimens
Docetaxel monotherapy Docetaxel + bevacizumab Docetaxel + ramucirumab Carboplatin-paclitaxel Carboplatin-paclitaxel + bevacizumab Carboplatin-paclitaxel + pembrolizumab Carboplatin-etoposide Carboplatin-etoposide + atezolizumab Cisplatin-paclitaxel Cisplatin-docetaxel Cisplatin-vinorelbine Cisplatin-etoposide	All other regimens

Notes: *Topotecan, carboplatin-docetaxel, and Carbo-docetaxel + bevacizumab were categorized as high risk, but these regimens were very infrequently used and were omitted from analyses.

Exhibit D-48: Colorectal Cancer Regimens Classified by Neutropenia Risk

Intermediate-Risk Regimens	Low-Risk Regimens
FOLFOX (5-FU + oxaliplatin) FOLFOX (5-FU + oxaliplatin) + bevacizumab FOLFOX (5-FU + oxaliplatin) + cetuximab FOLFOX (5-FU + oxaliplatin) + panitumumab FOLFOXIRI (5-FU + oxaliplatin + irinotecan) FOLFOXIRI (5-FU + oxaliplatin + irinotecan) + bevacizumab	All other regimens

We performed DID analyses to assess the use of prophylactic GCSF therapy in OCM and comparison episodes, stratified by cancer type and regimen-associated risk for fever and neutropenia. We also used DID analyses to assess use of filgrastim (versus pegfilgrastim) and use of biosimilar filgrastim (versus originator filgrastim). For the analysis of the use of pegfilgrastim with the on-body injector, we evaluated the adjusted average use during the intervention period, as the on-body injector was not available during the baseline period (precluding use of a DID analysis).

Results

As described in Section 7.3 in the main report, we observed reduced use of prophylactic GCSFs for breast cancer regimens with intermediate risk of neutropenia, but not for other types of regimens for breast, lung, or colorectal cancers. The reductions in use of prophylactic GCSFs during intermediate risk breast cancer treatment suggest more value-sensitive use of GCSFs. We conducted stratified analyses of OCM impact on prophylactic GCSF use for PP1–3 and for PP4–5 to understand whether the impact of OCM was changing over time. The OCM impact of less use of prophylactic GCSF for intermediate-risk breast cancer regimens was similar in PP1–3 and PP4–5 (**Exhibit D-49).** We saw a small increase in prophylactic GCSF use during OCM episodes with intermediate risk chemotherapy for colorectal cancers in PP4–5 and a small decrease in prophylactic growth factor use during low-risk chemotherapy for colorectal cancer in PP4–5. The importance of these small but statistically significant impacts is uncertain, and interpretation will require data from subsequent PPs.

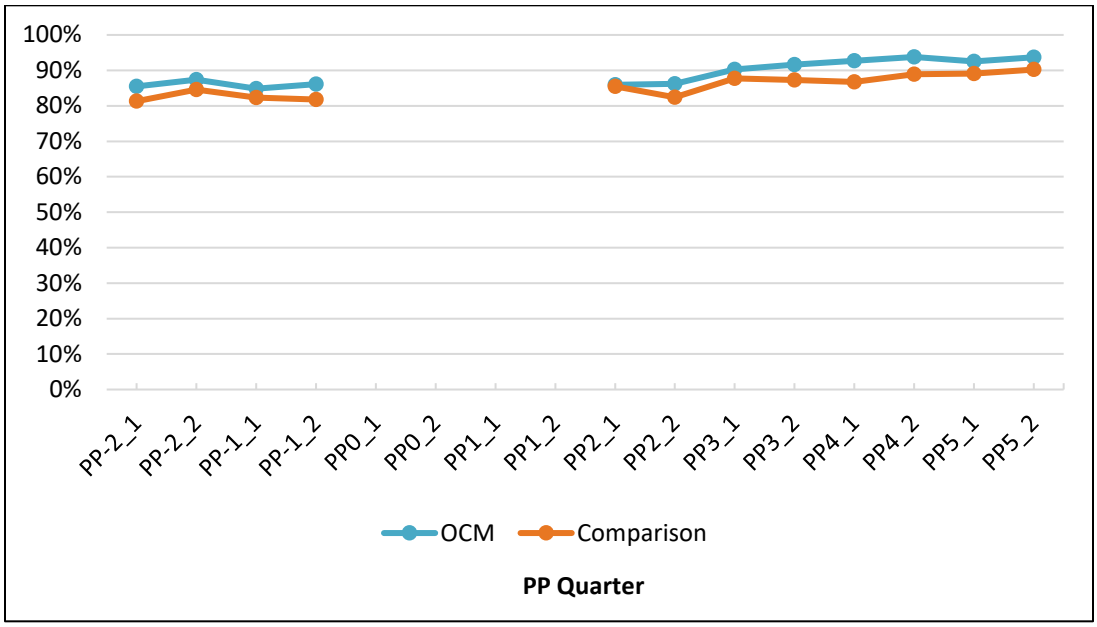
Exhibit D-49: Decrease in Prophylactic GCSF Use for Intermediate-Risk Breast Cancer was Similar in PP1–3 and PP4–5

Measure	DID Impact PP 1–5	90% CI	DID Impact PP1–3	90% CI	DID Impact PP4–5	90% CI
Use of Growth Factors – Breast Cancer						
High risk	1.3%	-1.0%, 3.6%	-0.1%	-2.3%, 2.2%	2.7%	-0.4%, 5.9%
Intermediate risk	-7.6%**	-12.6%, -2.7%	-7.7%**	-12.9%, -2.4%	-7.5%**	-13.3%, -1.7%
Low risk	-0.2%	-0.8%, 0.4%	0.0%	-0.6%, 0.6%	-0.4%	-1.1%, 0.3%
Use of Growth Factors – Lung Cancer						
Intermediate Risk	-1.3%	-3.4%, 0.8%	-0.8%	-3.0%, 1.4%	-1.7%	-4.2%, 0.8%
Low risk	-0.3%	-2.3%, 1.8%	0.1%	-1.9%, 2.1%	-0.6%	-2.9%, 1.7%
Use of Growth Factors – Colorectal Cancer						
Intermediate risk	1.9%	-0.2%, 3.9%	1.4%	-0.9%, 3.8%	2.4%*	0.1%, 4.6%
Low risk	-0.8%	-1.8%, 0.2%	0.1%	-1.0%, 1.1%	-1.7%**	-3.0%, -0.4%

*p≤0.10, **p≤0.05, ***p≤0.01
Source: Medicare claims 2014-2019.
Notes: DID: Difference-in-difference. CI: Confidence interval.

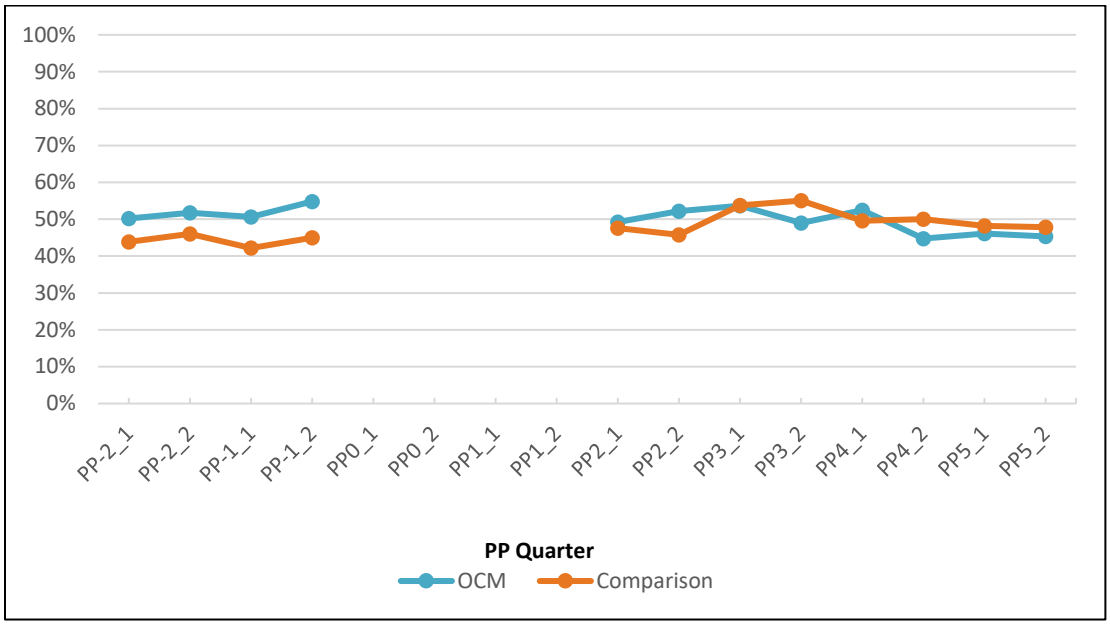
Exhibit D-50 through D-56 show unadjusted quarterly rates of GCSF use by cancer type and category of neutropenia risk. Baseline trends in prophylactic GCSF use were similar for OCM and comparison episodes.

Exhibit D-50: Use of Prophylactic GCSF for Breast Cancer – High-Risk Regimens by Quarter, Unadjusted



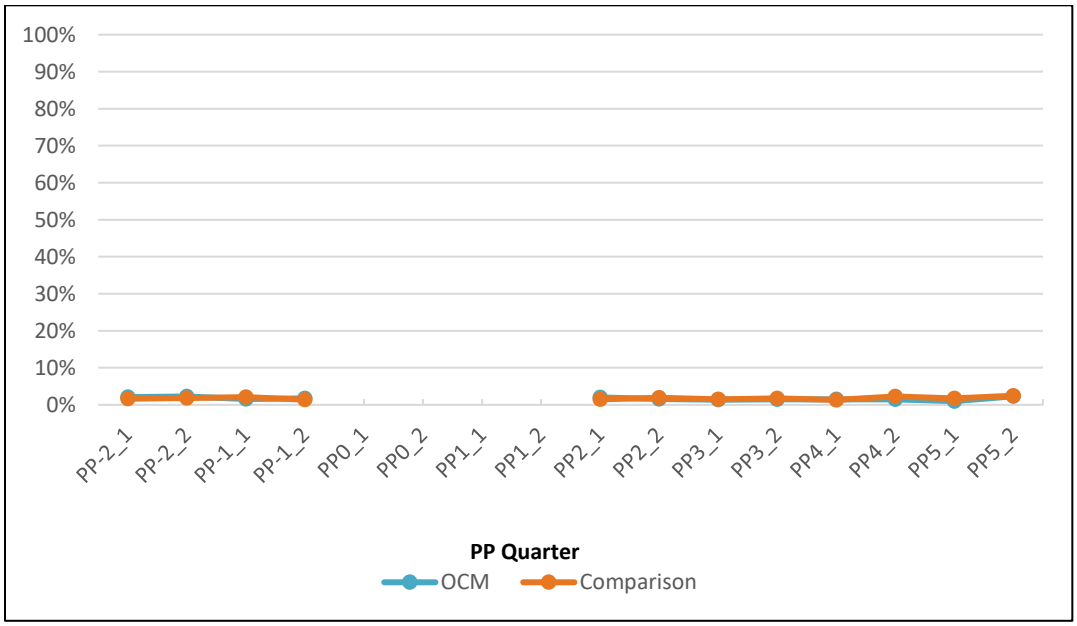
Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: 0.2% per quarter (95% CI: -1.5%, 1.8%), P=0.855

Exhibit D-51: Use of Prophylactic GCSF for Breast Cancer – Intermediate-Risk Regimens by Quarter, Unadjusted



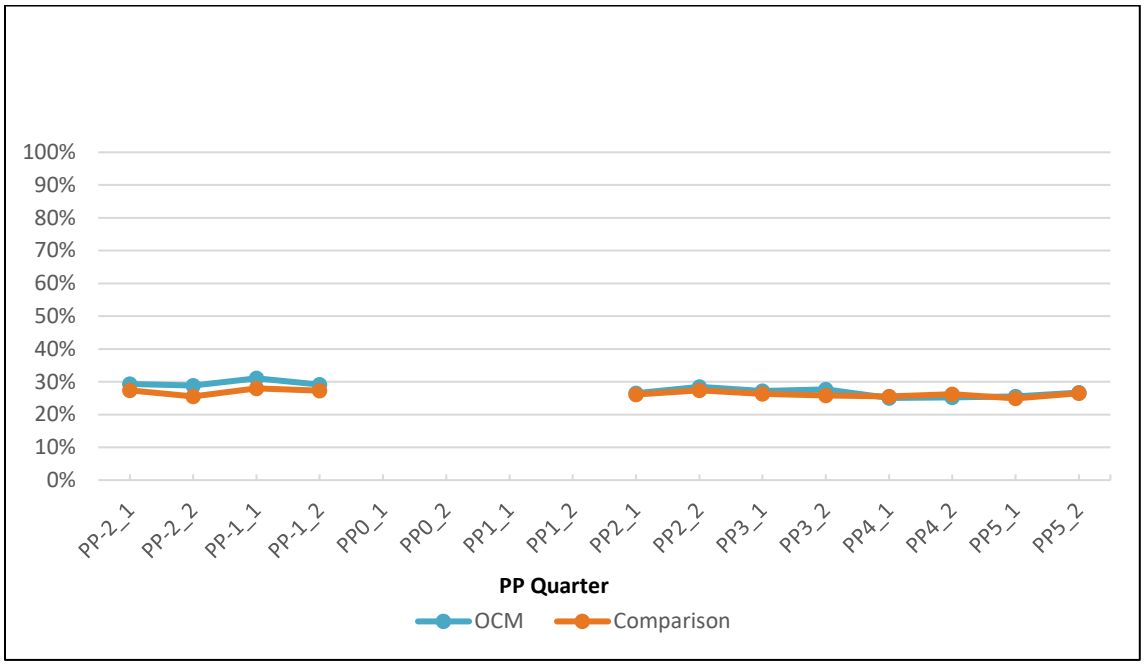
Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: 0.3% per quarter (95% CI: -3.1%, 3.7%), P=0.873

Exhibit D-52: Use of Prophylactic GCSF for Breast Cancer – Low-Risk Regimens by Quarter, Unadjusted



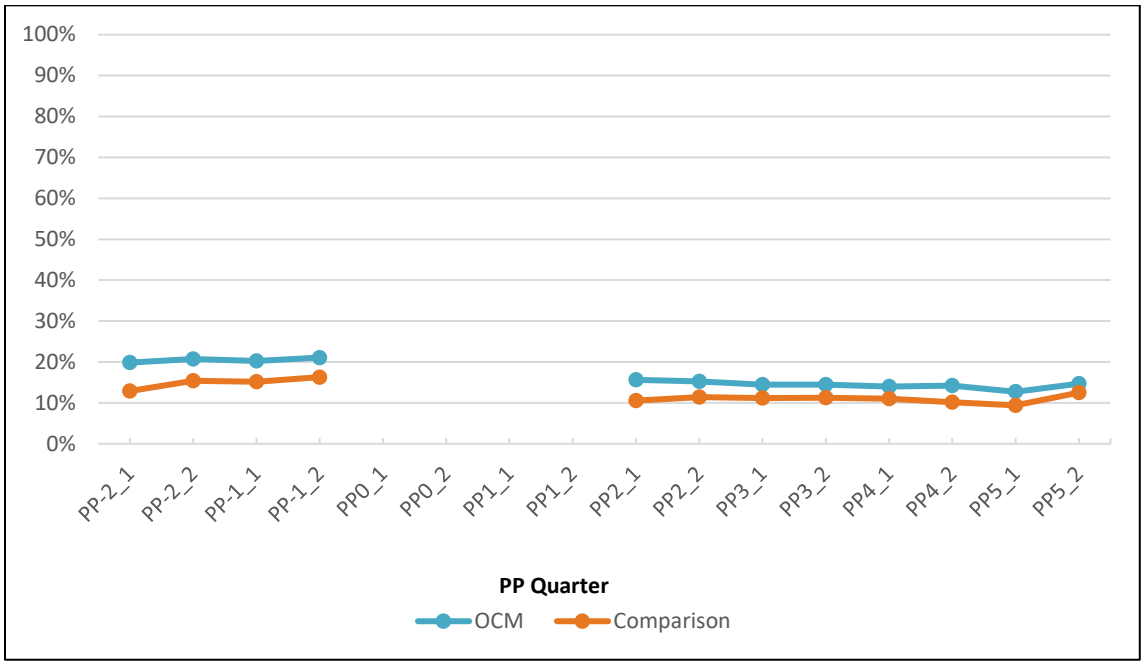
Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: -0.1% per quarter (95% CI: -0.5%, 0.4%), P=0.814

Exhibit D-53: Use of Prophylactic GCSF for Lung Cancer – Intermediate-Risk Regimens by Quarter, Unadjusted



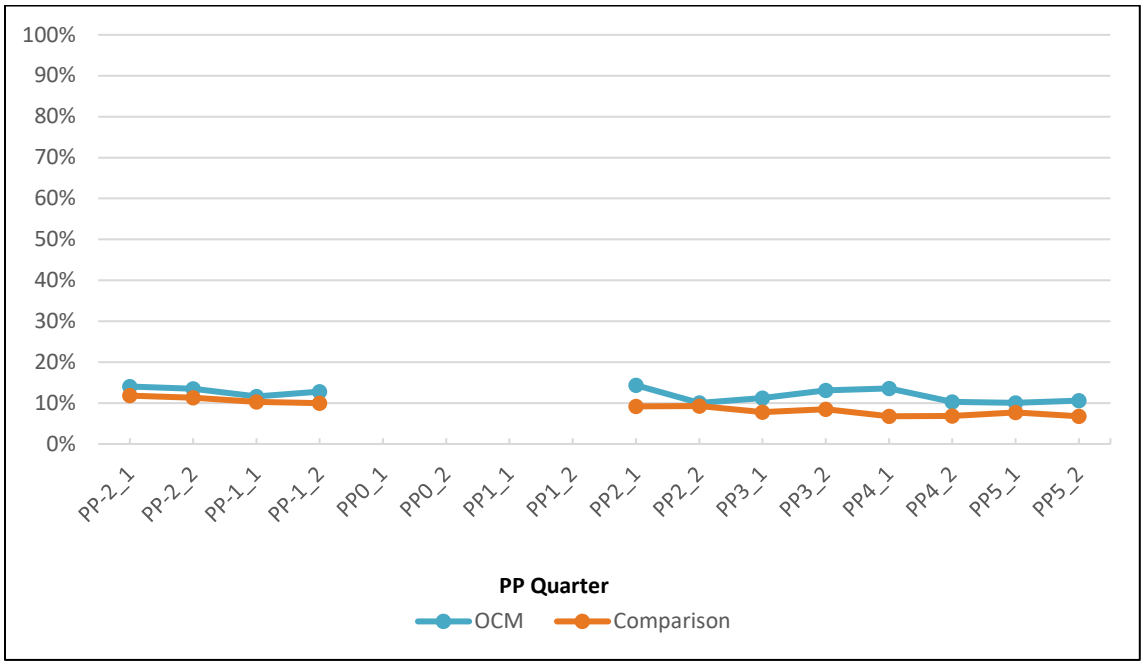
Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: 0.1% per quarter (95% CI: -1.3%, 1.6%), P=0.861

Exhibit D-54: Use of Prophylactic GCSF Use for Lung Cancer – Low-Risk Regimens by Quarter, Unadjusted



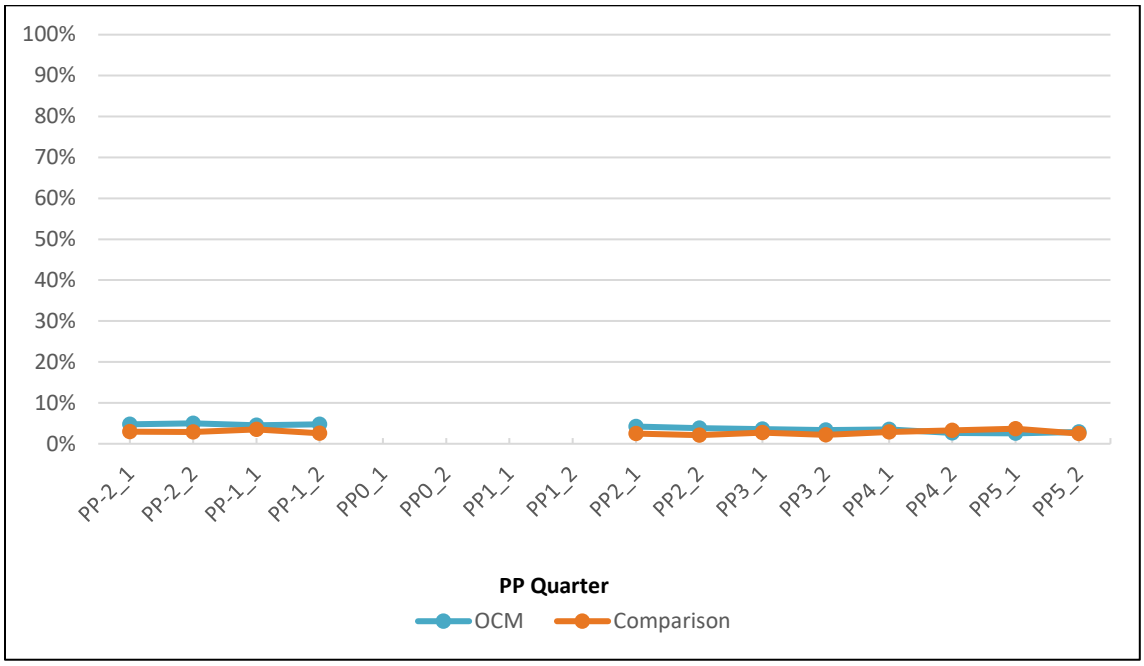
Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: -0.6% per quarter (95% CI: -1.7%, 0.5%), P=0.303

Exhibit D-55: Use of Prophylactic GCSF for Colorectal Cancer – Intermediate-Risk Regimens by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: 0.6% per quarter (95% CI: -1.1%; 2.3%), P=0.504

Exhibit D-56: Use of Prophylactic GCSF Use for Colorectal Cancer – Low-Risk Regimens by Quarter, Unadjusted

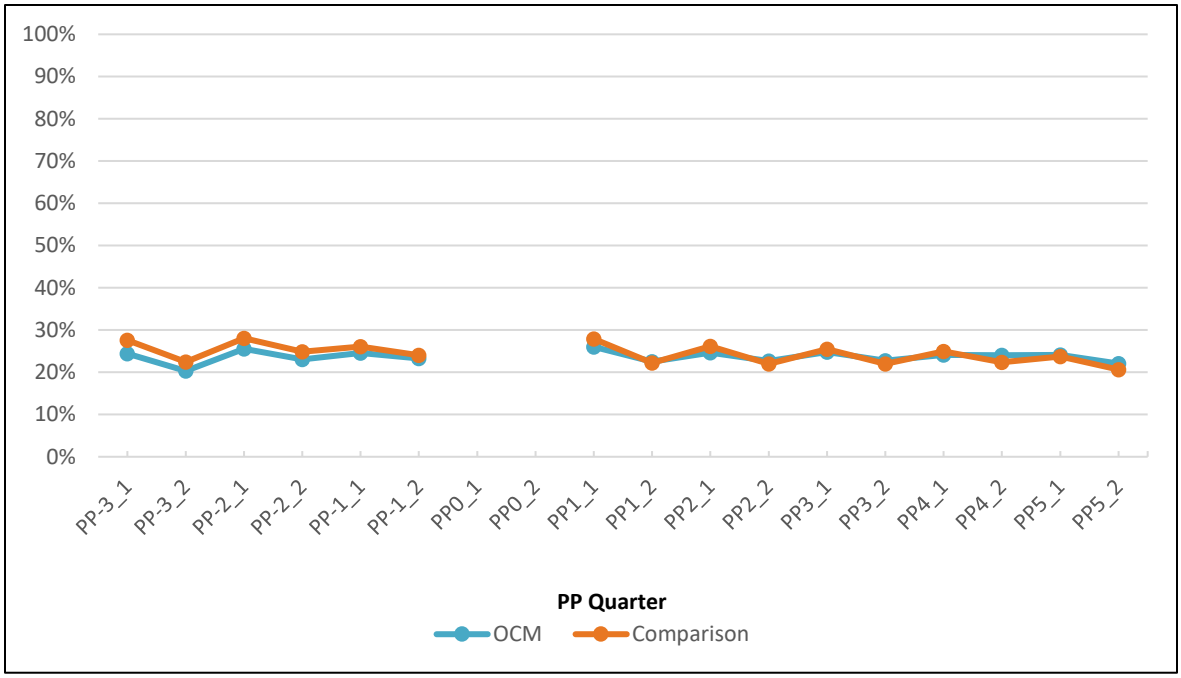


Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: 0.0% per quarter (95% CI: -0.8%, 0.9%), P=0.985

Trends in Use of Pegfilgrastim, versus Less Costly Filgrastim

Among patients receiving any GCSF, pegfilgrastim was used more often than the less costly filgrastim in both OCM and comparison episodes (approximately 75 percent at baseline). Use of filgrastim was increasing in OCM versus comparison episodes in the baseline period (e.g., baseline trends were non-parallel, see **Exhibit D-57**). DID models showed a statistically significant 2.0 percentage point OCM impact on use of filgrastim rather than pegfilgrastim. However, this result was no longer significant in sensitivity analyses that allowed for differential baseline period trends, and we conclude that OCM had no measurable impact on use of filgrastim versus pegfilgrastim.

Exhibit D-57: Proportion of Episodes with Filgrastim Use, among Those with Either Filgrastim or Pegfilgrastim, in Beneficiaries with Breast, Lung, or Colorectal Cancer, by Quarter, Unadjusted



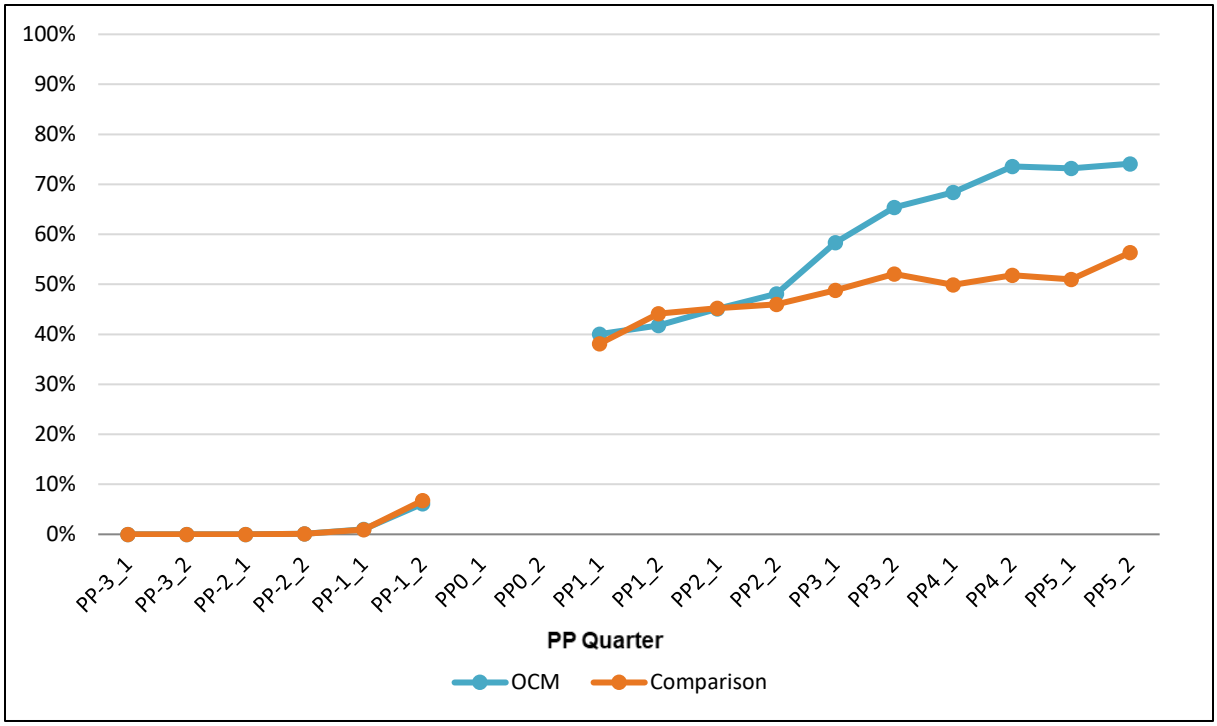
Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM vs. comparison group trend estimate in baseline period: 0.6% per quarter (95% CI: 0.03%, 1.1%), P= P=0.038

Trends in Use of Biosimilar Filgrastim

Biosimilar filgrastim approvals occurred in March 2015 (filgrastim-sndz) and July 2018 (filgrastim-aafi). With almost no use of biosimilar filgrastim in the baseline period, we examined trends in adoption and rates of use of biosimilar filgrastim (filgrastim-sndz or filgrastim-aafi) for OCM and comparison episodes during the intervention period among patients receiving either biosimilar filgrastim or originator filgrastim. In Section 6.4, we reported that OCM was associated with increased adoption and use of biosimilar filgrastim in the intervention period.

Exhibit D-58 shows unadjusted quarterly rates of use of biosimilar filgrastim. Rates of use were similar in OCM and comparison episodes until PP3, when use began to increase more rapidly in OCM versus comparison episodes.

Exhibit D-58: Proportion of Episodes with Biosimilar Filgrastim Use, among Those with Biosimilar or Originator Filgrastim, in Beneficiaries with Breast, Lung, or Colorectal Cancer, by Quarter, Unadjusted

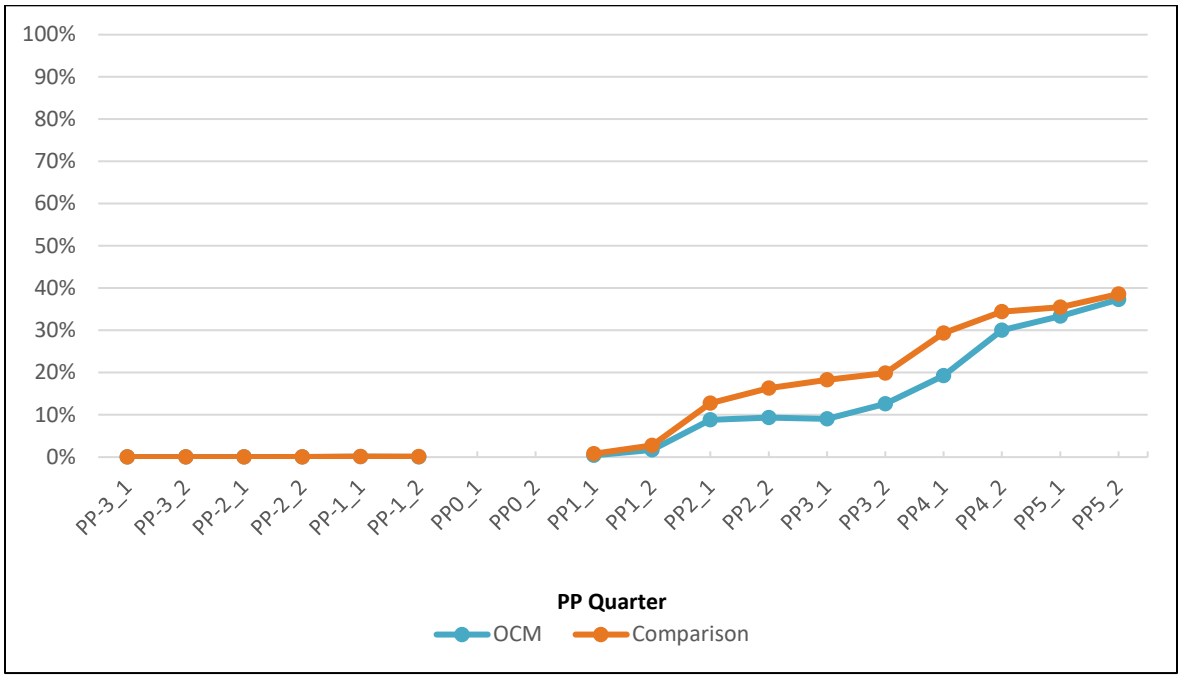


Source: Medicare claims 2014–2019.

Trends in Use of the Pegfilgrastim with the On-Body Injector

Exhibit D-59 shows use of the on-body injector among patients receiving pegfilgrastim. There was no use of on-body pegfilgrastim in the baseline period, because this delivery mechanism had not yet been approved by the FDA. For patients with breast cancer, lung cancer, and colorectal cancer, we found similar trends over time for use of the on-body injector in OCM and comparison episodes. The adjusted average use of on-body pegfilgrastim over the intervention period was 19.5 percent in OCM episodes and 15.9 percent in comparison episodes (difference= 3.6 percentage points, 90 percent CI= -5 percent, 12.3 percent). We conclude that OCM did not substantially impact use of on-body pegfilgrastim across PP1–5.

Exhibit D-59: Use of the On-Body Injector in Patients with Breast, Lung, or Colorectal Cancer Receiving Pegfilgrastim, by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Note: On-body injectors were not available in the baseline period, so there was no use.

D.5.3 Use of Prophylactic Antiemetics during Intravenous Chemotherapy

We assessed use of prophylactic antiemetics for chemotherapy regimens with high, moderate, or low risk of nausea and vomiting. Analyses focused on two classes of antiemetic medications: NK1 (neurokinin 1) antagonists (aprepitant, fosaprepitant, netupitant, fosnetupitant, and rolapitant) and long-acting serotonin antagonists.

Measures and Analytic Approach

We assigned an emetic risk (risk of vomiting) to each chemotherapy agent as outlined in the NCCN antiemesis guideline. We identified treatment episodes for OCM and comparison patients, and the dates of chemotherapy infusion in each episode. We then assigned each episode to the emetic risk class for the highest-emetic risk chemotherapy agent given during the episode. We excluded episodes for low-risk breast cancer and low-intensity prostate cancer with hormonal agents only, as well as episodes with moderate emetic risk agents where there was also a high-risk oral agent, because we could not be certain what date the oral agent was started. We then selected the first infusion date within a given emetic risk class for each patient. This was done so that patients were not represented more than once in each risk-class analysis, and also to reduce the likelihood of under-ascertainment of oral antiemetic use (because patients receiving subsequent episodes of chemotherapy may already have Part D antiemetic medications at home and may not need medication refills). If there were two (or more) chemotherapy regimens during a single episode, only the first regimen of the highest emetic risk category was included in the analysis.

We measured the use of oral and intravenous antiemetic medications separately for each chemotherapy regimen emetic risk category. Specifically, we looked for oral antiemetic medication dispensing in Part D, and Part B claims for antiemetic medications administered in the clinic. The following antiemetics were included: NK1 receptor antagonists (aprepitant, fosaprepitant, rolapitant, and the combination medications netupitant/palonosetron and fosnetupitant/palonosetron), serotonin (5-HT3) receptor

antagonists (ondansetron, dolasetron, granisetron, and palonosetron), olanzapine, dronabinol, and nabilone. We did not measure the use of prochlorperazine, dexamethasone, and other frequently used antiemetics because we assumed the wide use of these low-cost agents. The window for identification of primary prophylactic antiemetic use was within 14 days before through one day after the first chemotherapy date during the episode for each emetogenic chemotherapy agent.

We performed descriptive analyses to evaluate the components of prophylactic antiemetic treatment for each included episode. We then performed DID analyses within each emetic risk category to investigate the use of antiemetic medications from two costly classes: NK1 antagonists and long-acting serotonin antagonists.

Results

As described in Section 7.3, we found statistically significant OCM-related reductions in the prophylactic use of both NK1 antagonists and long-acting serotonin antagonists during moderately and highly emetic chemotherapy. There was no OCM impact on prophylactic use of long-acting serotonin antagonists during chemotherapy of low emetic risk.

Differential OCM impacts on prophylactic antiemetics in PP1-3 versus PP4-5

The OCM impact on prophylactic use of NK1 antagonists and long-acting serotonin antagonists varied between OCM PP1-3 and PP4-5 (see **Exhibit D-60**). In PP1-3 there were statistically significant reductions in the use of long-acting serotonin antagonists for episodes with both moderately and highly emetic chemotherapy; however, there was no significant impact of OCM on NK-1 antagonists in this period. Conversely, there were no statistically significant OCM impacts on use of long-acting serotonin antagonists in PP4-5; however, there were large, statistically significant reductions in use of NK-1 antagonists in PP4-5 for episodes with both moderately and highly emetic chemotherapy.

Exhibit 60: OCM Led to Decreased use of Long-Acting Serotonin Antagonists in OCM Episodes in PP1-3, and Decreased use of NK1 Antagonists in Comparison Episodes PP4-5

Measure	DID Percentage Point Impact PP 1–5	90% CI	DID Percentage Point Impact PP1–3	90% CI	DID Percentage Point Impact PP4–5	90% CI
High emetic risk episodes						
Receipt of NK1 antagonist	-6.0%***	-9.0%, -3.1%	-0.8%	-3.2%, 1.5%	-13.2%***	-19.5%, -6.8%
Receipt of long-acting serotonin antagonist	-4.5%**	-8.2%, -0.7%	-7.3%**	-12.1%, -2.5%	-0.3%	-4.6%, 4.0%
Moderate emetic risk episodes						
Receipt of NK1 antagonist	-3.5%*	-6.6%, -0.4%	-1.6%	-4.5%, 1.3%	-6.6%**	-11.4%, -1.9%
Receipt of long-acting serotonin antagonist	-4.4%**	-7.8%, -1.0%	-6.6%**	-10.9%, -2.2%	-1.5%	-4.9%, 1.9%
Low emetic risk episodes						
Receipt of long-acting serotonin antagonist	-0.3%	-1.4%, 0.9%	-0.4%	-1.5%, 0.7%	-0.3%	-1.6%, 1.0%

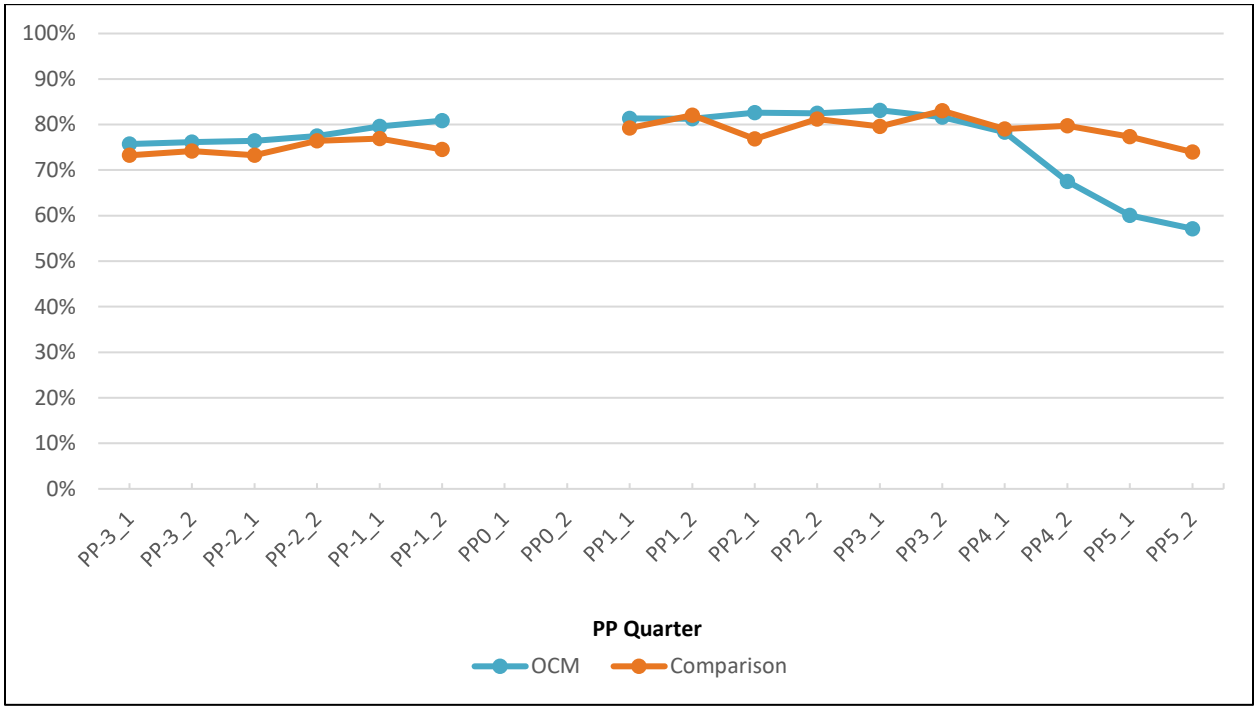
*p≤0.10, **p≤0.05, ***p≤0.01. LCL: Lower confidence limit; UCL: Upper confidence limit.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group; COMP: Comparison group. Int.: Intervention period. Asterisks denote statistically significant impact estimates at

The shifting pattern of impacts by performance period may reflect changes in available anti-emetic therapies during the OCM intervention period. For example, the FDA approved subcutaneous granisetron,

a new long-acting serotonin antagonist, in August of 2016. Subcutaneous granisetron is approved for prophylactic treatment of patients receiving moderately emetic chemotherapy, or for patients receiving certain highly emetic chemotherapy regimens (combination chemotherapy with anthracycline and cyclophosphamide regimens). Replacement of NK1 antagonists with subcutaneous granisetron preferentially by OCM practices would be consistent with the observed changes in PP4-5.[40,41]

The unadjusted trend lines for prophylactic use of NK1 antagonist and long-acting serotonin antagonists during regimens for high and moderate, and low emetic risk chemotherapy are shown below in **Exhibits D61-D65**.

Exhibit D-61: Prophylactic Use of NK1 Antagonists During High Emetic Risk Chemotherapy Declined for OCM Episodes In Later Quarters, Relative to Controls

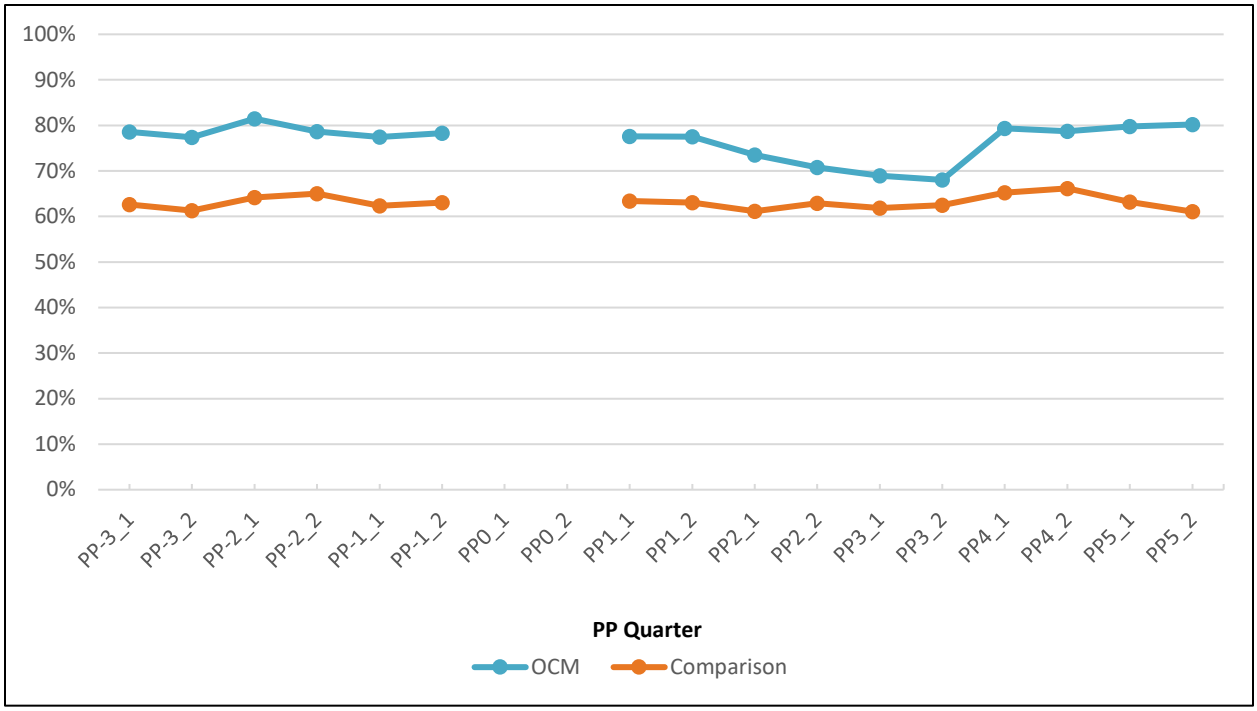


Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in the baseline period is 0.9% per quarter (95% CI: 0.02%, 1.9%)), P= 0.045

[40] Boccia R, O'Boyle E, Cooper W. Randomized phase III trial of APF530 versus palonosetron in the prevention of chemotherapy -induced nausea and vomiting in a subset of patients with breast cancer receiving moderately or highly emetogenic chemotherapy. *BMC Cancer* 2016; 16: 166. doi: 10.1186/s12885-016-2186-4

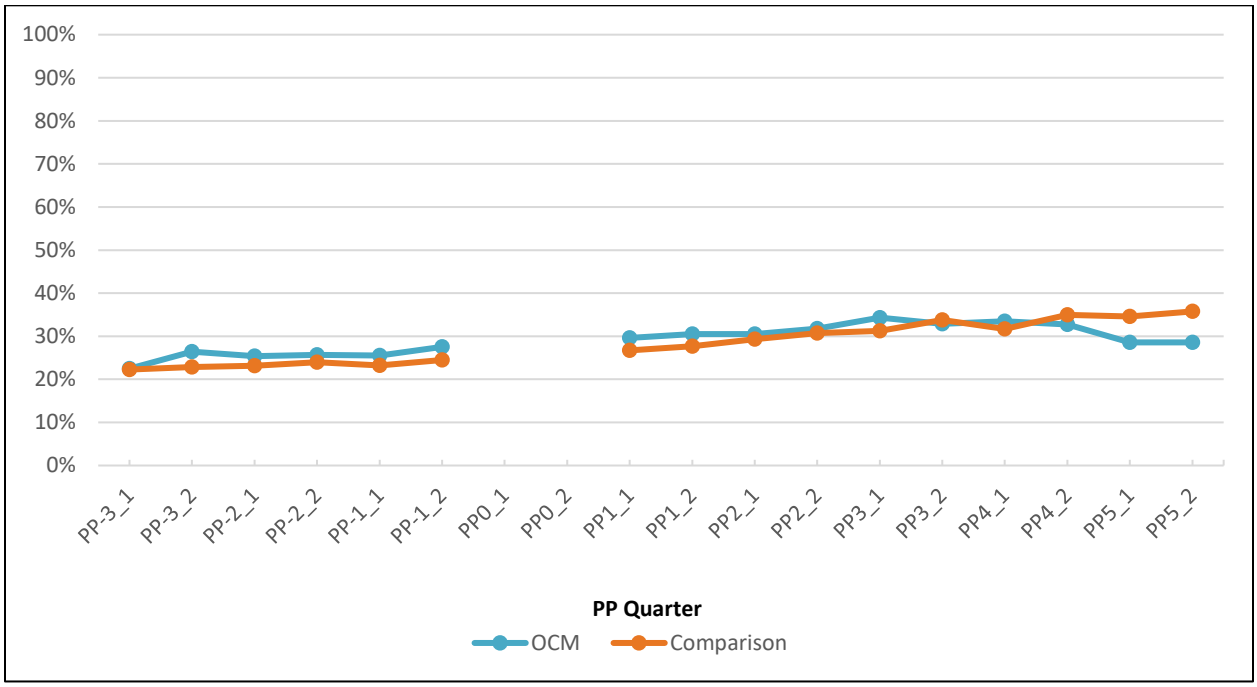
[41] Comparison of an extended-release formulation of granisetron (APF530) versus palonosetron for the prevention of chemotherapy-induced nausea and vomiting associated with moderately or highly emetogenic chemotherapy: results of a prospective, randomized, double-blind, noninferiority phase 3 trial. *Support Care Cancer* 2015 Mar;23(3):723-32. doi: 10.1007/s00520-014-2400-3.

Exhibit D-62: Prophylactic Use of Long-Acting Serotonin Antagonists During High Emetic Risk Chemotherapy Declined Initially for OCM Episodes Before Returning to Baseline in Later Quarters



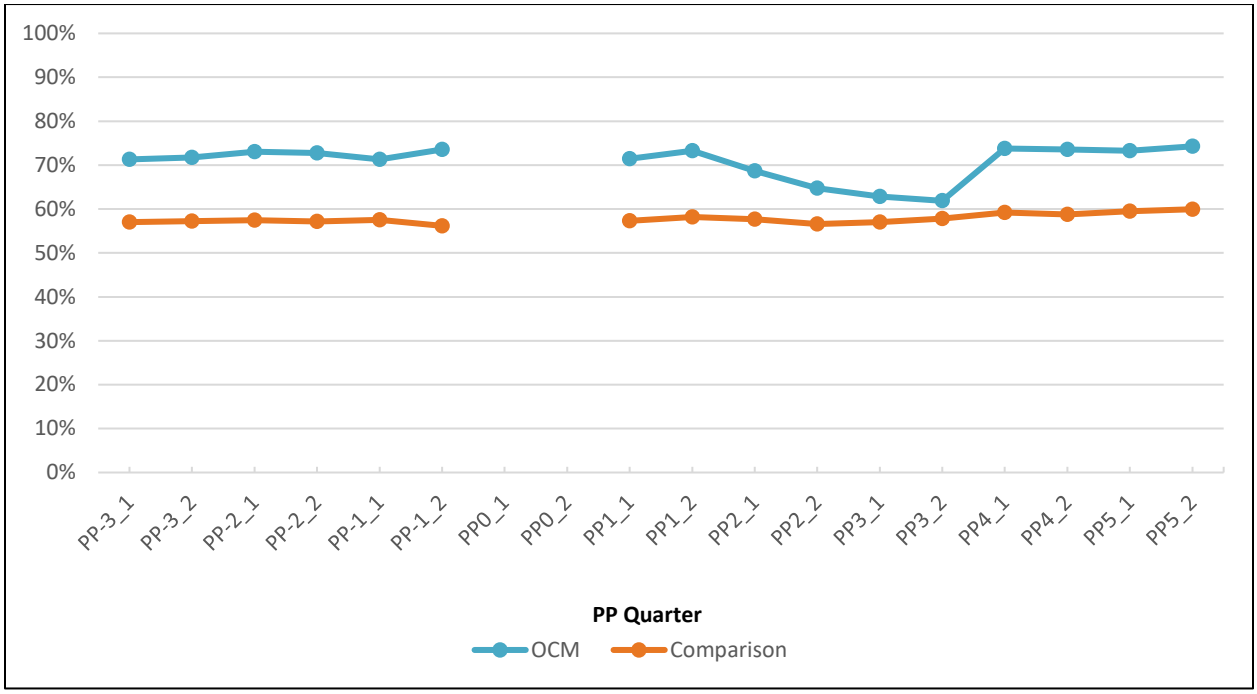
Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in the baseline period is -0.1% per quarter (95% CI: -1.2%, 1.0%)), P= 0.817

Exhibit D-63: Prophylactic Use of NK1 Antagonists During Moderately Emetic Chemotherapy Declined for OCM Episodes In Later Quarters, Relative to Controls



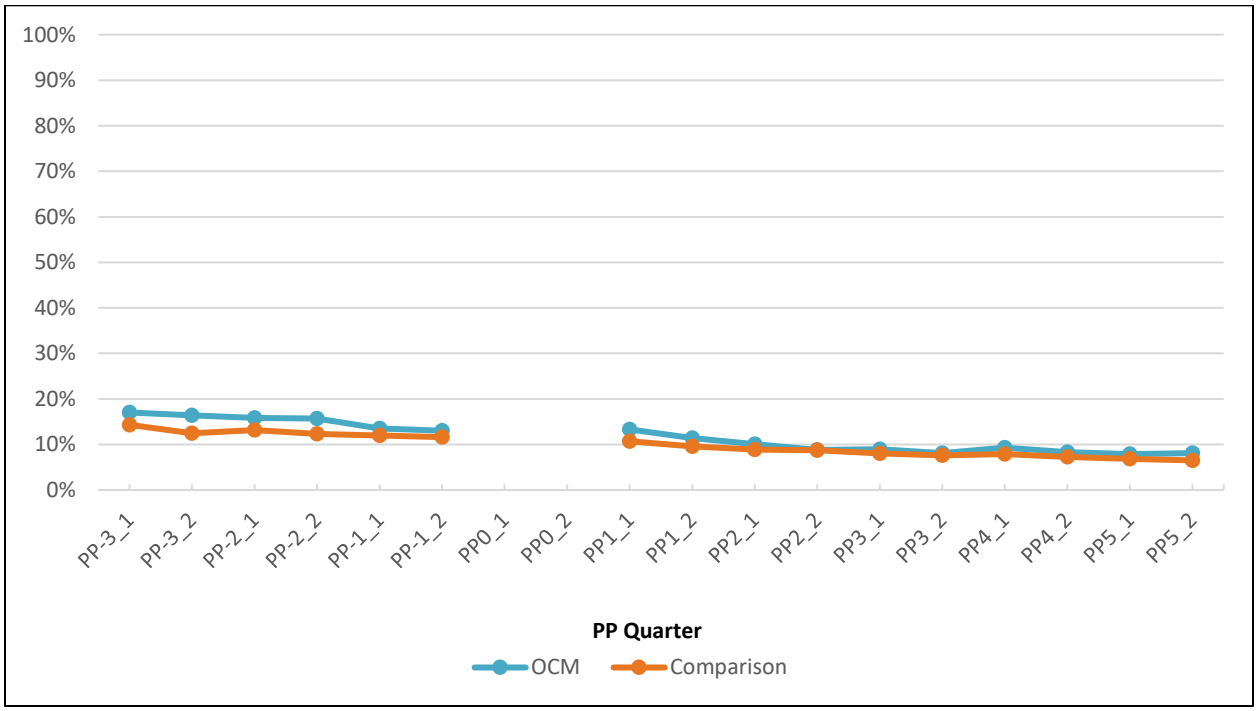
Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in the baseline period is 0.4% per quarter (95% CI: -0.2%, 1.0%)), P= 0.170

Exhibit D-64: Prophylactic Use of Long-Acting Serotonin Antagonists During Moderately Emetic Chemotherapy Declined Initially for OCM Episodes Before Returning to Baseline in Later Quarters



Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in the baseline period is 0.4% per quarter (95% CI: -0.3%, 1.1%)), P= 0.284

Exhibit D-65: Prophylactic Use of Long-Acting Serotonin Antagonists During Low Emetic Risk Chemotherapy Declined Over Time in Both OCM and Comparison Episodes

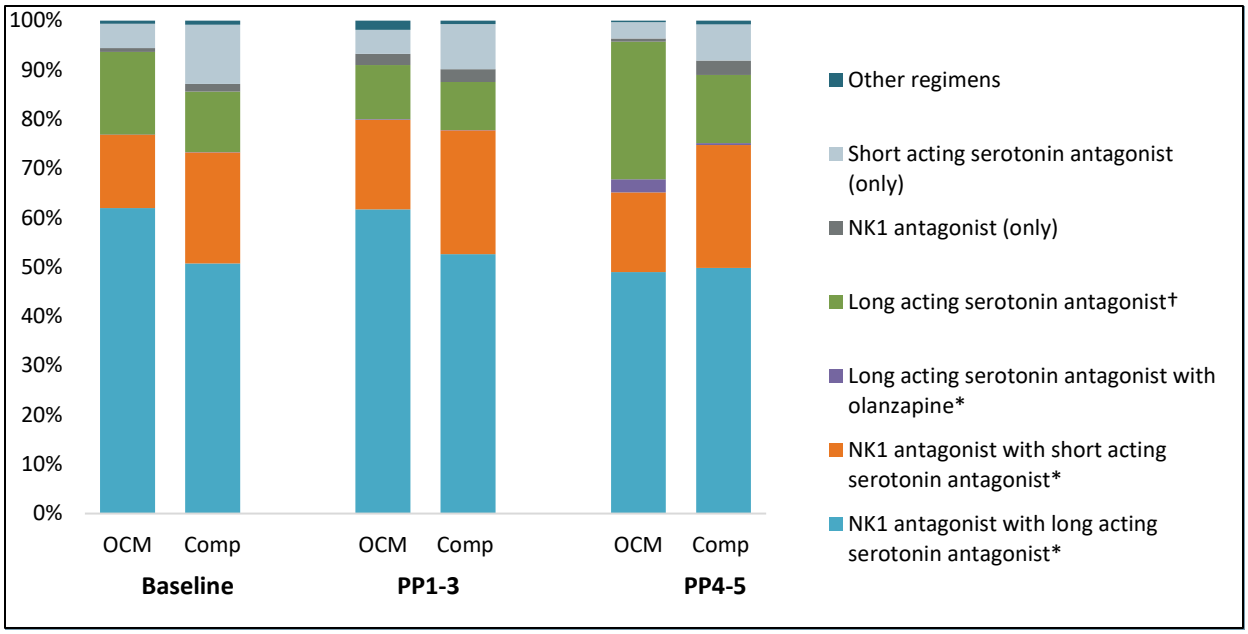


Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in the baseline period is -0.4% per quarter (95% CI: -0.9%, 0.01%)), P= 0.056

To further evaluate the OCM-related changes in use of prophylactic antiemetic therapies during highly and moderately emetic chemotherapy, we assessed the single or multi-drug prophylactic antiemetic combinations used in these episodes. **Exhibit D-66** shows that the decreased prophylactic use of NK1 antagonists during high emetic risk episodes was primarily explained by increasing use of long-acting serotonin antagonists (palonosetron or subcutaneous granisetron) without concomitant NK1 receptor antagonist. Because NK1 receptor antagonists are costly (greater than $200 per administration, per CMS payment limit allowances for Part B drugs),[42] use of a long-acting seratonin antagonist without a concomitant NK receptor antagonist is a lower-cost approach for nausea prophylaxis during high-emetic risk chemotherapy (subcutaneous granisetron, a long-acting serotonin antagonist, is approved by the FDA for the prevention of chemotherapy induced nausea and vomiting in patients receiving highly emetic chemotherapy with anthracycline and cyclophosphamide combinations.) **Exhibit D-67** shows that there were very modest differences in the types of multi-drug prophylactic antiemetic therapies used in OCM and comparison episodes, with high rates of guideline-recommended antiemetic treatment in OCM and comparison episodes (noted with asterisks), both before and after implementation of OCM.

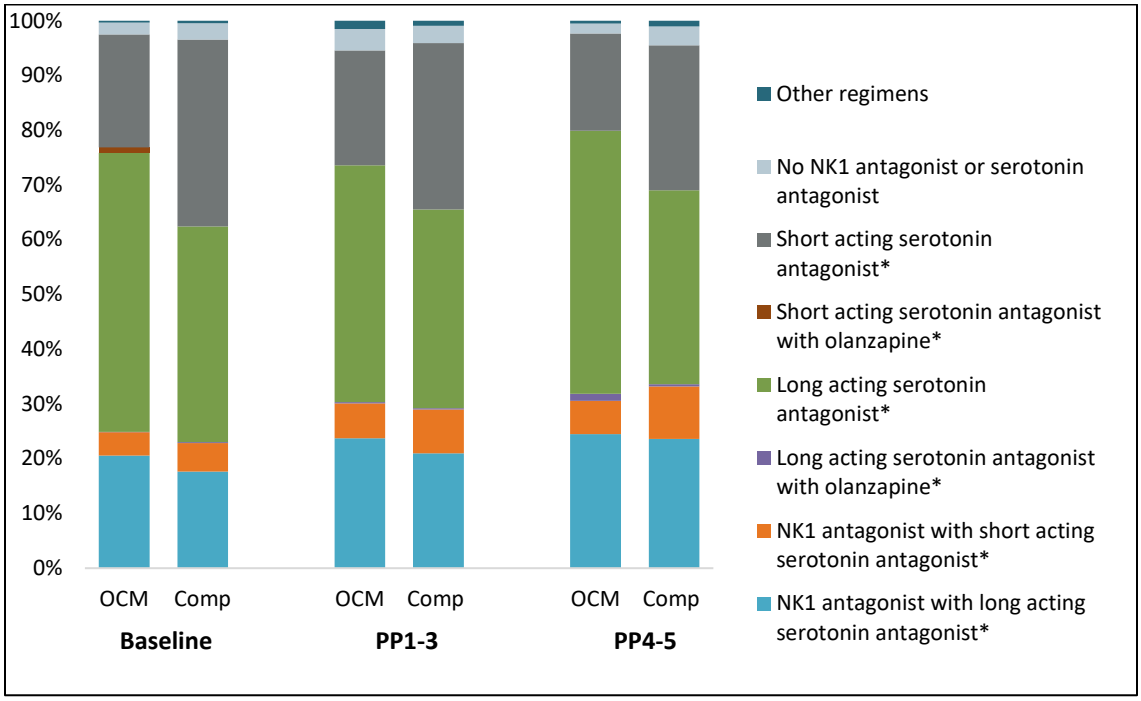
[42] CMS, 2020 ASP Drug Pricing Files. Accessed at ttps://www.cms.gov/medicare/medicare-part-b-drug-average-sales-price/2020-asp-drug-pricing-files on June 19, 2020.

Exhibit D-66: OCM Led to Differential Changes in the Antiemetic Treatments for High-Emetic Risk Chemotherapy, with Increased Use of Treatment Strategies Omitting Costly NK1 Antagonists



Source: Medicare claims 2014–2019.
Notes: * indicates regimens classified as NCCN "guideline recommended".
†Subcutaneous granisetron, a long-acting serotonin antagonist, is approved by the FDA for the prevention of chemotherapy induced nausea and vomiting in patients receiving highly emetic chemotherapy with anthracycline and cyclophosphamide combinations

Exhibit D-67: Use of Guideline-Recommended Antiemetic Treatments for Moderate-Emetic Risk Chemotherapy Remained High for Both OCM and Comparison Practices



Source: Medicare claims 2014–2019.

D.6. Timeliness of Chemotherapy

Measures and Analytic Approach

Timeliness of chemotherapy is a quality measure that can be assessed using administrative claims data. Observational studies suggest that cancer outcomes may be better for patients who receive more timely chemotherapy, although such studies may not adequately account for differences in patients whose chemotherapy is and is not delayed.[43,44] Nevertheless, the ASCO Quality Oncology Practice Initiative (QOPI) has adopted measures of adjuvant chemotherapy within two months of surgery for stage III colon cancer patients (QOPI measure 58) and adjuvant chemotherapy within 60 days after surgery for stage II or IIIA non-small cell lung cancer (measure 81).[45] Although QOPI does not have a similar measure for breast cancer, prior research suggests adverse outcomes association with chemotherapy delays of more than 60 days.[2]

For episodes for colorectal, lung, and high-risk breast cancer, we assessed chemotherapy initiation within 60 days after surgery for three clinical scenarios:

- Chemotherapy following lumpectomy/mastectomy for breast cancer (high-risk breast cancer)
- Chemotherapy following colon/rectum resection for colorectal cancer
- Chemotherapy following pneumonectomy, lobectomy, wedge resection for lung cancer

To identify adjuvant-type chemotherapy, we identified chemotherapy treatment episodes with a qualifying surgery (presumed curative-intent cancer surgery) in the 180 days before the start of the episode. Specifically, we identified the surgeries in the 180 days before the start of the first chemotherapy episode (denominator) and receipt of the first dose of chemotherapy within 60 days after surgery (numerator). The presumed curative-intent cancer surgeries are shown in **Exhibit D-68**. We focused on adjuvant chemotherapy that occurred after curative surgery and did not examine use of neoadjuvant chemotherapy (chemotherapy before curative surgery).

Exhibit D-68: Presumed Curative Intent Cancer Surgeries

Cancer Type	Curative Intent Surgeries
Breast cancer	Breast conserving surgery, mastectomy
Colorectal cancer	Colon resection, rectal resection
Lung cancer	pneumonectomy, segmentectomy, wedge resection

Some patients will receive adjuvant radiation therapy in addition to adjuvant chemotherapy. Most patients receive surgery, then chemotherapy, and then radiation therapy. Among individuals who had curative-intent surgery followed by chemotherapy within 180 days, receipt of radiation between surgery and chemotherapy was infrequent (1 percent of episodes for colorectal cancer, <5 percent for lung cancer, and <10 percent for breast cancer). Given the small number of episodes with radiation between episodes and

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43 Chavez-MacGregor M, Clarke CA, Lichtensztajn DY, Giordano SH. Delayed Initiation of Adjuvant Chemotherapy Among Patients with Breast Cancer. *JAMA Oncol*. 2016;2(3):322–329.

44 De Melo Gagliato D, Gonzalez-Angulo AM, Lei X, Theriault RL, Giordano SH, Valero V, Hortobagyi GN, Chavez-MacGregor M. Clinical impact of delaying initiation of adjuvant chemotherapy in patients with breast cancer. *J Clin Oncol.* 2014; 32: 735-744.

45 ASCO QOPI 2019 Reporting. Accessed at https://practice.asco.org/sites/default/files/drupalfiles/QOPI-2019-Round-1-Reporting-Tracks-Public-Posting.pdf on March 11, 2020.

the high rates of chemotherapy within 60 days for them, we used the same definition of timeliness of chemotherapy for patients who did and did not receive radiation.

Although we examined timeliness of chemotherapy for colorectal cancer, lung cancer, and breast cancer, analyses of baseline trends suggested potentially differential trends for timeliness of lung cancer chemotherapy (95% confidence interval of the OCM slope effect did not contain zero). We thus performed sensitivity analyses to assess robustness of our DID estimates. Our primary analyses suggested no impact of OCM on timeliness of lung cancer chemotherapy. However, the confidence intervals were large and analyses testing the sensitivity of our findings to differential trends did not allow us to conclude definitively that our null finding was robust. Therefore, we have not included the lung cancer findings in this report.

Results

As noted in the main text of the report, we found no OCM impact on the proportion of beneficiaries receiving timely chemotherapy as shown in **Exhibit D-69**.

Exhibit D-69: No Estimated OCM Impact on Timeliness of Adjuvant Chemotherapy for Colorectal Cancer or Breast Cancer

Proportion of beneficiaries initiating chemotherapy within 60 days of surgery for…	# of Episodes		OCM		COMP		Impact Estimates Through PP5			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
Colorectal cancer	10,651	11,530	59.6%	60.8%	60.2%	61.8%	-0.5%	-2.5%	1.6%	-0.8%
Breast cancer (high risk)	12,737	13,564	73.1%	72.6%	75.3%	73.7%	1.2%	-0.8%	3.1%	1.6%

Asterisks denote statistically significant impact estimates at *p≤0.10, **p≤0.05, ***p≤0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. LCL: Lower confidence limit. UCL: Upper confidence limit.

As shown in **Exhibit D-70**, we additionally conducted models stratified by PP1–3 versus PP4–5 and found no OCM impact on timeliness of chemotherapy in PP1–3 or PP4–5 (i.e., no improvement over time).

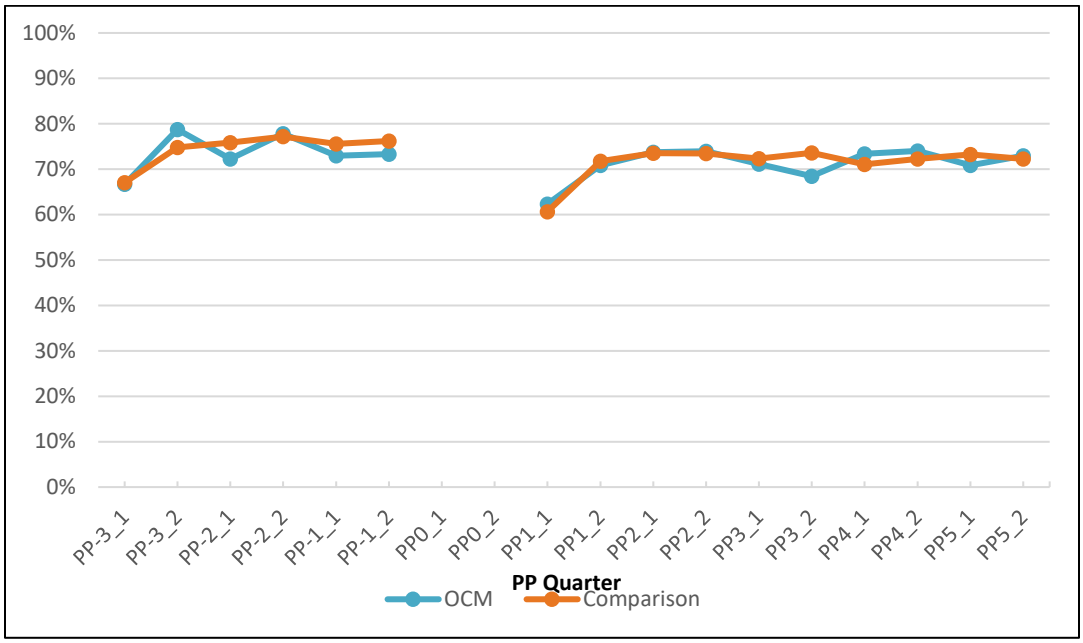
Exhibit D-70: No Effect of OCM on Timeliness of Chemotherapy for Colorectal or Breast Cancer in PP1–3 or PP4–5

Proportion of beneficiaries receiving chemotherapy within 60 days of surgery for…	DID Impact PP 1-5	90% CI	DID Impact PP1-3	90% CI	DID Impact PP4–5	90% CI
Colorectal cancer	-0.5%	-2.5%, 1.6%	-0.2%	-2.6%, 2.2%	-0.9%	-3.6%, 1.8%
Breast cancer (high risk)	1.2%	-0.8%, 3.1%	0.3%	-2.1%, 2.6%	2.3%	0.0%, 4.6%

Source: Medicare claims 2014–2019.
Notes: DID: Difference-in-difference. PP: Performance period. CI: Confidence interval

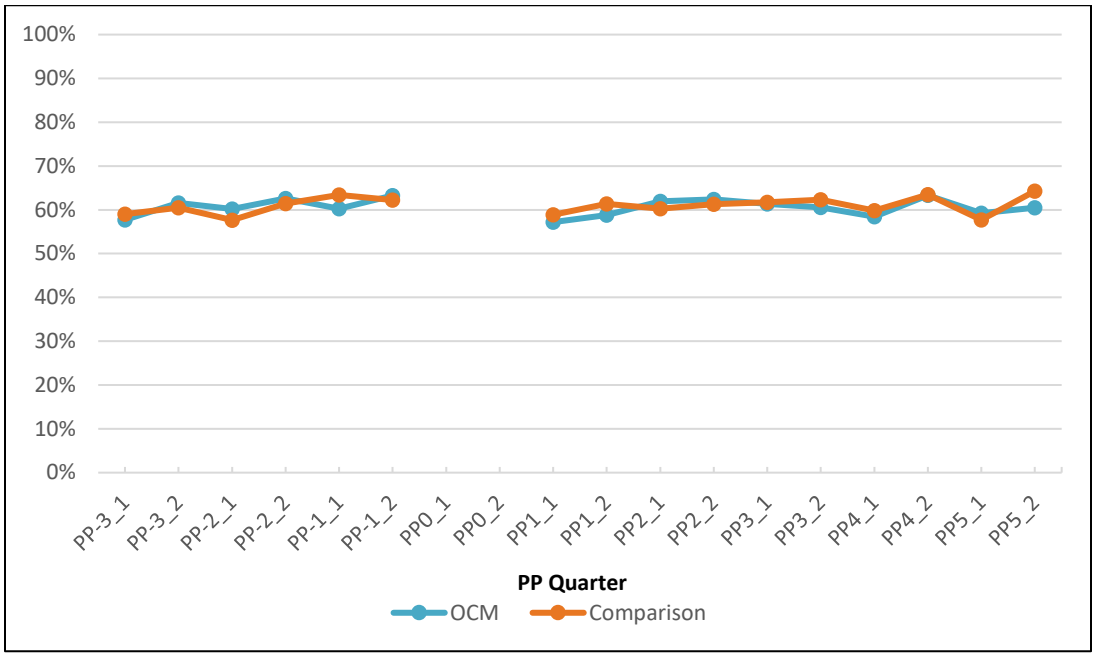
Exhibits D-71 and D-74 present raw rates of the proportion receiving chemotherapy within 60 days after surgery by quarter, starting in the baseline period, for OCM and comparison episodes.

Exhibit D-71: Breast Cancer – Adjuvant Chemotherapy within 60 Days of Surgery, by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: -0.6% per quarter (95% CI: -1.5%, 0.2%), P=0.135

Exhibit D-72: Colorectal Cancer – Adjuvant Chemotherapy within 60 Days of Surgery, by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: -0.2% per quarter (95% CI: -1.3%, 1.0%), P=0.799

D.7. Survival Analysis

Methods and Analytic Approach

We sought to examine survival for beneficiaries who were likely being treated for newly diagnosed or newly recurrent/progressive cancer. Therefore, 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. We measured beneficiary survival from the start of that episode. Beneficiaries could have more than one episode if they had another 12-month period without chemotherapy.[46] We compared restricted mean survival time (RMST)[47] through 18 months for beneficiaries in OCM and comparison groups in the baseline and intervention periods and calculated the adjusted DID estimates in days. 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[48] (which preliminary analyses of survival curves suggested was untrue 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, high-risk breast cancer, chronic leukemia, colorectal cancer, lung cancer, lymphoma, pancreatic cancer). We did not examine survival for low-risk breast cancer or low-intensity prostate cancer because almost all beneficiaries with those cancers survive for at least 18 months. We also assessed survival separately for each of the seven 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 (for example, 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 PP5 included episodes that started on or before January 1, 2019, we limited analyses to those that began by April 30, 2018, in order to have complete death data for all patients through 18 months (note that episodes starting in the last two months of PP4 through PP5, as shown with the dotted shading, did not have a full 18 months of follow-up and thus were not included). We plotted Kaplan-Meier curves for beneficiaries in OCM and comparison groups and then 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.

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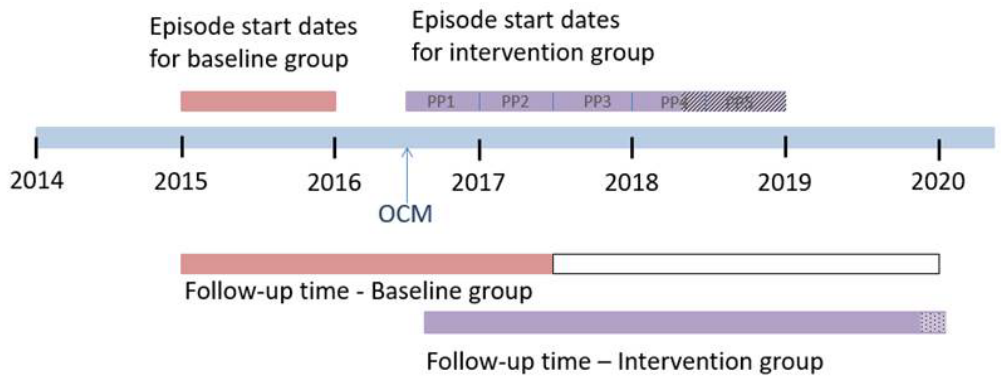
[46] 231,532 (97.9%) beneficiaries had a single episode; 4900 (2.1%) had two episodes, 29 (0.01%) had three episodes.

[47] Pak K, Uno H, Kim DH, Tian L, Kane RC, Takeuchi M, Fu H, Claggett B, Wei L-J. Interpretability of cancer clinical trial results using restricted mean survival time as an alternate to the hazard ratio. *JAMA Oncol.* 2017; 3(12): 1692-1696

[48] The proportional hazards assumption, which is important for Cox proportional hazards survival models, is that the ratio of the hazard function for any two individuals or groups is constant over time.

Exhibit D-73: 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 **Exhibit D-73**), we conducted sensitivity analyses restricting to beneficiaries whose baseline episode ended before the start of 2017 (to minimize overlap with PP1), 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.)

Results

As described in Chapter 10, OCM had no impact on survival through 18 months for patients with one of seven cancer types examined overall. As shown in **Exhibit D-74**, the estimate of the impact of OCM on 18-month survival was less than nine days for each of the seven cancers studied. 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.

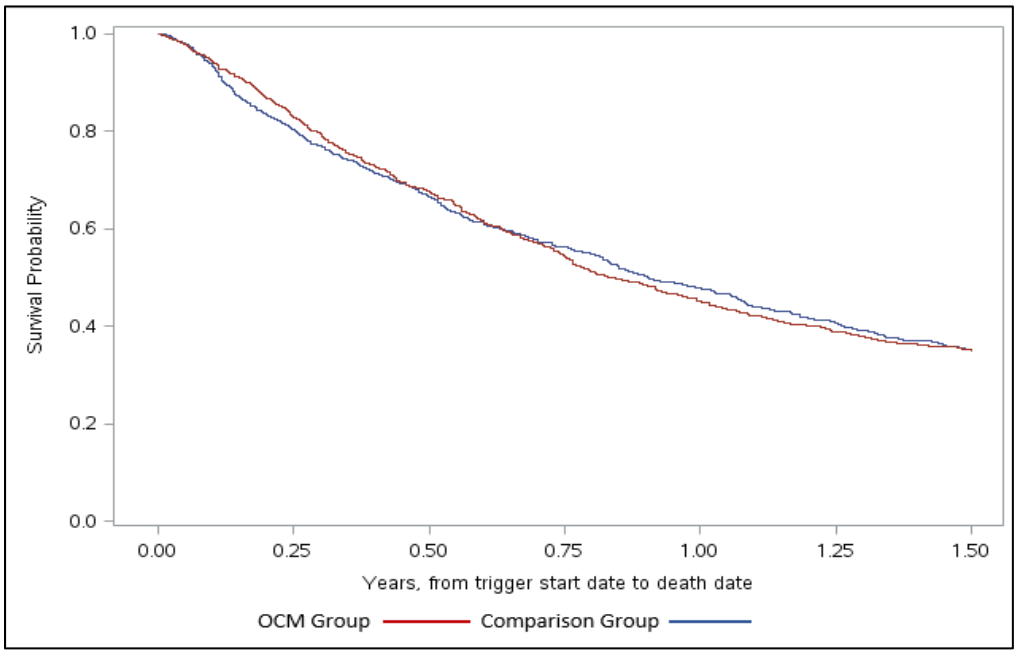
Exhibit D-74: No Clinically Significant OCM Impact on Survival, for Seven Cancers

Cancer Type	# of Beneficiaries		OCM		COMP		Impact Estimate	
	OCM	COMP	Baseline RMST	Int. RSMT	Baseline RMST	Int. RSMT	DID (days)	90% CL (days)
Acute leukemia RMST through 18 months	2,340	2,666	325.9	338.5	332.0	335.9	8.7	-12.5, 29.9
High-risk breast cancer RMST through 18 months	23,935	24,774	496.4	499.5	495.3	501.1	-2.7	-6.6, 1.1
Chronic leukemia RMST through 18 months	7,484	8,269	498.4	502.8	503.1	507.8	-0.2	-6.9, 6.5
Colorectal cancer RMST through 18 months	17,889	19,259	458.3	455.6	462.6	460.8	-0.9	-6.8, 5.1
Lung cancer RMST through 18 months	34,819	38,488	358.2	368.7	359.2	376.4	-6.7**	-11.6, -1.8
Lymphoma RMST through 18 months	21,294	22,116	475.3	483.3	479.6	483.6	3.9	-1.1, 8.9
Pancreas cancer RMST through 18 months	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.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. RMST: Restricted mean survival time. Int.: Intervention period. DID: Difference-in-difference. CL: Confidence limit.

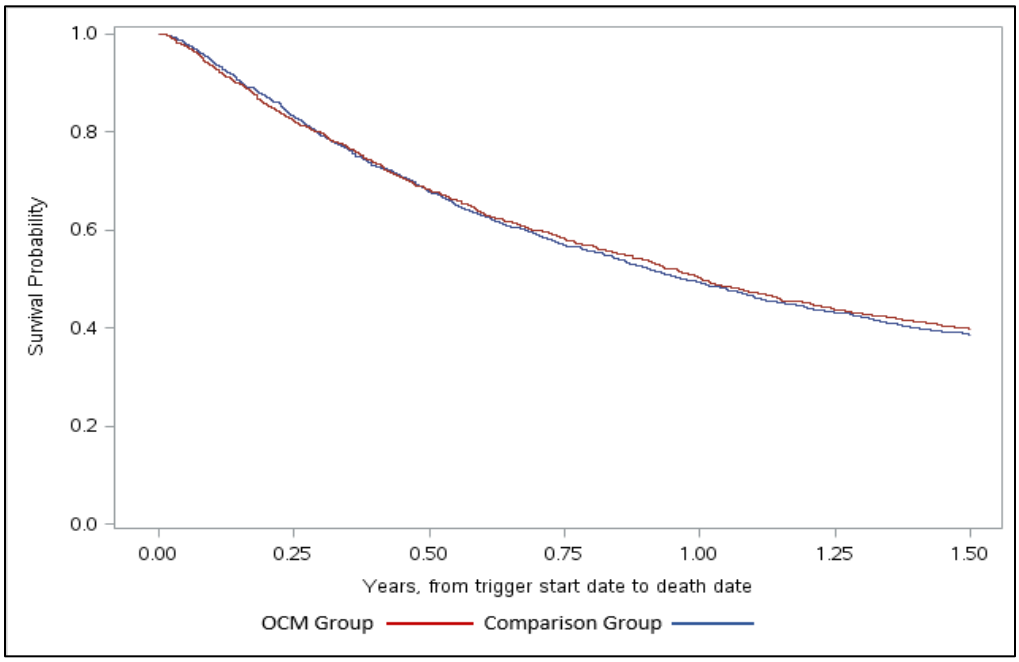
Exhibits D-75 through D-88 show Kaplan-Meier survival curves for the baseline and intervention periods, for each of the seven cancers.

Exhibit D-75: Similar Survival for OCM and Comparison Groups in the Baseline Period: Acute Leukemia



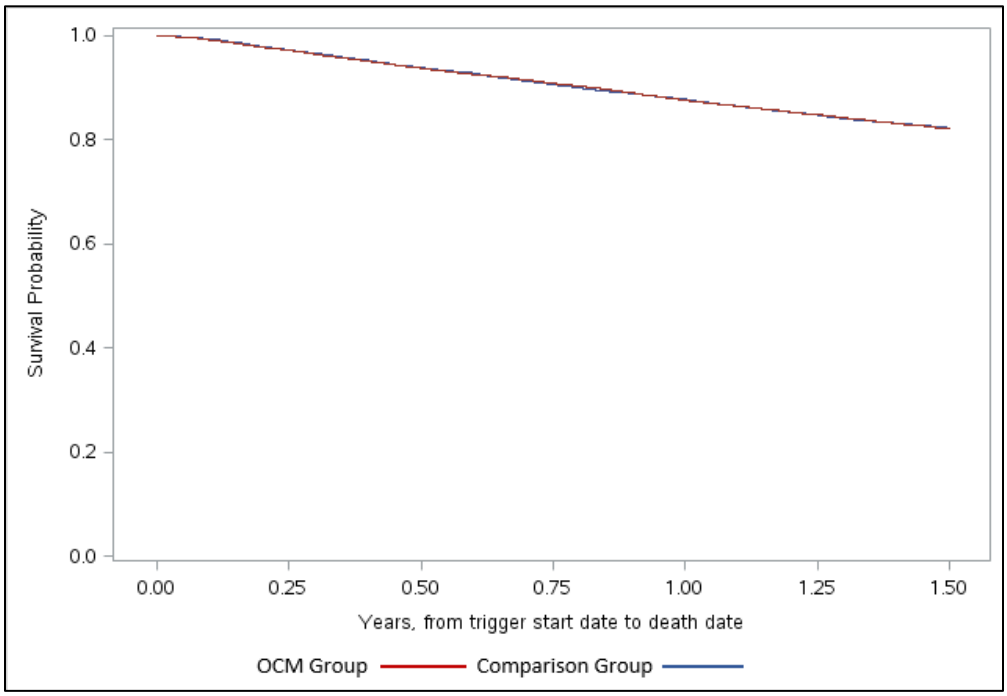
Source: Medicare claims 2014–2019.
Notes: N=786 OCM & 880 comparison beneficiaries.

Exhibit D-76: Similar Survival for OCM and Comparison Groups in the Intervention Period: Acute Leukemia



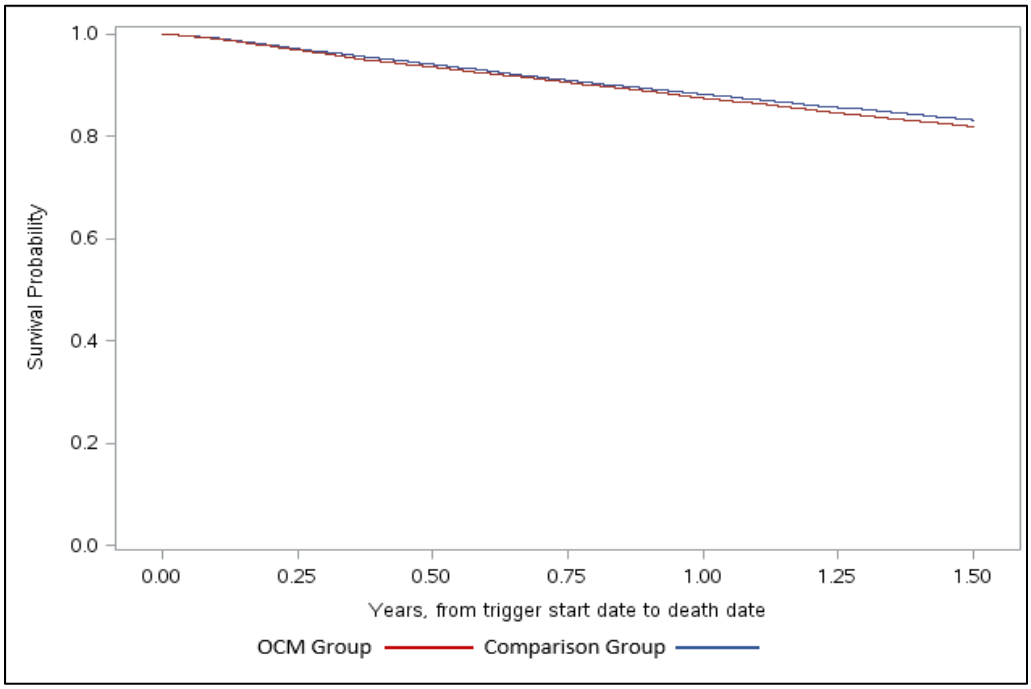
Source: Medicare claims 2014–2019.
Notes: N=1,554 OCM & 1,786 comparison beneficiaries.

Exhibit D-77: Similar Survival for OCM and Comparison Groups in the Baseline Period: High-Risk Breast Cancer



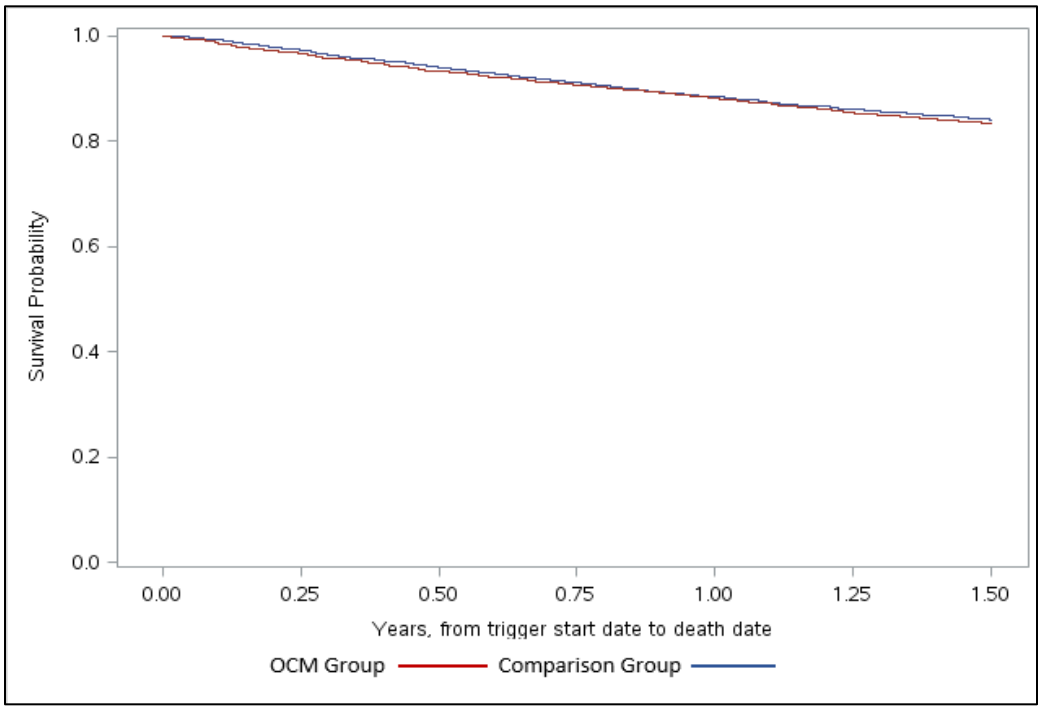
Source: Medicare claims 2014–2019.
Notes: N=8,546 OCM & 9,045 comparison beneficiaries.

Exhibit D-78: Similar Survival for OCM and Comparison Groups in the Intervention Period: High-Risk Breast Cancer



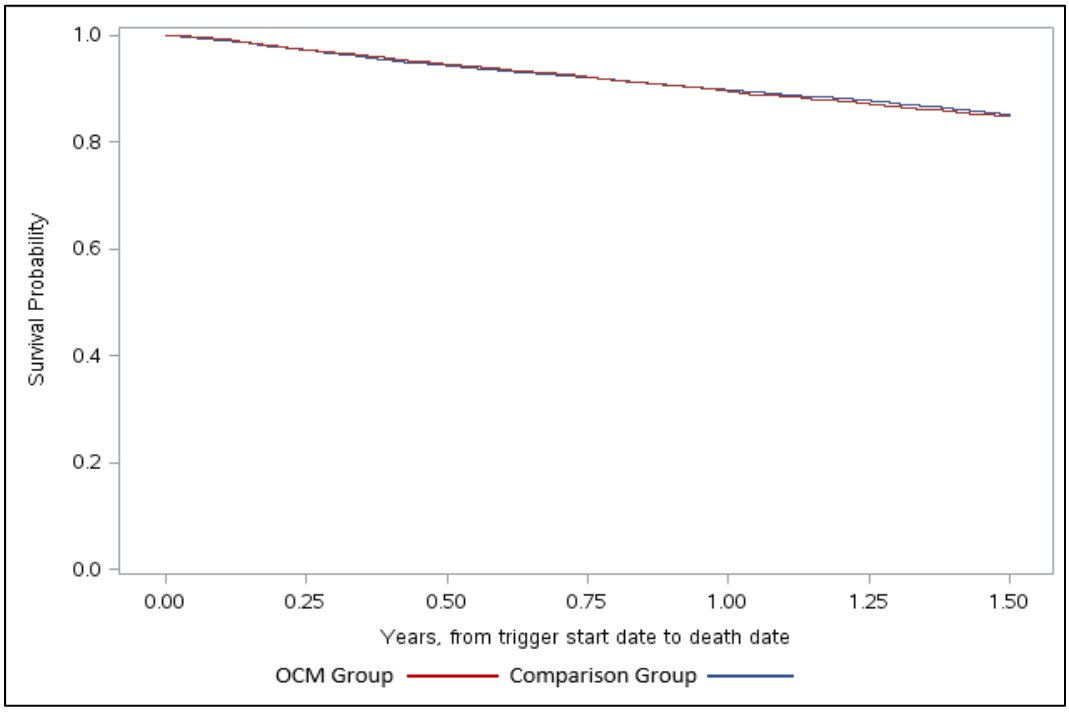
Source: Medicare claims 2014–2019.
Notes: N=15,389 OCM & 15,729 comparison beneficiaries.

Exhibit D-79: Similar Survival for OCM and Comparison Groups in the Baseline Period: Chronic Leukemia



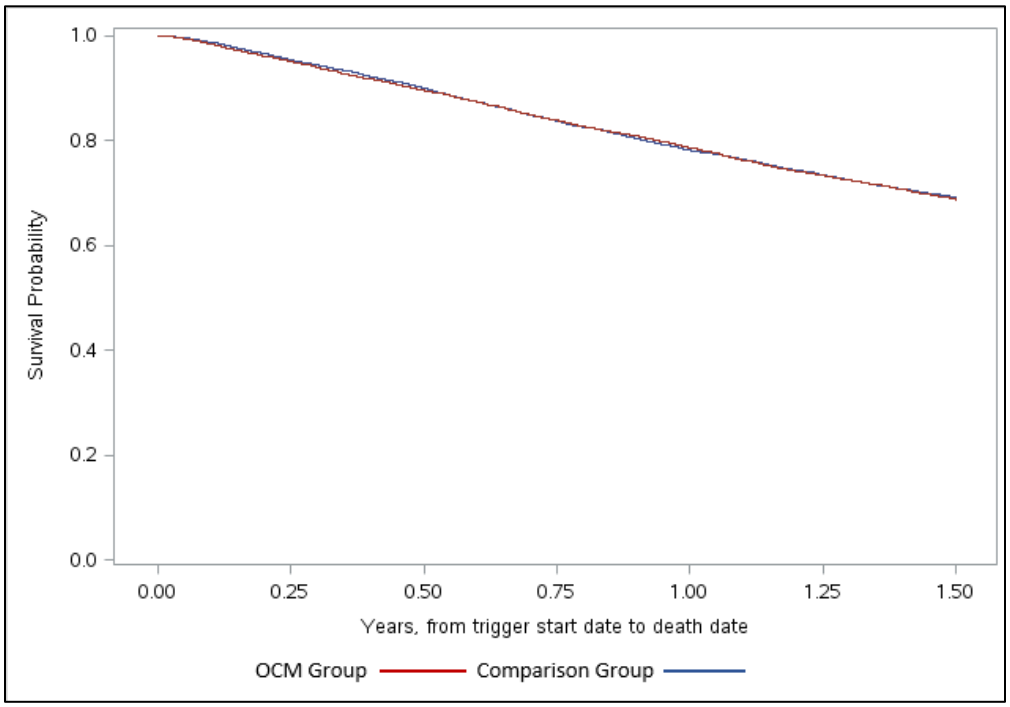
Source: Medicare claims 2014–2019.
Notes: N=2,759 OCM & 3,152 comparison beneficiaries.

Exhibit D-80: Similar Survival for OCM and Comparison Groups in the Intervention Period: Chronic Leukemia



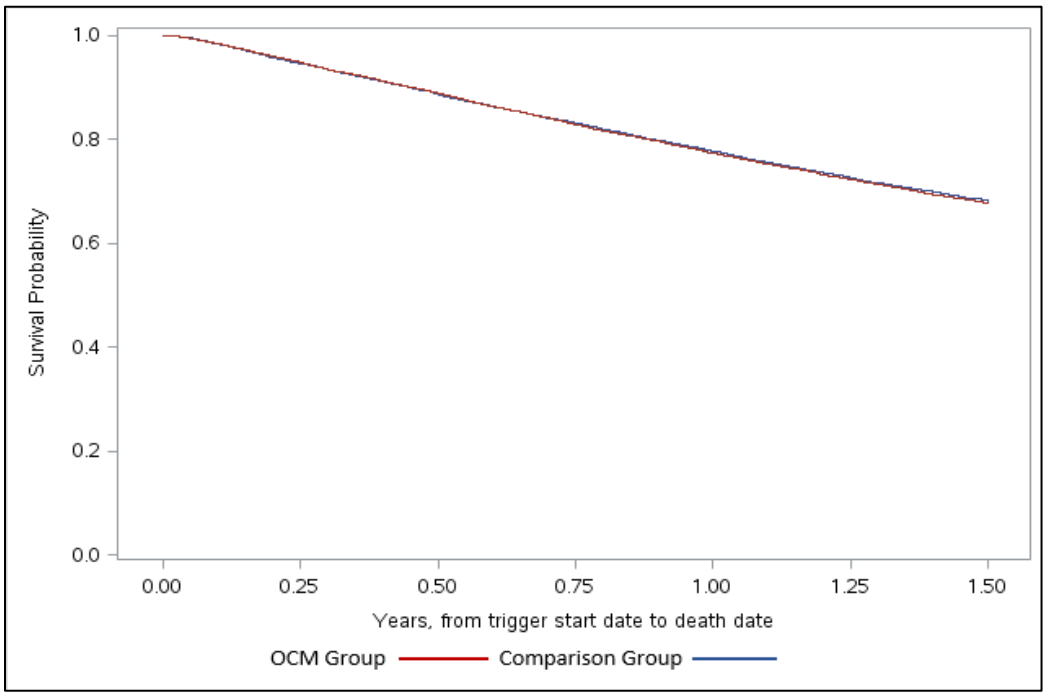
Source: Medicare claims 2014–2019.
Notes: N=4,724 OCM & 5,117 comparison beneficiaries.

Exhibit D-81: Similar Survival for OCM and Comparison Groups in the Baseline Period: Colon/Intestine Cancer



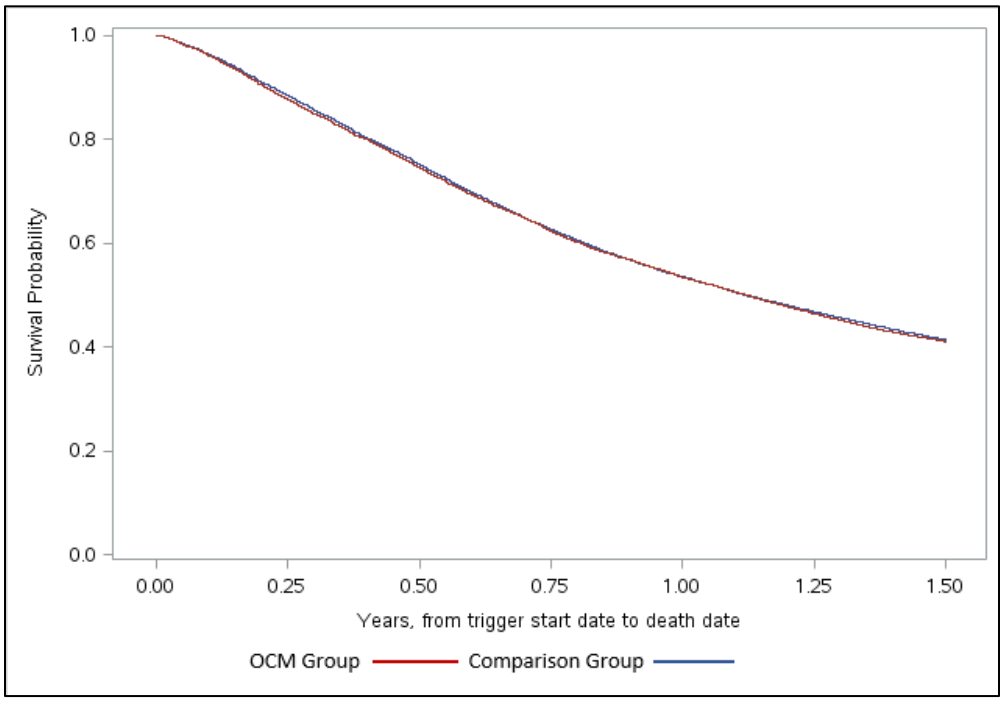
Source: Medicare claims 2014–2019.
Notes: N=6,576 OCM & 7,117 comparison beneficiaries.

Exhibit D-82: Similar Survival for OCM and Comparison Groups in the Intervention Period: Colon/Intestine Cancer



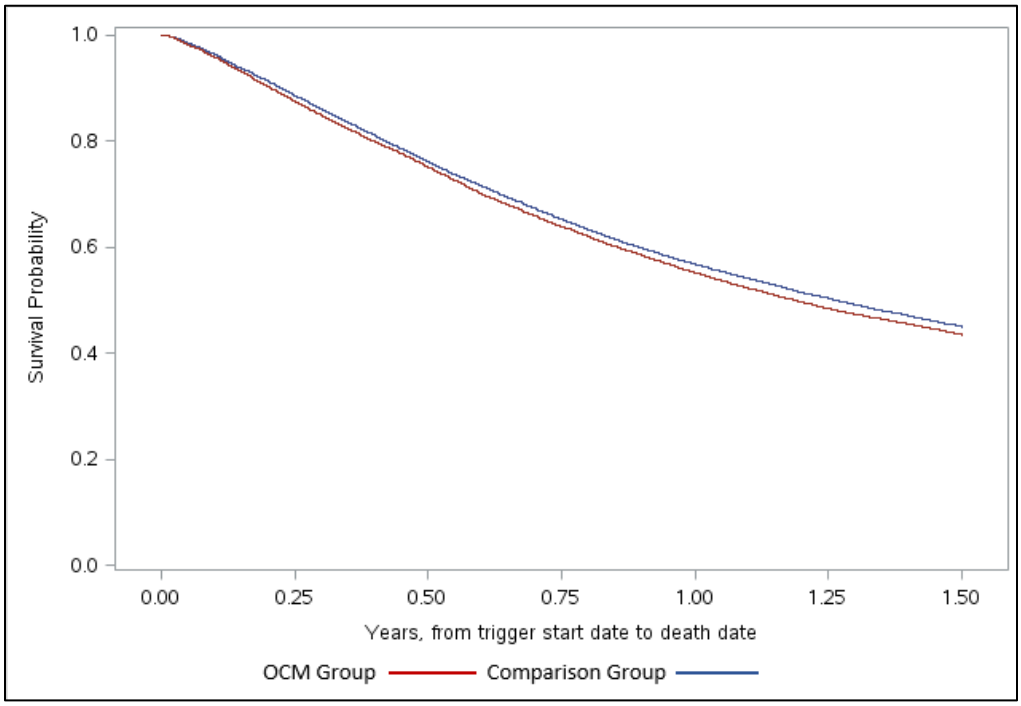
Source: Medicare claims 2014–2019.
Notes: N=11,313 OCM & 12,142 comparison beneficiaries

Exhibit D-83: Similar Survival for OCM and Comparison Groups in the Baseline Period: Lung Cancer



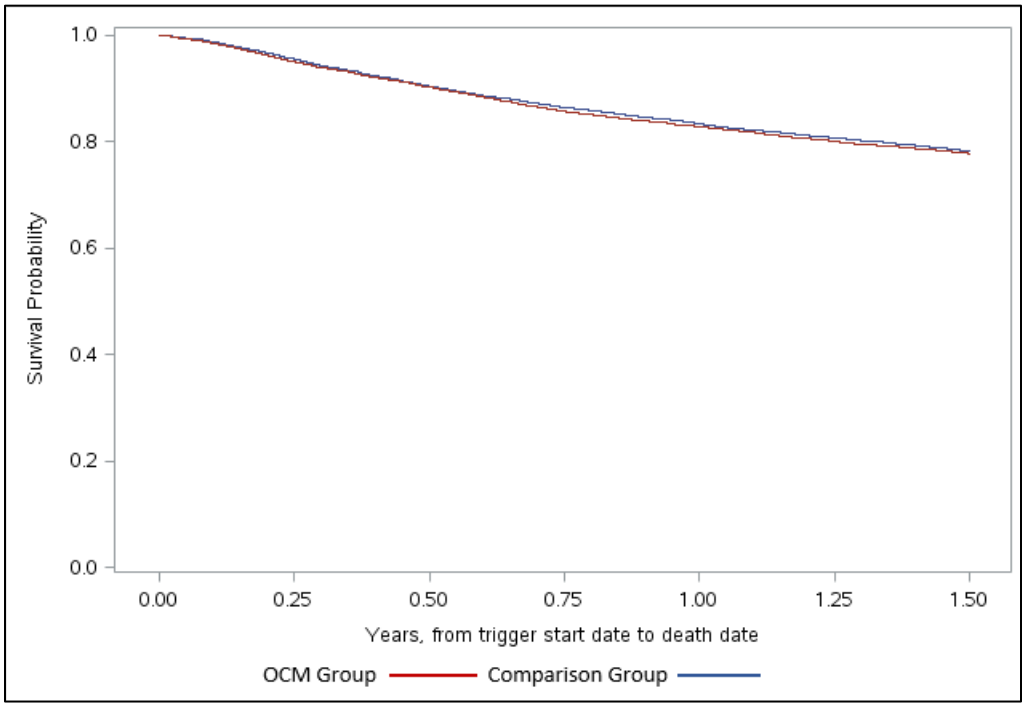
Source: Medicare claims 2014–2019.
Notes: N=12,532 OCM & 13,936 comparison beneficiaries.

Exhibit D-84: Similar Survival for OCM and Comparison Groups in the Intervention Period: Lung Cancer



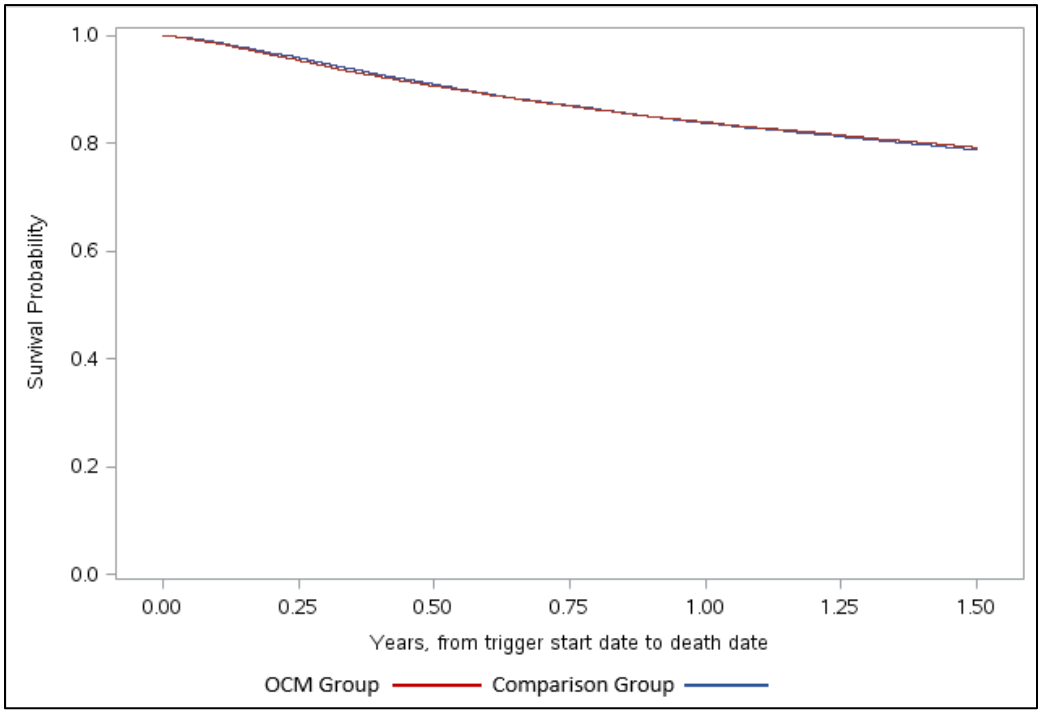
Source: Medicare claims 2014–2019.
Notes: N=22,287 OCM & 24,552 comparison beneficiaries.

Exhibit D-85: Similar Survival for OCM and Comparison Groups in the Baseline Period: Lymphoma



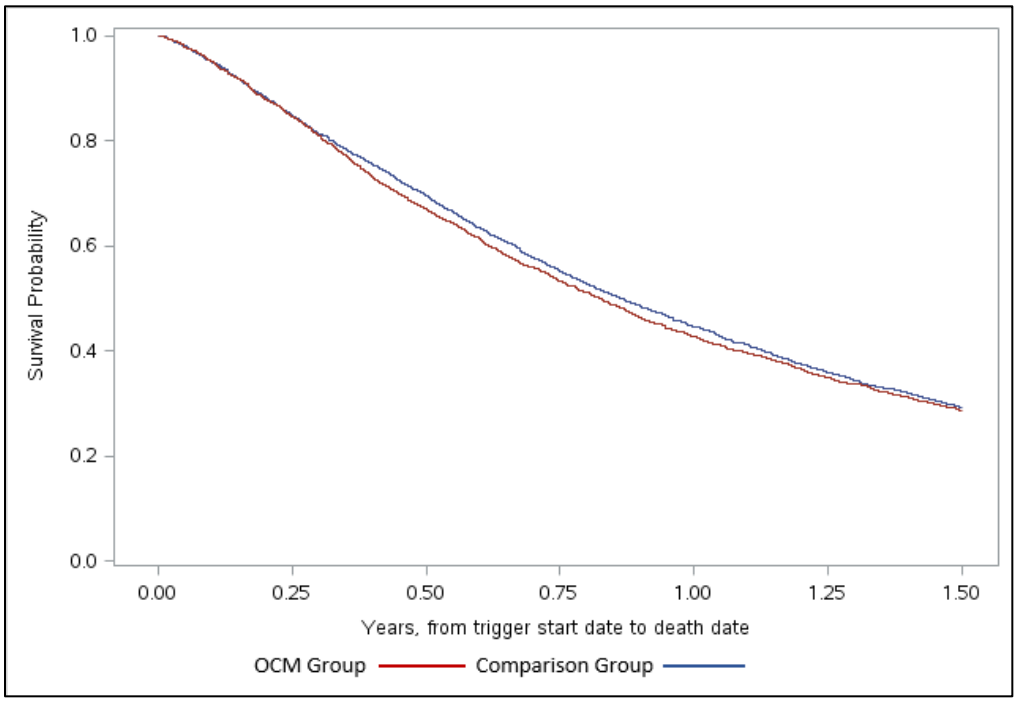
Source: Medicare claims 2014–2019.
Notes: N=7,662 OCM & 8,100 comparison beneficiaries.

Exhibit D-86: Similar Survival for OCM and Comparison Groups in the Intervention Period: Lymphoma



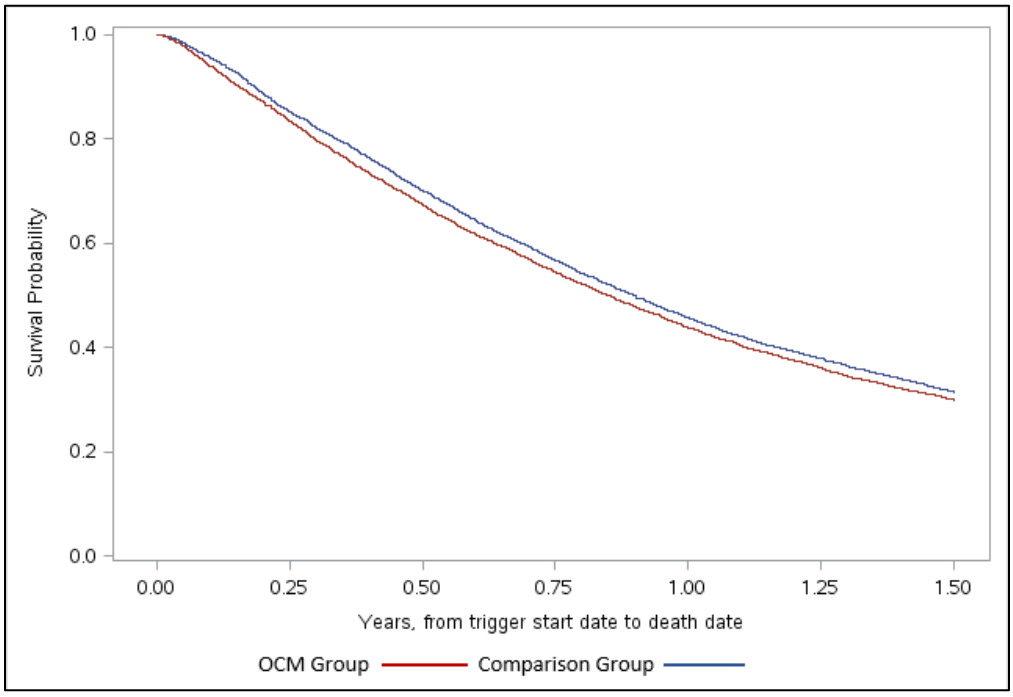
Source: Medicare claims 2014–2019.
Notes: N=13,632 OCM & 14,016 comparison beneficiaries.

Exhibit D-87: Slightly Lower Survival for OCM versus Comparison Groups in the Baseline Period: Pancreatic Cancer



Source: Medicare claims 2014–2019.
Notes: N=2,973 OCM & 3,292 comparison beneficiaries.

Exhibit D-88: Slightly Lower Survival for OCM versus Comparison Groups in the Intervention Period: Pancreatic Cancer



Source: Medicare claims 2014–2019.
Notes: N=5,499 OCM & 6,322 comparison beneficiaries.

Survival Analysis Stratified by (Imputed) Metastatic versus Non-Metastatic Colorectal Cancer

Methods

We developed a clinical stage classification algorithm for colorectal cancer using SEER-Medicare data for beneficiaries diagnosed in 2010–2011 and validated using data for beneficiaries diagnosed during 2012–2013. We then assessed the algorithm using more current data submitted to CMS by OCM practices. This was important for two reasons. First, new cancer treatments are now available that were not available in 2010–2013. Second, since 2015, ICD-10 codes have replaced ICD-9 codes.

For all beneficiaries with colorectal cancer included in the survival analyses described above, we stratified by whether their cancer was metastatic (advanced) or non-metastatic (early-stage), as described in the main report. Because we categorized stage based on care delivered within six months of the episode start date, we excluded beneficiaries who died within six months (N=1,932 OCM and 2,073 comparison beneficiaries) and began the observation period as of six months after the trigger date to avoid introducing a guarantee-time bias. We also excluded beneficiaries that our clinical algorithm could not classify as advanced or early stage (N=1,201 OCM and 1,415 comparison beneficiaries). Among the remaining 30,527 beneficiaries, we then identified those with (imputed) metastatic disease (8,298 OCM and 9,054 comparison beneficiaries) and with (imputed) non-metastatic disease (6,458 OCM and 6,717 comparison beneficiaries). We performed a DID analysis of the 12-month RMST beginning six months after the episode start date for beneficiaries treated in OCM and comparison episodes. We considered differences to be clinically meaningful if: 1) there was a statistically significant difference in survival for OCM versus comparison beneficiaries, and 2) the upper bound of the 90 percent confidence interval for the significant difference was greater than 30 days.

Results

Exhibit D-89 shows no clinically meaningful impact of OCM on survival for beneficiaries with (imputed) metastatic or non-metastatic colorectal cancer. Although the OCM impact for beneficiaries with non-metastatic colorectal cancers was statistically significant at the 10 percent level, the difference of 3.8 days (90 percent CI: -7.5 days, -0.04 days) is not clinically meaningful.

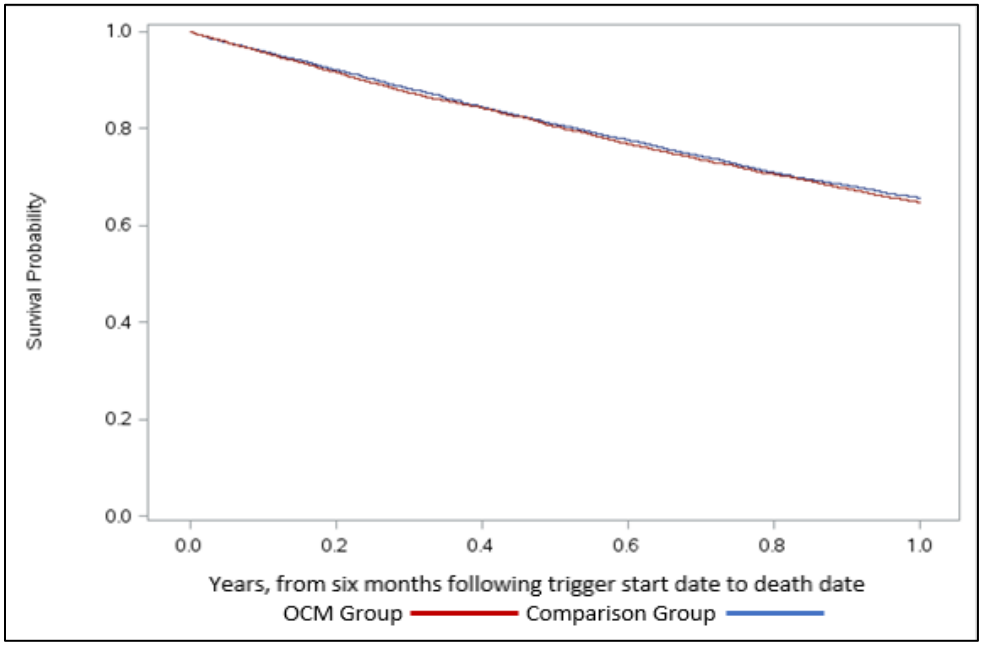
Exhibit D-89: No Clinically Meaningful Impact of OCM on Survival for (Imputed) Metastatic or Non-Metastatic Colorectal Cancer

Cancer Type	# of Beneficiaries		OCM		COMP		Impact Estimate	
	OCM	COMP	Baseline RMST	Int. RSMT	Baseline RMST	Int. RSMT	DID (days)	90% CL (days)
(Imputed) metastatic colorectal cancer	8,298	9,054	293.4	295.8	295.4	301.1	-3.3	-9.0, 2.4
(Imputed) non-metastatic colorectal cancer	6,458	6,717	346.0	347.4	344.1	349.2	-3.8*	-7.5, -0.04

Asterisks denote statistically significant impact estimates at *p≤0.10, **p≤0.05, ***p≤0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. RMST: Restricted mean survival time. Int.: Intervention period. DID: Difference-in-difference. CI: Confidence interval. CL: confidence limit.

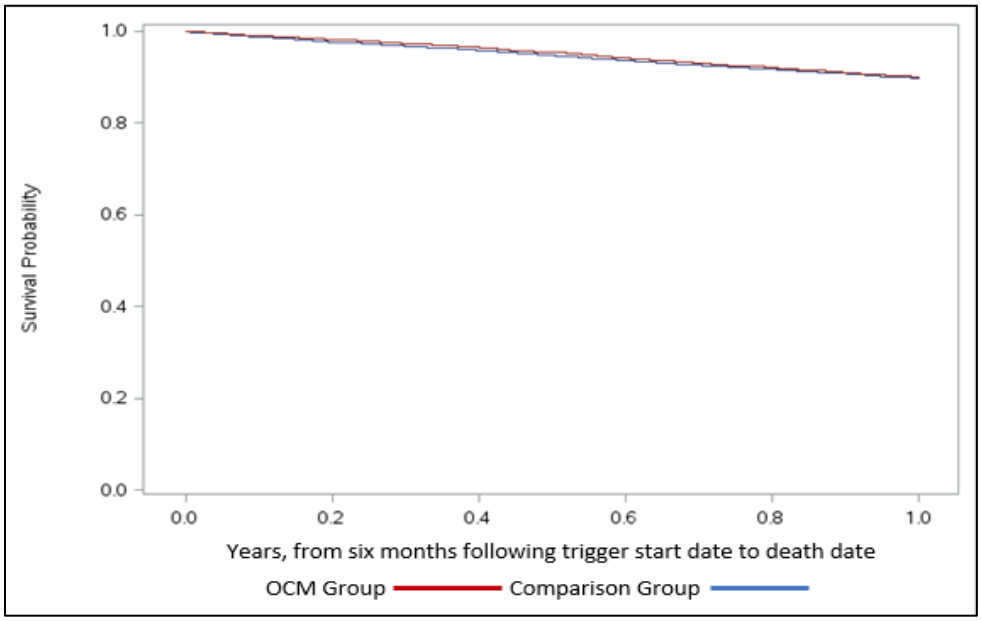
Exhibits D-90 and D-91 show Kaplan-Meier curves for beneficiaries with (imputed) metastatic and non-metastatic colorectal cancer.

Exhibit D-90: No OCM Impact on Survival through 18 Months for Beneficiaries with Metastatic Colorectal Cancer



Source: Medicare claims 2014–2019.
Notes: Analyses examined survival from 6 months post trigger date through 18 months post trigger date.

Exhibit D-91: No OCM Impact on Survival through 18 Months for Beneficiaries with Non-Metastatic Colorectal Cancer



Source: Medicare claims 2014–2019.
Notes: Analyses examined survival from 6 months post trigger date through 18 months post trigger date.

D.8. Stage Classification for Colorectal Cancer and Assessment for OCM-Related Shifts in Case Mix

We assessed whether OCM led to changes over time in the disease stage and case mix of beneficiaries treated by OCM practices, relative to comparison practices. We imputed stage based on a clinical stage classification algorithm developed using SEER-Medicare data from 2010 to 2013,[49] and we validated and updated the algorithm using Medicare claims linked with OCM data submitted by OCM practices.

Measures and Analytic Approach

We used the data reported by OCM practices for episodes in PP1–PP5 to validate our stage classification clinical algorithm. OCM practices report information about cancer stage to CMS, and beneficiaries with multiple episodes could have cancer stage reported more than once (i.e., due to disease progression). We focused on beneficiaries with a single cancer stage reported. We considered beneficiaries to have metastatic disease if the OCM practice reported M1, M1a, M1b, or M1c disease or if "distant CNS spread" or "extra-neural spread" was indicated. Additionally, we considered beneficiaries to have metastatic disease if "current clinical status" was reported to CMS as "recurrent or progressive disease."

Results: Validation of Colorectal Cancer Stage Classification Clinical Algorithm

Among the 33,133 OCM chemotherapy episodes for colorectal cancer during PP1–PP5, 20,620 (62 percent) could be matched to the practice-reported beneficiary-level data on cancer characteristics. We excluded 820 episodes for which beneficiary-level practice reported data had more than one entry that had different information about cancer stage, leaving 19,800 episodes for which had information about cancer stage. **Exhibit D-92** displays the number of episodes with metastatic or non-metastatic disease, based on the data reported by OCM practices versus our stage classification clinical algorithm.

Exhibit D-92: Classification of Episodes with Colorectal Cancer as Metastatic versus Non-Metastatic Cancers Based on OCM Practice-Reported Stage versus the Stage Classification Clinical Algorithm

Reported by OCM Practices	Stage Classification Clinical Algorithm	
	Non-Metastatic	Metastatic
Non-metastatic	3,824	2,437
Metastatic	1,241	12,298

Source: OCM Practice-Reported Stage Data

[49] Brooks GA, Bergquist S, Landrum MB, Rose S, Keating NL. Classifying lung cancer stage from health care claims: A comparison of multiple analytic approaches. *JCO Clin Cancer Inform* 2019:3:1–19.

Exhibit D-93 presents the sensitivity, specificity, and accuracy of our stage classification clinical algorithm for metastatic colorectal cancer (small intestine and colon cancers) using the OCM practice-reported data as a gold standard. The accuracy of 81.4 percent suggests very good performance (good discrimination of metastatic versus non-metastatic disease), and it is similar to the 82.7 percent accuracy in our original SEER-Medicare analysis.

Exhibit D-93: Performance of Colorectal Cancer Stage Classification Clinical Algorithm Applied to OCM Practice-Reported Data

Performance of Colorectal Cancer Stage Classification Clinical Algorithm Applied to OCM Practice-Reported Data		
Sensitivity	90.8%	(95%CI: 90.4–91.3%)
Specificity	61.1%	(95% CI: 59.9–62.3%)
Accuracy	81.4%	(95% CI: 80.9–82.0%)

Source: OCM Practice-Reported Stage Data

Results: DID Analysis of (imputed) Metastatic Stage

There was no effect of OCM on (imputed) metastatic colorectal cancer based on the clinical classification algorithm.

Exhibit 94: No OCM Impact on Proportion of Episodes for Patients with (Imputed) Metastatic Cancers (Based on Clinical Classification Algorithm)

Predicted Metastatic	# of Episodes		OCM		COMP		Impact Estimates Through PP5			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
Colorectal cancer – (imputed) metastatic	54,350	58,839	69.8%	72.2%	70.2%	72.7%	-0.2%	-1.2%	0.7%	-0.3%

Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. LCL: Lower confidence limit. UCL: Upper confidence limit

In analyses stratified by PP1–3 versus PP4–5, we found no impact of OCM on (imputed) metastatic stage in early or later performance periods (**Exhibit D-95**).

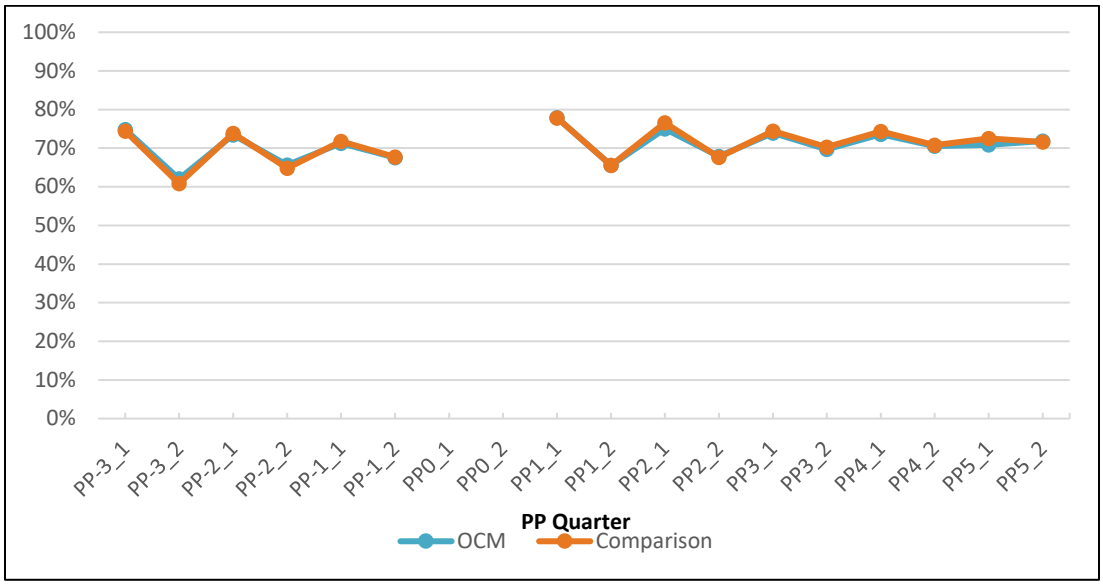
Exhibit D-95: No OCM Impact on Proportion of Episodes for Patients with (Imputed) Metastatic Stage Colorectal Cancers (Based on Clinical Classification Algorithm) in PP1–3 or PP4–5

Measure	DID Impact PP 1-5	90% CI	DID Impact PP1-3	90% CI	DID Impact PP4-5	90% CI
Colorectal cancer – (imputed) metastatic stage	-0.2%	-1.2%, 0.7%	-0.2%	-1.2%, 0.8%	-0.2%	-1.4%, 1.0%

Source: Medicare claims 2014-2019.

Exhibit D-96 shows baseline trends of (imputed) metastatic stage for colorectal cancer episodes and raw rates by quarter.

Exhibit D-96: Baseline Trends of (Imputed) Metastatic Stage, Colorectal Cancer Episodes – Proportion with (Imputed) Metastatic Cancer by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: Baseline Trend: -0.2% per quarter in OCM relative to comparison practices (95% CI: -0.6%, 0.3%), P=0.480

D.9. Minimal Chemotherapy

Unethical and fraudulent practices could attempt to game the model, for example by trying a single chemotherapy infusion to see how well a patient tolerates it, before deciding against further treatment, but then billing for a full six months of MEOS payments even if no further chemotherapy was given. Or practices might give one more (likely unnecessary) infusion after a beneficiary has completed a standard chemotherapy regimen, in order to trigger another episode and bill for another six months of MEOS payments. (If done solely for this purpose, with no potential benefit to the patient, such gaming behavior would constitute fraud.) . We assessed whether OCM led to an increase in episodes with minimal chemotherapy.

Measures: As described in the main report, we focused on episodes triggered by Part B chemotherapy in high-risk cancer bundles. We identified the date of the episode-triggering chemotherapy, and then counted the number of days of chemotherapy during the episode, categorized as one day (minimal chemotherapy) versus two or more days of chemotherapy during the episode.

Results: OCM had no impact on the proportion of episodes for which beneficiaries received a single day of chemotherapy versus two or more days (**Exhibit D-97**).

Exhibit D-97: OCM had No Impact on Proportion of Episodes with a Single Day of Chemotherapy

Episodes with Minimal Chemotherapy	# of Episodes		OCM		COMP		Impact Estimates Through PP5			
	OCM	COMP	Base-line Mean	Int. Mean	Base-line Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
1 day vs. 2 or more days	495,479	539,030	7.2%	7.1%	7.0%	6.9%	0.0%	-0.2%	0.2%	-0.3%

Asterisks denote statistically significant impact estimates at *p≤0.10, **p≤0.05, ***p≤0.01.
Source: Medicare claims 2014–2019.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Performance period. Int.: Intervention period. DID: Difference-in-difference. LCL: Lower confidence limit. UCL: Upper confidence limit.

We additionally stratified by PP1–3 and PP4–5 and found no impact of OCM on use of minimal chemotherapy in early or later performance periods (**Exhibit D-98**).

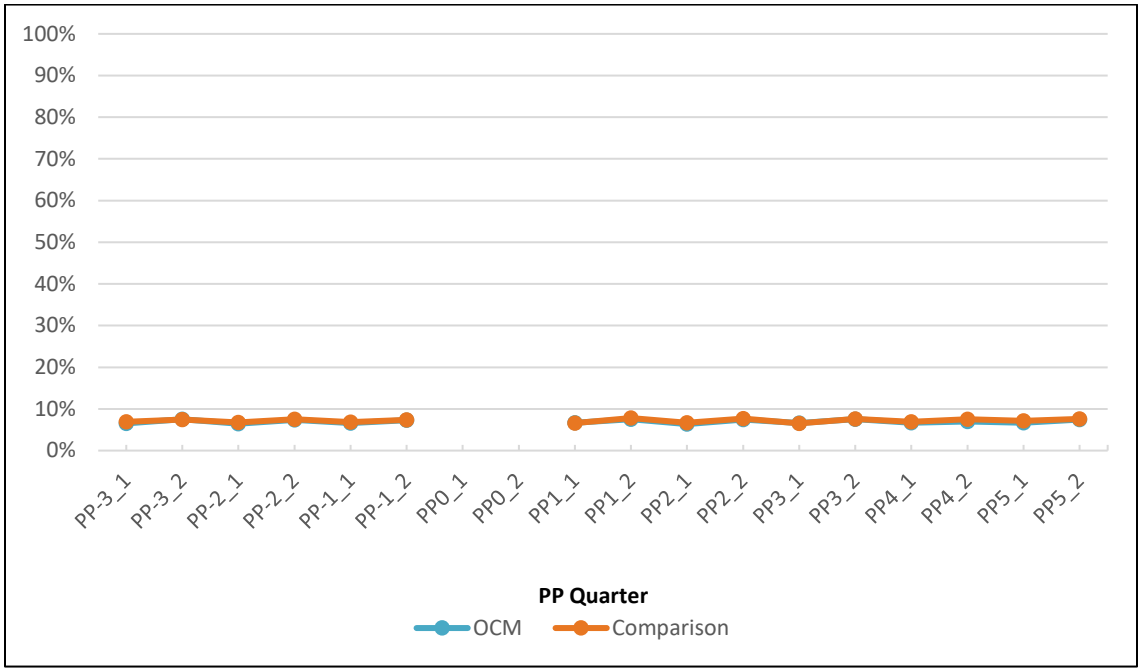
Exhibit D-98: No Effect of OCM on Proportion of Episodes with a Single Day of Chemotherapy in PP1–3 or PP4–5

Measure	DID Impact PP1–5	90% CI	DID Impact PP1–3	90% CI	DID Impact PP4–5	90% CI
1 day vs. 2 or more days	0.0%	-0.2%, 0.2%	0.0%	-0.2%, 0.3%	-0.1%	-0.4%, 0.2%

Source: Medicare claims 2014–2019.
Note: DID: Difference-in-difference. PP: Performance period. CI: Confidence interval.

Exhibit D-99 shows similar rates of one day versus two or more days of chemotherapy in OCM and comparison episodes in the baseline and intervention periods.

Exhibit D-99: Receipt of Minimal Chemotherapy (1 Day versus 2 or more) in OCM and Comparison Episodes, by Quarter, Unadjusted



Source: Medicare claims 2014–2019.
Notes: *Quarter*OCM versus comparison group trend estimate in baseline period: 0.1% per quarter (95% CI: 0.0%, 0.2%), P=0.260

E. End-of-Life Care Analyses

Exhibit E-1: No OCM Impact on EOL Experience, as Reported by Family Survey Respondents on Behalf of Deceased Patients (Higher-Risk and Lower-Risk Episodes Combined)

Outcome	N		OCM		Comparison		Impact Estimates Baseline to Intervention Period			
	OCM	Comp	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Any provider discussed hospice	3018	2453	83.18	83.79	82.57	82.88	0.29	-3.08	3.67	0.35
Cancer provider discussed hospice	2414	1937	58.04	55.73	58.32	55.32	0.69	-4.52	5.90	1.19
Ever entered hospice	2992	2456	78.70	77.41	78.34	76.32	0.73	-3.16	4.63	0.93
Hospice started at the right time	2191	1781	78.85	80.33	81.49	82.84	0.12	-4.26	4.50	0.16
Care team rated excellent	3074	2522	45.70	45.82	47.15	46.83	0.44	-4.09	4.97	0.96
Care team rated excellent or very good	3074	2522	89.89	90.31	89.48	91.26	-1.35	-3.82	1.12	-1.51
Provider always showed respect	3011	2479	73.05	73.46	71.43	74.48	-2.63	-6.51	1.26	-3.60
Provider always listened carefully	3002	2454	68.51	69.42	67.08	69.48	-1.48	-5.65	2.69	-2.16
Provider was always direct and straightforward	2975	2444	60.83	62.48	59.80	61.53	-0.07	-4.54	4.39	-0.12
Provider always explained clearly and in a way patient could understand	2970	2432	62.10	62.75	59.27	63.42	-3.50	-7.84	0.84	-5.63
Provider always spent enough time	3008	2473	53.88	56.91	52.01	54.80	0.23	-4.28	4.74	0.43
Patient never received conflicting information	2908	2375	77.44	77.17	77.34	79.07	-1.99	-5.77	1.80	-2.57
Patient preferred palliative care	2679	2200	73.16	75.93	75.75	75.12	3.39	-1.04	7.83	4.64
Provider followed end-of-life wishes a great deal of the time wishes	2671	2201	80.44	83.37	82.75	82.68	3.01	-0.99	7.01	3.74
Patient died at home	3088	2523	50.94	52.72	53.79	54.80	0.78	-3.77	5.33	1.53
Patient preferred to die at home	2727	2245	80.97	79.91	81.41	82.56	-2.21	-5.92	1.49	-2.73
Patient died in preferred location	2699	2217	73.60	75.93	74.94	75.97	1.29	-2.93	5.52	1.76

*p<0.10, **p<0.05, ***p<0.01

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

Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period; DID: Difference-in-difference; LCL: Lower confidence limit. UCL: Upper confidence limit. Means and DID impact estimates are regression-adjusted.

Exhibit E-2: No Pattern of OCM Impact on EOL Experience, as Reported by Family Survey Respondents, For Patients with Higher-Risk Episodes

Outcome	N		OCM		Comparison		Impact Estimates Baseline to Intervention Period			
	OCM	Comp	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Any provider discussed hospice	2786	2228	83.8	84.4	82.3	83.2	-0.3	-3.6	3.1	-0.3
Cancer provider discussed hospice	2248	1769	58.0	58.4	57.0	57.5	-0.2	-5.4	5.1	-0.3
Ever entered hospice	2761	2232	79.8	76.7	79.6	75.1	1.4	-2.7	5.6	1.8
Hospice started at the right time	2027	1627	78.0	79.6	82.3	83.6	0.3	-4.4	5.0	0.3
Care team rated excellent	2839	2297	45.5	46.6	46.8	48.0	-0.2	-4.9	4.6	-0.3
Care team rated excellent or very good	2839	2297	90.0	90.1	89.8	91.1	-1.2	-3.9	1.4	-1.4
provider always showed respect	2787	2265	73.7	72.3	72.6	74.7	-3.4	-7.5	0.7	-4.6
Provider always listened carefully	2779	2238	69.4	68.9	68.0	70.1	-2.6	-7.0	1.7	-3.8
Provider was always direct and straightforward	2759	2229	60.8	61.8	60.6	61.8	-0.2	-4.9	4.5	-0.3
Provider always explained clearly and in a way patient could understand	2755	2220	62.2	61.5	59.9	64.3	-5.1*	-9.6	-0.5	-8.1
Provider always spent enough time	2787	2257	54.8	56.4	51.7	54.9	-1.5	-6.2	3.2	-2.8
Patient never received conflicting information	2691	2165	76.8	76.5	77.3	79.1	-2.1	-6.1	1.9	-2.8
Patient preferred palliative care	2475	2006	72.0	76.0	74.8	74.5	4.3	-0.3	9.0	6.0
Provider followed end-of-life wishes a great deal of the time wishes	2468	2008	81.1	82.1	83.7	81.6	3.1	-1.3	7.5	3.8
Patient died at home	2854	2300	50.5	52.6	55.4	55.8	1.7	-3.0	6.4	3.5
Patient preferred to die at home	2523	2050	80.4	79.9	81.3	82.7	-1.9	-5.7	2.0	-2.3
Patient died in preferred location	2495	2021	73.9	75.4	77.0	76.1	2.4	-2.2	6.9	3.2

*p<0.10, **p<0.05, ***p<0.01

Source: OCM Evaluation Patient Alternative Surveys, and End-of-Life Surveys, at baseline (April–September 2016) and intervention period (July–December 2018).
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period; DID: Difference in difference; LCL: Lower confidence limit. UCL: Upper confidence limit. Means and DID impact estimates are regression-adjusted.

F. Practice Leader Survey Instrument

ONCOLOGY CARE MODEL

Practice Leader Survey for the Evaluation of the CMS Oncology Care Model

Please return this survey in the enclosed envelope to:

Abt Associates
10 Fawcett Street, Ste. 5
Cambridge, MA 02138

Abt Associates OCM Evaluation Team

DIRECTIONS

This survey should be completed by a senior administrative leader from your practice familiar with the oncology care model (OCM) and how your practice is implementing OCM. This person may be the CEO, administrator, oncology department director, or another individual, depending on the structure of your practice. If you have any questions about the best person from your practice to respond to this survey, please do not hesitate to contact us at OCMEvalSurvey@abtassoc.com or at 866-551-1980.

Instructions:

- Please read each question carefully and respond by shading the circle or box next to the response that most closely represents your opinion.
- For number boxes, please round to the nearest whole number (do not include decimals or fractions) or up to 1 if the answer is <1. Please enter your response as far to the right as possible.
- Please shade only one circle for each question, unless it tells you to "Choose all that apply."
- While you can use a pen, please use a PENCIL in case you want to change your answer.
- Please do NOT use felt tip pens.
- Please erase cleanly or white out any marks you wish to change.

You and your practice

We would first like some background information about you and your practice. **Please respond with respect to your entire practice.**

1. **What is your role in your practice?** *(Please choose all that apply)*
   - ☐ CEO or president
   - ☐ Practice administrator/manager
   - ☐ Oncology division or department director
   - ☐ Chief medical officer/medical director
   - ☐ Other (Please specify _____)

2. **How long have you worked in this practice, in your present role or another role?**
   - ○ 0-2 years
   - ○ 3-5 years
   - ○ 6-10 years
   - ○ >10 years

3. **Has your practice been part of a merger or acquisition in the past two years?**
   - ○ Yes
   - ○ No

4. **Currently, how many physicians work in your practice, <u>across all its locations</u>. Please include both full and part-time physicians and both cancer and non-cancer related specialties?** *(Your best estimate is fine.)*

   | | | | # physicians

For the remainder of this survey, please respond with respect to the cancer care your practice provides. This could include your entire physician practice if yours is a dedicated oncology practice. If your oncology group or department is situated within a larger organization, please answer only for the subset of your organization focused on cancer care.

5. **How many office locations does your practice have where your physicians see patients for cancer treatment?**

   | | | | # office locations

6. **How many physicians working in your practice treat patients for cancer?** *(Your best estimate is fine.)*

a. Medical oncologists…….....	☐☐☐	#
b. Radiation oncologists……...	☐☐☐	#
c. Gynecologic oncologists……..	☐☐☐	#
d. Surgical oncologists…….....	☐☐☐	#
e. Other…….	☐☐☐	#
Total physicians treating cancer patients	☐☐☐	#

7. **How many physicians in your practice are trained in palliative care and work with cancer patients?**

☐☐☐ # physicians

8. **How many FTEs of the following types are employed by your practice to care for cancer patients? How many were hired because of OCM and/or using Monthly Enhanced Oncology Services (MEOS) funds?** *(Please include each person in only one category. Your best estimate is fine.)*

	Total FTEs employed	Total FTEs hired because of OCM and/or using MEOS funds
a. Nurse practitioners and physician assistants……	☐☐☐ FTEs	☐☐☐ FTEs
b. Pharmacists…….	☐☐☐ FTEs	☐☐☐ FTEs
c. Care coordinators/case managers/patient navigators	☐☐☐ FTEs	☐☐☐ FTEs
d. Registered Nurses……	☐☐☐ FTEs	☐☐☐ FTEs
e. Social workers……	☐☐☐ FTEs	☐☐☐ FTEs
f. Health coaches/educators……	☐☐☐ FTEs	☐☐☐ FTEs
g. Scribes……	☐☐☐ FTEs	☐☐☐ FTEs

9. How would you describe the competitive environment your practice faces specifically with respect to cancer care?

- ○ Not at all competitive
- ○ Somewhat competitive
- ○ Very competitive

The cancer patients cared for by your practice

We would also like some information about your practice's cancer patients.

10. Approximately what is the age distribution of your practice's cancer patients? *(Your best estimate is fine.)*

a. 17 or younger [ ][ ][ ] %

b. 18-64……. [ ][ ][ ] %

c. 65 or older…. [ ][ ][ ] %

MUST SUM TO 100%

11. Approximately what percent of your practice's cancer patients are from the following racial/ethnic groups? *(Your best estimate is fine.)*

a. African American/Black [ ][ ][ ] %

b. Asian American…….. [ ][ ][ ] %

c. Hispanic/Latino…….. [ ][ ][ ] %

d. White/Caucasian…… [ ][ ][ ] %

e. Other……... [ ][ ][ ] %

MUST SUM TO 100%

12. Approximately what percent of your practice's cancer patients have limited proficiency in spoken English? *(Your best estimate is fine.)*

[ ][ ][ ] % patients with limited English proficiency

Delivery of cancer care

This section of the survey is about the cancer care your practice provides.

13. What proportion of your practice's patients who are prescribed infusion chemotherapy, receive their infusions at each of the following? *(Your best estimate is fine.)*

a. At one of your physician office sites or clinics? …….. ☐☐☐ %

b. At a hospital outpatient department or a hospital-operated infusion center? ☐☐☐ %

MUST SUM TO 100%

14. Who is the main point of contact for patients who need help navigating the healthcare system?

- ○ Their physician
- ○ A physician's dedicated nurse
- ○ An assigned care coordinator or patient navigator
- ○ Administrative staff
- ○ Other

15. What has your practice done during OCM that you believe has a positive impact on quality of care, costs to Medicare, and/or patient experiences? *(Please select all that apply.)*

- ○ Standardized telephone triage
- ○ Expanded same-day urgent care
- ○ Extended clinic hours
- ○ Upgraded/enhanced electronic health record
- ○ Adopted an oncology treatment pathway software program
- ○ Expanded palliative care services
- ○ Other, please specify: _____

16. Since July 2016, has your practice made any changes related to coding patient participation in clinical trials on the Part B claims to be submitted to Medicare?

- ○ Yes
- ○ No

Health information technology

This section of the survey is about the health information technology your practice has adopted, and especially the health IT related to cancer care.

17. Thinking about the physicians who *refer* cancer patients to your practice for cancer-directed systemic therapy, with what proportion of those physicians do you share an electronic health record? *(Your best estimate is fine.)*

[ ][ ][ ] %

Please answer questions 18 and 19 thinking about the main hospital where your cancer patients are admitted when they need inpatient care.

18. Can physicians at your practice access patients' electronic health record at the main hospital where your cancer patients are admitted?

- ○ Yes → GO TO QUESTION 18a
- ○ No → GO TO QUESTION 19

18a. Has access to patients' electronic health record at the main hospital where your cancer patients are admitted changed since OCM began in July 2016?

- ○ Yes
- ○ No

19. Can physicians at the main hospital access patients' electronic health records at your practice?

- ○ Yes → **GO TO QUESTION 19a**
- ○ No → **GO TO QUESTION 20**

19a. Has access to your practice's electronic health records by physicians at the main hospital where your cancer patients are admitted changed since OCM began in July 2016?

- ○ Yes
- ○ No

20. Does your practice currently use a pathway software program (a software program that uses diagnostic information to suggest one or more specific cancer treatment regimens)?
If yes, please choose all that apply:

- ☐ Yes, pathways software system from an external vendor
- ☐ Yes, pathways software system developed internally
- ☐ Yes, pathways required by commercial payers
- ☐ No

IF YOU ANSWERED NO TO QUESTION 20 ABOVE, PLEASE ANSWER QUESTION 21; OTHERWISE GO TO QUESTION 22

21. Please indicate how your practice updates regimens and/or order sets to reflect current evidence-based guidelines and whether your practice has begun using or enhanced each approach since OCM began in July 2016? (Please only indicate whether an approach is new or enhanced if the approach is currently being used.)

Approach	Practice uses this approach	New or enhanced since OCM began
a. Pharmacy & Therapeutics or other consensus committee routinely reviews new evidence and adjusts regimens/order sets	☐	○ Yes ○ No ○ N/A
b. Individual oncologists can add new regimens/order sets as needed	☐	○ Yes ○ No ○ N/A
c. Physician leaders review and approve all new or revised order sets	☐	○ Yes ○ No ○ N/A
d. Physician leaders' approval required before oncologists may deviate from guidelines and/or regimens (e.g., off-label use)	☐	○ Yes ○ No ○ N/A
e. Designated staff/committee routinely purge obsolete regimens/order sets	☐	○ Yes ○ No ○ N/A
f. Other, please specify: _____	☐	○ Yes ○ No ○ N/A

Physician compensation

We would also like some information about your practice's operations. **This information will be kept strictly confidential and will only be used for the purpose of evaluating the Oncology Care Model.**

22. For the majority of your physicians that provide cancer care, what is the percent of base compensation (not including bonuses) from your practice based on the following? *(Your best estimate is fine.)*

a. Salary not based on productivity or fee-for-service [ ][ ][ ] %

b. Salary based on productivity or fee-for-service [ ][ ][ ] %

c. Other compensation (base compensation not from salary) [ ][ ][ ] %

MUST SUM TO 100%

23. For the majority of your physicians that provide cancer care, how much can physicians potentially earn from bonuses or other incentive payments, as a proportion of base compensation? *(Your best estimate is fine.)*

a. Total potential income earned from bonuses or other incentive payments, as a proportion of base compensation [ ][ ][ ] %

IF YOU ANSWERED 1% OR GREATER TO QUESTION 23, PLEASE ANSWER QUESTION 24; OTHERWISE GO TO QUESTION 25

24. What percent of potential bonus income is based on the following *(Your best estimate is fine.)*

a. Patient experiences…….. [ ][ ][ ] %

b. Quality of care…..... [ ][ ][ ] %

c. Service to the practice (e.g., directorships) [ ][ ][ ] %

d. Other factors……. [ ][ ][ ] %

MUST SUM TO 100% OF POTENTIAL BONUS INCOME

25. Do physicians in the practice receive a share of any OCM revenue?

	Yes, currently	No, but practice is considering	No, and practice is not considering
a. Physicians share some of the MEOS revenue	O	O	O
b. Physicians share in any performance based payments	O	O	O

IF YOU ANSWERED YES TO QUESTION 25a or 25b, PLEASE ANSWER QUESTION 26; OTHERWISE GO TO QUESTION 27

26. How are these OCM revenues allocated to physicians in your practice?

a. Based on volume/number of Medicare patients	O Yes	O No
b. Based on patients' hospitalization or other utilization rates	O Yes	O No
c. Based on quality scores and/or patient surveys	O Yes	O No
d. Based on something else (Please specify _____)	O Yes	O No

Performance measurement and quality improvement

We are interested in the kind of information your practice collects on a routine basis about the care provided to patients receiving cancer-directed systemic therapy (including chemotherapy, immunotherapy, targeted therapy, or hormonal therapy) and how that information is used. **Please answer specifically with respect to care for cancer patients.**

27. Does your practice collect and routinely report the following data to the physicians in your practice, about the care provided to cancer patients?

a. Patient surveys about satisfaction/experiences with cancer care	O Yes	O No
b. Performance on cancer quality measures of guideline-recommended care	O Yes	O No
c. Cancer patients' use of emergency department and/or inpatient hospital utilization	O Yes	O No
d. Utilization of high cost therapies, imaging, or other technologies for cancer care	O Yes	O No

IF YOU ANSWERED YES TO ANY OF QUESTION 27 A-D, PLEASE ANSWER QUESTION 28; OTHERWISE GO TO QUESTION 29:

28. Do you routinely benchmark the performance of physicians in your practice who provide cancer care, against each other or against external benchmarks from other practices or national standards, for any measures of quality, utilization, or spending?

- O Yes
- O No

Payer mix and value-based payment model participation

29. Approximately what percentage of your practice's cancer patients have the following types of insurance? Please respond with respect to patients' primary insurance types. *(Your best estimate is fine.)*

a. Commercial…… ☐☐☐ %

b. Medicare fee-for-service ☐☐☐ %

c. Medicare Advantage….. ☐☐☐ %

d. Medicaid…… ☐☐☐ %

e. Uninsured……... ☐☐☐ %

f. Other…… ☐☐☐ %

MUST SUM TO 100%

30. Approximately what percentage of your practice's cancer patients are enrolled in managed care plans (including commercial health plans, Medicare Advantage plans, and Medicaid managed care plans)? *(Your best estimate is fine.)*

☐☐☐ %

31. Approximately what percent of your cancer patients undergoing chemotherapy are in cancer-focused value-based payment models? *(Your best estimate is fine)*

a. Percent of all your cancer patients who are in OCM (Traditional fee-for-service Medicare)? ☐☐☐ %

b. Percent of all your cancer patients covered under **other** cancer-focused value-based payment models (non-OCM)? ☐☐☐ %

c. Percent of all your cancer patients **not** covered under any cancer-focused value-based payment model? ☐☐☐ %

A+B+C MUST SUM TO 100% of your cancer patients

32. Thinking about OCM-related Learning Events and Resources (E.g., CMS webinars, office hours, OCM Connect), how much do you agree with the following statements?

	Strongly agree	Agree	Neutral	Disagree Strongly	Disagree
a. Staff from my practice consistently attend OCM Learning Events	O	O	O	O	O
b. My practice has implemented changes in care delivery that were motivated by OCM Learning Events or Resources	O	O	O	O	O

Thank you very much.

We greatly appreciate your participation in this survey. Your participation will be important in helping CMS to understand how to improve the effectiveness and efficiency of care for patients undergoing chemotherapy or hormonal therapy.