Evaluation of the Oncology Care Model

Performance Periods 1–9

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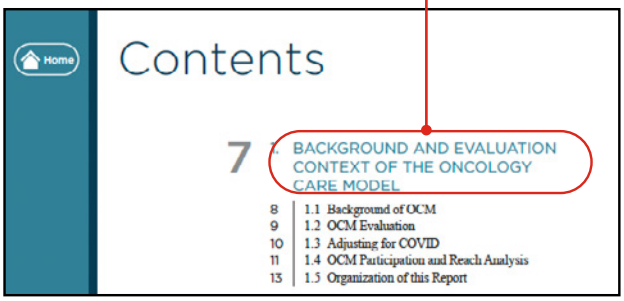

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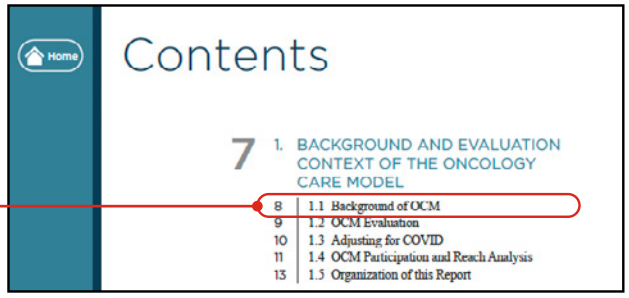

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Background and Evaluation Context of the Oncology Care Model

1.1 Background of OCM

The Centers for Medicare & Medicaid Services operated the Oncology Care Model (OCM) to test whether fostering coordinated and value-based cancer care could reduce Medicare payments and improve the quality of care for patients with cancer. OCM focused on Medicare fee-for-service (FFS) patients with cancer who underwent chemotherapy treatment.[1,2] OCM combined attributes of medical homes (patient-centeredness, accessibility, evidence-based guidelines, and continuous monitoring for improvement opportunities) with financial incentives to provide services efficiently and with high quality.[3,4]

The six-year OCM began with six-month chemotherapy treatment episodes, starting on July 1, 2016, and operated for 11 consecutive performance periods (PP). The last episodes ended on June 30, 2022. Some practices participated in OCM on a partnership basis by pooling their performance on cost and quality targets with that of other practices. This approach was often due to having one or more oncologists working part-time in two related practices.[5]

OCM featured a two-pronged financial incentive strategy. First, practices billed Medicare a $160 Monthly Enhanced Oncology Services (MEOS) fee for each FFS Medicare beneficiary with a chemotherapy episode that was attributed to the practice. These MEOS payments were intended to support enhanced oncology services, including the following:

- 24/7 patient access to an appropriate clinician who has real-time access to the practice's medical records
- Core functions of patient navigation
- A documented Care Plan for every OCM patient containing 13 components recommended by the Institute of Medicine[6]
- Cancer treatment that is consistent with nationally recognized clinical guidelines

Second, practices had the potential to receive retrospective calculated performance-based payments (PBPs) if they met OCM cost-saving and quality goals. CMS calculated PBPs by comparing all expenditures during an episode (including MEOS payments) to risk-adjusted historical benchmarks, minus a Medicare discount that CMS retained. These payments were adjusted to reflect performance on quality measures to both promote improvement and ensure that any efficiency efforts undertaken by participating practices did not harm quality.

Participating OCM practices (and pools) could voluntarily adopt one- or two-sided risk (**see Box above**). As the discount was lower under two-sided risk, high-performing practices stood to earn a larger PBP under two-sided risk than under one-sided risk.

OCM RISK ARRANGEMENTS

The Model featured three risk arrangements for OCM practices and pools:

During Performance Period (PP) 1, all OCM practices and episodes had **a one-sided risk arrangement** with a **4-percent Medicare discount.** OCM practices (and pools) received a performance-based-payment (PBP) if total expenditures for episodes (including MEOS) were below the target price. Practices were **not responsible** if their total expenditures for the episodes exceeded the target price. Practices could continue in one-sided risk if they were eligible for PBPs.

Beginning in PP2, practices or pools could elect **a two-sided risk arrangement** with a **2.75-percent Medicare discount.** OCM practices (and pools) received a PBP if total expenditures for episodes were below the target price. They received no PBP and **were responsible** for expenditures that exceeded the target price. Gains and losses were **capped at 20 percent of benchmark.**

Beginning in PP6, practices (and pools) could elect an **alternative two-sided risk arrangement** with a **2.5-percent Medicare discount,** and gains and losses **capped at 8 percent of benchmark.** They received no PBPs but were **not responsible** for repayment if expenditures were greater than the target price but lower than the benchmark.

1 Chemotherapy is defined for OCM purposes as systemic therapies including cytotoxic chemotherapy, hormonal therapy, biologic therapy, immunotherapy, and combinations of these therapies.

2 **Appendix Exhibit A-3** lists the reconciliation-eligible cancers covered by OCM.

3 Demartino JK and Larsen JK. Equity in cancer care: pathways, protocols, and guidelines. J Natl Compr Canc Netw Oct. 1, 2012;10, Supplement 1:S1–S9.

4 Page RD, Newcomer LN, Sprandino JD, et al. The Patient-Centered Medical Home in Oncology: From Concept to Reality. 2015 American Society of Clinical Oncology (ASCO) Educational Book.

5 For more about how CMS handles pooling arrangements in OCM, see: https://innovation.cms.gov/Files/x/ocm-pp3beyond-pymmeth.pdf

6 Institute of Medicine. Delivering high-quality cancer care: Charting a new course for a system in crisis. 2013. Washington, DC: The National Academies Press. Available at: https://www.nap.edu/catalog/18359. The Institute of Medicine's 13 care plan elements are listed in the glossary at the end of this report.

Beginning in PP8, two-sided risk was required for those practices that did not earn at least one PBP in the first four PPs, or else their participation was terminated. This affected PBP earned by participants relative to prior PPs, particularly when combined with overlapping policy changes related to the COVID-19 public health emergency (PHE).

CMS made three notable policy changes to OCM due to the PHE.

1. First, in PP8 and PP9, participating practices were allowed to opt out of PBP reconciliation, and simply receive MEOS payments.
2. Second, CMS made reporting the two practice-reported quality measures voluntary, leaving three required quality measures.[7] Of the remaining three required measures, achievement on measure OCM-2 (ED visits or observation stays) improved in PP8 and PP9 for many practices, because fewer ED visits occurred during the PHE. Accordingly, practices that chose to remain in payment reconciliation had an easier time meeting the threshold on the Aggregate Quality Score (AQS) to receive a 100-percent PBP performance multiplier. In PP8, for the first time since OCM began, a majority of practices received an AQS sufficiently high to keep their entire PBP, if earned.
3. Third, episodes with a diagnosis of COVID-19 were removed from reconciliation and the calculation of PBPs.

While the first two changes became effective starting in PP8, the third became active starting in PP7.[8]

Additional details about OCM, including previous evaluation reports, are available on the CMS website.

RELATED SECTIONS

As shown in Section 6.3, the proportion of practices receiving 100% of their Aggregate Quality Score multiplier ranged from 31 to 48 percent in PP1-4 and declined to 17 to 25 percent in PP5-7. The proportion increased to 67 percent in PP8 and to 74 percent in PP9.

1.2 OCM Evaluation

In 2015, CMS funded Abt Associates, along with its partners The Lewin Group, Harvard Medical School, GDIT, and the Geisel School of Medicine at Dartmouth, to conduct a comprehensive evaluation of OCM. The goal of the evaluation was to assess the extent to which OCM achieved CMS's stated goals of improving care and reducing costs. The OCM evaluation uses data from various sources to evaluate the impact of OCM on Medicare spending, utilization, quality of care, clinician perceptions, and patient experiences. Data sources include Medicare FFS claims and detailed CMS administrative data to construct measures of Medicare payments and use of care. We also collected primary data, including patient surveys and case study interviews, to evaluate OCM's impact on quality of care, patient satisfaction, and perceptions of clinical changes and quality that resulted from OCM. In this report, we include data from all of these sources to provide a holistic picture of the impact of OCM on participating practices. Appendix A provides detailed information on data sources and construction of measures.

The OCM evaluation used an intent-to-treat (ITT) approach, meaning that practices that ended OCM participation before the end of OCM are still included in the analysis. This design avoids biases that might arise when impact is measured only for those that remain in OCM for its full duration, as these participants are likely to have been the most successful. Therefore, the impacts in this report likely represent a conservative estimate of effects attributable to OCM.

We used a difference-in-differences (DID) study design to evaluate OCM impact. The DID design measured whether changes over the course of OCM differ for OCM episodes relative to episodes initiated by a matched comparison group. DID regression analyses controlled for factors unrelated to OCM that could influence outcomes. We used propensity score matching to identify physician practices comparable on observable characteristics to those participating in OCM during the baseline period. The comparison group thus serves as a counterfactual for what would have occurred among the OCM group in the absence of OCM. Section 1.4 below describes the extent to which OCM reflected the national landscape for chemotherapy treatment.

7 In PP8, OCM included five quality measures in the calculation of the AQS: OCM-2, "Risk-adjusted proportion of patients with all-cause emergency department (ED) visits or observation stays that did not result in a hospital admission within the 6-month episode"; OCM-3, "Proportion of patients who died who were admitted to hospice for 3 days or more"; OCM-4, "Pain assessment and management"; OCM-5, "Depression screening and follow-up plan"; and OCM-6, "Patient-reported experience of care." Practice achievement on the AQS was used to determine their eligibility to receive a PBP, if earned. Additional information on the OCM quality measures, the AQS, and how the AQS relates to PBPs can be found in Section 6.3.

8 CMS. OCM Performance-Based Payment Methodology. July, 2021. Available at: https://innovation.cms.gov/files/x/ocm-pp3beyond-pymmeth.pdf.

The intervention period for this report includes episodes that started from July 1, 2016, through January 1, 2021, and ended by June 30, 2021 (**Exhibit 1**). The baseline period in the DID analysis included three PPs prior to the start of OCM and comprised episodes that began from July 2, 2014, through January 1, 2016. To ensure no overlap between baseline and intervention episodes, the evaluation omitted episodes that started in the six months prior to the start of OCM, from January 2, 2016, through June 30, 2016.

DID regression analyses control for factors unrelated to OCM that could influence outcomes, including claims-based use measures, payment measures, end-of-life care, and clinical measures. For a subset of key outcomes, we estimated impacts on cancer-specific subgroups (e.g., higher- and lower-risk episode groups, the 10 most prevalent cancer types). For data from the patient survey, we assessed trends over time in care experiences among OCM patients only, because we did not collect surveys from comparison patients in recent PPs.

We conducted sensitivity analyses for selected key outcome measures. Sensitivity tests examined whether impact estimates changed when we varied model specifications (e.g., removing certain variables from our regression-adjustment), the practice samples used (e.g., excluding the two largest OCM practices that did not have a comparison analog), or episode samples used (e.g., excluding the top 1 percent most costly episodes). The sensitivity analyses findings were broadly consistent, which increases our confidence that the estimates in this report reflect real OCM impacts and are not an artifact of evaluation design decisions regarding which variables to control for or which episodes to include.

1.3 Adjusting for COVID

The COVID-19 PHE officially began on January 27, 2020.[9] It directly and indirectly affected health and health care delivery. Patients diagnosed with COVID-19 faced increased mortality, morbidity, and health care costs. The PHE has also disrupted availability, access, and the delivery of patient care. In June 2020, CMS provided guidelines[10] for adjustments in OCM methodology and reporting requirements in response to the COVID-19 PHE, including the flexibilities discussed above in Section 1.1. For the OCM evaluation, PPs 7 through 9 overlap with the first 18 months of the COVID-19 PHE (Exhibit 2). Some episodes initiated in PP7 (July 2, 2019, through January 1, 2020) were completed after the start of the PHE in early 2020. All episodes for PP8, triggered between January 2 and June 30, 2020, have at least some overlap with the PHE: episodes triggered on or after January 27, 2020, were fully within the PHE. All PP9 episodes occurred completely during the PHE (the full six months for each of these episodes occurred after the start of the pandemic).

We identified episodes with a COVID-19 diagnosis using B97.29 ICD-10 for episodes between January 1 and March 31, 2020, and U07.1 ICD-10 for episodes from April 1, 2020.[11] Using these criteria, 21,554 episodes (0.4 percent of PP7, 2.5 percent of PP8, and 5.7 percent of PP9 total episodes) were removed from all

Exhibit 1: OCM episodes occurred between 2016 and 2022

Period	Performance Period (PP)	Episode Start Dates	Episode End Dates
Baseline period	Baseline 3	7/2/14–1/1/15	1/1/15–6/30/15
	Baseline 2	1/2/15–7/1/15	7/1/15–12/31/15
	Baseline 1	7/2/15–1/1/16	1/1/16–6/30/16
Hold-out period	Hold-out	1/2/16–6/30/16	7/1/16–12/30/16
Intervention period	PP1	7/1/16–1/1/17	12/31/16–6/30/17
	PP2	1/2/17–7/1/17	7/1/17–12/31/17
	PP3	7/2/17–1/1/18	1/1/18–6/30/18
	PP4	1/2/18–7/1/18	7/1/18–12/31/18
	PP5	7/2/18–1/1/19	1/1/19–6/30/19
	PP6	1/2/19–7/1/19	7/1/19–12/31/19
	PP7†	7/2/19–1/1/20	1/1/20–6/30/20
	PP8†	1/2/20–7/1/20	7/1/20–12/31/20
	PP9†	7/2/20–1/1/21	1/1/21–6/30/21
	PP10†*	1/2/21–7/1/21	7/1/21–12/31/21
	PP11†*	7/2/21–1/1/22	1/1/22–6/30/22

Notes: PP: Performance period. †PP overlaps PHE. *Intervention periods for future evaluation reports.

[9] Azar, AM. Determination That a Public Health Emergency Exists. January 2020. Available at: https://aspr.hhs.gov/legal/PHE/Pages/2019-nCoV.aspx.
[10] CMS. CMS Innovation Center Models COVID-19 Related Adjustments. June 2020. Available at: https://www.cms.gov/files/document/covid-innovation-model-flexibilities.pdf.
[11] CMS. Preliminary Medicare COVID-19 Data Snapshot Methodology. ND. Available at: https://www.cms.gov/files/document/medicare-covid-19-data-snapshot-methodology.pdf

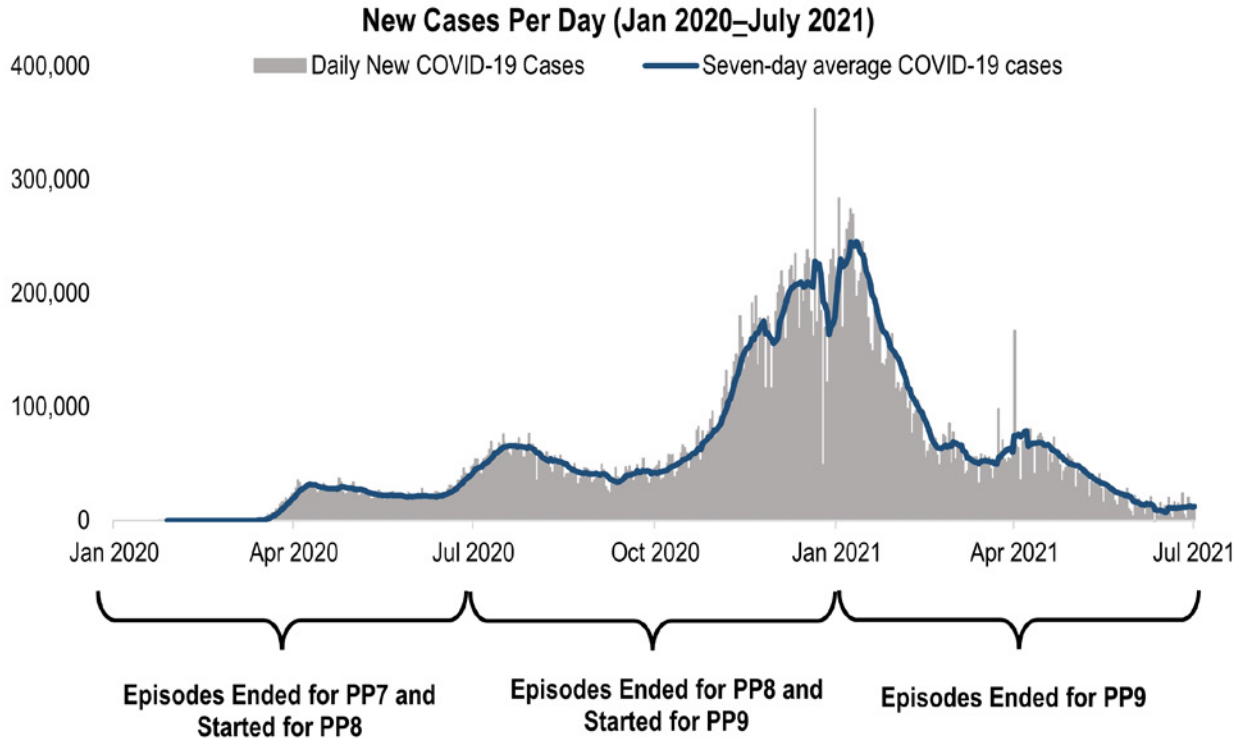
analyses: 11,120 of these episodes were associated with OCM practices (51.6 percent) and the remainder with comparison practices. We assessed the sensitivity of our results to the inclusion of episodes with COVID-19 diagnoses for key payment and utilization outcomes. The impact analyses included all other episodes for OCM and comparison practices (irrespective of attributed OCM practice risk arrangement and reconciliation status).

The prevalence and severity of the pandemic were not the same in every locality, and they varied over time. The evaluation's comparison group includes non-participating oncology practices that closely resemble OCM participants in numerous ways, including market attributes. However, the comparison practices were not selected to match OCM participants in the same community. It is possible that the PHE had varying influence at different times on OCM and comparison practices that were in different communities. We therefore developed new risk-adjusting covariates to include in our standard DID framework that were designed to disentangle the time-varying impact of OCM from the time- and community-varying effects of the pandemic. Specifically, we developed a set of four county-level time-varying, risk-adjusting covariates: cumulative COVID-19 infection rate, new COVID-19 infection rate, cumulative COVID-19 death rate, and new COVID-19 death rate. These variables were computed using daily county-level COVID-19 data that spanned the exact dates of the six-month episode and were included in all regression models. (Refer to **Appendix A.1.9** for details on risk adjustor development and sensitivity testing.)

1.4 OCM Participation and Reach Analysis

"Reach" refers to the degree to which the participants in a pilot program represent a sufficiently large and representative share of the ultimate target population to support inferences about potential impact if the pilot were to be scaled nationally.[12,13] **OCM participants treated over one quarter of all chemotherapy-initiated cancer episodes among FFS Medicare patients,** indicating that it had substantial national reach. It is important to assess the representativeness of those episodes and participating practices relative to non-participating oncology practices and episodes nationwide. Assessing representation is particularly

Exhibit 2: Most Oncology Care Episodes for Study Period PP7–PP9 Occurred during the COVID-19 PHE



Source: USA FACTS, US COVID-19 Cases and Deaths by County (https://usafacts.org/visualizations/coronavirus-covid-19-spread-map).
Notes: PP: Performance period. PHE: Public health emergency.

[12] Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. American Journal of Public Health. 1999 Sep;89(9):1322-7.
[13] Gaglio B, Shoup JA, Glasgow RE. The RE-AIM framework: a systematic review of use over time. American Journal of Public Health. 2013 June;103(6), 38-46.

important for voluntary models like OCM, because some oncology practices may be more likely to participate than others, potentially limiting the generalizability of evaluation findings. In general, the more representative OCM's reach into its target population, the more precisely our findings can inform decisions about expanding OCM. This analysis focused on baseline characteristics, but extended through PP6 for some outcomes to ensure that generalizability of patient characteristics was similar after the start of OCM. Throughout this section, reference to "non-OCM" practices reflects all non-participating practices, not just those selected into the OCM comparison group. Additional information on the methodology and results for this analysis is found in **Appendix A.2**.

What share of oncology practices and FFS Medicare population participated in OCM?

Only 5 percent of oncology practices participated in OCM, but accounted for 27 percent of all chemotherapy-initiated treatment episodes delivered to FFS Medicare beneficiaries from eligible practices. OCM coverage remained constant at 27–28 percent of potential episodes over both the baseline and the intervention periods, suggesting that OCM did not create opportunities or barriers that affected the relative share of patients served by participating practices.

Were market, practice, and patient characteristics of OCM episodes similar to those of non-OCM episodes?

Market-Level Characteristics

Overall, OCM practices served markets like those served by non-OCM practices in terms of income, education, and poverty (**Exhibit 3**). OCM markets have a greater supply of physicians: more primary care physicians and specialists per 10,000 county residents. OCM practices also spanned slightly more counties per practice, though over half of both OCM and non-OCM practices were in a single county. OCM practices also came from counties with a higher level of Medicare Advantage (MA) penetration. While Medicare FFS reimburses practices on a volume basis as services are provided, practices may be paid under different arrangements for services covered by MA plans, such as partial capitation,[14] which may provide greater familiarity with value-based purchasing. However, while greater than the standardized difference threshold of 0.10, the difference of 1.7 percentage points in MA penetration is of a relatively small magnitude.

Practice-Level Characteristics

Because practices could decide whether to join the voluntary OCM, we might expect there to be differences between the characteristics of participating and non-

KEY FINDINGS ON REACH

Overall, OCM had broad reach and good representation of non-participants.

The geographic markets served by OCM practices were mostly similar to the markets served by non-OCM practices. However, OCM markets had more primary care physicians and specialists per 10,000 county residents, and OCM practices served slightly more counties per practice. OCM patients were also somewhat more likely to reside in metropolitan areas.

OCM practices differed from non-OCM practices in a few important ways. OCM practices were more likely than non-OCM practices to be affiliated with an academic medical center, and OCM practices initiated more episodes for higher-risk cancers than non-OCM practices. On average, OCM practices were also larger than non-OCM practices in terms of number of episodes treated, number of clinicians, and market share. The differences were in part because **the three largest oncology practices in the country joined OCM.** When excluding these three practices, the size distributions were similar between OCM and non-OCM practices.

In total, OCM participants treated roughly a quarter of all eligible FFS Medicare chemotherapy-initiated episodes prior to OCM and continuing through the PPs, despite accounting for only 5 percent of all oncology practices nationwide. In general, OCM and non-OCM episodes had a similar mix of beneficiary demographic characteristics (including race/ethnicity and dual eligibility) and most cancer types. OCM and non-OCM episodes were also similarly distributed across the Area Deprivation Index (ADI), a neighborhood-level indicator of socio-economic disadvantage, reflecting factors relating to income, education, employment, and housing quality.

[14] Ems D, Murty S, Loy B, Gallagher J, Happe LE, Rogstad TL, et al. Alternative payment models in medical oncology: assessing quality-of-care outcomes under partial capitation payment models in medical oncology: assessing quality-of-care outcomes under partial capitation. Am Health Drug Benefits. 2018 Oct;11(7):371-378.

participating practices. OCM practices were larger than non-OCM practices (more episodes, clinicians, market share, and instances of multiple site locations) and were more likely to be affiliated with an academic medical center. OCM practices also had a smaller share of oncologists with radiation and surgery specialties than did non-OCM practices. None of these characteristics systematically affected the impact of OCM: i.e., sensitivity analyses demonstrated that the effects of OCM on total episode payments (TEP) and other key payment outcomes were not sensitive to the inclusion or exclusion of practice- and market-level characteristics. (See Appendix Exhibit A-9 for practice-level characteristics and Appendix B.1.5 for sensitivity analyses.)

Area Deprivation Index. The ADI is a validated measure of community resources that enable better health and access to care. The ADI was designed to characterize neighborhood-level socioeconomic status. It was calculated using data at the nine-digit ZIP code level from 17 socioeconomic measures obtained from the American Community Survey, capturing education, income/employment, housing, and household characteristics. Scores were converted to national quintiles. Episodes were assigned an ADI score and quintile indicator based on the beneficiary's mailing address. Beneficiaries who did not have data to impute missing values or had an address outside of the United States were dropped.

Episode-and Patient-Level Characteristics

When practices voluntarily elect to participate in a new payment model, the characteristics of the patients served by the practice may influence participation decisions. The percentage of episodes initiated by patients who were Black, Hispanic, or dually eligible was similar between OCM and non-OCM practices. OCM and non-OCM patients were also located in communities with a similar distribution of community resources and ADI scores.

OCM episodes had a greater portion of patients living in metropolitan areas, but lower proportions in micropolitan areas, suggesting that patients living in less densely populated areas were slightly underrepresented in OCM (Exhibit 4).

In addition to patient characteristics, we examined whether the mix of cancers treated in OCM episodes differed from those treated in non-OCM episodes (**Exhibit 5**). In aggregate, a lower proportion of lower-risk episodes and a greater proportion of higher-risk episodes were treated under OCM than outside OCM. Higher-risk episodes have driven total episode payments (TEP) reductions in OCM. If OCM were extended to the remaining FFS Medicare population, the slightly lower mix of higher-risk cancers could translate to smaller reductions than documented in this evaluation.

Discussion

Despite the voluntary nature of OCM, participants' patient-, practice-, and market-level characteristics were largely similar to those of non-participants. However, OCM practices had a greater share of episodes for high-risk cancers and were more likely to be affiliated with academic medical centers than non-participating practices. OCM practices also tended to be larger than non-participating practices. Sensitivity analyses indicated that our impact estimates were nearly identical whether we controlled for these characteristics or not. There are not enough data to understand whether rural patients and practices were well represented in OCM, or whether their outcomes differed from those of rural patients served by non-participating practices. Fewer than 3 percent of episodes nationwide were triggered by rural residents. Taken in total, OCM had good reach and representation.

1.5 Organization of This Report

Eight chapters make up this report, including this background chapter (**Chapter 1**). Chapters 2–6 present estimated OCM impacts and trends through PP9. In each of these chapters, we provide a brief summary of the key findings and important context related to data

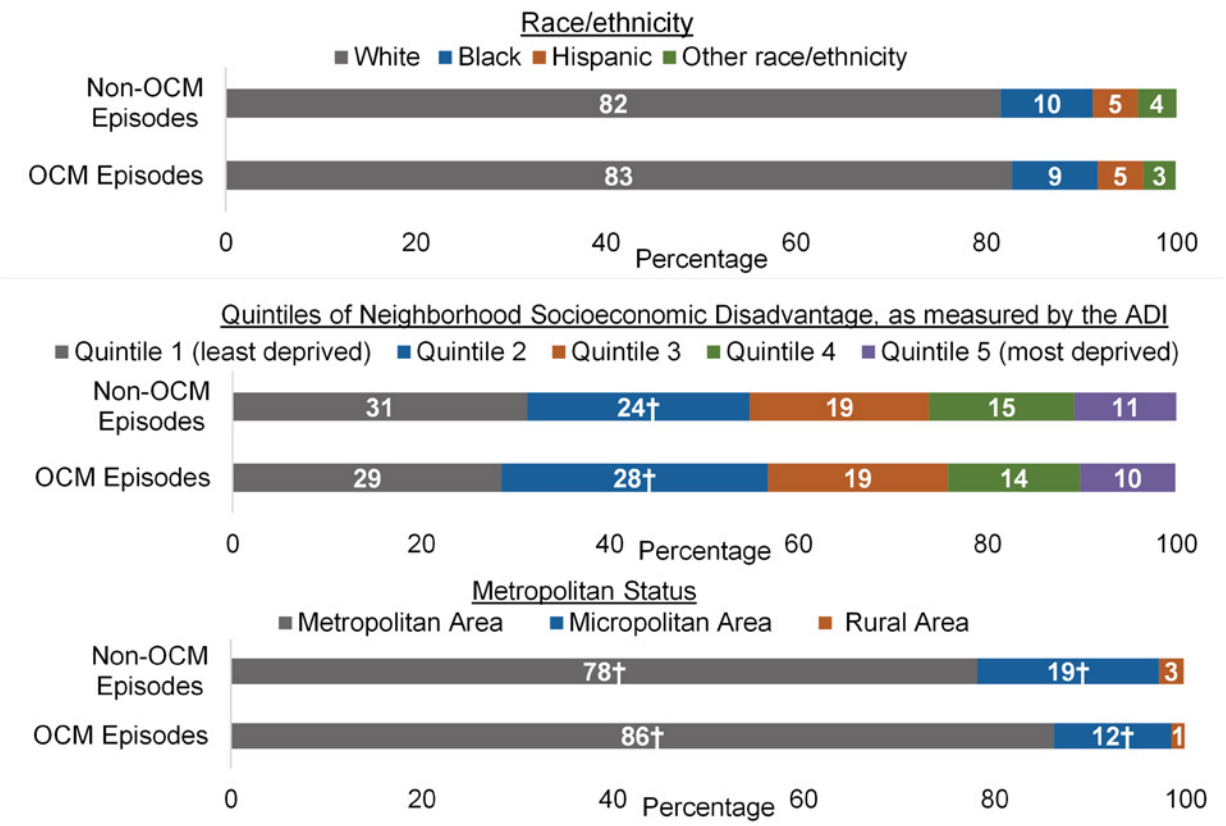
Exhibit 3: Markets Served by OCM Had Similar Demographics, but Higher Physician Supply and MA Penetration

Characteristics	OCM Practices Average	Non-OCM Practices Average	Difference
Median household income	$55,654	$56,227	-$573
Percentage of population with less than high school diploma	13.6%	13.6%	0.00%
Number of primary care physicians per 10,000	8.9	8.5	0.4†
Number of specialists per 10,000	13.4	12.1	1.3†
Percentage of MA penetration	31.4%	29.7%	1.70%†

Source: Medicare claims 2014–2021.
Notes: N=196 OCM practices and N=3,594 non-OCM practices with data in the baseline. Markets are defined as the counties where practice is located. †Absolute value of the standardized difference > 0.10. See Appendix Exhibit A-29 for other market-level findings MA: Medicare Advantage.

and analyses, and point readers to the Appendix for additional information. Chapter 2 addresses impacts on Medicare payments and net Medicare spending. Chapter 3 discusses OCM impacts on use of services. Chapter 4 and Chapter 5 review impacts on clinical care, including treatment for cancer, adoption of novel therapies, high-value use of supportive care medications, and other clinically relevant impacts. Chapter 6 reports on trends in patient-reported care experience and practice-reported quality. Chapter 7 discusses the impact of OCM on populations that have historically been underserved. Chapter 8 offers a brief conclusion.

Exhibit 4: At Baseline, Patients Served by OCM Practices Had Similar Demographics, but Were More Likely To Be Drawn from Metropolitan Communities



Source: Medicare claims 2014–2021.

Notes: Non-OCM episodes reflect all episodes not attributed to OCM practices, not just those attributed to the comparison group. N=345,881 OCM episodes and 925,119 non-OCM episodes. †Absolute value of the standardized difference > 0.10. Race was identified using the RTI race code reported on Medicare enrollment data. "Other race/ethnicity" included Asian/Pacific Islander, American Indian, Other, and Unknown. Generalization of findings for rural episodes was unreliable because of the small sample size of rural episodes.

Exhibit 5: OCM Had a Larger Share of Higher-Risk Episodes at Baseline

Characteristics	OCM Episodes Percent	Non-OCM Episodes Percent	Difference, Percentage Point
All lower-risk cancer types	32.8	38.9	-6.1†
All higher-risk cancer types	67.2	61.1	6.1†

Source: Medicare claims 2014–2021.

Notes: N=345,881 OCM episodes and 925,119 non-OCM episodes. †Absolute value of the standardized difference > 0.10. See Appendix Exhibit A-27 for results by episode cancer type.

Did OCM Lower Medicare Payments and Generate Net Medicare Savings?

CONTEXT AND KEY FINDINGS

A key objective of OCM is to lower Medicare spending while maintaining or improving quality of care. This chapter focuses on OCM's impact on Medicare payments.

OCM reduced total episode payments by 1.7 percent.

OCM reduced total episode payments in all performance periods The largest reduction in total episode payments occurred in Performance Period 8, which coincided with a substantial number of OCM practices making changes in risk arrangements. It was also the first performance period to occur entirely within the COVID-19 PHE.

The relative reduction in total episode payments was driven by savings in higher-risk episodes.

Higher-risk episodes are treatment intensive and make up two thirds of all episodes. The largest reductions were observed for breast cancer, lymphoma, lung cancer, and colorectal/small intestine cancer.

These was no change in payments for lower risk episodes. These cancers were medically less complex and typically treated with lower-cost drugs and fewer expensive services. Thus, these episode types may afford practices fewer opportunities to reduce payments and improve value.

Payment reductions were largely due to spending on supportive care drugs.

OCM reduced Part B non-chemotherapy drug payments relative to comparison episodes. The change was largely due to spending on supportive care drugs. Non-chemotherapy drugs make up 8 percent of total episode payments but accounted for approximately half of the overall relative reductions generated by OCM.

Yet OCM had no impact on chemotherapy payments, which were a larger component of spending and were a focus of the model. OCM also had no impact on physician, PAC, or emergency department (ED) payments, nor on acute-care hospitalization (ACH) payments, which were the largest contributor to Part A payments.

OCM is still resulting in net losses through Performance Period 8, but greater payment reductions in recent performance periods are beginning to balance out model payments to participants.

Across eight performance periods, OCM led to cumulative net losses of $528M. From Performance Periods 3 through 8, OCM generated net losses in both higher-risk and lower-risk episodes. However, higher-risk episodes generated net savings that were sufficient to cover MEOS payments in Performance Periods 7 and 8.

The Oncology Care Model (OCM) aims to lower Medicare spending while maintaining or improving quality of care. The main measure of Medicare spending is total episode payments (TEP), which includes total Medicare fee-for-service (FFS) payments attributed to an OCM episode, but not Monthly Enhanced Oncology Services (MEOS) or performance-based payments (PBPs).

We conducted difference-in-differences (DID) analyses to assess the impact of OCM on TEP, and which components of Medicare payment (Part A, B, or D) contributed to any relative changes. The DID analyses estimate the OCM impact as the change in average payments between the baseline and intervention periods for OCM episodes, relative to the change in payments for comparison episodes. We also explored whether the OCM impact differed over time across PPs through PP9, by cancer episode risk group, or by individual cancer episode type. We end the chapter with an assessment of whether OCM yielded net reductions or net increases in Medicare spending. Appendix A.1.8 provides detail on the DID analysis framework.

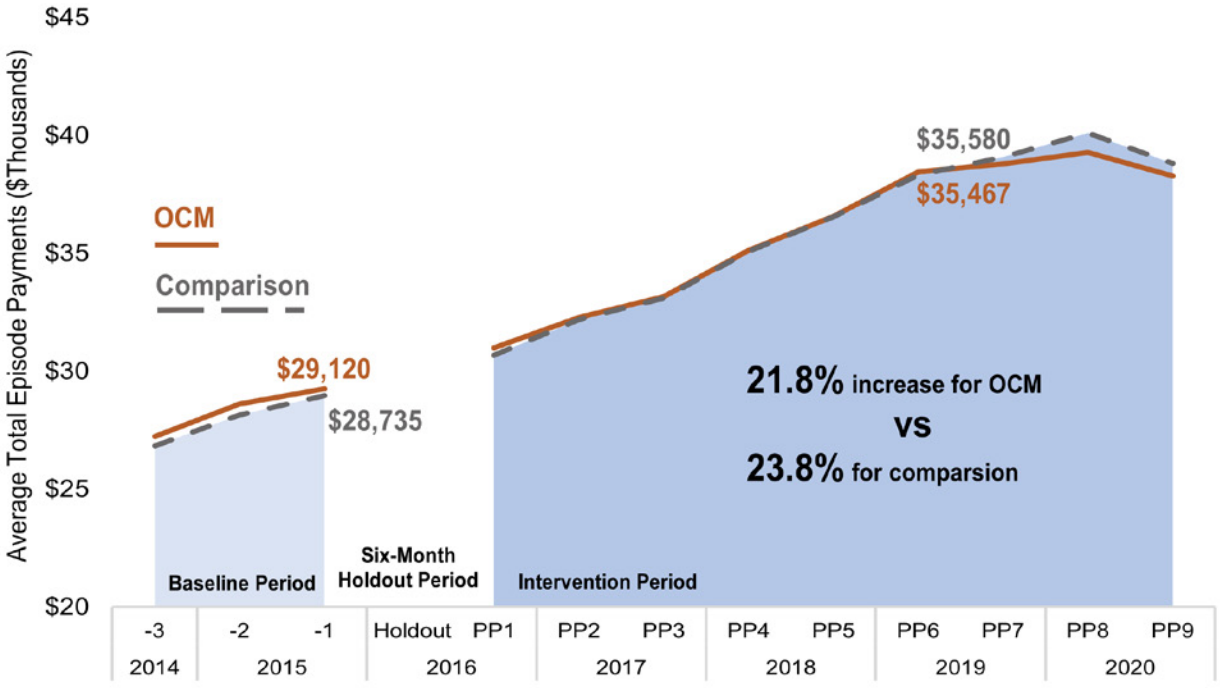
2.1 OCM Impacts on Payments

OCM had larger impacts on total episode payments in recent performance periods; reductions were limited to higher-risk episodes.

In the Evaluation Report for PP1–PP5, we showed that, on average, OCM led to a relative reduction in TEP of 1 percent. After including four additional PPs in analyses, we found that OCM reduced TEP by $499 relative to among comparison episode costs, or -1.7 percent of baseline—a slightly larger impact.

Exhibit 6 shows the trajectory of episode payments over the baseline and intervention period and illustrates OCM's impact on TEP. During the baseline period, OCM payments exceeded comparison group payments by 1.3 percent: average risk-adjusted TEP for OCM equaled $29,120, while average risk-adjusted TEP for the comparison group equaled $28,735. Payments rose rapidly during the OCM period of performance, for both OCM and comparison episodes of care, but more slowly for the former. Average risk-adjusted TEP for OCM episodes rose to $35,467 (a 21.8-percent relative increase) between the baseline and the intervention periods, while TEP for comparison episodes rose to $35,580 (a 23.8-percent relative increase). TEP for both OCM and comparison episodes peaked in PP8 and declined during PP9. On average, the relative increase in TEP was slightly greater for the comparison group than for OCM, yielding an estimated relative reduction of $499 per episode.

Exhibit 6: OCM Slowed the Increase in Total Episode Payments by $499 or 1.7% Relative to Baseline Payments



Source: Medicare claims 2014–2021.
Notes: To ensure no overlap between baseline and intervention episodes, the evaluation omitted episodes in a six-month hold-out period, including episodes that started from January 2, 2016, through June 30, 2016. TEP: Total episode payment. PP: Performance period.

The OCM impact on TEP was larger in the three most recent PPs (PP7–PP9) than in prior PPs (**Exhibit 7**). While PP2–PP6 had impact estimates ranging from -$286 to -$371, the impact estimates in PP7–PP9 were two to three times larger (ranging from -$687 to -$1,208). The largest single PP reduction occurred in PP8, which followed periods where a substantial number of practices changed from one-sided to two-sided risk and others opted out of reconciliation, as permitted during the COVID-19 public health emergency (PHE). That was also the first PP to occur entirely within the COVID-19 PHE. Our risk-adjustment method was designed to account for potential differences related to the COVID-19 PHE, by excluding episodes with a COVID-19 diagnosis during the episode from the analysis (consistent with the program rules). For additional detail on the approach used to account for potential bias to our estimates from the COVID-19 PHE, see **Appendix A.1.9**.

The impact of OCM varied by risk group and cancer type

Higher-Risk and Lower-Risk Episodes. Cancer is not a single disease, and each type of cancer has different treatments, side effects, costs, and potential for savings. CMS assigns each cancer episode to 1 of 24 cancer types. Twenty-one cancers are considered higher-risk, and episode costs are much higher because treatment typically involves cytotoxic chemotherapy, targeted therapy, and/or immunotherapy, which often have side effects.

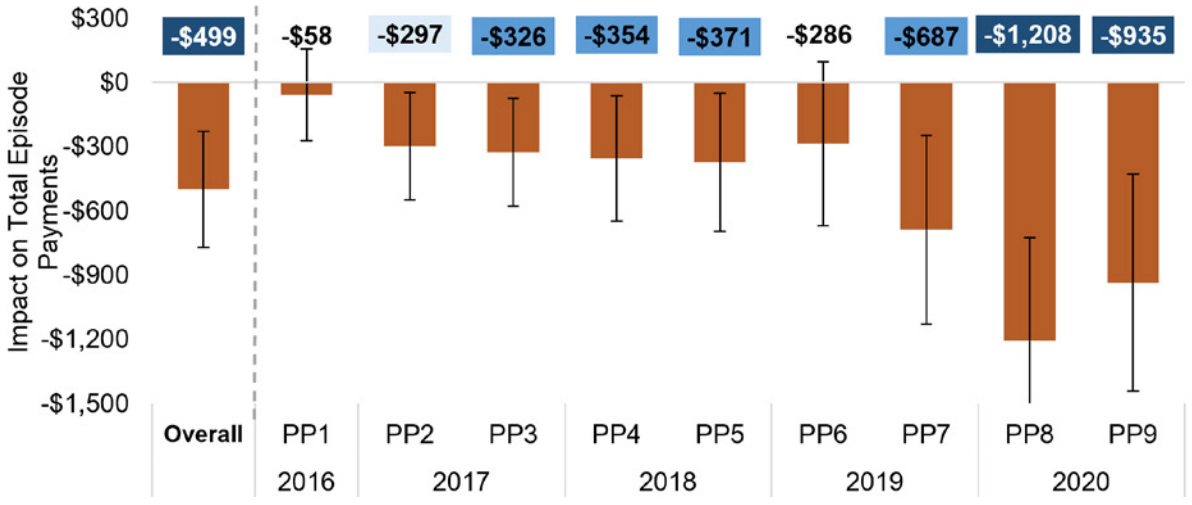
The three remaining types of cancer are categorized for OCM as lower-risk (low-intensity prostate cancer, low-risk breast cancer, and low-risk bladder cancer). These cancers are treated with hormonal therapies or local therapies, and patients typically have fewer side effects from their cancer or treatment; episode costs tend to be modest.

OCM impact differed by cancer episode risk group (**Exhibit 8**). Lower-risk episodes had a slight increase in TEP, while reductions in TEP were concentrated in higher-risk episodes, and specifically in high-risk breast cancer, lymphoma, colorectal, and lung cancer.

For higher-risk OCM and comparison episodes, average TEP increased over time, from the baseline period up through PP6, before flattening out in PP7–PP9 (**Exhibit 9**). For lower-risk-episodes, which make up 34 percent of all episodes, TEP was relatively flat throughout the baseline and intervention periods. For both higher- and lower-risk cancers, average TEP was higher for OCM practices than comparison practices in the baseline. For higher-risk cancers, the difference narrowed and then reversed in the intervention period, thereby generating the $755 reduction in TEP, representing -1.9 percent of baseline.

Exhibit 10 breaks out the trajectory of risk-adjusted TEP by PPs for lower- and higher-risk episodes. On average, OCM led to a relative reduction in TEP for higher-risk episodes in all PPs through PP9. Until PP7, relative reductions for higher-risk episodes were approximately $400–600 per episode and increased after PP7. In contrast, for lower-risk episodes, OCM contributed to an average 1-percent increase in TEP. Looking at individual PPs, there were small, but statistically significant, relative increases in payments concentrated in PP2–PP4. In the most recent PPs, TEP was slightly lower for lower-risk OCM episodes relative to comparison episodes, but the impact was not statistically significant. For the purposes of the evaluation, lower-risk episodes were predominantly what OCM categorized as low-risk breast cancer and lower-intensity prostate cancer. These cancers were medically less complex and typically treated with lower-cost drugs and fewer expensive services. Thus, these episode types may afford practices fewer opportunities to reduce payments and improve value.

Exhibit 7: The Impact of OCM on Reductions in Total Episode Payments more than doubled in Performance Periods 7-9



Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: Whisker bars represent 90% confidence intervals. TEP: Total episode payment. PP: Performance period. PP1 began July 1, 2016. Each subsequent calendar year had two six-month PPs, from January-June, and July-December.

The relative reduction in TEP was concentrated in episodes for high-risk breast cancer, lung cancer, lymphoma, and colorectal/small intestine cancer.

The significant relative reduction in TEP by episode cancer type was concentrated in four high-risk cancer bundles (high-risk breast cancer, lung cancer, lymphoma, and colorectal/small intestine cancer) (Exhibit 11). These cancers collectively accounted for approximately 30 percent of all episodes and approximately 44 percent of higher-risk episodes through PP9.

OCM impact on Medicare payments varied across Part A, Part B, and Part D.

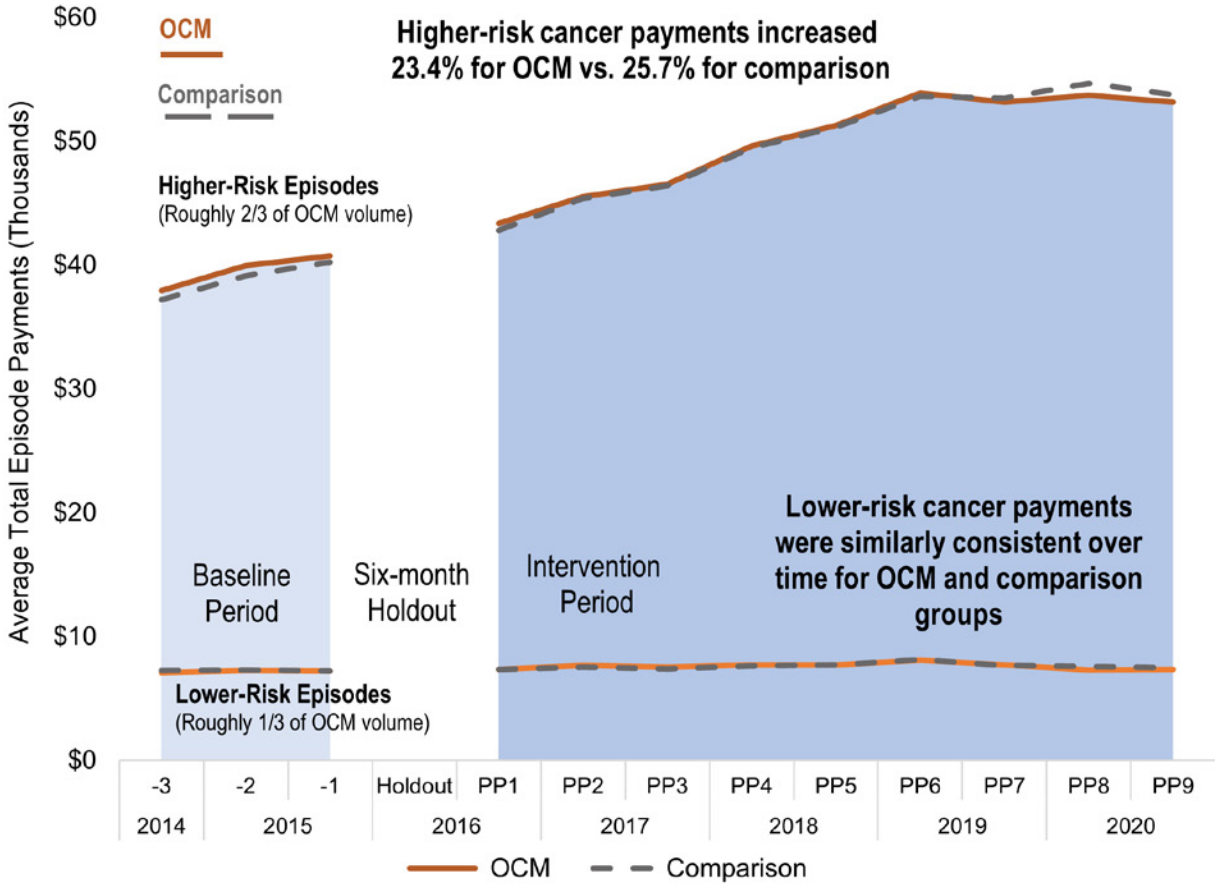
TEP includes payments for hospital inpatient and outpatient services, chemotherapy and non-chemotherapy drugs, physician services, diagnostic testing, and various ancillary services. These are paid by Medicare under Part A, Part B, and Part D. We assessed the impact of OCM payments across these Medicare parts to understand the underlying drivers behind observed reductions in payments. Section 3.1 reports on complementary changes in the use of select services that

Exhibit 8: OCM Reduced TEP for Higher-Risk Episodes but Increased TEP for Lower-Risk Episodes (PP1–PP9)

Episode Group	PP1–PP9 OCM Impact on TEP Relative to Comparison Group	Size of Impact
All episodes	$499 reduction	-1.7% of baseline
Higher-risk episodes	$755 reduction	-1.9% of baseline
Lower-risk episodes	$72 increase	+1.0% of baseline

Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: Total episode payment. PP: Performance period.

Exhibit 9: Higher-Risk Episode Payments Grew Sharply Over Time, though Growth Flattened Performance Periods 7-9; Lower-Risk Episode Payments Were Flat



Source: Medicare claims 2014–2021.
Notes: To ensure no overlap between baseline and intervention episodes, the evaluation omitted episodes in a six-month hold-out period, including episodes that started from January 2, 2016, through June 30, 2016. PP: Performance period. TEP: Total episode payment.

are covered under each of the Medicare payment Parts A, B, and D.

Exhibit 12 presents the share of Medicare spending by Part A, Part B, and Part D components, for OCM in the baseline and intervention periods. TEP increased cumulatively by 21.8 percent for OCM episodes and by 23.8 percent for comparison episodes between the baseline and intervention periods (PP1–PP9); similar trends were found for comparison episodes. Overall results include the following, with a detailed discussion in the sections below:

- **Part B** payments represent the largest portion of TEP, accounting for approximately 60 percent of overall TEP. The share of Part B payments remained relatively consistent over the evaluation period for OCM and comparison episodes. Within Part B, payments for chemotherapy drugs rose substantially for both OCM episodes and comparison episodes, rising from 27 percent of TEP in baseline to 33 percent for OCM in the intervention period and from 26 percent of TEP at baseline to 32 percent for comparison payments in the intervention period.
- **Part D** expenditures rose from approximately 23 percent of TEP during the baseline to 28 percent during the intervention period among OCM practices, and similarly increased from 24 percent to 29 percent for comparison practices.
- **Part A** payments declined both in absolute dollar terms and as a share of rising TEP. Part A payments declined from approximately 21 percent of episode cost in the baseline period to 16 percent during the intervention period for both OCM and comparison practices.

Exhibit 13 shows the estimated impact of OCM on Part A, Part B, and Part D payments for PP1–PP9.

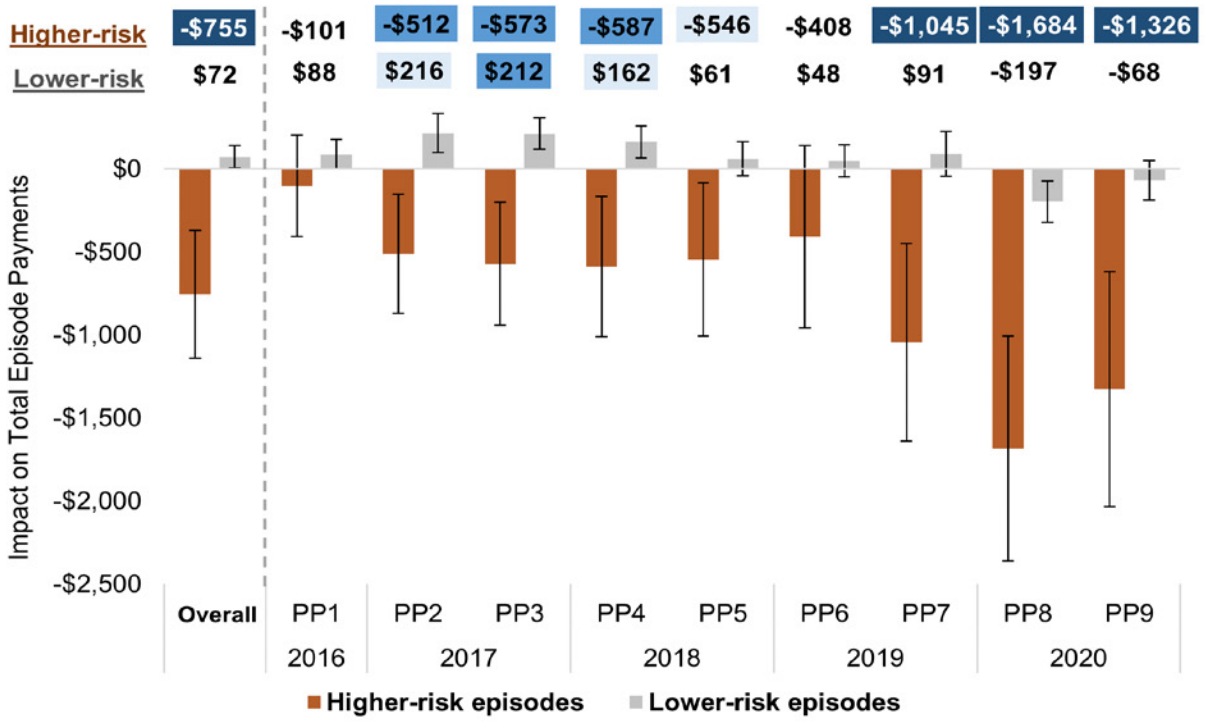
OCM had a small impact on Part A payments.

On average, OCM led to a reduction of $152 per episode in Part A payments. This statistically significant relative reduction represents 2.5 percent of OCM baseline Part A average payments. ACH payments are the largest component of Part A payments; OCM had no impact on ACH payments.

NSIGHT FROM THE FIELD

In case studies, OCM practices reported they were focusing on reducing preventable ED visits that could, in turn, generate savings on hospitalizations. While ACH payments fell over the intervention period, they fell for both OCM and comparison practices, and the decline among OCM practices was no greater. Instead, the relative reductions in Part A payments observed for OCM practices were primarily attributed to Other Inpatient payments (Appendix Exhibit B-3).

Exhibit 10: Relative Reductions in Total Episode Payments Were Driven by Higher-Risk Episodes; Impact Grew Larger in Performance Periods 7-9



Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: Whisker bars represent 90% confidence intervals. TEP: Total episode payment. PP: Performance period. PP1 began July 1, 2016. Each subsequent calendar year had two six-month PPs, from January-June, and July-December.

OCM led to a small relative reduction in Part B payments, driven by changes in non-chemotherapy drug payments.

OCM Part B payments declined relative to comparison payments, on average, by $276 per episodes, representing 1.6 percent of the OCM baseline average value.

The relative reductions in Part B payments were concentrated in Part B non-chemotherapy drugs, which are typically used for supportive care in treating cancer; e.g., anti-emetic medications to prevent nausea or white blood cell growth factors to prevent neutropenia (Exhibit 14). There were no significant changes in Part B chemotherapy payments, E&M payments, lab, or radiation therapy payments despite opportunities to improve value under OCM. Non-chemotherapy drugs make up 8 percent of TEP but accounted for approximately half of the overall relative reductions generated by OCM.

RELATED SECTIONS

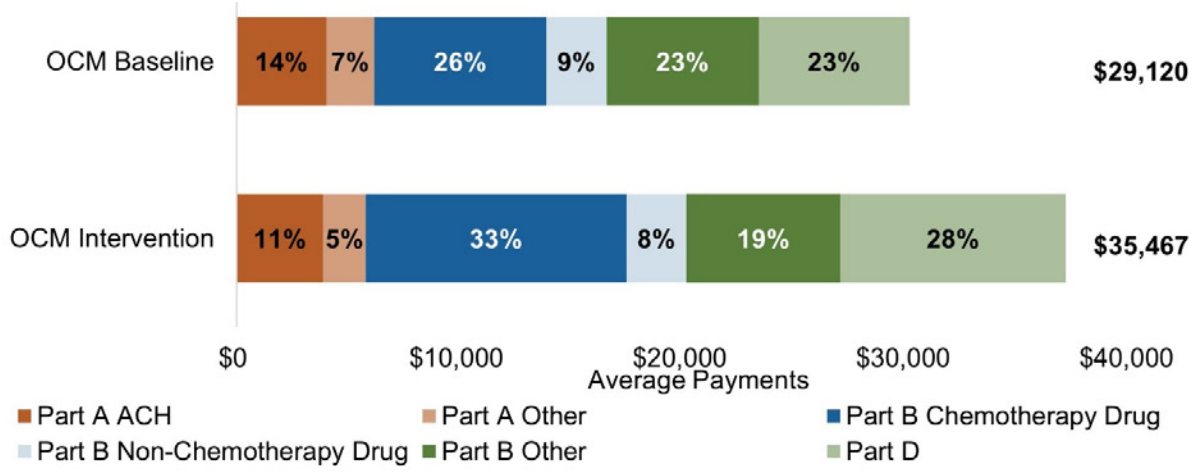
See Section 5.1 for more about use of bone-modifying agents, Section 5.2 for more about use of anti-emetic medications, and Section 5.3 for more about use of white blood cell growth factors.

Exhibit 11: Four Higher-Risk Episode Types Generated the Largest Reductions in Total Episode Payments

Episode type	Number of Episodes		Impact Estimates	
	OCM	COMP	Estimated OCM Impact	Percent Change Relative to Baseline
Low-risk breast cancer	355,083	364,581	$2	0.0%
High-risk breast cancer	152,752	151,896	-$1,166	-3.2%
Low-intensity prostate cancer	126,185	188,159	$65	0.6%
Lung cancer	141,563	149,973	-$1,092	-2.7%
Lymphoma	88,461	87,691	-$1,531	-3.4%
Colorectal/small intestine cancer	79,303	83,292	-$1,290	-3.6%
Multiple myeloma	90,605	93,745	-$452	-0.8%
Non-reconciliation eligible cancers	74,515	100,827	-$153	-0.4%
High-intensity prostate cancer	59,838	70,448	-$527	-1.3%
Chronic leukemia	52,000	53,731	$332	0.7%

Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: Episode types are ordered from most to fewest OCM episodes COMP: Comparison group.

Exhibit 12: Part B and Part D Drug Spending Drove the Growth in Payments Between the Baseline and Intervention Periods



Source: Medicare claims 2014–2021.
Notes: See Appendix Exhibit B-5 for breakout of TEP categories for higher/lower-risk cancer types. All values are risk-adjusted. Part A Other includes: other inpatient hospital payments, skilled nursing facility payments, home health payments, inpatient rehab facility payments, long-term care facility payments, and hospice payments. Part B Other Includes: chemotherapy administration payments, radiation payments, non-cancer evaluation and management (E&M) payments, cancer E&M payments, imaging payments, lab payments, and other Part B non-institutional payments without Monthly Enhanced Oncology Services. ACH: Acute-care hospitalizations.

The evaluation investigated how OCM created clinical opportunities to improve value in the number and types of supportive care drugs prescribed to patients. OCM practices have increased use of less costly white blood cell growth factors, anti-emetics, and bone-modifying agents relative to in the comparison group. These shifts in use of supportive care drugs could explain the relative reductions observed in Part B non-chemotherapy spending.

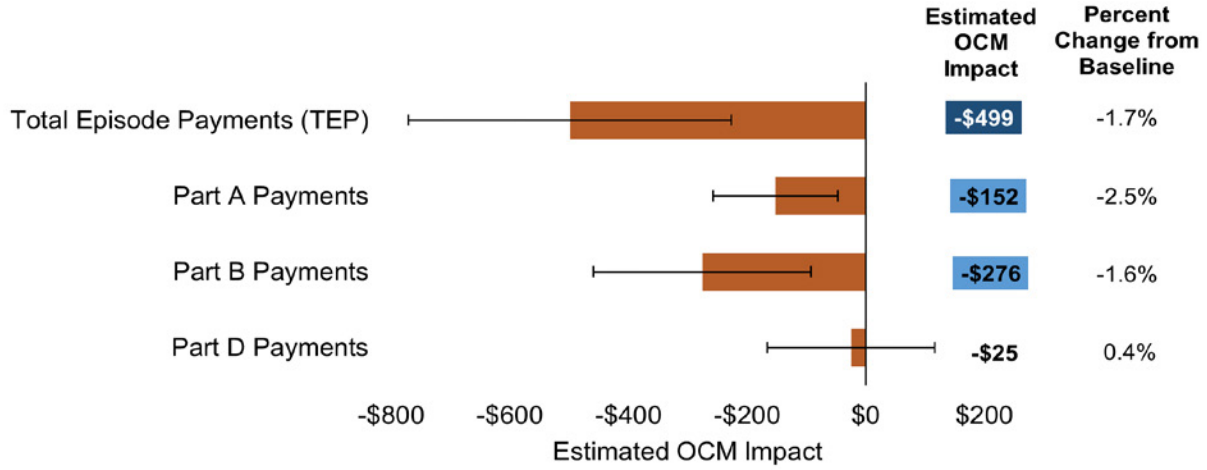
OCM had no impact on Part D payments.

Together with Part B chemotherapy drugs, Part D drug spending contributed significantly to the overall growth in TEP. On average, OCM and comparison episodes show similar increases in Part D payments over the course of the evaluation period, with no significant impacts of OCM on Part D payments. However, as shown in Appendix Exhibit B-2, there was a marked change in PP8–9, when Part D spending increased less in OCM episodes than in comparisons by at least $200 per episode. Future analyses of PP10–11 will allow us to assess whether this reflects a persistent impact or if it was a transitory effect during the PHE.

Higher-risk episodes drove observed changes in Part A and Part B spending.

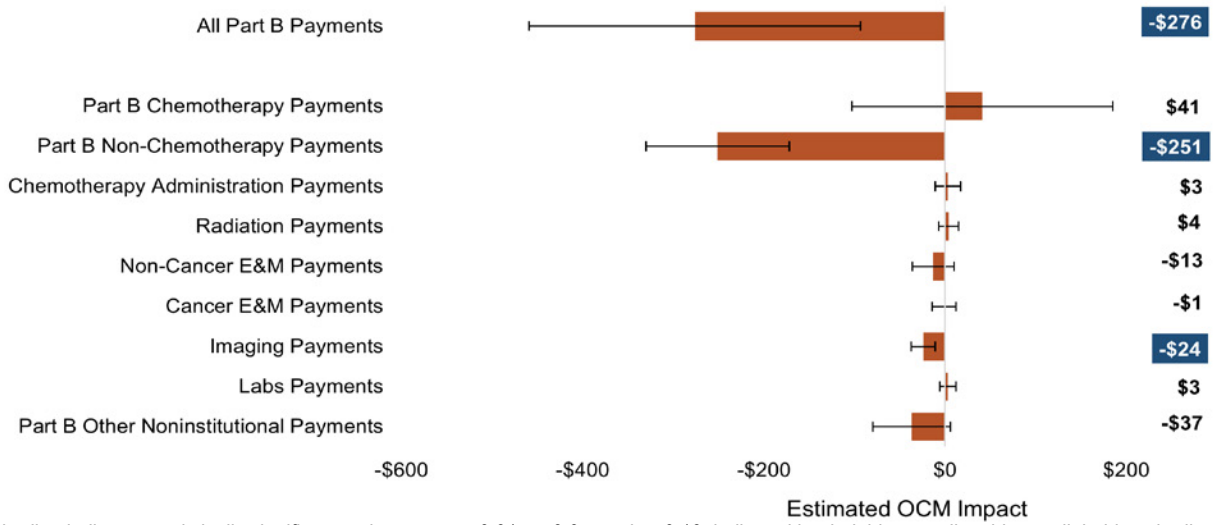
Exhibit 15 breaks out OCM's impact on Part A, B, and D spending by higher- and lower-risk episodes. The pattern of greater relative reductions in TEP among higher-risk episodes is similar when analyzing Part A, Part B, and Part D as individual components of TEP. The observed reductions in total Medicare payments from OCM were driven almost entirely by reductions in payments in higher-risk episodes. OCM reduced Part A payments among higher-risk cancers by $245 (versus $152 overall) and Part B payments by $403 (versus $276 overall). There remained no impact on Part D for either higher- or lower-risk episodes overall.

Exhibit 13: OCM Led to a Relative Reduction in Part A and Part B Payments



Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: Whisker bars represent 90% confidence intervals. TEP: Total episode payment. DID: Difference-in-differences.

Exhibit 14: Reductions in Part B Payments Were Concentrated in Non-Chemotherapy Drugs



Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: Whisker bars represent 90% confidence intervals. DID: Difference-in-differences. E&M: Evaluation and management. MEOS: Monthly Enhanced Oncology Services.

2.2 Payment Impacts among Chemotherapy and Non-Chemotherapy Drugs

Non-chemotherapy drugs drove reductions in Part B payments.

Non-chemotherapy drugs drove reductions in Part B payments overall for higher-risk episodes, and this reduction is particularly pronounced for four common higher-risk episode cancer types: high-risk breast cancer, lung cancer, colorectal/small intestine cancer, and high-intensity prostate cancer (Exhibit 16). This effect is consistent with our understanding of where OCM practices perceived opportunities to change prescribing patterns for higher-value use of non-chemotherapy drugs in supportive care. That is, focusing care redesign on high-volume cancers provides bigger returns for the same effort it would take to redesign care for lower-volume cancers.

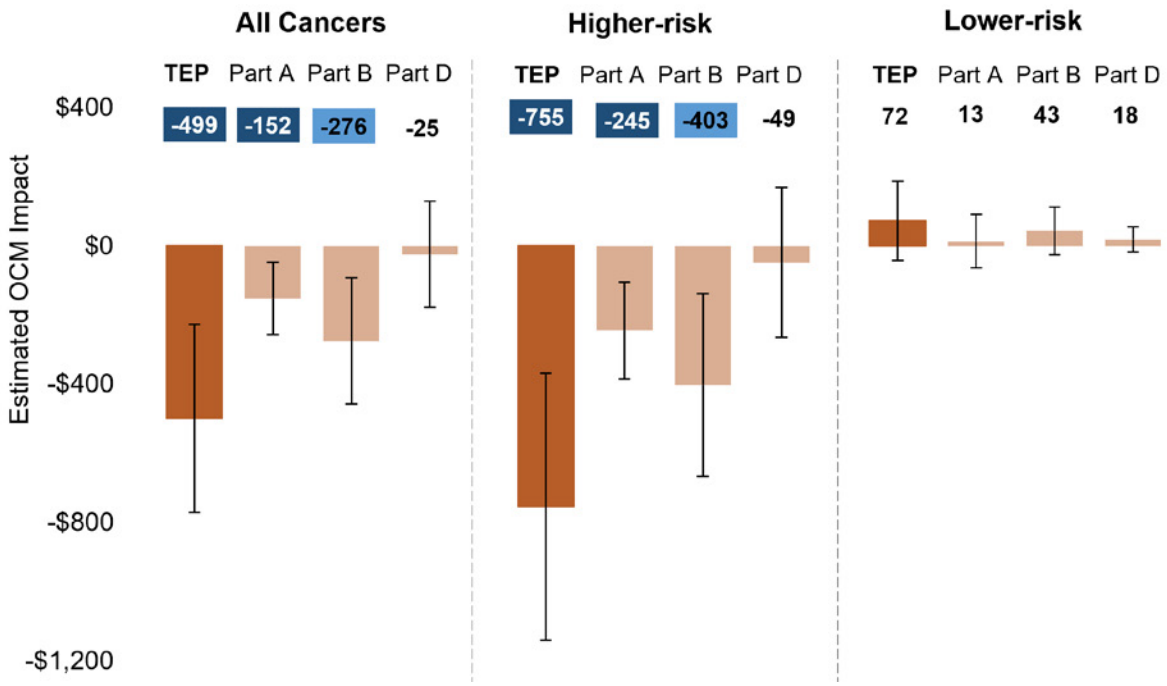
Part B non-chemotherapy drug payments accounted for most of the observed relative reductions in Part B spending. Yet, non-chemotherapy drugs make up only 7–9 percent of the overall accountable spending for OCM practices. As discussed further below, OCM has not led to reductions in payments for chemotherapy drugs or care that is primarily related to cancer treatments (see Appendix B.1.2 for additional findings for higher- and lower-risk episodes).

2.3 Net Impact on Medicare Spending

The change in net payments is defined as the change in total "gross" episode payments for cancer care (calculated as the change in TEP times number of episodes) plus total payments made to OCM practices for MEOS and PBPs.[15] We calculated net savings or losses to Medicare through PP8. Results through PP9 were not included because episode reconciliation data were not yet available at the time of writing. Therefore, net payments are calculated using TEP estimates from PP1-PP8, whereas the rest of the report presents TEP estimates that include PP9 as well. We also examined whether savings generated from TEP reductions cover the costs of MEOS (excluding PBPs) for higher- and lower-risk cancers.

Over PP1–PP8, OCM led to average TEP reductions equal to $429, generating gross savings to Medicare. However, when MEOS and PBPs are included in the calculation, OCM resulted in net losses to Medicare. Cumulatively, from PP1 through PP8, total payments on OCM episodes of care fell by $446M. MEOS payments plus PBPs equaled $970M, yielding a net cumulative increase in Medicare payments of $528M, or $504 per episode.

Exhibit 15: OCM Reduced Part A and Part B Payments; Reductions Were Driven by Higher-Risk Episodes



Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: Whisker bars represent 90% confidence intervals. DID: Difference-in-differences. TEP: Total episode payment.

[15] The gross change in Medicare payments was calculated by multiplying the number of OCM episodes by the estimated impact of OCM on TEP. We refer to the gross change in payments as gross Medicare savings (or losses). MEOS payments and PBPs are obtained from the CMS OCM program data. The number of OCM episodes is also taken from program data. Net Medicare savings (or losses) is the sum of gross Medicare savings (losses), PBPs, and MEOS payments.

OCM resulted in net, but decreasing, losses to Medicare in each of Performance Periods 1-8.

Medicare incurred net losses in each PP, although individual PP losses were smaller in later periods than in earlier periods. The magnitude of the respective cost components—TEP, MEOS, PBPs—varied over time (**Exhibit 17**).

- Driven by larger estimated savings in TEP, gross Medicare savings increased over time, from approximately $8M in PP1 to $134M in PP8.
- Medicare's costs associated with MEOS payments trended downward from $98M in PP1 to $77M in PP8, as participation declined over time, leaving fewer episodes covered by MEOS.
- Total PBPs to practices in each PP were between $14M and $33M in PP1–PP7. However, in PP8, PBPs increased sharply to $92M, likely due to selection effects introduced by the program changes discussed in Section 1.1.
- Net losses (defined as the sum of TEP savings plus the cost of MEOS and PBP payments) were largest in PP1 when net costs increased by $105M ($750 per episode). Net losses were smallest in PP7 and PP8, when costs rose by $28M and $39M, respectively ($167 and $325 per episode).

RELATED SECTIONS

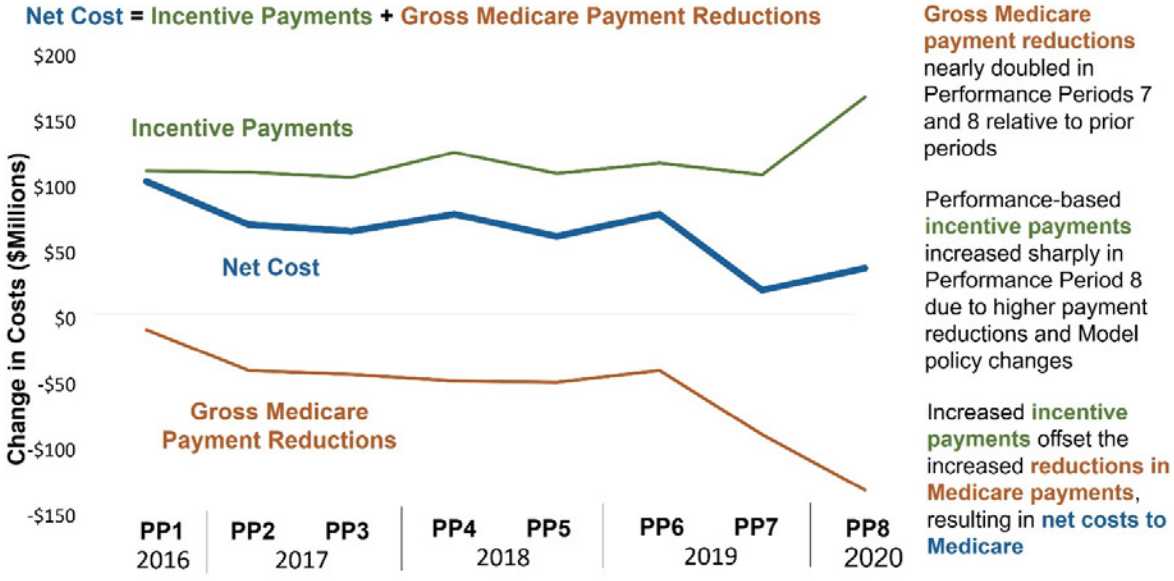
CMS held practices accountable for quality of care by calculating an Aggregate Quality Score (AQS) using several quality measures. See Section 6.3 for more about changes in AQS performance over time and implications for PBPs.

Exhibit 16: Payments for Non-Chemotherapy Drugs Drove Part B Payment Reductions

Subgroup	Estimated OCM Impacts Through PP9		
	Part B Payments	Part B Chemo Payments	Part B Non-Chemo Drug Payments
All cancers	-$276	$41	-$251
All higher-risk cancers	-$403	$101	-$374
High-risk breast cancer	-$993	-$467	-$419
Lung cancer	-$565	$96	-$438
Colorectal/small intestine cancer	-$1,115	$16	-$714
High-intensity prostate cancer	-$801	-$214	-$554

Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: PP: Performance period.

Exhibit 17: Despite Gross Payment Reductions, OCM Resulted in Net Costs to Medicare in Every Performance Period After Accounting for Monthly and Performance-Based Payments: PP1–PP8



Source: Medicare claims 2014–2021 and OCM program data.
Notes: PP: Performance period. Incentive payments included $160 per-beneficiary in Monthly Enhanced Oncology Services payments, as well as performance-based payments for achieving payment and quality thresholds. Gross payment reductions were equal to the average reduction in total episode payments multiplied by the total number of episodes.

Savings on higher-risk cancer episodes covered the cost of monthly payments in Performance Periods 7 and 8; in all other performance periods, monthly payments exceeded episode savings.

OCM generated larger relative reductions in TEP for higher-risk than for lower-risk cancer episodes (see Section 2.1). It is not possible to fully break down Medicare savings and losses by cancer type, since MEOS is paid for individual episodes, but PBPs are earned by the practice. Therefore, any allocation of PBPs to individual episodes would involve unsubstantiated assumptions. However, we examined whether TEP savings were sufficient to cover the cost of MEOS alone (See Appendix B.1.4 for detailed findings).

For higher-risk episodes, OCM resulted in TEP savings in each period from PP3 to PP8. In some PPs, these savings were sufficient to cover MEOS. In PP3–PP6, MEOS payments exceeded TEP savings, so that Medicare payments rose between $154 (PP4) and $293 (PP6) per episode. Reductions in TEP became large enough to offset MEOS payments in PP7 ($375 per episode) and PP8 ($959 per episode).

For lower-risk episodes, MEOS payments were not covered by TEP savings in any PPs. In fact, in all but PP8, TEP increased for lower-risk episodes, generating losses rather than savings. On average, in PP3–PP7, the combined effect of TEP increases and MEOS payments increased Medicare payments between $635 (PP6) and $832 (PP3) per episode. In PP8, OCM led to an estimated reduction in TEP for lower-risk episodes, but this was still insufficient to cover MEOS. On average, MEOS payments exceeded lower-risk TEP savings by $440 per episode in PP8.

2.4 Discussion

Average TEP increased substantially from the baseline through the first 3 and a half years of the intervention period, before leveling off in the last year. The pattern affected both OCM and comparison episodes and was driven almost entirely by increases in Part B chemotherapy and Part D drug spending. However, OCM slowed this increase by $499, or 1.7 percent. These reductions were limited to higher-risk cancers, with statistically significant reductions occurring for four cancer types: high-risk breast cancer, lung cancer, lymphoma, and colorectal/small intestine cancer.

Payment reductions were also largely driven by changes in spending on supportive care drugs. Although only 8 percent of TEP was spent on non-chemotherapy drugs, more than half of the reductions in TEP were attributable to changes in payments for these drugs. Significant reductions in Part A payments accounted for the remainder of TEP reductions. Although Part B chemotherapy drugs and Part D drugs constitute the largest categories of TEP, OCM did not have a significant impact on payments for either category of chemotherapy drugs.

OCM achieved significant reductions in TEP in seven of the first nine PPs, and reductions in PP7-9 were double or triple the size of reductions in the preceding PPs. Despite this, OCM yielded net losses to Medicare in each of the first eight PPs (reconciliation data for PP9 were not calculated in time for inclusion in this report), totaling $528 million cumulatively. Net losses in PP8 were primarily due to a sharp uptick in PBP, likely caused by selection effects resulting from program changes.

Forty-eight of the practices that continued participation in PP8 would have been required to take on two-sided risk in the absence of the COVID-19 PHE flexibilities. However, 29 of these practices opted out of reconciliation but remained in the Model. Of the 29 practices that opted out, none had PBPs by PP4, and only four earned a PBP by PP7. In contrast, of 21 practices that took two-sided risk in PP8 (including 19 who did so based on the new requirements), 10 had earned at least one PBP by PP4, and all but one had earned a PBP by PP7. This result suggests that practices that would otherwise have left the Model or faced the possibility of owing recoupment payments to CMS, instead continued to collect MEOS payments with limited promise of future success. At the same time, previously successful practices, which tended to be higher volume on average, faced lower discounts under two-sided risk. Lower discounts combined with higher volumes meant higher earnings potential for these practices relative to those under one-sided risk. Moreover, due to the COVID-19 PHE, these practices were more easily able to meet quality thresholds due to system-wide reductions in ED visits, and program rules relaxing mandatory reporting for practice-reported quality measures. The positive selection into two-sided risk, combined with higher potential earnings and easier quality achievements, is the most likely explanation for the large increase in PBP in PP8, which offset increased reductions in TEP.

Our results did show that gross savings for higher-risk cancer episodes covered the cost of MEOS alone (not PBPs) in PP7 and PP8. The forthcoming Enhancing Oncology Model (EOM) focuses on seven cancer types that tend to have higher risk of side effects and higher episode costs than the lower-risk cancers included in OCM. These results hold some promise that EOM will achieve net Medicare savings, particularly given EOM's reduced monthly payments relative to OCM, and mandatory two-sided risk.

Did OCM Affect Service Use Pattern?

CONTEXT AND KEY FINDINGS

OCM aimed to improve care coordination and quality of care. If effective, these changes would also impact service use.

OCM significantly reduced use of some types of hospital-based care.

OCM led to small but significant relative reductions in both the likelihood of an ED visit resulting in a hospital admission and the number of ED visits that resulted in hospital admissions. However, OCM had no impact on the probability of having an ED visit not resulting in a hospital admission. OCM also reduced the number of readmissions and the likelihood of ICU admissions.

OCM mostly did not affect outpatient and post-acute service use. Exceptions were mixed: use of some services increased while use of other services decreased.

OCM had no significant impact on cancer or overall evaluation and management (E&M) services and no significant impacts on the use of skilled nursing facilities. However, OCM led to a relative decrease in the likelihood of receiving a home health service. Changes in outpatient rehabilitation therapy services differed by higher- and lower-risk episodes, with higher-risk episodes seeing a relative increase in outpatient rehabilitation therapy and lower-risk episodes having a relative decrease in outpatient rehabilitation therapy.

OCM reduced end-of-life hospital admissions but did not affect other measures of end of life care.

OCM led to relative reductions in hospitalizations during deceased beneficiaries' last weeks of life. However, OCM did not impact ED visits, receipt of chemotherapy, nor use of hospice care in beneficiaries' last weeks of life.

OCM had one small impact on chemotherapy-associated ED visits among higher-risk episodes.

OCM yielded a small but significant reduction in the occurrence of chemotherapy-associated ED visits that did not lead to a hospital admission. OCM had no impact on chemotherapy-related hospital admissions nor on ED visits that resulted in hospital admissions.

The Oncology Care Model (OCM) aimed to provide higher-quality and better-coordinated oncology care than usual care. Key OCM components included increasing 24/7 access to care, using care coordinators and patient navigators, providing patient education, and relying on evidence-based methods to deliver effective and timely care. The care delivery reforms encouraged by OCM were hypothesized to affect service use patterns. For example, better care coordination may lead to reductions in hospitalizations or emergency department (ED) visits.

This chapter reviews OCM impact on health care use. To assess how OCM affected use, the chapter presents two sets of analyses.

1. First, we assessed whether OCM changed the *likelihood* that a service would be used at all.

2. Second, conditional on observing any use, we assessed whether OCM changed the *number of times* a service would be used. Measuring the likelihood of use of services gives insight into access, especially for preventive and appropriate care. For potentially avoidable services, likelihood measures can give insight into the effectiveness of care coordination. Measuring conditional use represents a new approach for this evaluation, as prior reports focused on overall use (i.e., including episodes with zero use, which make up the majority of episodes for most types of services). Measuring conditional utilization allows a more granular assessment that captures repeated use of a service and can better illuminate issues in care for high-utilization patients. This is also the first report where we separately analyzed ED visits that resulted in an admission and those that did not, which also allows a more complete picture of patient care trajectories.

Different measures of hospital and post-acute care (PAC) are inextricably linked. For example, reductions in readmissions through better care coordination may also manifest as reductions in total inpatient admissions or intensive care unit (ICU) stays. Changes in use of inpatient services will also have downstream effects on use of PAC, even if OCM did not directly affect PAC services. Therefore, while significant findings across multiple measures may represent distinct impacts of OCM, they may also represent fewer impacts but captured from several different angles.

3.1 Inpatient Service and ED Use

OCM significantly reduced the number of ED visits that resulted in hospital admissions but did not affect ED visits that did not result in a hospital admission.

There was a small, statistically significant reduction in the likelihood of an ED visit that resulted in an inpatient stay. The likelihood of having at least one ED visit that resulted in an inpatient stay was 21.3 percent at baseline there was a relative reduction of 0.3 percentage points ($p<0.10$), or 1.6 percent. This reduction translates to approximately 4,000 fewer episodes with ED visits resulting in inpatient stays over performance period (PP) 1 through PP9. In addition, for patients with at least one ED visit resulting in an inpatient stay, OCM led to a small, statistically significant decrease in the number of ED visits resulting in an inpatient stay (Exhibit 18). The number of these visits was reduced by 0.01 visits ($p<0.05$), representing a reduction of 0.8 percent in the baseline mean of 1.45 visits. This decrease translates to a conditional reduction of approximately 2,650 visits over PP1–PP9 for patients with OCM episodes of care. OCM had no effect on ED visits that did not result in an inpatient stay or on the occurrence of at least one ED visit of any type (Appendix Exhibit B-16). OCM practices commented that reducing these often "avoidable" ED visits was also a goal of care management. While rates declined, the reduction was similar in OCM and comparison episodes. We found no statistically significant differences in the likelihood or number of inpatient admissions between the OCM and comparison groups, overall, or among lower- and higher-risk episodes.

Results varied by cancer type. The reduction in the number of ED visits resulting in an inpatient stay was driven by significant impacts for lymphoma and multiple myeloma, each falling 2 to 3 percent relative to baseline values (Appendix Exhibit B-19). Conversely, chronic leukemia exhibited significantly higher relative utilization in total ED visits among episodes with at least one ED visit: both for ED visits that resulted in an inpatient admission and those that did not.

NSIGHT FROM THE FIELD

In case studies, most OCM practices said that they had a goal of minimizing avoidable ED visits and hospitalizations. For example, at one practice, interviewees reported that they were working on reducing ED visits and hospitalizations prior to OCM, but that participation in OCM renewed that effort by implementing new approaches such as increasing use of ambulatory care. An oncologist at the practice reported that "the push to see our patients here as opposed to sending them to the ED was facilitated by OCM."

OCM reduced the number of readmissions among patients with at least one readmission, and the likelihood of an ICU admission among all patients.

OCM reduced the number of 30-day readmissions among episodes with at least one readmission, a 1.2 percent reduction relative to baseline ($p<0.10$; **Exhibit 18**), or an estimated reduction of approximately 1,200 fewer episodes with a readmission over the intervention period. Reductions were driven by unplanned readmissions, which make up most readmissions. The likelihood of ICU admissions also fell for OCM episodes relative to the comparison group. OCM reduced the likelihood of ICU admissions by 0.6 percentage points, or 5.7 percent of baseline ($p<0.10$). This result translates to 6,480 fewer episodes with an ICU stay during PP1–PP9. OCM episodes had a higher likelihood of ICU stays during the baseline, and so the reduction in ICU admissions represents convergence with the comparison group rather than an absolute decline. Fewer readmissions and fewer ICU stays may indicate that, when a hospitalization does occur, the patient may be managed with a lesser intensity of services, and with better care coordination at the time of discharge.

Examining impacts by cancer type, OCM significantly reduced readmissions and unplanned readmissions for low-intensity prostate cancer, lymphoma, and multiple myeloma episodes (**Appendix Exhibits B-22 and B-23**). For lymphoma, the likelihood of an unplanned readmission fell by 8 percent relative to baseline values. For low-intensity prostate cancer and multiple myeloma episodes, the number of readmissions fell by 4 percent relative to baseline values among episodes with at least one readmission. Additionally, the number of ICU stays fell by 4 percent of baseline values for lymphoma.

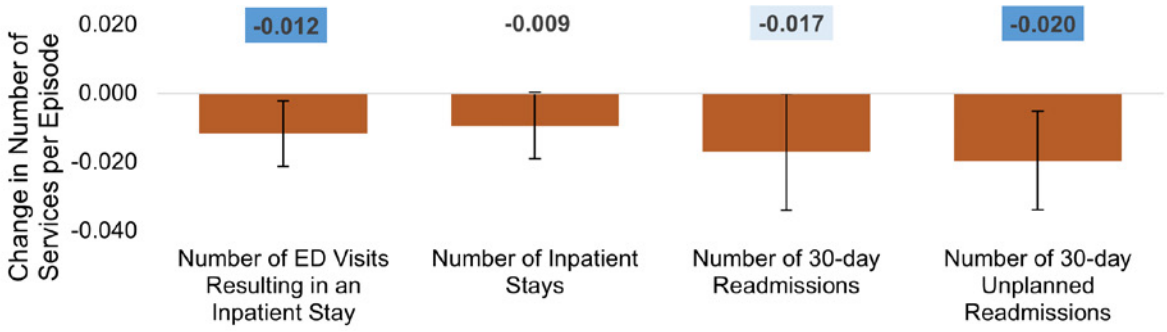
3.2 Outpatient Service Use

OCM's impact on outpatient service use varied.

In general, use of outpatient services was largely unchanged by OCM, although OCM's impact on outpatient services varied across service and by episode cancer type. Where significant impacts were detected, they were generally small both relative to baseline values and in financial terms, especially because outpatient services were a relatively small share of episode payments (see Chapter 2). Subgroup analyses found some larger impacts among higher-risk episodes. Key results include:

- **There was a small, statistically significant reduction in the likelihood of receiving home health services:** Relative to the comparison group, OCM episodes had a 0.7-percentage point decline in use of home health services ($p<0.01$) compared to the baseline, where 15.9 percent of episodes used home health services. This translates to a reduction of 8,430 episodes where the patient used post-acute home health care during the OCM intervention period.
  - The decrease in home health services resulted from reductions in lower-risk cancer episodes, with no significant impacts in the higher-risk episodes (**Appendix B.2.2**).
  - OCM had no impact on other PAC services, consistent with the finding of no impact on PAC payments.
- OCM led to **a small, statistically significant decrease in the number of outpatient rehabilitation services for lower-risk cancers** ($p<0.01$), and **an increase in the number of outpatient rehabilitation services for higher-risk episodes** ($p<0.05$). Rehabilitation therapy can be an effective means for supporting patients' functional status and may reduce risk for readmissions, so an increase in utilization may represent a positive development. The impact for higher-risk episodes exhibited a trend that was increasing over time.
- OCM led to **a small, statistically significant reduction in the number of standard imaging services** relative to comparison episodes. The result was driven by higher-risk episodes, notably lung cancer and colorectal cancer. Across all episodes, the decline amounted to 1.5 percent of baseline values ($p<0.01$) and 1.8 percent of baseline for higher-risk episodes ($p<0.01$).

Exhibit 18: OCM Led to a Material Reduction in the Number of Inpatient Stays and Readmissions, Among Patients Using Those Services



Shading indicates statistically significant estimates at $p\leq0.01$, $p\leq0.05$, and $p\leq0.10$, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: Whisker bars represent 90% confidence intervals. ED: Emergency department.

- OCM had **no impact on the use of radiation therapy services for higher-risk episodes, but a small significant increase in the number of radiation therapy services for lower-risk episodes** (3.8 percent increase relative to baseline, $p<0.10$). This aligns with the payments results, which showed a significant increase in radiation therapy payments for lower-risk cancer episodes.

OCM had no impact on overall or cancer-related E&M visits across all episodes or for any set of cancer-specific episodes.

3.3 Service Use at End of Life

Sections 3.1 and 3.2 evaluated impacts for all OCM episodes, or conditional on specific types of care (e.g., having at least one ED visit resulting in a hospital admission). In this section, we limit the analysis to episodes in which the patient died during the episode or within 90 days of the end date of their final episode.

OCM led to relatively fewer hospitalizations during deceased patients' last weeks of life.[16]

In Evaluation of the Oncology Care Model: Performance Periods 1-3, we described care transformation activities that many OCM practices implemented, including hiring palliative care specialists and enhancing access to palliative care, encouraging patients to engage in advance care planning, and documenting patient wishes and proxy decision makers.

These efforts practices described to improve care at the end of life had a small impact on ACH in the last month of life. ACH decreased by 0.8 percentage points for OCM patients who died relative to comparison patients ($p\leq0.10$); this is equivalent to avoiding hospitalization in the last 30 days of life for nearly 1 out of every 125 OCM patients who died (see **Exhibit 19**). OCM had no impact on the occurrence of outpatient ED use (two or more visits) in the last 30 days of life, or use of chemotherapy in the last two weeks of life.

One of the quality measures that CMS used to adjust performance-based payments (PBPs) is hospice care enrollment more than two days prior to death. Despite this focus, OCM had no impact on use, duration, or timing of hospice care among deceased OCM patients (Exhibit 20).

3.4 Chemotherapy-Related Hospitalizations and ED Visits

Among higher-risk episodes, OCM had no clinically meaningful impact on chemotherapy-related hospitalizations.

For patients with higher-risk episodes, side effects of toxic chemotherapy are a leading cause of ED visits and hospitalizations. In the Evaluation of the Oncology Care Model: Performance Periods 1-5 report, we described how many OCM practices had adopted systematic approaches/tools to identify patients undergoing especially toxic treatments and support them in the clinic setting.

Despite these efforts, OCM had no impact on the likelihood of any chemotherapy-related hospitalization among high-risk episodes through PP9. As shown in Exhibit 21, OCM led to a slight 0.2-percentage point relative reduction ($p<0.10$) in the likelihood of any chemotherapy-related outpatient ED visit without a hospital admission, which we judge to not be clinically meaningful.

3.5 Discussion

OCM practices had strong financial incentives to avoid costly hospitalizations and ED visits. They were also held accountable for ED visits that did not lead to a hospitalization as part of the Model quality measures. Activities subsidized by the Monthly Enhanced Oncology Services (MEOS) payments to coordinate care and enhance access for OCM patients aimed to facilitate use of appropriate care outside of the acute care setting. Insights from case studies confirmed that reducing this type of care was a key emphasis of

Exhibit 19: OCM Led to Fewer Hospitalizations at the End of Life

Measures for High-Intensity Care	OCM		COMP		Estimated OCM Impact	
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Estimate	Percent Change
Any chemotherapy in last 14 days of life	11.9%	10.6%	11.6%	10.3%	0.0 pp	-0.4%
Any hospitalization in last 30 days of life	53.1%	51.6%	53.3%	52.6%	-0.8 pp	-1.5%
ED use (2+ visits) in last 30 days of life	14.9%	15.3%	15.7%	16.5%	-0.4 pp	-2.9%

Shading indicates statistically significant estimates at $p\leq0.01$, $p\leq0.05$, and $p\leq0.10$, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: Means and DID impact estimates are regression-adjusted. OCM: OCM intervention group. COMP: Comparison group. PP: Percentage points. Int.: Intervention period. DID: Difference-in-differences. ED: Emergency department.

[16] Claims-based end-of-life results are at the beneficiary level and not the episode level because death is a person event, not an episode event.

care redesign under OCM for at least some practices. With all of this, OCM succeeded in reducing repeat readmissions and the likelihood of a hospital stay requiring ICU admission. OCM also slightly reduced the probability of having a hospital admission in the last 30 days of life. However, OCM did not affect overall hospital admissions, nor ED visits not leading to an admission. OCM also failed to reduce the likelihood of chemotherapy-related hospitalizations or ED visits among higher-risk episodes. Overall, reductions in the use of acute care services did help to achieve modest reductions in Part A spending but were not the primary driver of overall reductions in TEP. Accountable care organizations (ACOs), which have similar care coordination capabilities and similarly strong financial incentives to reduce unnecessary use of acute care, have failed to curtail the use of these services among oncology patients, both overall and at the end of life.[17-19] This may suggest that new strategies are needed to minimize avoidable hospitalizations or ED visits among oncology patients.

While OCM had impacts on a few measures of outpatient service use, including small reductions in the likelihood of receiving home health services and the number of standard imaging services, in general OCM had little influence on these outcomes. These findings are consistent with the payment results in Exhibit 15, which show little reduction in Part B payments outside of non-chemotherapy drug payments. OCM also failed to improve the timely receipt of hospice care at the end of life despite the OCM quality measure holding practices accountable for this outcome.

Overall, to the extent that OCM affected the care trajectory of patients (as discussed more in Chapter 4 and Chapter 5), the influence on the utilization of inpatient and outpatient services was limited to small impacts on a handful of measures. Outcomes specifically targeted by the Model, such as ED visits not leading to an inpatient admission, or timely hospice use at the end of life, were not affected by OCM relative to the comparison group. While this highlights the difficulty in improving these outcomes, it also signals that room for improvement may remain.

Exhibit 20: Among Patients Who Died, OCM Had No Impact on Use, Duration, or Timing of Hospice Care

Measures of Hospice Care Use	OCM		COMP		Estimated OCM Impact	
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Estimate	Percent Change
Never used hospice care	32.2%	30.3%	33.4%	31.7%	-0.3 pp	-0.8%
Hospice stay of 3–180 days and dying with hospice care	58.7%	60.0%	57.6%	58.7%	0.2 pp	0.3%
Hospice stay of 1–2 days and dying with hospice care	7.5%	7.9%	7.3%	7.8%	-0.1 pp	-0.8%

Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare administrative data 2014–2021.
Notes: Means and DID impact estimates are regression-adjusted. OCM: OCM intervention group. COMP: Comparison group. PP: Percentage points. Int: Intervention period. DID: Difference-in-differences.

Exhibit 21: OCM Had No Overall Impact on Chemotherapy-Related Hospitalizations or ED Visits

Measures of Chemotherapy-Related Hospitalizations and ED Visits	OCM		COMP		Estimated OCM Impact	
	Baseline Mean	Int Mean	Baseline Mean	Int Mean	DID Estimate	Percent Change
Any chemotherapy-associated hospitalizations	13.1%	12.3%	12.5%	11.6%	0.1 pp	0.8%
Any chemotherapy-associated ED visits	17.1%	16.2%	17.0%	16.4%	-0.3 pp	-1.5%
Any chemotherapy-associated ED visits resulting in a hospital admission	10.3%	9.9%	9.8%	9.5%	-0.1 pp	-1.2%
Any chemotherapy-associated ED visits without a hospital admission	8.3%	7.8%	8.8%	8.4%	-0.2 pp	-2.4%

Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int: Intervention period. DID: Difference-in-differences. PP: Percentage points.

[17] Lam MB, Zheng J, Orav EJ, Jha AK. Early accountable care organization results in end-of-life spending among cancer patients. Journal of the National Cancer Institute. December 2019. 111(12); pp 1307-1313.
[18] Lam MB, Figueroa JF, Zheng J, Orav EJ, Jha AK. Spending among patients with cancer in the first 2 years of accountable care organization participation. Journal of Clinical Oncology. October 2018. 36(29); pp 2955-2960.
[19] Erfani P, Phelan J, Orav EJ, Figueroa JF, Jha AK, Lam MB. Spending outcomes among patients with cancer in accountable care organizations 4 years after implementation. Cancer. March 2022. 128(5); 1093-1100.

Did OCM Affect Cancer Treatment and Adoption of Novel Therapies?

KEY FINDINGS

OCM's financial incentives encouraged the use of higher-value cancer treatments that were consistent with national clinical guidelines. An unintended consequence of these incentives could be decreased access to worthwhile high-cost treatments. To counteract the potential for this unintended consequence, OCM included a novel therapy adjustment intended to protect patients' access to the latest advances in cancer treatment.

We assessed the impact of OCM on specific clinical scenarios that have multiple guideline-consistent treatment options with different costs, including initial anti-cancer therapy for high-risk breast cancer and chronic myeloid leukemia, a common type of chronic leukemia, use of novel therapies for lung cancer; and use of biosimilar and oral generic anti-cancer therapies.

OCM did not affect initial anti-cancer therapy for high-risk breast cancer or chronic myeloid leukemia.

OCM did not impede adoption of immunotherapy or a newer, more effective but more costly targeted therapy for lung cancer.

OCM episodes had greater use of three higher-value biosimilar anti-cancer treatments, relative to the originator drugs.

OCM episodes did not have greater use of higher-value generic oral cancer treatments.

OCM also encouraged care coordination, adherence to national guidelines, patient education, and financial counseling. We assessed adherence to national guidelines for palliative radiation therapy, avoidance of delays in initiating chemotherapy after surgery for breast or colorectal cancer, and patient adherence to oral cancer treatment regimens for prostate cancer or chronic myeloid leukemia.

OCM did not improve timeliness of initiating post-surgical chemotherapy.

OCM did not improve patient adherence to oral cancer regimens for prostate cancer or chronic myeloid leukemia.

OCM did not improve adherence to guidelines for higher-value (fewer fractions) palliative radiation therapy for bone metastases.

Across these many separate analyses, the only consistent impact of OCM on cancer treatment was substitution of biosimilar drugs for originator anti-cancer drugs. The overall lack of findings on clinical care is consistent with the Evaluation of the Oncology Care Model: Performance Periods 1-5, which covered a period before biosimilar anti-cancer drugs were available.

Oncologists often have a range of cancer treatment options that may be appropriate for a particular patient. Oncologists usually select a specific care regimen based on multiple factors, including the effectiveness and toxicities of the treatment, as well as patient characteristics. Chemotherapy regimens vary in their associated costs, and Oncology Care Model (OCM) incentives could lead to value-based changes in chemotherapy regimens (i.e., preferential selection of less costly chemotherapy regimens, all else being equal[20]).

In this chapter, we present results of several analyses designed to identify whether OCM is impacting the selection of anti-cancer therapies provided to patients. Anti-cancer therapies refer to treatments intended to directly combat cancer, in contrast to treatment that mitigates the side effects of anti-cancer treatments (the supportive-care medications described in Chapter 5).

4.1 Choice of Treatment Regimens

To assess the impact of OCM on the selection of treatment regimens, we measured three clinical scenarios that have multiple guideline-consistent treatment options with different costs: 1) initial anti-cancer therapy for high-risk breast cancer; 2) use of first- versus second-generation tyrosine kinase inhibitor (TKI) therapy for chronic myeloid leukemia (CML), a common type of chronic leukemia; and 3) use of immunotherapy for lung cancer or adoption of a newer, more effective, and more costly therapy for lung cancer.

Initial Chemotherapy Regimens for High-Risk Breast Cancer

In the Evaluation of the Oncology Care Model: Performance Periods 1-5 report, we evaluated the choice of initial chemotherapy treatment regimens during episodes for high-risk breast cancer, lung cancer, colorectal cancer, and high-intensity prostate cancer. Treatment regimens were similar in OCM and comparison episodes before OCM and through OCM's first three years. For the current report, we focused on initial treatment regimens for high-risk breast cancer only, because high-risk breast cancer has several different recommended regimens that vary greatly in cost.[21]

OCM did not affect the initial chemotherapy regimens oncologists selected to treat breast cancer.

Descriptive analysis indicates very similar patterns of initial chemotherapy treatment regimens in OCM and comparison episodes for high-risk breast cancer, and changes between baseline and intervention periods were quite similar in the two groups. This result suggests that OCM did not affect patient access to new, often expensive, therapies, but also suggests that OCM did not lead to preferential selection of higher-value (more effective, less costly, or both) chemotherapy treatment approaches. Detailed descriptions of episode-initiating chemotherapy regimens for high-risk breast cancer episodes are included in Appendix C.2.1.

Use of First versus Second-Generation TKI Therapy for CML

We assessed whether OCM incentives might influence use of the first-generation TKI (imatinib) instead of second-generation TKIs (nilotinib, dasatinib, bosutinib) for CML. The costs of second-generation TKIs are higher than for the first-generation TKI, and cost differences became particularly notable after the price of generic imatinib began to decline in 2019.[22] Some evidence suggests that second-generation TKIs offer a faster and deeper response and lower risk for transformation of CML to acute leukemia, which could lead some oncologists to prefer them over the first-generation TKI. However, second-generation TKIs do not improve survival compared with first-generation TKI.[23] National guidelines recommend either first- or second-generation TKIs as initial therapy for all patients with CML, although second-generation therapies are preferred over first-generation TKI for certain patients with high-risk CML.[24]

OCM did not lead to higher-value use of first- versus second-generation drugs for chronic myeloid leukemia.

We conducted difference-in-differences (DID) analysis to assess whether OCM promoted attention to value, as evidenced by greater reliance on first-generation TKI therapy, especially for patients newly diagnosed with CML. We first examined all episodes with CML that involved any TKI therapy and then narrowed the analysis to episodes for patients with no prior TKI use in Medicare claims data since 2014 (reflecting patients who were likely newly diagnosed with CML).

[20] Jackman DM, Zhang Y, Dalby C, et al. Cost and survival analysis before and after implementation of Dana-Farber clinical pathways for patients with stage IV non-small-cell lung cancer. J Oncol Pract. 2017;13(4):e346:e352.

[21] Giordano SH, Niu J, Chavez-MacGregor M, et al. Estimating regimen-specific costs of chemotherapy for breast cancer: Observational cohort study. Cancer. 2016;122(22):3447-3455.

[22] Dusetzina SB, Muluneh B, Keating NL, Huskamp HA. Broken Promises—How Medicare Part D has failed to deliver savings to older adults. N Engl J Med. 2020; 383:2299-2301.

[23] Yun S, Vincelette ND, Segar JM, et al. Comparative effectiveness of newer tyrosine kinase inhibitors versus imatinib in the first-line treatment of chronic-phase chronic myeloid leukemia across risk groups: A systematic review and meta-analysis of eight randomized trials. Clin Lymphoma Myeloma Leuk. 2016 Jun;16(6):e85-94

[24] National Comprehensive Care Network. NCCN Clinical Practice Guidelines in Oncology: Chronic Myeloid Leukemia. Version 3.2022.

Among all episodes for treatment of CML, OCM episodes were less likely than comparison episodes to include the higher-value (less costly) first-generation TKI (imatinib), versus second-generation TKIs (DID -2.5 percentage points, p<0.10). There was no statistically significant difference in use of the first-generation TKI among the subset of episodes for patients with no prior TKI use who were likely newly diagnosed, although the point estimate was similar to the overall analysis; wide confidence intervals suggests that this analysis may have too few episodes to estimate this effect precisely (Appendix C.2.2).

Use of Third-Generation Osimertinib versus First-Generation Erlotinib for Epidermal Growth Factor Receptor-Mutated Lung Cancer)

We assessed use of osimertinib, a third-generation epidermal growth factor receptor (EGFR) TKI, relative to erlotinib, a first-generation drug. Osimertinib was first approved by the Food and Drug Administration (FDA) in November 2015. In January 2018, a clinical trial demonstrated that osimertinib showed efficacy superior to that of standard EGFR TKIs, such as erlotinib, in the first-line treatment of EGFR mutation-positive advanced non-small cell lung cancer, and had lower rates of serious adverse events.[25] In January 2020, follow-up data from that clinical trial also showed superior overall survival for osimertinib.[26] Erlotinib became available as a generic product in 2019, making erlotinib much less costly than osimertinib.

OCM did not inhibit use of more effective, but more expensive, targeted treatments for lung cancer.

We assessed whether OCM's financial incentives had the unintended consequence of reducing use of the more effective osimertinib and promoting use of the less costly but less effective erlotinib. There is no evidence that OCM fostered use of the inferior erlotinib; rather, there was a greater rate of adoption of osimertinib in OCM versus comparison episodes (0.4 percentage points greater rate, p<0.01; Appendix C.2.3). This result suggests that OCM did not inhibit use of new clinically effective drugs, even under OCM's incentives to reduce Medicare payments.

4.2 Novel Therapy Adoption and Immunotherapy Use

Novel Therapy Adoption

In OCM, benchmark prices for a given practice were adjusted to account for use of novel therapies, if the percentage of that practice's average expenditures for novel therapies exceeded the average among non-participating practices. The novel therapies adjustment was intended to account for a practice's use of newly approved oncology drugs, which often have high costs that may not be reflected in benchmark trends. Even so, some clinicians and researchers expressed concerns that the methodology may not fully account for the high cost of novel therapies, which could incentivize practices to limit the use of these innovative treatments.[27]

> Novel therapies are treatments newly approved by the FDA for treatment of cancer. Most new oncology drugs or indications are considered "novel" for two years following FDA approval.

Since novel therapies are cancer-specific and introduced intermittently over time, we investigated the effects of OCM on the use of novel therapies covered under both Part B and Part D for the higher-risk cancer subgroup and a subsample of specific higher-risk episodes.[28]

NSIGHT FROM THE FIELD

Several practices we visited for case studies consider themselves early adopters of new treatments. Some interviewees noted that this was due to involvement in clinical trials. Physician-investigators involved in clinical trials at OCM practices explained that they and their colleagues become quite familiar with new drugs during the clinical trial phase, and quickly transition to using the drugs as "standard care" after FDA approval. None of these practices reported a change in their clinical trial involvement or earlier or delayed adoption of new drugs as a result of OCM.

[25] Soria JC, Ohe Y, Vansteenkiste J, et al. Osimertinib in untreated EGFR-mutated advanced non-small-cell lung cancer. N Engl J Med. 2018 Jan 11;378(2):113-125.

[26] Ramalingam SS, Vansteenkiste J, Planchard D, et al. Overall survival with osimertinib in untreated, EGFR-mutated advanced NSCLC. N Engl J Med. 2020 Jan 2;382(1):41-50.

[27] Lyss AJ, Supalla SN, Schleicher SM. The Oncology Care Model—Why it works and why it could work better: accounting for novel therapies in value-based payment. JAMA Oncol. 2020 Aug 1;6(8):1161-1162.

[28] Prescription drugs are considered to have novel status only for a limited period; because of this, analyses for some cancers and outcomes had power limitations. The higher-risk cancers with sufficient information to estimate OCM effects on payment outcomes include high-risk breast cancer, lung cancer, colorectal/small intestine cancer, multiple myeloma, lymphoma, high-intensity prostate cancer, chronic leukemia, and non-reconciliation-eligible cancers. Cancers with sufficient information to estimate OCM effects on both Part D and Part B novel utilization outcomes include lung cancer, lymphoma, and multiple myeloma. In the case of higher-risk breast cancer, there was only sufficient information to estimate the effect of OCM on novel Part D utilization. Lastly, in the case of colorectal/small intestine cancer, there was only sufficient information to estimate the effect of OCM on novel Part B utilization.

OCM had no systematic impact on the use of Part B or Part D novel therapies, but small impacts were detected for some individual cancer-type episodes.

We did not find evidence that OCM led to a reduction in the use of novel therapies. OCM had no significant effect on the use of novel therapies overall, or Part B and Part D therapies considered separately in higher-risk episodes through the first nine performance periods (PPs). When we examine specific cancers, we find limited evidence that OCM may have increased use of novel Part B or Part D therapies.

Among individual episode cancer types, OCM increased the use of novel therapies in lung cancer episodes by 2.49 percentage points ($p<0.05$), or 21.1 percent from baseline. Immunotherapy—a type of therapy that uses substances to stimulate or suppress the immune system to help the body fight cancer—became available for several new indications for lung cancer during the OCM intervention period. The novel therapy effects were greatest in PP6–PP9 (see **Appendix C.3.1** for additional detail). This increase coincided with rapid expansion of immunotherapy use in the first-line treatment of lung cancer, characterized by many approvals for new treatments in late 2018 and 2019.

RELATED SECTIONS

OCM led to a small increase in Part B novel therapy payments but had no overall effect on Part D payments. On average, OCM increased Part B novel therapy payments per higher-risk episode by $198 (9.2 percent of baseline mean) over the first nine PPs. Across all higher-risk cancers, OCM had no significant effect on Part D novel therapy per-episode payments. Combining Part B and Part D therapies, OCM led to a significant $157, or 2.7 percent of the baseline mean, increase in novel therapy payments per episode of higher-risk cancers. See **Appendix B.1.3** for additional detail.

Additionally, for episodes with Part D novel anti-cancer therapies, OCM had no impact on the likelihood of novel therapy use during the episode, but OCM led to a relative increase in the number of prescription fills for Part D drugs used during lymphoma, multiple myeloma, and chronic leukemia episodes.

Access to High-Cost Immunotherapy Treatments

In recent years, the FDA has approved several new immunotherapies and expanded the indications for several existing immunotherapies.[29] Immunotherapies demonstrably enhance survival for patients with lung cancer and a wide range of other cancer types.[30] Immunotherapies are also very costly, whether given alone or in combination with chemotherapy treatments. We examined use of high-cost immunotherapies at any point during lung cancer episodes (not limited to the first regimen only). We focused on whether OCM affected the use of high-cost immunotherapies for lung cancer because it had the greatest use of immunotherapies during the study period for this report.

OCM did not limit access to high-cost immunotherapy treatment.

Immunotherapy use increased between the baseline and PP1–PP9 for both OCM and comparison lung cancer episodes. Before OCM began, immunotherapy use was lower in OCM lung cancer episodes than in comparison episodes (**Exhibit 22**). During PP1–PP9, immunotherapy use in OCM episodes exceeded that in comparison episodes, yielding a statistically significant relative increase in immunotherapy use due to OCM. OCM did not limit access to high-cost immunotherapies for lung cancer, and it may have increased access (with associated costs). There were numerous approvals for expanded indications for immunotherapy for lung cancer during the intervention period, and it is possible that the novel therapies adjustment contributed to the greater use of immunotherapy in OCM episodes.

Exhibit 22: OCM Led to a Relative Increase in Use of Immunotherapies for Lung Cancer

Use of Immunotherapy	OCM Baseline Percent	OCM Int. Percent	COMP Baseline Percent	COMP Int. Percent	Estimated OCM Impact DID Estimate	Estimated OCM Impact Percent Change
Lung cancer	9.2%	52.3%	11.3%	50.1%	4.3 pp	46.2%

Shading indicates statistically significant estimates at $p\leq0.01$, $p\leq0.05$, and $p\leq0.10$, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int: Intervention period. DID: Difference-in-differences. PP: Percentage points.

[29] Cancer Research Institute. FDA Approval Timeline of Active Immunotherapies. Available at: https://www.cancerresearch.org/en-us/scientists/immuno-oncology-landscape/fda-approval-timeline-of-active-immunotherapies.
[30] Mok TSK, Wu YL, Kudaba I, et al. Pembrolizumab versus chemotherapy for previously untreated, PD-L1-expressing, locally advanced or metastatic non-small-cell lung cancer (KEYNOTE-042): a randomised, open-label, controlled, phase 3 trial. Lancet. 2019;393(10183):1819-1830

We also explored the association of OCM with use of costly dual immunotherapy regimens (versus regimens with a single immunotherapy agent) for cancer types where such regimens are approved. Use of dual immunotherapy regimens was very low in both OCM and comparison practices, precluding further analysis (see Appendix C.3.2).

4.3 Biosimilar versus Originator Anti-Cancer Therapies

Adoption of Biosimilar Anti-Cancer Therapies

OCM likely contributed to faster adoption of biosimilar versions of three high-cost anti-cancer therapies.

Biosimilar versions of three high-cost and high-volume anti-cancer therapies (rituximab, trastuzumab, and bevacizumab) became available in recent years. Rituximab is used extensively in the treatment of lymphoma; trastuzumab is a targeted therapy primarily used for treatment of breast cancer that is positive for Human Epidermal Growth Factor 2 (HER2); bevacizumab is used to treat colorectal cancer and other solid tumors. These drugs are administered in the office or hospital and covered under Medicare Part B. These three drugs were also all in the top 20 drugs by total Medicare Part B spending in 2019; rituximab was fourth ($1.7B in annual Medicare spending), bevacizumab was eighth ($1.0B), and trastuzumab was eleventh ($821M).[31]

We evaluated whether OCM led to greater use of biosimilars (versus originator products). Because biosimilar agents were not available before OCM began, it was not possible to use a DID analytic approach. We therefore examined the regression-adjusted difference in the proportion of episodes using biosimilar products and the adjusted rate of adoption for OCM versus comparison episodes after these products became available. These analyses were restricted to episodes for cancer types relevant to the core uses for each drug.

For each of the three biosimilar anti-cancer therapies that became available during the OCM period (2016 or later), there was a statistically significant increase in the rate of adoption, as measured by the post-period trend, and greater use of biosimilars in OCM versus comparison episodes (**Exhibit 23**).

Two of these three drugs (rituximab and trastuzumab) also had subcutaneous formulations introduced shortly before the intravenous biosimilar product became available. The subcutaneous formulations can be administered more quickly, which is potentially more convenient for patients, and they also allow oncology practices to turn over their infusion chairs more rapidly, increasing practice-level capacity to treat more patients. However, the subcutaneous formulations are originator products (there are no biosimilars available) and are therefore more costly than intravenous biosimilar alternatives.

We examined the adjusted difference in the proportion of episodes using the more costly subcutaneous rituximab (Rituxan Hycela) and trastuzumab (Herceptin Hycleta) as well as the rate of adoption of these products for OCM versus comparison episodes in the time periods they were available. We found modestly faster adoption of subcutaneous rituximab in OCM versus comparison episodes, but no significant difference in average level of use. We found no difference in OCM versus comparison episodes in the rate of adoption

Biosimilars are biological therapies that the FDA recognizes as "interchangeable" with an originator drug. Biosimilars are generally less costly than the originator drug and offer an opportunity for reducing drug expenditures with equivalent therapeutic agents. The American Society of Clinical Oncology (ASCO) and other organizations endorse the use of biosimilar therapeutics as a strategy to improve the value of cancer care while maintaining treatment efficacy.[32]

Exhibit 23: Faster Rate of Adoption and Greater Use of Biosimilar Rituximab, Trastuzumab, and Bevacizumab in OCM Episodes

Therapy Type	Intervention Mean		Difference in Use (Percentage Points)	Rate of Adoption (Post-Period Trend)
	OCM	COMP	Estimate	Estimate
Rituximab biosimilar	16.1%	11.5%	4.6 pp	1.8%
Trastuzumab biosimilar	23.9%	19.3%	4.6 pp	1.7%
Bevacizumab biosimilar	28.9%	22.2%	6.7 pp	1.9%

Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. PP: Percentage points.

[31] CMS. Medicare Part B Spending by Drug. Available from: https://data.cms.gov/summary-statistics-on-use-and-payments/medicare-medicaid-spending-by-drug/medicare-part-b-spending-by-drug/data. Last accessed August 31, 2022.
[32] Nahleh Z, Lyman GH, Schilsky RL, et al. Use of biosimilar medications in oncology. JCO Oncol Pract. 2022 Mar;18(3):177-186.

or average use of the more costly subcutaneous trastuzumab (Appendix C.4). Overall, these analyses suggest that OCM did not meaningfully affect use of new (and more costly) subcutaneous formulations of rituximab and trastuzumab.

4.4 Adoption of Generic Anti-Cancer Therapies

OCM did not impact use of generic versus brand-name oral anti-cancer therapies (imatinib, abiraterone, erlotinib).

Generic drugs offer an opportunity for savings for Medicare, and generic oral anti-cancer drugs could potentially reduce patients' out-of-pocket costs under Medicare Part D. We assessed use of generic versus brand-name oral anti-cancer drugs that were available during the intervention period (imatinib for CML and gastrointestinal stromal tumors, abiraterone for high-intensity prostate cancer, and erlotinib for lung cancer) to understand whether OCM led to increased use of generic anti-cancer therapies. None of these three generic oral drugs (imatinib, abiraterone, and erlotinib) were adopted more rapidly in OCM episodes than in comparison episodes (see results in Appendix C.5). We conclude that OCM did not impact use of generic versus brand-name oral anti-cancer therapies.

It is not entirely clear why OCM led to greater substitution of biosimilar drugs but not generic drugs. One factor may be that oral drugs which patients get from a pharmacy, may have received less attention as an opportunity for savings from participating practices than biosimilar drugs that the practices provide directly. Greater attention to use of generic versus brand Part D drugs may be an opportunity for savings.

4.5 Higher-Value Use of Radiation Therapy for Bone Metastases

Radiation therapy is an integral component of cancer treatment. During chemotherapy treatment episodes, radiation therapy may be used concurrently with or following chemotherapy. It may be delivered as part of curative treatment or with palliative intent to reduce pain from bone metastases. The necessary dose of radiation is divided into separate treatments (called fractions) as prescribed by the treating radiation oncologist. In fee-for-service (FFS) Medicare, a claim is submitted for each fraction, which could incentivize delivering the radiation dose in more fractions (more separate treatments). When clinically appropriate, radiation oncologists can reduce the cost of care and increase value by prescribing fewer radiation fractions.

OCM had no impact on use of higher-value palliative radiation for bone metastases.

Patients with cancer (of any type) that has metastasized to the bone may receive palliative radiation treatment to alleviate pain, reduce fracture risk, or prevent neurologic impairment due to spinal cord compression. Longer radiation treatment courses (more fractions) do not improve symptom relief compared with shorter schedules, and fewer treatments are more convenient for patients and less costly for patients and payers.[33] As a result, in 2013 the American Society for Radiation Oncology recommended that radiation oncologists should avoid *using treatment courses of longer than 10 fractions when delivering palliative treatment for bone metastases*.[34]

We evaluated the number of radiation fractions during episodes with radiation therapy for bone metastases (as determined from diagnosis codes). The use of 10 or fewer fractions increased from the baseline period to the intervention period for both OCM and comparison episodes. The increase was similar in the two groups, and OCM had no impact on guideline-concordant treatment with 10 or fewer radiation fractions. The lowest-cost and most convenient treatment regimen of a single fraction decreased slightly in both OCM and comparison episodes between the baseline and intervention periods, with no impact of OCM (see Appendix C.6).

4.6 Timeliness of Post-Surgical Chemotherapy Initiation

Consensus recommendations call for timely initiation of adjuvant chemotherapy following curative-intent surgery. Observational studies have shown that delays in initiating post-operative chemotherapy are associated with worse outcomes.[35,36] Timely chemotherapy after surgery is also more patient centered. These considerations led the ASCO Quality Oncology Practice Initiative (QOPI) to include measures of timeliness of adjuvant chemotherapy as quality measures. Specifically, the QOPI measures include timeliness of adjuvant chemotherapy (defined as within two months after surgery) for patients with stage III colon cancer (QOPI measure 58).[37] Prior research also suggests that chemotherapy delays of more than 60 days are also associated with worse breast cancer outcomes.[38]

[33] Hartsell WF, Scott CB, Bruner DW, Scarantino CW, Ivker RA, Roach M 3rd, Suh JH, Demas WF, Movsas B, Petersen IA, Konski AA, Cleeland CS, Janjan NA, DeSilvio M. Randomized trial of short- versus long-course radiotherapy for palliation of painful bone metastases. J Natl Cancer Inst. 2005 Jun 1;97(11):798-804.

[34] American Society for Radiation Oncology. Choosing Wisely: Things Physicians and Patients Should Question. Last updated August 2022. Available from: https://www.choosingwisely.org/societies/american-society-for-radiation-oncology/.

[35] Chavez-MacGregor M, Clarke CA, Lichtenstein DY, Giordano SH. Delayed initiation of adjuvant chemotherapy among patients with breast cancer. JAMA Oncol. 2016;2(3):322–329.

[36] 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.

[37] ASCO QOPI 2019 Reporting. Accessed on March 11, 2020, but since discontinued by ASCO.

[38] Chavez-MacGregor M, Clarke CA, Lichtenstein DY, Giordano SH. Delayed initiation of adjuvant chemotherapy among patients with breast cancer. JAMA Oncol. 2016;2(3):322–329.

For each chemotherapy episode, we identified patients who had a qualifying surgical procedure within the 180 days before the start of the episode. We assessed timing of adjuvant chemotherapy (based on the QOPI definition of adjuvant treatment within 60 days after surgery) for two clinical scenarios: 1) adjuvant chemotherapy following colon/rectum resection for colorectal cancer, and 2) adjuvant chemotherapy following lumpectomy/mastectomy for breast cancer (high-risk breast cancer episodes). Since claims data do not contain information about disease stage, we identified adjuvant chemotherapy based on receipt of chemotherapy following presumed curative-intent surgery.

OCM had no impact on the timeliness of chemotherapy after surgery for colorectal cancer or breast cancer.

Overall, among patients with OCM or comparison episodes who underwent one of the specified surgeries, approximately 60 percent of colorectal cancer patients and nearly 75 percent of breast cancer patients received chemotherapy within 60 days after surgery. Despite the expansion of patient navigation in OCM practices, OCM had no impact on the proportion of patients with colorectal cancer or breast cancer whose first chemotherapy episode began within 60 days after surgery (see Appendix C.7).

4.7 Patient Adherence to Oral Medications

Evidence has found that adherence to effective oral anti-cancer drugs, as measured by drugs dispensed, is suboptimal.[39,40] During site visits and annual follow-up calls, many OCM practices told us about care coordination initiatives seeking to improve patient adherence to oral cancer treatment regimens. Examples include improving patient education efforts about oral cancer treatments and providing financial counseling to address high out-of-pocket costs. Adherence is important; for example, for patients with CML, greater adherence is directly related to achieving a major molecular response, which is associated with better survival.[41] We explored the impact of such efforts to address barriers and improve patient adherence to oral (Part D) treatment regimens. We measured adherence using the proportion of days covered. The numerator for covered days was the number of days a patient had the drug available, which we measured as the number of days that could be covered by the supply of drugs dispensed. The denominator was all days in which the patient was eligible for the drug during the episode (Appendix C.8).

In our previous Evaluation of the Oncology Care Model: Performance Periods 1-5 report, we assessed the impact of OCM on adherence to Part D (oral) drugs for two cancer types for which expensive Part D chemotherapy drugs play a key role: CML and high-intensity prostate cancer. We also examined adherence to hormonal therapies for low-risk breast cancer episodes. We concluded at that time that OCM had not affected adherence to Part D drugs for these conditions. We updated the analyses for the current report, focusing on the two high-priced therapies: TKIs for CML and novel hormonal agents for high-intensity prostate cancer. Although we found no OCM impact on adherence to medications in PP1–PP5, we thought it was possible that the practices' efforts to improve adherence could take time to have an effect. Also, we thought the COVID-19 pandemic might negatively impact adherence as a result of disruptions in in-person visits, since refills are often provided at clinic visits, and if so, OCM-related care delivery changes could lessen that negative impact.

OCM did not improve adherence to Part D (oral) drug treatment regimens for CML or high-intensity prostate cancer.

Adherence rates during PP1–PP9 were similar for OCM and comparison episodes, both for TKI for CML (approximately 86 percent) and for enzalutamide or abiraterone for prostate cancer (approximately 85 percent), and remained stable through the COVID-19 pandemic period.[42] Despite the efforts of many OCM

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OCM could impact timeliness of adjuvant chemotherapy if practices are better able to coordinate care and streamline new-patient appointment scheduling. During case studies, several practices described efforts to reduce delays between patients' hospital discharge after surgery and appointments with the medical oncologist. It is important to recognize, however, that timeliness of adjuvant chemotherapy depends on many factors, some of which are beyond the control of medical oncology practices, such as timeliness of referrals from surgeons and patients' recovery following surgery.

[39] Winn AN, Keating NL, Dusetzina SB. Factors associated with tyrosine kinase inhibitor initiation and adherence among Medicare beneficiaries with chronic myeloid leukemia. J Clin Oncol. 2016;34(36):4323-4328.

[40] Caram MEV, Oerline MK, Dusetzina S, Herrel LA, Modi PK, Kaufman SR, et al. Adherence and out-of-pocket costs among Medicare beneficiaries who are prescribed oral targeted therapies for advanced prostate cancer. Cancer. 2020;126(23):5050-5059

[41] Marin D, Bazeos A, Mahon F-X, Eliasson L, Milojkovic D, Bua M, et al. Adherence is the critical factor for achieving molecular responses in patients with chronic myeloid leukemia who achieve complete cytogenetic responses on imatinib. J Clin Oncol. 2010 May 10;28(14):2381-8. doi: 10.1200/JCO.2009.26.3087.

[42] Note that adherence to these oral medications was higher than in some prior studies of Medicare patients, including the Winn et al and Caram et al studies cited above. This is likely because we studied chemotherapy episodes that were triggered by the dispensing f the oral cancer drug. In other words, beneficiaries who were not filling their prescriptions regularly would trigger fewer OCM-defined chemotherapy episodes and would be underrepresented in these episode-level data.

practices to educate patients, address barriers, and improve adherence, OCM had no overall impact on adherence among patients taking TKIs for CML or enzalutamide or abiraterone for prostate cancer (Appendix C.8).

4.8 Discussion

In assessing the impact of OCM on cancer treatment and adoption of novel therapy through the first nine PPs, OCM had no impact on anti-cancer treatments that we studied, with the exception of greater adoption and use of biosimilar anti-cancer therapies. Initial treatment regimens for breast cancer were similar for OCM and comparison episodes. OCM did not limit adoption of high-priced novel therapies or immunotherapies. OCM episodes had greater use of three higher-value biosimilar cancer treatments rather than originator drugs. However, OCM episodes did not lead to greater use of higher-value generic oral cancer medications. OCM had no impact on timeliness of initiating post-surgical chemotherapy, on patient adherence to oral cancer regimens for prostate cancer or CML, or on adherence to guidelines for higher-value (fewer fractions) palliative radiation therapy for bone metastases. FFS Medicare pays per fraction, which is a powerful financial incentive for radiation oncologists.

These findings suggest that OCM did not have negative impacts on access to anti-cancer therapies. Furthermore, modestly greater use of biosimilar anti-cancer medications in OCM episodes suggests a mechanism for potential cost savings under future models.

Did OCM Incentivize High-Value Use of Supportive Care Medications?

CONTEXT AND KEY FINDINGS

Cancer treatment can cause toxic side effects; some of which can be prevented or reduced through effective supportive therapy—often given prophylactically, accompanying the first chemotherapy infusion. We assessed the impact of OCM on use of bone-modifying agents to prevent fractures, anti-emetics to manage chemotherapy-related nausea, and white blood cell growth factors to prevent fever and neutropenia. In each category, there are multiple drugs with different costs and potency, and guidelines recommend which should be used based on the expected toxicity of a patient's anti-cancer treatments. When treatments are less toxic with less risk of causing side effects, it may be reasonable to start with a lower-cost, less-potent supportive care approach, and if this does not sufficiently control symptoms, shift to a more potent and costly approach. In addition, GCSFs are available in originator, biosimilar, and on-body forms that have different costs and varying convenience for patients.

OCM generally led to more value-focused use of supportive therapies to mitigate side effects of cancer treatment.

Specifically, OCM led to higher-value use of bone-modifying agents to prevent fractures; higher-value use of prophylactic anti-emetic medications when chemotherapy had high emetic risk; higher-value use of prophylactic GCSFs relative to the comparison group during breast cancer episodes when chemotherapy had intermediate risk of causing fever and neutropenia, and during colorectal cancer episodes when chemotherapy had low risk for causing fever and neutropenia. OCM was also associated with more use of less costly biosimilar GCSFs. This result is consistent with the substitution of biosimilar anti-cancer treatments described in **Chapter 4**.

There were two exceptions to the above patterns in our analyses. OCM was not associated with higher-value use of GCSFs in lung cancer episodes, and there were no differences between OCM and comparison episodes in use of the costly (but more convenient) on-body format of the GCSF pegfilgrastim.

As noted in Chapter 2, the Oncology Care Model (OCM) led to Part B payment reductions for supportive care medications, overall and for specific cancer types. Supportive care medications, including white blood cell growth factors (i.e., granulocyte colony-stimulating factors [GCSFs]), anti-nausea medications, and bone-modifying agents, are a critical component of safe and effective cancer treatment. Supportive care medications can also be costly. Oncology practices have opportunities to reduce total episode payments (TEP) by using lower-cost supportive care medications that meet patients' needs. In several common clinical situations, oncologists can select between different supportive care medications with similar clinical efficacy but very different costs. This chapter presents evidence about the impact of OCM on the use of supportive care medications during cancer treatment for four such clinical situations. Specifically, we analyzed OCM impacts on the use of 1) bone-modifying agents, 2) anti-nausea medications (anti-emetics), and 3) white blood cell growth factors (i.e., GCSFs). This chapter also discusses biosimilar versus originator white blood cell growth factors and use of on-body injectors.

RELATED SECTIONS

See Section 2.1 for more about payments for Part B drugs.

5.1 Use of Bone-Modifying Agents for Patients with Bone Metastases

Bone metastases are common in patients with certain types of metastatic cancer, including metastatic breast cancer, lung cancer, and prostate cancer. Clinical practice guidelines of the National Comprehensive Cancer Network (NCCN) recommend use of bone-modifying agents to reduce the risk of cancer-associated bone fracture for most patients with bone metastases from breast cancer, lung cancer, or castration-resistant prostate cancer.[43,44,45]

Two types of bone-modifying agents can be used to prevent fractures from bone metastases: bisphosphonates (zoledronic acid and pamidronate) and denosumab. Use of either denosumab or a bisphosphonate meets NCCN guidelines for treatment of bone metastases to prevent fractures in patients with breast cancer, prostate cancer, or lung cancer. Bisphosphonates are relatively inexpensive intravenous drugs that are available in generic formulations. For the bisphosphonates, the Medicare payment amount for a single dose of zoledronic acid in 2022 is approximately $27,[46] and it is administered every 3-12 weeks; the payment amount and dosing schedule for pamidronate are similar. Denosumab is a newer monoclonal antibody given by subcutaneous injection, and no generic or biosimilar equivalents are available. The Medicare payment amount for a single dose of denosumab in 2022 is approximately $2,551, and denosumab is administered every four weeks. Given the clinical equivalency of bisphosphonates and denosumab for most patients, and the substantially higher cost of denosumab, use of a bisphosphonate for treatment of bone metastases can be considered higher value in most situations. (Denosumab is preferred for patients with impaired kidney function.) This higher-value alternative presents an opportunity for OCM practices to reduce Medicare episode payments while meeting patient needs.

To evaluate OCM impact on use of bone-modifying agents during cancer treatment, we conducted two sets of analyses. Both analyses focused on episodes for treatment of breast cancer (high-risk or low-risk), prostate cancer (high-intensity or low-intensity), or lung cancer, with one or more diagnosis codes for bone metastasis during an episode or in the 180 days preceding the episode.[47] First, we tested whether OCM affected the use of any bone-modifying agent, as is generally recommended in these situations. Second, we tested whether OCM affected the choice of higher-value bisphosphonates versus lower-value denosumab.

OCM led to relatively higher-value use of bone-modifying agents.

Use of any bone-modifying treatment for bone metastases from breast, prostate, or lung cancer was very similar in OCM and comparison episodes, and OCM did not affect the proportion of episodes that included use of beneficial bone-modifying medication. Among episodes when a bone-modifying agent was used, use of the more costly (and lower-value) denosumab was similarly high in both OCM and comparison episodes at baseline

INSIGHT FROM THE FIELD

During case studies, oncologists described efforts to prioritize use of bisphosphonates, rather than the more costly denosumab, to reduce the risk of fractures for patients with bone metastases.

[43] National Comprehensive Care Network. NCCN Clinical Practice Guidelines in Oncology: Breast Cancer. Version 3.2020–March 6, 2020.
[44] National Comprehensive Care Network. NCCN Clinical Practice Guidelines in Oncology: Non-Small Cell Lung Cancer. Version 3.2020–February 11, 2020.
[45] National Comprehensive Care Network. NCCN Clinical Practice Guidelines in Oncology: Prostate Cancer. Version 1.2020–March 16, 2020.
[46] CMS. April 2022 Average Sales Price (ASP) Pricing Files. June 2, 2022. Available from: https://www.cms.gov/medicare/medicare-part-b-drug-average-sales-price/2022-asp-drug-pricing-files.
[47] Lower-risk episodes were included in this analysis because some patients with metastatic breast cancer or prostate cancer can be treated with hormonal therapy only, and thus would be in the low-risk breast cancer or low-intensity prostate cancer groups.

(approximately 65 percent for breast cancer, 72 percent for prostate cancer, and 58 percent for lung cancer). Use of denosumab increased somewhat in both groups over time. The increases were consistently less in OCM episodes than in comparison episodes, suggesting that OCM encouraged a somewhat more cost-conscious approach to oncologists' choice of bone-modifying agents (**Exhibit 24**).

5.2 Anti-Emetics Use for High-, Intermediate, and Low-Risk Chemotherapy Regimens

Nausea is a common side effect of chemotherapy, and anti-emetic (anti-nausea) medications are prescribed or administered as supportive care for most patients undergoing chemotherapy treatment. Some chemotherapy treatments are especially prone to causing nausea—they have a high emetic risk. NCCN guidelines specify the recommended prophylactic anti-emetic combinations, given with the first chemotherapy cycle, for patients receiving chemotherapy that has low, moderate, or high emetic risk. There are multiple guideline-recommended anti-emetic combinations for each emetic risk level, and the cumulative cost of distinct anti-emetic combinations can vary substantially. In recent years, the average sales price for several anti-emetic drugs declined substantially. For example, the average sales price of a single dose of palonosetron (a widely used long-acting serotonin antagonist) declined from $226 in the third quarter of 2018 to $38 in the third quarter of 2020.

We evaluated the OCM impact on use of prophylactic anti-emetics, focusing on episodes with intravenous chemotherapy regimens of high emetic risk (i.e., those where an appropriate anti-emetic is particularly important). We evaluated the use of two relatively costly classes of anti-emetic drugs that are featured in the NCCN antiemesis guideline: palonosetron and the neurokinin-1 (NK1) antagonists (aprepitant, fosaprepitant, netupitant, fosnetupitant, and rolapitant). Serotonin antagonists (both short- and long-acting) are among the most commonly used anti-emetic drugs, and they are recommended for all patients receiving chemotherapy with high emetic risk. Palonosetron is the most effective of the serotonin antagonists, but it has generally been more costly than other serotonin antagonists. NK1 antagonists are a newer class of anti-emetics that are recommended for use in combination with serotonin antagonists for patients receiving chemotherapy that has high emetic risk. NK1 antagonists are the costliest class of anti-emetics, although the average sales price of commonly used formulations began to decline substantially in 2020 (starting around the time of PP8).

Because both palonosetron and NK1 antagonists are relatively costly medications, we anticipated that OCM might lead to substitution of less costly alternatives. For example, we expected that OCM practices might substitute less costly short-acting serotonin antagonists for palonosetron, or might emphasize the guideline-concordant and NK1-sparing anti-emetic regimen of palonosetron and olanzapine. While appropriate and higher-value substitution of individual anti-emetic drugs would be consistent with OCM objectives, underuse of guideline-recommended anti-emetic regimens would represent a negative impact on quality. We therefore also evaluated the composition of multi-drug anti-emetic regimens, classifying these regimens as "guideline-recommended" or "other." We considered a prophylactic

Exhibit 24: OCM Led to Reductions in the Use of Low-Value Bone-Modifying Agents

Use of Bone- Modifying Agents	OCM		COMP		Estimated OCM Impact	
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Estimate	Percent Change
Use of any of the three bone-modifying agents						
Breast cancer and bone metastases	74.1%	70.6%	71.3%	68.0%	-0.3 pp	-0.5%
Prostate cancer and bone metastases	66.9%	60.9%	62.8%	57.1%	-0.2 pp	-0.2%
Lung cancer and bone metastases	56.9%	50.2%	56.1%	50.2%	-0.8 pp	-1.3%
Use of denosumab, among episodes with any bone-modifying agents						
Breast cancer and bone metastases	65.1%	67.6%	65.2%	74.9%	-7.2 pp	-11.1%
Prostate cancer and bone metastases	72.0%	72.8%	71.9%	79.3%	-6.6 pp	-9.1%
Lung cancer and bone metastases	58.4%	62.2%	58.7%	69.4%	-7.0 pp	-12.0%

Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int: Intervention period. DID: Difference-in-differences. PP: Percentage points.

anti-emetic regimen to be "guideline-recommended" for high-emetic-risk chemotherapy regimens if it contained either 1) an NK1 antagonist and a serotonin antagonist (long- or short-acting), or 2) palonosetron and olanzapine (without an NK1 antagonist).

OCM led to higher-value use of preventative anti-nausea medications during episodes with chemotherapy regimens that had high risk of nausea and vomiting.

During episodes when chemotherapy regimens had high emetic risk, rates of guideline-recommended anti-emetic combinations were high for both OCM and comparison practices. Use of guideline-recommended anti-emetic combinations increased from 78 percent to 83 percent for OCM practices, and from 73 percent to 78 percent for comparison practices. Accordingly, OCM led to a 7.2-percentage point statistically significant relative reduction in the use of palonosetron (**Exhibit 25**). These reductions began in PP1–PP3, when costs for palonosetron were relatively high, and were sustained through PP9, even as costs for palonosetron declined (see Appendix C.10). OCM had no impact on use of NK1 antagonists, although it is difficult to draw definitive conclusions, because the OCM and comparison group trajectories differed before OCM began (they had non-parallel baseline trends).

OCM had no apparent difference-in-differences (DID) impact on use of guideline-recommended anti-emetic combinations. As with the analysis of NK1 antagonists, the OCM and comparison group trajectories differed before OCM began, hindering definitive conclusions from the analysis. Appendix C.10 provides additional information about trends in use of palonosetron, NK1 antagonists, and guideline-recommended anti-emetic therapies.

We conclude that OCM practices identified opportunities to substitute higher-value alternative anti-emetic agents for palonosetron, a costly anti-emetic, without negatively affecting quality of care for preventing nausea and vomiting. However, because the Medicare payment rates for palonosetron and other important anti-emetic drugs declined in later OCM PPs, any cost-control strategy focused on anti-emetic drugs became less salient over time.

5.3 Use of White Blood Cell Growth Factors for High-, Intermediate-, and Low-Risk Chemotherapy Regimens

Patients undergoing chemotherapy are at risk of developing bacterial infections, such as sepsis or pneumonia, because chemotherapy can suppress immune function by inhibiting production of white blood cells in the bone marrow. White blood cell growth factors, known as GCSFs (granulocyte colony-stimulating factors), are often given prophylactically, starting with first chemotherapy treatment and continuing with subsequent treatments, to prevent infection, fever, and neutropenia (low white blood count).

Distinct chemotherapy regimens have different risks for causing fever, neutropenia, and immunosuppression, and NCCN guidelines categorize regimens as high-, intermediate-, or low-risk for causing fever and neutropenia. High-risk is defined as greater than 20-percent risk of fever and neutropenia, intermediate as 10–20-percent risk, and low as less than 10-percent risk.[48]

Guidelines of the American Society of Clinical Oncology (ASCO) and NCCN recommend giving prophylactic GCSFs to all patients receiving chemotherapy regimens with high risk of causing fever

Exhibit 25: OCM Led to Higher-Value Anti-Emetic Use for Patients Receiving Chemotherapy with High Emetic Risk

Measure	OCM		COMP		Estimated OCM Impact	
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Estimate	Percent Change
Use of palonosetron	75.6%	66.6%	67.6%	65.7%	-7.2 pp	-9.5%
Use of NK1 antagonist	79.5%	83.4%	75.1%	80.0%	-1.0 pp	-1.3%
Use of guideline-recommended therapy	78.2%	82.8%	73.3%	77.7%	0.2 pp	0.3%

Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int: Intervention period. DID: Difference-in-differences. PP: Percentage points
Baseline trends were not parallel for OCM and comparison episodes in receipt of NK1 antagonists or receipt of guideline-recommended therapy, precluding definitive interpretation of OCM impact.

[48] National Comprehensive Care Network. NCCN Clinical Practice Guidelines in Oncology: Hematopoietic Growth Factors. Version 1.2022–December 22, 2021.

and neutropenia. The guidelines generally recommend not giving prophylactic GCSFs given to those receiving low-risk chemotherapy regimens, with rare exceptions. Patients receiving intermediate-risk chemotherapy may benefit from prophylactic GCSFs if patient characteristics indicate increased risk for fever and neutropenia, but GCSFs are widely suspected to be overused in such situations, reflecting low-value care.[49] Accordingly, ASCO's 2012 Choosing Wisely campaign included the recommendation: "Do not use white cell stimulating factors for prevention of febrile neutropenia for patients with less than 20-percent risk for this complication."[50]

We evaluated the impact of OCM on use of GCSFs during episodes when the chemotherapy regimen had intermediate or low risk for causing febrile neutropenia, where less use of GCSFs reflects guideline-recommended and higher-value care. We focused on three common cancers: high-risk breast cancer,[51] lung cancer, and colorectal cancer. In breast cancer episodes, we also assessed the impact of OCM on prophylactic use of GCSFs when chemotherapy regimens had a high risk of causing febrile neutropenia and prophylactic use of GCSFs is recommended (and non-use would indicate poor-quality care). In the latter analysis, we focused only on breast cancer because none of the commonly used chemotherapy regimens for treatment of lung or colorectal cancer are classified as having high risk for causing febrile neutropenia.

We anticipated that OCM incentives might lead to less use of prophylactic GCSFs when chemotherapy has an intermediate risk of causing febrile neutropenia because these episodes have the greatest potential for reducing unnecessary prophylactic use of GCSFs. We expected less OCM impact on use of prophylactic GCSFs in episodes where the chemotherapy regimen had low risk for causing febrile neutropenia because there should be little use of GCSFs in such episodes.

INSIGHT FROM THE FIELD

During case studies, several OCM practices mentioned focusing on appropriate use of GCSFs.

OCM led to higher-value preventative use of white blood cell growth factors relative to the comparison group, during some breast cancer and colorectal cancer episodes. OCM did not significantly affect use of white blood cell growth factors in lung cancer episodes.

Breast Cancer: Prophylactic use of GCSFs during chemotherapy regimens that have intermediate risk for causing fever and neutropenia is subject to clinical discretion but is generally of lower value. Prophylactic GCSF use in such intermediate-risk episodes was relatively high at baseline (for both OCM and comparison episodes), suggesting opportunities for reduction and thus higher-value care. OCM led to a statistically significant 7.7 percentage point relative reduction in prophylactic GCSF use during intermediate-risk chemotherapy episodes, driven by an increase in the comparison group between the baseline and intervention periods (**Exhibit 26**).

Prophylactic GCSF use was appropriately very low during breast cancer episodes when chemotherapy had low risk for causing fever and neutropenia, and OCM had no impact on GCSF use in these episodes. Prophylactic use of GCSFs was appropriately high during breast cancer episodes when chemotherapy had high risk of causing febrile neutropenia, and increased similarly over time in both OCM and comparison episodes, consistent with guideline-recommended care.

Colorectal Cancer: Prophylactic GCSF use during colorectal cancer episodes when the chemotherapy regimen had intermediate or low risk for causing fever and neutropenia was quite low before OCM began. Nonetheless, OCM led to a statistically significant 1.2-percentage point relative reduction in prophylactic GCSF use during low-risk chemotherapy episodes, as use declined slightly in OCM episodes and increased slightly in comparison episodes. Although the relative difference was small in magnitude, this reflects higher-value care. However, OCM had no impact on prophylactic GCSF use during colorectal cancer episodes with intermediate risk for fever and neutropenia.

Lung Cancer: OCM had no impact on prophylactic GCSF use during lung cancer episodes when chemotherapy had intermediate or low risk for causing neutropenia. Use of GCSFs declined in both OCM and comparison episodes when the chemotherapy regimen posed low risk of febrile neutropenia, but over 10 percent of low-risk episodes (where guidelines discourage use) still had prophylactic GCSF use in both groups. This suggested additional room to improve.

[49] Smith TJ, Bohlke K, Lyman GH, et al. Recommendations for the use of WBC growth factors: American Society of Clinical Oncology Clinical Practice Guideline update. J Clin50Oncol. Oct 1, 2015;33(28):3199–3212.

[50] Schnipper LE, Smith TJ, Raghavan D, et al. American Society of Clinical Oncology identifies five key opportunities to improve care and reduce costs: the top five list for oncology. J Clin Oncol. May 10 2012;30(14):1715–1724.

[51] This analysis excludes episodes that CMS considers lower-risk, defined as hormonal therapy only without intravenous chemotherapy.

In summary, in some patient subgroups—mainly breast cancer episodes—there is increasing evidence that OCM practices have identified reducing overuse of prophylactic GCSFs during chemotherapy with intermediate or low risk of fever and neutropenia as an opportunity for improving high-value care.

5.4 Biosimilar Versus Originator White Blood Cell Growth Factors and Use of On-Body Injector

As shown in Section 4.3, OCM led to greater use of biosimilar cancer treatments as substitutes for originator anti-cancer drugs. We assessed whether the same was true for an important class of supportive care drugs—white blood cell growth factors, or GCSFs—used to prevent neutropenia.

Choice of biosimilar growth factor and on-body pegfilgrastim

White blood cell growth factors are used to prevent low white blood cell counts for chemotherapy regimens that suppress white blood cell production. As shown in Exhibit 27, the two commonly used white blood cell growth factor (GCSF) medications are filgrastim and pegfilgrastim. Filgrastim is less costly than pegfilgrastim but requires daily subcutaneous injections—often for several days—and may involve frequent laboratory monitoring. Pegfilgrastim can be conveniently administered as a single injection given 24 hours after each chemotherapy treatment, but pegfilgrastim is more costly than filgrastim: the Medicare payment amount for one dose of pegfilgrastim was approximately $2,808 in the 2nd quarter of 2021, compared with $399 per dose of filgrastim in the same quarter.

Biosimilar filgrastim products first became available in 2015, and biosimilar pegfilgrastim products became available in 2018. Biosimilar pharmaceutical products are less costly than originator products, making biosimilars higher value. In late 2017, the manufacturer of originator pegfilgrastim released an on-body formulation that can be applied via a "patch" on the day of the chemotherapy infusion and automatically injects the drug 24 hours later, offering patients the convenience of not needing to return to the clinic for the injection. No biosimilar version of on-body pegfilgrastim is available.

OCM was associated with greater use of biosimilar growth factor drugs versus more costly originator drugs.

The Food and Drug Administration (FDA) approved the first filgrastim biosimilar (filgrastim-sndz) in March 2015, just before OCM began, and additional biosimilar formulations have been approved since then. Biosimilar pegfilgrastim-jmdb was first approved in June 2018, and three additional forms of biosimilar pegfilgrastim have been approved since then. Because biosimilar filgrastim and pegfilgrastim were generally not available during the baseline period, we could not conduct DID analyses (for which consistent baseline trends would have been required). Instead, we examined use (proportion using during the time period) and rate of adoption of biosimilar filgrastim during PP1–PP9, and of biosimilar pegfilgrastim in PP4– PP9—the time periods when each of these biosimilar GCSF agents were widely available.

During episodes when filgrastim was used (originator or biosimilar), a greater adjusted proportion of OCM episodes used biosimilar filgrastim than did comparison episodes (Exhibit 28), although the rate of adoption was

Exhibit 26: OCM Led to Relatively Higher-Value Use of Prophylactic GCSF in Some Subgroups of Breast and Colorectal Cancer Episodes, But Not in Lung Cancer Episodes

Chemotherapy Regimen Fever and Neutropenia Risk Category	OCM		COMP		Estimated OCM Impact	
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Estimate	Percent Change
Use of Growth Factors—Breast Cancer						
High-risk	85.2%	90.6%	87.0%	91.0%	1.4 pp	1.6%
Intermediate-risk	49.8%	49.8%	41.4%	49.1%	-7.7 pp	-15.5%
Low-risk	1.6%	1.4%	1.6%	1.7%	-0.3 pp	-16.1%
Use of Growth Factors—Colorectal Cancer						
Intermediate-risk	10.7%	9.8%	11.7%	10.8%	0.0 pp	0.1%
Low-risk	4.1%	3.1%	3.1%	3.4%	-1.2 pp	-30.4%
Use of Growth Factors—Lung Cancer						
Intermediate-risk	29.3%	25.7%	27.6%	26.0%	-2.0 pp	-7.0%
Low-risk	17.3%	12.5%	15.8%	12.1%	-1.1 pp	-6.6%

Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: GCSF: Granulocyte colony-stimulating factors. OCM: OCM intervention group. COMP: Comparison group. Int: Intervention period. DID: Difference-in-differences. PP: Percentage points. Risk refers to risk for fever and neutropenia.

similar. Similarly, adjusted analyses showed greater use of biosimilar pegfilgrastim in OCM versus comparison episodes, although the rate of adoption was similar. The preferential use of biosimilar rather than originator filgrastim and pegfilgrastim in OCM episodes reflects a straightforward strategy of therapeutic substitution and more value-based use of GCSFs. This is consistent with the earlier finding that OCM led to greater use of biosimilar versus originator anti-cancer drugs. There were no differences in use of on-body pegfilgrastim during OCM versus comparison episodes (see Appendix C.12.4 for additional details).

5.5 Discussion

OCM led to high-value changes in use of costly cancer supportive care medications, including bone-modifying agents, anti-emetic medications, and white blood cell growth factors. Importantly, changes in use of supportive care medications were not associated with negative impacts on measures reflecting the quality of cancer supportive care.

Specifically, OCM led to reduced use of the costly bone-modifying agent denosumab among patients with breast, prostate, and lung cancer, without affecting the proportion of patients who received appropriate treatment for bone metastases. OCM also led to reduced prophylactic use of the relatively costly anti-emetic drug palonosetron during chemotherapy episodes with high emetic risk, without apparent impact on receipt of a guideline-recommended, multi-drug anti-emetic regimen. However, the cost of palonosetron and other anti-emetic medications decreased substantially during the period covered by this evaluation, and OCM impacts on prophylactic anti-emetic use appear to have waned over time as the medication cost has declined. Lastly, OCM led to high-value reductions in use of prophylactic white blood cell growth factors during breast cancer chemotherapy with intermediate neutropenia risk and colorectal cancer chemotherapy with low neutropenia risk, without affecting recommended use of prophylactic white blood cell growth factors during breast cancer chemotherapy with high risk for neutropenia.

These changes would be expected to lead to lower spending for supportive care medications in OCM episodes, consistent with the finding of significant OCM impacts on spending for supportive care medications presented in Chapter 2.

Exhibit 27: Average Sales Prices For Biosimilar GCSF Products Were Lower Than For Originator

Filgrastim (NEUPOGEN®)
Short –acting
Daily use x ~3-5 days starting day after chemotherapy
In clinic or at home ~$399/dose

Biosimilar filgrastims

–sndz	Mar 2015	~$158/dose
–aafi	Jul 2018	~$189/dose
–ayow	Feb 2022	n/a

Pegfilgrastim (NEULASTA®)
Long –acting
1 dose
Given day after chemotherapy
~$2,808/dose

Biosimilar pegfilgrastims

–jmdb	Jun 2018	~$2,837
–cbqv	Nov 2018	~$3,016
–bmez	Nov 2018	~$3,322
–apgf	Jun 2020	~$4,043

Pegfilgrastim (NEULASTA®) On-Body
Long –acting
Applied day of chemotherapy, injects automatically the next day
Available in late 2017
~$20 for injector + ~$2,808/dose

No biosimilar formulation available

Notes: All prices based on Medicare Average Sale Price data from April 2021. -sndz, -aafi, -ayow, -jmdb, -cbqv, -bmez, -apgf are suffixes designating different biosimilar products.

Exhibit 28: OCM Was Significantly Associated with Greater Use of Lower-Cost Biosimilar Filgrastim and Pegfilgrastim, Rather Than Originator Products, in the Intervention Period

	Intervention Mean		Difference in Use (Percentage Points)	Rate of Adoption (Post-Period Trend)
	OCM	COMP	Estimate	Estimate
Biosimilar filgrastim	56.3%	46.6%	9.7 pp	0.7%
Biosimilar pegfilgrastim	24.9%	20.1%	4.8 pp	-0.8%

Shading indicates statistically significant estimates at p≤0.01, p≤0.05, and p≤0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. This analysis assessed use of lower-cost biosimilar versus originator filgrastim, during breast, lung, or colorectal cancer episodes, when filgrastim was used at all. The Rate of Adoption reflects the coefficient of the trend line in the post-periods during which the biosimilar product was available.

Did Care Experiences Improve over Time among OCM Patients?

CONTEXT AND KEY FINDINGS

OCM included several quality measures that were tied to performance-based payments, including patient experiences. Monthly Enhanced Oncology Services (MEOS) payments were also provided with the explicit goal of enhancing care quality, including patient-reported measures such as access, communication, information exchange, and shared decision making. OCM also required practices to submit two self-reported quality measures: 1) pain assessment and management and 2) depression screening and follow-up plan.

Care experience for OCM patients changed little during OCM, as measured by six patient-reported composite measures of care experience and an overall rating of the cancer care team.

Patients reported high care quality at the beginning of the model, and so it is possible that there was little room for improvement among the measures for which practices were held accountable.

OCM practices reported high rates of pain assessment andmanagement rates, which improved moderately over time, and low rates of depression screening and follow-up plans, which improved substantially over time.

However, patient reports about the involvement of their cancer therapy team in managing pain and depression did not show similar improvements over time, suggesting that patients did not always notice these transformations.

Oncology Care Model (OCM) requirements emphasized timely access to care, shared decision making, patient navigation, and care coordination. OCM also included several quality measures that were tied to performance-based payments (PBPs), including patient experiences. By including a measure of care experience as one of the OCM quality measures, OCM explicitly incentivized participating practices to provide positive care experiences. As described in prior reports (Evaluation of the Oncology Care Model: Performance Periods 1-3 and Evaluation of the Oncology Care Model: Performance Periods 1-5), many practices implemented care redesign efforts, such as educating patients to "Call Us First" before going to an emergency department (ED), and using protocol-driven approaches to patient navigation between clinic visits and after hours.

These requirements and the resulting changes that practices made may have had implications for patient care experience and quality of care among OCM patients. We assessed patient care experiences through two different lenses: 1) directly, via a patient experience survey; and 2) indirectly, through case studies and quality measure information that practices report to CMS about their efforts to identify and manage pain and depression.

6.1 Patient-Reported Care Experience and Overall Rating of the Cancer Care Team

We surveyed OCM patients every quarter throughout the OCM PP to measure care experiences for OCM patients and support CMS's efforts to calculate patient experience scores at the practice level for the purposes of PBPs. Information about the OCM patient survey methodology is available in Appendix A.3, and the OCM patient survey instrument is available in the online appendix.[52]

Patient-reported care experience did not change during OCM.

The patient survey contained six composite measures; each was calculated based on responses to several survey questions related to patient experience and satisfaction, and one single-item measure of overall satisfaction with the cancer care team (Exhibit 29). See Appendix A.3.2 for the additional detail on the survey questions that make up each composite. All seven measures were scored on a scale of 0 to 10, where 0 was the worst possible score, and 10 was the best possible score.

At the start of OCM, survey respondents gave high scores for the overall rating of the cancer therapy team and the composite measures for affective communication, access, and exchanging information (each averaging roughly 9 on a 10-point scale) (Exhibit 30). In contrast, the composite measures for shared decision making, enabling patient self-management, and symptom management had more room for improvement, with ratings averaging 6 to 7 on a 10-point scale. Across all measures, average ratings changed little over time, even when looking at episodes that occurred during the COVID-19 public health emergency (PHE).

Trends over time were statistically significant and positive for four of the seven measures (overall rating, shared decision making, access, and affective communication), and statistically significant and negative for one survey measure (symptom management). However, the magnitude of changes was small, even for the statistically significant measures, reflective of the large sample size used in the analysis. The measure with the largest change over time, shared decision making, had a change comparable to an increase of 0.25 on a scale of 0 to 10 from the baseline wave through PP9. We found similar trends over time among patients with higher-risk and lower-risk episodes. The trendlines for the OCM patient survey measures remained generally stable over time, even during the COVID-19 PHE, which suggests that OCM had a minimal impact on patient experiences.

These findings are similar to those reported in a prior report, Evaluation of the Oncology Care Model: Performance Periods 1-5, where we compared survey responses from OCM and comparison patients with episodes initiated between July and December 2018, relative to the baseline. In that difference-in-differences (DID) analysis, we found small differences over time in the patient survey composite measures between the OCM and comparison groups that were not statistically significant.[53]

NSIGHT FROM THE FIELD

OCM practices received quarterly feedback reports from CMS that summarized their performance on the survey composite measures. A few practices we visited described gaining actionable insight from those data. For example, two practices noticed their low scores on the "shared decision making" survey composite and implemented changes they hoped would improve these scores.

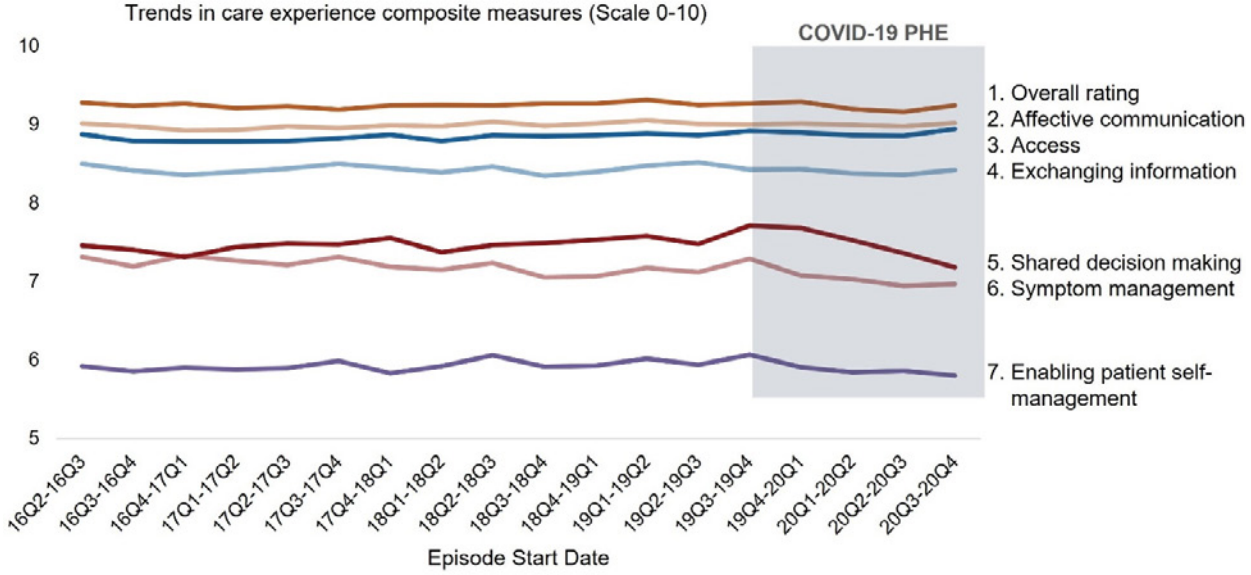
[52] OCM used a modified version of the Cancer Consumer Assessment of Healthcare Providers and Systems instrument to measure patient experiences with cancer care. Additional information about this survey instrument can be found at https://www.ahrq.gov/cahps/surveys-guidance/cancer/develop-cancer-surveys.html.

[53] While we previously collected surveys from patients with comparison group episodes, those comparison group surveys were discontinued following the episodes initiated between July and December 2018.

Exhibit 29: Measures of Patient-Reported Care Experience Covered Multiple Domains

Care Experience Measures	Description
Overall rating	Single-item measure rating the cancer therapy team on a scale of 0 to 10.
Access	Composite measure reflecting patient experiences with the accessibility and convenience of cancer care, including between visits, after hours, and if side effects occurred.
Affective communication	Composite measure reflecting whether patients felt that their cancer care team respected, listened to, spent enough time with, and explained care aspects clearly to them.
Enabling patient self-management	Composite measure reflecting whether cancer care team spoke with patients about three symptoms (pain, changes in energy levels, and depression/anxiety) and helped address symptoms when needed; also reflects whether patients spoke to their cancer care team about services to manage cancer at home and about things to do to maintain health during treatment.
Exchanging information	Composite measure reflecting whether patients felt the cancer care team explained side effects of treatment, next steps in treatment, test results, and medications.
Shared decision making	Composite measure reflecting whether patients spoke with their cancer care team about reasons to have (or not have) chemotherapy treatment, asked for their opinion about having chemotherapy treatment, and involved them in decisions as desired.
Symptom Management	Composite measure reflecting whether cancer care team helped patients with eight symptoms, when needed: pain, changes in energy levels, depression/anxiety, nausea/vomiting, difficulty breathing, coughing, constipation/diarrhea, and neuropathy.

Exhibit 30: Care Experience for OCM Patients Changed Little during OCM



Source: OCM Patient and Caregiver Surveys. Includes episodes initiated from April 2016 through December 2020; data collection for these episodes occurred from January 2017 through June 2021..

Notes: N= 179,445 survey responses. Gray shading in the chart indicates survey waves with some portion of episodes occurring during the COVID-19 public health emergency. OCM episodes lasted for 180 days, and patients typically received surveys roughly 6–9 months following the start of their episode. Estimates were weighted for sampling and non-response and regression adjusted. Patients with a COVID-19 diagnosis during the episode were excluded from analysis.

OCM patients reported slightly improved symptoms during OCM, relative to baseline

The patient survey also asked respondents whether they were bothered by eight symptoms from their cancer or cancer treatment, and whether their cancer therapy team tried to help them manage those symptoms.[54] The share of OCM respondents who reported not having symptoms increased slightly over time during OCM for seven of the eight symptoms, even during the COVID-19 PHE (Appendix Exhibit D-2). For example, at baseline, 71 percent and 75 percent of respondents reported having no symptoms related to breathing and coughing, respectively; among respondents with episodes initiated in late 2020, this increased to 73 percent of respondents for breathing and 78 percent of respondents for coughing. These improvements in symptoms were driven by modest improvements among higher-risk episodes. Notably, analyses included only OCM respondents (no comparison group) and excluded episodes with a COVID-19 diagnosis during the episode. Similar trends may have also occurred among non-OCM cancer patients.

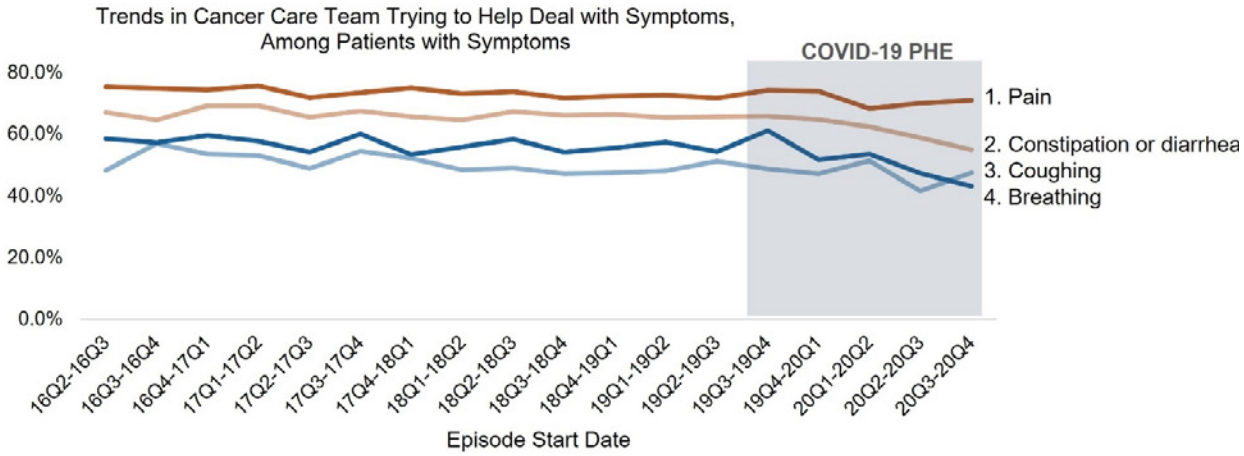
OCM patients reported diminished involvement of their cancer therapy team in managing some symptoms, relative to baseline

Among patients who reported having symptoms, the share of OCM respondents reporting that their cancer therapy team tried to help manage symptoms declined slightly for four of eight symptoms (pain, breathing, coughing, and constipation or diarrhea; p-values for trend coefficients < 0.05) (**Exhibit 31**). Extrapolating across all survey waves, these trends indicate a negative change from the baseline wave ranging from negative 3 percentage points for management of constipation or diarrhea to negative 6 percentage points for management of coughing. While the findings for pain and constipation/diarrhea were driven by higher-risk episodes, the findings for the coughing and breathing occurred for both lower- and higher-risk episodes (Appendix Exhibit D-3). As with the prior patient survey analyses, these analyses included OCM patients only (no comparison group) and cannot be considered causal. It is possible that the stay-at-home orders early during the COVID-19 PHE were associated with reductions in patient perceptions of symptom management for both OCM and non-OCM patients.

RELATED SECTIONS

As shown in Section 5, OCM generally led to more value-focused use of supportive therapies to mitigate side effects of cancer treatment. That OCM patients reported small but significant improvements in several common cancer symptoms suggests that the adoption of value-focused supportive therapies in OCM practices did not adversely impact symptom management among OCM patients.

Exhibit 31: OCM Patients Reported Diminished Involvement of Their Cancer Therapy Team in Managing Some Symptoms Over Time



Source: OCM Patient and Caregiver Surveys. Includes episodes initiated from April 2016 to December 2020; data collection for these episodes occurred from January 2017 to June 2021.

[54] The survey asked about symptoms and symptom management for: pain, energy level/fatigue, emotional problems, nausea, breathing, coughing, constipation, and neuropathy.

6.2 Practice-Reported Pain and Depression Management Quality Measures

Practices self-reported high pain assessment and management rates and lower (but improving) rates of depression screening and follow-up plans.

Many cancer patients experience pain and depression while undergoing treatment, and evidence suggests that attention to pain and depression can improve health outcomes and survival.[55] OCM practices that consistently screen patients for depression and pain, and effectively manage these important symptoms, may help reduce overall health care use and Medicare spending while improving quality of care. OCM practices submit quality measures to CMS for each PP, and among these practice-reported measures are pain management and depression screening with follow-up plans as needed.[56] We assessed changes over time for two practice-reported measures: OCM-4 ("Pain assessment and management")[57] and OCM-5 ("Depression screening and follow-up plan").[58] Both measures required screening patients for pain or depression and documenting a plan of care (for pain) or a follow-up plan (for depression).

On average, from PP2 to PP6, practices improved their measure scores by roughly 10 percentage points for OCM-4 and 13 percentage points for OCM-5 ($p<0.05$ for both) (**Exhibit 32**).[59] While practices continued to improve on OCM-5 from PP7 to PP9, by another 7 percentage points on average, practice performance on OCM-4 remained stable.

Exhibit 36 shows results for all practices that submitted measures in a given PP. Therefore, scores in later PPs, when there were fewer remaining practices, may be partly a result of survivor bias (higher-performing practices remaining active longer). Focusing on the 104 practices that consistently reported data over time, including during PP7-9 (when COVID-19 PHE flexibilities made quality measure reporting options), allows us to assess improvements more clearly over time. By PP9, on average, these 104 practices had met the measure criteria for OCM-4 ("Pain assessment and management") for 93 percent of their patients and had met OCM-5 ("Depression screening and follow-up") criteria for 82 percent of their patients (Exhibit 33).

INSIGHT FROM THE FIELD

In case studies, multiple practices reported that screening for depression was challenging. Practices often lacked internal resources for treating depressed patients, and many also reported a lack of mental health clinicians in their regions who could provide that care. More details on those findings can be found in the December 2021 report: Evaluation of the Oncology Care Model: Participant Perspectives.

Exhibit 32: OCM Practices Reported Improvements in Pain Screening and Management, and Depression Screening and Follow-up

Quality Measure	Average Performance Rate Across All OCM Practices†							
	2017		2018		2019		2020	
	PP2	PP3	PP4	PP5	PP6	PP7	PP8	PP9
Number of practices submitting practice-reported quality measures	183	182	179	173	172	125	118	114
OCM-4: Pain assessment and management	77.6	80.7	84.1	86.9	87.1	88.2	89.8	88.8
OCM-5: Depression screening and follow-up plan	57.7	64.0	64.9	71.1	70.9	73.5	75.0	77.9

Shading indicates statistically significant estimates relative to PP2 at $p \leq 0.05$, indicated by blue shading.

Source: OCM quality measure data reported to CMS by participating practices.

Notes: †N=190 across all Performance Periods; the sample sizes varied across PPs due to practice terminations over time, and because not all practices submitted the practice-reported measures in all PPs. PP: Performance period.

[55] Reyes CC, Anderson KO, Gonzalez CE, et al. (2019). Depression and survival outcomes after emergency department cancer pain visits. BMJ Supportive & Palliative Care. 9:e36.

[56] The practice-reported quality measures contribute to CMS's calculation of an AQS for each practice, in each PP. Payments are adjusted downward for practices that fail to reach an AQS threshold set by CMS.

[57] To meet the measure criteria for OCM-4, OCM practices were required to screen patients for pain at each contact. Additionally, patients with pain present were required to have a documented plan of care, which could include use of opioids, nonopioid analgesics, psychological support, patient and/or family education, referral to a pain clinic, or reassessment of pain at an appropriate time interval.

[58] To meet the measure criteria for OCM-5, practices were required to screen patients for depression who did not have an active diagnosis for depression or bipolar disorder. Additionally, patients who screened positive for depression were required to have a documented appropriate follow-up plan, such as additional evaluation or assessment for depression; suicide risk assessment; referral to a practitioner who is qualified to diagnose and treat depression; pharmacological interventions; or other interventions or follow-up for the diagnosis or treatment of depression.

[59] Performance rates from the practice-reported data were not available for the baseline period or for PP1.

While these practices demonstrated improvement on both measures over time, the distribution of practice performance rates differed. For OCM-4 ("Pain assessment and management"), most practices had achieved a high performance rate by PP6. In contrast, for OCM-5 ("Depression screening and follow-up"), the distribution of performance rates still varied widely in PP9. This result indicates that some practices may need additional support or resources to improve their performance on OCM-5.

6.3 Practice Achievement on the Aggregate Quality Score (AQS)

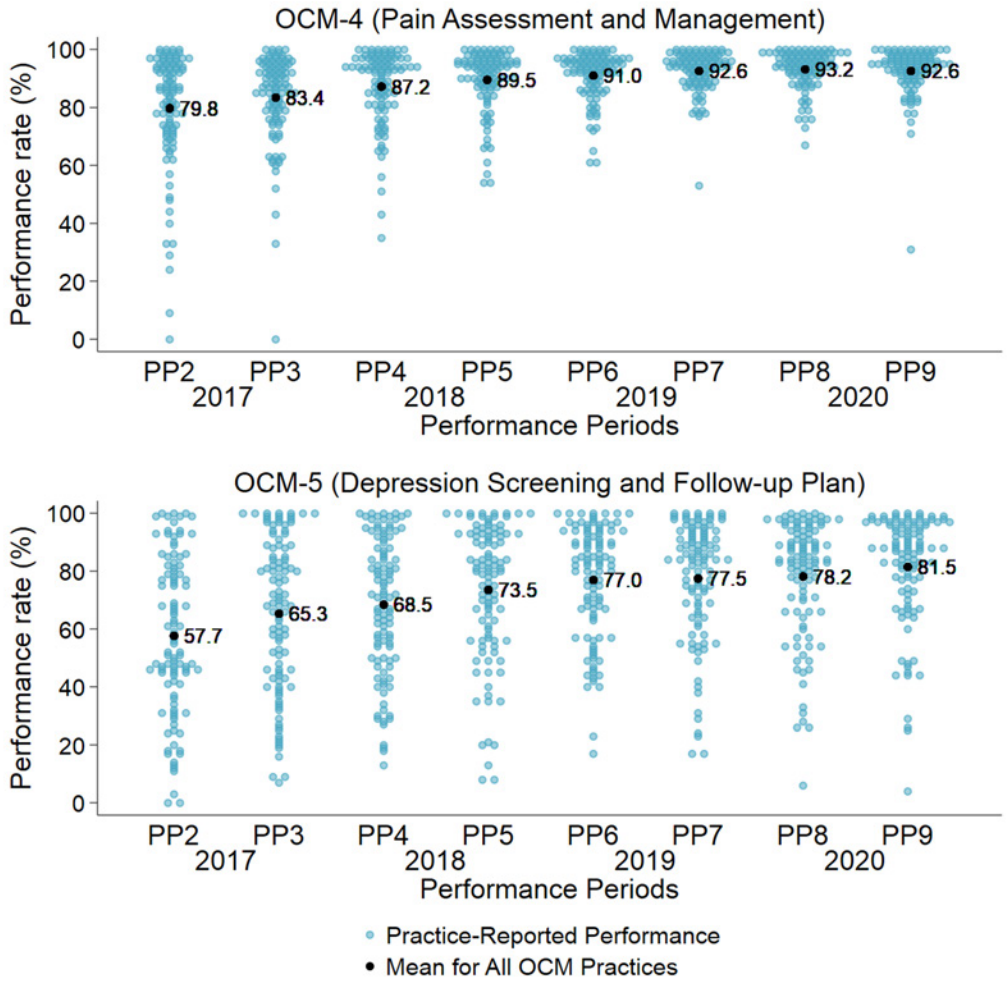
OCM practices were more likely to have performance multipliers of 100 percent in Performance Periods 8-9, relative to prior Performance Periods.

To ensure OCM practices maintain or improve quality while also reducing spending throughout OCM, CMS used OCM practices' performance on several quality measures to determine whether they qualified for PBP earnings. The quality measures used in the AQS calculation changed over time, but were stable starting in PP6. From PP6 on, AQS included five equally weighted quality measures:

- OCM-2, "Risk-adjusted proportion of patients with all-cause ED visits or observation stays that did not result in a hospital admission within the 6-month episode"
- OCM-3, "Proportion of patients who died who were admitted to hospice for 3 days or more"
- The two practice-reported measures discussed above in Section 6.2 (OCM-4, "Pain assessment and management" and OCM-5, "Depression screening and follow-up plan")
- OCM-6, "Patient-reported experience of care"

Based on each practice's performance on the quality measures used in each performance period, CMS

Exhibit 33: Most OCM Practices Reported High Performance on Pain Screening and Management by Performance Period 6, but Performance on Depression Screening and Follow-up Remained Inconsistent through Performance Period 9



Source: OCM quality measure data reported to CMS by participating practices.
Notes: N=104 practices that submitted practice-reported quality measures in all Performance Periods (PPs) from PP2 to PP9.

calculated each practice's AQS. The AQS was used to hold practices accountable for quality, where practices lost some or all of their PBP (if earned) if they had AQS values below certain thresholds. In particular, practices earning at least 75 percent of possible AQS points received a performance multiplier of 100 percent, meaning that they were able to keep their entire PBP.

In PP8 and PP9, practices were more likely to have AQS performance multipliers of 100 percent relative to prior PPs (**Exhibit 34**). This increase in AQS performance was driven by a policy change implemented by CMS starting in PP8, where CMS made reporting the two practice-reported quality measures (OCM-4 and OCM-5) voluntary, leaving just three required quality measures. Additionally, of the remaining three required measures, achievement on measure OCM-2 (ED visits or observation stays) improved in PP8 and PP9 for many practices because fewer ED visits occurred during the PHE. Most practices that chose to take two-sided risk with payment reconciliation were able to meet the threshold on the AQS to receive their full PBP.[60]

6.4 Discussion

Patient-reported care experience changed little during OCM even though many practices implemented care redesign intended to improve care experiences for patients. Likewise, while practices self-reported substantial improvements in screening and follow-up care for pain and depression, patient perceptions about the involvement of their cancer therapy team in managing symptoms for pain and depression were broadly stable over time.

These findings have potential implications for the Enhancing Oncology Model. Limited room for improvement remains for OCM-4 ("Pain assessment and management"), even as roughly a quarter of OCM patients who reported having pain in the patient survey also reported that their cancer therapy team did not try to help them deal with their pain. Most practices achieved a high degree of success on OCM-4, and future care improvement efforts related to screening and management of pain could face diminishing returns, at least as measured by the OCM-4 quality measure. It is possible that survey respondents did not recall certain efforts taken by their care team in responding to the survey (i.e., recall bias). In contrast, despite substantial improvements made by many practices on OCM-5 ("Depression screening and follow-up plan") of over 20 percentage points on average, room for improvement remains for many practices. Fewer than half of respondents who reported having emotional problems, such as depression or anxiety, on the patient survey reported that their cancer care teams helped them deal with their problems. Based on qualitative insights from practices, improvement in connecting patients with mental health services may be challenging without broader changes in the mental health care landscape.

Exhibit 34: OCM Practices Were More Likely to Have AQS Performance Multipliers of 100 Percent in Performance Periods 8-9, Relative to Prior Performance Periods

Year and Performance Period	2016	2017		2018		2019		2020	
	PP1	PP2	PP3	PP4	PP5	PP6	PP7	PP8	PP9
Number of OCM practices receiving an AQS	196	191	195	194	183	177	175	140	139
Percent of OCM practices that had performance multipliers of 100%†	31%	39%	48%	37%	17%	19%	25%	67%	74%

Source: OCM quality measure data reported to CMS by participating practices.
Notes: †Practices earned performance multipliers of 100% by receiving at least 75% of the maximum AQS points. AQS: Aggregate Quality Score. PP: Performance period.

[60] The *OCM Performance-Based Payment Methodology* has additional information on the calculation of the AQS (available for download at https://innovation.cms.gov/Files/x/ocm-pp3beyond-pymmeth.pdf).

How did Outcomes Change for Historically Underserved Populations Under OCM?

CONTEXT AND KEY FINDINGS

This chapter considers outcomes for three historically underserved population groups: patients who were Black (hereafter, "Black patients"), patients who were Hispanic (hereafter, "Hispanic patients"), and patients with dual Medicare-Medicaid eligibility. In addition to estimating the association between OCM and outcomes of interest within each underserved population, we also assessed the relative impact of OCM for each underserved population against a corresponding reference population. Changes in outcomes for Black and Hispanic patients were compared to those for patients who were non-Hispanic White (hereafter, "White patients"), and changes for patients with dual eligibility were compared to those patients with only Medicare. **Key findings included**:

OCM was associated with reduced total episode payments for all populations analyzed.

Significant reductions in total episode payments associated with OCM were similar for Black patients compared with White patients and for patients with dual eligibility compared to patients with only Medicare. The reduction in total episode payments associated with OCM for Hispanic patients was substantially larger. OCM was associated with similar-sized reductions in Part B non-chemotherapy drug payments in all populations. Larger total episode payment reductions among Hispanic patients were attributable to a significant reduction in Part D payments.

Prior to OCM, all three historically underserved populations had more inpatient admissions and ED visits relative to their reference populations. During OCM, differences in some measures inpatient and ED care increased between Black patients and White patients, and between patients with dual eligibility and those with Medicare only.

Relative to White patients, OCM was associated with an increased probability of having an ED visit or 30-day readmission for Black patients. It is inconclusive whether this was primarily due to increased utilization among Black patients or decreased utilization among White patients.

Similarly, OCM was associated with an increased probability of an ED visit, inpatient stay, or ICU admission among patients with dual eligibility relative to those with Medicare only. Differences in ICU admissions were driven by a reduction in the probability of an ICU admission among patients with only Medicare. It is inconclusive whether relative increases in ED visits and inpatient stays were attributable to increased use among patients with dual eligibility or decreased use among patients with Medicare only.

Adherence to high-cost oral cancer drugs improved during OCM for all three historically underserved populations.

Prior to OCM, all three historically underserved populations had significantly lower adherence to high-cost oral cancer drugs relative to their reference populations. OCM was associated with significant increases in adherence among all three historically underserved populations. both in absolute terms and relative to their reference populations.

Patient care experiences were similarly high for all populations analyzed during the baseline survey wave and remained high during OCM.

Overall, OCM did not have consistent effects on health equity, for better or worse.

One of the Centers for Medicare & Medicaid Services' (CMS's) stated goals in the 2022 Framework for Health Equity is "to explicitly measure the impact of our policies on health equity." In support of this goal, the Oncology Care Model (OCM) evaluation conducted exploratory analyses for populations that have been historically underserved. OCM, which began in July 2016, did not explicitly incorporate principles of health equity into the Model design. Nonetheless, the enhanced oncology services that OCM encouraged may have promoted more equitable outcomes for historically underserved populations.

In particular, OCM encouraged patient navigation, use of care plans, and attention to symptom management, which could have disproportionately benefited populations who historically faced disparities in access and care.[61] Conversely, OCM could have exacerbated disparities if systemic barriers prevented historically underserved populations from experiencing certain improvements related to OCM that were realized by other populations, or if the financial incentives built into OCM had adverse impacts for some populations.

We analyzed outcomes for historically underserved populations that we could identify in available data, and for whom we had sufficient sample size to detect model impacts. These included:

- Patients who were Black
- Patients who were Hispanic
- Patients with dual Medicare-Medicaid eligibility

Beyond assessing outcomes within a population, we also compared changes in outcomes among historically underserved populations relative to corresponding "reference populations." The reference populations reflect groups that have generally not been as underserved historically, and which may therefore have had different outcomes on average prior to OCM, and may have experienced different impacts under the Model. Patients who were non-Hispanic White (hereafter referred to as "White patients") were the reference population for patients who were Black and Hispanic (hereafter "Black patients" and "Hispanic patients.") Patients with only Medicare were the reference population for patients with dual eligibility. We provide additional detail on the identification of each population and the analytic methods used for these analyses, in Appendix E. During the intervention period, roughly 8 percent of OCM episodes covered care for Black patients, 5 percent covered care for Hispanic patients, and 83 percent covered care for White patients.[62] Likewise, during the OCM intervention period, roughly 13 percent of OCM episodes covered care for patients with dual eligibility, with the other 87 percent of OCM episodes covering patients with Medicare only. There was some overlap in these populations, as roughly one-third of Black patients and one-half of Hispanic patients also had dual eligibility, while fewer than 1 in 10 White patients had dual eligibility. Despite this, White patients were a slim majority (55 percent) of patients with dual eligibility, while roughly 21 percent were Black and 16 percent were Hispanic. Sample sizes and descriptive statistics for each population included in our analysis are provided in Appendix Exhibit E-3 **to** E-8 Since this analysis was not exhaustive of all historically underserved populations, we cannot infer the potential effect of OCM on other populations based on the results of these analyses.

Section 7.1 assesses the association of OCM with total episode payments (TEP) and acute-care utilization for historically underserved and reference populations. It also shows how those impacts affected the magnitude of differences between underserved and reference populations. Section 7.2 reports results for clinical outcomes, and Section 7.3 focuses on patient care experiences.

ANALYTIC APPROACH USED IN THIS CHAPTER

The analyses in Chapters 2-5 use a difference-in-difference (DID) approach to compare changes between OCM and comparison groups over time. This can be interpreted as the impact of OCM. To assess the association of OCM with outcomes for historically underserved populations, we used a "difference-in-difference-in-differences" (DDD) approach, which compares two population-specific DID estimates to one another (e.g., the change for Black OCM patients versus Black comparison patients, relative to the change for White OCM patients versus White comparison patients). This allows us to assess changes within historically underserved populations and within the corresponding reference population, while also assessing the relative change between the two populations among OCM patients. This informs whether OCM increased or decreased differences between groups, relative to traditional Medicare.

[61] American Cancer Society. Cancer Disparities: A Chartbook; 2018. Retrieved from Fight Cancer: http://www.fightcancer.org/disparitieschartbook.

[62] The other 4 percent of OCM episodes covered care for patients classified by Medicare enrollment data as Asian or Pacific Islander, Native America/Alaska Native, or Other. None of these individual groups had sufficient sample size for reliable analysis.

7.1 Changes In Payment and Utilization Outcomes

Payment Outcomes

OCM was associated with similar reductions in total episode payments and Part B non-chemotherapy drug payments for Black and White patients, as well as for patients with dual eligibility or Medicare only. Reductions in total episode payments were greater for Hispanic patients than for other populations, primarily due to larger reductions in Part D payments.

Prior to OCM, all three historically underserved populations had higher TEP than their reference populations, primarily due to larger Part D payments that offset lower Part B payments (Appendix Exhibits E-9 to E-11). Reductions in TEP were similar between Black patients and White patients, and between patients with dual eligibility and those with only Medicare. These reductions were consistent in magnitude with the overall estimate of -$499 and were similarly driven primarily by reductions in Part B non-chemotherapy drug payments (see Section 2.1).

OCM was associated with a substantially larger reduction in TEP for Hispanic patients than the other populations. **Exhibit 35** presents a visual breakdown of estimated reductions in TEP for Hispanic patients relative to White patients, illustrating the approach used for estimating the association of OCM with outcomes of interest for historically underserved populations relative to the reference population. Between the baseline and intervention periods, TEP increased by over $6,000 for White patients in the OCM and comparison groups but increased by $423 less among White OCM patients relative to White comparison patients (p<0.01). Similarly, TEP increased substantially for Hispanic patients in both the OCM and comparison groups. However, among Hispanic patients, TEP for OCM patients increased by $1,519 less than for comparison patients (p<0.01). The difference between these two estimates (-$1,519 minus -$423) was -$1,096, indicating that OCM yielded significantly greater reductions in TEP among Hispanic patients than among White patients (p<0.01).

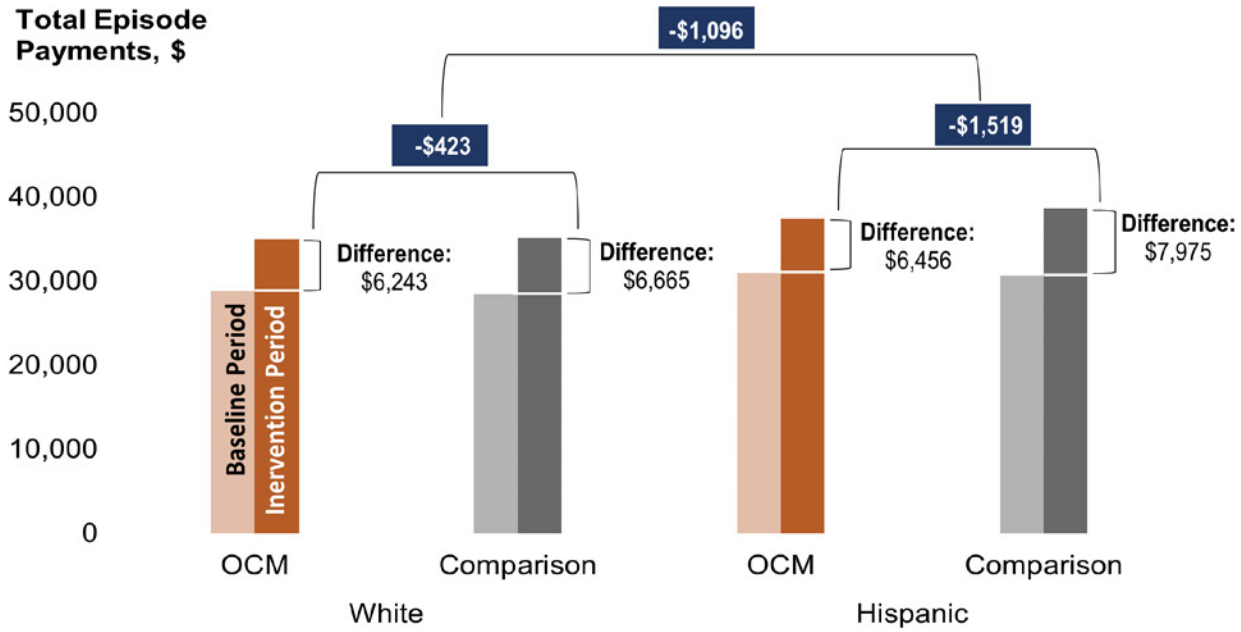
As shown in Exhibit 36, OCM was associated with similar statistically significant reductions in Part B non-chemotherapy drug payments for both White patients and Hispanic patients. However, OCM was associated with a reduction of $816 in Part D payments among Hispanic patients (p<0.01), with no difference in Part D payments for White patients. The Part D payment reduction was the primary driver of larger overall reductions in TEP among Hispanic patients relative to White patients during OCM ($870).

Use of Hospital Inpatient and ED Services

Use of some measures of hospital inpatient and ED services increased for Black patients relative to White patients, and for patients with dual eligibility relative to patients with only Medicare.

Exhibit 37 and Appendix Exhibit E-13 show summary findings related to use of acute-care services for Black patients and Hispanic patients relative to White patients. Exhibit 38 reports acute-care service use for patients with dual eligibility relative to patients with only Medicare. Appendix Exhibits E-12 to E-14 show

Exhibit 35: Reductions in TEP Associated with OCM Were Substantially Larger for Hispanic Patients Relative to non-Hispanic White Patients



Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.

additional findings for other outpatient service use outcomes among each population.

Prior to OCM, all three historically underserved populations were substantially more likely to have an ED visit, inpatient stay, or 30-day readmission than their corresponding reference populations. OCM was not associated with changes in acute-care service use among Black patients, but was associated with reductions among White patients in the occurrence of 30-day readmission (-0.5 pp, p<0.10) and in the occurrence of an ICU stay (-0.4 pp, p<0.10). The combined effect of changes among Black patients and White patients during OCM resulted in an increased likelihood of an ED visit for Black patients relative to White patients (0.7 pp; p<0.10). The effect of these changes also resulted in an increased likelihood of at least one 30-day readmission for Black patients relative to White patients (1.4 pp; p<0.05). OCM was not associated with changes in use of acute-care services among Hispanic patients or with differences in acute-care service use between Hispanic and White patients.

Exhibit 36: Baseline Differences in TEP between Hispanic and White Patients Decreased by Nearly Half during OCM, through Differential Reductions in Part D Payments

Outcome	OCM Baseline			Estimate Associated with OCM		
	Hispanic	White	Difference (% Difference)	Hispanic (A)	White (B)	Differential (A-B)
TEP without MEOS	$30,936	$28,750	$2,186 (7.6%)	-$1,519	-$423	-$1,096
Part B chemotherapy payments	$7,127	$7,796	-$668 (-8.6%)	-$288	$38	-$326
Part B non-chemotherapy drug payments	$2,370	$2,718	-$348 (-12.8%)	-$326	-$245	-$81
Part D payments	$9,239	$6,285	$2,954 (47.0%)	-$816	$54	-$870

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. TEP: Total episode payment. MEOS: Monthly Enhanced Oncology Services payment.

Exhibit 37: OCM Was Associated with a Small, Statistically Significant Increase in the Likelihood of an ED Visit and the Likelihood of a 30-Day Readmission for Black Patients Relative to White Patients

Outcome	OCM Baseline			Estimate Associated with OCM		
	Black	White	Difference (% Difference)	Black (A)	White (B)	Differential (A-B)
Any ED visit	41.4%	35.2%	6.3 pp (17.9%)	0.6 pp	-0.2 pp	0.7 pp
Any inpatient stay	29.4%	27.0%	2.4 pp (8.8%)	0.5 pp	-0.1 pp	0.6 pp
Any 30-day readmission	27.9%	24.8%	3.1 pp (12.4%)	0.9 pp	-0.5 pp	1.4 pp
Any ICU admission	10.5%	10.0%	0.5 pp (4.8%)	-0.1 pp	-0.4 pp	0.3 pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. ED: Emergency department. pp: Percentage point. ICU: Intensive care unit.

Exhibit 38: OCM Was Associated with Differentially Increased Hospital Utilization for Patients with Dual Eligibility Relative to Patients with Only Medicare

Outcome	OCM Baseline			Estimate Associated with OCM		
	Dual	Non-Dual	Difference (% Difference)	Dual (A)	Non-Dual (B)	Differential (A-B)
Any ED visit	44.5%	34.2%	10.3pp (30.0%)	0.4pp	-0.2pp	0.6pp
Any inpatient stay	31.7%	26.5%	5.2pp (19.8%)	0.6pp	-0.1pp	0.7pp
Any 30-day readmission	28.1%	24.7%	3.4pp (13.7%)	0.1pp	-0.5pp	0.6pp
Any ICU admission	11.9%	9.7%	2.2pp (22.8%)	0.1pp	-0.4pp	0.6pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. ED: Emergency department. pp: Percentage point. ICU: Intensive care unit.

Results among patients with dual eligibility were similar to those among Black patients. OCM was not associated with changes in acute-care service use among patients with dual eligibility, but was associated with some reduction among patients with only Medicare. Changes among patients with only Medicare included a significant reduction in the occurrence of 30-day readmission (-0.5 pp, $p<0.10$) and in the occurrence of an ICU stay (-0.4 pp, $p<0.05$). The combined effect of changes among the two populations during OCM resulted in the following among patients with dual eligibility relative to those with only Medicare: an increase in the likelihood of an ED visit (0.6 pp; $p<0.10$); an increase in the likelihood of at least one inpatient stay (0.7 pp; $p<0.10$); and an increase in the likelihood of an ICU admission (0.6 pp; $p<0.10$).

The relative increase in ICU admission rates among patients with dual eligibility versus Medicare only was driven by statistically significant decreased use among patients with only Medicare; findings were inconclusive about whether relative changes in ED visits and inpatient stays were due to increased use among patients with dual eligibility, decreased use among patients with only Medicare, or some combination of both.

Service Use at End of Life

OCM was associated with reduced end-of-life ED visits among Hispanic patients relative to White patients, and was associated with increased end-of-life ED use and a decrease in timely hospice initiation among patients with dual eligibility relative to patients with only Medicare.

Prior to OCM, all three historically underserved populations were more likely to have a hospitalization in the last 30 days of life or two or more ED visits in the last 30 days of life than their corresponding reference populations and were less likely to enroll in hospice care at least 3 days before death (**Appendix Exhibit E-15 to E-17**).

Service use at the end of life did not change for Black patients or White patients under OCM; OCM did not affect differences between these two groups.

Among Hispanic patients, OCM was associated with a 2.7 pp reduction in the likelihood of two or more ED visits in the last 30 days of life ($p<0.05$). This change among Hispanic patients resulted in a 2.4 pp reduction relative to White patients ($p<0.10$).

OCM was associated with a 0.7 pp reduction in the likelihood of two or more ED visits in the last 30 days of life among Medicare-only patients ($p<0.05$). This change resulted in an increase of 1.5 pp among patients with dual eligibility relative to patients with only Medicare ($p<0.05$). OCM was also associated with a 1.7 pp reduction in the likelihood of hospice initiation 3 or more days before death among patients with dual eligibility ($p<0.10$), which resulted in a 2.3 pp decrease relative to patients with only Medicare ($p<0.05$). As OCM was designed to encourage timely receipt of hospice care at the end of life, there is not a clear mechanism by which Model incentives would decrease access to hospice care among patients with dual eligibility, which makes it difficult to interpret this finding.

Chemotherapy-Related ED Visits and Hospitalizations

OCM had no impact on the use of chemotherapy-associated inpatients admissions or ED visits for historically underserved populations.

Prior to OCM, all three historically underserved populations had greater use of chemotherapy-associated ED visits and hospitalizations relative to their reference populations (**Appendix Exhibit E-18 to E-20**). OCM was associated with a 0.3 pp reduction in the likelihood of a chemotherapy-related ED visit that did not result in a hospital admission among White patients ($p<0.10$). Although there was no corresponding change among Black patients, this reduction among White patients resulted in a 0.9 pp increase in the likelihood of a chemotherapy-related ED visit that did not result in a hospital admission among Black patients relative to White patients ($p<0.05$). OCM was not associated with changes in chemotherapy-related acute-care service use among Hispanic patients, patients with dual eligibility or patients with only Medicare.

7.2 Changes In Clinical Outcomes[63]

Adherence to High-Priced Oral Cancer Treatments

Adherence to high-priced oral cancer drugs improved during OCM for all three historically underserved populations.

All three historically underserved populations had significantly lower rates of adherence to high-cost oral cancer treatments for prostate cancer prior to OCM, and Black patients and patients with dual eligibility had lower rates of adherence to high-priced drugs for chronic myeloid leukemia (CML) (**Exhibit 39**). OCM was associated with statistically significant increases in adherence to oral treatments for prostate cancer among all three historically underserved populations (ranging from 2.4 pp to 3.9 pp; $p<0.01$ in all cases). OCM was also associated with a significant 3.6 pp increase in adherence to high-priced oral treatments for CML among Black patients ($p<0.01$) and a significant 2.3 pp increase in adherence to oral treatments for CML among patients with dual eligibility. At the same time, OCM

[63] Since historically underserved populations have a relatively low sample size compared to the full OCM sample, some of the clinical analyses presented in this section are based on fewer than 1,000 Black or Hispanic patients, or patients with dual eligibility. Lack of statistical significance may not definitively imply that OCM was not associated with clinical outcomes among historically underserved populations.

was associated with reductions in adherence to high-priced oral treatments for CML by 1.3 pp for White patients and by 1.7 pp for patients with only Medicare. The combined result of these changes was a substantial improvement in adherence among each historically underserved population relative to the corresponding reference population.

NSIGHT FROM THE FIELD

Many practices reported hiring dedicated financial counselors who increased transparency about drug costs and helped connect patients with resources to cover out-of-pocket costs. This may have disproportionately benefitted patients from historically underserved populations. More details on financial counseling under OCM can be found in the December 2021 report: **Evaluation of the Oncology Care Model: Participant**

Chemotherapy Initiation Within 60 Days After Surgery

OCM Was Associated with More Timely Initiation of Chemotherapy After Surgery for Black Breast Cancer Patients

Prior to OCM, Black patients who underwent surgery for breast or colorectal cancer before initiating chemotherapy were significantly less likely to have timely initiation of chemotherapy (i.e., within 60 days of surgery) than White patients treated with surgery (Exhibit 40). Similarly, prior to OCM, patients with dual eligibility who underwent surgery for breast or colorectal cancer were less likely to have timely initiation of chemotherapy relative Medicare-only patients who underwent surgery. Differences between Hispanic patients and White patients in timely receipt of chemotherapy for breast cancer were similar in magnitude to differences between Black patients and White patients, as well as between patients with dual eligibility and patients with only Medicare. However, differences were not statistically significant, likely due to a smaller sample size of Hispanic patients (see Appendix Exhibit E-7).

OCM was associated with a 5.5pp improvement in the likelihood that Black breast cancer patients received timely chemotherapy after surgery ($p<0.05$), a differential improvement of 5.1pp relative to White patients ($p<0.05$). OCM was not associated with any change in the likelihood that Black patients or White patients received timely chemotherapy after colon cancer surgery, nor was OCM associated with any change in the likelihood that patients with dual eligibility or those with Medicare only received timely chemotherapy after breast cancer surgery. The proportion of patients with dual eligibility who received timely chemotherapy following colorectal cancer surgery decreased by a non-statistically significant 4.0pp, contributing to a relative increase in the difference in timely initiation of chemotherapy

Exhibit 39: OCM Was Associated with Improved Adherence to High-Priced Oral Cancer Treatments for Black, Hispanic, and Dual-Eligible Patients, Which Substantially Decreased or Eliminated Baseline Differences in Adherence Relative to White and Medicare-Only Patients

Adherence to High-Priced Oral Cancer Treatments	OCM Baseline			Estimate Associated with OCM		
	Black	White	Difference (% Difference)	Black (A)	White (B)	Differential (A-B)
Prostate cancer	86.2%	89.8%	-3.6 pp (-4.0%)	2.4 pp	-0.2 pp	2.6 pp
CML	82.5%	88.5%	-6.0 pp (-6.8%)	3.6 pp	-1.3 pp	4.9 pp
	Hispanic	White	Difference (% Difference)	Hispanic (A)	White (B)	Differential (A-B)
Prostate cancer	86.3%	89.8%	-3.5 pp (-3.9%)	3.4 pp	-0.2 pp	3.6 pp
CML	84.9%	88.5%	-3.6 pp (-4.1%)	1.5 pp	-1.3 pp	2.8 pp
	Dual	Non-Dual	Difference (% Difference)	Dual (A)	Non-Dual (B)	Differential (A-B)
Prostate cancer	87.4%	89.4%	-2.0 pp (-2.2%)	3.9 pp	-0.2 pp	4.1 pp
CML	86.0%	88.1%	-2.0 pp (-2.3%)	2.3 pp	-1.7 pp	4.0 pp

Shading indicates statistically significant estimates at $p<0.01$, $p<0.05$, and $p<0.10$, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: High-priced oral treatments included enzalutamide or abiraterone for prostate cancer, and tyrosine kinase inhibitors for CML. pp: Percentage point. CML: chronic myeloid leukemia.

for colorectal cancer patients with dual eligibility versus colorectal cancer patients with Medicare only (-4.3pp, p<0.10).

Treatment With Recommended Supportive Care Medications

OCM was not associated with receipt of recommended supportive care medications among historically underserved populations.

Prior to OCM, Black patients and patients with dual eligibility both had significantly lower use of bone-modifying drugs for bone metastases relative to their reference populations (Appendix Exhibit E-21). Prior to OCM, differences between historically underserved and reference populations in use of antiemetic (anti-nausea) medications and white blood cell growth factors were small and non-significant.

OCM was not significantly associated with differences in supportive care medications (bone modifying drugs, antiemetic medications, or white blood cell growth factors) for any of the populations we examined.

Average 18-month Survival for Patients With Lung Cancer Initiating Chemotherapy

OCM was associated with larger reductions in average 18-month survival for Hispanic patients with lung cancer than for White patients with lung cancer.

Prior to OCM, Black patients and Hispanic patients had longer average 18-month survival for lung cancer than White patients, while patients with dual eligibility had shorter mean survival times relative to patients with Medicare only (Exhibit 41). Differences among patients with dual eligibility and Hispanic patients are consistent with other evidence on cancer survival in the literature.[64-67] However, longer survival among Black patients is contrary to existing evidence: population-based data consistently show lower rates of receiving treatment and worse survival for age-matched Black patients, when compared with White patients.[68,69,14] This difference in lung cancer survival time may be related to unmeasured differences between Black patients and White patients regarding who was offered chemotherapy and who choose to pursue chemotherapy for lung cancer treatment.[70] For example, if White

Exhibit 40: OCM Was Associated with More Timely Initiation of Chemotherapy After Surgery for Black Breast Cancer Patients, Which Eliminated Baseline Differences Relative to White Patients; OCM Was Also Associated With Increased Differences Between Dual-Eligible and Medicare-Only Patients in Timely Initiation of Chemotherapy After Surgery

Timely initiation of chemotherapy after surgery for…	OCM Baseline			Estimate Associated with OCM		
	Black	White	Difference (% Difference)	Black (A)	White (B)	Differential (A-B)
Breast cancer	68.6%	73.1%	-4.5pp (-6.2%)	5.5pp	0.4pp	5.1pp
Colorectal cancer	55.3%	60.7%	-5.4pp (-8.9%)	-0.1pp	-0.3pp	0.3pp
	Hispanic	White	Difference (% Difference)	Hispanic (A)	White (B)	Differential (A-B)
Breast cancer	68.7%	73.1%	-4.4pp (-6.0%)	4.1pp	0.4pp	3.7pp
Colorectal cancer	60.4%	60.7%	-0.3pp (-0.5%)	-1.7pp	-0.3pp	-1.3pp
	Dual	Non-Dual	Difference (% Difference)	Dual (A)	Non-Dual (B)	Differential (A-B)
Breast cancer	68.7%	73.0%	-4.3pp (-5.9%)	2.6pp	1.0pp	1.5pp
Colorectal cancer	56.0%	61.0%	-5.0pp (-8.2%)	-4.0pp	0.2pp	-4.3pp[a]

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: [a]After dropping the two largest OCM practices, the differential estimate became non-significant (-3.3pp, 90% CI: -7.8, 1.2). pp: Percentage point.

[64] Mehta AJ, Stock S, Gray SW, Nerenz DR, Ayanian JZ, Keating NL. Factors contributing to disparities in mortality among patients with non-small-cell lung cancer. Cancer Med. 2018;7(11):5832-5842.
[65] Mahal AR, Mahal BA, Nguyen PL, Yu JB. Prostate cancer outcomes for men aged younger than 65 years with Medicaid versus private insurance. Cancer. 2018;124(4):752-759.
[66] Ward E, Halpern M, Schrag N, et al. Association of insurance with cancer care utilization and outcomes. CA Cancer J Clin. 2008;58(1):9-31.
[67] Price SN, Flores M, Hamann HA, Ruiz JM. Ethnic differences in survival among lung cancer patients: A systematic review. JNCI Cancer Spectr. 2021;5(5):pkab062. Published 2021 Jul 7.
[68] Bach PB, Cramer LD, Warren JL, Begg CB. Racial differences in the treatment of early-stage lung cancer. N Engl J Med. 1999;341(16):1198-1205.
[69] Hunt B, Balachandran B. Black:White disparities in lung cancer mortality in the 50 largest cities in the United States. Cancer Epidemiol. 2015;39(6):908-916.
[70] Mehta AJ, Stock S, Gray SW, Nerenz DR, Ayanian JZ, Keating NL. Factors contributing to disparities in mortality among patients with non-small-cell lung cancer. Cancer Med. 2018;7(11):5832-5842.

patients with poor lung cancer prognoses were more likely to initiate chemotherapy than Black patients in similar situations, the population of Black patients who did initiate chemotherapy (and who were therefore eligible to be included in OCM) would be healthier, on average, relative to the population of White patients who initiated chemotherapy, and therefore have longer average survival.

OCM was not associated with any differential impact on survival for Black patients or patients with dual eligibility compared with their reference populations. On the other hand, OCM was associated with a reduction of 20.1 days in mean survival time among Hispanic patients with lung cancer ($p<0.05$). OCM was also associated with a reduction of 5.2 days in mean survival among White patients with lung cancer ($p<0.10$). Together, these changes resulted in a differential reduction in survival between Hispanic and White patients (-14.9 days, $p<0.10$).

7.3 Patient-Reported Care Experience

In the baseline survey, Black and Hispanic patients, as well as respondents with dual eligibility reported similarly positive care experience to White respondents and respondents with only Medicare. Small changes in patient experience during OCM were similar between historically underserved populations and their corresponding reference groups.

Analyses of patient care experiences assessed trends over time for subgroups of patients in OCM-participating practices because we did not survey patients treated in comparison practices throughout the study period.[71] We present full results of care experience analyses in **Appendix Exhibits E-22 to E-24**. In general, all populations included in these analyses reported positive care experiences during their chemotherapy treatment. For example, in the baseline survey wave, Hispanic and White respondents, as well as respondents with dual eligibility and those with only Medicare gave their care team an overall rating of 9.3 out of 10 on average. Black patients gave their care team an overall rating of 9.1 on average, which was not significantly different from White patients' average ratings. Both Hispanic respondents and Black respondents had less favorable ratings for the shared decision making composite relative to White respondents on average: differences of -0.4 ($p<0.05$) and -0.5 ($p<0.10$) respectively on a 10-point scale. This difference did not change during OCM.

Averages for measures other than the shared decision-making composite were similar to or more positive for Black respondents and Hispanic respondents than for White respondents during the baseline survey wave. The only relative change over time by race and ethnicity was in the overall rating of the cancer care team, which improved among Black respondents relative to White respondents, a difference in trends of 0.011 per quarterly survey wave ($p<0.05$). This equates to an improvement of 0.2, or 2 percentage points, among Black respondents relative to White respondents, across all nine performance periods. There was no change in care team rating among White respondents, and thus over time, ratings from Black respondents improved slightly relative to White respondents (0.011, $p<0.10$). The greater improvement among Black respondents is equivalent to a differential improvement of 0.19 points on a scale of 0–10 (or 1.9pp) in the overall rating across all 18 quarterly survey waves. However, in a

Exhibit 41: OCM Was Associated Decreased Lung Cancer Survival Times; Decreases were Significantly Larger for Hispanic Patients Relative to White Patients

Average 18-month survival	OCM Baseline			Estimate Associated with OCM		
	Black	White	Difference (% Difference)	Black (A)	White (B)	Differential (A-B)
Lung cancer survival time	366.9 days	356.7 days	10.2 days (2.9%)	-0.3 days	-5.2 days	4.9 days
	Hispanic	**White**	**Difference (% Difference)**	**Hispanic (A)**	**White (B)**	**Differential (A-B)**
Lung cancer survival time	376.2 days	356.7 days	19.4 days (5.4%)	-20.1 days	-5.2 days	-14.9 days[a]
	Dual	**Non-Dual**	**Difference (% Difference)**	**Dual (A)**	**Non-Dual (B)**	**Differential (A-B)**
Lung cancer survival time	346.4 days	360.8 days	-14.5 days (-4.0%)	-6.3 days	-5.2 days	-1.1 days

Shading indicates statistically significant estimates at $p<0.01$, $p<0.05$, and $p<0.10$, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: [a]After dropping the two largest practices, the differential estimate became non-significant (-13.2 days; 90% CI: -31.7, 5.3 days).

[71] We surveyed patients with comparison oncology episodes twice during the study period; once in the baseline wave and again in the third year of OCM. Comparison patients were not included in this analysis, which was extended through the fifth year of OCM.

sensitivity analysis removing the two largest OCM practices, this finding was smaller in magnitude and no longer statistically significant, so this finding should be interpreted with caution. Moreover, the analyses lacked a comparison group to assess if these changes over time were similar or different compared with patients not treated by OCM-participating practices.

There were no differences in patient care experiences between respondents with dual eligibility and those with only Medicare during the baseline survey wave and there were no significant relative changes in outcomes between the two populations during OCM.

7.4 Discussion

Changes in most outcomes during OCM were similar for Black and Hispanic patients relative to non-Hispanic White patients, and for patients with dual eligibility relative to those with Medicare only. However, there were several noteworthy patterns of results that serve to demonstrate progress made by OCM and to highlight areas for future improvement.

In Chapter 2, we presented estimates showing that TEP reductions attributable to OCM averaged $499 across all patients, driven primarily by reductions in Part B non-chemotherapy drug payments. Estimated reductions in TEP for Black and White patients, patients with dual eligibility, and patients with only Medicare, were very similar to the overall estimate, and estimated reductions in Part B non-chemotherapy drug payments in each population were similar to the overall estimate of $245. While TEP reductions associated with OCM were higher for Hispanic patients due to large decreases in Part D payments, reductions in Part B non-chemotherapy drug payments among Hispanic patients were similar to those in the other four populations. These results suggest that changes the participating practices made in the use of supportive care drugs paid through Part B were applied similarly across all patients, including those from historically underserved populations. It is uncertain why OCM was associated with reduced Part D payments for Hispanic patients, and we will continue to monitor this finding in our final evaluation report. These results differ from findings through PP5 reported in the Evaluation Report for PP1–PP5. Prior findings indicated significant reductions in TEP among White patients, but not Black or Hispanic patients. That reductions in TEP for Black or Hispanic patients occurred later in OCM than reductions for White patients may indicate that certain care redesign activities took longer to affect historically underserved populations. It is also possible that practices serving large proportions of historically underserved populations were slower to adopt certain care redesign strategies.

Our analysis of acute-care utilization outcomes suggests that OCM was associated with small changes in some measures of acute-care service use that may have increased differences in utilization between Black and White patients and between patients with dual eligibility and those with Medicare only. For example, OCM was associated with a roughly 0.5pp (less than two percent) reduced likelihood of a 30-day readmission among White patients but not Black patients[72]. Similarly, OCM was associated with reductions of 0.4pp (roughly four percent) in the likelihood of an ICU admission among patients with only Medicare, but not patients with dual eligibility.

On the other hand, some outcomes differentially increased between historically underserved populations and their corresponding reference populations during OCM, without a clear change in the measures for the individual populations. For example, we did not observe statistically significant changes in the likelihood of an ED visit for Black patients or White patients, but insignificant changes in both groups yielded a small but significant increase among Black patients relative to White patients. We found a similar pattern for increased differences in ED visits and inpatient stays between patients with dual eligibility and patients with only Medicare. In such cases, our results were unable to disentangle whether acute-care use increased for historically underserved populations, decreased for reference populations, or both.

Each of the historically underserved populations we analyzed had significantly higher use of acute-care services, including ED visits, hospitalizations, readmissions, and ICU stays, prior to OCM, relative to the reference populations. In Section 3.5, we noted the challenge that OCM and other value-based payment programs have had in reducing acute-care use, and our results indicate that these challenges were equally or more difficult to surmount among historically underserved populations, despite historically underserved populations potentially more room for improvement. New, tailored supportive care strategies may be required to improve equity in the use of acute-care services during cancer treatment.

By analyzing results separately by population, we were able to uncover some findings that were not evident when pooled across all OCM patients. For example, the overall impact estimates of OCM on adherence to

[72] In the **Evaluation Report for PP1–PP5**, estimates through PP5 showed a significant increase in readmissions among Black patients but not White patients. The differential increase among Black patients relative to White patients is consistent over time, although the more recent results suggestion that OCM may no longer be associated with absolute increases in readmissions among Black patients.

[73] Hershman DL, Tsui J, Wright JD, Coromilas EJ, Tsai WY, Neugut AI. Household net worth, racial disparities, and hormonal therapy adherence among women with early-stage breast cancer. J Clin Oncol. 2015;33(9):1053-1059.

[74] Wheeler SB, Spencer J, Pinheiro LC, Murphy CC, Earp JA, Carey L, Olshan A, Tse CK, Bell ME, Weinberger M, Reeder-Hayes KE. Endocrine therapy nonadherence and discontinuation in Black and White women. J Natl Cancer Inst. 2019 May 1;111(5):498-508.

high-priced oral cancer drugs in Section 4.7 were small and nonsignificant. However, the results in this chapter indicated significant improvements in adherence among all three historically underserved populations when each group was analyzed separately. This finding is consistent with past evaluation results through PP5. Prior research has also found lower adherence to oral cancer medications for patients of color,[73,74] which may reflect financial burden experienced by historically underserved populations, resulting in non-adherence due to high out-of-pocket costs for such Part D drugs.[75,76] It is possible that improved outreach from patient navigators and financial counseling required under OCM helped address financial barriers and contributed to better adherence.

Similarly, the overall impact of OCM on changes in timely initiation of chemotherapy after breast cancer surgery was not significant (Section 4.6). However, timely chemotherapy-initiation after surgery for breast cancer significantly improved among Black patients. Improvements were of similar magnitude for Hispanic patients, although the improvements were not statistically significant. Timely initiation of chemotherapy after surgery for colorectal cancer did not improve for Black or Hispanic patients, which is consistent with overall impact estimates. This difference in timeliness of chemotherapy findings between breast and colorectal cancer may be related to prior recognition in the literature that delays in breast cancer treatment are associated with worse survival,[77-80] which has led to numerous programs and studies engaging patient navigators in the coordination of breast cancer care to enhance access to timely treatment for at-risk populations.[81-83]

While analyzing outcomes separately for historically underserved populations identified some new patterns for clinical outcomes, this was not the case for measures of patient care experience measured through a patient survey. Within OCM practices, Black and Hispanic patients, and patients with dual eligibility, reported similarly positive care experience outcomes relative to White patients and those with only Medicare, particularly with regards to their overall rating of their cancer care team. Positive care experiences were sustained, but not improved upon, for all historically underserved populations treated in OCM practices during the Model period. Prior evaluation results through PP5 showed some evidence of slightly worsening patient care experience among Hispanic patients (see Evaluation Report for PP1–PP5). More recent results through PP9 suggest that any potential adverse effects on patient care experience in the early part of the model were mitigated over time.

For several key outcomes, we uncovered minimal changes associated with OCM, both for each historically underserved population specifically and in relation to the corresponding reference populations. Value-based payment models may have limited potential to improve health equity unless deliberately designed to do so.[84-88] The forthcoming Enhancing Oncology Model includes design elements specifically intended to address inequities in health outcomes, such as increased incentive payments for treating patients with dual eligibility, and mandatory screening for social determinants of health, which could help to overcome those limitations.

Lastly, we acknowledge concerns that episode-based payment models could incentivize avoidance of historically underserved populations if they are perceived as more medically complex and as having higher average costs relative to other patients. Although we did not directly assess this possibility in the current report, prior analysis by our team reported in the Evaluation Report for PP1–PP5 did not find any evidence that access to care was lessened for Black or Hispanic patients, or patients with dual eligibility, treated by OCM practices relative to comparison practices after the start of the Model.

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[75] Smith GL, Lopez-Olivo MA, Advani PG, et al. Financial burdens of cancer treatment: A systematic review of risk factors and outcomes. J Natl Compr Canc Netw. 2019;17(10):1184-1192.

[76] Knight TG, Deal AM, Dusetzina SB, et al. Financial toxicity in adults with cancer: Adverse outcomes and noncompliance. J Oncol Pract. 2018;JOP1800120.

[77] McLaughlin JM, Anderson RT, Ferketich AK, Seiber EE, Balkrishnan R, Paskett ED. Effect on survival of longer intervals between confirmed diagnosis and treatment initiation among low-income women with breast cancer. J Clin Oncol. 2012;30(36):4493-4500.

[78] Gagliato DdeM, Gonzalez-Angulo AM, Lei X, et al. Clinical impact of delaying initiation of adjuvant chemotherapy in patients with breast cancer. J Clin Oncol. 2014;32(8):735-744.

[79] Bleicher RJ, Ruth K, Sigurdson ER, et al. Time to surgery and breast cancer survival in the United States . JAMA Oncol. 2016;2(3):330-339. Correction in JAMA Oncol. 2016 Sep 1;2(9):1244.

[80] Colleoni M, Bonetti M, Coates AS, et al. Early start of adjuvant chemotherapy may improve treatment outcome for premenopausal breast cancer patients with tumors not expressing estrogen receptors. The International Breast Cancer Study Group. J Clin Oncol. 2000;18(3):584-590.

[81] Gunn CM, Clark JA, Battaglia TA, Freund KM, Parker VA. An assessment of patient navigator activities in breast cancer patient navigation programs using a nine-principle framework. Health Serv Res. 2014;49(5):1555-1577.

[82] Ko NY, Darnell JS, Calhoun E, et al. Can patient navigation improve receipt of recommended breast cancer care? Evidence from the National Patient Navigation Research Program. J Clin Oncol. 2014;32(25):2758-2764.

[83] Battaglia TA, Freund KM, Haas JS, et al. Translating research into practice: Protocol for a community-engaged, stepped wedge randomized trial to reduce disparities in breast cancer treatment through a regional patient navigation collaborative. Contemp Clin Trials. 2020;93:106007.

[84] Maughan BC, Kahvecioglu DC, Marrufo G, Gerding GM, Dennen S, Marshall JK, Cooper DM, Kummet CM, Dummit LA. Medicare's Bundled Payments For Care Improvement Initiative Maintained Quality Of Care For Vulnerable Patients. Health Aff (Millwood). 2019 Apr;38(4):561-568.

[85] McClellan SR, Trombley MJ, Maughan BC, Kahvecioglu DC, Marshall J, Marrufo GM, Kummet C, Hassol A. Patient-reported Outcomes Among Vulnerable Populations in the Medicare Bundled Payments for Care Improvement Initiative. Med Care. 2021 Nov 1;59(11):980-988.

[86] Joynt Maddox KE, Orav EJ, Zheng J, Epstein AM. Medicare's Bundled Payments For Care Improvement Advanced Model: Impact On High-Risk Beneficiaries. Health Aff (Millwood). 2022 Nov;41(11):1661-1669.

[87] Navathe AS, Liao JM. Aligning Value-Based Payments With Health Equity: A Framework for Reforming Payment Reforms. JAMA. 2022;328(10):925–926.

[88] The Lewin Group. CMS Comprehensive Care for Joint Replacement (CJR) Model: Performance Year 4 Evaluation Report. September 2021. Available at: https://innovation.cms.gov/data-and-reports/2021/cjr-py4-annual-report.

Conclusion

The Oncology Care Model (OCM) launched in July 2016 with the goal of improving care and lowering costs through two primary design elements. CMS provided participating practices with a $160 Monthly Enhanced Oncology Services (MEOS) payment for fee-for-service (FFS) Medicare beneficiaries. The MEOS payment was intended to fund increased access to timely ambulatory care and improved patient navigation. Practices were also eligible for performance-based payments (PBPs) if they met benchmarks on claims-based and patient-reported quality measures and reduced total episode payments (TEP) below set benchmarks.

This report covers the first 9 out of 11 total OCM performance periods (PPs), extending prior evaluation findings by three additional PPs (PP7-PP9). These nine PPs cover episodes initiated from mid-2016 through the end of 2020. Notably, episodes initiated during the final three PPs partially or completely overlapped with the COVID-19 public health emergency (PHE). This report includes estimated changes in total TEP during OCM relative to the 18-month period preceding the Model's start. The report also summarizes findings on changes in use of anti-cancer and supportive care treatments, acute care, and end-of-life care underlying the payment outcomes, as well as the impact of OCM on care quality.

The report includes analyses on how OCM was associated with health equity for three historically underserved populations: Black patients, Hispanic patients, and patients with dual Medicaid-Medicare eligibility. To understand the equity landscape prior to OCM, we first assessed the extent to which outcomes differed between the historically underserved populations and their corresponding reference populations (non-Hispanic White and Medicare-only patients) during the OCM baseline. We then evaluated the extent to which OCM differentially affected care for patients from historically underserved populations and whether this increased or decreased baseline differences in outcomes.

All results in this report are based on an intent-to-treat design, which attributes OCM episodes to all practices that ever participated in the Model, even if they terminated their participation in OCM partway through the Model's full PP. This approach avoids "survivor bias" whereby impacts in later performance periods are attributable to the practices that performed well enough in the Model to warrant continued participation. This design decision became more relevant beginning in PP8, since at that time, practices that had failed to achieve a PBP by PP4 were required to take on two-sided risk or terminate their participation. With the onset of the COVID-19 PHE, CMS also allowed participating practices to opt out of reconciliation for the PBPs, while continuing to receive MEOS payments. Even with this flexibility, the cumulative number of terminating practices increased by 37 in PP8: from 27 in PP7 to 64 in PP8. An additional 29 practices chose to opt out of reconciliation starting in PP8, but continued to receive MEOS. After OCM termination, practices were no longer eligible to receive MEOS payments and may not have continued implementing all of the practice redesign elements required under OCM. Accordingly, the estimates in this report may be considered a lower bound of the true impact of OCM.

During the 18-month baseline period preceding OCM, average TEP was $29,120 for episodes initiated by OCM practices. TEP increased to an average of $35,467 across the first five years of the Model, a 22-percent relative increase that was driven by increases in Part B and Part D chemotherapy payments. However, the increase in TEP among OCM episodes was $499 less than the corresponding increase for comparison episodes over the same time period, representing a relative reduction of 1.7 percent. These reductions were limited to higher-risk cancers, which constituted about two-thirds of all OCM episodes, and which had relative reductions in TEP averaging $755. Reductions were primarily driven by four types of cancer: high-risk breast cancer, lymphoma, lung cancer, and colorectal/small intestine cancer. There was no impact on TEP for lower-risk cancer episodes.

OCM achieved significant reductions in TEP in seven of the first nine PPs, beginning with reductions of $297 in the second PP. Notably, reductions in TEP were much larger in PP7-PP9 than in prior PPs. Through PP6, the largest single reduction in any PP was $371. In PP7-PP9, reductions ranged from $687 to $1,280, indicating that OCM achieved substantially larger savings in the three most recent PPs.

Episodes initiated in PP7-PP9 corresponded with the first 18 months of the COVID-19 PHE. In the first few months of the pandemic, the overall health care landscape changed dramatically, with massive reductions in elective and preventive care.[89] In the early months of the pandemic, many oncology practices had substantially reduced operational capacity, which led to pauses in treatment and a shift towards providing care via telehealth.[90-92] By the summer of 2020, oncology treatment had largely resumed, although with more

[89] Whaley, CM, Pera MF, Cantor J, Chang J, Velasco J, Hagg HK, Sood N, and Bravata DM. Changes in health services use among commercially insured US populations during the COVID-19 pandemic. JAMA Netw Open. 2020; 3(11): e2024984.

[90] Patt DA, Wilfong L, Toth S, Broussard S, Kanipe K, Hammonds J, Allen V, Mautner B, Campbell N, Dubey AK, Wu N. Telemedicine in community cancer care: how technology helps patients with cancer navigate a pandemic. JCO Oncology Practice. 2021 Jan;17(1):e11-5.

[91] Knudsen KE, Willman C, Winn R. Optimizing the use of telemedicine in oncology care: Postpandemic opportunities. Clinical Cancer Research. 2021 Feb 15;27(4):933-6.

[92] Qian AS, Schiaffino MK, Nalawade V, Aziz L, Pacheco FV, Nguyen B, Vu P, Patel SP, Martinez ME, Murphy JD. Disparities in telemedicine during COVID-19. Cancer Medicine. 2022 Feb;11(4):1192-201.

telehealth visits and fewer in-person visits than before the pandemic. After vaccines for frontline personnel became available in December 2020, care continued to return to pre-pandemic standards. Sporadic disruptions continued due to new variants of COVID-19 and clinical staffing challenges exacerbated by the PHE.

PP7-PP9 also included increased adoption of two-sided risk arrangements. Through PP6, the proportion of episodes covered by two-sided risk was less than 0.1 percent. This proportion increased to 12 percent in PP7, and to more than 35 percent in PP8-PP9 once two-sided risk became mandatory for some practices. The increased financial incentive corresponding to two-sided risk may have influenced OCM practices to make additional changes over this timeframe. To better describe OCM impacts on TEP, we separately evaluated the impact of OCM on Part A, Part B, and Part D spending in PP7-PP9, compared with impacts in prior PPs. In doing so, our evaluation noted several patterns during PP7-PP9 that contributed to the increased magnitude of TEP reductions during this time, which may be attributable to the PHE and to the shift towards two-sided risk.

First, we estimated larger OCM-related relative reductions in Part A spending in two of the most recent PPs (PP7-PP8). In each of the first six PPs, estimated reductions relative to the comparison group were $162 or less. Initially during the COVID-19 PHE, the differences were much larger: $324 in PP7 and $376 in PP8. This effect was due in part to reductions in readmissions and to small reductions in post-acute care payments for the first time. It is possible that the patient navigation, care coordination, and enhanced access to care, which OCM practices implemented in the early years of the Model, helped them prevent readmissions and other Part A use during the PHE. The OCM impact on Part A payments was temporary, however, and by PP9 the difference was once again small ($55) and not statistically significant.

Second, estimated reductions in Part B spending related to OCM also increased in magnitude during the additional PPs covered in this report. In PP1-7, average differences were $270 or less in each period. These modest reductions were in part due to greater substitution of biosimilar for originator supportive care drugs in OCM episodes and higher-value use of other supportive care drugs. In PP8–PP9, relative reductions in Part B were much larger: $585 in PP8 and $567 in PP9. These larger reductions were primarily due to larger decreases in payments for non-chemotherapy drugs covered by Part B in PP8 and PP9, which suggest that practices' ability to substitute higher-value supportive care drugs increased over time.

Lastly, after more than three years of no OCM impact on Part D payments, there was a marked change in PP8–PP9, when spending increased less in OCM episodes than in comparison episodes by at least $200 per episode. It is unclear what was driving the new reductions in Part D spending—for example, we found no evidence for greater use of generic Part D drugs—or whether it will continue. The final OCM Evaluation report will explore trends in the final two PPs.

Despite consistent reductions in TEP attributable to OCM, the Model generated an estimated net loss to Medicare of $528 million through PP8, after accounting for MEOS and PBPs. Net losses were largest in PP1 ($105M), and smallest in PP7 ($22M). Gross savings (from TEP reductions) were not sufficient to cover both MEOS and PBP in any PPs, for either higher-risk or lower-risk cancer episodes.

Lack of net savings in PP8 despite the notably larger reductions in TEP likely resulted from an interaction of program rules and the PHE. In PP8, practices that had not achieved at least one PBP by PP4 were required to take on two-sided risk or terminate participation in the Model. However, under PHE flexibilities introduced by CMS, practices could continue to receive MEOS while opting out of reconciliation. Twenty-nine practices that would have been required to take on two-sided risk exercised this option. Among these 29 practices, only 4 had achieved at least one PBP by PP7. These practices, with little track record of success, continued to receive MEOS payments and did not face the risk of recoupment payments to CMS that two-sided risk would entail. On the other hand, practices that adopted two-sided risk, which had been disproportionately successful at earning PBPs in prior PPs, had an easier time hitting quality benchmarks for maximum PBPs during the PHE. This success was in large part due to system-wide reductions in emergency department (ED) visits caused by the PHE.

Although OCM did not yield net savings in any PP after accounting for MEOS and PBP, gross savings for higher-risk cancer episodes did cover the cost of MEOS alone (not PBP) in PP7 and PP8. The Enhancing Oncology Care Model (EOM), which is slated to begin in July of 2023, will focus on patients with one of seven types of cancer that tend to have higher risk of treatment-related side effects and higher episode costs than the lower-risk cancers included in OCM. These results suggest that EOM may be more successful than OCM in achieving net Medicare savings.

Beyond reductions in payments, OCM was intended to transform the way in which practices deliver care to Medicare beneficiaries, through better adherence to clinical guidelines and substitution towards higher-value treatment options. That is, lower-cost treatments known to achieve results similar to those of higher-priced alternatives, or similarly-priced treatments known to achieve better outcomes than other regimens. Financial incentives from OCM particularly encouraged

substitution towards high-value chemotherapy regimens, since Part B chemotherapy payments were the single largest contributor to TEP. Despite this, we did not find any evidence for increased use of higher-value chemotherapy treatment regimens. At the same time, OCM did not reduce patient access to effective but costly lung cancer treatments, including immunotherapy and targeted therapy agents, such as osimertinib.

Our results highlight one shift towards higher-value anti-cancer treatment. OCM episodes had faster adoption and greater use of intravenous biosimilar cancer treatments among OCM participants, which are generally less costly than originator drugs and are thus higher-value treatments. In contrast, OCM was not associated with greater adoption of generic oral drugs. It is possible that OCM practices emphasized use of biosimilar Part B drugs, which they provide directly, but did not prioritize efforts to increase prescribing of generic oral drugs that patients obtain from pharmacies.

OCM had no effect on anti-cancer treatments that we studied, outside of increased use of certain biosimilar drugs. However, OCM practices did substitute higher-value supportive care therapies designed to address symptoms corresponding to anti-cancer treatment. Specifically, OCM led to higher-value use of bone-modifying drugs (to prevent fractures in patients with bone metastases), anti-nausea medications (anti-emetics), and white blood cell growth factors. Although OCM also incentivized shorter courses of palliative radiation therapy for painful bone metastases (fewer treatment fractions per course), which would better align with national guidelines, there was no impact of OCM in reducing fractions for palliative radiation. Shorter courses of radiation would have been especially useful during the PHE, to reduce the number of visits required by patients. However, OCM targeted medical oncology practices, which may have had limited influence on treatment decisions by radiation oncologists, who have a financial incentive to provide more rather than fewer fractions under traditional Medicare FFS.

In contrast to other episode-based payment models tested by CMS, OCM included the MEOS payments to participating oncology practices for each episode initiated, with the explicit goal of improving care coordination and overall care quality. We estimated that OCM led to small, statistically significant reductions in readmissions and intensive care unit (ICU) admissions among all patients, and to reductions in hospitalizations for patients at the end of life. These findings may reflect better advance care planning or enhanced care coordination among OCM participants. However, OCM did not reduce ED visits that did not lead to a hospitalization or increase the timely use of hospice care, despite practices being held accountable for both outcomes through Model quality measures.

Patient-reported measures of quality were high when the Model started and did not substantively improve in the first nine performance periods. The high initial performance among participants may suggest that there is not much room for improvement in these measures as currently defined.

Although OCM did not explicitly incorporate health equity into the Model design, it did encourage patient navigation, use of Care Plans, and attention to symptom management, which may have had different impacts on different patient populations. To assess the impact of OCM on health equity, we analyzed OCM impacts among Black and Hispanic patients, and patients with dual eligibility (historically underserved populations) relative to non-Hispanic White patients, and patients with only Medicare coverage (reference populations).

We found that in the baseline period preceding OCM, historically underserved patients had higher use of hospital inpatient and ED care, and higher TEP, as well as lower adherence to oral medication, less timely initiation of chemotherapy after surgery, and less hospice use at end of life. OCM was associated with improvements in adherence to oral medications among all three historically underserved populations, which improved adherence relative to the reference populations. We also found evidence of improved timeliness of chemotherapy following surgery for some groups. However, there was no other pattern of outcomes indicating that OCM disproportionately benefitted historically underserved populations. Conversely, while results suggest that acute care use among Black patients and patients with dual eligibility increased slightly relative to their reference populations during OCM, our results generally showed little evidence that OCM worsened care for historically underserved populations. Overall, our findings suggest that OCM had similar impacts across subpopulations.

In addition to the impact analyses described above, this report also included an assessment of how representative OCM was of the broader FFS cancer care environment. We found that roughly one-quarter of all FFS Medicare chemotherapy episodes were attributed to OCM participants, and the characteristics of patients served by OCM practices were similar to those served by other practices nationwide. These results suggest that the findings summarized in this report may be similar in a model expanded to other FFS patients who are not currently covered by the Model.

Each of the three most recent PPs that were new to our analysis since the last annual report occurred during the COVID-19 PHE. To control for direct impacts of the PHE in PP7–PP9, we temporarily removed episodes with a COVID-19 diagnosis code. In sensitivity analyses for the payment and utilization measures that retained episodes with a COVID-19 diagnosis, results did not

change. To account for indirect effects of the PHE—strain on the health care system in different places at different times—we controlled for county-level COVID-19 incidence rates and death rates. Adding these controls also did not materially affect results.

It is possible that these efforts to account for the PHE were insufficient; the PHE may have contributed to estimated OCM impacts in ways that we cannot measure or for which we cannot adjust. However, the robustness of our estimates to the inclusion of episodes with COVID-19 diagnoses, and the exclusion of controls for local COVID-19 severity, gives us confidence that our results reflect true OCM impacts and are not biased by differing area-level effects of COVID-19. Moreover, our results are consistent with prior reports, which showed that the majority of TEP reductions were attributable to changes in non-chemotherapy Part B drug spending. The consistency of our findings over time also lends credence to the reliability of our more recent results.

Overall, our results suggest that OCM has had limited success meeting Model objectives in the first nine PPs. Reductions in TEP were insufficient to cover Model costs, yielding net losses to Medicare. Despite the ongoing provision of MEOS, OCM achieved no improvement in claims-based quality measures, and had little impact on claims-based or patient-reported quality measures. Looking ahead, the increase in TEP among higher-risk cancers in later PPs suggest that EOM may have greater success achieving its financial goals than did OCM. Our results suggest several lessons for EOM participants.

First, substitution of higher-value supportive care drugs is a proven strategy for reducing TEP that may be appropriate for certain patients.

Second, achieving greater reductions in use of hospital inpatient and ED services may be challenging without innovations in care delivery given the lack of progress in the past five years, corresponding with similar challenges in reducing use for oncology patients among accountable care organizations (ACOs).[93-95]

Third, if EOM participants are to exceed the progress made by OCM participants, they will likely need to find ways to reduce Part B and D chemotherapy payments. These remain the two biggest contributors to TEP, but OCM participants did not meaningfully reduce these payments relative to comparison practices through the first nine PPs.

The sixth and final evaluation report will inform whether results in PP10-PP11 are similar to results from PP7-PP9, as the COVID-19 PHE continued into 2021 and early 2022. That report will also provide a summative assessment of the entire Model, including impact estimates and net Medicare payments through all 11 PPs. While OCM concluded in June of 2022, the final set of results will determine the extent to which OCM successfully met its goals.

[93] Lam MB, Zheng J, Orav EJ, Jha AK. Early Accountable care organization results in end-of-life spending among cancer patients. Journal of the National Cancer Institute. December 2019. 111(12); pp 1307-1313.

[94] Lam MB, Figueroa JF, Zheng J, Orav EJ, Jha AK. Spending among patients with cancer in the first 2 years of accountable care organization participation. Journal of Clinical Oncology. October 2018. 36(29); pp 2955-2960.

[95] Erfani P, Phelan J, Orav EJ, Figueroa JF, Jha AK, Lam MB. Spending outcomes among patients with cancer in accountable care organizations 4 years after implementation. Cancer. March 2022. 128(5); 1093-1100.

Appendix

A. Data and Methods

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

This appendix section contains information about the data and methods used to construct payment outcome measures from Medicare claims for the Oncology Care Model (OCM) evaluation. The primary data sources used to measure OCM impacts on payment 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 episodes were identified for analysis, how the comparison group was constructed and validated, and the analytic approaches used to quantify impacts of OCM.

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
2014–2021 Part B Claims (Virtual Research Data Center (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.
2014–2021 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.
2014–2021 Part A Claims (VRDC)	• Calculate episode-level utilization and payment measures for Part A services. • Construct HCC scores. • Identify use of radiation and surgery.
2014–2021 Integrated Data Repository System	• Determine standardized Part A and B payments.
2014–2021 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
2014–2021 Enrollment Database Files (VRDC)	• Determine Medicare Secondary Payer information for beneficiary eligibility criteria for episode identification.

Data Source	Purpose
2014–2021 Common Medicare Environment Files (VRDC)	• Determine end-stage renal disease coverage for episode identification.
2016–2021 Food and Drug Administration National Drug Code Directory	• Identify PDEs that are for drugs, excluding vaccines.
2016–2021 Medicare Part B Drug Average Sales Price	• Identify Part B claims that are indicative of drugs.
2014–2021 CMS Health Professional Shortage Area (HPSA) Files	• Identify proportion of the population within a county residing in a HPSA.
2014–2021 National Plan and Provider Enumeration System (NPPES; VRDC)	• Supplement provider specialty information in Part B claims data.
2014–2021 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[a] Office-Based Physician File	• Link practice sites to Tax Identification Numbers (TINs) to construct practice's affiliation with health system and hospital ownership.
2014–2020 Area Health Resource Files	• Construct county-level sociodemographic and market supply characteristics.
Welch and Bindman (2016), [b] list of Association of American Medical Colleges medical schools, [c] and websites of medical school oncology/hematology departments, divisions, and institutes	• We used TINs compiled by Welch and Bindman (2016) to identify practices affiliated with a medical school's academic medical group. We updated this list in 2019, using a similar approach as described in Welch and Bindman (2016).
National Comprehensive Cancer Network (NCCN) and American Society of Clinical Oncology (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 performance period (PP) and associated expenditures. • Identify total amount paid by Medicare for performance-based payment (PBP) and Monthly Enhanced Oncology Services (MEOS).
USA FACTS 2021[d]	• Construct average cumulative and new COVID-19 death rate per 10,000 individuals in a county. • Construct the average cumulative and new COVID-19 infection rate per 10,000 individuals in a county.

Notes: [a] IQVIA. Physician Data for Marketing & Research. Available from: https://www.onekeydata.com/databases/physician-data. [b] Welch P, Bindman, AB. Town and gown differences among the largest medical groups in the US. Journal of Academic Medicine. 2016 July;91(7):1007–14. [c] Association of American Medical Colleges (AAMC). AAMC Medical School Members. Available from: https://members.aamc.org/eweb/DynamicPage.aspx?site=AAMC&webcode=AAMCOrgSearchResult&orgtype=Medical%20School. [d] USA FACTS. US COVID-19 cases and deaths by state. Available from: https://usafacts.org/visualizations/coronavirus-covid-19-spread-map/.

The Medicare claims used in this report were retrieved as of October 2021, and three months of claims run-out was applied uniformly. A report on Medicare claims maturity[96] estimates that over 90 percent of Part A and Part 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 monthly per-beneficiary $160 MEOS payment that practices may bill for 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 includes episodes that started between July 1, 2016, and January 1, 2017 and ended by June 30, 2017. The last PP, PP11, includes episodes starting between July 2, 2021, and January 1, 2022, all of which ended by June 30, 2022.

This report covers OCM impacts through PP9. 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 OCM's first nine PPs (PP1–PP9), between July 1, 2016, and January 1, 2021, and ended between December 31, 2016 and June 30, 2021. 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,[97] 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 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.

A.1.3 Episode Identification

We followed the OCM program methodology to construct six-month episodes and attribute each episode to a single practice with at least one oncologist. We defined episodes based on beneficiary (patient) eligibility and qualifying trigger events. Each episode was attributed to the practice that provided the plurality of E&M visits for cancer. We identified all eligible cancer episodes nationwide that occurred during the baseline period, and, separately, during the intervention period, following the OCM methodology. **Exhibit A-2** shows the number of episodes used in this report, for the OCM and comparison groups, for each period. **Exhibit A-3** shows the types of cancer into which we classified episodes. The original OCM methodology included 21 reconciliation-eligible cancer types. These were expanded to 24, with breast cancer divided into low- versus high-risk episodes, prostate cancer divided into low- versus high-intensity episodes, and bladder cancer divided into low- versus high-risk episodes. We also analyzed all non-reconciliation eligible cancer types combined, for a total of 25 distinct episode cancer types.

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 patients with a trigger chemotherapy event, we used Part B carrier claims to determine whether the patient 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 clinician (National Provider Identifier (NPI)). Finally, we required that the patient 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 patient died.

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

[97] As a consequence of the Medicare Part D benefit structure, Medicare payments are not observed on individual 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: Number of Episodes by Performance Period

Period (Episodes Initiating)	Number of Episodes	
	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
PP6 (1/2/19–7/1/19)	137,418	147,758
PP7 (7/2/19–1/1/20)	128,269	133,904
PP8 (1/2/20–7/1/20)	127,853	131,987
PP9 (7/2/20–1/1/21)	121,793	126,603
Total All Periods	1,502,665	1,662,849

Source: Medicare claims 2014–2021.
Notes: PP: Performance period. For PP7–PP8, number of episodes exclude episodes with one or more claims with COVID-19 diagnosis. Refer to Appendix Section A.1.9 for more details.

Exhibit A-3: Episodes Were Classified into One of 25 Cancer Types

Cancer Type
Acute leukemia
Anal cancer
Bladder cancer - low-risk
Bladder cancer - high risk
Breast cancer - low-risk
Breast cancer - high risk
Chronic leukemia
Central nervous system tumor
Endocrine tumor
Female genitourinary cancer other than ovary
Gastro/esophageal cancer
Head and neck cancer
Kidney cancer
Liver cancer
Lung cancer
Lymphoma
Malignant melanoma
Myelodysplastic syndromes
Multiple myeloma
Ovarian cancer
Pancreatic cancer
Prostate cancer - low-intensity
Prostate cancer - high-intensity
Small intestine / Colorectal cancer
All non-reconciliation eligible cancers

A.1.4 Attribution of Episodes to Practices

After identifying eligible episodes following the OCM attribution methodology, we assigned episodes to the practice that provided the plurality of cancer-related E&M services during the episode.[98] A practice is defined as a TIN with at least one oncology clinician. TINs are billing units for tax purposes and may or may not align with the structure of physician group organizations; 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 were not available for groups not participating in OCM (i.e., comparison TINs used for this evaluation), we were unable to track organizational changes similarly among the comparison group, and instead attributed episodes to individual comparison TINs. We therefore defined a comparison practice as a TIN with at least one oncology clinician.

A.1.5 Sample of OCM and Comparison Practices

OCM practices volunteered to participate in the Model and may differ from non-OCM practices. We included 202 practices participating in OCM.[99,100] 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. We used propensity score matching (PSM) to select comparison practices.[101,102] 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, patient, and market characteristics. The PSM process resulted in a comparison group of 534 practices. Detailed information about the comparison group selection and PSM methodology is provided in the Performance Period One Report.[103]

The PP1–PP9 intervention period had 522 comparison practices with at least one attributed episode across the intervention period; for PP9, there were 418 practices with at least one episode. We anticipated that some attrition would occur and deliberately constructed the comparison group to be large enough to accommodate a modest reduction in TINs and episodes over time. Attrition was 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.

A.1.6 Claims-Based Utilization, Payment and End-of-Life Outcome Measures

Exhibits A-4, A-5, and **A-6** define each of the utilization, payment, and end-of-life 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 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.

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

[99] Practices that joined OCM late in the Model were reflected in the baseline when they were forced to pool with an existing OCM practice. When practices joined the Model through mergers with existing OCM practices, no change was reflected in the baseline.

[100] 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.

[101] Stuart, EA. Matching methods for causal inference: A review and a look forward. Statistical science: a review journal of the Institute of Mathematical Statistics. 2010;25(1):1–21.

[102] Austin, PC. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behavioral Research, 2011;46(3):399–424.

[103] Abt Associates. Second Annual Report from the Evaluation of the Oncology Care Model: Performance Period One. Prepared for the Centers for Medicare and Medicaid Services, in partnership with the Lewin Group, Harvard Medical School, GDIT, and Dartmouth College. Abt Associates, Bethesda, MD; February 1, 2018. Available from https://innovation.cms.gov/files/reports/ocm-secondannualeval-pp1.pdf

Outcome Measure	Definition
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 patient 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.
30-day readmissions	**Occurrence** and **number of 30-day ACH readmissions per episode.** Only readmissions associated with an index ACH hospitalization (a stay during which the patient survives the hospitalization) that originated during the episode were included. A 30-day 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.
Inpatient ED visits	**Number** of ED visits resulting in a hospitalization at the same facility, per episode. This measure includes ED visits that did ultimately lead to an admission to the same facility (based on the same revenue center codes above).
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.
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).

Outcome Measure	Definition
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.[1]
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 Healthcare Common Procedure Coding System (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.
Part B drug services	**Number** of Part B drug services per episode.
Part D chemotherapy services	**Occurrence** and **number** of Part D chemotherapy services per episode. Part D chemotherapy drugs were identified using the HCPCS codes found within the chemotherapy trigger list, per OCM model specifications
Part D novel therapy services	**Occurrence** and **Number** of Part D novel therapy services 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.
Part D fills per episode	**Number** of overall Part D fills per episode.
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.

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.

[104] Centers for Medicare and Medicaid Services. Annual therapy update [Internet homepage]. Last modified November 26, 2019. Available from: https://www.cms.gov/Medicare/Billing/TherapyServices/AnnualTherapyUpdate.html.

Outcome Measure	Definition
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 patients 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 patients 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.
30-day readmission payments	Payments for 30-day readmissions per episode.
Payments for inpatient stays originating in the ED	Payments for inpatient stays originating in the ED 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 (IRF) payments	Payments for post-acute services at an inpatient rehabilitation facility per episode (claim types 60, 61).
Long-term care hospital (LTCH) payments	Payments for post-acute services at a long-term care hospital per episode (claim types 60, 61).
Other inpatient hospital payments	Other inpatient hospital payments per episode includes inpatient psychiatric facilities and prospective payment system-exempt cancer hospitals.
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.
ED visit payments not resulting in inpatient stay	Part B payments not resulting in an inpatient stay per episode.
Other institutional payments	Other institutional payments 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 drug payments	Payments for Part B 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-nausea) medications; white blood cell, red blood cell, and platelet growth factors; and bone-modifying agents.
Part B chemotherapy administration payments	Payments for chemotherapy administration per episode.
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.
Part D chemotherapy payments	Part D chemotherapy payments per episode.
Part D novel therapy payments	Payments for Part D novel therapy drugs per episode.

Outcome Measure	Definition
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 patient's date of death.
Any hospitalization in the last 30 days of life	**Occurrence** of any hospitalization within 30 days of the patient'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 patient's date of death.
Hospice Care Utilization and Timing	
Never admitted to hospice care	**Occurrence** of a patient 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 patien 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 patien 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 patient-, episode-, and practice-level characteristics used in analyses in this report.

Exhibit A-7: Definition of Patient-Level Characteristics

Characteristic	Definition
HCC risk score	Used to quantify patient severity of illness for their cancer and non-cancer comorbidities and predict plan payments in Medicare Advantage risk adjustment. HCC scores are based on patient demographics and diagnostic history, including cancer and non-cancer codes. Each episode was assigned an HCC score based on the patient'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 through June 30, 2015 claims.
Age group	Patients were divided into the following groupings: 0–64, 65–69, 70–74, 75–79, 80–84, and 85+.
Dual eligibility status	Patients were flagged as dual eligible if they were either Medicaid full-dual or partial-dual eligible.
Race/ethnicity	Patients 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 Research Triangle Institute (RTI) race code methodology.[105]

[105] Additional detail on the RTI race code methodology can be found here: https://www.resdac.org/cms-data/variables/research-triangle-institute-rti-race-code.

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,[106] and bladder cancer divided into low- versus high-risk episodes.[107] We also analyzed 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.

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.
Clinical specialty mix	A practice's NPIs were classified into the following clinical 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 clinician 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 impact analyses conducted for this Annual Report. Analyses were conducted in CMS's VRDC environment using SAS Enterprise Guide v7.1 and Stata/MP 16.1 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

[106] Low- and high-intensity designations for prostate cancer follow the methodology used in the OCM 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.

[107] 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.

period (PP1–PP9), and for individual intervention PPs. 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 used DID regression analyses to estimate Model impact on important payment outcomes. The DID design 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. Accordingly, the DID models estimate the average effect of OCM over the entire duration of the intervention period, and for each of the first nine PPs individually. We performed all DID analyses at the episode level. We estimated regression models for payment outcome measures using ordinary least squares (OLS) regression. For utilization outcomes, we estimated logit models for the occurrence of the event and OLS models for the count, or intensity, of the event, conditional upon occurrence. We specified the models to derive estimates of the impact of OCM for each PP quarter (two quarters per PP). Using a weighted average methodology, we combined PP quarter estimates into a single cumulative impact estimate and individual PP estimates. Because multiple episodes were attributed to each OCM and comparison practice, patterns that affect all episodes attributed to a practice will result in errors that are correlated. Accordingly, we clustered standard errors at the practice level.

DID Impact Specification: Payment Outcomes

The growth rate of many payment outcome measures varied considerably by episode cancer type, over time. For example, in PP4 and PP5, there was a sharp increase in TEP for lung cancer episodes that was not present in PP1 to PP3; in contrast, for colorectal cancer episodes, the change in TEP (relative to baseline) was the same in all PPs. These differences by episode cancer type were likely due to the availability of new, more expensive treatments used for specific cancer types in more-recent PPs. To account for these varied trajectories by episode cancer type, we incorporated cancer type interaction terms in the DID specification used to assess payment measures. Including these interaction terms in the specification improved model fit.

The form of the DID specification we use for assessing payment outcomes is as follows:

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

where Y is an outcome for each episode originating in quarter q; OCM is an indicator variable equal to one for OCM practices and zero for comparison practices; similarly, 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 α_q in model (1) captures the marginal impact of the OCM intervention on outcome Y, in quarter q. The coefficient ρ_{qc} captures the impact of cancer-type c for the OCM intervention on outcome Y, in quarter q. We use the estimated coefficients to generate predicted values of the outcome measures. For both the baseline and intervention period, we compared two predictions to calculate the marginal effect. The overall marginal effect is equal to the average marginal effect for each observation, which is calculated as the difference between the predicted outcome for the OCM group and a predicted counterfactual outcome for the comparison group, where the impact of OCM is assumed to be zero.[108] Using this model, we constructed estimates of the overall impact of OCM and impact of OCM in each PP by taking linear combinations of the estimates of the appropriate PP quarters. The ρ_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. 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. In all impact analyses, we excluded episodes with a COVID-19 diagnosis during the episode from the estimation sample.

[108] Puhani PA. The treatment effect, the cross difference, and the interaction term in nonlinear "difference-in-differences" models. Economics Letters. 2002;115(1):85–87.

For sub-group analyses, model specification varied on the subgroup. For estimates specific to the higher- and lower-risk cancer types, we used the same model as used for overall estimates, model (1) described above. For estimates specific to each cancer type, we used the following form of the DID specification:

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

where $\mathbf{PPQ_q}$ indicates episodes that originate in quarter q of the intervention period. This model is similar to the model specified in model (1), but without the cancer-type interactions. The coefficients $\boldsymbol{\alpha_q}$ in model (2) capture the incremental, or marginal, impact of the OCM intervention on outcome Y in PP quarter q, relative to changes from baseline to the same quarters among comparison episodes. (See the subsection below on "Subgroup Analyses" for additional detail on the subgroup analyses.)

In addition to the DID estimates, we estimated regression-adjusted means of the outcome measures for OCM and comparison episodes during the baseline and intervention periods and examined trends across the two periods. We also estimated the DID estimate as a percentage of the OCM baseline mean to provide context (scale) and quantify the relative percentage change associated with OCM. For some key payment measures, we calculated trends reflecting the risk-adjusted mean in the outcome measure for each PP from the start of baseline until PP9, separately for OCM and comparison episodes.

DID Impact Estimation: Binary and Count Outcomes

For utilization outcomes, we take a two-stage approach. For binary outcomes (e.g., the occurrence of a given outcome at least once), we estimated the logit analogs of equations (1) and (2) using maximum likelihood estimation. In these cases, the coefficient α_q captures changes in the log-odds that Y occurs for OCM episodes, relative to changes from baseline to the same quarters among comparison episodes. We estimated cumulative and PP-level impacts from the quarterly estimates using the same approach described for model (1).[109]

To estimate the effect of OCM on the intensity that an event occurs (e.g., number of times the event occurred), we used the linear specification as described in models (1) and (2), using OLS regression. For these analyses, we estimated the models conditional on the event occurring (e.g., the sample is restricted to observations with a count greater than zero). Additionally, we excluded episodes with extreme values (observations in the top 0.1% of the distribution) from respective OCM intensity estimation.[110] For interpretation of impact on count variables, we estimated total change in the number of events during the whole OCM model intervention based on the relevant DID estimates. This was accomplished by multiplying the per-episode DID impact by the total number of OCM episodes with a non-zero event count occurring at any time during the intervention period (PP1-PP9).

Covariate Selection

The DID models control for time-varying changes/influences that affect both the comparison and OCM groups, as long as the model assumptions are met. The primary DID assumption of parallel trends assumes that outcomes in the treatment and comparison group evolved the same way prior to the intervention, and that they would continue to follow these parallel trends in the absence of the intervention. **Exhibit A-10** shows the patient-, practice-, and market-level factors we control for in DID analyses. The covariates in the DID models were informed by the broader research literature on oncology outcomes, a review of National Quality Forum measures,[111] discussions with clinical experts, and extensive statistical testing of alternative specifications using baseline period data. We included 31 covariates in all DID impact analyses. Models also included state fixed effects to adjust for state-level characteristics (e.g., regulations, policies) not otherwise captured by the covariates included in the models. For a small group of outcomes, we excluded covariates that were redundant due to sample selection. For example, for all Part D-related outcome measures that apply to beneficiaries enrolled in Part D, the covariate indicating Part D enrollment is excluded.

Due to the overlap of OCM and the COVID-19 public health emergency (PHE), we include four covariates in our analyses to control for market-level COVID-19 effects on care delivery (see **Appendix A.1.9** for additional detail on controlling for the COVID-19 PHE).

[109] End-of-life DID outcome estimates employ the simple DID approach used in 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.

[110] Outlier or extreme values can be unusual data points that can distort underlying model assumptions, estimation and conclusions.

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

Exhibit A-10: Covariates Included in DID Models

Domain	Model Covariate	Definition
Patient-Level		
Patient characteristics	Sex	Patients were categorized as male, or female based on documented sex.
	Race and ethnicity	Patients were categorized as non-Hispanic White, Black, Hispanic, or Other based on RTI race code methodology.
	Age	Patients were categorized as under 65, 65–69, 70–74, 75–79, 80–84, and 85+ years of age.
	Medicaid dual eligibility	Patients were categorized as having full/partial Medicaid benefits or having no benefits.
	Part D enrollee	Patients were coded as a Part D enrollee if enrolled in Part D for all months of the episode, while alive.
CMS program alignment	Patient alignment to other CMS programs	Patients were coded as aligned if they were involved in at least one of the following CMS initiatives during their episode: Pioneer ACO, MSSP, Next Generation ACO, CPC, or CPC+.
Patient 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 Patients 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 patient used during the episode: Part B chemotherapy only, Part D chemotherapy only, or Part B and D chemotherapy.
	CMS HCC risk score	A Patient'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.
	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.

Domain	Model Covariate	Definition
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 inpatient ED visits among FFS population	The practice's county-level inpatient 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).
Market-level COVID-19 exposure	COVID-19 average cumulative death rate	All time cumulative confirmed COVID-19 death rate per 10,000 individuals in a county, averaged over the 6-month episode.
	Average new death rate	Seven-day moving average of confirmed COVID-19 death rate per 10,000 individuals in a county, averaged over the 6-month episode
	Average cumulative infection rate	All time cumulative confirmed COVID-19 infection rate per 10,000 individuals in a county, averaged over the 6-month episode
	Average new infection rate	Seven-day moving average of new confirmed COVID-19 infection rate per 10,000 individuals in a county, average over the 6-month episode
State fixed effects	Indicator variables	A set of indicator variables equal to one if practices are located in each state, and zero otherwise.

Subgroup Analyses

We conducted subgroup analyses for a select group of outcome measures to examine differential impacts of OCM by episode cancer type. The subgroup analyses serve several purposes: (1) to inform the generalizability and to assess the participation and reach 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 patients. We identified two subgroup categories: cancer treatment intensity (i.e., higher-risk and lower-risk episodes) and individual episode cancer type. 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 including: 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 (resulting / not resulting in inpatient admission), 30-day unplanned readmissions, and number of 60-day home health spells.

Exhibit A-11: Subgroups Evaluated in the Report Covering PP1–PP9

Subgroup Category	Episode Subgroups
Treatment intensity	Lower-Risk Episodes[112] Higher-Risk Episodes[113]
Cancer type	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

Parallel Trends Assumption

The DID model 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.

If we rejected the null hypothesis that baseline trends are parallel, we reviewed the data to determine whether OCM and comparison baseline trends appeared visually parallel, and whether the removal of a small number 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 outcome measures (and relevant subgroups, where applicable) that cannot be reliably reported due to a potential bias in the DID estimate. None of the outcome measures included in this report failed DID parallel trends tests.

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. We performed sensitivity testing on the following payment outcome measures: TEP, Part A payments, Part B payments without MEOS, Part D payments, Part B chemotherapy payment, Part D chemotherapy payment, Part B&D chemotherapy payment, Part A ACH hospitalization payment, and key utilization outcomes. We selected these measures, because they are important for understanding the impact of OCM, and because they rely on different types of data and have different functional forms. We conducted sensitivity tests for the full sample of episodes and for the subsamples of higher-risk and lower-risk episodes, separately.

- We conducted the following sensitivity tests:
- Varying model specifications for payment outcomes (excluding all covariates and cancer-type interactions, excluding market-level and practice-level covariates only, including cancer-type interactions only)
- 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 were part of the US Oncology Network
- Exclusion of episodes for patients without Part D enrollment in all months
- Exclusion of episodes for which patient had a chemotherapy episode in previous PP (i.e., new versus ongoing chemotherapy or hormonal therapy treatment)

[112] Lower-risk cancer episodes include low-risk breast cancer, low-intensity prostate cancer, and low-risk bladder cancer.
[113] Higher-risk cancer episodes include the 21 cancer types and non-reconciliation eligible cancers not included in the lower-risk cancer type subgroup.

- Estimation of zero-inflated negative binomial model for count outcomes instead of OLS regression
- Exclusion of episodes with the use of CAR-T therapy for utilization outcomes

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 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. Reconciliation data (MEOS and PBP data source) was available through PP8. Hence, for this report, the net impact to Medicare was estimated for PP1–PP8. To calculate the net impact, we add 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–PP8, we also calculated the impact on Medicare spending separately among 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 for higher-risk and lower-risk episodes. **Exhibit A-12** defines the measures 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-differences. TEP: Total episode payments. PP: Performance period. MEOS: Monthly enhanced oncology services. PBP: Performance-based payments.

A.1.9 Risk Adjustment for Time and Geography Variant Severity of COVID-19 Pandemic

In this section, we describe our analytic approach to address direct and indirect impacts of the COVID-19 pandemic and associated PHE on OCM impact analyses. The section is organized in the following order: (1) Background and Motivation, (2) Approach to Risk Adjuster Development, and (3) Summary of Findings.

Background and Motivation

The ongoing COVID-19 PHE, which officially began on January 27, 2020, has had direct and indirect effects on health and health care delivery.[114] PP7 through PP9 overlapped with the first 18 months of the COVID-19 PHE (Exhibit 2 in the main report). Some episodes initiated in PP7 (July 2, 2019 through January 1, 2020) and most episodes initiated in PP8 (January 2, 2020 through July 1, 2020) completed after the start of the PHE in early 2020. All episodes for PP9 occurred entirely (episode start and subsequent oncology care) during the PHE.

The prevalence of COVID-19 varied across time (Exhibit 1 in the main report) and geographic regions. The comparison group used from the start of this evaluation includes non-participating oncology practices that closely resemble the OCM participants on numerous dimensions, including market attributes. However, the selected comparison practices were not matched to OCM participants exactly in the same community. It is possible that the COVID-19 pandemic affected OCM and comparison practices that were in different communities, at different times and in different ways. Therefore we developed strategies to disentangle the time-varying impact of OCM from the time- and community-varying effects of the PHE.

[114] https://aspr.hhs.gov/legal/PHE/Pages/2019-nCoV.aspx

Approach to Risk Adjuster Development

To analyze changes during the COVID-19 PHE and to develop risk adjusters that may help control for the time- and geography-varying severity of the pandemic, we followed four sequential steps:

1. Identified the number of episodes, for OCM and comparison practices, in which the patient had a COVID-19 diagnosis.
2. Examined whether trends in the utilization of services and/or costs changed during the PHE, both for episodes with a COVID-19 diagnosis and those episodes that did not contain a COVID-19 diagnosis.
3. Developed COVID-19 risk adjusters to help account for the effects of COVID-19 on costs and utilization, and tested for usability in the DID OCM impact regressions.
4. Examined the sensitivity of OCM impact estimates to: (i) using new COVID-19 risk adjusters and (ii) including or excluding episodes with COVID-19 diagnosis.

In this section we discuss the analytic methodology for each step in the process.

Step 1: How many episodes were associated with patients diagnosed with COVID-19 during the episode and what was the composition of those patients?

Episodes with COVID-19 diagnoses were identified using ICD10 diagnosis codes.[115] For COVID-19 diagnoses between January 1 and March 31, 2020, we used B97.29[116] ICD10. For COVID-19 diagnoses from April 1, 2020, and thereafter, we used U07.1 ICD10. We conducted descriptive analyses to:

(a) Count episodes with and without a COVID-19 diagnosis over time.

(b) Compare composition of episodes with and without a COVID-19 diagnosis by selected patient characteristics, health status, and cancer mix.

(c) Compare average per-episode payment and utilization for episodes with and without a COVID-19 diagnosis.

Step 2 (Trajectory Analysis): Did utilization trends change during the PHE and were they different for OCM and comparison episodes?

To understand whether there were changes in trends during the COVID-19 PHE, we structured our analyses into the following research questions:

1. Did trends in outcome measures change during the PHE relative to pre-COVID-19 trends?
2. Did the changes in trends differ between OCM and comparison episodes?

For selected key outcomes (TEP, Part A payments, Part B payments, ED visits, and unplanned readmissions), we developed models to estimate counterfactual cost and utilization measures for the episodes during the PHE, under the assumption that outcomes would have continued their previous observed trends had the pandemic not occurred. The regression models used data from the pre-PHE performance period (PP1 through PP6) and included many of the same covariates used in the DID regressions for OCM impact analyses. We developed time-series models and used model fit statistics (e.g., R-squared, mean absolute percentage error, mean squared error) to compare the relative performance. All models were estimated using three alternative functional forms for time trends—linear, quadratic, and cubic—and varied the sets of covariates that were used in the estimating equations. Our goal was to determine if observed costs and utilization departed from trends during the PHE, and that any observed departure was robust to reasonable alternative modeling approaches.

Step 3: Development of COVID-19 Risk Adjusters

The trajectory analysis found evidence that the observed values of many of the OCM outcomes were different than expected during the PHE period. Departures from trends were not sensitive to modeling choices, but the deviations from trends were significantly related to the local level of COVID-19 in the community where the patient resides (refer to the Summary of Findings section for details). Hence, we developed new COVID-19-related risk adjusters to control for local time-varying effects of the pandemic in our OCM impact analyses.

[115] https://www.cms.gov/files/document/medicare-covid-19-data-snapshot-methodology.pdf

[116] Recommendations were to use "screening for viral illness" and only use U07.1 for confirmed cases. We expect claims to have COVID-19 diagnosis codes only for confirmed cases, not for lab tests that solely rule out COVID-19.

Identifying COVID-19 Covariates

We constructed the COVID-19-related covariates to ensure they followed two principles: (1) covariates should account for the pandemic's variable intensity across geography and time; (2) covariates can be estimated for all episodes in the analytic data. There are multiple publicly available data sources and measures that capture information related to the local intensity of the pandemic. For our purpose, we identified measures that vary along two dimensions: (1) infection versus death rates; and (2) new versus cumulative rates. Both infection rates (or COVID-19 case rates) and death rates may proxy for severity of COVID-19 outbreaks in an area at a given time. Cumulative rates may proxy for the behaviors related to the history of local impact (e.g., clinician/patient awareness, precaution, and experience), while new rates may proxy for the point-in-time intensity of the pandemic. **Exhibit A-13** shows a list of measures we considered.

COVID-19 Covariate Data Source

County-level daily counts of COVID-19 cases, deaths related to COVID-19, and population were obtained from USA FACTS.[117]

COVID-19 Covariate Construction

We calculated the rates for each measure as the county-level average over the six-month episode time frame, in the county associated with patient residence address. For example, to calculate "Average New Infection Rate" for an episode spanning from November 3, 2020 to May 2, 2021 for a patient residing in County A, we: (1) calculated daily new infection rates for each day in the episode time span as new infection counts divided by the population count in County A multiplied by 10,000; and (2) calculated the average of the daily rates over the episode time frame. We obtained daily infection rates and county populations from USA FACTS.

Exhibit A-13: Covariate Considerations for Measuring Time Variant Severity of PHE

COVID-19 Measure	Definition	Used in Final Analysis?
Average new infection rate	New confirmed COVID-19 infection rate per 10,000 individuals in a county, averaged over the 6-month episode.	Yes
Average cumulative infection rate	All time cumulative confirmed COVID-19 infection rate per 10,000 individuals in a county, averaged over the 6-month episode.	Yes
Average new death rate	New confirmed COVID-19 death rate per 10,000 individuals in a county, averaged over the 6-month episode.	Yes
Average cumulative death rate	All time cumulative confirmed COVID-19 death rate per 10,000 individuals in a county, averaged over the 6-month episode.	Yes
New infection rate at the start of the episode	Daily new confirmed COVID-19 infection rate per 100,000 individuals in a county on the first day of the episode.	No
Cumulative infection rate at the start of the episode	All time cumulative confirmed COVID-19 infection rate per 10,000 individuals in a county on the first day of the episode.	No
New death rate at the start of the episode	Daily new confirmed COVID-19 death rate per 100,000 individuals in a county on the first day of the episode.	No
Cumulative death rate at the start of the episode	All time cumulative confirmed COVID-19 death rate per 10,000 individuals in a county on the first day of the episode.	No
Hospitalization rates[a]	COVID-19 hospitalization rate per 10,000 individuals in a county.	No

Notes: [a]Hospitalization data did not start until August 2020, approximately seven months after the official start of the PHE, and therefore were not included as part of the covariate construction and selection process.

Step 4: Sensitivity Analysis – Effect on OCM impact Estimates

After identifying the COVID-19 risk adjusters, we developed sensitivity analyses to examine:

1. Does including COVID-19 covariates in the DID regressions affect impact estimates?
2. We ran DID regressions using data through PP9 including and excluding the four COVID-19 risk adjusters and compared the impact estimates from each of the models for PPs overlapping the PHE. As the only difference

[117] https://usafacts.org/visualizations/coronavirus-covid-19-spread-map/

between the two model runs were the COVID-19 covariates, any observed shifts in the impact estimates were likely due to these new variables.

3. Does excluding episodes with a COVID-19 diagnosis have any impact on the OCM impact estimates? We ran DID regressions using data through PP9 including and excluding episodes with a COVID-19 diagnosis. Both models included the four newly developed COVID-19 covariates.

Summary of Findings

In this section, we discuss the findings from each step in the process to develop the COVID-19 risk adjusters.

Step 1 Findings: The number of episodes with a COVID-19 diagnosis increased across time. Episodes with a COVID-19 diagnosis had higher HCC scores and higher costs.

Episodes having at least one claim with a COVID-19 diagnosis accounted for fewer than 1 percent of all episodes across all PPs and fewer than 6 percent of the episodes in the three PPs that overlapped with the COVID-19 PHE (**Exhibit A-14**).

Exhibit A-14: Number of Episodes with COVID-19 Diagnosis Increased between PP7 and PP9 (Data: Baseline–PP9)

Performance Period Quarters	Number of Episodes Without COVID-19	Episodes with COVID-19		
		Total Episodes	% of OCM Episodes	% of Comparison Group Episodes
		All PP		
Baseline–PP6	2,395,105	0	0.0%	0.0%
PP7_1	135,344	26	0.0%	0.0%
PP7_2	126,829	943	0.8%	0.7%
PP8_1	138,403	2,600	2.0%	1.7%
PP8_2	121,437	3,809	3.2%	2.9%
PP9_1	128,116	7,480	5.7%	5.3%
PP9_2	120,280	6,696	5.5%	5.0%
Total	**3,165,514**	**21,554**	**0.7%**	**0.6%**
		PP 7–9		
PP7–PP9	**770,409**	**21,554**	**2.86%**	**2.59%**

Source: Medicare claims 2014–2021

Notes: PP: Performance period.

Although episodes with a COVID-19 diagnosis represented a small proportion of total episode volume, if these episodes had characteristics that were different from other episodes or had outlier values for outcome measures (not necessarily due to OCM), then the inclusion or exclusion of such outlier observations could influence DID impact estimates. To examine whether episodes with a COVID-19 diagnosis were different from other episodes, we compared characteristics of these episodes to the episodes without COVID-19 diagnosis. The composition was mostly similar **(Exhibits A-15** and **A-16)** with some differences. Episodes with a COVID-19 diagnosis:

- Had higher proportions of patients who were Black or Hispanic, received Medicaid coverage, were enrolled to receive Part D coverage
- Were associated with patients with higher HCC scores
- Had lower proportions of female patients
- Had lower proportions of lower-risk breast cancer

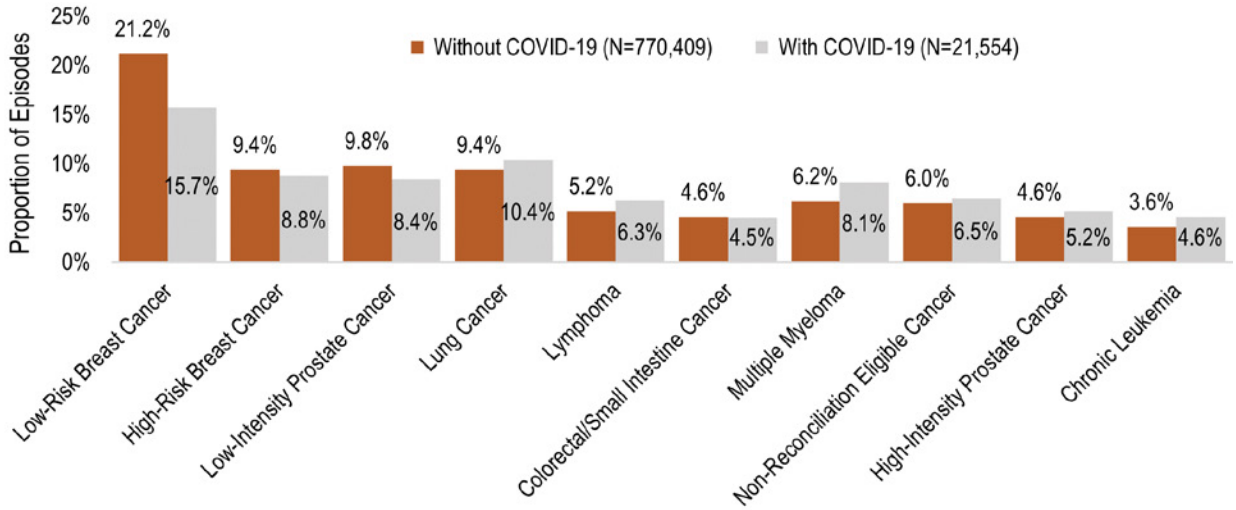
Home

Exhibit A-15: Composition of Episodes with and without COVID-19 Diagnosis Differed Slightly for Selected Demographic and Health Condition (Data: PP7–PP9)

Characteristics	Episodes without COVID-19 (N=770,409)	Episodes with COVID-19 (N=21,554)
Gender		
Female	56.9%	53.0%
Age		
Under 65	8.0%	9.3%
65 to <70	23.8%	22.2%
70 to <75	25.6%	23.0%
75 to <80	20.5%	20.3%
80 to <85	13.0%	14.3%
Over 85	9.2%	10.9%
Medicaid		
Had Medicaid coverage	12.8%	20.5%
Part D enrollment		
Was enrolled to receive Part D benefits	83.9%	85.2%
Race/Ethnicity		
Non-Hispanic White	83.0%	78.5%
Non-Hispanic Black	7.6%	9.4%
Hispanic	4.3%	7.3%
Other	5.2%	4.8%
HCC Score Quartile		
1st HCC Quartile	22.7%	15.5%
2nd HCC Quartile	21.8%	20.9%
3rd HCC Quartile	24.1%	24.1%
4th HCC Quartile	31.4%	39.6%

Source: Medicare claims 2014–2021.
Notes: Race = Other includes Asian/Pacific Islander, American Indian, Other, Unknown. Race/ethnicity was determined using the RTI race code methodology. HCC: Hierarchical condition category.

Exhibit A-16: Episodes with a COVID-19 Diagnosis Had a Lower Proportion of Episodes with Low-Risk Breast Cancer Relative to Episodes without COVID-19 Diagnosis (Data: PP7–PP9)



Source: Medicare Claims 2014–2021
Notes: The exhibit does not include all cancer types. Hence the proportion of episodes by cancer type for with / without COVID-19 diagnosis will not sum to 100%.

In addition to patient composition, we examined the distribution of selected outcome measures by COVID-19 diagnosis: TEP, Part A and B payments, Part A payment only, Part B payment only, and total inpatient stays. On average, episodes with a COVID-19 diagnosis had significantly higher payments and inpatient stays relative to other episodes (Exhibit A-17). Higher TEP was primarily due to significantly large increases in Part A payments (more than three times larger for episodes with a COVID-19 diagnosis). It is not known if these higher values were due to

care required for the COVID-19 infection or whether COVID-19 increased the cost and complexity of other care delivered during the episode.

Exhibit A-17: Both OCM and Comparison Episodes with a COVID-19 Diagnosis had Higher Costs and Inpatient Stay Compared to Episodes without COVID-19 Diagnosis (Data: Performance Periods 7–9)

Key Outcome Measures (Average per Episode)	Episodes without COVID-19 Comparison (N=392,494)	Episodes without COVID-19 OCM (N=377,915)	Episodes with COVID-19 Comparison (N=10,434)	Episodes with COVID-19 OCM (N=11,120)
Total Part A, B, and D Payments	$39,040	$39,069	$55,826	$55,289
Standardized Part A and B Payments	$28,822	$29,219	$43,898	$43,864
Standardized Part A Payments	$5,537	$5,557	$18,199	$18,726
Standardized Part B Payments	$23,285	$23,662	$25,699	$25,138
Number of Inpatient Stays	0.32	0.34	0.90	0.98

Source: Medicare Claims 2014–2021

SUMMARY: IMPACT OF ANALYSIS OF EPISODES WITH COVID-19 DIAGNOSES

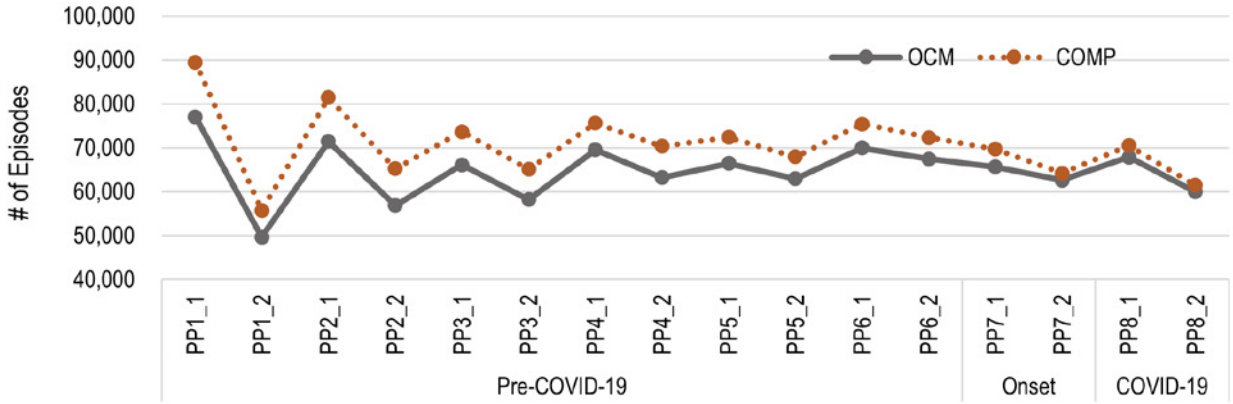
Episodes with COVID-19 diagnoses were excluded from the evaluation impact analyses since they were poorly understood outliers that could potentially bias DID impact estimates. COVID-19 episodes are excluded from reconciliation, and so the evaluation is aligned with program rules.

Step 2.1 Descriptive Trends Analysis: Descriptive analyses show a decline in episode volume, and small changes in episode characteristics during the PHE.

We started by examining patterns in the episode data from PP1 through PP8, looking particularly for any interruption in trends, spikes, or dips around the start of the PHE. Descriptive findings inform analyses in the next section, where we examined departures from a forecasted trend. Episode volume and key episode characteristics were examined for OCM and comparison episodes.

Starting from the second quarter of PP6, before the COVID-19 PHE, there was a decline in the number of episodes triggered (**Exhibit A-18**). The decline continued in PP8 (episode trigger from January 1, 2020, during COVID-19 PHE). It is unknown if the decline in PP7 and onward was due to the pandemic. The rate of decline was greater among the comparison group episodes relative to episodes associated with OCM practices.

Exhibit A-18: Episode Volume Decreased during the PHE (PP1–PP8)

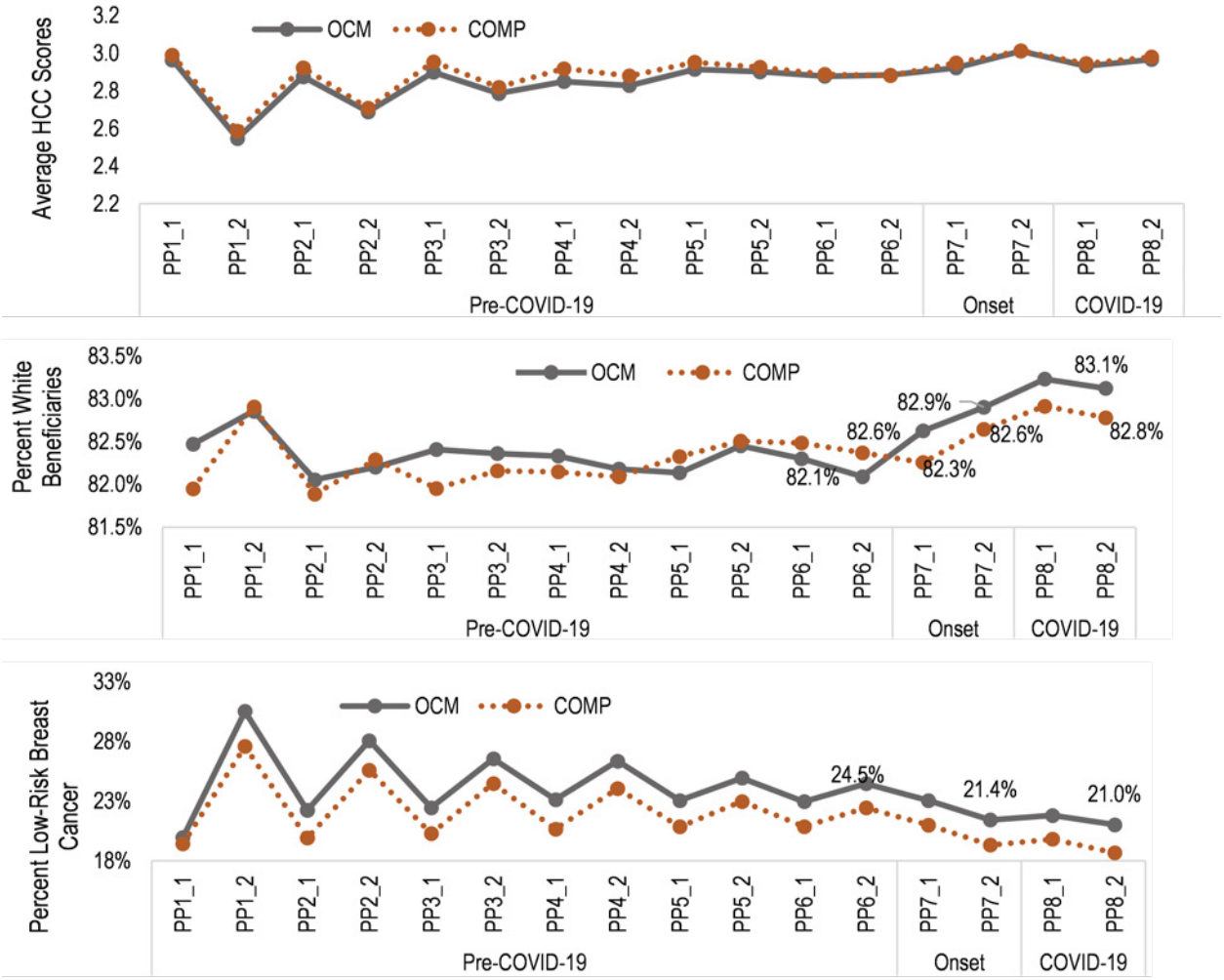


Source: Medicare Claims 2014–2021.
Notes: OCM divided each PP into two time periods referred to as PP quarters. E.g. PP1_1 is the first three-month quarter of PP1. Each PP quarter had a three-month range for episode trigger start and end date. Episode activities were captured for six months from episode trigger date. Exhibit shows data by PP quarter from PP1 to PP8. Excludes episodes with COVID-19 diagnosis.

The case-mix and patient characteristics associated with episodes triggered in PP7 and PP8 (during the PHE) were mostly similar to PPs before the PHE, with some differences (**Exhibit A-19**):

- Proportion of episodes associated with White patients was higher.
- Average HCC risk score was slightly higher than the pre-COVID period.
- Proportion of episodes associated with cancer types varied by PP. For PPs during the PHE, the number and proportion of episodes of certain cancer types consistently declined (e.g., low-risk breast cancer, low-intensity prostate cancer, colorectal cancer), while for other cancers (e.g., high-intensity prostate cancer) the relative share increased.

Exhibit A-19: Patient Composition and Cancer Mix during the PHE Varied Slightly with Higher Average HCC Scores, Higher Proportion of White Patients (Data: PP1–PP8)



Source: Medicare claims 2014–2021.
Notes: OCM divided each PP into two time periods referred to as PP quarter. Each PP quarter had a three-month range for episode trigger start and end date. Episode activities were captured for six months from episode trigger date. Exhibit shows data by PP quarter from PP1 to PP8 (PP1_1 first quarter of PP1). It excludes episodes with COVID-19 diagnosis.

SUMMARY: DESCRIPTIVE TRENDS

Visual examination showed a decline in episode volume for both OCM and the comparison group. Additionally, there were small observable differences in case mix of episodes, suggesting further testing for changes in trends in key outcome measures after the start of the COVID-19 PHE.

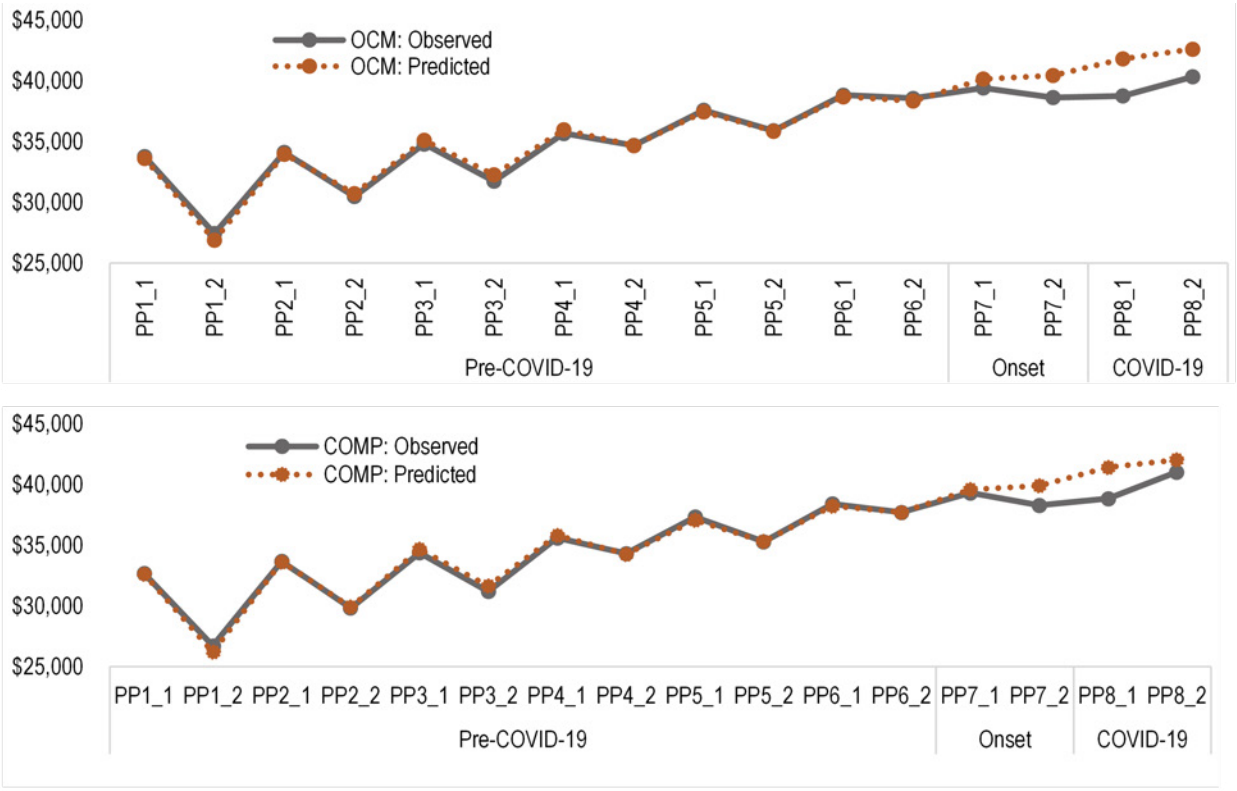
Step 2.2 Trajectory Analysis Findings: Utilization and payment trends changed during the PHE and the change in trends was slightly different between OCM and comparison

The descriptive analyses above illustrated potential changes in the trajectory of key outcomes, and also small changes in the composition of the episodes around the start of the PHE. To develop a more precise understanding of the magnitude and timing of these changes, we compared the observed values of key outcomes to predictions that assumed pre-PHE trends continued. We predicted outcomes using the methods outlined above in the Approach to Risk Adjuster Development section.

There is evidence that trends in many outcomes changed during the PHE period for both OCM and comparison:

- Observed payment and utilization outcomes were consistently lower than predicted in the PHE period:
  - TEP were approximately $2,000 less than expected in PP7 and PP8 (**Exhibit A-20)**,
  - Part A payments, Part B payments, ED use, and unplanned readmissions were lower than expected for both OCM and comparison practices during PP7-PP8.
- OCM and comparison practices followed similar, but not identical paths (Exhibit A-21):
  - Observed OCM TEP was lower than expected in PP7 and PP8 by almost $600, relative to the comparison group.
  - Observed OCM Part B payments were lower than expected by $123, relative to the comparison group.

Exhibit A-20: Observed TEP was Lower than Predicted during the PHE for Both OCM and Comparison Groups, Differences were Greater for OCM Relative to Comparison (Data: Performance Periods 1-8)



Source: Medicare claims 2014–2021. Excludes episodes with COVID-19 diagnosis.
Notes: OCM divided each performance period (PP) into two time periods referred to as PP quarter. Each PP quarter had a three-month range for episode trigger start and end date. Episode activities were captured for six months from episode trigger date. Exhibit shows data by PP quarter from PP1 to PP8 (PP1_1 first quarter of PP1). Predicted values displayed in the exhibit are based on the linear model that included patient-level covariates. Similar trends were observed using quadratic and cubic models (not displayed in this report). Average TEP was calculated for each performance period quarter based on the available TEP and predicted TEP (based on estimated regression model). Model estimation and calculation of average TEP excludes episodes with COVID-19 diagnosis. TEP: Total episode payment. PHE: Public health emergency.

Exhibit A-21: Observed Trends during the PHE period differed from Predictions. Differences between Observed and Predicted Values were Small for PP6 and were Relatively Higher for Performance Periods 7 and 8

PP	OCM , COMP	Difference between Observed and Predicted[a]				
		TEP	Part A	Part B	ED Use	Unplanned Readmission
PP6	OCM (O)	$173	$190	-$61	0.02	0.00
	COMP (C)	$188	$7	-$426	0.01	0.00
	Difference (O – C)[b]	-$15	$183	$365	0.01	0.00
PP7, PP8	OCM (O)	-$1,973	-$479	$1,084	-0.08	-0.01
	COMP (C)	-$1,382	-$396	-$961	-0.07	-0.01
	Difference (O – C)[b]	-$591	-$83	-$123	-0.01	0.00

Source: Medicare claims 2014–2021.

Notes: Predicted values displayed in the exhibit are based on the linear model that included patient-level covariates. Similar trends were observed using quadratic and cubic models (not displayed in this report). PHE: Public health emergency. OCM: OCM intervention group; COMP: Comparison group. TEP: Total episode payment. ED: Emergency department. PP: Performance period.

[a]Difference in Total Actual and Total Predicted was calculated as weighted average of difference in total actual value and predicted value of the outcome across relevant PP quarter. Episode volume for each PP quarter was used for weighting. Model estimation and calculation of average TEP excludes episodes with COVID-19 diagnosis.

[b]Difference (O – C) shows relative change between OCM and comparison. Change was larger in magnitude for OCM with, on average, lower observed values than expected based in trends pre-PHE for the outcomes tested.

SUMMARY: IMPACT OF ANALYSIS OF EPISODES WITH COVID-19 DIAGNOSES

Episodes with COVID-19 diagnoses were excluded from the evaluation impact analyses since they were poorly understood outliers that could potentially bias DID impact estimates. COVID-19 episodes are excluded from reconciliation, and so the evaluation is aligned with program rules.

Step 3 Findings: We identified four variables capturing the intensity of the COVID-19 pandemic to disentangle the effects of the pandemic from the impact of OCM in our DID models.

The trajectory analyses indicated there were changes in trends for key outcomes after the start of the COVID-19 PHE. Next, we identified county-level measures that potentially captured the varying intensity of the pandemic: New and cumulative six-month average case and death rates.[118] COVID-19 infection and death rates may have both direct and indirect effects on the availability of and access to patient care. We hypothesized that controlling for location- and time-specific COVID-19 infection and death rates may help separate any potential COVID-19 effects from OCM effects, which we assess below.

To examine the association between COVID-19 covariates and the selected key outcomes, we assessed several specifications of regression models (listed in Exhibit A-13) and compared the standardized beta coefficients of the COVID-19 covariates. Estimates from across the models showed similar patterns. Overall, many of the coefficients on the COVID-19 covariates were statistically significant and had meaningful magnitudes (Exhibit A-22), indicating that they capture variability of outcome measures. No single measure appeared to explain variation better than others: often both case rate and death measures were statistically significant and both the new incidence and cumulative measures added explanatory power.

Exhibit A-22 Standardized Beta Coefficients and Statistical Significance

COVID-19 Covariates	TEP	Part B Payments	Part A Payments	Inpatient Stays	ED Visits
Cumulative case rate	0.0062	0.0041	0.0073	0.0067	-0.0008
New case rate	-0.0063	-0.0073	-0.0018	-0.0062	0.0022
Cumulative death rate	-0.0041	0.0004	0.0023	0.0036	-0.0045
New death rate	0.0107	0.0026	0.0046	-0.0012	-0.0067

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: County-level daily COVID-19 case, and death count accessed from USA FACTS. Data Downloaded: February 2022. Outcome measures are from Medicare claims data 2014–2021.
Notes: TEP: Total episode payments. ED: Emergency department.

SUMMARY: IMPACT OF ANALYSIS

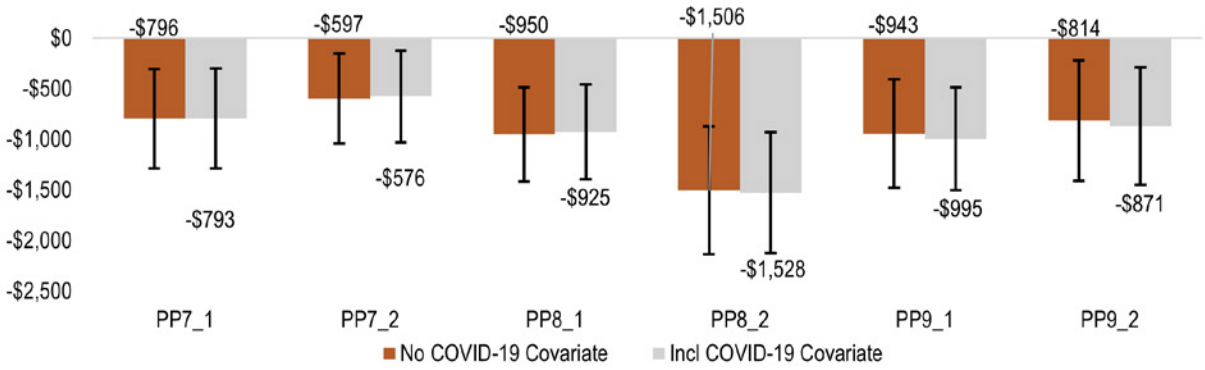
Empirical findings suggest that the four select COVID-19 covariates (infection and death rates, cumulative and new) account for some variability in the outcome measures. The evaluation team used all four covariates as risk adjusters in all OCM impact analyses.

However, there is no empirical method to test whether these covariates capture the full impact of the PHE or if impact estimates after risk adjustment (using these covariates) are only due to OCM or some other unknown factors. Additionally, with changes in COVID testing (e.g., at-home testing) and capture of incidence data, case rates may become less accurate as a proxy for PHE intensity moving forward. Use of the risk adjusters will require regular monitoring and any effects attributed to the adjusters interpreted with caution.

Step 4 Findings: Risk adjusters had a small impact on DID estimates for PPs overlapping the PHE period, and exclusion of the episodes with a COVID-19 diagnosis did not affect the DID impact estimates.

In addition to testing for association with outcomes, we examined whether the COVID-19 risk adjusters have material impact on the DID estimates. We estimated the DID impact for two outcome variables (TEP and Part A payment only) using data through PP9 for two scenarios: (1) all identified DID covariates, (2) Scenario (1) plus the four COVID-19 adjusters. Although within similar confidence intervals, the point estimates for PPs overlapping the COVID-19 PHE were slightly different for the two scenarios (**Exhibit A-23**).

Exhibit A-23: Using COVID-19 Risk Adjusters, TEP DID Estimates Varied Slightly for Period Overlapping PHE (Data Display: Performance Periods 7-9)



Source: Medicare claims 2014–2021.
Notes: Estimates were run using data until PP9. Exhibit only displays the PP quarter DID estimates and 90 percent upper and lower confidence limits for PP7–PP9 (period overlapping COVID-19 PHE). As a majority of the episode activity for the first quarter of PP7 (PP7_1) were before the PHE, there were not differences in impact for the period including or not including the risk adjusters in the DID model. Estimation excluded all episodes with COVID-19 diagnosis. PP: Performance period. TEP: Totally episode payment. DID: Difference-in-differences.

[118] COVID hospitalization rates were also considered, but county-level data were not reliably available for the full span of the PHE; the data were available only beginning in August 2020, approximately seven months after the official start of the PHE.

The number of episodes with a COVID-19 diagnosis increased over time. These episodes had higher costs and slightly differing patient characteristics and cancer mix compared to episodes without a COVID-19 diagnosis (refer to Exhibits A-15 – A-17). Therefore, we also assessed the sensitivity of our OCM impact estimates to excluding or including episodes with a COVID-19 diagnosis for total payment and Part A payments. To do so, we estimated DID models using data from baseline through PP9 with and without the episodes with a COVID-19 diagnosis. The DID models included all covariates used in our default DID regression, as well as the four COVID-19 risk adjusters. Excluding episodes with a COVID-19 diagnosis did not materially change the OCM impact estimates for the selected set of outcomes (**Exhibit A-24**).

Exhibit A-24: Exclusion of COVID-19 Episodes Did Not Materially Impact the OCM Impact Estimates – Consistent in Direction (Positive or Negative), Size, and Statistical Significance

Selected Outcome Measures	DID Estimate (Data: Baseline–Performance Period 9)	
	Include Episodes with COVID-19 (N= 3,187,068)	Exclude Episodes with COVID-19 (N= 3,165,514)
Total Part A, B, and D payments	-$500	-$499
Standardized Part A payments	-$142	-$152

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: DID: Difference-in-differences.

SUMMARY: COVID-19 RISK ADJUSTER DEVELOPMENT ANALYSIS

Episodes with a COVID-19 diagnosis increased over time, were higher in cost, and had a slightly different case mix. Excluding these episodes did not materially change the OCM impact estimates.

- ✓ Decision: All episodes with a COVID-19 diagnosis were excluded from OCM impact analyses.

Episode volume decreased after the start of the COVID-19 PHE. Trends in key outcomes changed after the start of the PHE. There was slight, but detectable, differences between the PHE-period trends in OCM versus comparison episodes. We identified four COVID-19 risk adjusters that had reasonable association with time- and geographic-varying intensity of the pandemic.

- ✓ Decision: All four COVID-19 risk adjusters were included as covariates for all DID impact analysis in this report.
- ✓ Limitations: While the covariates are correlated with the pandemic, we cannot rule out that they capture events that are not associated with the pandemic. Nor is it likely that they capture all the effects of the pandemic. Hence, OCM impact estimates during the PPs that overlap the PHE should still be interpreted with caution.

A.2. Methods and Findings for the Reach Analysis

The OCM reach analysis examined the share of all potential FFS Medicare chemotherapy episodes that were attributed to OCM participants and describes similarities and differences between OCM and non-OCM episodes, practices, and markets at baseline.[119]

We calculated standardized mean differences (SMD) to summarize differences between OCM participants and non-participants for selected episode-, practice-, and market-level characteristics. Standardized differences represent the average difference between the two groups divided by the pooled standard deviation. In formulaic terms, standardized difference = $(\mu_1 - \mu_2)/\sqrt{(\sigma_1^2 + \sigma_2^2)/2}$. Differences were assessed to be meaningful where SMD were larger than 0.10 in absolute value. This section provides detailed findings organized by type of characteristics analyzed.

A.2.1 Participation

OCM covered 27 percent of all chemotherapy-initiated cancer care delivered to FFS Medicare beneficiaries from eligible practices **(Exhibit A-25)**.

Exhibit A-25: OCM Included over a Quarter of Eligible Medicare Chemotherapy Episodes in the Baseline and Intervention Periods

Period	Number of Episodes		Distribution of Episodes		Number of Practices		Distribution of Practices	
	OCM	Non-OCM	OCM	Non-OCM	OCM	Non-OCM	OCM	Non-OCM
Baseline (7/2/2014 –1/1/2016)	345,881	925,119	27.2%	72.8%	196	3,687	5.0%	95.0%
Intervention through PP6 (7/1/2016 –7/1/2019)	778,869	2,032,170	27.7%	72.3%	202	3,617	5.3%	94.7%

Source: Medicare claims 2014–2021.
Notes: Non-OCM practices were identified by unique Tax Identification Number associated with chemotherapy episodes for Medicare fee-for-service beneficiaries attributed to practices identified as not participating in OCM. PP6: Performance period 6.

Patient-level Characteristics

Relative to non-OCM practices, OCM practices had similar proportion of episodes by race and dual eligibility status (**Exhibit A-26**). OCM episodes had a greater portion of patients living in counties in a metropolitan area, but lower proportions in micropolitan areas, suggesting greater OCM participation in communities that were urban. There were relatively small number (and proportion) of chemotherapy episodes (OCM practices = 1.4 percent, non-OCM episodes = 2.6 percent) where the patient's residence was in a rural county. While rural coverage is similar among OCM and non-OCM practices, there are too few episodes to adequately assess whether the OCM findings generalize to rural settings.

Exhibit A-26. At Baseline, Patients Served by OCM practices had Similar Demographics, but were More Likely to be Drawn from Urban Communities

Characteristics	OCM Episodes Percent	Non-OCM Episodes Percent	Difference, Percentage Points
Race/ethnicity			
White	82.7	81.5	1.2
Black	9.0	9.7	-0.7
Hispanic	4.8	4.7	0.1
Other race/ethnicity	3.4	4.1	-0.7
Dual eligibility			
Patient is dual eligible at least one month	15.2	18.1	-2.9
ADI Quintile‡[120]			

[119] Non-OCM episodes are defined as hypothetical six-month episodes of care, triggered by chemotherapy, received by FFS Medicare beneficiaries with cancer diagnoses, delivered by practices (TINs) that did not join OCM. Comparison group episodes are a subset of non-OCM episodes of care. In the baseline period, there were 196 OCM practices treating 345,881 OCM episodes, and 3,687 non-OCM practices treating 925,119 non-OCM episodes.

[120] The ADI is a validated measure of community resources that enable better health and access to care. It was calculated using ZCTA data on 17 socioeconomic measures obtained from the American Community Survey, and scores were converted to national quintiles. Episodes were assigned an ADI score and quintile indicator based on the beneficiary's mailing address. Beneficiaries who did not have data to impute missing values or had an address outside of the US were not dropped.

Characteristics	OCM Episodes Percent	Non-OCM Episodes Percent	Difference, Percentage Points
Patient resides in ADI Quintile 1 (Highest community resources)	28.5	31.2	-2.7
Patient resides in ADI Quintile 2	28.2	23.6	4.6[a]
Patient resides in ADI Quintile 3	19.1	19.0	0.1
Patient resides in ADI Quintile 4	14.0	15.4	-1.4
Patient resides in ADI Quintile 5 (Lowest community resources)	10.1	10.8	-0.7
Metropolitan status			
Patient resides in metropolitan area	86.2	78.2	8.0 [a]
Patient resides in micropolitan area	12.3	19.0	-6.7 [a]
Patient resides in rural area	1.4	2.6	-1.2

Source: Medicare claims 2014–2021.
Notes: N=345,881 OCM Episodes and 925,119 Non-OCM Episodes.
[a] Absolute value of the standardized difference > 0.10. ADI: Area Deprivation Index.

Exhibit A-27: OCM had a Larger Share of Higher-Risk Episodes (Baseline period)

Characteristics	OCM Episodes Percent	Non-OCM Episodes Percent	Difference, Percentage Point
Lower-Risk Cancer Episodes			
All Lower-Risk Cancer Types	**32.8**	**38.9**	**-6.1** [a]
Lower Risk Breast Cancer	23.8	22.8	1.0
Lower Risk Prostate Cancer	8.3	14.4	-6.1a
Higher-Risk Cancer Episodes			
All Higher-Risk Cancer Types	**67.2**	**61.1**	**6.1**[a]
Higher Risk Breast Cancer	10.6	8.8	1.8
Higher Intensity Prostate Cancer	3.8	4.0	-0.2
Chronic Leukemia	3.4	3.1	0.3
Small Intestine/Colorectal Cancer	6.1	5.5	0.6
Multiple Myeloma	5.5	4.8	0.7
Lung Cancer	9.3	8.2	1.1
Lymphoma	6.7	5.5	1.2
Non-reconciliation Eligible	4.2	5.0	-0.8
All Other Cancers	18.2	17.9	0.3

Source: Medicare claims 2014–2021.
Notes: N=345,881 OCM episodes and 925,119 Non-OCM episodes.
[a]Absolute value of the standardized difference > 0.10.

Practice-level Characteristics

To study differences between OCM and non-OCM practices, we identified an array of practice-level covariates that reflect the number of providers, training and specialty, academic affiliations, and practice size (Exhibit A-28).

OCM practices:

- Had a smaller share of oncology clinicians with radiation and surgery specialties than non-OCM practices
- Were generally larger than non-OCM practices (more episodes, providers, market share, and more multiple site locations)
- Were more likely to be affiliated with an academic medical center[121]

[121] Affiliation with an academic medical center is associated with multi-site physician groups, episodes with greater hospital use, higher-risk beneficiaries (HCC score), different types of cancer episodes (lower proportion of lung cancer, colorectal cancer, and breast cancer episodes, and a higher proportion of melanoma, and other cancers), and on average a higher total Medicare payment per episode.

While the practice-level characteristics display several large SMD, practice size and provider specialty have not been statistically meaningful covariates that affect the impact of the model on TEP and measures of utilization.

Exhibit A-28: OCM Practices were Larger than Non-OCM practices and More Likely to be Affiliated with Academic Medical Centers

Characteristics	OCM Practices Average	Non-OCM Practices Average	Difference
Provider mix of practice (mean of percent)			
Share of all providers with oncology specialty	76.2%	77.4%	-1.2
Share of oncology clinicians with radiation specialty	11.1%	29.9%	-18.8[a]
Share of oncology clinicians with surgery specialty	2.8%	5.5%	-2.7[a]
Share of oncology clinicians with gynecology specialty	4.0%	5.4%	-1.4
Employment of Nurse Practitioner/Physician Assistant (mean of percent)			
Share of providers that are NP/PA	12.4%	6.1%	6.3[a]
Practice Size and Volume of Episodes (mean)			
Number of clinicians per practice	35.9	8.0	27.9[a]
Episodes per oncology clinician	18.1	11.0	7.1[a]
Episode volume	294.2	42.9	251.3[a]
Multi-site Locations (percent)			
Practice had multi-site locations	46.4%	15.8%	30.6[a]
Market Share (mean of percent)			
Practice's market share of all eligible episodes initiated in the county	45.1%	24.3%	20.8[a]
Academic Affiliation (percent)			
Affiliated with academic medical center	15.8%	4.8%	11.0[a]

Source: Medicare claims 2014–2021.
Notes: There were 195- OCM Practices and 3,557 Non-OCM Practices with data in the baseline. NP/PA: Nurse practitioner or physician assistant.
[a]Absolute value of the standardized difference > 0.10.

Market-level Characteristics

For this analysis, we focused on market characteristics related to access barriers and disparities—including median income levels, education, poverty, and provider supply—and examined if there were differences between the localities served by OCM and non-OCM practices.[122]

Overall, OCM practices served markets like those served by non-OCM practices in terms of income, education, and poverty (**Exhibit A-29**). OCM markets have a greater supply of physicians—more primary care physicians and specialists per 10,000 county residents. OCM practices also spanned slightly more counties per practice, though over half of both OCM and non-OCM practices were in a single county.[123] OCM practices also came from counties with a higher level of Medicare Advantage penetration, possibly suggesting a greater familiarity with value-based purchasing.

Exhibit A-29: Markets Served by OCM had Similar Demographics, But Higher Physician Supply and Medicare Advantage Penetration (Baseline period)

Characteristics	OCM Practices Average	Non-OCM Practices Average	Difference
Percent of population 65 and older	14.6%	14.9%	-0.30%

[122] We defined markets based on the counties where practices were located. For practices that have sites located in multiple counties, market-level characteristics were created by means of a weighted average based on the number of evaluation and management services billed for each location. Counties that had both OCM and non-OCM practices would contribute to each group average.
[123]OCM practices must use a single TIN, per model rules, and participants consolidated their TINs prior to joining the model. Non-OCM practices may use multiple TINs.

Characteristics	OCM Practices Average	Non-OCM Practices Average	Difference
Median household income	$55,654	$56,227	-573
Percent of population with less than HS diploma	13.6%	13.6%	0.00%
Percent of population below poverty line	15.5%	15.3%	0.20%
County population	1,238,625	1,124,905	113,720
Number of ED visits per 10,000	5,299.4	5,181.3	118.1
Number of hospital beds per 10,000	38.0	36.1	1.9
Number of primary care physicians per 10,000	8.9	8.5	0.4[a]
Number of specialists per 10,000	13.4	12.1	1.3[a]
Medicare Advantage penetration	31.4%	29.7%	1.70%[a]
Number of counties served by practice	1.5	1.2	0.3[a]

Source: Medicare claims 2014–2021.
Notes: N=196 OCM Practices and N=3594 Non-OCM Practices with data in the baseline. Markets are defined as the counties where practice is located. HS: High school.
a Absolute value of the standardized difference > 0.10.

A.3 Patient Survey Methods

A.3.1 Patient Survey Analytic Methods

For this report covering PP1 and PP9, we examined the impact of OCM on care experiences collected from the OCM patient surveys among OCM patients only (no comparison group) using a time trend analysis. The analysis includes survey responses from the baseline survey (April 2016–September 2016)[124] through responses from patients with episodes initiated in PP9 (July 2020–December 2020). The analysis used the following regression model:

$$y_i = \beta_0 + \beta_1 Baseline_i + \beta_2 TimeTrend_i + X_i'\beta_2 + \varepsilon_i$$

where yi is a survey outcome for patient i, **Baseline**$_i$ represents the average regression adjusted value of the outcome in the baseline wave, **TimeTrend**$_i$ represents the average change in the outcome over time across each Wave, and Xi 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 OLS regression if the outcome measure was a continuous variable and a logistic regression if the outcome measure was a dichotomous variable. We report the 90 percent confidence intervals for all estimates of interest.

We combined responses to the main and alternative surveys (described in Exhibit A-30, in the next section) to understand care received by patients who survived and those who did not, except for end-of-life care questions. These questions are not asked in the survey sent to living patients.

We weighted the main and alternative surveys using sampling and nonresponse weights, and clustered the standard errors at the practice level. Patients with a COVID-19 diagnosis during the episode were excluded from analysis.

Risk Adjustment

For all patient survey analyses, we included patient characteristics, practice characteristics, and measures of the incidence and prevalence of COVID-19 cases and deaths during each episode 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; 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.

[124] 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.3.2 Patient Survey Instruments and Response Rates

Attributes of the OCM Patient Survey instrument and administration are described below (**Exhibit A-30 – Exhibit A-32**).

Exhibit A-30: Patient Survey Instruments and Timing

	Main Survey	Alternative 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)
Survey questions	Complete set of survey questions except end-of-life 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 end-of-life care questions
Survey addressee	Patient	"To the Family of…."
Frequency	Every quarterly wave	Every quarterly wave
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 end-of-life questions are used in scoring or payment adjustment.	

Exhibit A-31: 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]
Affective 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]
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]

Composite	Questions
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-32: Patient Survey Response Rates

Survey Wave[a]	Main Patient Survey		Alternative Survey	
	Surveys Sent	Response Rate	Surveys Sent	Response Rate
Baseline wave (4/16–9/16)	39,057	48.2%	3,308	38.9%
Intervention wave 1 (7/16–12/16)	21,679	47.1%	1,957	37.1%
Intervention wave 2 (10/16–3/17)	21,042	46.3%	1,688	33.2%
Intervention wave 3 (1/17–6/17)	22,169	45.0%	1,756	33.8%
Intervention wave 4 (4/17–9/17)	22,048	45.8%	1,674	36.4%
Intervention wave 5 (7/17–12/17)	22,052	47.3%	1,727	35.1%
Intervention wave 6 (10/17–3/18)	21,825	48.6%	1,727	35.1%
Intervention wave 7 (1/18–6/18)	23,043	44.9%	2,015	32.6%
Intervention wave 8 (4/18–9/18)	22,195	46.5%	1,933	36.1%
Intervention wave 9 (7/18–12/18)	20,767	45.8%	1,543	34.5%
Intervention wave 10 (10/18–3/19)	20,876	45.9%	1,663	34.0%
Intervention wave 11 (1/19–6/19)	21,765	44.3%	1,642	33.1%
Intervention wave 12 (4/19–9/19)	19,251	45.3%	1,474	35.3%
Intervention wave 13 (7/19–12/19)	21,388	48.1%	1,654	38.9%
Intervention wave 14 (10/19–3/20)	20,061	46.8%	1,669	35.1%
Intervention wave 15 (1/20–6/20)	15,655	45.0%	1,191	33.0%
Intervention wave 16 (4/20–9/20)	15,127	45.3%	1,165	34.5%
Intervention wave 17 (7/20–12/20)	16,751	43.3%	724	31.9%

Source: OCM Patient and Caregiver Surveys.
Notes: [a]Range of episode start dates included in each survey waves is shown in parentheses.

B. Payment and Utilization Outcome Analyses

B.1 Impact on Payment Outcomes

B.1.1 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 PP9			
	Number of Episodes	Baseline Mean	Int. Mean	Number of Episodes	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
TEP without MEOS	1,502,665	$29,120	$35,467	1,662,849	$28,735	$35,580	-$499	-$771	-$227	-1.7%
Part A payments	1,502,665	$6,165	$5,781	1,662,849	$6,008	$5,776	-$152	-$257	-$47	-2.5%
Part B payments	1,502,665	$17,230	$21,290	1,662,849	$17,000	$21,335	-$276	-$459	-$92	-1.6%
Part D payments	1,242,884	$6,769	$10,079	1,384,853	$6,816	$10,151	-$25	-$178	$129	-0.4%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: Part D payments are calculated as the sum of low-income cost-sharing and reinsurance amounts, as reflected on the PDE. TEP: Total Episode Payments. MEOS: Monthly Enhanced Oncology Services payment. OCM: OCM intervention group; COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-2: Impact on TEP and Payment Components by Performance Periods

Measure	Total Number of Episodes	Period-by-Period Impact Estimates								
		PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID	PP6 DID	PP7 DID	PP8 DID	PP9 DID
TEP without MEOS	3,165,514	-$58	-$297	-$326	-$354	-$371	-$286	-$687	-$1,208	-$935
Part A payments	3,165,514	-$63	-$134	-$162	-$128	-$76	-$54	-$324	-$376	-$55
Part B payments	3,165,514	-$59	-$180	-$158	-$268	-$208	-$201	-$270	-$585	-$567
Part D payments	2,627,737	$97	$69	$34	$127	-$64	$38	-$47	-$211	-$284

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: 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. PP: Performance period. DID: Difference-in-differences.

Exhibit B-3: Impact on Part A Payments by Performance Periods

Measure	Period-by-Period Impact Estimates N=3,165,514								
	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID	PP6 DID	PP7 DID	PP8 DID	PP9 DID
All Part A Payments	-$63	-$134	-$162	-$128	-$76	-$54	-$324	-$376	-$55
ACH payments	$48	$0	-$18	$43	$86	$77	-$66	-$102	$160
SNF payments	$7	-$13	-$24	-$18	-$26	$12	-$38	-$43	-$29
HHA payments	-$13	-$1	-$17	-$21	-$2	-$14	-$48	-$59	-$60
Hospice payments	$7	-$2	$10	-$18	-$7	-$14	-$27	-$24	-$7
IRF payments	-$2	$5	$2	-$7	$3	$21	$32	-$7	$7
LTCH payments	$9	$9	$6	$6	-$11	-$10	-$7	-$6	$0
OIP payments	-$118	-$132	-$121	-$113	-$121	-$127	-$172	-$135	-$126

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: ACH: Acute care hospital. SNF: Skilled nursing facility. HHA: Home health agency. IRF: Inpatient rehabilitation facility. LTCH: Long-term care hospital. OIP: Other inpatient facility. PP: Performance period. DID: Difference-in-differences.

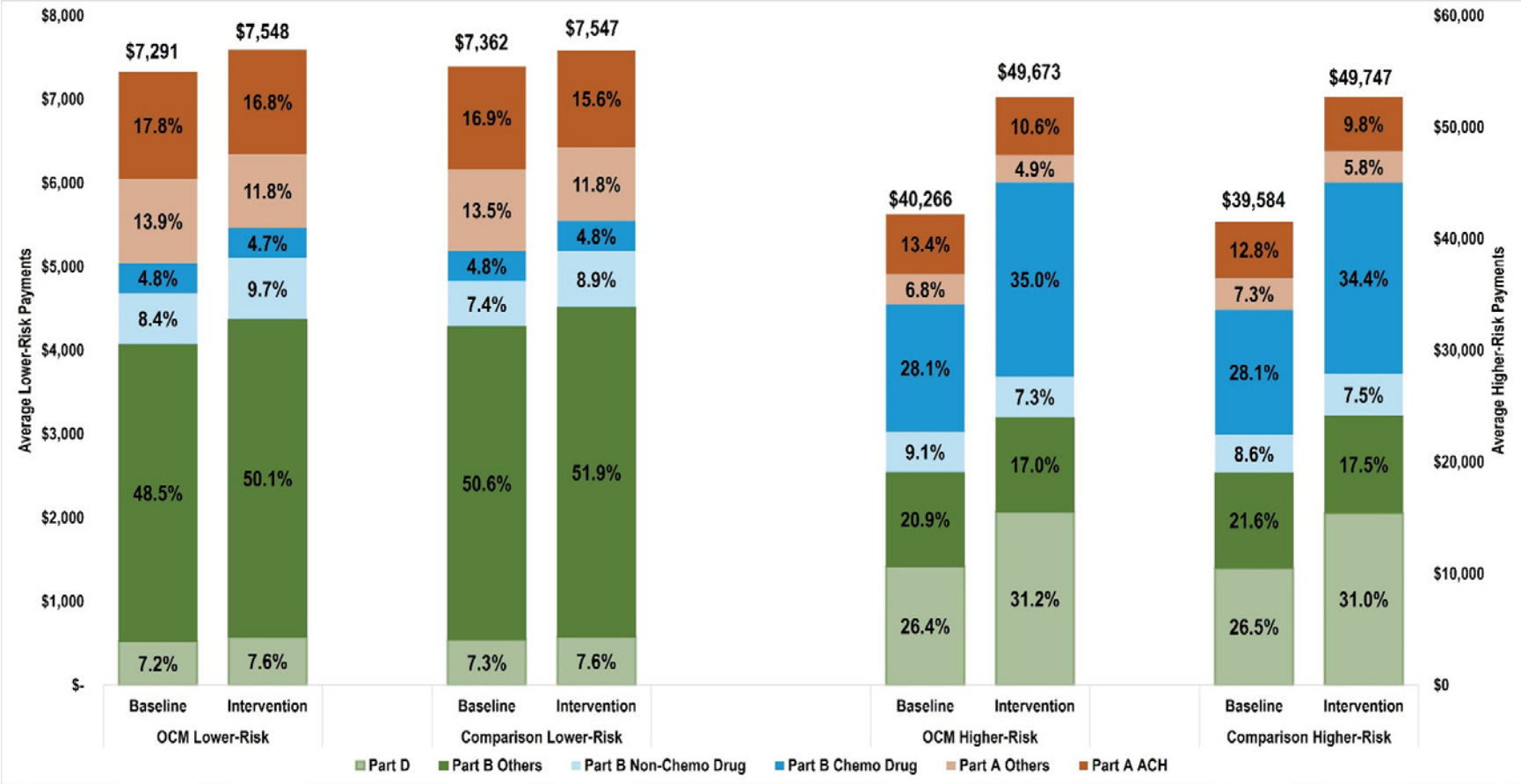
Exhibit B-4: Impact on Part B Payments by Performance Period

Measure	Period-by-Period Impact Estimates N=3,165,514								
	PP1 DID	PP2 DID	PP3 DID	PP4 DID	PP5 DID	PP6 DID	PP7 DID	PP8 DID	PP9 DID
All Part B Payments	-$59	-$180	-$158	-$268	-$208	-$201	-$270	-$585	-$567
Chemo payments	$151	-$64	$51	-$74	$2	$90	$200	$68	$44
Other payments without MEOS	-$16	-$26	-$36	-$23	-$6	-$53	-$41	-$83	-$47
Non-chemo drug payments	-$87	-$118	-$161	-$159	-$209	-$237	-$381	-$451	-$469
Non-cancer E&M payments	-$9	-$1	-$9	-$13	-$4	-$2	-$18	-$45	-$20
Imaging payments	-$9	-$10	-$18	-$25	-$21	-$22	-$26	-$43	-$40
Radiation therapy payments	-$0	$22	$13	$22	$17	$8	-$18	-$17	-$15
Chemo administration payments	$6	$12	$9	$8	$10	$8	-$2	-$12	-$8
Labs payments	$5	$7	-$1	-$5	$2	$2	$12	$5	-$0
Cancer E&M payments	$0	$5	$2	$7	$4	$2	-$3	-$9	-$16

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: MEOS: Medicare Enhanced Oncology Service payment. E&M: Evaluation and management. PP: Performance Period. DID: Difference-in-differences.

B.1.2. Differential Impacts by Cancer Type and Episode Risk Grouping

Exhibit B-5: TEP Components by Higher- and Lower-Risk Cancers



Source: Medicare claims 2014–2021.

Notes: Part D payments are calculated as the sum of low-income cost-sharing and reinsurance amounts, as reflected on the PDE. Part B Other includes: Chemotherapy Administration Payments, Radiation Payments, Non-Cancer E&M Payments, Cancer E&M Payments, Imaging Payments, Lab Payments, and other Part B Non-Institutional Payments without MEOS. Part A Other Includes: Other Inpatient Hospital Payments, SNF Payments, Home Health Care Payments, Inpatient Rehab Facility Payments, Long-Term Care Facility Payments, and Hospice Payments. TEP: Total Episode Payments.

Exhibit B-6: OCM Reduced Part B Payments for Higher-Risk Episodes, Including High-Risk Breast, Colorectal, and High-Intensity Prostate Cancers

Part B Payments	OCM N=1,502,665		COMP N=1,662,849		OCM N=1,502,665					
	Number of Episodes	Baseline Mean	Number of Episodes	Baseline Mean	Number of Episodes	Baseline Mean	DID	90% LCL	90% UCL	Percent Change
Episode Risk Group										
Lower-risk episodes	491,690	$4,533	$4,908	571,501	$4,662	$4,994	$43	-$26	$111	0.9%
Higher-risk episodes	1,010,975	$23,514	$29,602	1,091,348	$23,199	$29,690	-$403	-$667	-$139	-1.7%
Cancer Type										
Low-Risk Breast Cancer	355,083	$3,160	$3,353	364,581	$3,225	$3,435	-$18	-$65	$30	-0.6%
Low-Intensity Prostate Cancer	126,185	$7,526	$8,320	188,159	$7,640	$8,397	$37	-$140	$213	0.5%
High-Risk Breast Cancer	152,752	$24,649	$27,568	151,896	$23,944	$27,855	-$993	-$1,421	-$564	-4.0%
Lung Cancer	141,563	$27,336	$42,530	149,973	$26,931	$42,690	-$565	-$1,151	$20	-2.1%
Lymphoma	88,461	$31,130	$35,881	87,691	$31,694	$36,973	-$529	-$1,137	$80	-1.7%
Colorectal/Small Intestine Cancer	79,303	$25,819	$26,271	83,292	$24,809	$26,376	-$1,115	-$1,738	-$492	-4.3%
Multiple Myeloma	90,605	$22,465	$29,934	93,745	$22,041	$29,858	-$349	-$977	$279	-1.6%
High-Intensity Prostate Cancer	59,838	$17,774	$18,593	70,448	$17,249	$18,869	-$801	-$1,428	-$174	-4.5%
Chronic Leukemia	52,000	$12,376	$13,238	53,731	$12,334	$13,251	-$55	-$431	$321	-0.4%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.

Source: Medicare claims 2014–2021.

Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-differences. 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-7: OCM had No Overall Impact on Part B Chemotherapy Payments for Higher- or Lower-Risk Episodes or Individual Cancers apart from High-Risk Breast Cancer

Part B Chemo Payments	OCM N=1,502,665			COMP N=1,662,849			Impact Estimates Through PP9			
	Number of Episodes	Baseline Mean	Int Mean	Number of Episodes	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change
Episode Risk Group										
Lower-Risk Episodes	491,690	$355	$361	571,501	$355	$362	-$1	-$8	$5	-0.3%
Higher-Risk Episodes	1,010,975	$11,364	$17,415	1,091,348	$11,179	$17,130	$101	-$109	$311	0.9%
Cancer Type										
Low-Intensity Prostate Cancer	126,185	$1,149	$1,162	188,159	$1,150	$1,168	-$4	-$25	$17	-0.4%
High-Risk Breast Cancer	152,752	$12,770	$15,364	151,896	$12,064	$15,125	-$467	-$820	-$115	-3.7%
Lung Cancer	141,563	$12,964	$29,021	149,973	$12,726	$28,687	$96	-$447	$639	0.7%
Lymphoma	88,461	$19,757	$23,287	87,691	$20,089	$23,951	-$331	-$813	$150	-1.7%
Colorectal/Small Intestine Cancer	79,303	$11,822	$12,744	83,292	$11,589	$12,495	$16	-$433	$465	0.1%
Multiple Myeloma	90,605	$13,428	$20,594	93,745	$13,094	$20,441	-$181	-$772	$410	-1.3%
High-Intensity Prostate Cancer	59,838	$6,161	$6,877	70,448	$5,997	$6,928	-$214	-$731	$302	-3.5%
Chronic Leukemia	52,000	$6,129	$6,554	53,731	$5,868	$6,447	-$153	-$431	$125	-2.5%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Low-risk breast cancer is not included in this measure as chemotherapy is not a primary treatment for this cancer type. 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-8: OCM Reduced Part B Non-Chemotherapy Drug Payments for Higher-Risk Episodes with Reductions Concentrated in High-Risk Breast, Lung, Colorectal, High-Intensity Prostate Cancers in addition to Non-Reconciliation Eligible Cancers

Part B Non-Chemo Payments	OCM N=1,502,665			COMP N=1,662,849			Impact Estimates Through PP9			
	Number of Episodes	Baseline Mean	Int Mean	Number of Episodes	Baseline Mean	Int Mean	DID	90% LCL	90% UCL	Percent Change
Episode Risk Group										
Lower-Risk Episodes	491,690	$614	$735	571,501	$547	$674	-$5	-$47	$36	-0.9%
Higher-Risk Episodes	1,010,975	$3,682	$3,661	1,091,348	$3,410	$3,762	-$374	-$489	-$258	-10.1%
Cancer Type										
Low-Risk Breast Cancer	355,083	$321	$397	364,581	$327	$402	$0	-$27	$28	0.2%
Low-Intensity Prostate Cancer	126,185	$1,324	$1,491	188,159	$1,151	$1,324	-$6	-$124	$111	-0.5%
High-Risk Breast Cancer	152,752	$4,307	$4,471	151896	$4,167	$4,750	-$419	-$567	-$270	-9.7%
Lung Cancer	141,563	$4,201	$3,420	149,973	$3,784	$3,441	-$438	-$644	-$231	-10.4%
Lymphoma	88,461	$4,463	$5,569	87,691	$4,608	$5,692	$21	-$210	$252	0.5%
Colorectal/Small Intestine Cancer	79,303	$4,608	$3,999	83,292	$3,926	$4,031	-$714	-$1,113	-$316	-15.5%
Multiple Myeloma	90,605	$2,026	$2,465	93,745	$1,814	$2,433	-$180	-$384	$25	-8.9%
Non-Reconciliation Eligible Cancers [a]	74,515	$3,086	$2,901	100,827	$2,884	$3,035	-$337	-$536	-$138	-10.9%
High-Intensity Prostate Cancer	59,838	$5,604	$5,551	70,448	$5,123	$5,625	-$554	-$837	-$272	-9.9%
Chronic Leukemia	52,000	$1,590	$2,090	53,731	$1,695	$2,201	-$6	-$172	$160	-0.4%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.

Source: Medicare claims 2014–2021.

Notes: [a] Non-Reconciliation Eligible Cancers are types of cancer identified by CMS to be rare. OCM episodes for these cancer types are not included in PBPs, although practices may submit claims for MEOS payment during treatment episodes for these types of cancer. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit.

B.1.3 Impact on Novel Therapy Drug Payments

OCM led to small increase in part B novel therapy payments, no overall effect on part D payments.

On average, OCM increased Part B novel therapy payments per higher-risk episode by $198 (9.2 percent of baseline mean) over the first nine PPs (**Exhibit B-9**). Period-by-period estimates revealed that the increase is driven primarily by PP6 and PP7 (Exhibit B-11). Across all higher-risk cancers, OCM had no significant effect on Part D novel therapy per-episode payments. Combining Part B and Part D therapies, OCM led to a significant $157, or 2.5 percent of the baseline mean, increase in novel therapy payments per episode in higher-risk cancers.

Exhibit B-9: OCM Increased part B Novel Therapy Payments in the Higher Risk Subgroup, but no effect on Part D Novel Therapy Payments

Outcome	OCM		COMP		Impact Estimates Through PP9	
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	Percent Change
Payment Outcomes						
Part B and Part D novel therapy drug payments	$6,309	$11,431	$6,235	$11,201	$157	2.5%
Part B novel therapy drug payments	$2,168	$7,195	$2,210	$7,039	$198	9.2%
Part D novel therapy drug payments	$5,157	$5,278	$5,023	$5,180	-$36	-0.7%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-differences.

Cancer-specific analyses revealed that OCM increased total novel therapy payments for lung, lymphoma, and high-intensity prostate cancers and decreased payments for chronic leukemia. The effects of OCM on novel therapy payments by cancer type are presented in Exhibit B-10.

Exhibit B-10: OCM Impact on Novel Chemotherapy Payments

Subgroup	OCM		COMP		Impact Estimates Through PP9	
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	Percent Change
Total Novel Chemotherapy Payments						
High-Risk Breast Cancer	$4,347	$6,483	$3,975	$6,334	-$222	-5.1%
Lung Cancer	$5,047	$25,313	$5,545	$24,754	$1,058	21.0%
Lymphoma	$2,943	$5,127	$3,021	$4,858	$348	11.8%
Colorectal/Small Intestine Cancer	$6,354	$1,738	$6,207	$1,702	-$111	-1.7%
Multiple Myeloma	$20,787	$32,258	$20,313	$31,699	$86	0.4%
Non-Reconciliation Eligible Cancers	$5,499	$3,876	$3,981	$3,694	-$1,336	-24.3%
High-Intensity Prostate Cancer	$12,079	$12,259	$12,719	$11,807	$1,092	9.0%
Chronic Leukemia	$8,003	$3,355	$8,021	$2,959	$415	5.2%
Part B Novel Chemotherapy Payments						
High-Risk Breast Cancer	$1,134	$2,613	$1,035	$2,618	-$105	-9.3%
Lung Cancer	$2,858	$22,418	$3,289	$21,786	$1,064	37.2%
Lymphoma	$280	$3,037	$408	$2,988	$177	63.4%
Colorectal/Small Intestine Cancer	$5,721	$1,407	$5,583	$1,373	-$104	-1.8%
Multiple Myeloma	$4,869	$12,336	$4,594	$12,482	-$422	-8.7%

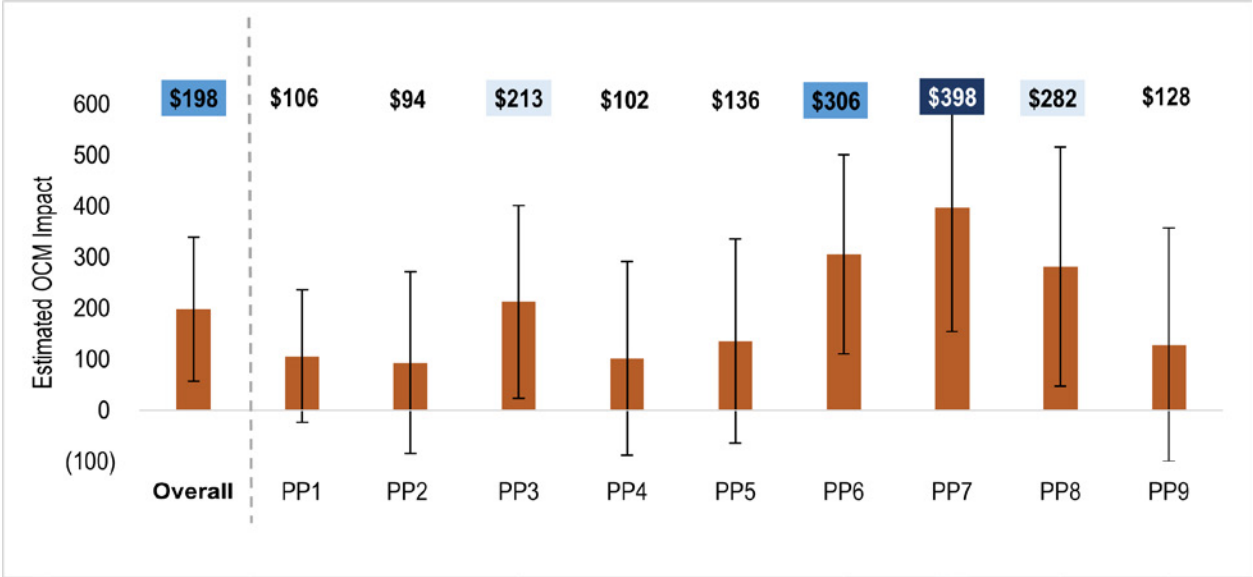
Subgroup	OCM		COMP		Impact Estimates Through PP9	
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	Percent Change
Non-Reconciliation Eligible Cancers	$972	$3,597	$657	$3,419	-$137	-14.1%
High-Intensity Prostate Cancer	$27	$317	-$7	$250	$34	126%
Chronic Leukemia	$1,333	$149	$1,049	$106	-$243	-18.2%
Part D Novel Chemotherapy Payments						
High-Risk Breast Cancer	$3,981	$4,775	$3,656	$4,576	-$126	-3.2%
Lung Cancer	$2,821	$3,804	$2,929	$3,896	$16	0.6%
Lymphoma	$3,547	$2,750	$3,470	$2,460	$213	6.0%
Colorectal/Small Intestine Cancer	$863	$434	$837	$436	-$28	-3.2%
Multiple Myeloma	$18,641	$23,167	$18,456	$22,366	$616	3.3%
Non-Reconciliation Eligible Cancers	$5,543	$332	$4,051	$332	-$1,493	-26.9%
High-Intensity Prostate Cancer	$13,393	$13,293	$14,111	$12,866	$1,145	8.5%
Chronic Leukemia	$7,317	$3,473	$7,642	$3,110	$686	9.4%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-differences.. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period.

OCM increased Part B novel therapy payments in lung cancer patients by $1,064 (37.2 percent of baseline mean). Like the utilization results discussed above, this increase in payments was driven by increases beginning in PP6 (**Exhibit B-11**). OCM also decreased Part B novel therapy payments in chronic leukemia patients by $243 (18.2 percent of baseline mean).

OCM increased Part D novel therapy payments in high-intensity prostate cancers by $1,145 (8.5 percent of baseline mean). As discussed in previous annual reports, the increase in novel therapy payments in high-intensity prostate cancers in the earlier PPs was due to the introduction of abiraterone and enzalutamide;[125] while the later increase coincides with the 2019 introduction of apalutamide—and further approval of enzalutamide—to treat metastatic, castrate sensitive prostate cancer (Exhibit B-12).

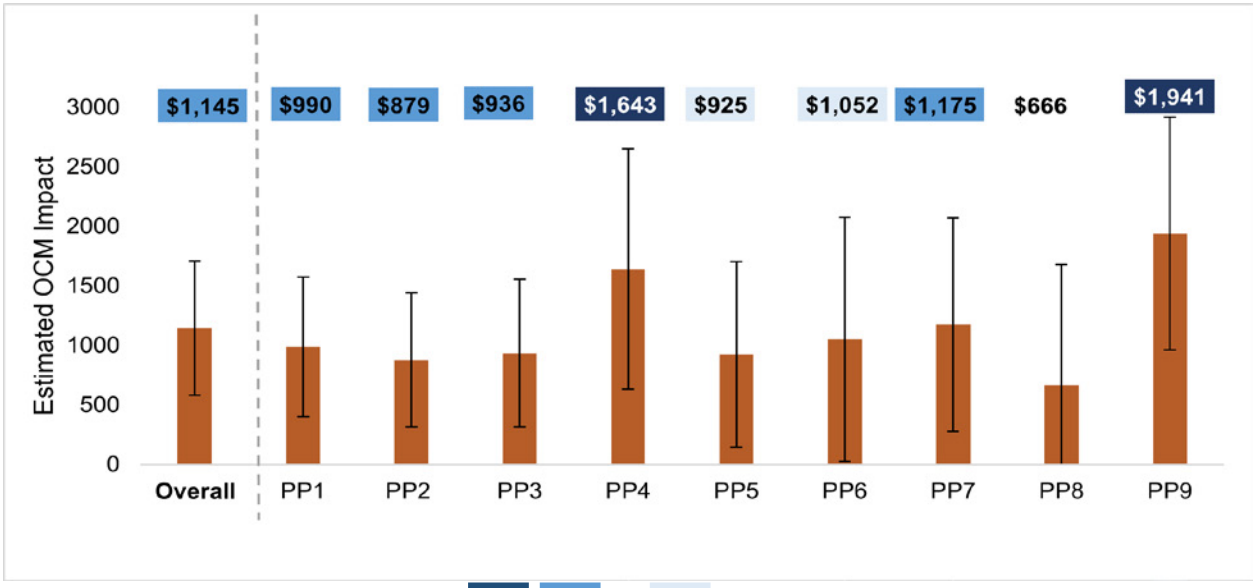
Exhibit B-11: Impact Estimates: Part B Novel Payments per Higher-Risk Episode



Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: DID: difference-in-differences. CI: Confidence interval. PP: Performance period.

[125] Abt Associates. Evaluation of the Oncology Care Model: Performance Periods 1-5. Prepared for the Centers for Medicare and Medicaid Services, partnership with the Lewin Group, Harvard Medical School, GDIT, and Dartmouth College. Abt Associates, Bethesda, MD; January 2021. Available from: Evaluation of the Oncology Care Model: Performance Periods 1-5 (cms.gov)

Exhibit B-12: Impact Estimates: Part D Novel Therapy Drug Payments per Episode for High-Intensity Prostate Cancers



Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: PP=Performance period. pp=percentage point.

B.1.4 Net Impact of OCM

Exhibit B-13: OCM Resulted in Larger Per-Episode Losses for Lower-Risk Episodes Compared to Higher-Risk Episodes

Cancer Type Risk Group	Gross Impact on TEP	MEOS Payments	Total Cost to Medicare†	Number of Episodes	Per episode net cost to Medicare‡
PP3					
Lower-risk episodes	$8,768,018	$25,644,224	$34,412,242	41,344	$832
Higher-risk episodes	-$50,066,335	$63,820,574	$13,754,239	87,380	$157
All episodes	-$41,952,907	$89,464,798	$47,511,891	128,724	$369
PP4					
Lower-risk episodes	$7,025,394	$27,658,538	$34,683,932	43,454	$798
Higher-risk episodes	-$52,690,024	$66,475,986	$13,785,962	89,748	$154
All episodes	-$47,218,934	$94,134,524	$46,915,589	133,202	$352
PP5					
Lower-risk episodes	$2,523,789	$25,529,140	$28,052,929	41,470	$676
Higher-risk episodes	-$47,845,294	$63,364,754	$15,519,460	87,628	$177
All episodes	-$47,954,230	$88,893,894	$40,939,664	129,098	$317
PP6					
Lower-risk episodes	$2,135,416	$25,920,349	$28,055,766	44,161	$635
Higher-risk episodes	-$38,142,553	$65,522,321	$27,379,768	93,416	$293
All episodes	-$39,320,416	$91,442,670	$52,122,255	137,577	$379
PP7					
Lower risk episodes	$3,468,852	$21,368,012	$24,836,864	38,323	$648
Higher risk episodes	-$93,520,440	$59,921,299	-$33,599,142	89,524	-$375
All episodes	-$87,881,563	$81,556,473	-$6,325,090	127,847	-$49

Cancer Type Risk Group	Gross Impact on TEP	MEOS Payments	Total Cost to Medicare†	Number of Episodes	Per episode net cost to Medicare‡
			PP8		
Lower-risk episodes	-$6,235,720	$20,121,235	$13,885,515	31,583	$440
Higher-risk episodes	-$128,427,647	$55,422,497	-$73,005,150	76,262	-$957
All episodes	-$130,261,015	$77,403,202	-$52,857,813	107,845	-$490

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: Data are not available to break out MEOS payments by higher- and lower-risk episodes in PP1 and PP2; therefore, analysis begins in PP3. COVID episodes were removed from the higher- and lower-risk episode counts in PP7 and PP8. There were a total of 3,328 COVID episodes removed. As MEOS was a cost incurred, for program net impact estimate, MEOS for all episodes includes MEOS paid related to episodes with COVID-19 diagnosis. Episodes with COVID-19 diagnosis did not have a higher or lower risk indicator. Hence MEOS for all episodes is not the total of MEOS related to higher and lower risk. Gross impact was estimated as total program episode multiplied by the DID. Overall DID is a weighted estimate. Hence the gross estimate for all episodes does not always equal the sum of the gross impact for higher and lower risk episodes. †Total Cost to Medicare was calculated as the sum of the Gross Impact on TEP plus MEOS payments. ‡Per episode net cost to Medicare was calculated as the sum of the Gross Impact on TEP plus MEOS payments divided by the number of episodes. TEP: Total episode payment. MEOS: Monthly Enhanced Oncology Services. PP: Performance period. TEP: Total Episode Payments, MEOS: Monthly Enhanced Oncology Services.

B.1.5 Results of Sensitivity Analyses for Payment Outcome Measures

As discussed in Appendix Section 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-14** summarizes the sensitivity tests that were conducted for each of the key payment outcome measures.

Exhibit B-14: Sensitivity Tests Conducted for Selected Payment Outcome Measures

Type of Test	Sensitivity Test	Payment Outcome Measures							
		TEP	Part A	Part B	Part D	Part B Chemo	Part A ACH	Part D Chemo	Part B&D Chemo
Model specification	Exclusion of all episode-, practice-, and market-level covariates; excludes interactions with cancer type	X	X	X	X	X	X	X	X
	Exclusion of all episode-, practice-, and market-level covariates, includes interactions with cancer type	X	X	X	X	X	X	X	X
	Exclusion of practice- and market-level covariates, including only episode-level covariates	X	X	X	X	X	X	X	X
Payment outliners exclusions	Exclusion of episodes with payments in the top 5% of the distribution	X	X	X	X	X	X	X	X
	Exclusion of episodes with payments in the top 10% of the distribution	X	X	X	X	X	X	X	X
Practice based exclusions	Exclusion of the two largest OCM practices	X	X	X	X	X	X	X	X
	Exclusion of practices that are part of the US Oncology Network	X	X	X		X	X	X	X
Other exclusions	Inclusion of patients not enrolled in Part D for all months of the episode				X			X	
	Exclusion of episodes for which the patient had a chemo episode in the previous PP	X	X	X	X	X	X	X	X
	Exclusion of episodes with inpatient or outpatient CAR-T cell therapy	X	X	X			X		

The impact estimates of payment outcomes were consistent across the different specifications and sample exclusions, with five minor exceptions. Exhibit B-15 displays five cases where payment outcome measures were sensitive to one of the sensitivity tests. We chose not to revise the main estimates as these 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-15: 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
1. Exclusion of episodes with payments in the top 10% of the distribution 2. Exclusion of the two largest OCM practices 3. Exclusion of episodes for which the patient had a chemo episode in the previous PP	Part A payments	The impact estimate for Part A payments was smaller in absolute magnitude and was no longer statistically significant for the three sensitivity analyses.
1. Exclusion of practices that are part of the US Oncology Network 2. Exclusion of the two largest OCM practices	Part D Chemo payment	The impact estimate for Part D chemo payments was larger in absolute magnitude and was statistically significant for these two sensitivity analyses.

Exhibit B-16: Meaningful Reductions in Number of ED Visits Resulting in an Inpatient Stay among Higher-Risk Cancer Episodes

Measure	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Any Inpatient Stay	1,502,665	1,662,849	27.1%	24.5%	25.5%	23.6%	-0.04pp	-0.7pp	0.6pp	-0.1%
Low-risk cancer episodes	491,690	571,501	11.0%	9.9%	11.3%	9.9%	0.3pp	-0.0pp	0.6pp	2.4%
High-risk cancer episodes	1,010,975	1,091,348	32.4%	29.0%	31.1%	28.1%	-0.1pp	-1.0pp	0.8pp	-0.4%
Number of Inpatient Stays	377,508	399,863	1.565	1.542	1.542	1.530	-0.009	-0.019	0.000	-0.6%
Low-risk cancer episodes	49,975	58,679	1.322	1.311	1.313	1.298	0.004	-0.010	0.019	0.3%
High-risk cancer episodes	327,506	341,136	1.603	1.580	1.579	1.566	-0.010	-0.021	0.001	-0.6%
Number of Inpatient Days	370,965	392,132	8.645	8.336	8.513	8.243	-0.039	-0.144	0.066	-0.4%
Low-risk cancer episodes	48,688	57,103	6.055	5.898	6.042	5.768	0.118	-0.036	0.271	1.9%
High-risk cancer episodes	322,292	335,037	9.060	8.734	8.921	8.640	-0.045	-0.158	0.068	-0.5%
Any ED Visit or Observation Stay not Resulting in an Inpatient Stay	1,502,665	1,662,849	24.0%	22.9%	25.2%	24.2%	0.08pp	-0.5pp	0.6pp	0.4%
Low-risk cancer episodes	491,690	571,501	15.9%	15.3%	16.8%	15.9%	0.3pp	-0.1pp	0.8pp	2.1%
High-risk cancer episodes	1,010,975	1,091,348	26.5%	25.2%	28.4%	27.0%	-0.1pp	-0.8pp	0.6pp	-0.4%
Any ED Visit not Resulting in an Inpatient Stay	1,502,665	1,662,849	23.1%	22.1%	24.4%	23.5%	-0.07pp	-0.6%	0.5%	-0.3%
Low-risk cancer episodes	491,690	571,501	15.4%	14.7%	16.4%	15.4%	0.2pp	-0.2pp	0.7pp	1.6%
High-risk cancer episodes	1,010,975	1,091,348	25.5%	24.3%	27.6%	26.3%	-0.2pp	-0.8pp	0.5pp	-0.6%
Number of ED Visits not Resulting in an Inpatient Stay	334,774	393,901	1.497	1.494	1.515	1.508	0.005	-0.007	0.016	0.3%
Low-risk cancer episodes	73,167	89,238	1.408	1.390	1.404	1.392	-0.006	-0.023	0.011	-0.4%
High-risk cancer episodes	261,607	304,663	1.522	1.523	1.547	1.541	0.007	-0.006	0.021	0.5%
Any ED Visits Resulting in an Inpatient Stay	1,502,665	1,662,849	21.3%	19.2%	20.0%	18.2%	-0.3pp	-0.7pp	0.0pp	-1.6%
Low-Risk Cancer Episodes	491,690	571,501	8.1%	7.3%	7.9%	6.9%	0.1pp	-0.1pp	0.3pp	1.4%
High-Risk Cancer Episodes	1,010,975	1,091,348	27.9%	25.1%	26.1%	23.9%	-0.5pp	-1.0pp	-0.1pp	-2.0%

Measure	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Number of ED Visits Resulting in an Inpatient Stay	298,064	306,067	1.453	1.454	1.439	1.452	-0.012	-0.021	-0.002	-0.8%
Low-risk cancer episodes	36,027	41,484	1.302	1.301	1.296	1.289	0.006	-0.011	0.022	0.4%
High-risk cancer episodes	262,025	264,561	1.474	1.476	1.460	1.475	-0.013	-0.024	-0.002	-0.9%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. pp = percentage points. pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Intensity (Number of Visits or Stays) measures are conditional on observing any use of measure and less than the 99.9 percentile.

Exhibit B-17: Meaningful reductions in Lymphoma and Multiple Myeloma for Number of Inpatient Stays

Subgroup	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Cancer Type										
Low-Risk Breast Cancer	28,836	29,211	1.257	1.250	1.241	1.245	-0.011	-0.028	0.007	-0.9%
High-Risk Breast Cancer	34,957	33,830	1.473	1.453	1.471	1.436	0.015	-0.007	0.037	1.0%
Low-Intensity Prostate Cancer	19,167	26,324	1.400	1.377	1.394	1.353	0.018	-0.007	0.043	1.3%
Lung Cancer	57,241	58,104	1.590	1.575	1.574	1.577	-0.018	-0.039	0.003	-1.1%
Lymphoma	24,698	24,635	1.832	1.762	1.761	1.738	-0.047	-0.092	-0.001	-2.5%
Colorectal/Small Intestine Cancer	28,384	29,008	1.536	1.520	1.522	1.508	-0.001	-0.029	0.027	-0.1%
Multiple Myeloma	25,826	25,998	1.596	1.519	1.567	1.537	-0.046	-0.077	-0.015	-2.9%
Non-Reconciliation Eligible Cancers	22,502	28,716	1.561	1.561	1.538	1.521	0.017	-0.015	0.050	1.1%
High-Intensity Prostate Cancer	15,494	16,694	1.516	1.509	1.518	1.487	0.024	-0.011	0.059	1.6%
Chronic Leukemia	11,112	11,165	1.519	1.534	1.540	1.509	0.047	-0.003	0.096	3.1%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-18: Any ED Visits not Resulting in an Inpatient Stay: Chronic Leukemia is an outlier

Subgroup	OCM		COMP		Impact Estimates Through PP9			
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Cancer Type								
Low-Risk Breast Cancer	13.9%	13.1%	14.7%	13.5%	0.2pp	-0.3pp	0.6pp	1.2%
High-Risk Breast Cancer	22.5%	21.4%	24.5%	23.2%	-0.3pp	-1.2pp	0.7pp	-1.1%
Low-Intensity Prostate Cancer	19.4%	18.8%	19.4%	18.4%	0.4pp	-0.3pp	1.1pp	2.2%
Lung Cancer	30.9%	28.7%	33.7%	31.5%	-0.1pp	-1.1pp	1.0pp	-0.2%
Lymphoma	22.7%	22.6%	24.5%	24.8%	-0.5pp	-1.6pp	0.5pp	-2.2%
Colorectal/Small Intestine Cancer	27.0%	25.9%	29.0%	28.8%	-0.9pp	-2.0pp	0.3pp	-3.2%
Multiple Myeloma	25.0%	23.6%	26.0%	24.9%	-0.4pp	-1.6pp	0.7pp	-1.7%
Non-Reconciliation Eligible Cancers	26.2%	24.9%	28.1%	26.3%	0.5pp	-0.7pp	1.7pp	1.9%
High-Intensity Prostate Cancer	26.8%	24.9%	27.6%	25.3%	0.2pp	-1.1pp	1.5pp	0.7%
Chronic Leukemia	21.9%	21.3%	24.8%	22.4%	1.6pp	0.3pp	3.0pp	7.5%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit.

Exhibit B-19: Number of ED Visits Resulting in an Inpatient Stay driven by Lymphoma and Multiple Myeloma

Subgroup	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Cancer Type										
Low-Risk Breast Cancer	19,461	19,103	1.248	1.253	1.237	1.245	-0.003	-0.025	0.019	-0.2%
High-Risk Breast Cancer	28,223	26,483	1.413	1.401	1.405	1.390	0.002	-0.022	0.027	0.2%
Low-Intensity Prostate Cancer	15,216	20,216	1.363	1.352	1.353	1.331	0.011	-0.016	0.038	0.8%
Lung Cancer	49,148	48,368	1.503	1.508	1.489	1.512	-0.018	-0.038	0.002	-1.2%
Lymphoma	19,405	18,805	1.509	1.480	1.468	1.487	-0.048	-0.080	-0.016	-3.2%
Colorectal/Small Intestine Cancer	20,915	20,589	1.443	1.443	1.419	1.434	-0.015	-0.046	0.016	-1.1%
Multiple Myeloma	20,235	19,605	1.468	1.439	1.449	1.455	-0.035	-0.068	-0.001	-2.4%
Non-Reconciliation Eligible Cancers	17,930	22,255	1.450	1.475	1.440	1.442	0.023	-0.008	0.054	1.6%
High-Intensity Prostate Cancer	13,183	13,740	1.437	1.450	1.437	1.437	0.013	-0.024	0.049	0.9%
Chronic Leukemia	8,922	8,675	1.393	1.441	1.451	1.430	0.070	0.022	0.117	5.0%

Shading indcates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Intensity (Number of Visits or Stays) measures are conditional on observing any use of measure and less than the 99.9 percentile.

Exhibit B-20: Small (but significant) Reduction in Number of ED Visits not Resulting in an Inpatient Stay for Colorectal/Small Intestine Cancer and Increases for Chronic Leukemia

Subgroup	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Cancer Type										
Low-Risk Breast Cancer	47,136	50,386	1.348	1.347	1.350	1.345	0.004	-0.016	0.024	0.3%
High-Risk Breast Cancer	33,077	35,726	1.475	1.481	1.485	1.478	0.013	-0.016	0.042	0.9%
Low-Intensity Prostate Cancer	23,852	35,048	1.492	1.451	1.497	1.469	-0.012	-0.042	0.018	-0.8%
Lung Cancer	41,327	47,962	1.545	1.530	1.569	1.544	0.010	-0.018	0.038	0.7%
Lymphoma	19,990	21,655	1.471	1.468	1.496	1.485	0.008	-0.028	0.045	0.6%
Colorectal/Small Intestine Cancer	20,774	23,991	1.533	1.504	1.544	1.573	-0.058	-0.100	-0.016	-3.8%
Multiple Myeloma	21,605	23,597	1.504	1.472	1.487	1.487	-0.032	-0.071	0.007	-2.1%
Non-Reconciliation Eligible Cancers	18,739	26,901	1.517	1.520	1.529	1.520	0.012	-0.027	0.051	0.8%
High-Intensity Prostate Cancer	15,151	18,162	1.545	1.532	1.567	1.548	0.006	-0.039	0.051	0.4%
Chronic Leukemia	11,139	12,354	1.514	1.510	1.585	1.474	0.106	0.057	0.156	7.0%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Intensity (Number of Visits or Stays) measures are conditional on observing any use of measure and less than the 99.9 percentile.

Exhibit B-21: Reduction in number of Readmissions among Episodes with any Readmissions and Occurrence of ICU Admissions

Measure	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Occurrence of 30-day Readmission	377,675	400,076	26.4%	26.0%	25.4%	25.7%	-0.31pp	-1.0pp	0.4pp	-1.2%
Low-risk cancer episodes	50,006	58,734	15.5%	15.3%	15.6%	15.2%	0.2pp	-0.9pp	1.3pp	1.3%
High-risk cancer episodes	327,669	341,342	27.0%	26.6%	26.4%	26.3%	-0.4pp	-1.1pp	0.4pp	-1.4%
Occurrence of 30-day Unplanned Readmission	377,675	400,076	24.9%	24.4%	24.0%	24.0%	-0.21pp	-0.9pp	0.4pp	-0.9%
Low-risk cancer episodes	50,006	58,734	14.4%	14.1%	14.6%	14.1%	0.2pp	-0.8pp	1.2pp	1.5%
High-risk cancer episodes	327,669	341,342	25.4%	24.8%	24.9%	24.5%	-0.3pp	-1.0pp	0.5pp	-1.0%
Number of 30-day Readmissions	94,084	97,632	1.485	1.469	1.459	1.461	-0.017	-0.034	-0.000	-1.2%
Low-risk cancer episodes	7,506	8,786	1.355	1.321	1.334	1.331	-0.031	-0.070	0.007	-2.3%
High-risk cancer episodes	86,578	88,843	1.497	1.483	1.471	1.473	-0.016	-0.034	0.003	-1.1%
Number of 30-day Unplanned Readmissions	88,211	91,534	1.424	1.404	1.401	1.401	-0.020	-0.034	-0.005	-1.4%
Low-risk cancer episodes	6,952	8,165	1.344	1.301	1.317	1.310	-0.036	-0.072	0.000	-2.7%
High-risk cancer episodes	81,259	83,369	1.431	1.413	1.409	1.409	-0.018	-0.033	-0.002	-1.3%
Occurrence of ICU Admission	1,502,665	1,662,849	10.5%	9.7%	8.8%	8.6%	-0.56pp	-1.0pp	-0.1pp	-5.4%
Number of ICU Admissions	148,110	143,890	1.250	1.256	1.236	1.250	-0.008	-0.019	0.003	-0.6%
Low-risk cancer episodes	16,263	17,458	1.179	1.196	1.178	1.186	0.009	-0.010	0.028	0.8%
High-risk cancer episodes	131,847	126,432	1.260	1.265	1.243	1.258	-0.010	-0.022	0.002	-0.8%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.

Source: Medicare claims 2014–2021.

Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Intensity (Number of Visits or Stays) measures are conditional on observing any use of measure and less than the 99.9 percentile. Occurrence of Readmissions conditional on having an inpatient stay.

Exhibit B-22: Reductions in Occurrence of Unplanned Readmissions driven by Lymphoma

Subgroup	OCM		COMP		Impact Estimates Through PP9			
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Cancer Type								
Low-Risk Breast Cancer	25.4%	24.8%	24.9%	24.5%	-0.3pp	-1.0pp	0.5pp	-1.0%
Low-Risk Breast Cancer	11.6%	11.3%	11.4%	11.5%	-0.5pp	-1.7pp	0.7pp	-4.2%
High-Risk Breast Cancer	21.4%	21.2%	21.2%	20.8%	0.0pp	-1.4pp	1.5pp	0.2%
Low-Intensity Prostate Cancer	18.3%	17.8%	17.9%	16.5%	1.0pp	-0.7pp	2.7pp	5.5%
Lung Cancer	28.3%	27.6%	28.1%	27.8%	-0.3pp	-1.6pp	1.0pp	-1.0%
Lymphoma	28.2%	26.6%	26.2%	26.8%	-2.2pp	-4.3pp	-0.2pp	-7.9%
Colorectal/Small Intestine Cancer	24.1%	23.8%	23.9%	23.6%	0.2pp	-1.5pp	1.8pp	0.6%
Multiple Myeloma	25.0%	23.1%	24.5%	23.3%	-0.7pp	-2.5pp	1.1pp	-2.9%
Non-Reconciliation Eligible Cancers	24.6%	25.6%	25.0%	24.8%	1.2pp	-0.9pp	3.3pp	4.7%
High-Intensity Prostate Cancer	24.7%	24.1%	24.0%	22.1%	1.6pp	-0.7pp	3.8pp	6.4%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. Pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Occurrence of Unplanned Readmissions conditional on having an inpatient stay.

Exhibit B-23: Meaningful Reductions in Number of Readmissions driven by Low-Intensity Prostate Cancer and Multiple Myeloma

Subgroup	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Cancer Type										
Low-Risk Breast Cancer	3,497	3,526	1.290	1.281	1.313	1.292	0.012	-0.044	0.068	0.9%
High-Risk Breast Cancer	7,482	7,116	1.380	1.374	1.401	1.367	0.027	-0.016	0.070	2.0%
Low-Intensity Prostate Cancer	3,586	4,629	1.397	1.349	1.346	1.358	-0.060	-0.119	-0.002	-4.3%
Lung Cancer	15,334	15,517	1.423	1.418	1.406	1.414	-0.013	-0.050	0.024	-0.9%
Lymphoma	7,520	7,440	1.860	1.821	1.806	1.822	-0.055	-0.142	0.033	-2.9%
Colorectal/Small Intestine Cancer	6,862	6,954	1.439	1.435	1.408	1.442	-0.039	-0.092	0.015	-2.7%
Multiple Myeloma	6,371	6,426	1.527	1.445	1.446	1.442	-0.078	-0.134	-0.021	-5.1%
Non-Reconciliation Eligible Cancers	5,762	7,237	1.503	1.462	1.435	1.426	-0.033	-0.099	0.034	-2.2%
High-Intensity Prostate Cancer	3,802	3,833	1.367	1.427	1.415	1.439	0.036	-0.024	0.096	2.6%
Chronic Leukemia	2,715	2,598	1.439	1.488	1.489	1.465	0.073	-0.013	0.159	5.1%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Intensity (Number of Visits or Stays) measures are conditional on observing any use of measure and less than the 99.9 percentile.

Exhibit B-24: Reduction in Number of ICU Admissions Driven by Lymphoma

Subgroup	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Cancer Type										
Low-Risk Breast Cancer	8,504	7,701	1.157	1.179	1.164	1.169	0.017	-0.010	0.043	1.4%
High-Risk Breast Cancer	12,197	10,572	1.228	1.222	1.216	1.209	0.001	-0.026	0.027	0.0%
Low-Intensity Prostate Cancer	7,025	8,663	1.204	1.214	1.188	1.201	-0.003	-0.032	0.026	-0.2%
Lung Cancer	26,164	23,646	1.277	1.280	1.257	1.274	-0.013	-0.034	0.008	-1.0%
Lymphoma	9,921	9,305	1.346	1.321	1.283	1.307	-0.049	-0.086	-0.012	-3.7%
Colorectal/Small Intestine Cancer	10,347	9,645	1.206	1.235	1.185	1.215	-0.000	-0.027	0.027	-0.0%
Multiple Myeloma	10,097	9,634	1.263	1.246	1.267	1.271	-0.020	-0.053	0.012	-1.6%
Non-Reconciliation Eligible Cancers	8,617	10,596	1.243	1.246	1.242	1.250	-0.006	-0.040	0.029	-0.4%
High-Intensity Prostate Cancer	5,912	5,765	1.228	1.232	1.218	1.224	-0.002	-0.037	0.033	-0.2%
Chronic Leukemia	4,370	4,042	1.262	1.296	1.298	1.284	0.049	-0.005	0.104	3.9%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Intensity (Number of Visits or Stays) measures are conditional on observing any use of measure and less than the 99.9 percentile.

B.2.2 Impact on Use of Post-Acute Care

Exhibit B-25: Impact on Post-Acute Care Services

Measure	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Any Home Health Service	1,502,665	1,662,849	15.9%	14.8%	14.4%	13.8%	-0.73pp	-1.2pp	-0.3pp	-4.6%
Number of 60-day Home Health Spells	225,710	231,616	1.868	1.990	1.853	1.983	-0.008	-0.033	0.017	-0.4%
Low-risk cancer episodes	35,248	38,975	1.886	1.943	1.840	1.953	-0.056	-0.101	-0.011	-3.0%
High-risk cancer episodes	190,462	192,641	1.864	2.000	1.854	1.988	0.002	-0.023	0.027	0.1%
Any skilled nursing facility (SNF) stay	1,502,665	1,662,849	5.1%	4.2%	4.9%	4.1%	-0.0pp	-0.2pp	0.2pp	-0.6%
Low-Risk Cancer Episodes	491,690	571,501	2.6%	2.1%	2.6%	2.1%	0.1pp	0.0pp	0.2pp	3.4%
High-Risk Cancer Episodes	1,010,975	1,091,348	6.5%	5.2%	6.2%	5.0%	-0.1pp	-0.3pp	0.1pp	-1.4%
Number of SNF Stays	66,285	71,139	1.292	1.272	1.289	1.275	-0.005	-0.018	0.008	-0.4%
Low-risk cancer episodes	10,823	13,059	1.264	1.241	1.254	1.234	-0.003	-0.029	0.023	-0.2%
High-risk cancer episodes	55,510	58,120	1.301	1.284	1.301	1.286	-0.002	-0.017	0.013	-0.2%
Number of SNF Days	65,900	70,681	27.838	26.016	26.946	25.585	-0.461	-0.966	0.044	-1.7%
Low-risk cancer episodes	10,719	12,929	30.113	27.448	28.831	27.252	-1.085	-2.296	0.125	-3.6%
High-risk cancer episodes	55,181	57,752	27.355	25.708	26.570	25.231	-0.308	-0.839	0.223	-1.1%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Intensity (Number of Visits or Stays) measures are conditional on observing any use of measure and less than the 99.9 percentile.

B.2.3 Impact on Use of In-Episode Hospice

We measured the likelihood of in-episode hospice use, which captures the fraction of episodes in which hospice services were used among all episodes and was not limited to episodes where the patient is near death. Findings for hospice use at end-of-life are presented in Section 3.3 in the main report.

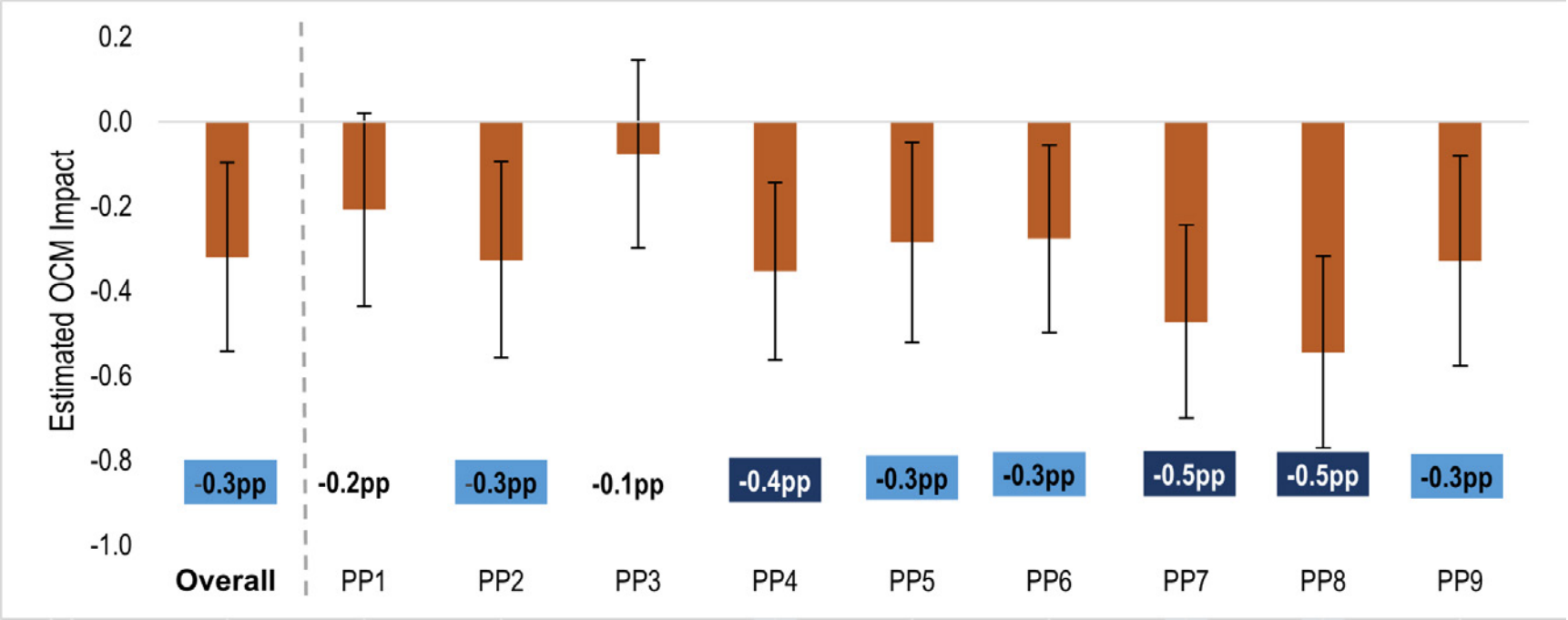
OCM led to a 0.32 percentage point decrease in the likelihood of receiving hospice care relative to comparison episodes (p=0.02, Exhibit B-25). With the exception of PP1 and PP3, this finding was consistently significant across all performance periods (Exhibit B-26).

Exhibit B-26: Impact on Use of In-Episode Hospice

Measure	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Any Hospice Service	1,502,665	1,662,849	8.3%	7.5%	7.7%	7.2%	-0.32pp	-0.5pp	-0.1pp	-3.8%
Number of Days Spent in Hospice Care	115,196	120,546	27.404	27.553	27.316	27.319	0.146	-0.522	0.813	0.5%
Low-risk cancer episodes	7,268	8,231	38.661	38.002	36.550	38.625	-2.734	-5.544	0.076	-7.1%
High-risk cancer episodes	107,920	112,314	26.638	26.794	26.698	26.514	0.340	-0.337	1.017	1.3%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Intensity (Number of Visits or Stays) measures are conditional on observing any use of measure and less than the 99.9 percentile.

Exhibit B-27: OCM Led to a Significant Reduction in the Occurrence of Hospice Services in Most PPs



Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: PP=Performance Period, pp=percentage point.

B.2.4 Impact on Use of Imaging Services, Outpatient Rehabilitation Therapy, and E&M services

Exhibit B-28: Impact of OCM varied for Imaging Services, Outpatient Rehabilitation Therapy, and E&M services

Measure	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Number of Standard and Other Imaging Services	1,103,743	1,212,758	5.876	5.220	5.775	5.206	-0.087	-0.139	-0.036	-1.5%
Low-risk cancer episodes	357,729	404,548	5.059	4.526	4.930	4.445	-0.048	-0.113	0.017	-0.9%
High-risk cancer episodes	745,992	808,230	6.272	5.561	6.180	5.580	-0.111	-0.170	-0.052	-1.8%
Number of Advanced Imaging Services	983,499	1,085,008	5.378	5.465	5.343	5.462	-0.031	-0.104	0.041	-0.6%
Low-risk cancer episodes	186,786	220,953	3.658	3.666	3.623	3.638	-0.007	-0.067	0.054	-0.2%
High-risk cancer episodes	796,771	864,105	5.796	5.905	5.773	5.915	-0.034	-0.113	0.045	-0.6%
Any Outpatient Rehabilitation Therapy Services	1,502,665	1,662,849	8.2%	8.8%	8.8%	9.6%	-0.17pp	-0.5pp	0.2pp	-2.0%
Low-Risk Cancer Episodes	491,690	571,501	8.5%	9.0%	8.7%	9.4%	-0.2pp	-0.5pp	0.1pp	-2.2%
High-Risk Cancer Episodes	1,010,975	1,091,348	8.5%	8.8%	8.8%	9.4%	-0.2pp	-0.5pp	0.1pp	-2.5%
Number of Outpatient Rehabilitation Therapy Services	129,671	156,279	19.935	18.619	19.285	17.915	0.054	-0.417	0.525	0.3%
Low-risk cancer episodes	43,346	53,256	23.507	21.577	21.774	21.158	-1.314	-2.101	-0.527	-5.6%
High-risk cancer episodes	86,324	103,025	18.049	17.122	17.973	16.298	0.748	0.187	1.309	4.1%
Number of EM Services	1,500,934	1,661,497	21.053	18.639	20.101	17.991	-0.305	-0.894	0.285	-1.4%
Low-risk cancer episodes	491,174	570,987	13.392	12.038	13.084	11.783	-0.052	-0.358	0.253	-0.4%
High-risk cancer episodes	1,009,801	1,090,472	24.838	21.959	23.666	21.187	-0.400	-1.173	0.373	-1.6%
Number of Cancer-Related EM Services	1,501,043	1,661,581	5.319	4.993	5.049	4.724	-0.001	-0.112	0.110	-0.0%
Low-risk cancer episodes	491,263	571,070	2.148	2.082	2.075	2.018	-0.009	-0.038	0.019	-0.4%
High-risk cancer episodes	1,009,834	1,090,543	6.875	6.450	6.576	6.128	0.023	-0.137	0.183	0.3%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Intensity (Number of Visits or Stays) measures are conditional on observing any use of measure and less than the 99.9 percentile.

Exhibit B-29: Relative Reductions in Number of Imaging Services driven by Lung Cancer and Colorectal Cancer

Subgroup	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Cancer Type										
Low-Risk Breast Cancer	276,996	283,154	5.248	4.699	5.144	4.655	-0.060	-0.137	0.017	-1.1%
High-Risk Breast Cancer	119,931	119,626	6.222	5.663	6.108	5.630	-0.082	-0.188	0.025	-1.3%
Low-Intensity Prostate Cancer	73,650	109,315	4.531	4.011	4.332	3.873	-0.060	-0.146	0.025	-1.3%
Lung Cancer	109,330	116,950	6.666	5.963	6.565	6.038	-0.175	-0.283	-0.068	-2.6%
Lymphoma	62,743	62,205	6.143	5.456	6.008	5.435	-0.114	-0.240	0.011	-1.9%
Colorectal/Small Intestine Cancer	53,136	56,502	5.456	4.913	5.345	4.948	-0.147	-0.265	-0.029	-2.7%
Multiple Myeloma	68,542	70,989	6.629	5.546	6.535	5.583	-0.131	-0.268	0.006	-2.0%
Non-Reconciliation Eligible Cancers	53,252	72,627	6.036	5.366	5.905	5.333	-0.099	-0.248	0.050	-1.6%
High-Intensity Prostate Cancer	39,472	46,288	5.348	4.520	5.279	4.490	-0.038	-0.185	0.109	-0.7%
Chronic Leukemia	34,430	35,273	5.705	5.103	5.812	5.010	0.199	0.045	0.353	3.5%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.

Source: Medicare claims 2014–2021.

Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. Pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Intensity (Number of Visits or Stays) measures are conditional on observing any use of measure and less than the 99.9 percentile.

Exhibit B-30: Relative Increase in the Number of Radiation Therapy Services for Lower-Risk Cancer Episodes

Measure	Number of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID	90% LCL	90% UCL	Percent Change
Any Radiation Therapy Services	1,502,665	1,662,849	13.5%	12.8%	13.7%	13.4%	0.11pp	-0.2pp	0.4pp	0.8%
Number of Radiation Therapy Services	194,563	223,966	33.416	33.108	35.409	34.504	0.597	-0.096	1.289	1.8%
Low-risk cancer episodes	35,702	48,005	39.595	39.883	43.797	42.600	1.485	0.218	2.753	3.8%
High-risk cancer episodes	158,861	175,957	32.164	31.578	33.150	32.276	0.289	-0.410	0.988	0.9%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. pp = percentage points. PP: Performance period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. Intensity (Number of Visits or Stays) measures are conditional on observing any use of measure and less than the 99.9 percentile.

B.2.5 Results of Sensitivity Analyses for Utilization Outcome Measures

We ran sensitivity tests on key utilization 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-32** summarizes the sensitivity tests that were conducted for each of the key occurrence outcome measures. Exhibit B-33 summarizes the sensitivity tests that were conducted for each of the key intensity/count outcome measures.

Exhibit B-31: Sensitivity Tests Conducted for Selected Occurrence Outcomes

		Outcome Measures (Occurrence)						
Type of Test	**Sensitivity Test**	**ED Visits not Resulting in an inpatient Stay**	**ED Visits/ Observation Stays not Resulting in an Inpatient Stay**	**Inpatient Stay**	**30-day Readmission**	**30-day Unplanned Readmission**	**ICU Admission**	**In-Episode Mortality**
Other Exclusions	Exclusion of episodes with inpatient or outpatient CAR-T cell therapy	X	X	X	X	X	X	X
Practice-Based Exclusions	Exclusion of the two largest OCM practices	X	X	X	X	X	X	X

Exhibit B-32: Sensitivity Tests Conducted for Selected Intensity/Count Outcomes

		Outcome Measures (Intensity/Count)						
Type of Test	**Sensitivity Test**	**ED Visits not Resulting in an Inpatient Stay**	**ED Visits Resulting in an Inpatient Stay**	**ED Visits**	**Inpatient Stay**	**30-day Readmission**	**30-day Unplanned Readmission**	**ICU Admission**
Other Exclusions	Exclusion of episodes with inpatient or outpatient CAR-T cell therapy	X	X	X	X	X	X	X
Practice-Based Exclusions	Exclusion of the two largest OCM practices	X	X	X	X	X	X	X
Model Specification	Zero-Inflated Negative Binomial	X	X	X	X	X	X	X

The impact estimates of utilization outcomes were consistent across the different sensitivity specifications, with three minor exceptions triggered by exclusion of the two largest OCM practices. **Exhibit B-33** displays all the cases where outcome measures were sensitive. We chose not to revise the main estimates as these 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-33: 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 the two largest OCM practices	# of ED visits	The impact estimate was no longer statistically significant.
	# of inpatient stays	The impact estimate was larger in absolute magnitude and was statistically significant.
	# of 30-day readmissions	The impact estimate was no longer statistically significant.

C. Clinical Analyses

C.1 Overview of Methods for Clinical Analyses

Details about variable definitions for each of the clinical analyses are described in this appendix section. Impact analyses used DID models, which included all adjustment variables as described previously, including covariates for COVID-19. We also estimated DID effects over time, for PP1–3, PP4–6, and PP7-9.

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). We focused the DID analyses on variables for which we did not find evidence for differential trends, with two exceptions, both related to prophylactic use of antiemetics. These were Prophylactic Use of NK1 Antagonists During High Emetic Risk Chemotherapy and Prophylactic Use of Guideline-Recommended Antiemetics. There were numerous changes over time in use of antiemetics that we believed were important to document. For these measures, we noted when we observed differential trends (e.g., if a 95 percent confidence interval of the OCM slope effect did not contain zero) and included a footnote in the results cautioning the reader about our inability to make definitive interpretations of OCM impact for these two measures. We also described raw rates by quarter for all measures.

For some outcomes, we could not conduct DID models due to limited or no use of a given treatment in the baseline period (e.g., for treatments that became available after the start of the model). For these (where baseline rates were less than 5 percent among all episodes), we estimated linear probability models fit to the intervention period (or to the period where a treatment was available) to examine differential trends in adoption between OCM and comparison practices. As with models examining differential baseline trends, these models included an indicator variable for OCM practices (an intercept) in addition to a linear interaction between quarter number and treatment group (a slope). We report the estimated differential trend (rate of adoption) in addition to an adjusted difference in the proportion of episodes using the treatment after these treatments became available. We adjusted these models for the same covariates as in the DID models.

C.2 Choice of Chemotherapy Treatment Regimens

C.2.1 Initial Chemotherapy Regimens for Breast Cancer

We studied the initial chemotherapy regimens for high-risk breast cancer to understand if OCM influenced choice of chemotherapy and whether OCM practices were deemphasizing certain high-cost regimens.

Methods

We selected episodes for high-risk breast cancer, identified all chemotherapy agents received within eight days after the episode trigger date, and considered these drugs to be the initial 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. (Dose-dense regimens may indicate differences in cancer or patient characteristics that we cannot otherwise observe in claims data, with attendant differences in costs and clinical outcomes, compared with regimens that are not dose-dense).[126] We assessed the initial treatment regimen for OCM and comparison episodes of high-risk breast cancer, during the baseline and intervention periods, and categorized chemotherapy regimens by common elements for breast cancer (Exhibit C-1, described in more detail below). Due to the many permutations of chemotherapy regimens, the analysis is descriptive, and we did not perform statistical testing. Additional information about the distribution of initial treatment regimens for high-risk breast cancer is shown in Exhibit C-2.

Results

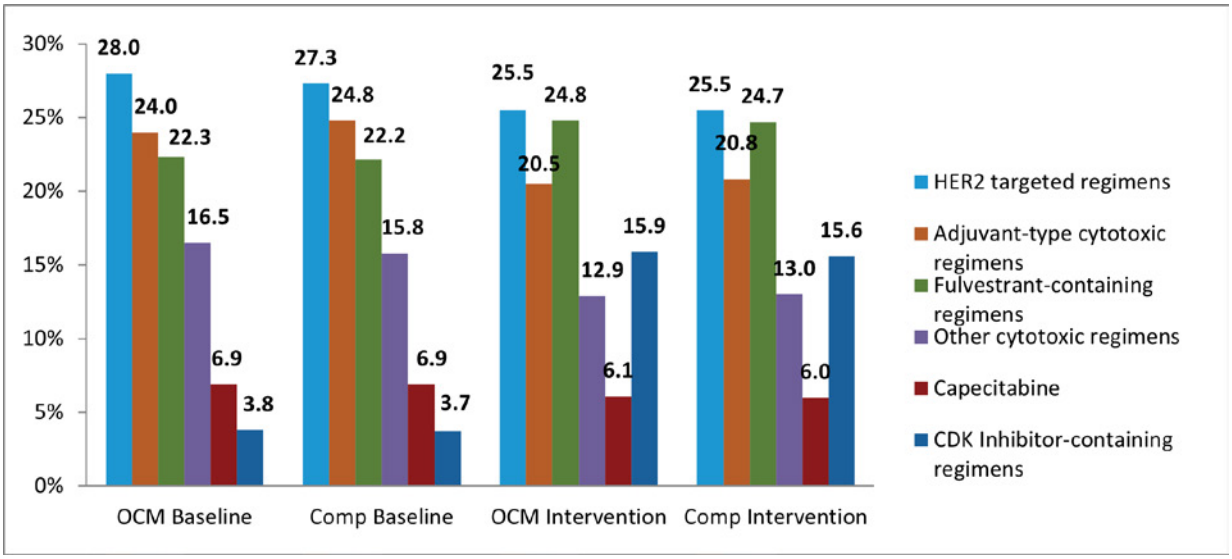
High-risk breast cancer includes two distinct groups of patients: those receiving adjuvant chemotherapy after breast cancer surgery and those receiving palliative chemotherapy for metastatic breast cancer.[127] Patterns of initial treatment regimens were nearly identical for OCM and comparison episodes during the baseline and intervention periods, as shown in **Exhibit C-1.** For example, similar proportions of OCM and comparison episodes included initial adjuvant-type cytotoxic regimens, human epidermal growth factor 2 (HER2)-targeted regimens, and fulvestrant-containing regimens. OCM does not appear to have slowed the adoption of new and expensive drugs, such as cyclin-dependent kinase (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.

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

[127] Episodes with regimens that include only tamoxifen or aromatase inhibitors are grouped for OCM as low-risk breast cancer episodes and are not included in this analysis of chemotherapy regimens for high-risk breast cancer episodes.

Although costs are substantially different for equally effective adjuvant chemotherapy regimens, suggesting opportunities to reduce episode spending, OCM did not lead to differential changes in initial chemotherapy regimen (see **Exhibit C-2**). Estimated monthly treatment costs of breast cancer treatment regimens are shown in Exhibit C-3.

Exhibit C-1: Similar Initial Treatment Regimens for Breast Cancer in OCM and Comparison Episodes



Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. Comp: Comparison group. Intervention: Intervention period. CDK: Cyclin-dependent kinase.

Exhibit C-2 shows the initial treatment regimens used in high-risk breast cancer episodes. Initial treatment regimens were similar in OCM and comparison episodes, both at baseline and during the intervention period. OCM did not lead to increased use of lower-cost initial treatment regimens or avoidance of high-cost regimens.

Exhibit C-2: Similar Changes in Breast Cancer Initial Treatment Regimens in OCM and Comparison Episodes with No Shift Toward Lower-Cost Regimens

Initial Treatment Regimen	OCM		COMP	
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean
Fulvestrant	21.2	20.2	21.1	20.4
Trastuzumab	15.2	11.3	14.9	11.4
Capecitabine	6.9	6.1	6.9	6.0
TC (docetaxel, cyclophosphamide)	6.5	5.5	6.9	5.9
Everolimus	3.6	1.3	3.8	1.4
Dose-dense AC (doxorubicin, cyclophosphamide)	3.3	3.5	3.5	3.6
Fulvestrant + palbociclib	0.4	3.5	0.5	3.3
Palbociclib	3.4	10.7	3.2	10.7
Paclitaxel every 7 days	3.2	2.7	3.3	2.5
Protein-bound Paclitaxel	3.3	1.9	2.6	1.7
Trastuzumab + Pertuzumab	2.6	4.8	2.6	4.6
Ado-Trastuzumab Emtansine	2.5	2.7	2.4	2.8
Eribulin	2.3	1.7	2.1	1.6
Non-dose-dense AC (doxorubicin, cyclophosphamide)	1.9	1.5	2.1	1.5
Other	23.7	22.6	24.1	22.6

Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention. Figures include all regimens identified ≥ 2% of all episodes in the baseline and/or intervention period.

[128] 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 C-3: Estimated Drug Prices for Breast Cancer Regimens per 28 Days

Regimen	Cost Estimate, April 2018	Cost Estimate, April 2021
Fulvestrant	$1,938	$902
Trastuzumab	$5,659	$5,246 ($3,814) [a]
Capecitabine	$450	$214
TC (docetaxel, cyclophosphamide)	$901	$557
Fulvestrant and palbociclib	$17,374	$13,893
Everolimus	$14,901	-
Dose-dense AC (doxorubicin, cyclophosphamide)	$962	$725
Palbociclib	$15,436	$12,991
Paclitaxel	$62	$109
Protein-bound paclitaxel	$5,002	$6,006
Trastuzumab-pertuzumab	$12,101	$12,540 ($11,107) [a]
Ado-trastuzumab emtansine	$10,184	$11,054
Eribulin	$6,410	$6,791
AC (doxorubicin, cyclophosphamide)	$641	$483

Notes: Estimated costs of Part B medications are based on payment limits from the April 2018 and April 2021 Medicare Part B Average Sales Price files (https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Part-B-Drugs/McrPartBDrugAvgSalesPrice). Estimated costs of palbociclib and everolimus in April 2018 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. Data on the cost of palbociclib in April 2021 were not available, and the estimate above is based on the 2020 Part D spending data from Dusetzina SB. Your money or your life—the high cost of cancer drugs under Medicare Part D. N Engl J Med. 2022 Jun 9;386(23):2164-2167. doi: 10.1056/NEJMp2202726. Data on the cost of everolimus in April 2021 were not available. Calculations are based on a patient with a weight of 70 kilograms and a body surface area of 1.8 square meters.

[a] The parenthetical values included in the April 2021 costs for trastuzumab and trastuzumab-pertuzumab use cost estimates for biosimilar formulations of trastuzumab (calculated based on trastuzumab-qyyp, the trastuzumab biosimilar with the median Average Sales Price).

C.2.2 Use of First- versus Second-Generation Tyrosine Kinase Inhibitors for Chronic Myeloid Leukemia

Guidelines recommend using first- or second-generation tyrosine kinase inhibitors (TKIs) as initial therapy for most patients with chronic myeloid leukemia (CML). The prices for second-generation TKIs (e.g., nilotinib, dasatinib, and bosutinib) are notably higher than for imatinib, a first-generation TKI.[129] Preferential use of first-generation TKIs is an opportunity for OCM practices to reduce Medicare spending.

Methods

We used DID analysis to assess the OCM impact on use of first- versus second-generation TKIs among all CML episodes that included TKI treatment. We repeated the analyses for patients with no prior TKI use observable in Medicare claims data since 2014 (which we considered to likely indicate newly diagnosed CML).

Results

As seen in **Exhibit C-4**, OCM led to reduced use of the less costly first-generation imatinib versus nilotinib/dasatinib/bosutinib (more costly second-generation TKIs), relative to comparison episodes. Similar relative reductions were present after restricting to episodes for newly diagnosed CML, but this reduction was not statistically significant, likely due to smaller sample sizes.

[129] Dusetzina SB, Muluneh B, Keating NL, Huskamp HA. Broken promises—How Medicare Part D has failed to deliver savings to older adults. N Engl J Med. 2020; 383:2299-2301.

Exhibit C-4: OCM Associated with Less Use of Imatinib versus Nilotinib/Dasatinib/Bosutinib

TKI Use	# of Episodes		OCM		COMP		Impact Estimates			
	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	18,689	20,093	56.1%	50.8%	55.1%	52.4%	-2.5pp	-5.0pp	-0.1pp	-4.5%
Use of imatinib vs. nilotinib/dasatanib/ bosutinib among episodes for patients with no prior TKI use	4,121	4,586	57.0%	52.8%	56.9%	55.2%	-2.5pp	-6.3pp	1.2pp	-4.4%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. PP: Percentage points.

In sensitivity analyses that excluded the two largest OCM practices, there was no longer a statistically significant OCM impact on use of imatinib for all patients (DID = -1.7 percent, p = 0.27); results were similar (no statistically significant impacts) among episodes for patients with no prior TKI use.

C.2.3 Use of Osimertinib versus Erlotinib

We assessed use of osimertinib (a third-generation epidermal growth factor receptor (EGFR) TKI) versus erlotinib, a first-generation product. Osimertinib was first approved by the U.S. Food and Drug Administration (FDA) in November 2015. In January 2018, a clinical trial demonstrated that osimertinib showed efficacy superior to that of standard EGFR-TKIs, such as erlotinib, in the first-line treatment of EGFR mutation–positive advanced non-small cell lung cancer, with a similar safety profile and lower rates of serious adverse events.[130] In January 2020, follow-up data from that trial showed superior overall survival for osimertinib.[131] Erlotinib became available as a generic product in 2019. We assessed whether OCM financial incentives had an unintended consequence of reducing use of osimertinib in favor of the less costly but inferior generic erlotinib treatment.

Methods

Because there was minimal use of osimertinib in the baseline period, we examined adoption of osimertinib in the intervention period only, among lung cancer episodes treated with either osimertinib or erlotinib. We assessed adjusted trends in the rate of adoption and adjusted difference in the proportion of episodes with osimertinib use for OCM versus comparison episodes during the OCM intervention period, adjusted for episode covariates.

Results

There was a greater rate of adoption of osimertinib in OCM versus comparison episodes (Exhibit C-7) (0.4 percentage points greater for OCM versus comparison episodes (90% CI 0.2%, 0.7%)). Averaging over the intervention period (PP1-9), the adjusted proportion using osimertinib versus erlotinib did not differ for OCM and comparison episodes (**Exhibit C-7**). Results were similar in sensitivity analyses excluding the two largest OCM practices, for which no similarly sized comparison practices were available.

[130] Soria JC, Ohe Y, Vansteenkiste J, et al. Osimertinib in untreated EGFR-mutated advanced non-small-cell lung cancer. N Engl J Med. 2018 Jan 11;378(2):113-125.
[131] Ramalingam SS, Vansteenkiste J, Planchard D, et al. Overall survival with osimertinib in untreated, EGFR-mutated advanced NSCLC. N Engl J Med. 2020 Jan 2;382(1):41-50.

Exhibit C-5: Faster Adjusted Rate of Adoption for Osimertinib versus Erlotinib in OCM versus Comparison Episodes, with Similar Adjusted Levels of Use

Use of Osimertinib vs. Erlotinib	# of Episodes		Intervention Mean		Percentage Point Difference in Use	90% LCL	90% UCL	Rate of Adoption	90% LCL	90% UCL
	OCM	COMP	OCM	COMP						
Use of osimertinib vs. erlotinib	5,971	7,735	56.2%	55.7%	0.5%	-1.9%	2.9%	0.4pp	0.2pp	0.7pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. LCL: Lower confidence limit. UCL: Upper confidence limit. PP: Percentage points.

C.3 Novel Therapy Adoption and Immunotherapy Use

C.3.1 Novel Therapy Adoption

Exhibit C-6: OCM Had No Effect on Use of Novel Therapies in the Higher-Risk Cancer Subgroup

Outcome	OCM		COMP		Impact Estimates	
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	Percent Change
Occurrence of novel therapy use	16.1%	19.0%	15.8%	18.5%	-0.1pp	-0.9%
Occurrence of novel Part B therapy use	7.5%	12.5%	7.1%	12.0%	-0.1pp	-1.9%
Occurrence of novel Part D therapy use	9.2%	7.3%	9.2%	7.4%	-0.2pp	-2.3%
Total Part B chemotherapy count	11.7	13.40	11.56	13.4	-0.13	-1.1%
Total Part D 30-day novel chemotherapy equivalents	3.91	4.03	3.92	4.00	0.05	1.3%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: Analyses included only higher-risk episodes. OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. DID: Difference-in-differences. PP: Percentage points.

Exhibit C-7: OCM Increased the Use of Novel Therapies in Lung Cancer Episodes

Subgroup	OCM		COMP		Impact Estimates	
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	Percent Change
Occurrence of Episodes with Part B Novel Therapy Use						
Lung cancer	11.8%	54.2%	12.5%	52.1%	2.49pp	21.1%
Lymphoma	2.5%	6.9%	2.5%	6.6%	0.37pp	15.2%
Colorectal/small intestine cancer	37.1%	3.5%	35.5%	3.5%	-0.94pp	-2.6%
Multiple myeloma	15.3%	38.3%	14.5%	38.4%	-0.16pp	10.2%
Total Part B Novel Chemotherapy Count						
Lung cancer	6.56	7.59	6.36	7.71	-0.32	-4.9%
lymphoma	12.07	6.38	12.22	6.38	0.14	1.2%
Colorectal/small intestine cancer	6.04	6.04	6.77	6.02	0.01	0.1%
Multiple myeloma	20.86	12.39	20.57	12.86	-0.76	-3.7%
Occurrence of Episodes with Part D Novel Therapy Use						
High-risk breast cancer	9.3%	12.0%	9.6%	12.1%	0.4pp	4.2%
Lung cancer	12.9%	5.2%	14.4%	6.5%	0.3pp	2.0%
Lymphoma	8.8%	5.7%	8.8%	6.5%	0.4pp	4.6%
Multiple myeloma	4.6%	38.5%	4.6%	40.3%	-0.3pp	0.7%

Subgroup	OCM		COMP		Impact Estimates	
	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	Percent Change
Chronic leukemia	2.2%	10.2%	2.3%	9.5%	1.6pp	7.3%
Total Part D 30-Day Novel Chemotherapy Equivalents						
High-risk breast cancer	3.26	3.74	3.26	3.26	-0.05	-1.5%
Lung cancer	4.21	4.58	4.58	4.25	0.11	2.5%
Lymphoma	4.10	4.02	4.02	4.14	0.18	4.3%
Multiple myeloma	4.00	4.57	4.57	4.00	0.10	2.4%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. PP: Performance period. DID: Difference-in-differences. pp: Percentage point. As described in Appendix Section B.1.3 for the total Part B novel chemotherapy count and total Part D 30-day novel chemotherapy equivalents, the sample is restricted to observations with at least one occurrence.

C.3.2 Access to High-Cost Immunotherapy

Immunotherapy is relatively new and costly, and we evaluated whether OCM could be impeding adoption of this new treatment. We focused on lung cancer treatment episodes and 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).

As described in the main report, OCM led to a relative increase in the use of immunotherapy for lung cancer. In sensitivity analyses excluding the two largest OCM practices, for which there were no similarly sized comparison practices, this difference was smaller and no longer statistically significant (DID = 2.0 percentage points, 90% CI -0.2, 4.2).

C.3.3 Use of Dual Immunotherapy Regimens

Most patients who receive treatment with immunotherapy are treated with a single immunotherapy drug, sometimes in combination with one or more anticancer therapies. However, there are also two multi-drug immunotherapy regimens (ipilimumab plus nivolumab and relatlimab plus nivolumab) that are approved by the FDA for distinct treatment indications. In all cases where dual immunotherapy regimens are approved, single-agent immunotherapy regimens are also available. Evidence to compare the outcomes of treatment with single-agent versus dual immunotherapy regimens is limited, though available data suggest that dual immunotherapy regimens have greater toxicity, and greater efficacy in certain clinical situations.[132] In the setting of considerable uncertainty about comparative risks and benefits, clinicians must choose between recommending the more costly dual immunotherapy regimens versus less costly and less toxic single-agent immunotherapy regimens.

Methods

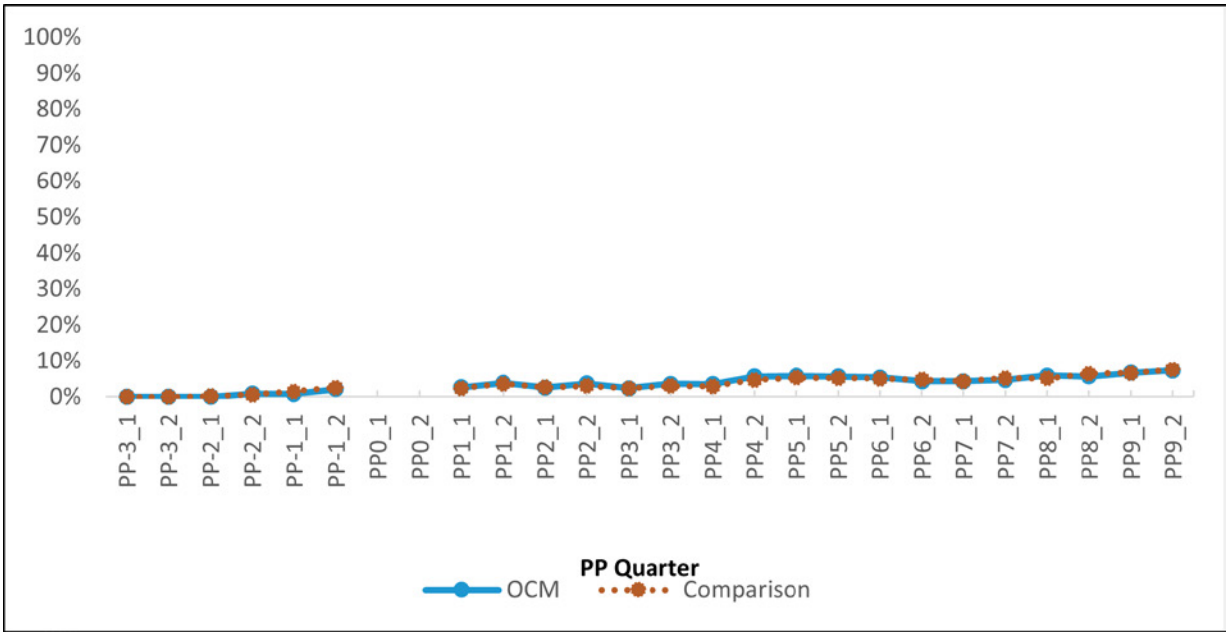
We explored whether OCM and comparison episodes differed in their use of dual immunotherapy regimens (ipilimumab plus nivolumab or relatlimab plus nivolumab). We focused on episodes for colorectal cancer, liver cancer, melanoma, lung cancer, and kidney cancer—the reconciliation-eligible cancer types for which these regimens have been approved. Among all patients with these cancer types and with any immunotherapy use, we calculated the proportion of episodes with any use of ipilimumab plus nivolumab or any use of relatlimab plus nivolumab. We plotted unadjusted proportional use of dual immunotherapy to explore whether use was sufficient to evaluate with adjusted models.

Results

As shown in Exhibit C-8, there was very little use of dual immunotherapy in OCM or comparison episodes. Therefore, we did not conduct multivariable analyses.

[132] Larkin J, Chiarion-Sileni V, Gonzalez R, et al. Combined nivolumab and ipilimumab or monotherapy in untreated melanoma. N Engl J Med. 2015 Jul 2;373(1):23-34. doi: 10.1056/NEJMoa1504030. Epub 2015 May 31. Erratum in: N Engl J Med. 2018 Nov 29;379(22):2185.

Exhibit C-8: Use of Dual Immunotherapy (Ipilimumab + Nivolumab or Relatlimab + Nivolumab) for OCM and Comparison Episodes by Quarter, Unadjusted



Source: Medicare claims 2014–2021.

C.4 Use of Biosimilar versus Originator Anticancer Therapies (Trastuzumab, Bevacizumab, Rituximab)

Three biosimilar infused anticancer therapies became available in recent years: rituximab, trastuzumab, and bevacizumab. Biosimilar therapies are less costly than the originator product and offer an opportunity for savings without altering the choice of agent. For two of these three drugs, a subcutaneous formulation was introduced shortly before the biosimilar product became available.

C.4.1 Rituximab for Lymphoma

Rituximab is an infused therapy used to treat lymphoma. It was initially approved by the FDA in November 1997, and expanded indications were approved in 2011 and 2021. It is infused weekly, or every 3-8 weeks, depending on indication. In June 2017, a subcutaneous form of rituximab called Rituxan Hycela (rituximab with hyaluronidase) was approved. Subcutaneous rituximab is injected by clinical staff in the office, and patients are observed for 15 minutes. For patients receiving rituximab only and no other infusions, use of subcutaneous rituximab could more quickly free up a chair in the infusion center for another patient and enable the clinic to treat more patients. The first infused rituximab biosimilar was approved in 2019. There is no biosimilar for the subcutaneous product.

We examined the adjusted rate of adoption and differences in the proportion of episodes in which the following treatments were used: (1) subcutaneous rituximab among episodes with any form of rituximab, and (2) biosimilar rituximab among episodes with originator or biosimilar infused rituximab (i.e., omitting subcutaneous rituximab; results were similar examining biosimilar rituximab among episodes with any form of rituximab). As described in the main text of this report and shown in Exhibit C-9, there was a modestly faster rate of adoption of subcutaneous rituximab in OCM versus comparison episodes, with similar levels of use. As described in the main section of this report, there was a modestly faster rate of adoption of biosimilar rituximab for OCM versus comparison episodes and greater adjusted proportions of episodes using biosimilar rituximab. Results were similar in sensitivity analyses excluding the two largest OCM practices, for which no similarly sized comparison practices were available. Results for biosimilar rituximab were also similar when we excluded subcutaneous rituximab from the denominator.

Exhibit C-9: Faster Adjusted Rate of Adoption of Subcutaneous Rituximab for OCM versus Comparison Lymphoma Episodes, with Similar Levels of Use

Outcome	# of Episodes		Intervention Mean		Percentage Point Difference in Use	90% LCL	90% UCL	Rate of Adoption	90% LCL	90% UCL
	OCM	COMP	OCM	COMP						
Subcutaneous rituximab	19,290	18,085	4.9%	4.6%	0.3%	-0.9%	1.5%	0.5pp	0.2pp	0.7pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. LCL: Lower confidence limit. UCL: Upper confidence limit. PP: Percentage points.

C.4.2 Trastuzumab for HER2 Positive Breast Cancer

Trastuzumab is an infused therapy, initially approved by the FDA in 2012, used to treat HER2 positive breast cancer. It is typically given every three weeks for a year to patients receiving adjuvant chemotherapy for early-stage breast cancer, or until disease progression to patients with metastatic breast cancer. In June 2019, a subcutaneous form of trastuzumab (Herceptin Hylecta, or trastuzumab with hyaluronidase) was approved. Like subcutaneous rituximab, the dose is given in the office, and patients are observed for 15 minutes. Biosimilar trastuzumab products were approved starting in 2017, but their availability was delayed due to lawsuits.

We examined the adjusted rate of adoption and differences in the adjusted proportions of episodes in which the following treatments were used: (1) subcutaneous trastuzumab among episodes with any form of trastuzumab, and (2) biosimilar trastuzumab among episodes with originator or biosimilar infused trastuzumab (i.e., omitting subcutaneous trastuzumab; results were similar examining biosimilar rituximab among episodes with any form of trastuzumab). As described in the main section of this report, we found no difference in adoption of subcutaneous trastuzumab for OCM versus comparison episodes; details are of this analysis are shown in **Exhibit C-10**. As presented in the main report, we observed faster rates of adoption and higher levels of use of biosimilar versus originator trastuzumab for OCM versus comparison episodes. Results were similar in sensitivity analyses excluding the two largest OCM practices, for which no similarly sized comparison practices were available. Results for biosimilar trastuzumab were also similar when we excluded subcutaneous rituximab from the denominator.

Exhibit C-10: No Difference in the Adjusted Rate of Adoption or Proportion of Episodes Using Subcutaneous Trastuzumab in OCM versus Comparison Breast Cancer Episodes

Adoption of Subcutaneous Trastuzumab and Biosimilar Trastuzumab	# of Episodes		Intervention Mean		Percentage Point Difference in Use	90% LCL	90% UCL	Rate of Adoption	90% LCL	90% UCL
	OCM	COMP	OCM	COMP						
Subcutaneous trastuzumab	12,009	11,306	0.9%	1.3%	-0.4%	-1.1%	0.3%	-0.1%	-0.2%	0.1%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. LCL: Lower confidence limit. UCL: Upper confidence limit.

C.4.3 Bevacizumab

Bevacizumab is an infused therapy approved for treatment of several cancers, including colorectal cancer (approved 2004), lung cancer (2006), breast cancer (2008; later revoked), brain cancer (2009), kidney cancer (2009), cervical cancer (2014), and ovarian cancer (2014). Biosimilar bevacizumab products were approved starting in 2017, but their availability was delayed due to lawsuits.

We focused on cancer episode types for which bevacizumab has active FDA approvals: colorectal, lung, ovarian, central nervous system (CNS) tumors, other female genitourinary, and kidney; Exhibit C-11 shows the proportion of episodes with any bevacizumab use by cancer type. We used multivariable models to assess the adjusted rate of adoption and differences in the adjusted proportions of episodes in which biosimilar bevacizumab was used in OCM versus comparison episodes.

Exhibit C-11: Episodes with Use of Bevacizumab

Cancer Type	Percent
Colorectal cancer	52.2%
Ovarian cancer	17.1%
Lung cancer	15.3%
CNS tumor	9.0%
Other female genitourinary	5.0%
Kidney cancer	1.5%

Source: Medicare claims 2014–2021.

C.5 Adoption of Generic Anticancer Therapies

We assessed differences in use of generic versus brand drugs available during the intervention period (imatinib for CML and gastrointestinal stromal tumors, abiraterone for high-intensity prostate cancer, and erlotinib for lung cancer). Generic drugs offer an opportunity for savings for Medicare and potentially for patients' out of pocket costs.[133]

Physicians can prescribe generic drugs directly, or if they prescribe the brand version in a state with automatic generic substitution laws, the pharmacist will substitute the generic drug (unless the prescribing physician explicitly specifies "no substitutions" or "dispense as written").

We assessed use of generic imatinib for episodes with any imatinib, focusing on episodes for chronic leukemia or non-reconciliation eligible cancers (to capture gastrointestinal stromal tumors) with any imatinib use. Similarly, we examined use of generic abiraterone for high-risk prostate cancer episodes with any abiraterone use. Finally, we assessed use of generic erlotinib for lung cancer episodes with any erlotinib. We used adjusted models to assess the adjusted rate of adoption and the difference in the adjusted proportion of episodes using these generic drugs after they were introduced; these analyses focus on the intervention period because these drugs were not available in the baseline period.

C.5.1 Adoption of Generic versus Brand Imatinib

As described in the main section of this report, we found no evidence that OCM was associated with a faster rate of adoption of generic imatinib; in fact, the rate of adoption of generics was 0.3 percentage points lower per quarter in OCM episodes than in comparison episodes (90 percent CI -0.5 percent, -0.03 percent; p=0.07) (**Exhibit C-12**). Averaging over the PP1–9 period, the adjusted average use of generics was 74.4 percent in OCM episodes and 73.9 percent in comparison episodes; a difference of 0.5 percentage points (90 percent CI-1.7, 2.8). Results were similar in sensitivity analyses excluding the two largest OCM practices, for which no similarly sized comparison practices were available.

Exhibit C-12: Slightly Slower Adjusted Rate of Adoption of Generic Imatinib in OCM versus Comparison Episodes with a Similar Proportion of Episodes Using Generic Imatinib

Generic Imatinib	# of Episodes		Intervention Mean		Percentage Point Difference in Use	90% LCL	90% UCL	Rate of Adoption	90% LCL	90% UCL
	OCM	COMP	OCM	COMP						
Generic imatinib (chronic leukemia, non-reconciliation-eligible)	10,825	12,233	74.4%	73.9%	0.5%	-1.7%	2.8%	-0.3pp	-0.5pp	0.0pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. LCL: Lower confidence limit. UCL: Upper confidence limit. PP: Percentage points.

[133] It can take years before sufficient competition develops in the generic market for prices of these high-priced oral drugs to decrease substantially. For example, generic imatinib was available in 2016, but it was not until 2019 that patients paid less for generic than for the brand imatinib (Gleevec). See Dusetzina SB, Muluneh B, Keating NL, Huskamp HA. Broken promises—How Medicare Part D has failed to deliver savings to older adults. N Engl J Med. 2020; 383:2299-2301.

C.5.2 Adoption of Generic versus Brand Abiraterone

OCM was not associated with a faster rate of adoption or a greater proportion of episodes using generic abiraterone (**Exhibit C-13**). The adjusted rate of adoption of generics was 0.02 percentage points higher per quarter in OCM relative to comparison episodes (90 percent CI -0.2 percent, 0.6 percent). Averaging over PP5–9 (after the generic's introduction), the adjusted average use of generic abiraterone was 60.6 percent in OCM episodes and 59.2 percent in comparison episodes; a difference of 1.4 percentage points (90 percent CI -1.3, 4.1). Results were similar in sensitivity analyses excluding the two largest OCM practices, for which no similarly sized comparison practices were available.

Exhibit C-13: No Difference in Adjusted Rate of Adoption and Adjusted Proportion of Episodes Using Generic Abiraterone in OCM versus Comparison Episodes, Performance Periods 5-9

Generic Abiraterone	# of Episodes		Intervention Mean		Difference in Use	90% LCL	90% UCL	Adjusted Rate of Adoption	90% LCL	90% UCL
	OCM	COMP	OCM	COMP						
Abiraterone (high-risk prostate cancer)	10,540	12,310	60.6%	59.2%	1.4pp	-1.3pp	4.1pp	0.2%	-0.2%	0.6%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. LCL: Lower confidence limit. UCL: Upper confidence limit. PP: Percentage points.

C.5.3 Adoption of Generic versus Brand Erlotinib

OCM was not associated with a faster rate of adoption or a greater proportion of episodes using generic erlotinib for OCM versus comparison episodes (**Exhibit C-14**). The adjusted rate of adoption of generic erlotinib was the same in OCM and comparison episodes (90 percent CI for difference in rate of adoption = -0.5 percent, 0.5 percent). Averaging over the period PP6–9, the adjusted average use of generic erlotinib was 6.6 percent in OCM episodes and 7.7 percent in comparison episodes; a difference of -1.1 percentage points (90 percent CI -3.0, 0.8). The overall average is low because there was relatively little erlotinib use in later quarters as osimertinib was increasingly used instead for treatment of lung cancer. Results were similar in sensitivity analyses excluding the two largest OCM practices, for which no similarly sized comparison practices were available.

Exhibit C-14: No Difference in Use of Generic Erlotinib in OCM versus Comparison Episodes

Generic Erlotinib	# of Episodes		Intervention Mean		Percentage Point Difference in Use	90% LCL	90% UCL	Rate of Adoption	90% LCL	90% UCL
	OCM	COMP	OCM	COMP						
Generic erlotinib	2,406	3,031	6.6%	7.7%	-1.1pp	-3.0pp	0.8pp	0.0%	-0.5%	0.5%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. LCL: Lower confidence limit. UCL: Upper confidence limit. PP: Percentage points.

C.6 Palliative Radiation Therapy for Bone Metastasis

Measures and Analytic Approach

As described in the main report, we assessed use of 10 or fewer radiation fractions, and use of a single fraction, for patients receiving radiation therapy for bone metastases, which would generally reflect higher-value care. We identified episodes for all patients (any cancer type) with an index claim for radiation therapy during an OCM-defined chemotherapy episode. The index radiation claim was defined as any radiation claim with no prior radiation claim in the preceding 30 days. Individual patients could have had more than one index radiation claim during an episode, or over multiple episodes if they had multiple sites of metastatic disease.

Among episodes with at least one index radiation claim, we next assessed if the radiation was for treatment of bone metastases.[134, 135] 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 (CPT codes: 99201–99215, 99241–99245, 99221–99239, 99291–99292, 99281–99285), and selected those with 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 dates with a radiation billing code (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).

We examined DID models assessing the impact of OCM on these two measures of radiation therapy for bone metastases. Medical oncologists who work in the same practice with radiation oncologists might be able to more successfully engage with their colleagues to reduce palliative radiation fractions; this engagement may be more difficult with external radiation oncologists who do not work in the same practice. We therefore assessed whether results differed for practices that do or do not employ radiation oncologists.

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 C-15**). Results were similar in sensitivity analyses excluding the two largest OCM practices, for which there were no similarly sized practices in the comparison group).

Exhibit C-15: 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			
	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	11950	14294	85.3%	89.1%	83.4%	88.0%	-0.7pp	-2.1pp	0.6pp	-0.9%
10 or fewer radiation fractions, for practices with a radiation oncologist	8249	7714	85.9%	89.4%	83.9%	87.3%	0.1pp	-1.7pp	1.9pp	0.1%
10 or fewer radiation fractions, for practices without a radiation oncologist	3701	6580	85.8%	89.5%	82.0%	87.6%	-1.8pp	-3.9pp	0.2pp	-2.1%
Single Radiation Fraction										
Single radiation fraction – all episodes	11950	14294	13.5%	13.0%	13.9%	12.7%	0.7pp	-1.1pp	2.5pp	5.4%
Single radiation fraction, for practices with a radiation oncologist	8249	7714	13.1%	13.9%	13.6%	13.1%	1.2pp	-1.1pp	3.6pp	9.3%
Single radiation fraction, for practices without a radiation oncologist	3701	6580	15.0%	11.1%	14.5%	11.9%	-1.4pp	-4.0pp	1.3pp	-9.1%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. DID: Difference-in-differences. LCL: Lower confidence limit. UCL: Upper confidence limit. PP: Percentage points.

[134] 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. 2016 Mar;21(3):320-326.
[135] Robinson TJ, Dinan MA, Li Y, Lee WR, Reed SD. Longitudinal trends in costs of palliative radiation for metastatic prostate cancer. J Palliat Med. 2015 Nov;18(11):933-939.

C.7 Timeliness of Post-Surgical Chemotherapy Initiation

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.[136,137] Nevertheless, the ASCO Quality Oncology Practice Initiative (QOPI) adopted measures of adjuvant chemotherapy within two months of surgery for stage III colon cancer patients (QOPI measure 68) and adjuvant chemotherapy within 60 days after surgery for stage II or IIIA non-small cell lung cancer (measure 81).[138] Although QOPI does not have a similar measure for breast cancer, prior research suggests that adverse outcomes are associated with chemotherapy delays of more than 60 days.[2]

For episodes for colorectal and high-risk breast cancer, we assessed chemotherapy initiation within 60 days after surgery. We assessed chemotherapy initiation after lung cancer surgery for AR03 but found evidence of differential baseline trends—indicating that trends over time for the OCM and comparison groups may have differed before the model began; we therefore did not pursue lung cancer analyses further.

Specifically, we examined the following two clinical scenarios:

- Chemotherapy following lumpectomy or mastectomy for high-risk breast cancer
- Chemotherapy following colon or rectum resection for colorectal cancer

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 chemotherapy episodes with surgeries in the 180 days before the episode start (denominator) and receipt of the first dose of chemotherapy within 60 days after surgery (numerator). We focused on adjuvant chemotherapy that occurred after surgery and did not examine episodes where chemotherapy began before surgery.

Some patients receive adjuvant (postoperative) radiation therapy in addition to adjuvant chemotherapy. Most patients who receive both chemotherapy and radiation in the postoperative setting receive chemotherapy first. Among individuals who had presumed 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 and <10 percent for breast cancer). Given the small number of episodes with radiation between episodes, and 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. We did not include episodes from the first quarter of the baseline and intervention periods in our analysis, to ensure that we were identifying patients with no chemotherapy in the prior 6 months.

Results

As noted in the main report, there was no cumulative OCM impact on the proportion of patients receiving timely chemotherapy following surgery for colorectal cancer or breast cancer through PP9, as shown in **Exhibit C-16**. Results were similar in sensitivity analyses excluding the two largest OCM practices, for which no similarly sized comparison practices were available.

Exhibit C-16: No Cumulative OCM Impact on Timeliness of Adjuvant Chemotherapy for Colorectal Cancer or Breast Cancer

	# of Episodes		OCM		COMP		Impact Estimates			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Impact	90% LCL	90% UCL	Percent Change
Colorectal cancer	15,682	16,195	60.1%	61.4%	60.9%	62.6%	-0.4%	-2.4%	1.5%	-0.7%
Breast cancer (high risk)	19,479	20,306	72.4%	71.6%	74.6%	72.7%	1.2%	-0.7%	3.1%	1.6%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. Int.: Intervention period. LCL: Lower confidence limit. UCL: Upper confidence limit. PP: Percentage points.

[136] 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.
[137] 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.
[138] ASCO QOPI 2021 Reporting. Accessed at t https://practice.asco.org/sites/default/files/drupalfiles/QOPI-2019-Round-1-Reporting-Tracks-Public-Posting.pdf on May 17, 2023.

C.8 Patient Adherence to Oral Medications

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

Measures and Analytic Approach

For high-intensity prostate cancer episodes, we focused on adherence to abiraterone or enzalutamide. 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 also assessed use of any of the TKIs (including imatinib, dasatinib, nilotinib, bosutinib, and ponatinib).

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 patient died before the end of the episode, or until evidence of a switch to a different drug for treating that patient's cancer. For high-intensity prostate cancer, we looked for a switch to enzalutamide or apalutamide (if on abiraterone); abiraterone or apalutamide (if on enzalutamide); or use of docetaxel, cabazitaxel, sipuleucel-T, or mitoxantrone, suggesting progression.

Results

As noted in the main report, DID analysis showed no impact of OCM on improved adherence among patients taking TKIs for CML or enzalutamide or abiraterone for prostate cancer (**Exhibit C-17**). Results were similar in sensitivity analyses excluding the two largest OCM practices, for which no similarly sized comparison practices were available).

Exhibit C-17: There was No Impact of OCM on Adherence (Proportion of Days Covered) to TKIs for CML or Enzalutamide or Abiraterone for Prostate Cancer

Adherence	# of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Percentage Point Impact	90% LCL	90% UCL	Percent Change
Abiraterone/ enzalutamide for prostate cancer	36,714	44,097	89.1%	85.4%	89.7%	85.5%	0.4pp	-0.3pp	1.1pp	0.4%
TKIs for CML	17,034	18,125	87.7%	85.8%	87.9%	86.7%	-0.7pp	-1.6pp	0.3pp	-0.8%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: COMP: comparison group. DID: difference-in-differences. Int.: intervention period. LCL: lower confidence limit. OCM: OCM intervention group. PP: performance period. UCL: upper confidence limit. TKI=tyrosine kinase inhibitor. CML=chronic myeloid leukemia. PP: Percentage points..

C.9 Use of Bone-Modifying Agents for Patients with Bone Metastases

We evaluated the impact of OCM on the use of bone-modifying agents to prevent fracture in patients with bone metastases from 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 agent during a six-month OCM episode. Second, we tested whether OCM affected the choice of Part B bone-modifying agent, among episodes with any bone-modifying agent.

Results

As noted in the main report, there were no relative differences in use of any bone-modifying agents for patients with bone metastases, but OCM led to relative reductions in the use of low-value bone-modifying agents during episodes for breast cancer, prostate cancer, or lung cancer with bone metastases. Results were similar in sensitivity analyses excluding the two largest OCM practices, for which no similarly sized comparison practices were available.

C.10 Use of Prophylactic Antiemetics during Intravenous Chemotherapy

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

Measures and Analytic Approach

We assigned an emetic risk (risk of vomiting) to each chemotherapy agent as outlined in the National Comprehensive Cancer Network (NCCN) antiemesis guideline. We identified OCM and comparison chemotherapy episodes, and the dates of chemotherapy infusion in each episode. We then assigned the emetic risk category to each episode, based on the chemotherapy agent with the highest emetic risk given during the episode. We selected episodes with use of high emetic risk chemotherapy and identified the first infusion date associated with high emetic risk.

We measured the use of clinic-administered antiemetic medications (oral and intravenous) in Part B claims and used Part D event records to identify pharmacy-dispensed antiemetic medications. 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 there was wide use of these low-cost agents. We classified antiemetic use as prophylactic (i.e., given with the first dose of a high emetic risk chemotherapy) if the antiemetic agent was administered or dispensed within 14 days before through one day after the first chemotherapy date during the episode.

We performed descriptive analyses to evaluate the components of prophylactic antiemetic treatment for each included episode. We then performed DID analyses to evaluate the impact of OCM on prophylactic use of palonosetron, NK1 antagonists, and guideline-recommended antiemetic regimens (drug combinations). We considered an antiemetic regimen to be consistent with guideline recommendations if it included either (1) an NK1 antagonist, with any serotonin antagonist; or (2) palonosetron, with olanzapine (without an NK1 antagonist).

Results for Overall OCM Impacts

As described in Section 5.2 in the main report, OCM led to a statistically significant reduction in the prophylactic use of palonosetron during episodes with high emetic risk chemotherapy. There was no apparent OCM impact on prophylactic use of NK1 antagonists during episodes with high emetic risk chemotherapy, although the OCM and comparison group trajectories differed before OCM began (non-parallel baseline trends), making it difficult to draw definitive conclusions. Likewise, there was no apparent OCM impact on use of guideline-recommended prophylactic antiemetic therapy during episodes with high emetic risk chemotherapy, although baseline trends were also non-parallel for this analysis. Results of these three analyses were similar in sensitivity analyses excluding the two largest OCM practices, for which no similarly sized comparison practices were available.

C.11 Growth Factor Use for High-, Intermediate, and Low-Risk Chemotherapy Regimens

We assessed guideline-recommended use of prophylactic white blood cell growth factors (granulyte colony-stimulating factors, GCSFs) for patients with colorectal, breast, or lung cancer, when chemotherapy regimens had varying risk of causing fever and neutropenia (high, intermediate, low). According to ASCO's 2012 Choosing Wisely campaign, 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 most cases such use reflects low-value care.

Measures and Analytic Approach

We identified new chemotherapy episodes for patients with breast cancer, colorectal cancer, or lung cancer. We restricted the analysis to patients who had not received chemotherapy in the previous 12 months, to focus on those who were candidates for prophylactic GCSFs (i.e., starting with the first chemotherapy infusion). 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 between the first and second treatment cycle. Patients receiving any form of white blood cell growth factor (i.e., filgrastim, pegfilgrastim, or related biosimilars) within eight days after the index date were classified as receiving prophylactic GCSF therapy. We categorized all chemotherapy regimens as high, intermediate, or low risk for causing fever and neutropenia, using NCCN guidelines; when a regimen was not specifically listed in the NCCN guidelines, we used other published sources to classify the regimen's fever and neutropenia risk.

Chemotherapy regimens for breast cancer, lung cancer, or colorectal cancer are presented in **Exhibits C-18 through C-20**, stratified by risk of neutropenia.

Exhibit C-18: Breast Cancer Regimens Classified by Neutropenia Risk

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

Exhibit C-19: Lung Cancer Regimens Classified by Neutropenia Risk

Intermediate-Risk Regimens	Low-Risk Regimens
Docetaxel monotherapy	All other regimens
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	

Note: 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 C-20: Colorectal Cancer Regimens Classified by Neutropenia Risk

Intermediate-Risk Regimens	Low-Risk Regimens
FOLFOX (5-FU + oxaliplatin)	All other regimens
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	

We performed DID analyses to assess the use of prophylactic GCSF therapy in OCM and comparison episodes, stratified by cancer type and chemotherapy regimen-associated risk for fever and neutropenia.

Results

As described in Section 5.3 in the main report, OCM led to reduced use of prophylactic GCSFs relative to the comparison group for breast cancer chemotherapy regimens that had intermediate risk of causing neutropenia. This was due to an increase in the comparison group, not a decrease in the OCM group. OCM also led to a small relative reduction for colorectal cancer chemotherapy regimens with low risk of causing neutropenia, but not for other subgroups of breast, lung, or colorectal cancer. The observed reductions in use of prophylactic GCSFs for two subgroups of episodes in two cancer types suggests more value-sensitive use of GCSFs.

We conducted sensitivity analyses omitting episodes from the two largest OCM practices, for which no similarly sized comparison practices were available. There were no substantial changes in the findings from the breast and colorectal cancer sensitivity analyses. In the lung cancer sensitivity analyses that omitted episodes from the two largest OCM practices, OCM led to a relative reduction in prophylactic GCSF use of 2.0 percentage points during low-risk lung cancer chemotherapy episodes (P=0.066).

C.12 Biosimilar versus Originator White Blood Cell Growth Factors and Use of On-Body Injector

C.12.1 Methods for Assessing Choice of White Blood Cell Growth Factors

Measures

We assessed the use of white blood cell growth factors (GCSFs) in OCM and comparison episodes. First, we evaluated the use of less costly 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, given 24 hours after the chemotherapy). Second, among patients receiving filgrastim, we evaluated use of biosimilar filgrastim versus the more costly originator filgrastim. Third, we assessed the use of biosimilar pegfilgrastim when it became available, versus the more costly originator pegfilgrastim. Fourth, among patients receiving pegfilgrastim, we assessed use of pegfilgrastim with the on-body injector. The on-body injector is a novel drug administration device that attaches to the body and automatically injects pegfilgrastim 24 hours after chemotherapy is delivered, avoiding the need for a patient to return to the clinic for this injection. The on-body injector is only available for originator pegfilgrastim.

Analyses focused on all cancer episodes with any use of filgrastim or pegfilgrastim. For each episode, we characterized GCSF use based on the first administration in the episode (Exhibit C-21). This table includes the filgrastim and pegfilgrastim products examined.

Exhibit C-21: White Blood Cell Growth Factor (GCSF) Drug Types

Drug Name	Code Description	Code
Filgrastim	Filgrastim 300 mcg injection	J1440
Filgrastim	Filgrastim 480 mcg injection	J1441
Filgrastim	Injection filgrastim excluding biosimilar	J1442
Filgrastim-aafi	Injection, filgrastim-aafi, biosimilar, (nivestym), 1 microgram	Q5110
Filgrastim-sndz	Injection filgrastim biosimilar	Q5101
Pegfilgrastim	Injection, pegfilgrastim 6mg	J2505
Pegfilgrastim	Pegfilgrastim, 1 mg	Q4053
Pegfilgrastim-cbqv	Injection, pegfilgrastim-cbqv, biosimilar, (udenyca), 0.5 mg	Q5111
Pegfilgrastim-jmdb	Injection, pegfilgrastim-jmdb, biosimilar, (fulphila), 0.5 mg	Q5108
Pegfilgrastim-apgf	Injection, pegfilgrastim-apgf, biosimilar, (Nyvepria), 0.5 mg	Q5122
Pegfilgrastim-bmez	Injection, pegfilgrastim-bmez, biosimilar, (ZIEXTENZO), 0.5 mg	Q5120
Pegfilgrastim-bmez	Injection, pegfilgrastim-bmez, biosimilar, (Ziextenzo) 0.5 mg	C9058

Notes: We did not include Tbo-filgrastim (J1446, J1447) in analyses. Tbo-filgrastim is a product similar to other biosimilar products that was approved before the FDA established the regulatory definition of a biosimilar agent.

Analytic Approach

We used DID analyses to assess use of filgrastim versus pegfilgrastim. Because the biosimilar GCSFs and on-body injector were not available during most or all of the baseline period, DID analyses were not possible. Therefore, for analyses of biosimilar filgrastim, biosimilar pegfilgrastim, and on-body pegfilgrastim, we evaluated the adjusted average proportion of episodes with use as well as the rate of adoption during the intervention period quarters when the treatments were available. Analyses of biosimilar pegfilgrastim excluded episodes using on-body pegfilgrastim, as that was only available for the originator product. However, since a clinician choosing pegfilgrastim has three options (originator pegfilgrastim, biosimilar pegfilgrastim, or on-body pegfilgrastim (originator only), we conducted sensitivity analyses where we also included on-body pegfilgrastim in the denominator. Results were similar and are not presented.

C.12.2 Use of Filgrastim versus More Costly Pegfilgrastim

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). We found some evidence that baseline trends were non-parallel (P for trend = 0.05). DID models showed a statistically significant OCM impact of 2.7 percentage points on use of filgrastim rather than pegfilgrastim. Results were similar in sensitivity analyses excluding the two largest OCM practices, for which no similarly sized comparison practices were available (**Exhibit C-22**).

Exhibit C-22: OCM Led to a Relative Increase in Use of Less Costly Filgrastim versus Pegfilgrastim

Filgrastim vs. Pegfilgrastim (originator + biosimilar) Breast, Lung, CRC	# of Episodes		OCM		COMP		Impact Estimates Through PP9			
	OCM	COMP	Baseline Mean	Int. Mean	Baseline Mean	Int. Mean	DID Percentage Point Impact	90% LCL	90% UCL	Percent Change
Filgrastim vs. pegfilgrastim	196,667	203,806	27.7%	28.0%	29.3%	26.8%	2.7pp	1.2pp	4.3pp	9.8%
Filgrastim vs. pegfilgrastim (dropping 2 largest practices)	158,400	175,623	25.7%	26.1%	27.9%	25.4%	2.9pp	1.5pp	4.2pp	11.2%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: CRC: colorectal. COMP: comparison group. DID: difference-in-differences. Int.: intervention period. LCL: lower confidence limit. OCM: OCM intervention group. PP: performance period. UCL: upper confidence limit. PP: Percentage points.

C.12.3 Use of Biosimilar Filgrastim

Biosimilar filgrastim products were approved in March 2015 (filgrastim-sndz) and July 2018 (filgrastim-aafi). With almost no use of biosimilar filgrastim in the baseline period, DID analyses were not possible. Instead, 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. As reported in Section 5.4 in the main report, OCM was associated with greater use of biosimilar filgrastim in the intervention period, although the rate of adoption of biosimilar filgrastim was similar. Results were similar in sensitivity analyses that excluded the two largest OCM practices, for which no similarly sized comparison practices were available.

C.12.4 Use of Biosimilar Pegfilgrastim

As reported in Section 5.4 and in **Exhibit C-23**, in adjusted analyses, OCM was associated with greater use of biosimilar pegfilgrastim in the intervention period, although the rate of adoption of biosimilar pegfilgrastim was similar. The size of the adjusted difference was even larger in sensitivity analyses that excluded the two largest OCM practices, for which no similarly sized comparison practices were available. These findings were not evident in unadjusted analyses (Exhibit C-24 and C-25) or when adjusting for only cancer episode type, where the point estimate for the difference in use was negative (-3.4 percent, 90% CI -8.9%, 2.2%). Further adjustment for other covariates, including state fixed effects, led to the positive adjusted differences. Results were similar in analyses that examined only differences in use and did not include a quarterly trend by OCM interaction (**Exhibit C-23**).

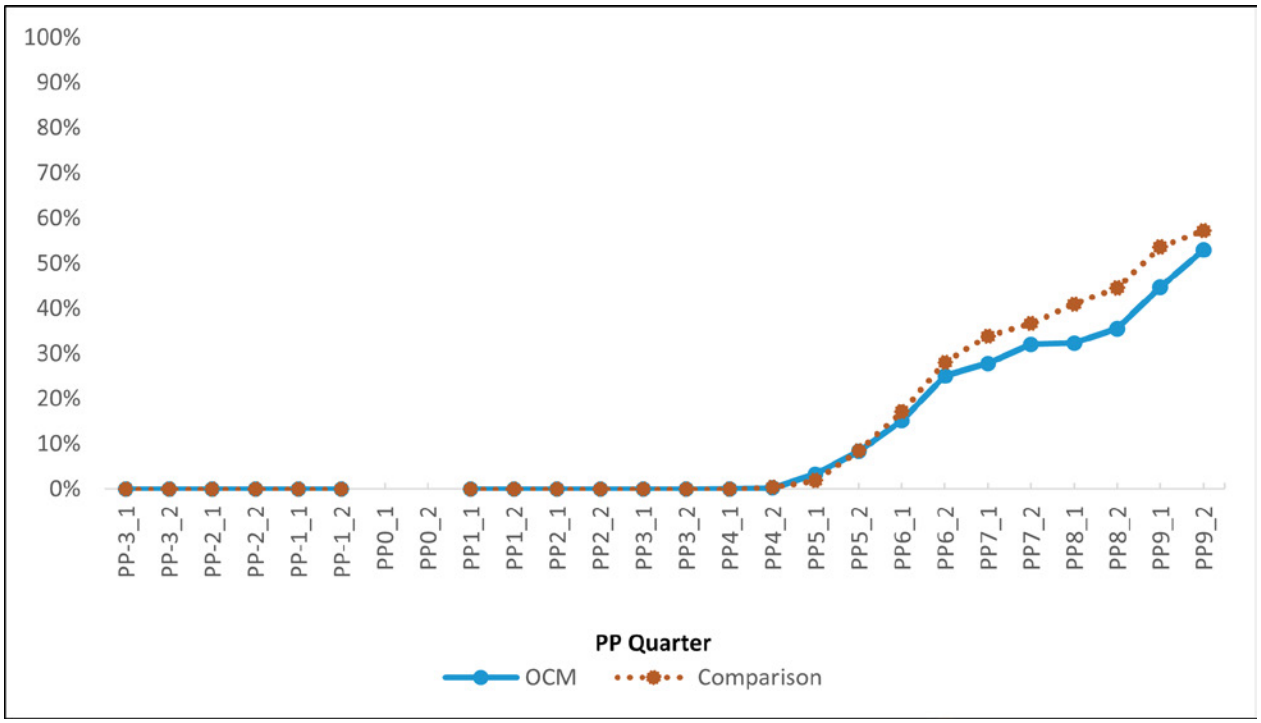
Exhibit C-23: Greater Use of Biosimilar Pegfilgrastim in OCM versus Comparison Episodes in Fully- Adjusted Models, a Finding That Was Sensitive to Including State Fixed Effects

Adoption of Biosimilar Pegfilgrastim	# of Episodes		Intervention Mean		Difference in Use	90% LCL	90% UCL	Rate of Adoption	90% LCL	90% UCL
	OCM	COMP	OCM	COMP						
All practices (fully adjusted)	41,257	42,315	24.9%	20.1%	4.8pp	0.3pp	9.3pp	-0.8%	-1.8%	0.2%
Dropping 2 largest practices (fully adjusted)	34,223	36,192	27.5%	19.6%	7.9pp	3.6pp	12.3pp	0.0%	-1.0%	0.9%
All practices, adjusted for only cancer type	41,257	42,315	20.7%	24.1%	-3.4pp	-8.9pp	2.2pp	-0.9%	-2.1%	0.3%
All practices, diff w/o quarterly OCM trend interaction, adj	41,257	42,315	24.8%	20.2%	4.6pp	0.1pp	9.1pp	n/a	-	-
All practices, diff w/o quarterly OCM trend interaction, adj for cancer type only	41,257	42,315	20.7%	24.1%	-3.4pp	-8.9pp	2.1pp	n/a	-	-

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014–2021.
Notes: OCM: OCM intervention group. COMP: Comparison group. LCL: Lower confidence limit. UCL: Upper confidence limit. PP: Percentage points.

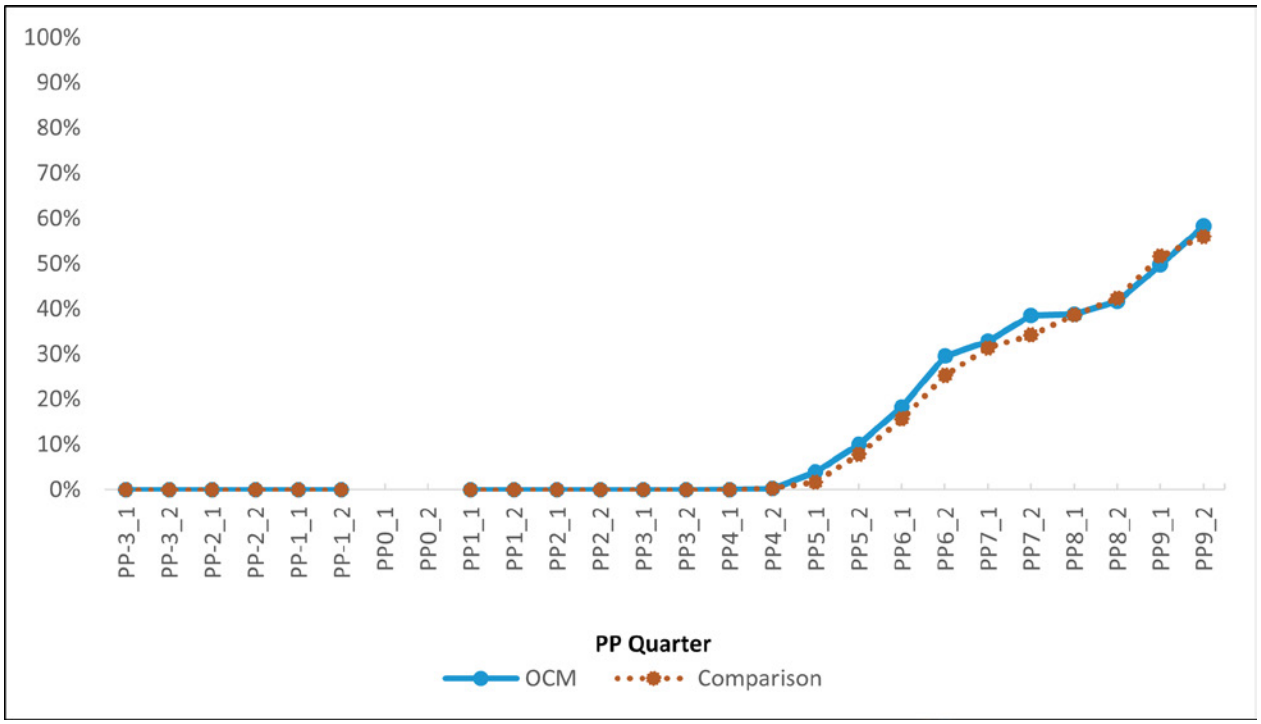
As noted above, unadjusted trends in use of biosimilar pegfilgrastim among patients receiving originator or biosimilar pegfilgrastim (excluding on-body pegfilgrastim) suggest less use in OCM than comparison episodes (**Exhibit C-24**); although after dropping the two largest OCM practices, unadjusted rates of biosimilar use appeared very similar (**Exhibit C-25**).

Exhibit C-24: Proportion of Episodes with Biosimilar Pegfilgrastim Use Among those with Biosimilar or Originator Pegfilgrastim, Unadjusted



Source: Medicare claims 2014–2021.

Exhibit C-25: Proportion of Episodes with Biosimilar Pegfilgrastim Use Among Those with Biosimilar or Originator Pegfilgrastim, Excluding the Two Largest Practices, Unadjusted



Source: Medicare claims 2014–2021.

C.12.5 Use of the Pegfilgrastim with the On-Body Injector

There were no differences in use of on-body pegfilgrastim during OCM versus comparison episodes overall, and this was true after excluding the two largest practices (**Exhibit C-26**). The adjusted average use of on-body pegfilgrastim over the intervention period was 27.1 percent in OCM episodes and 29.7 percent in comparison episodes (difference= -2.6 percentage points, 90 percent CI 6.2, 1.1).

Exhibit C-26: No Difference in Use or Adoption of On-Body Pegfilgrastim for OCM versus Comparison Episodes (Among Episodes with Any Pegfilgrastim)

Adoption of On-Body Pegfilgrastim	# of Episodes		Intervention Mean		Difference in Use	90% LCL	90% UCL	Rate of Adoption	90% LCL	90% UCL
	OCM	COMP	OCM	COMP						
All practices	41,257	42,315	27.1%	29.7%	-2.6%	-6.2%	1.1%	0.2%	-0.3%	0.7%
Excluding two largest practices	34,223	36,192	28.1%	29.5%	-1.4%	-4.8%	2.1%	0.1%	-0.4%	0.5%

Asterisks denote statistically significant impact estimates at p<0.01, p<0.05, and p<0.10.
Source: Medicare claims 2014–2021.
Notes: COMP: comparison group. DID: Difference-in-differences. Int.: Intervention period. LCL: Lower confidence limit. OCM: OCM intervention group. PP: Performance period. UCL: Upper confidence limit.

D. Patient Survey and OCM Quality Measure Findings

D.1 Composite Measures of Patient-Reported Care Experience

Exhibit D-1: No Meaningful Changes over Time in Adjusted Composite Measures of Quality of Care

	Composite Measures (scale 0–10), All OCM Respondents						
	Shared Decision Making	Access to Care	Affective Communication	Exchange of Information	Self-Management	Symptom Management	Overall Rating of Cancer Team
All Episodes							
N	168,593	172,240	170,818	169,592	168,569	85,201	164,146
Linear time trend	0.015	0.006	0.004	0.000	0.006	-0.013	0.001
Baseline period mean	7.46	8.88	9.02	8.50	5.92	7.32	9.28
Higher-risk Episodes							
N	117,731	120,667	119,765	119,237	118,471	72,627	114,996
Linear time trend	0.014	0.004	0.001	0.001	0.001	-0.012	0.000
Baseline period mean	7.42	9.01	9.04	8.62	6.48	7.52	9.26
Lower-risk Episodes							
N	50,862	51,573	51,053	50,355	50,098	12,574	49,150
Linear time trend	0.015	0.012	0.010	-0.001	0.018	-0.014	0.004
Baseline period mean	7.55	8.54	8.97	8.18	4.51	5.99	9.32

Shading indicates statistically significant estimates at $p<0.01$, $p<0.05$, and $p<0.10$, indicated by dark blue, medium blue, or light blue shading.

Source: OCM Patient and Caregiver Surveys, April 2016–December 2020.

Notes: The dates in the exhibit indicate the range of episode start dates included in each survey wave. OCM episodes lasted for 180 days, and patients typically received surveys roughly 6-9 months following the start of their episode. Estimates were weighted for sampling and nonresponse weights and adjusted for demographic characteristics, health status, cancer type and treatment duration, the calendar month when the episode was triggered, practice characteristics, and the incidence and prevalence of COVID-19 cases and deaths during each episode. Patients with a COVID-19 diagnosis during the episode were excluded from analysis. The baseline survey covered the time period April 2016 through September 2016.

D.2 Patient-Reported Onset and Management of Symptoms

D.2.1 Prevalence of Patient-Reported Symptoms (Not Bothered by Symptoms)

Exhibit D-2: Patient-Reported Symptoms Improved Slightly over Time for OCM Patients, Driven by Changes Among Higher-Risk Episodes

	Not Bothered by Symptoms, All OCM Respondents							
	Pain	Energy Level	Emotional Problems	Nausea	Breathing	Coughing	Constipation or Diarrhea	Neuropathy
All Episodes								
N	165,652	166,528	165,886	164,950	165,417	165,124	166,664	165,682
Linear time trend	0.1%	0.2%	0.1%	0.1%	0.1%	0.2%	0.2%	0.0%
Baseline period mean	45.4%	23.2%	50.1%	66.6%	71.5%	74.8%	38.7%	53.1%
Higher-Risk Episodes								
N	116,453	117,195	116,472	115,984	116,251	115,989	117,345	116,511
Linear time trend	0.1%	0.2%	0.1%	0.1%	0.2%	0.2%	0.2%	0.1%
Baseline period mean	40.0%	15.1%	46.1%	58.3%	65.3%	69.8%	27.4%	46.2%
Lower-Risk Episodes								
N	49,199	49,333	49,414	48,966	49,166	49,122	49,319	49,171
Linear time trend	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.1%	-0.1%
Baseline period mean	58.7%	43.4%	60.2%	87.9%	87.0%	87.2%	67.1%	69.9%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.

Source: OCM Patient and Caregiver Surveys, April 2016–December 2020.

Notes: The dates in the exhibit indicate the range of episode start dates included in each survey wave. OCM episodes lasted for 180 days, and patients typically received surveys roughly 6-9 months following the start of their episode. Estimates were weighted for sampling and nonresponse weights and adjusted for demographic characteristics, health status, cancer type and treatment duration, the calendar month when the episode was triggered, practice characteristics, and the incidence and prevalence of COVID-19 cases and deaths during each episode. Patients with a COVID-19 diagnosis during the episode were excluded from analysis. The baseline survey covered the time period April 2016 through September 2016.

D.2.2 Patient-Reported Management of Symptoms

Exhibit D-3: Small Decline in Patient Perceptions of Their Cancer Care Team's Management of Some Symptoms, All Patients

	Not Bothered by Symptoms, All OCM Respondents							
	Pain	Energy Level	Emotional Problems	Nausea	Breathing	Coughing	Constipation or Diarrhea	Neuropathy
All Episodes								
N	88,534	125,687	79,780	53,535	44,242	40,082	97,858	74,371
Linear time trend	-0.2%	0.0%	0.0%	0.0%	-0.2%	-0.3%	-0.2%	-0.1%
Baseline period mean	75.3%	52.7%	44.2%	81.0%	58.5%	48.3%	67.1%	49.0%
Higher-Risk Episodes								
N	69,521	97,666	61,831	47,945	38,497	34,217	82,341	59,790
Linear time trend	-0.3%	0.0%	0.0%	0.0%	-0.2%	-0.2%	-0.2%	-0.1%
Baseline period mean	79.0%	54.0%	44.7%	82.8%	60.1%	49.9%	70.8%	52.1%
Lower-Risk Episodes								
N	19,005	28,021	17,949	5,570	5,745	5,865	15,517	14,581
Linear time trend	0.0%	-0.1%	-0.1%	-0.1%	-0.5%	-0.8%	0.2%	-0.2%
Baseline period mean	60.2%	47.0%	42.0%	62.9%	45.2%	39.8%	45.8%	35.5%

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.

Source: OCM Patient and Caregiver Surveys, April 2016–December 2020.

Notes: The dates in the exhibit indicate the range of episode start dates included in each survey wave. OCM episodes lasted for 180 days, and patients typically received surveys roughly 6-9 months following the start of their episode. Estimates were weighted for sampling and nonresponse weights and adjusted for demographic characteristics, health status, cancer type and treatment duration, the calendar month when the episode was triggered, practice characteristics, and the incidence and prevalence of COVID-19 cases and deaths during each episode. Patients with a COVID-19 diagnosis during the episode were excluded from analysis. The baseline survey covered the time period April 2016 through September 2016.

Exhibit D-4: OCM Practices Reported Improvements in Pain Screening and Management and in Depression Screening and Follow-Up

Quality Measure	Average Performance Rate Across OCM Practices							
	PP2	PP3	PP4	PP5	PP6	PP7	PP8	PP9
All practices (n=190 reporting in any PP)								
Number of practices submitting practice-reported quality measures	n=183	n=182	n=179	n=173	n=172	n=125	n=118	n=114
Pain assessment and management	77.6	80.7	84.1	86.9	87.1	88.2	89.8	88.8
Depression screening and follow-up plan	57.7	64.0	64.9	71.1	70.9	73.5	75.0	77.9
Practices reporting in all PPs from PP2 through PP9 (n=104)								
Pain assessment and management	79.8	83.4	87.2	89.5	91.0	92.6	93.2	92.6
Depression screening and follow-up plan	57.8	65.3	68.5	73.5	77.0	77.5	78.2	81.5
Practices active in PP9 that did not report in all performance periods (n=30 practices reporting in any PP)								
Pain assessment and management	72.4	78.8	75.4	81.2	75.4	68.9	80.7	62.6
Depression screening and follow-up plan	55.5	60.8	56.8	62.2	61.6	57.1	68.5	53.8

Shading indicates statistically significant estimates at $p<0.01$, $p<0.05$, and $p<0.10$, indicated by dark blue, medium blue, or light blue shading.
Source: OCM quality measure data reported to CMS by participating practices.
Notes: The sample sizes do not always match across practice cohorts and performance periods due to practice terminations over time, and because not all practices submitted the practice-reported measures in all PPs. PP: performance period.

E. Supporting Analyses for Health Equity Impacts

This appendix contains additional detail on the analytic methods and findings related to the equity analyses presented in Chapter 7.

E.1 Analytic Methods for Equity Analyses

In this section, we present a detailed discussion on our approach to analyzing equity. The discussion is organized as follows: **Section E.1.1** identifies the definition of historically underserved populations included in this report; **Section E.1.2** identifies the outcome measures that we analyzed for the study; and Section E.1.3 presents a detailed discussion on the analytic methods.

E.1.1 Study Population

For this report, we studied three historically underserved populations, with two corresponding reference populations. **Exhibit E-1** presents the definition for each population, which was based on the Medicare beneficiary enrollment data.

Exhibit E-1: Study Population

Historically Underserved Population	Definition	Reference Population
Black	Research Triangle Institute (RTI) race code lists beneficiary as "Black or African American"	Non-Hispanic White
Hispanic	RTI race code lists beneficiary as "Hispanic"	Non-Hispanic White
Dual Medicare-Medicaid eligibility[a]	Enrollment data indicate Medicaid full-dual or partial-dual eligibility	Medicare-only; Patients

Notes: [a] Dual-eligibility is a proxy for low-income status. It is recognized as an independent social risk factor for value-based payment programs by the Department of Health and Human Services Office of the Assistant Secretary for Planning and Evaluation, per the following Report to Congress.

E.1.2 Outcome Measures for Equity Analyses

We focused on a subset of payment, utilization, and clinical outcomes measures selected for three reasons: (1) measures that had significant impacts in the main analyses, (2) measures with conceptual justification for potential differential impacts, and (3) measures with reasonably large sample sizes. We also included patient-reported care experience measures to incorporate patient perspectives. **Exhibit E-2** shows the outcome measures we examined. Exhibits A-4 to A-6, found in Appendix A, describe the payment and utilization outcome measures. Appendix C provides additional detail on the clinical outcome measures. Appendix Exhibit A-31 describes the patient-reported experience measures.

Exhibit E-2: List of Measures Included in the Equity Analyses

Domain	Outcome Measures
Inpatient utilization	30-day unplanned readmissions 30-day readmissions ACH intensive care unit (ICU) admissions
ED utilization	Total ED (Emergency Department) visits
Part B outpatient service utilization	60-day home health agency services Cancer-related E&M services Outpatient therapy services
Service use at end of life	Any chemotherapy in last 14 days of life Any hospitalization in last 30 days of life ED use (2+ visits) in last 30 days of life Hospice stay 3 or more days prior to death
Chemotherapy-related hospitalizations	Chemotherapy-associated hospitalizations Chemotherapy-associated ED visits resulting in a hospital admission Chemotherapy-associated ED visits without a hospital admission

Domain	Outcome Measures
Payments	Total episode payments (TEP), including Parts A, B, and D Part B non-chemotherapy drug payments Part B chemotherapy payments Part D payments
Treatment with recommended supportive care medications	White blood cell growth factors[a] Antiemetics[b] Bone-modifying drugs[c]
Chemotherapy initiation within 60 days after surgery	Breast cancer Colorectal cancer
Adherence to high-priced oral cancer treatments	Enzalutamide or abiraterone for prostate cancer Tyrosine Kinase Inhibitors for chronic myelogenous leukemia
18-month restricted mean survival for patients initiating chemotherapy	Lung cancer survival time
Patient-reported experience	Overall rating of the cancer care team Shared decision making Access Affective communication Exchanging information Enabling patient self–management Symptom management

Notes: [a] Includes breast cancer episodes where the chemotherapy regimen had a high risk of causing neutropenia; [b] Includes episodes with chemotherapy regimens with high risk of causing nausea and vomiting; [c] includes chemotherapy episodes for patients with bone metastases.

E.1.3 Approach for Equity Analyses

In this section, we describe the methodology for the equity study, including:

- Difference-in-Difference-in-Differences (DDD) approach
- Parallel trend tests conducted to ensure the internal validity of our DD and DDD estimations
- Model specification for each outcome measure
- Risk-adjusting covariates used in the DDD estimations

Impact Analyses

We analyzed OCM's differential impact on historically underserved populations using the DDD approach. In this case, the DDD approach includes three separate impact estimates of interest: (1) OCM impact on each subpopulation, (2) OCM impact on the reference subpopulation for each subpopulation, and (3) the difference between the two OCM impacts to determine if OCM impacted the subpopulation of interest differently than the corresponding reference subpopulation. The estimation of all three impacts takes place in a single regression, subject to the constraint that the coefficients on risk-adjustment covariates are the same for both the focal and reference subpopulations.

All analyses used data from baseline through the first nine intervention periods (PP1–PP9).

Model

We employed a specification similar to the overall DID analysis with inclusion of additional interaction terms for the equity groups to estimate the marginal effect of all categories within an interest area.

The linear form of the DDD specification is as follows:

$$Y = \beta + \varphi OCM + \sum_{q=1}^{N} \gamma_q PPQ_q + \sum_{c=1}^{G} \partial_c Can_c + \sum_{q=1}^{N} \alpha_q OCM \cdot PPQ_q + \sum_{c=1}^{G} \theta_c OCM \cdot Can_c + \sum_{q=1}^{N} \left(\sum_{c=1}^{G} \delta_{qc} Can_c \cdot PPQ_q \right) + \sum_{q=1}^{N} \left(\sum_{c=1}^{G} \rho_{qc} OCM \cdot Can_c \cdot PPQ_q \right) + \sum_{k=1}^{K} \left(\sum_{q=1}^{N} \tau_{qk} OCM \cdot Subpopulation_k \cdot PPQ_q \right) + \sum_{k=1}^{K} \left(\sum_{q=1}^{N} \vartheta_{qk} Subpopulation_k \cdot PPQ_q \right) + \sum_{k=1}^{K} \mu_k Subpopulation_k \cdot OCM + \pi' X + \varepsilon, \quad (3)$$

where Y is an outcome for each episode originating in quarter **q; OCM** is an indicator variable equal to one for OCM practices and zero for 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 c, including the group of non-reconciliation-eligible cancer types; and **X** is a vector of pre-determined risk-adjustors for each episode. The indicators for OCM, PPQ, and Can are interacted to account for cancer-specific trajectories in payments between the baseline and intervention periods.

The key DDD variable is **Subpopulation**, which is a binary indicator variable distinguishing each underserved population from its reference population. The subscript k denotes each subpopulation. The coefficient τ_qk reveals the differential OCM impact between the underserved populations of interest k and its reference population, in quarter q. The coefficient α_q captures the marginal impact of the OCM intervention on outcome Y, in quarter q, for the reference population. Therefore, the marginal impact of the OCM intervention on outcome Y, in quarter q, for underserved population k can be calculated by $\alpha\_q+\tau\_qk$. Using this model, we estimated the overall differential impact of OCM by taking linear combinations of the estimates of the appropriate PP quarters for each underserved population of interest. We weighted the PP quarter estimates by the number of episodes in each PP quarter to obtain the average cumulative impacts and used the delta method to assign significance to combined estimates. For all impact analyses, we excluded episodes with a COVID-19 diagnosis during the episode from the estimation sample, consistent with our main analyses.

We applied nonlinear analogs of equation (3) for binary and count outcomes as discussed in Appendix A.1.8.

For clinical analyses, because of smaller sample sizes for most measures, a modified approach was used. Specifically, clinical analyses used a single intervention variable instead of quarterly intervention dummies. In addition, as most clinical outcomes involved a single cancer type, these analyses did not include cancer type interactions (with either OCM or intervention dummies), although outcomes that included more than one cancer type included fixed effects for cancer type.

Covariate Selection

As in our DID models, the DDD models also control for time-varying characteristics that affect both the comparison and OCM groups. Systematic marginalization based on race, ethnicity, or Medicaid eligibility may lead to correlation with other social risk factors that combine to adversely affect patient outcomes above-and-beyond the impact of belonging to a given underserved population. Controlling for these correlated risk factors may lead to understating differences between underserved populations and their reference population. Therefore, we estimated baseline differences in outcomes between underserved and reference populations using a full set of risk-adjusting covariates, as well as using a reduced set of risk-adjusting covariates that may better capture true underlying baseline differences. Fully adjusted baseline differences are reported with our impact estimates in the main report, while baseline differences with reduced risk adjustment are reported in the online appendix.

Variables included in the full risk adjustment are listed in Appendix Exhibit A-9.[139] The reduced risk adjustment removed the following variables from the regression:

- Race and ethnicity
- Dual eligibility status
- Percentage of county in poverty
- Medicare Advantage penetration
- State indicator variables

[139] These analyses included an additional control variable for patients residing in the top 20% most disadvantaged ZIP codes, according to the Area Deprivation Index (ADI). Roughly 0.08% of episodes were missing ADI and thus excluded from our fully adjusted equity analyses.

Parallel Trends

To ensure the internal validity of our DID and DDD estimation, we conducted parallel trend tests using the baseline periods within subpopulations (DID) and across subpopulations (DDD). Our results show that parallel trends testing rejected equal trends for a small portion of outcomes at the $p<0.05$ level:

- For race and ethnicity, parallel trends were rejected for outpatient therapy services outcomes within the Black subpopulation; parallel trends were rejected for Part B non-chemotherapy drug payments and outpatient therapy services between the Black subpopulation and the reference white subpopulation; parallel trends were rejected for appropriate use of anti-emetics within the white population.
- For dual eligibility status, parallel trends were rejected for only one outcome, cancer-related E&M services, both within the dual-eligible subpopulation and between this subpopulation and the reference Medicare-only subpopulation.

We examined whether the above violations of the parallel trend assumptions reflected material differences in trends, or if large samples led to rejections of parallel trends signifying small differences. We found that all the magnitudes were of an important size. Estimated changes in these outcomes may be meaningfully biased and should be interpreted with caution.

Patient Survey

For the survey outcomes, we did not have survey data from comparison group episodes. Therefore, we assessed baseline differences and differences in trends over time in OCM patient survey outcome measures between populations.

The equity analysis of patient-reported outcomes used the following regression model:

$$y = \beta_0 + \beta_1 Subpopulation + \beta_2 Wave + \beta_3 (Subpopulation * Wave) + \beta_4 X + \varepsilon$$

where y is a survey outcome, Subpopulation is a binary indicator variable distinguishing each underserved population from its reference population, Wave is a continuous measure indicating the wave of each survey response, and X represents a set of patient- and practice-level covariates for patient i. In this model, the coefficient β_1 captures the baseline difference between groups, the coefficient β_2 captures the trend over time for the reference population, and the coefficient β_3 captures the difference in the trend over time between the underserved population and the reference population.

Estimates were weighted for sampling and nonresponse weights and adjusted for demographic characteristics, health status, cancer type, treatment duration, the calendar month when the episode was triggered, practice characteristics, and the incidence and prevalence of COVID-19 cases and deaths during each episode. Patients with a COVID-19 diagnosis during the episode were excluded from analysis.

All measures included in the equity analysis were scaled on a range of 0–10. Accordingly, we used linear regression in conducting risk adjustment.

Sensitivity Analyses

The large differential reduction in TEP for Hispanic patients is driven by a large differential reduction in Part D payments. We ran multiple sensitivities to investigate this effect. First, we ran the following Total Part D payment models:

- Low-risk cancers only
- High-risk cancers only
- Outlier trimming: dropping episodes with the top 1,000th percent of Part D spending
- Excluding the two largest OCM practices
- Non-Medicaid expansion states only
- Medicaid expansion states only
- Including a full set of terms for Hispanic ethnicity-dual eligibility-performance quarter interaction

We also ran the model with Part D gross drug costs (GDC) as the outcome. We found that the differential reduction in Part D payments for Hispanic patients is driven by high-risk cancers. Descriptive statistical analysis indicates that this finding is not driven by a single cancer. However, multiple myeloma is the largest contributor.

The differential reduction in Part D payments for Hispanic patients is not driven by payment outliers, nor by large practice effects. It is also robust to using GDC to measure spending. This suggests that the estimate is not an artifact of copay or secondary payor effects. The differential reduction in Part D payments for Hispanic patients is also robust to multiple sensitivities for Medicaid policy changes.

E.2 Descriptive Statistics for Equity Analyses

E.2.1 Sample Sizes Associated with Each Outcome

Exhibit E-3 Patient-Level Characteristics, by Population

Population	Full Sample	Black	Hispanic	White	Dual-Eligible	Medicare-Only
Sample Size	1,156,784	96,969	54,077	955,385	152,718	1,004,066
Age	73.2 (8.5)	70.7 (10.0)	70.9 (10.0)	73.7 (8.2)	67.9 (11.8)	74.0 (7.6)
HCC Score	2.9 (2.0)	3.0 (2.1)	2.9 (2.0)	2.9 (2.0)	3.4 (2.2)	2.8 (1.9)
Gender						
Female	59.4	59.9	61.1	59.5	67.2	58.2
Male	40.6	40.1	38.9	40.5	32.8	41.8
Race and Ethnicity						
Asian/Pacific Islander, Native American/Alaska Native	4.4	0.0	0.0	0.0	8.6	3.7
Black	8.4	100.0	0.0	0.0	20.3	6.6
Hispanic	4.7	0.0	100.0	0.0	15.7	3.0
White	82.6	0.0	0.0	100.0	55.4	86.7
Medicaid Enrollment Status						
Medicare-only	86.8	68.0	55.7	91.1	0.0	100.0
Dually eligible	13.2	32.0	44.3	8.9	100.0	0.0
Neighborhood Disadvantage						
Top ADI quintile	13.1	31.6	20.3	11.0	26.2	11.1
Lower four ADI quintiles	86.9	68.4	79.7	89.0	73.8	88.9
Part D for all months						
No	16.6	18.6	13.6	16.8	1.0	19.0
Yes	83.4	81.4	86.4	83.2	99.0	81.0
Had a prior OCM episode						
No	49.1	47.4	48.5	49.2	47.9	49.3
Yes	50.9	52.6	51.5	50.8	52.1	50.7
Type of chemotherapy						
Part B only	52.2	51.1	48.0	52.7	43.0	53.6
Part D only	35.5	33.7	37.5	35.5	40.9	34.6
Part B and Part D	12.3	15.2	14.4	11.8	16.1	11.8

Source: Medicare claims 2014-2021.
Notes: Standard deviation in parentheses for continuous variables. HCC: Hierarchical condition category. ADI: Area deprivation index. For a description of the ADI see Section 1.4.

Exhibit E-4: Equity Analysis Sample Sizes – Claims-Based Utilization and Payment Outcomes

Outcome	Population	OCM		Comparison	
		Baseline	Intervention	Baseline	Intervention
TEP ($)	Black	31,151	96,856	37,308	101,234
	Hispanic	16,718	54,024	17,676	55,074
	White	286,022	955,217	334,885	1,035,982
	Dual-eligible	49,895	152,702	68,241	189,304
	Medicare-only	295,870	1,003,719	337,182	1,067,329
Part D payments ($)[a]	Black	25,372	78,876	30,658	82,711
	Hispanic	14,281	46,677	15,351	48,423
	White	228,883	795,106	270,486	867,451
	Dual-eligible	49,275	151,214	67,498	187,677
	Medicare-only	229,124	812,927	262,149	866,950
Likelihood of hospitalizations[b]	Black	9,000	25,583	10,229	25,563
	Hispanic	4,583	13,573	4,539	13,104
	White	77,183	233,125	85,213	244,085
	Dual-eligible	15,660	44,678	20,319	52,498
	Medicare-only	78,142	239,079	83,201	243,894

Source: Medicare claims 2014-2021.

Notes: [a] For Part D related outcomes, sample was restricted to those with Part D coverage; [b] For readmission related outcomes, sample was restricted to those with at least one hospitalization. TEP: Total episode payment. Black, Hispanic, and White define mutually exclusive groups of patients based on race and ethnicity. Dual-eligible and Medicare-only define mutually exclusive groups of patients based on Medicaid enrollment status.

Exhibit E-5: Equity Analysis Sample Sizes – End-of-Life Claims-Based Utilization Outcomes

Outcome	Population	OCM		Comparison	
		Baseline	Intervention	Baseline	Intervention
Any chemotherapy in last 14 days of life	Black	3,161	12,229	3,598	12,712
	Hispanic	1,641	6,709	1,699	6,775
	White	30,450	123,387	34,264	130,884
	Dual-Eligible	5,659	22,597	7,502	27,243
	Medicare-Only	30,823	125,671	33,598	130,748
Any hospitalization in the last 30 days of life	Black	3,161	12,229	3,598	12,712
	Hispanic	1,641	6,709	1,699	6,775
	White	30,450	123,387	34,264	130,884
	Dual-Eligible	5,659	22,597	7,502	27,243
	Medicare-Only	30,823	125,671	33,598	130,748
ED use (2+ visits) in last 30 days of life	Black	3,161	12,229	3,598	12,712
	Hispanic	1,641	6,709	1,699	6,775
	White	30,450	123,387	34,264	130,884
	Dual-Eligible	5,659	22,597	7,502	27,243
	Medicare-Only	30,823	125,671	33,598	130,748
Hospice stay 3 or more days prior to death	Black	3,161	12,229	3,598	12,712
	Hispanic	1,641	6,709	1,699	6,775
	White	30,450	123,387	34,264	130,884
	Dual-Eligible	5,659	22,597	7,502	27,243
	Medicare-Only	30,823	125,671	33,598	130,748

Outcome	Population	OCM		Comparison	
		Baseline	Intervention	Baseline	Intervention
No hospice care use	Black	3,161	12,229	3,598	12,712
	Hispanic	1,641	6,709	1,699	6,775
	White	30,450	123,387	34,264	130,884
	Dual-Eligible	5,659	22,597	7,502	27,243
	Medicare-Only	30,823	125,671	33,598	130,748

Source: Medicare claims 2014-2021.
Note: ED: Emergency department. Black, Hispanic, and White define mutually exclusive groups of patients based on race and ethnicity. Dual-eligible and Medicare-only define mutually exclusive groups of patients based on Medicaid enrollment status.

Exhibit E-6: Toxicity Equity Analysis Sample Sizes – Chemotherapy-Associated Acute Care Utilization Outcomes

Outcome	Population	OCM		Comparison	
		Baseline	Intervention	Baseline	Intervention
Any chemotherapy-associated hospitalization	Black	20,735	65,268	23,741	66,623
	Hispanic	11,360	36,686	11,631	37,710
	White	191,936	641,699	214,445	681,534
	Dual-eligible	33,763	108,824	45,308	135,333
	Medicare-only	198,535	669,518	215,268	694,932
Any hemotherapy-associated ED visit resulting in a hospital admission	Black	20,735	65,268	23,741	66,623
	Hispanic	11,360	36,686	11,631	37,710
	White	191,936	641,699	214,445	681,534
	Dual-eligible	33,763	108,824	45,308	135,333
	Medicare-only	198,535	669,518	215,268	694,932
Any chemotherapy-associated ED visit without a hospital admission	Black or African American	20,735	65,268	23,741	66,623
	Hispanic	11,360	36,686	11,631	37,710
	White	191,936	641,699	214,445	681,534
	Dual-eligible	33,763	108,824	45,308	135,333
	Medicare-only	198,535	669,518	215,268	694,932

Source: Medicare claims 2014-2021.
Note: ED: Emergency department. Black, Hispanic, and White define mutually exclusive groups of patients based on race and ethnicity. Dual-eligible and Medicare-only define mutually exclusive groups of patients based on Medicaid enrollment status.

Exhibit E-7: Equity Analysis Sample Sizes – Clinical Analyses

Outcome	Population	OCM		Comparison	
		Baseline	Intervention	Baseline	Intervention
WBC growth factors[a]	Black	391	1,275	469	1,325
	Hispanic	135	545	133	471
	White	2,582	9,512	2,785	9,564
	Dual-eligible	433	1,376	637	1,765
	Medicare-only	2,792	10,454	2,905	10,157
Antiemetics[b]	Black	438	1,057	584	1,178
	Hispanic	316	818	340	952
	White	4,928	14,413	6,187	16,036
	Dual-eligible	1,384	3,392	2,032	4,618
	Medicare-only	4,520	13,694	5,367	14,630
Bone-modifying drugs[c]	Black	3,853	12,275	4,508	13,136
	Hispanic	1,946	6,456	1,969	6,267
	White	34,462	11,5452	40,104	125,234
	Dual-eligible	5,876	19,228	7,615	22,387
	Medicare-only	35,787	120,952	40,840	129,884

Outcome	Population	OCM		Comparison	
		Baseline	Intervention	Baseline	Intervention
Timeliness of chemotherapy for breast cancer	Black	553	1,457	636	1,507
	Hispanic	203	668	231	585
	White	4,013	11,798	4,421	12,021
	Dual-eligible	636	1,754	965	2,194
	Medicare-only	4,292	12,797	4,529	12,618
Timeliness of chemotherapy for colorectal cancer	Black	392	918	472	896
	Hispanic	281	621	190	488
	White	3,599	9,088	4,079	9,230
	Dual-eligible	707	1,611	910	1,869
	Medicare-only	3,759	9,605	4,067	9,349
Adherence for prostate cancer	Black	1,006	3,293	1,261	3,913
	Hispanic	459	1,586	500	1,703
	White	6,396	22,164	8,197	26,184
	Dual-eligible	1,173	4,474	1,511	5,870
	Medicare-only	6,958	24,109	8,847	27,869
Adherence for CML	Black	384	1,084	488	1,259
	Hispanic	293	973	289	844
	White	3,492	9,922	3,969	10,436
	Dual-eligible	1,033	3,499	1,456	4,148
	Medicare-only	3,316	9,186	3,465	9,056
Lung cancer survival time	Black	983	4,015	1,114	4,186
	Hispanic	413	1,600	423	1,539
	White	10,732	45,458	11,855	47,382
	Dual-eligible	2,025	8,541	2,678	10,420
	Medicare-only	10,507	44,533	11,258	45,411

Source: Medicare claims 2014-2021.

Notes: [a] Includes breast cancer episodes where the chemotherapy regimen had a high risk of causing neutropenia; [b] includes episodes with chemotherapy regimens with high risk of causing nausea and vomiting; [c] includes chemotherapy regimens for patients with bone metastases. WBC: white blood cell. CML: chronic myeloid leukemia. Black, Hispanic, and White define mutually exclusive groups of patients based on race and ethnicity. Dual-eligible and Medicare-only define mutually exclusive groups of patients based on Medicaid enrollment status.

Exhibit E-8: Sample Sizes for the Patient Experience Equity Analyses

Outcome	Population	OCM	
		Baseline	Intervention
OCM patient survey respondents	Black	736	10,906
	Hispanic	270	4,731
	White	8,703	141,073
	Dual-eligible	1,113	15,602
	Medicare-only	10,220	152,510

Source: OCM Patient and Caregiver Surveys. Includes episodes initiated from April 2016 through December 2020; data collection for these episodes occurred from January 2017 through June 2021.

Notes: Comparison group sample sizes were not included in this table, because the patient experience analyses included only responses from OCM patients. Black, Hispanic, and White define mutually exclusive groups of patients based on race and ethnicity. Dual-eligible and Medicare-only define mutually exclusive groups of patients based on Medicaid enrollment status.

E.3 Findings from Equity Analyses

Exhibit E-9: OCM Decreased TEP Similarly for Black and White Patients

Outcome	OCM Baseline			Estimate Associated with OCM		
	Black	White	Difference (Difference %)	Black (A)	White (B)	Differential (A-B)
TEP without MEOS	$30,907	$28,750	$2,158 (7.5%)	-$580	-$423	-$157
Part B chemotherapy payments	$7,192	$7,796	-$603 (-7.7%)	$194	$38	$156
Part B non-chemotherapy drug payments	$2,734	$2,718	$17 (0.6%)	-$263	-$245	-$19[a]
Part D payments	$9,042	$6,285	$2,757 (43.9%)	-$266	$54	-$320

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. MEOS: Monthly Enhanced Oncology Services payment. TEP: Total episode payment. a Baseline trends were not equal between Black and White patients, which may suggest meaningful bias in this estimate. The estimated differential for Part B non-chemotherapy drug payments should be interpreted with caution.

Exhibit E-10: Baseline Differences in TEP between Hispanic and White Patients Decreased by Nearly Half during OCM, through Differential Reductions in Part D Payments

Outcome	OCM Baseline			Estimate Associated with OCM		
	Hispanic	White	Difference (Difference %)	Hispanic (A)	White (B)	Differential (A-B)
TEP without MEOS	$30,936	$28,750	$2,186 (7.6%)	-$1,519	-$423	-$1,096
Part B chemotherapy payments	$7,127	$7,796	-$668 (-8.6%)	-$288	$38	-$326
Part B non-chemotherapy drug payments	$2,370	$2,718	-$348 (-12.8%)	-$326	-$245	-$81
Part D payments	$9,239	$6,285	$2,954 (47.0%)	-$816	$54	-$870

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. MEOS: Monthly Enhanced Oncology Services payment. TEP: Total episode payment.

Exhibit E-11: OCM Was Associated with Similar Reductions in Part D Spending for Dual-Eligible and Medicare-Only Patients

Outcome	OCM Baseline			Estimate Associated with OCM		
	Dual	Non-Dual	Difference (Difference %)	Dual (A)	Non-Dual (B)	Differential (A-B)
TEP without MEOS	$34,347	$28,218	$6,129 (21.7%)	-$580	-$426	-$154
Part B chemotherapy payments	$6,744	$7,862	-$1,118 (-14.2%)	$84	$18	$66
Part B non-chemotherapy drug payments	$2,282	$2,770	-$0,488 (-17.6%)	-$269	-$252	-$17
Part D payments	$10,558	$5,969	$4,590 (76.9%)	-$299	$104	-$403

Shading indicates statistically significant estimates atp<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. MEOS: Monthly Enhanced Oncology Services payment. TEP: Total episode payment.

Exhibit E-12: OCM Was Associated with a Small but Statistically Significant Increase in the Likelihood of an ED Visit and the Total Number of ED Visits for Black Patients

Outcome	OCM Baseline			Estimate Associated with OCM		
	Black	White	Difference (Difference %)	Black (A)	White (B)	Differential (A-B)
Any ED visit	41.4%	35.2%	6.3pp (17.9%)	0.58pp	-0.16pp	0.74pp
Number of ED visits	0.86	0.64	0.22 (34.4%)	0.02	-0.01	0.026
Any inpatient stay	29.4%	27.0%	2.4pp (8.8%)	0.5pp	-0.06pp	0.56pp
Number of inpatient stays	0.49	0.43	0.06 (13.1%)	0.01	-0.01	0.013
Occurrence of 30-day readmission	27.9%	24.8%	3.1pp (12.4%)	0.92pp	-0.47pp	1.39pp
Number of 30-day readmissions	0.43	0.36	0.07 (18.8%)	0.02	-0.01	0.031
Any 30-day unplanned readmission	26.9%	23.3%	3.6pp (15.2%)	0.53pp	-0.38pp	0.91pp
Number of 30-day unplanned readmissions	0.40	0.33	0.07 (22.5%)	0.01	-0.01	0.019
Any home health service	20.1%	15.4%	4.7pp (30.2%)	-0.32pp	-0.16pp	-0.16pp
Number of 60-day home health spells	0.41	0.28	0.13 (46.5%)	0.00	-0.01	0.001
Any cancer-related E&M service	92.7%	92.9%	-0.2pp (-0.2%)	-0.04pp	0.09pp	-0.13pp
Number of cancer-related E&M services	5.13	5.30	-0.17 (-3.2%)	-0.05	0.01	-0.054
Any Part B outpatient therapy service	8.1%	8.7%	-0.6pp (-6.9%)	-0.07pp[a]	-0.24pp	0.17pp[b]
Number of Part B outpatient therapy services	1.70	1.73	-0.03 (-1.9%)	0.01[a]	-0.03	0.039[b]
Any ICU admission	10.5%	10.0%	0.5pp (4.8%)	-0.05pp	-0.36pp	0.31pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. For our equity analysis, we chose to examine overall ED visits, which includes ED visits resulting in inpatient stay and ED visits not resulting in inpatient stay. In aggregate, OCM did not have significant impacts on total ED visits, and the results were not included in Chapter 3 findings. pp: Percentage point. ED: Emergency department. E&M: Evaluation and management. ICU: Intensive care unit. [a] Baseline trends were not equal between Black patients in the OCM and comparison groups, which may suggest meaningful bias in these estimates. Results for Part B outpatient therapy services should be interpreted with caution. [b] Baseline trends were not equal between Black and White patients, which may suggest meaningful bias for this estimate. Estimated differentials should be interpreted with caution.

Exhibit E-13: OCM Was Not Associated with Differential Changes between Hispanic and White Patients for Measures of Utilization

Outcome	OCM Baseline			Estimate Associated with OCM		
	Hispanic	White	Difference (Difference %)	Hispanic (A)	White (B)	Differential (A-B)
Any ED visit	38.9%	35.2%	3.7pp (10.6%)	-0.31pp	-0.16pp	-0.15pp
Number of ED visits	0.77	0.64	0.12 (19.1%)	-0.02	-0.01	-0.01
Any inpatient stay	28.0%	27.0%	1.0pp (3.5%)	0.74pp	-0.06pp	0.8pp
Number of inpatient stays	0.45	0.43	0.02 (4.8%)	0.01	-0.01	0.02
Any 30-day readmission	27.4%	24.8%	2.6pp (10.5%)	-0.29pp	-0.47pp	0.18pp
Number of 30-day readmissions	0.42	0.36	0.06 (16.0%)	-0.01	-0.01	0.00
Any 30-day unplanned readmission	26.1%	23.3%	2.8pp (12.0%)	-0.14pp	-0.38pp	0.24pp
Number of 30-day unplanned readmissions	0.38	0.33	0.06 (17.4%)	0.00	-0.01	0.00
Any home health service	19.8%	15.4%	4.4pp (28.4%)	-0.32pp	-0.16pp	-0.16pp
Number of 60-day home health spells	0.41	0.28	0.14 (49.3%)	-0.02	-0.01	-0.03
Any cancer-related E&M service	93.6%	92.9%	0.6pp (0.7%)	-0.08pp	0.09pp	-0.17pp

Outcome	OCM Baseline			Estimate Associated with OCM		
	Hispanic	White	Difference (Difference %)	Hispanic (A)	White (B)	Differential (A-B)
Number of cancer-related E&M services	5.52	5.30	0.22 (4.2%)	-0.10	0.01	-0.10
Any Part B outpatient therapy service	6.8%	8.7%	-1.9pp (-21.6%)	-0.62pp	-0.24pp	-0.38pp
Number of Part B outpatient therapy services	1.31	1.73	-0.41 (-24.0%)	0.08	-0.03	0.09
Any ICU admission	10.7%	10.0%	0.7pp (7.0%)	-0.33pp	-0.36pp	0.03pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. For our equity analysis, we chose to examine overall ED visits, which includes ED visits resulting in inpatient stay and ED visits not resulting in inpatient stay. In aggregate, OCM did not have significant impact on total ED visits, and the results were not included in Chapter 3 findings. pp: Percentage point. ED: Emergency department. E&M: Evaluation and management. ICU: Intensive care unit.

Exhibit E-14: OCM Was Associated with Differentially Increased Hospital Utilization for Dual-Eligible Patients Relative to Medicare-Only Patients

Outcome	OCM Baseline			Estimate Associated with OCM		
	Dual	Non-Dual	Difference (Difference %)	Dual (A)	Non-Dual (B)	Differential (A-B)
Any ED visit	44.5%	34.2%	10.3pp (30.0%)	0.41pp	-0.24pp	0.64pp
Number of ED visits	0.98	0.61	0.37 (60.4%)	0.01	-0.01	0.02
Any inpatient stay	31.7%	26.5%	5.2pp (19.8%)	0.6pp	-0.11pp	0.71pp
Number of inpatient stays	0.55	0.42	0.13 (31.7%)	0.01	-0.01	0.02
Any 30-day readmission	28.1%	24.7%	3.4pp (13.7%)	0.07pp	-0.47pp	0.55pp
Number of 30-day readmissions	0.44	0.36	0.08 (21.5%)	0.00	-0.01	0.01
Any 30-day unplanned readmission	27.0%	23.3%	3.8pp (16.3%)	-0.26pp	-0.38pp	0.13pp
Number of 30-day unplanned readmissions	0.41	0.33	0.08 (24.6%)	-0.01	-0.01	0.00
Any home health service	22.3%	14.9%	7.4pp (49.5%)	-0.78pp	-0.12pp	-0.67pp
Number of 60-day home health spells	0.46	0.27	0.19 (72.8%)	-0.02	0.00	-0.02
Any cancer-related E&M service	92.7%	93.0%	-0.3pp (-0.3%)	0.06pp[a]	0.07pp	-0.01pp[b]
Number of cancer-related E&M services	5.21	5.32	-0.11 (-2.1%)	-0.02[a]	0.00	-0.02[b]
Any Part B outpatient therapy service	9.8%	8.3%	1.5pp (18.3%)	0.03pp	-0.27pp	0.29pp
Number of Part B outpatient therapy services	2.64	1.53	1.10 (71.9%)	0.22	-0.03	0.25
Any ICU admission	11.9%	9.7%	2.2pp (22.8%)	0.14pp	-0.4pp	0.55pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. For our equity analysis, we chose to examine overall ED visits, which includes ED visits resulting in inpatient stay and ED visits not resulting in inpatient stay. Overall, OCM did not have significant impact on total ED visits, and the results were not included in Chapter 3 findings. pp: Percentage point. ED: Emergency department. E&M: Evaluation and management. ICU: Intensive care unit. [a] Baseline trends were not equal between dual-eligible patients in the OCM and comparison groups, which may suggest meaningful bias in these estimates. Results for cancer-related E&M visits should be interpreted with caution. [b] Baseline trends were not equal between dual-eligible patients and Medicare-only patients, which may suggest meaningful bias for this estimate. Estimated differentials in cancer-related E&M visits should be interpreted with caution.

Exhibit E-15: OCM Was Not Associated with Changes in End-of-Life Service Use among Black and White Patients

Outcome	OCM Baseline			Estimate Associated with OCM		
	Black	White	Difference (Difference %)	Black (A)	White (B)	Differential (A-B)
Any chemotherapy in last 14 days of life	11.3%	12.0%	-0.7pp (-5.8%)	0.5pp	-0.1pp	0.6pp
Any hospitalization in last 30 days of life	59.2%	52.0%	7.2pp (13.8%)	-1.3pp	-0.7pp	-0.6pp
ED use (2+ visits) in last 30 days of life	18.3%	14.3%	4.0pp (28.0%)	0.0pp	-0.3pp	0.3pp
Hospice stay 3 or more days prior to death	51.8%	59.9%	-8.1pp (-13.5%)	1.9pp	-0.1pp	2.0pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. pp: Percentage point. ED: Emergency department.

Exhibit E-16: OCM Was Associated with Reduced ED Use at the End of Life among Hispanic Patients Relative to White Patients

Outcome	OCM Baseline			Estimate Associated with OCM		
	Hispanic	White	Difference (Difference %)	Hispanic (A)	White (B)	Differential (A-B)
Any chemotherapy in last 14 days of life	12.0%	12.0%	0.1pp (0.8%)	-0.3pp	-0.1pp	-0.2pp
Any hospitalization in last 30 days of life	57.1%	52.0%	5.0pp (9.6%)	-1.6pp	-0.7pp	-0.9pp
ED use (2+ visits) in last 30 days of life	18.8%	14.3%	4.5pp (31.5%)	-2.7pp	-0.3pp	-2.4pp
Hospice stay 3 or more days prior to death	55.4%	59.9%	-4.4pp (-7.3%)	2.4pp	-0.1pp	2.5pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. pp: Percentage point. ED : Emergency department.

Exhibit E-17: OCM Was Associated with Increased ED Use and Decreased Use of Hospice at End of Life Among Dual-Eligible Patients Relative to Medicare-Only Patients

Outcome	OCM Baseline			Estimate Associated with OCM		
	Dual	Non-Dual	Difference (Difference %)	Dual (A)	Non-Dual (B)	Differential (A-B)
Any chemotherapy in last 14 days of life	11.9%	12.0%	-0.1pp (-0.8%)	-0.2pp	0.0pp	-0.1pp
Any hospitalization in last 30 days of life	54.8%	52.8%	2.0pp (3.8%)	-0.1pp	-1.0pp	0.9pp
ED use (2+ visits) in last 30 days of life	17.5%	14.5%	3.0pp (20.7%)	0.7pp	-0.7pp	1.5pp
Hospice stay 3 or more days prior to death	54.5%	59.6%	-5.0pp (-8.4%)	-1.7pp	0.6pp	-2.3pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. pp: Percentage point. ED : Emergency department.

Exhibit E-18: OCM Differentially Increased the Probability of a Chemotherapy-Associated ED Visit That Did Not Lead to a Hospital Admission among Black Patients Relative to White Patients

Outcome	OCM Baseline			Estimate Associated with OCM		
	Black	White	Difference (Difference %)	Black (A)	White (B)	Differential (A-B)
Any chemotherapy-associated hospitalization	14.6%	13.0%	1.5pp (11.5%)	0.0pp	0.0pp	0.0pp
Any chemotherapy-associated ED visit resulting in a hospital admission	11.9%	10.2%	1.7pp (16.7%)	-0.2pp	-0.2pp	0.0pp
Any chemotherapy-associated ED visit without a hospital admission	11.2%	8.0%	3.2pp (40.0%)	0.6pp	-0.3pp	0.9pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. pp: Percentage points. ED: Emergency department.

Exhibit E-19: OCM Was Not Associated with Differential Changes in Chemotherapy-Related Use of Hospital Services for Hispanic Patients Relative to White Patients

Outcome	OCM Baseline			Estimate Associated with OCM		
	Hispanic	White	Difference (Difference %)	Hispanic (A)	White (B)	Differential (A-B)
Any chemotherapy-associated hospitalization	14.3%	13.0%	1.2pp (9.2%)	0.7pp	0.0pp	0.6pp
Any chemotherapy-associated ED visit resulting in a hospital admission	12.1%	10.2%	1.9pp (18.6%)	0.4pp	-0.2pp	0.6pp
Any chemotherapy-associated ED visit without a hospital admission	9.7%	8.0%	1.6pp (20.0%)	0.2pp	-0.3pp	0.5pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. pp: Percentage point. ED: Emergency department.

Exhibit E-20: Dual-Eligible Patients Had Greater Utilization of Chemotherapy-Associated Acute Care at Baseline, and OCM Did Not Affect These Differences

Outcome	OCM Baseline			Estimate Associated with OCM		
	Dual	Non-Dual	Difference (Difference %)	Dual (A)	Non-Dual (B)	Differential (A-B)
Any chemotherapy-associated hospitalization	16.1%	12.7%	3.3pp (26.0%)	0.1pp	0.0pp	0.0pp
Any chemotherapy-associated ED visit resulting in a hospital admission	13.0%	9.9%	3.1pp (31.3%)	-0.1pp	-0.2pp	0.1pp
Any chemotherapy-associated ED visit without a hospital admission	12.3%	7.6%	4.7pp (61.8%)	0.1pp	-0.2pp	0.3pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: We did not conduct tests for the statistical significance of baseline differences for the claims-based measures of utilization and payment, because of the large sample sizes. pp: Percentage point. ED: Emergency department.

Exhibit E-21: OCM Not Associated with Change in Supportive Care Medication Use Among Any Population

Treatment with recommended supportive care medications	OCM Baseline			Estimate Associated with OCM		
	Black	White	Difference (Difference %)	Black (A)	White (B)	Differential (A-B)
WBC growth factors[a]	86.8%	85.1%	1.8pp (2.1%)	-0.2pp	1.9pp	-1.8pp
Antiemetics[b]	77.5%	78.9%	-1.4pp (-1.8%)	1.8pp	-0.1pp[c]	2.0pp
Bone-modifying drugs[d]	65.0%	68.1%	-3.1pp (-4.6%)	0.9pp	-0.3pp	1.3pp
	Hispanic	White	Difference (Difference %)	Hispanic (A)	White (B)	Differential (A-B)
WBC growth factors	83.9%	85.1%	-1.2pp (-1.4%)	-1.4pp	1.9pp	-3.4pp[e]
Antiemetics	76.9%	78.9%	-1.9pp (-2.4%)	2.8pp	-0.1pp	3.0pp
Bone-modifying drugs	68.5%	68.1%	0.3pp (0.4%)	-0.1pp	-0.3pp	0.3pp
	Dual	Non-dual	Difference (Difference %)	Dual (A)	Non-dual (B)	Differential (A-B)
WBC growth factors	84.2%	85.4%	-1.2pp (-1.4%)	-0.3pp	1.7pp	-2.1pp
Antiemetics	76.9%	79.3%	-2.4pp (-3.0%)	0.7pp	0.0pp	0.7pp
Bone-modifying drugs	65.2%	68.4%	-3.2pp (-4.7%)	0.0pp	-0.3pp	0.3pp

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: Medicare claims 2014-2021.
Notes: [a] Includes episodes where the chemotherapy regimen had a high risk of causing neutropenia; [b] includes episodes with chemotherapy regimens with high risk of causing nausea and vomiting; [c] Baseline trends were not equal between White OCM and White comparison patients, which may introduce meaningful bias in this estimate. Estimated changes in antiemetic use among White patients should be interpreted with caution. d includes chemotherapy regimens for patients with bone metastases; e After dropping the two largest practices, the DDD became significant (-4.8 percentage points, 90% CI: -9.4, -0.3). WBC: White blood cell. pp: Percentage point.

Exhibit E-22: Black Respondents Reported Better Experiences Relating to Symptom Management Than White Respondents at Baseline but Worse Experiences Relating to Shared Decision Making

Outcomes	OCM Baseline*			Trend for Black Patients (A)	Trend for White Patients (B)	Difference in Trends (A-B)
	Black	White	Difference (Difference %)			
Overall rating	9.1	9.3	-0.2 (-1.8%)	0.011	0.001	0.011
Shared decision making	7.2	7.5	-0.4 (-4.9%)	0.010	0.014	-0.004
Access	8.8	8.9	-0.1 (-0.6%)	0.011	0.006	0.005
Affective communication	8.9	9.1	-0.1 (-1.2%)	0.009	0.003	0.006
Exchanging information	8.3	8.5	-0.2 (-2.2%)	-0.003	-0.001	-0.003
Enabling patient self–management	6.2	5.9	0.3 (5.2%)	0.003	0.006	-0.003
Symptom management	7.7	7.3	0.4 (5.7%)	-0.022	-0.013	-0.009

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: OCM Patient and Caregiver Surveys. Includes episodes initiated from April 2016 through December 2020; data collection for these episodes occurred from January 2017 through June 2021.
Notes: *Baseline survey wave included episodes initiated from April to September 2016. Estimates were weighted for sampling and nonresponse and regression adjusted.

Exhibit E-23: Hispanic Respondents Reported Better Experiences Relating to Access, Communication, and Symptom Management Than White Respondents at Baseline but Worse Experiences Relating to Shared Decision Making

Outcomes	OCM Baseline*			Trend for Hispanic Patients (A)	Trend for White Patients (B)	Difference in Trends (A-B)
	Hispanic	White	Difference (Difference %)			
Overall rating	9.3	9.3	0.0 (0.1%)	0.000	0.001	0.000
Shared decision making	7.1	7.5	-0.5 (-6.3%)	0.021	0.014	0.007
Access	9.3	8.9	0.4 (4.3%)	0.005	0.006	-0.001
Affective communication	9.4	9.1	0.3 (3.6%)	0.007	0.003	0.005
Exchanging information	8.6	8.5	0.0 (0.5%)	0.008	-0.001	0.008
Enabling patient self–management	6.3	5.9	0.4 (7.0%)	0.026	0.006	0.020
Symptom management	7.8	7.3	0.4 (6.1%)	-0.003	-0.013	0.011

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: OCM Patient and Caregiver Surveys. Includes episodes initiated from April 2016 through December 2020; data collection for these episodes occurred from January 2017 through June 2021.
Notes: *Baseline survey wave included episodes initiated from April to September 2016. Estimates were weighted for sampling and nonresponse and regression adjusted.

Exhibit E-24: Dual-Eligible and Medicare-Only Respondents Reported Similar Care Experiences at Baseline and throughout OCM

Outcomes	OCM Baseline*			Trend for Dual Patients (A)	Trend for Non-Dual Patients (B)	Difference in Trends (A-B)
	Dual	Non-Dual	Difference (Difference %)			
Overall rating	9.3	9.3	0.0 (0.2%)	-0.003	0.002	-0.005
Shared decision making	7.7	7.5	0.2 (2.9%)	0.004	0.016	-0.012
Access	8.8	8.9	-0.1 (-1.6%)	0.015	0.005	0.010
Affective communication	8.9	9.1	-0.1 (-1.6%)	0.013	0.002	0.011
Exchanging information	8.4	8.5	-0.1 (-1.6%)	0.006	-0.001	0.007
Enabling patient self–management	6.2	5.9	0.3 (4.3%)	0.005	0.006	-0.001
Symptom management	7.4	7.3	0.1 (1.4%)	-0.018	-0.014	-0.005

Shading indicates statistically significant estimates at p<0.01, p<0.05, and p<0.10, indicated by dark blue, medium blue, or light blue shading.
Source: OCM Patient and Caregiver Surveys. Includes episodes initiated from April 2016 through December 2020; data collection for these episodes occurred from January 2017 through June 2021.
Notes: *Baseline survey wave included episodes initiated from April to September 2016. Estimates were weighted for sampling and nonresponse and regression adjusted.

Acronyms

F. Acronyms

ACH	Acute-Care Hospitalization
ACO	Accountable Care Organization
ADI	Area Deprivation Index
APM	Alternative Payment Model
APP	Advanced Practice Provider
AQS	Aggregate Quality Score
ASCO	American Society of Clinical Oncology
CDS	Clinical Decision Support
CML	Chronic Myeloid Leukemia
CMS	Centers for Medicare & Medicaid Services
CPC	Comprehensive Primary Care
DID	Difference-in-Differences
DDD	Difference-in-Differences-in-Differences
E&M	Evaluation and Management
ED	Emergency Department
EGFR	Epidermal Growth Factor Receptor
EHR	Electronic Health Record
EOM	Enhancing Oncology Care Model
FDA	U.S. Food and Drug Administration
FFS	Fee-for-Service
GCSF	Granulocyte Colony-Stimulating Factor
HCC	Hierarchical Condition Category
HER2	Human Epidermal Growth Factor 2
HHA	Home Health Agency
HPSA	Health Professional Shortage Area
ICU	Intensive Care Unit
IRF	Inpatient Rehabilitation Facility
LCL	Lower Confidence Limit
MA	Medicare Advantage
MEOS	Monthly Enhanced Oncology Services
MIPS	Merit-Based Incentive Payment System
NCCN	National Comprehensive Cancer Network
NK1	Neurokinin-1
NP/PA	Nurse Practitioner/Physician Assistant
NPI	National Provider Identifier
NQF	National Quality Forum
OCM	Oncology Care Model
OIP	Other Inpatient Facility
OLS	Ordinary Least Squares
PAC	Post-Acute Care
PBP	Performance-Based Payment
PDE	Prescription Drug Event
PECOS	Provider Enrollment, Chain, and Ownership System
PHE	Public Health Emergency
POLST	Physician Order for Life-Sustaining Treatment
PP	Performance Period
PSM	Propensity Score Matching
QOPI	Quality Oncology Practice Initiative
QPP	Quality Payment Program
SMD	Standard Mean Differences
SNF	Skilled Nursing Facility
TEP	Total Episode Payment
TIN	Tax Identification Number
TKI	Tyrosine Kinase Inhibitor
UCL	Upper Confidence Limit
VRDC	Virtual Research Data Center

Glossary

G. Glossary

Accountable Care Organization (ACO)	An ACO is a group of doctors, hospitals, and other health care providers that come together voluntarily to give coordinated high-quality care to their Medicare patients. When an ACO succeeds both in delivering high-quality care and in spending health care dollars more wisely, the ACO will share in the savings it achieves for the Medicare program.
Adjuvant therapy	Adjuvant therapy is an additional cancer treatment given after surgery to lower the risk that the cancer will come back. Adjuvant therapy may include chemotherapy, radiation therapy, hormone therapy, targeted therapy, or biological therapy. Neo-adjuvant therapy is given before surgery, usually to shrink the tumor or make it more accessible.
Advance care planning	A conversation between a physician (or other qualified health care professional) and a patient to discuss the patient's wishes regarding their medical treatment, if they should become unable to communicate. This discussion may or may not include completing relevant legal forms, such as health care proxies or advance directives.
Advanced Alternative payment model	An advanced alternative payment model is a subset of alternative payment models (APMs) that let physician practices earn payments for taking on down-side risk related to patient outcomes. Practices that participate in an advanced APM are eligible for up to a 5-percent incentive payment beginning in 2019 and are excluded from the Merit-Based Incentive Payment System (MIPS) reporting requirements and payment adjustment.
Advanced practice provider	Medical professionals other than physicians who are authorized to prescribe medications, such as physician assistants and nurse practitioners.
Alternative Payment Model (APM)	An APM is a payment approach that rewards providers or practices with incentive payments for providing high-quality and cost-efficient care.
Anti-emetic	Anti-emetics are medications that prevent or reduce nausea and vomiting.
Baseline period	The baseline period is the evaluation's analytic time period during which outcomes are assessed prior the implementation of the Oncology Care Model (OCM), covering episodes that initiate July 1, 2014 to January 1, 2016.
Biosimilar drug	A biosimilar drug is a biological drug that is very much like another biological drug (called the reference drug) that has already been approved by the U.S. FDA. Biosimilar drugs and reference drugs are made from living organisms, but they may be made in different ways and of slightly different substances. To be called biosimilar, a biological drug must be shown to be as safe as, work as well as, and work in the same way as its reference drug. It must also be used in the same way, at the same dose, and for the same condition as the reference drug. Biosimilar drugs must be approved by the FDA and may cost less than the reference drugs.
Cancer bundle	The cancer bundle represents the primary cancer a patient has during their episode. An episode is assigned a cancer type using the plurality of diagnoses on evaluation and management (E&M) services in the carrier file that occurred during the episode, per OCM program rules. The 21 reconciliation-eligible cancer types in the original OCM methodology are then expanded to 24, with breast cancer divided into low- versus high-risk, prostate cancer divided into low- versus high-intensity, and bladder cancer divided into low- versus high-risk. The 25th bundle is for all non-reconciliation-eligible cancer types combined.

Care coordination/ care coordinators	Care coordination involves deliberately organizing care activities and sharing information among all of the participants involved in a patient's care, to ensure the safe, appropriate, and effective delivery of health care services. The individuals who coordinate care may be called care coordinators or nurse navigators.
Care Plan	Practices participating in OCM are required to document a Care Plan for every OCM patient that includes 13 components as outlined by the Institute of Medicine. The OCM Care Plan should include: 1) patient information (e.g., name, date of birth, medication list, allergies); 2) diagnosis, including specific tissue information, relevant biomarkers, and stage; 3) prognosis; 4) treatment goals; 5) initial plan for treatment and proposed duration, including surgeries and radiation therapy; 6) expected response to treatment; 7) treatment benefits and harms; 8) information on quality of life and patient's likely experience with treatment; 9) who will take responsibility for specific aspects of a patient's care; 10) advance care plans, including advance directives and other legal documents; 11) estimated total and out-of-pocket (OOP) costs of treatment; 12) a plan for addressing a patient's psychosocial health needs, including psychological, vocational, disability, legal, and financial concerns, and; 13) a survivorship plan.
Chemotherapy (chemo)	For OCM purposes, CMS defines chemotherapy as systemic therapies including cytotoxic chemotherapy, hormonal therapy, biologic therapy, immunotherapy, and combinations of these therapies.
Clinical guidelines	Systematically developed statements to assist practitioner and patient decisions about appropriate treatment in specific clinical circumstances. Guidelines contain recommendations based on evidence from a rigorous systematic review and synthesis of the published medical literature, and define the role of specific diagnostic and treatment modalities in the diagnosis and management of patients. A clinical guideline may be broad, with several acceptable treatment regimens considered as compliant with the guideline. While clinical guidelines identify and describe generally recommended courses of treatment, they are not presented as a substitute for the advice of a physician or other knowledgeable health care professional or provider.
Coinsurance	The patient's share of costs of a covered health care service, calculated as a percentage. For example, a patient may pay 20 percent for a lab test or 80 percent for a prescribed medication that is not listed on their insurance plan's approved medication list.
Comparison practice	A non-OCM oncology practice (identified by its TIN) selected to be in the evaluation comparison group. The evaluation team found selected comparison practices to be statistically similar to participating OCM practice(s) according to propensity score matching methods.
Copay/copayment	A fixed amount or percentage that a patient pays for a covered health service. For example, a patient may need to pay $20 to visit a doctor, or for a prescription.
Cost-sharing	What a patient pays for medical services covered by their health insurance. Typical cost-sharing includes deductible, copayment, coinsurance, and premium.
Deductible	The amount a patient must spend for health care services that the patient's plan covers, before their health insurance begins to pay. For example, if a patient's deductible is $1,000, their plan will not pay anything until they have met the $1,000 deductible for covered health care services.

Difference-in-Differences (DID)	A statistical technique that quantifies the impact of an intervention by comparing changes in outcomes of treatment cases (i.e., OCM episodes) to changes in outcomes in a matched comparison group (i.e., comparison episodes), from before to after OCM implementation.
Dual eligible	A beneficiary who is enrolled in Medicare and also receiving full or partial Medicaid benefits.
Emetic	An emetic agent induces vomiting.
Emetogenic	Emetogenic describes a substance that causes nausea and vomiting.
Enhanced oncology services	OCM practices are required to make the following enhanced services available to beneficiaries with traditional Medicare insurance: 24/7 patient access to an appropriate clinician who has real-time access to patient's medical records; 2) core functions of patient navigation; 3) a documented Care Plan that contains the 13 components recommended by the Institute of Medicine; and 4) therapies consistent with nationally recognized clinical guidelines (and explain deviations).
Episodes (for OCM)	A six-month period of care that is triggered by receipt of chemotherapy with at least one cancer-related E&M service occurring within six months of the initial chemotherapy. Episodes initiate upon the date of service for an initial Part B chemotherapy drug claim with a corresponding cancer diagnosis on the claim, or upon the fill date for an initial Part D chemotherapy drug claim with a corresponding Part B claim for cancer on the date of, or in the 59 days preceding, the drug claim. If treatment continues for a beneficiary after the six-month episode, a new episode begins when the episode criteria are met again (i.e., a Part B chemotherapy infusion or Part D chemotherapy prescription within 59 days after a Part B claim for cancer, followed by a cancer E&M within six months).
Evaluation and Management (E&M)	The billing code for a specific type of patient visit with a physician or advanced practice provider, which includes at minimum the following components: 1) history; 2) examination; and 3) medical decision making. An E&M service with a cancer diagnosis on the same claim line on a carrier claim is required to identify an OCM episode as well as assign the cancer bundle to the episode.
Evidence-based care	Evidence-based care incorporates three fundamental components: 1) individual clinical expertise; 2) best external evidence; and 3) patient values and expectations. Also referred to as evidence-based practice.
Fee-for-Service (FFS)	A method in which doctors and other clinicians are paid for each service performed. Examples of services include tests and office visits. Traditional Medicare is also referred to as FFS Medicare insurance.
Fractions	The full dose of radiation is usually delivered in separate sessions, called fractions. This allows healthy cells to recover between treatments. In Medicare, a separate claim is submitted for each fraction/session.
Generic drugs	Generic drugs are copies of brand-name drugs that have exactly the same dosage, intended use, effects, side effects, route of administration, risks, safety, and strength as the original drug. Their pharmacological effects are exactly the same as those of their brand-name counterparts.
Gross drug costs	Total spending for the prescription claim, including payments from Medicare, supplemental insurance, and beneficiary payments.
Growth factors	Proteins that help the body produce white blood cells. They are also called hematopoietic, meaning blood-forming, colony-stimulating factors (CSFs). White blood cells help fight infection and can be destroyed during some types of cancer treatment. Growth factors can be administered to cancer patients, to prevent neutropenia and infection.

Gynecologic oncology	The diagnosis and treatment of cancers located on a woman's reproductive organs (e.g., ovarian cancer).
Health system or integrated health system	An organization that includes at least one hospital, and at least one group of physicians who are connected with each other and with the hospital through common ownership or joint management and combine their activities to deliver comprehensive health care services.
Health care proxy	A legally designated person who will express a patient's wishes and make health care decisions for them if they are unable to speak for themselves.
Hematology-oncology	The diagnosis, treatment, and prevention of blood diseases and blood cancers, such as leukemia, lymphoma, and myeloma.
Hierarchical condition categories (HCC)	CMS-HCC flags are used to calculate risk scores that adjust capitation payments to MA health care plans for the health expenditure risk of their enrollees. HCC scores use clinical diagnoses and comorbidities (i.e., severity of illness) from the previous year to predict costs in the coming year.
Higher-risk episodes	Includes 22 of the 25 defined cancer bundles and excludes the following: low-risk breast cancer, low-intensity prostate cancer, and low-risk bladder cancer.
Hold-out period	The six-month time period prior to the implementation of OCM during which the evaluation does not include episodes in order to prevent overlap between baseline and intervention episodes.
Home health care	Medical care provided in a patient's home. Home health care can include skilled nursing care, physical therapy, occupational therapy, intravenous drug therapy, and non-medical home aide services.
Hormone therapy	A type of therapy that adds, blocks, or removes hormones. Hormones can cause certain cancers (such as prostate and breast cancer) to grow. To slow or stop the growth of cancer, synthetic hormones or other drugs may be given to block the body's natural hormones. Also called endocrine therapy, hormonal therapy, and hormone treatment.
Hospice care	End-of-life care provided by a team of health care professionals and volunteers. The goal of hospice care is to help people who are dying have peace, comfort, and dignity. Hospice care is covered by Medicare when a patient is terminally ill and expected to live for six months or less. Patients must stop active treatment for their terminal condition to receive Medicare-covered hospice services. Hospice care can take place at home, at a hospice center, in a hospital, or in a skilled nursing facility.
Hospital readmission	An admission to an acute care hospital within 30 days of discharge from an acute care hospital.
Hospital utilization measures	Hospital utilization measures include measures of inpatient care such as hospitalizations and length of stay (i.e., Medicare covered inpatient days per episode).
Imaging	A type of test that makes detailed pictures of areas inside the body. Imaging tests use different forms of energy, such as x-rays (high-energy radiation), ultrasound (high-energy sound waves), radio waves, and radioactive substances to help diagnose or treat cancer, and to monitor for cancer recurrence. Examples of imaging tests are computed tomography, ultrasonography, magnetic resonance imaging, and nuclear medicine tests.
Immunotherapy	A type of therapy that uses substances to stimulate or suppress the immune system to help the body fight cancer.

Infusion	Treatment in which fluids, including drugs, are given through a needle or tube inserted into a vein, and travel through the blood. Also called intravenous infusion.
Inpatient care	Inpatient care is medical treatment administered to a patient who has been formally admitted to a hospital or other health care facility.
Intent-to-treat (ITT)	A method for analyzing results in a prospective study where all participants are included in the statistical analysis and analyzed according to the group they were originally assigned (intervention or comparison), regardless of what treatment (if any) they received. In the OCM evaluation, ITT analysis includes all originally participating practices, including those that terminate participation.
Intervention period	The intervention period is the analytic time period during which outcomes are assessed while the OCM intervention is in effect. For this report, the intervention period covers episodes that initiate in PP1–PP9.
Intravenous chemotherapy	Treatment in which anti-cancer drugs are given through a needle or tube inserted into a vein, and travel through the blood to kill cancer cells in the body.
Long-term care	A variety of services designed to meet a person's health or personal care needs when they can no longer perform everyday activities on their own. Long-term care is provided in different places by different caregivers, depending on a person's needs. It can be provided at home by unpaid family members and friends, or in a facility such as a nursing home.
Lower-risk episodes	Includes low-risk breast cancer, low-intensity prostate cancer, and low-risk bladder cancer.
Lumpectomy	Excision of a breast tumor with a limited amount of associated tissue.
Malignant	Cancerous. Malignant cells can invade and destroy nearby tissue and spread to other parts of the body.
Mastectomy	Surgery to remove part or all of the breast.
Medical homes	An approach to the delivery of primary care that is: 1) patient-centered; 2) comprehensive; 3) coordinated; 4) accessible; and 5) committed to quality and safety.
Medical oncology	The diagnosis and treatment of cancer using chemotherapy, hormonal therapy, biological therapy, and targeted therapy. A medical oncologist often is the main health care provider while a person is undergoing treatment for cancer. A medical oncologist also gives supportive care and may coordinate treatment given by other specialists.
Medicare Advantage (MA)	A type of Medicare health plan offered by a private company that contracts with Medicare. MA plans include: Health Maintenance Organizations, Preferred Provider Organizations, Private FFS Plans, Special Needs Plans, and Medicare Medical Savings Account Plans.
Medicare beneficiary	A person enrolled in Medicare insurance, whether traditional Medicare or an MA plan.
Merit-based Incentive Payment System (MIPS)	CMS operates a quality payment incentive program, referred to as the Quality Payment Program (QPP), which rewards value and outcomes in one of two ways: MIPS and Advanced APMs. Performance is measured in four areas: 1) quality; 2) improvement activities; 3) promoting interoperability of electronic health information; and 4) cost. All eligible clinicians were required to participate in MIPS starting in 2017 or be subject to a negative 4 percent payment adjustment on Medicare Part B

	reimbursements starting in 2019. Those who participate in an Advanced APM are eligible to receive up to a 5 percent bonus adjustment.
Metastasis	The spread of cancer cells from the place where they first formed to another part of the body. The new metastatic tumor is the same type of cancer as the primary tumor.
Monthly Enhanced Oncology Service (MEOS) payment	Payment intended to support care redesign and enhanced oncology services (see definition for enhanced oncology services). MEOS and PBPs are the financial incentives in OCM. OCM practices may bill Medicare a $160 per beneficiary fee for each month of a six-month episode, unless the beneficiary enters hospice care or dies. MEOS payments billed for beneficiaries who do not meet all episode eligibility criteria (e.g., those who switch to MA during the episode) will be recouped, since no episode will be identified for these beneficiaries.
Multi-specialty practice	Includes physicians certified in different specialties, for example, oncologists, cardiologists, surgeons, and pediatricians.
National Comprehensive Cancer Network (NCCN)	A not-for-profit alliance of leading cancer centers devoted to patient care, research, and education. NCCN is dedicated to improving and facilitating quality, effective, efficient, and accessible cancer care. NCCN develops resources that present valuable information to the numerous stakeholders in the health care delivery system, promote the importance of CQI, and create/update clinical practice guidelines for cancer care.
National provider identifier (NPI)	A unique identification number assigned to health care providers in the United States, used for administrative and financial transactions, such as submitting claims to Medicare for payment of services rendered to Medicare beneficiaries.
Neoplasm	An abnormal mass of tissue that results when cells divide more than they should or do not die when they should. Neoplasms may be benign (not cancer), or malignant (cancer). Also called tumor.
Neutropenia	A condition in which there is a lower-than-normal number of neutrophils (a type of white blood cell) in the blood. Neutrophils are made in the bone marrow. People who have neutropenia have a higher risk of getting serious infections.
Non-Reconciliation-Eligible Cancer	Types of cancer identified by CMS to be rare. OCM episodes for these cancer types are not included in PBPs, although practices may submit claims for MEOS payment during treatment episodes for these types of cancer.
Novel therapies	Novel therapies are treatments newly approved by the FDA for treatment of cancer. In OCM, PBPs are adjusted for novel therapies, which are often more costly than alternative therapies. Use of the novel therapy must be consistent with the FDA-approved indications. Most new oncology drugs/ indications are considered "novel" for two years after FDA approval for that specific indication. Payment adjustment is based on the percentage of each practice's average episode expenditures for novel therapies, compared to the average percentage for practices that are not participating in OCM.
OCM Data Registry	CMS requires practices participating in OCM to enter information about each patient's anatomic disease staging, and other clinically relevant data, into a data registry (e.g., molecular mutations that enable the use of targeted therapies). In addition, practices must report quality measurement data for the purposes of calculating PBPs and for measuring practice quality improvement.
OCM practice	An oncology practice that is participating in the OCM. OCM practices comprise the evaluation treatment group.

Oncologist	A physician who treats cancer and provides medical care for people with cancer.
Oncology	A branch of medicine that specializes in the diagnosis and treatment of cancer.
Oral chemotherapy	Treatment with drugs given by mouth to kill cancer cells or stop them from dividing.
Palliative care	Palliative care addresses symptoms of disease and treatment, to improve the quality of life of patients and their families facing life-threatening illness. Palliative care aims to prevent or relieve pain and other suffering, whether physical, psychosocial, or spiritual.
Part A	Medicare Part A is insurance coverage for inpatient care in a hospital, skilled nursing facility, inpatient rehabilitation facility, or long-term care hospital, as well as hospice care and home health care.
Part B	Medicare Part B is insurance coverage for outpatient/medical care, including medically necessary physician and other professional services and therapies, preventive services, and professionally administered prescription drugs such as chemotherapy infusions.
Part D	Medicare Part D is optional insurance coverage to help Medicare beneficiaries pay for self-administered prescription drugs. Medicare Part D plans are offered by private insurance companies.
Pathways	Pathways software programs provide CDS that guides physicians about which treatment regimen to select for a patient, based on clinical guidelines about the most efficacious or the best-value treatment option (for example, when more than one drug is equally efficacious, with equivalent toxicity risk, but they have different costs). Pathways software programs are sold by vendors and can be incorporated into or separate from a practice's EHR.
Patient navigator	A health professional who focuses on the patient's needs. The navigator helps guide the patient through the health care system and works to overcome obstacles that are in the way of the patient's receiving the care and treatment they require.
Performance period (PP)	OCM episodes are organized into six-month PPs. At each participating practice, all episodes that begin during a PP are reconciled together. For example, PP1 includes OCM-defined six-month treatment episodes that began between July 1, 2016, and January 1, 2017, the last of which ended by June 30, 2017.
Performance-based payment (PBP)	A practice participating in OCM may be eligible to receive a proportion of reductions in Medicare episode paymentsas compared with its historic benchmarks (less a discount retained by CMS). The PBP is calculated retrospectively for each PP, based on the practice's reductions in Medicare payments below a target price, adjusted for quality. The combination of these PBPs, along with monthly per-patient payments for enhanced oncology services (the MEOS payment), form the financial and quality incentives in OCM.
Post-acute care (PAC)	Includes rehabilitation or palliative services that beneficiaries receive after, or in some cases instead of, hospital care. Depending on the intensity of care the patient requires, PAC may be provided in a skilled nursing facility or in a patient's home by a home health agency.
Practice	Physician group or business entity that provides cancer care to patients, defined for OCM purposes by the unique TIN that the physicians use to submit claims for Medicare payment. Practices can be independently owned, health-system/ hospital owned, or part of an academic medical center.

Prognosis	The likely outcome or course of a disease; the chance of recovery or recurrence. A cancer prognosis may indicate the likelihood of cure, or the anticipated life expectancy when cure is not possible.
Propensity score matching	Propensity score matching is used to select a comparison group that is statistically similar to an intervention/treatment group. Propensity scores can be used to reduce or eliminate selection bias in observational studies by balancing observed covariates (the characteristics of participants' practices, markets and attributed episodes) between treatment and comparison groups. The goal is to approximate a random experiment, eliminating many of the problems that come with observational data analysis.
Prophylactic	A preventive measure. A medication or treatment designed to prevent a disease or other outcome from occurring.
Quality Payment Program (QPP)	The Medicare Access and CHIP Reauthorization Act of 2015 requires CMS to operate the Medicare QPP. There are two ways clinicians can participate in the QPP: MIPS or Advanced APMs. (See previous definitions.)
Radiation oncology	One of the three primary specialties in oncology, the other two being surgical and medical oncology, involved in the treatment of cancer. Radiation can be given as a curative modality, either alone or in combination with surgery and/or chemotherapy. It may also be palliative, to relieve symptoms (e.g., pain from bone metastases) in patients with incurable cancer.
Radiation therapy	The use of high-energy radiation from x-rays, gamma rays, neutrons, protons, and other sources to kill cancer cells or shrink tumors. Radiation may come from a machine outside the body (external-beam radiation therapy) or from radioactive material placed in the body near cancer cells (internal radiation therapy or brachytherapy). Also called irradiation and radiotherapy.
Regimen	A treatment plan that specifies the drug, dosage, schedule, and duration of treatment. A treatment regimen for a specific patient may include chemotherapy drugs as well as supportive therapy drugs such as white cell growth factors or antiemetics.
Shared decision making	A process in which clinicians and patients work together to make decisions and select tests, treatments, and Care Plans based on clinical evidence that balances risks and expected outcomes with patient preferences and values.
Office-Based Physician File	This proprietary data source of physician data contains information about every practice site in the United States where medical professionals provide care. It includes the ownership, size, address, and list of individual providers operating at the practice site, along with their health and hospital affiliations.
Skilled nursing facility (SNF)	An inpatient nursing facility where medical professionals provide skilled nursing care. Medicare Part A covers up to 100 days of care in an SNF each benefit period.
Stage	Cancer staging is usually based on the size of the tumor, whether lymph nodes contain cancer, and whether the cancer has spread from the original site to other parts of the body. Higher stages indicate larger, or more broadly spread, cancer in the body, and usually a poorer prognosis.
Supportive therapy	Medications that are used to ameliorate chemotherapy-related side effects that may occur during cancer treatments. Common types of supportive therapies include anti-nausea medications, blood cell growth factors, and bone-stabilizing medications.

Surgical oncology	Surgical oncology is one of the three primary specialties in the treatment of cancer and involves the use of surgery to remove cancerous tumors. Surgery can be used by itself or with other (adjuvant) treatments, such as chemotherapy and radiation.
Survivorship plan	A detailed plan given to a patient after successful treatment ends that contains a summary of the patient's treatment, along with recommendations for follow-up care. In cancer, the survivorship plan is based on the type of cancer and the treatment the patient received. A survivorship care plan may include schedules for physical exams and medical tests (also called surveillance) to detect whether the cancer has recurred or spread to other parts of the body. This follow-up care and surveillance usually continues for several years. A survivorship plan may also include information to help meet the emotional, social, legal, and financial needs of the patient, such as referrals to specialists and recommendations for a healthy lifestyle.
Tax identification number (TIN)	CMS uses IRS-assigned TINs to identify hospitals, physicians, and others that submit claims for payment, for services delivered to Medicare beneficiaries. The TIN is the same as the Federal Employer ID Number (FEIN) or Employer Identification Number (EIN). In OCM, all providers in a practice must submit claims for their services under one unified TIN.
Total episode payment (TEP)	The total gross Medicare Part A, B, and D payment for all cancer and non-cancer care for a patient during a six-month OCM-defined episode. Part A and B payments are standardized to remove geographic differences in labor costs and to exclude payments to providers that support larger Medicare program goals, such as disproportionate share payments. Part D payments are not standardized and are calculated as the sum of low-income cost-sharing and reinsurance. TEP does not include MEOS payments.
Toxicity	The extent to which treatment is poisonous or harmful, or causes side effects.
Two-sided risk	Participating OCM practices may voluntarily adopt two-sided risk, in which CMS recoups Medicare payments above the target. Accepting two-sided risk meets the QPP's criteria for being an advanced APM. Practices were required to move to two-sided risk (or their participation will be terminated) if they did not achieve a PBP for at least one of the first four PPs. Practices that had achieved a PBP in one of the first four PPs could choose to stay in OCM under one-sided risk.
Value-based payment models	Value-based payment models reward health care providers with incentive payments for the quality of care they provide to patients. These models are part of CMS's larger quality strategy to reform how health care is delivered and paid for.