SPECIAL SERIES: ECONOMIC ISSUES IN CANCER CARE

Trends in the Cost of Cancer Care: Beyond Drugs

Aaron A. Laviana, MD[1]; Amy N. Luckenbaugh, MD[1]; and Matthew J. Resnick, MD, MPH, MMHC[1]

INTRODUCTION

According to the Centers for Medicare & Medicaid Services (CMS), inflation-adjusted US health care spending grew 3.9% in 2017, exceeding the US economic growth rate.[1] US health care spending growth has outpaced economic growth for every decade since the 1970s[2] and total US health care costs now approximate $3.5 trillion, or $10,739 per capita.[3] In comparison, the next highest Organization for Economic Cooperation and Development country, Switzerland, averaged $8,009 in health care dollars per capita in 2017.[4]

The cost of cancer care continues to outpace other sectors of the US health care system, with 7% of all health care spending associated with cancer diagnosis, treatment, and survivorship.[1,5] Rising costs have been driven, in large part, by increasing per-capita costs of cancer care as opposed to increasing incidence or prevalence of common US cancers.[1,5] Of the five costliest health conditions in the United States, personal direct medical expenditures for cancer are the highest.[2]

Policy responses to increasing health care costs seek to identify opportunities to reduce low-value health care spending. To achieve success in improving the value of US cancer care, we must characterize the key cost drivers, identify how these cost drivers vary by cancer subtype, and ultimately determine how best to systematically improve underuse of high-value services and minimize the use of low-value services.

APPROPRIATENESS OF CARE

Understanding Costs

Total cost of care, borne by any health care purchaser, consists of two elements, quantity and price. While US health care purchasers continue to transition toward rewarding providers, hospitals, and health systems for value, the predominant model of payment in the United States remains fee for service in which those delivering health care are rewarded financially for providing more care, which, in turn, drives health care spending. Policymakers, employers, insurers, and patients continue to experiment with models to improve and reduce cost. Indeed, there are delivery system innovations, many centered around the concept of health care consumerism, that apply downward pressure on health care prices. In addition, there are novel care delivery models that seek to improve value by optimizing the intensity of care delivered to patients by improving the use of high-value services and minimizing the use of low-value services. It is important to acknowledge that targets of interventions in price and quantity are frequently different. Whereas such programs as high-deductible health plans and reference pricing engage patients as consumers to seek out low(er) priced providers and sites of service, accountable care organizations and bundled payments target providers and provider organizations to reduce the overuse of low-value services, such as postacute care, emergency department visits, and hospitalizations at the end of life.

There is rich literature that details the extent of unexplained variation in the intensity of cancer care delivery.[6-11] The Dartmouth Atlas championed investigation into variation in the delivery of care unexplained by patient or disease factors, leading to policy proposals to target high-spending areas for lower Medicare payments or coverage constraints.[12] This unexplained variation is observed across the cancer spectrum, ranging from imaging overuse for breast and prostate cancer in certain US regions[13] to the overtreatment of small papillary thyroid cancer.[14]

In 2014, the Medicare Payment Advisory Commission stated, "the greatest impact on spending growth is the advancement of medical technology."[15] There is perhaps no specialty for which innovation has driven—and continues to drive—spending than in the treatment of cancer. There is a critical tension, however, between innovation and value, in large part because of the US culture of technology adoption and diffusion. Although characterizing the value associated with any given health care service, defined as patient outcomes per unit cost,[16] is conceptually straightforward, the empirical measurement of value remains difficult. Challenges associated with value measurement are underscored in cancer care owing to the clear tension between survival and quality of life with cancer treatment. Cost-effectiveness analysis remains a valuable approach with which to measure the critical intersection between survival and quality of life. Nonetheless, all current methods have shortcomings in characterizing value that center, in large part, around variation in the quality of evidence that underlies model assumptions and interpretability for translation into clinical practice.[16,17] As we continue

Author affiliations and support information (if applicable) appear at the end of this article.

Accepted on October 2, 2019 and published at ascopubs.org/journal/jco on December 5, 2019: DOI https://doi.org/10.1200/JCO.19.01963

to transition from a fee-for-service model to value, it will be increasingly important to experiment with new methods to evaluate technology in advance of widespread diffusion.

Improving Underuse of Cancer Care Services

While frequently ignored in discussions surrounding value, improving the underuse of services is integral to delivering appropriate cancer care. For example, racial disparities in cancer treatment and outcomes have been noted in several population-based studies,[18-20] but despite this knowledge, the adoption of evidence-based cancer treatments in minority populations continues to lag. Fang et al[19] found that black patients were less likely to receive guideline-concordant curative treatment for stage III breast cancer postmastectomy radiation therapy, stage I non–small-cell lung cancer stereotactic radiation or surgery, stage III non–small-cell lung cancer chemotherapy in addition to radiation therapy or surgery, and stage III prostate cancer radiation therapy or prostatectomy. Another study by Landrum et al[20] examined 584 patients who were diagnosed or treated for cancer in Department of Veterans Affairs facilities to better understand why effective therapies were used more sparingly in elderly and minority populations. Whereas 92% to 99% of eligible patients were referred to the appropriate specialist, there was a large disparity in the receipt of surgery for stage I and II lung cancer explained by a higher rate of refusal among black versus white patients (16.2% *v* 5.7%). Improving the underuse of cancer treatment will unquestionably require the development of culturally sensitive strategies to engage populations at particular risk of cancer undertreatment.

Despite level 1 evidence to support early palliative care to improve quality of life and prolong survival for patients with metastatic non–small-cell lung cancer, its adoption remains poor, with only 19% of patients being referred at diagnosis. Research by Feld et al[21] found that 98% of patients state they would accept a referral if recommended by their oncologist and 64% were unfamiliar with palliative care altogether. Indeed, there is evidence of systematic underuse of palliative care services, which, we hope, will catalyze the development of new models to improve palliative care engagement among patients with cancer.[22]

Reducing Overuse of Cancer Care Services

In the past decade, the National Quality Forum, the American Board of Internal Medicine Foundation's Choosing Wisely program, and the US Preventative Services Task Force have all targeted low-value care.[23] Low-value care is defined with regard to net benefit, a function of the expected benefit versus cost for a group or individual, and is assessed relative to alternatives, including no treatment.[23] Interventions that are aimed at health care providers and organizations have been proven to more successfully align incentives to reduce the overuse of low-value cancer care services.

Perhaps the most significant challenge in the delivery of value-based cancer care is the tension between innovation and the discipline necessary to characterize clinical and economic value in advance of widespread technology diffusion. Indeed, there are myriad examples of high-cost technology diffusion in the delivery of cancer care absent high-quality evidence. One notable example of technology diffusion is the use of proton beam therapy for clinically localized prostate cancer. Proton beam therapy purports to deliver more precise radiation therapy to the prostate, which, in turn, results in more favorable functional outcomes. Nevertheless, there exist no randomized clinical trials to suggest that proton beam therapy is superior to intensity-modulated radiation therapy or stereotactic body radiation therapy with respect to either oncologic control or functional outcome.[24] In 2013, Blue Shield of California took the initiative to limit reimbursement for proton beam therapy, stating "there is no scientific evidence to justify spending $30,000 more for proton beam treatment compared with the price it pays for other forms of radiation that deliver similar results."[25] Whereas additional national payers followed suit, there remains a strong bias toward the early adoption of high-cost technology in the United States, specifically in cancer care.

Undoubtedly, insurers face considerable political and regulatory pressure from clinicians, health care systems, and patients rendering coverage determinations. All of these factors have contributed, in part, to the rapid adoption of robotic surgery for prostate, bladder, and endometrial cancer, among others. Since robotic surgery was first approved in 2000, its use has expanded rapidly, with more than 570,000 procedures performed worldwide in 2014.[26] Current estimates predict that robotic surgery will continue to grow near 10% per year over the next 5 years.[26] While robotic surgical systems have the potential to improve surgical technique and near-term clinical outcomes, they also create a unique set of risks and patient safety concerns. Despite multiple studies demonstrating the superiority of robotic prostatectomy over the open approach with respect to blood loss and convalescence, there remain few, if any, high-quality comparative effectiveness data that characterize long-term outcomes and costs of robotic surgery compared with conventional open surgical approaches.[27] Robotic surgery is continually found to be more expensive than open surgery and minimally invasive surgery, even after accounting for lower hospitalization costs and readmissions.[28] To this end, despite the widespread diffusion of robotic technology in oncologic surgery, there remains uncertainty as to whether the observed technology diffusion will drive meaningful improvements in the value of cancer care. Robotic surgery is but one example of rapid high-cost technology diffusion without high-quality evidence to support downstream effects on either meaningful clinical outcomes or health care costs.

There is a widespread perception that end-of-life cancer care in the United States is resource intensive, expensive, and lacks patient centeredness. More than 25% of the Medicare budget is devoted to beneficiaries who die in that year, and although challenges with end-of-life care are not new, profound growth in low-value cancer care spending has resulted in a renewed imperative to optimize the intensity of care delivered at the end of life.[29,30] Indeed, among patients with cancer with poor prognoses, those receiving hospice care had significantly lower rates of hospitalization, intensive care unit admission, invasive procedures at the end of life, and significantly lower costs during the last year of life ($71,517 for nonhospice *v* $62,819 for hospice), likely more in line with preferences.[30] Better aligning patients' goals and objectives at the end of life holds promise in both aligning health care delivery with individual patient and family preferences and minimizing health care spending at the end of life.

HOSPITAL CONSOLIDATION

Prices vary widely across the United States for the same health care service. For example, a single California employer paid between $848 and $5,984 for colonoscopy with no discernible difference in quality, while magnetic resonance imaging in the Washington DC metro area was found to range from $400 to $1,861.[31] Price differences are driven, in large part, by differences in sites of service. In oncology practice, there are material differences in infusion pricing in a hospital-based infusion center than in a freestanding office-based setting. A recent analysis of Medicare billing records of 3,248 hospitals across the United States found variation in charges by hospital across oncology specialties (radiology, hematology/oncology, medical oncology, pathology, and radiation oncology). Higher prices correlated with for-profit status for medical oncology services and prestige status for radiology and pathology services.[32] Observed price variations were two to six times the rate of Medicare reimbursement and were not explained by the quality of care delivered to populations. Similarly, large variation in radiation therapy costs has been noted for prostate cancer, with Medicare expenditures ranging from $7,948 to $13,522 in the lowest- and highest-spending quintiles, respectively.[33]

The moral hazard of US health care delivery is well known. Limited patient responsibility for health care expenditures superimposed on the administrative complexity and inconsistent price transparency in the US health care system create important barriers to the successful engagement of patients, employers, and payers to seek low(er) priced providers and sites of care delivery. The landscape of consolidation in the health care marketplace, however, seems to be driving prices in the wrong direction. From 1998 to 2012, there were 1,113 mergers and acquisitions involving 2,277 hospitals, indicating that hospitals have been aggregating into fewer and larger economic units, which, in turn, inflates market power.[34] Last year alone, Definitive Healthcare tracked more than 350 merger and acquisition announcements between health care facilities.[35] These mergers reduce price competition, thereby increasing prices. While it is theoretically possible that consolidation drives clinical integration with downstream improvements in quality, there is little empirical evidence that consolidation materially improves quality.[36] In a study that examined horizontal integration (hospital–hospital mergers) and vertical integration (hospitals' acquisition of physician practices) in California, the percentage of physicians in practices owned by a hospital increased from approximately 25% in 2010 to greater than 40% in 2016.[37] The impact of the increase in vertical integration in highly concentrated hospital markets was found to be associated with a 12% increase in marketplace premiums, with the impact of hospital concentration on premiums becoming greater as vertical integration increased. The increase in vertical integration was also associated with a 9% increase in specialist prices and a 5% increase in primary care prices. Previous studies have found that per-patient expenditures for physician groups in multihospital systems were 19.8% higher than physician-owned organizations and per-patient costs for groups owned by hospitals were 10.3% higher.[37]

MODELS TO IMPROVE VALUE

Accountable Care Organizations

In an effort to improve quality and reduce costs, CMS and multiple commercial US insurers developed alternative payment models to better align financial incentives with value. Accountable care organizations (ACOs) were developed to allow for the improved coordination of care, resulting in reduced health care costs and improved quality of health care.[38,39] There is significant variation in the delivery of low-value care, even among physicians within the same institution.[40] Current evidence suggests that ACO enrollment modestly improves health care spending and reduces the delivery of low-value health care services.[41-44] The Blue Cross Blue Shield Alternative Quality Contract resulted in slowed spending and improved quality of care in 2009. The majority of savings were achieved by changes in referral patterns rather than use.[45]

Whereas Medicare ACO enrollment results in modest improvements in spending and quality, the effect of ACO enrollment on the value of cancer care remains largely unknown. Reducing overscreening and improving underscreening is one potential vehicle that ACOs could leverage to improve the aggregate value of US cancer care. Data have demonstrated small reductions in overscreening for breast cancer and improvements in appropriate screening for colorectal cancer. Data are conflicting for prostate cancer, with some evidence demonstrating slowed decline in prostate biopsy testing for ACO-aligned beneficiaries,[46] whereas other evidence

demonstrated a reduction in prostate-specific antigen screening.[47,48]

There remain few data characterizing the effect of ACO participation on the quality or cost of cancer care. ACO participation has been associated with a 17% reduction in prostate cancer overtreatment; however, this observed change does not seem to be associated with improvements in prostate cancer spending.[49-51] In addition, there remains wide variation in ACO spending, which is not consistent across ACOs, with Medicare payments for prostate cancer care ranging from $16,523.52 to $34,766.33 in the year after diagnosis.[52] Nonetheless, ACO participation does seem to drive small magnitude reduction in readmission after major cancer surgery, which suggests that readmission reduction may be a mechanism by which ACOs may improve the value of cancer care in the United States.[53] In addition, data suggest that ACO participation does not affect end-of-life spending among patients with cancer, nor does ACO participation reduce emergency department visits, hospitalization, intensive care unit admission, or hospice care.[54]

Early evidence suggests that ACOs have not significantly affected cancer-related spending, calling into question the extent to which the ACO model will drive wholesale changes in the value of cancer care delivery.[50,52] There remain improvement opportunities for ACOs to reduce the cost of cancer care; however, this will undoubtedly require deeper engagement by specialists in ACOs, which, to date, have been largely primary care centric.

Oncology Care Model

Developed in 2015 by CMS, the Oncology Care Model (OCM) is another effort to improve the coordination of and reduce costs associated with cancer care. As of 2017, there were 190 practices participating in OCM, with more than 150,000 beneficiaries enrolled per year.[55] The goal of the OCM is to provide high-value, high-quality, and patient-centered care by using a 6-month episode-based payment model, payment incentives, and practice redesign.[55,56] Participants receive quarterly reports on rates of adherence with quality and best practice measures, and if cost savings of 4% or greater are achieved, practices receive performance-based financial bonuses.

The program remains in its infancy, and there are thus little data about cost savings achieved among practices participating in OCM. Early data have demonstrated adherence with quality measures for colon and breast cancer; however, cancer-related expenditures exceeded spending benchmarks, and the extent to which the OCM will result in material cost savings to the Medicare program remains largely unknown.[55] Similarly, median total costs per episode were $21,800 and $20,200 for OCM practices and non-OCM practices, respectively.[57] It is not surprising that the earliest evaluations of the OCM have not yielded substantive cost improvements, and it is likely that as the OCM matures the program will realize more significant cost savings, as has been demonstrated in the Medicare Shared Savings Program.[43,44] Nonetheless, it will be critically important to identify scalable solutions to improve the value of cancer care delivery among OCM practices and build infrastructure to disseminate these solutions.

Centers of Excellence

Given the prevalence of employer-sponsored health insurance in the United States, increasing health care costs are passed to employers and, ultimately, to employees through rising premiums. There remains significant variation in the cost of health care, with up to 50% variation for the same surgical procedure and, in some regions, up to a ten-fold variation in cost with no improvement in the quality of care delivered.[58] For these reasons, a number of large self-insured employers have begun to contract directly with health systems to care for their employees. These centers of excellence (COE) programs seek to reduce variation in quality and cost largely via reduction in unnecessary care and care duplication.

Existing COE programs generally develop separate bundles for evaluation and management to untangle the financial incentives aligned with delivering more care. Payment is defined prospectively, negotiated with the provider, and paid shortly after the service is received. Specifically, Walmart has built COEs for cardiac, spine, joint replacement, cancer evaluations, and bariatric surgery over the last 6 years. Early results have demonstrated lower rates of surgery, shorter lengths of stay, reduced rates of readmission, lower rates of discharge to skilled nursing facility, and importantly, earlier return to work for patients having spine and joint surgery at a COE. Overall, in 2017, it is estimated that $19.4 million was saved by Walmart, Lowe's, and McKesson through the spine and joint COE programs. The majority of the cost savings resulted from reductions in unnecessary care and improvement in complications and readmissions, with only one third a result of direct cost reductions.[58] Although data are not publicly available for the oncology programs, there is early evidence that suggests that breast, colorectal, and lung cancer COEs are more frequently used by employees than any of the other orthopedic or cardiovascular programs.[59] Going forward, these programs should be rigorously evaluated to gain insight into their successes and shortcomings to ensure that COE programs are able to provide high-value, patient-centered cancer care.

Consumerism in Cancer Care

With the increased focus on patient-centered care, there remain ongoing discussions surrounding the role of patients as consumers. Determining the optimal cancer treatment strategy requires evaluation of preferences and priorities and necessitates shared decision making between the patient and their health care team. The idea that price transparency may inform consumer decision making

in health care is not new; however, given the administrative complexity of the multipayer US health care system, it has yet to be realized. Cost sharing and high out-of-pocket payments do result in lower health care spending. Unfortunately, evidence suggests that higher levels of cost sharing result in the indiscriminate reduction in health service consumption, not simply a reduction in low-value services. In addition, it is possible that greater out-of-pocket spending will increase the burden for those of lower socioeconomic status.[60]

Models to more deeply engage patients in the financial incentives perpetuated in cancer care delivery have been proposed. For example, inclusive shared savings has been proposed to offer financial incentives to both physicians and patients who elected for lower-cost, but equally effective care.[61] Patients as consumers in health care will require careful consideration going forward. It is our responsibility to build and disseminate strategies to empower patients to make high-quality decisions inclusive of the costs of care. Certainly, as we develop and disseminate tools for transparency around price and quality, patients will be empowered to help guide their treatment plans. It will be our responsibility to respond to this empowerment and to incorporate patient attitudes toward value into personalized oncology care.

In conclusion, the cost of cancer care in the United States is increasing at a higher rate than any other sector in health care.[62] Unfortunately, observed increases in health care spending are not uniformly associated with improvements in quality. Efforts to mitigate the observed increases in cancer-related costs include supply-side interventions, such as ACOs, bundled payments, and COEs. Despite these efforts, there remains limited evidence of value improvement in cancer care delivery. This may simply be a reflection of the infancy of these efforts or it may represent the complex multidimensionality of oncologic care. Going forward, it will be critical for patients, providers, and health care systems to develop multistakeholder, collaborative interventions to ensure that the right care is delivered to the right patient at the right time.

AFFILIATION

[1]Vanderbilt University Medical Center, Nashville, TN

CORRESPONDING AUTHOR

Matthew J. Resnick MD, MPH, MMHC, Department of Urology, Vanderbilt University Medical Center, A-1302 Medical Center North, Nashville, TN 37232; Twitter: @ResnickMJ; @a_laviana; @amyluckenbaugh; @VUMChealth; e-mail: matthew.resnick@vumc.org.

EQUAL CONTRIBUTION

A.A.L. and A.N.L. contributed equally to this work.

SUPPORT

Supported by the Paul Calabresi Career Development Award for Clinical Oncology K12 (NIH Institutional Research Career Development K12 grant mechanism; A.A.L.), by a Mentored Research Scholar Grant in Applied and Clinical Research, MRSG-15-103-01-CHPHS from the American Cancer Society (M.J.R.), and the American Urological Association/Urology Care Foundation Rising Stars in Urology Research Program (M.J.R.).

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST AND DATA AVAILABILITY STATEMENT

Disclosures provided by the authors and data availability statement (if applicable) are available with this article at DOI https://doi.org/10.1200/JCO.19.01963.

AUTHOR CONTRIBUTIONS

Conception and design: All authors
Financial support: Matthew J. Resnick
Administrative support: Matthew J. Resnick
Collection and assembly of data: Aaron A. Laviana, Amy N. Luckenbaugh
Data analysis and interpretation: Aaron A. Laviana, Amy N. Luckenbaugh
Manuscript writing: All authors
Final approval of manuscript: All authors
Accountable for all aspects of the work: All authors

REFERENCES

1. Centers for Medicare and Medicaid Services: National health expenditure data. https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports/nationalhealthexpenddata/nationalhealthaccountshistorical.html
2. Peterson-Kaiser Health System Tracker: How has US spending on healthcare changed over time? https://www.healthsystemtracker.org/chart-collection/u-s-spending-healthcare-changed-time/#item-health-insurance-represents-a-growing-share-of-total-health-expenditures-particularly-public-programs_2017
3. Bureau of Economic Analysis: National economic accounts. https://www.bea.gov/national/
4. Peterson-Kaiser Health System Tracker: How does health spending in the US compare to other countries? https://www.healthsystemtracker.org/chart-collection/health-spending-u-s-compare-countries/#item-start
5. Peterson-Kaiser Health System Tracker: What are recent trends in cancer spending and outcomes? https://www.healthsystemtracker.org/chart-collection/recent-trends-cancer-spending-outcomes/#item-u-s-higher-average-disease-burden-lung-cancer
6. Sheetz KH, Ibrahim AM, Nathan H, et al: Variation in surgical outcomes across networks of the highest-rated US hospitals. JAMA Surg 154:510-515, 2019
7. Hoffman KE, Niu J, Shen Y, et al: Physician variation in management of low-risk prostate cancer: A population-based cohort study. JAMA Intern Med 174: 1450-1459, 2014
8. Fisher S, Gao H, Yasui Y, et al: Treatment variation in patients diagnosed with early stage breast cancer in Alberta from 2002 to 2010: A population-based study. BMC Health Serv Res 15:35, 2015
9. Nash R, Goodman M, Lin CC, et al: State variation in the receipt of a contralateral prophylactic mastectomy among women who received a diagnosis of invasive unilateral early-stage breast cancer in the United States, 2004-2012. JAMA Surg 152:648-657, 2017

10. Tataru D, Spencer K, Bates A, et al: Variation in geographical treatment intensity affects survival of non-small cell lung cancer patients in England. Cancer Epidemiol 57:13-23, 2018
11. Ho V, Ku-Goto MH, Zhao H, et al: Regional differences in recommended cancer treatment for the elderly. BMC Health Serv Res 16:262, 2016
12. The Dartmouth Atlas Project: The Dartmouth Atlas of Health Care. Lebanon, NH, Dartmouth College, 2010
13. Makarov DV, Soulos PR, Gold HT, et al: Regional-level correlations in inappropriate imaging rates for prostate and breast cancers: Potential implications for the Choosing Wisely campaign. JAMA Oncol 1:185-194, 2015
14. Welch HG, Doherty GM: Saving thyroids: Overtreatment of small papillary cancers. N Engl J Med 379:310-312, 2018
15. The Medicare Payment Advisory Commission: Report to the Congress: Medicare payment policy. http://www.medpac.gov/ documents/reports/mar14_entire report.pdf
16. Porter ME: What is value in health care? N Engl J Med 363:2477-2481, 2010
17. Chernew ME, Newhouse JP: Health care spending growth, in Pauly MV, McGuire TG, Barros PP (eds): Handbook of Health Economics. Amsterdam, the Netherlands, Elsevier, 2012, 1-38
18. Shavers VL, Brown ML: Racial and ethnic disparities in the receipt of cancer treatment. J Natl Cancer Inst 94:334-357, 2002
19. Fang P, He W, Gomez D, et al: Racial disparities in guideline-concordant cancer care and mortality in the United States. Adv Radiat Oncol 3:221-229, 2018
20. Landrum MB, Keating NL, Lamont EB, et al: Reasons for underuse of recommended therapies for colorectal and lung cancer in the Veterans Health Administration. Cancer 118:3345-3355, 2012
21. Feld E, Singhi EK, Phillips S, et al: Palliative care referrals for advanced non-small-cell lung cancer (NSCLC): Patient and provider attitudes and practices. Clin Lung Cancer 20:e291-e298, 2019
22. Laviana AA, Pannell SC, Huen KHY, et al: Engaging patients in complex clinical decision-making: Successes, pitfalls, and future directions. Urol Oncol 35: 569-573, 2017
23. Colla CH: Swimming against the current: What might work to reduce low-value care? N Engl J Med 371:1280-1283, 2014
24. Sheets NC, Goldin GH, Meyer AM, et al: Intensity-modulated radiation therapy, proton therapy, or conformal radiation therapy and morbidity and disease control in localized prostate cancer. JAMA 307:1611-1620, 2012
25. California Healthline: Blue Shield reduces coverage for proton beam cancer treatment. https://californiahealthline.org/morning-breakout/blue-shield-reduces-coverage-for-proton-beam-cancer-treatment/
26. Intuitive Surgical: Investor overview. http://investor.intuitivesurgical.com/?c=122359&p=irol-IRHome
27. Coughlin GD, Yaxley JW, Chambers SK, et al: Robot-assisted laparoscopic prostatectomy versus open radical retropubic prostatectomy: 24-month outcomes from a randomised controlled study. Lancet Oncol 19:1051-1060, 2018
28. Laviana AA, Ilg AM, Veruttipong D, et al: Utilizing time-driven activity-based costing to understand the short- and long-term costs of treating localized, low-risk prostate cancer. Cancer 122:447-455, 2016
29. Hogan C, Lunney J, Gabel J, et al: Medicare beneficiaries' costs of care in the last year of life. Health Aff (Millwood) 20:188-195, 2001
30. Obermeyer Z, Makar M, Abujaber S, et al: Association between the Medicare hospice benefit and health care utilization and costs for patients with poor-prognosis cancer. JAMA 312:1888-1896, 2014
31. Rosenthal E: The $2.7 trillion medical bill. The New York Times. https://www.nytimes.com/2013/06/02/health/colonoscopies-explain-why-us-leads-the-world-in-health-expenditures.html
32. Park A, Xu T, Poku M, et al: Variation in markups on outpatient oncology services in the United States. Am J Manag Care 24:e59-e60, 2018
33. Saraf AA: Geographic variation in the costs of prostate cancer care [master thesis]. Yale University, New Haven, CT, 2013
34. Barlas S: Health care consolidation continues apace: The impact on providers and patients is either mixed or unclear. P&T 40:823-858, 2015
35. Definitive Healthcare: Impacts of consolidation on the healthcare supply chain. https://www.definitivehc.com/product/healthcare-data/healthcare-provider-news
36. Nikpay SS, Richards MR, Penson D: Hospital-physician consolidation accelerated in the past decade in cardiology, oncology. Health Aff (Millwood) 37: 1123-1127, 2018
37. Scheffler RM, Arnold DR, Whaley CM: Consolidation trends in California's health care system: Impacts on ACA premiums and outpatient visit prices. Health Aff (Millwood) 37:1409-1416, 2018
38. Berwick DM: ACOs: Promise, not panacea. JAMA 308:1038-1039, 2012
39. Berwick DM, Nolan TW, Whittington J: The triple aim: Care, health, and cost. Health Aff (Millwood) 27:759-769, 2008
40. Schwartz AL, Jena AB, Zaslavsky AM, et al: Analysis of physician variation in provision of low-value services. JAMA Intern Med 179:16-25, 2019
41. McWilliams JM, Landon BE, Chernew ME: Changes in health care spending and quality for Medicare beneficiaries associated with a commercial ACO contract. JAMA 310:829-836, 2013
42. McWilliams JM, Landon BE, Chernew ME: Performance in year 1 of pioneer accountable care organizations. N Engl J Med 373:777, 2015
43. McWilliams JM, Hatfield LA, Chernew ME, et al: Early performance of accountable care organizations in Medicare. N Engl J Med 374:2357-2366, 2016
44. McWilliams JM, Hatfield LA, Landon BE, et al: Medicare spending after 3 years of the Medicare Shared Savings Program. N Engl J Med 379:1139-1149, 2018
45. Song Z, Safran DG, Landon BE, et al: Health care spending and quality in year 1 of the alternative quality contract. N Engl J Med 365:909-918, 2011
46. Luckenbaugh AN, Hollenbeck BK, Kaufman SR, et al: Impact of accountable care organizations on diagnostic testing for prostate cancer. Urology 116:68-75, 2018
47. Resnick MJ, Graves AJ, Gambrel RJ, et al: The association between Medicare accountable care organization enrollment and breast, colorectal, and prostate cancer screening. Cancer 124:4366-4373, 2018
48. Resnick MJ, Graves AJ, Thapa S, et al: Medicare accountable care organization enrollment and appropriateness of cancer screening. JAMA Intern Med 178: 648-654, 2018
49. Borza T, Kaufman SR, Yan P, et al: Early effect of Medicare Shared Savings Program accountable care organization participation on prostate cancer care. Cancer 124:563-570, 2018
50. Lam MB FJ, Figueroa JF, Zheng J, et al: Spending among patients with cancer in the first 2 years of accountable care organization participation. J Clin Oncol 36: 2955-2960, 2018
51. Cole AP, Krasnova A, Ramaswamy A, et al: Prostate cancer in the Medicare Shared Savings Program: Are accountable care organizations associated with reduced expenditures for men with prostate cancer? Prostate Cancer Prostatic Dis 10.1038/s41391-019-0138-1 [epub ahead of print on April 12, 2019]

52. Modi PK, Kaufman SR, Borza T, et al: Variation in prostate cancer treatment and spending among Medicare Shared Savings Program accountable care organizations. Cancer 124:3364-3371, 2018
53. Borza T, Oerline MK, Skolarus TA, et al: Association between hospital participation in Medicare Shared Savings Program accountable care organizations and readmission following major surgery. Ann Surg 269:873-878, 2019
54. Lam M, Zheng J, Orav EJ, et al: Early accountable care organization results of end of life spending among cancer patients. J Natl Cancer Inst 2019:djz033, 2019
55. Kline R, Adelson K, Kirshner JJ, et al: The Oncology Care Model: Perspectives from the Centers for Medicare & Medicaid Services and participating oncology practices in academia and the community. Am Soc Clin Oncol Educ Book 37:460-466, 2017
56. Kline RM, Bazell C, Smith E, et al: Centers for Medicare and Medicaid Services: Using an episode-based payment model to improve oncology care. J Oncol Pract 11:114-116, 2015
57. Abt Associates: First annual report from the evaluation of The Oncology Care Model: Baseline period. https://downloads.cms.gov/files/cmmi/ocm-baselinereport.pdf
58. Woods L, Slotkin JR, Coleman MR: How employers are fixing health care. Harvard Business Review. https://hbr.org/cover-story/2019/03/how-employers-are-fixing-health-care
59. Gamble M: Walmart has no shelf space for hospitals' shoddy healthcare. Becker's Hospital Review. https://www.beckershospitalreview.com/strategy/walmart-has-no-shelf-space-for-hospitals-shoddy-healthcare.html
60. Gusmano MK, Maschke KJ, Solomon MZ: Patient-centered care, yes; patients as consumers, no. Health Aff (Millwood) 38:368-373, 2019
61. Schmidt H, Emanuel EJ: Lowering medical costs through the sharing of savings by physicians and patients: Inclusive shared savings. JAMA Intern Med 174: 2009-2013, 2014
62. Akscin J, Barr TR, Towle EL: Key practice indicators in office-based oncology practices: 2007 report on 2006 data. J Oncol Pract 3:200-203, 2007

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

Trends in the Cost of Cancer Care: Beyond Drugs

The following represents disclosure information provided by authors of this manuscript. All relationships are considered compensated unless otherwise noted. Relationships are self-held unless noted. I = Immediate Family Member, Inst = My Institution. Relationships may not relate to the subject matter of this manuscript. For more information about ASCO's conflict of interest policy, please refer to www.asco.org/rwc or ascopubs.org/journal/jco/site/ifc.

Open Payments is a public database containing information reported by companies about payments made to US-licensed physicians (Open Payments).

Matthew J. Resnick
Leadership: Embold Health
Stock and Other Ownership Interests: Embold Health
Consulting or Advisory Role: MDxHealth, Photocure
Research Funding: Genomic Health (Inst)

No other potential conflicts of interest were reported.