

Collaboration Between Surgeons and Medical Oncologists and Outcomes for Patients With Stage III Colon Cancer

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Abstract

Purpose: Collaboration between specialists is essential for achieving high-value care in patients with complex cancer needs. We explore how collaboration between oncologists and surgeons affects mortality and cost for patients requiring multispecialty cancer care.

Patients and Methods: This was a retrospective cohort study of patients with stage III colon cancer from SEER-Medicare diagnosed between 2000 and 2009. Patients were assigned to a primary treating surgeon and oncologist. Collaboration between surgeon and oncologist was measured as the number of patients shared between them; this has been shown to reflect advice seeking and referral relationships between physicians. Outcomes included hazards for all-cause mortality, subhazards for colon cancer-specific mortality, and cost of care at 12 months.

Results: A total of 9,329 patients received care from 3,623 different surgeons and 2,319 medical oncologists, representing 6,827 unique surgeon–medical oncologist pairs. As the number of patients shared between specialists increased from one to five (25th to 75th percentile), patients experienced an approximately 20% improved survival benefit from all-cause and colon cancer-specific mortalities. Specifically, for each additional patient shared between oncologist and surgeon, all-cause mortality improved by 5% (hazard ratio, 0.95; 95%CI, 0.92 to 0.97), and colon cancer-specific mortality improved by 5% (subhazard ratio, 0.95; 95% CI, 0.91 to 0.97). There was no association with cost.

Conclusion: Specialist collaboration is associated with lower mortality without increased cost among patients with stage III colon cancer. Facilitating formal and informal collaboration between specialists may be an important strategy for improving the care of patients with complex cancers.

Introduction

With cancer burden rising and the complexity of treatment growing, cost of cancer care has outpaced that of medical care overall and is projected to reach \$158 billion by 2020.^{1,2} Furthermore, quality and outcomes across the cancer continuum remain suboptimal.³ Consequently, clinicians and policymakers are focused on delivering high-value care—that is, care that maximizes patient outcomes while containing cumulative cost.^{4,5}

Coordination of cancer care has received significant attention as a strategy to promote high-value care.⁶ Cancer treatment frequently requires multiple modalities across several care settings, delivered by a variety of health professionals and over an extended period of time. Without appropriate coordination, patients experience worse access to treatment, poorer outcomes, and higher costs.⁷⁻¹² The Institute of Medicine has identified the “poorly coordinated delivery” of cancer care as a “priority area for improvement,”^{6(p10)} and many current health care reforms seek to improve coordination of care through building integrated networks of providers to deliver complex care.¹³

One aspect of care coordination that has rarely been studied is collaboration between cancer specialists.¹⁴ Collaboration reflects the extent to which specialists work together to achieve optimal outcomes for a given patient and may result from better interpersonal information exchange and reflect longstanding relationships between specialists.¹⁵⁻¹⁹

We focus on the potential collaboration between surgeons and medical oncologists for stage III colon cancer. Colorectal cancer is the third leading cause of cancer mortality and the second most expensive cancer in the United States.¹ Stage III colon cancer requires timely surgery and adjuvant chemotherapy to improve survival.²⁰ Because this involves coordination between specialists, patients with stage III colon cancer are vulnerable to poor coordination; many patients do not receive guideline-concordant care, and disparities exist.²⁰

We used administrative claims data to explore whether patients who receive care from surgeons and medical oncologists who potentially collaborate more frequently with each other have improved overall survival, colon cancer-specific survival, and lower 12-month cost of care. We operationalized collaboration between surgeons and oncologists as the number of patients they shared (ie, when both providers bill for medical services for the same patient), because this has been shown to reflect advice seeking and referral relationships between physicians.²¹⁻²⁴

Patients and Methods

Study Population

Patients with colon cancer diagnosed between 2000 and 2009 were identified using SEER-Medicare data, a population-based cancer registry (ie, SEER) linked to claims from Medicare.

SEER encompasses 17 sites and approximately 28% of the US population; Medicare claims have been linked to approximately 93% of the Medicare patients in SEER.²⁵

Patients eligible for inclusion included those with stage III colon cancer (not rectal cancer) with continuous Part A and B Medicare coverage during the 12 months before and 12 months after their diagnosis date. We excluded patients age < 66 years who were enrolled in a health maintenance organization during the 2-year interval, diagnosed at autopsy or death, or diagnosed with a second cancer within 12 months of the colon cancer diagnosis (Appendix Figure A1, online only). We excluded patients who could not be assigned to an oncologist (n = 6,176), who did not undergo any surgery (n = 3,127) or underwent surgery beyond 3 months of diagnosis (n = 323), who could not be assigned to a surgical and/or oncologic hospital (n = 54), and whose operative surgeon could not be identified (n = 115). Because investigation of missingness revealed the missing data mechanism likely to be completely random, we excluded those who had missing covariate information (n = 791).²⁶ The final analytic cohort included 9,329 patients.

Measures

Outcomes. All-cause mortality with survival time calculated from date of colon cancer diagnosis to Medicare date of death (or censor date of December 31, 2011) was the primary outcome. Colon cancer–specific mortality was a secondary outcome; the censor date was December 31, 2009, because cause of death was not available thereafter. Total cost of care at 12 months after diagnosis was calculated as the total reimbursement made on patient claims using the Medicare Provider Analysis and Review File, Carrier Claims, and the Outpatient Statistical Analysis File.²⁷

Patient sharing between medical oncologist and surgeon. To generate more stable estimates of shared patients, we used all patients with colon cancer diagnosed between 2000 and 2009 in SEER-Medicare files, regardless of stage, who could be assigned to both a surgeon and medical oncologist. Patients were assigned to the surgeon who performed their definitive colon cancer surgery based on billing codes. For the 420 patients (4.5%) who underwent more than one surgery, assignment of surgical care was based on the first operation.^{28,29} Regarding medical oncologic care, for the 653 patients (7%) who received care from > one oncologist, we assigned patients to the medical oncologist who billed for the plurality of their visits—that is, the single medical oncologist who billed for the greatest number of visits—in the year after diagnosis.^{30,31} We used specialty codes (available in Carrier File) 83 and 90 to identify medical oncologists and 2, 28, and 91 to identify surgeons. A total of 31,310 patients with colon cancer were assigned to both a surgeon and medical oncologist. On the basis of these physician assignments for patients, we counted the number of patients shared by each unique oncologist–surgeon pair for each calendar year. Because of the non-normal distribution of shared patients, the number of shared patients between a pair of providers

was top coded at eight patients per year, representing the 99th percentile of the distribution.

Patient-level covariates. Covariates included age, sex, self-reported Medicare race (black, white, or other), census tract median household income (in quartiles), year of diagnosis, Charlson comorbidity score in the 12 months before diagnosis, urban or rural residence, and SEER site. Cancer characteristics included tumor grade, adequate lymph node resection during surgery (≥ 12 lymph nodes), and, for patients diagnosed from 2004 onward, cancer substage.³²

Physician-level covariates. Yearly surgical volume was tabulated using the total number of all patients with colon cancer on whom surgeons operated in a given year,²⁹ modeled in quartiles (< two, two, three to four, > four patient cases per year). Similarly, the yearly panel size of all patients with colon cancer attributed to each medical oncologist was modeled in quartiles (< two, two to three, four to five, > five patient cases per year).

Hospital-level covariates. Surgical hospital was defined as the location of the surgical procedure. Because a large portion of medical oncologic care is delivered in the outpatient setting, we used the approach of Bynum et al³³ to assign patients to the hospital where their medical oncologist billed for their inpatient care; oncologists who did not bill for any inpatient claims were assigned to the hospital where the plurality of their patients were admitted in a given year. Hospital characteristics from the SEER-Medicare Hospital File included National Cancer Institute–recognized status, academic hospital status (whether teaching hospital or affiliated with one), and for-profit status (government or voluntary nonprofit *v* for-profit). We determined the volume of patients with colon cancer (all stages) who underwent colon resection (as identified by International Classification of Diseases [ninth revision] codes) and received medical oncologic care at hospitals between 2000 and 2009.^{34,35} Hospital volume was analyzed in quartiles, with the following cutoffs: volume of patients with colon cancer receiving surgical care at the surgical hospital (< 112, 112 to 198, 199 to 312, > 312 patient cases) and volume of patients with colon cancer receiving oncologic care at the oncologic hospital (< 130, 130 to 210, 211 to 320, > 320 patient cases).

Statistical Analyses

We used Cox proportional hazards to model all-cause mortality and Fine and Gray's method for competing risk regression to model mortality resulting from colon cancer, where death resulting from other causes was a competing risk.³⁶ To assess the proportional hazards assumption, we used the Grambsch and Therneau test of nonzero slope.³⁷

Total cost of care accrued at 12 months was modeled with generalized linear models.³⁸ Modified Park test determined the distribution and link functions³⁹ used for modeling our data: gamma variance distribution and log link for nonextreme costs (bottom 95% of patient costs) and inverse Gaussian variance distribution and log link for extreme costs (top 5%). All US

Table 1. Association of Patient Sharing With Characteristics of Patients With Stage III Colon Cancer, Their Providers, and Their Hospitals

Characteristic	Sample (N = 9,329)		Patient Sharing per Year*		P†
	No.	%	Median	IQR	
Patients					
Age, years					.40
> 65 to 70	1,505	16.1	3	1 to 5	
71 to 75	2,166	23.2	3	1 to 5	
76 to 80	2,431	26.1	4	1 to 7	
81 to 85	1,988	21.3	4	1 to 6	
> 86	1,239	13.3	3	1 to 6	
Sex					.80
Female	5,324	57.1	3	1 to 5	
Male	4,005	42.9	3	1 to 5	
Race					.06
White	7,988	85.7	4	1 to 6	
Black	710	7.6	3	1 to 5	
Other	625	6.7	4	1 to 6	
Median income, quartile					.18
Lowest	2,331	25.0	3	1 to 5	
Second	2,340	25.1	3	1 to 5	
Third	2,319	24.9	3	1 to 5	
Highest	2,339	25.0	3	1 to 4	
Urban or rural residence, population size					.001
≥ 1 million	5,243	56.2	4	1 to 5	
≥ 250,000 to < 1 million	2,638	28.3	3	1 to 5	
< 250,000	1,448	15.5	3	1 to 5	
Charlson comorbidity score					.045
0	5,300	56.8	3	1 to 5	
1	2,353	25.2	4	1 to 5	
≥ 2	1,676	18.0	4	1 to 5	
Tumor grade, differentiation					.59
Well	476	5.1	3	1 to 5	
Moderate	5,893	63.2	3	1 to 5	
Poor	2,758	29.6	3	1 to 4	
Undifferentiated	202	2.2	3	1 to 4	
Adequate lymph node resection					.70
< 12	2,849	30.5	4	1 to 6	
≥ 12	6,480	69.5	3	1 to 5	
Substage‡					.006
IIIA	591	10.4	3	1 to 5	
IIIB	3,230	57.0	3	1 to 5	
IIIC	1,844	32.6	4	1 to 5	
Providers					
Yearly surgical volume, quartile					< .001
Lowest	2,046	22.0	2	1 to 4	
Second	1,885	20.2	2	1 to 5	
Third	2,773	29.7	3	1 to 6	
Highest	2,625	28.1	5	2 to 8	

continued on next column

Table 1. (continued)

Characteristic	Sample (N = 9,329)		Patient Sharing per Year*		P†
	No.	%	Median	IQR	
Hospitals					
Yearly oncologist panel size, quartile					.001
Lowest	2,346	25.2	2	1 to 4	
Second	2,414	25.8	2	1 to 5	
Third	2,262	24.3	4	1 to 5	
Highest	2,307	24.7	6	2 to 8	
Volume of patients, quartile					
Surgical hospital					
Lowest	2,310	24.9	2	1 to 5	
Second	2,323	25.1	3	1 to 5	
Third	2,315	25.0	4	1 to 5	
Highest	2,313	25.0	4	1 to 6	
Medical oncology hospital					
Lowest	2,320	24.9	3	1 to 5	< .001
Second	2,343	25.1	3	1 to 5	
Third	2,321	24.9	4	1 to 6	
Highest	2,343	25.1	4	1 to 6	
NCI recognized					
Surgical					
Yes	280	3.0	2	1 to 3	< .001
No	9,049	97.0	3	1 to 5	
Medical oncology					
Yes	237	2.5	2	1 to 3	< .001
No	9,029	97.5	3	1 to 5	
Academic center					
Surgical					
Yes	4,854	52.0	3	1 to 5	.003
No	4,475	48.0	4	1 to 5	
Medical oncology					
Yes	5,169	55.4	3	1 to 5	.08
No	4,160	44.6	3	1 to 5	
For-profit status					
Surgical					
Yes	899	9.6	3	1 to 4	.04
No	8,430	90.4	3	1 to 5	
Medical oncology					
Yes	838	9.0	3	1 to 5	.34
No	8,491	91.0	3	1 to 5	
Outcome Measures					
No. of deaths	5,160	55.3	NA	NA	NA
Total cost for first year of care			NA	NA	NA
Median	\$63,853				
IQR	\$40,400 to \$110,495				

Abbreviations: IQR, interquartile range; NA, not applicable; NCI, National Cancer Institute.

* Patient sharing top coded at eight.

† Kruskal-Wallis test for difference in medians, probability with ties.

‡ Sample restricted to those diagnosed from 2004 onward, for whom these data were available.

dollar values were inflated to 2009 using annual gross domestic product price indices.⁴⁰

For all models, we used multivariable regression to adjust for patient, physician, and hospital covariates. Variance inflation factors were examined to check for multicollinearity between provider and hospital characteristics. We corrected for clustering within each medical–surgical hospital pair in which the patient received care using generalized estimating equations for cost models and robust variance estimation for survival analysis.

We performed sensitivity analyses to ensure robustness of findings. First, we modeled all analyses varying the way patient sharing was operationalized: as continuous, without top coding, and as binary (upper *v* lower three quartiles). Second, although previous studies have used quartiles to adjust for provider patient volumes on cancer outcomes,^{29,41} to ensure our findings for patient sharing did not result from residual confounding from yearly surgical volume and oncologist panel size, we adjusted for these as continuous variables. Third, we modeled all analyses controlling for substage in the subcohort of patients diagnosed from 2004 onward (when this information became available). Fourth, we modeled total cost of care at 6 months and costs at both 6 and 12 months only among those surviving to each time. Fifth, we tested for potential interactions between patient sharing and race, median census tract income, urban or rural residence, and comorbidity index. Sixth, we included patients who had missing information for covariates, applying multiple imputation to model missing values using all other available patient information. Finally, because collaboration may be more challenging across hospital systems, we estimated effects for patient sharing after controlling for whether patients received their surgical and medical oncologic care at a single hospital or different hospitals as well as considering this construct as an effect modifier. Data were analyzed using STATA IC software (version 12.1; STATA, College Station, TX). Our study received approval from the Johns Hopkins University School of Medicine Institutional Review Board.

Results

Table 1 summarizes characteristics of patients with stage III colon cancer in our analytic sample. There were 9,329 individuals assigned to 3,623 different surgeons and 2,319 medical oncologists, representing 6,827 unique surgeon–medical oncologist pairs. Their physicians shared a median of three patients with colon cancer per year (interquartile range, one to five); 28% of patients were treated by a surgeon–medical oncologist pair who shared no other patients in that diagnosis year (ie, patient sharing between these physicians was limited to only one patient with colon cancer in our study). Rural patients had lower numbers of shared patients between physicians than their urban counterparts.

Overall, 5,160 patients (55.3%) died during the 12-year observation period (median and total time at risk, 3.6 and 39,448 years, respectively); median survival time was 5.3 years. Cause of death data were available up to 2009; during this 10-year period (median and total time at risk, 2.6 and 30,617 years, respectively), 2,537 patients (27%) died as a result of

colon cancer; more than 75% of deaths at 5.3 years (median survival time for cohort) resulted from colon cancer. Median unadjusted cost of care at 12 months was \$63,853 (interquartile range, \$40,400 to \$110,495).

Figure 1 shows unadjusted Kaplan-Meier curves for all-cause and colon cancer–specific mortalities for patients in the 25th (one patient shared), 50th (three patients), and 75th percentiles (five patients) of patient sharing; there is a statistically significant improvement in all-cause and colon cancer–specific survival with increasing patient sharing. **Table 2** summarizes the fully adjusted regression models for all-cause mortality, colon cancer–specific mortality, and total cost of care at 12 months. In fully adjusted analyses, for each additional patient shared per year between oncologist and surgeon, all-cause mortality improved by 5% (hazard ratio, 0.95; 95% CI, 0.92 to 0.97). A similar survival benefit was observed with colon cancer–specific mortality, with a 5% improvement in colon cancer–specific survival for every each additional patient shared (subhazard ratio, 0.95; 95% CI, 0.91 to 0.97). Patient sharing between physicians was not associated with cost of care.

Sensitivity analyses are summarized in **Table 2**. The significant association between number of shared patients per year and survival persisted when we varied how we modeled patient sharing. Accounting for whether a patient received surgical and medical oncologic care from providers of the same hospital (*v* two different hospitals) did not alter our findings. No prespecified tests of interaction were statistically significant.

Discussion

We found that potential collaboration between a patient’s treating surgeon and oncologist is associated with improved patient survival. For each patient shared per year between specialists, we observed an associated 5% survival benefit. As the number of patients shared increased from one to five (25th to 75th percentile), this translated into an approximately 20% improved survival benefit from all-cause and colon cancer–specific mortalities. In contrast, patients’ cost of care at 12 months did not vary by the number of patients shared between physicians. These results raise important considerations, which may inform strategies for improving the value of care for patients with colon cancer.

Previous studies have demonstrated that a surgeon’s operative volume and hospital surgical volume affect outcomes of patients with colon cancer.^{29,34,35,42–44} We found that the volume of patients shared between a patient’s surgeon and oncologist also played a role in patient outcomes. Our study suggests that patients with stage III colon cancer treated by physicians who share many patients experience a survival benefit over their counterparts treated by physicians who share fewer patients.

As a measure of potential physician interaction,²¹ patient sharing may capture both formal and informal opportunities for meaningful collaboration between two providers, which has been shown to improve outcomes. Formal mechanisms that promote collaboration may include working in the same practice, sharing electronic medical records, and using electronic referrals. Adoption of shared electronic medical records by

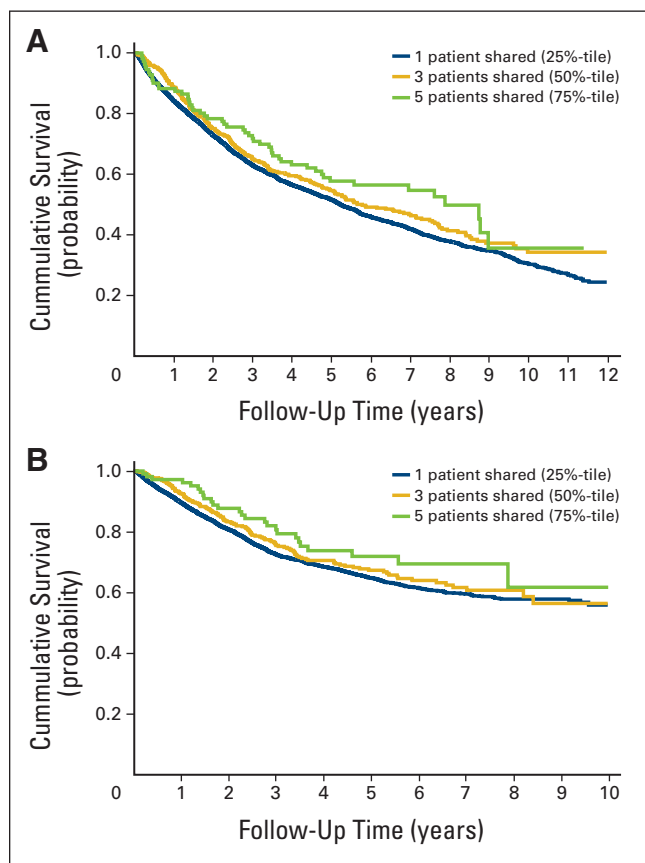


Figure 1. Kaplan-Meier survival curves from date of colon cancer diagnosis for (A) all-cause mortality and (B) colon cancer–specific mortality.

health systems may be associated with small but significant changes in mortality and cost^{45,46}; however, these associations are mixed.⁴⁷

Even after accounting for whether specialists worked in the same or different hospitals, patient sharing remained associated with lower mortality, which may suggest that additional informal mechanisms are important. A recent meta-analysis on physician collaboration found that improving interactive communication (two-way communication between providers in form of e-mail exchanges, telephone conversations, and so on) “offers an equal if not better return on investment than many clinical interventions.”^{48(p253)} Similarly, shared care, which refers to joint participation (and information exchange) between physicians in the planning of patient care, has been shown in some settings to improve cancer outcomes.⁴⁹⁻⁵² Providers may feel an increased sense of professional accountability to deliver timely, appropriate care when working with colleagues with whom they frequently collaborate.⁵³ These formal and informal mechanisms may improve coordination of care, resulting in timely transition to adjuvant chemotherapy, earlier detection and management of both postsurgical and chemotherapy-related complications, and decreased treatment-related errors, thereby improving survival.

It is noteworthy that a substantial minority of patients with colon cancer (> 25%) in our study received care from physi-

cians who did not otherwise share fee-for-service Medicare patients in a given year. We were unable to determine the reasons for this. However, for high-risk cancer surgeries, policy efforts to promote care from high-volume surgeons may have unintended consequences for collaboration.^{29,34,35,42-44} Although high-volume surgeons may be more likely to communicate with local oncologists in decisions about ongoing care,⁵⁴ little is known about how geography affects collaboration. Rural residents with cancer may be at highest risk for receiving care across geographic divides, and the danger of poor collaboration may be further heightened by an oncologic workforce in these communities that is understaffed and experiences high turnover rates.⁵⁵⁻⁵⁹

Although prior literature has demonstrated associations between higher patient sharing and lower cost among patients with chronic illnesses and in cancer survivorship care,^{23,60} we did not find a statistically significant cost savings associated with patient sharing among the patients with stage III colon cancer in our study. There are considerable costs associated with guideline-concordant treatment for stage III colon cancer, including initiation of adjuvant chemotherapy within 4 months of diagnosis.²⁰ Therefore, improved survival that is cost neutral may reflect high-value resource use among collaborating physicians rather than wasteful care that may occur more often in the care of patients with physicians who collaborate less.

There are limitations to our study. First, there were a substantial number of patients in our cohort who could not be assigned to a medical oncologist; these findings are consistent with other population-based studies, which have found that 30% to 50% of patients with stage III colon cancer do not receive chemotherapy.⁶¹⁻⁶³ Understanding the reasons why patients do not receive timely referral to a medical oncologist and adjuvant treatment, and if this is related to patient sharing, is an important area of future study. Furthermore, because of concerns regarding completeness of chemotherapy claims after changes in billing codes during the study period, we were unable to examine whether timely administration of chemotherapy potentially explained improved survival among patients receiving care from high-patient-sharing physicians. Second, to ensure high patient sharing was not simply a marker of two skilled physicians who shared many overlapping patients because of the high volume of patients each saw, we included several volume measures in our model and ensured our findings were robust to several ways of operationalizing volume. Our volume measures were based solely on Medicare data; however, volume measures constructed using Medicare data are highly correlated with those constructed from all-payer data.^{64,65} Third, we used total cost of care because of the potential difficulties in trying to specify solely cancer-related costs. Finally, because of the sample of patients in SEER-Medicare data, this study focused on patients in fee-for-service Medicare and may not be generalizable to younger patients or those in preferred provider organizations or health maintenance organizations or with other types of insurance.

Notwithstanding these limitations, our work underscores the importance of care-delivery strategies that encourage regular

Table 2. All-Cause and Colon Cancer–Specific Mortalities and Cost at 12 Months Associated With Patient Sharing per Year

Analysis	All-Cause Mortality*		Colon Cancer–Specific Mortality*		Dollars Saved at 12 Months*†	
	HR	95% CI	Sub-HR	95% CI	Mean	95% CI
Final Model						
Patient sharing as continuous with top coding‡	0.95	0.92 to 0.97	0.95	0.91 to 0.97	345	–571 to 1,222
Sensitivity Analyses						
Varying how patient sharing is modeled						
Patient sharing as continuous without top coding§	0.95	0.91 to 0.98	0.94	0.90 to 0.97	405	–325 to 1,217
Upper quartile of patient sharing (compared with lower three quartiles)	0.86	0.82 to 0.89	0.85	0.81 to 0.87	1,047	–998 to 2,009
Varying covariates in adjustment model						
Patient-sharing where oncologist panel and yearly surgical volume are modeled as continuous	0.93	0.89 to 0.95	0.92	0.89 to 0.94	339	–633 to 1,034
Patient sharing where models additionally adjust for substage	0.95	0.93 to 0.97	0.94	0.92 to 0.97	594	–1,051 to 2,799
Patient sharing where models additionally adjust for care at one or two hospitals	0.93	0.90 to 0.97	0.93	0.91 to 0.96	331	–789 to 1,205
Varying cost models						
Dollars saved among top 5% of costs	NA		NA		–14,621	–64,193 to 31,497
Dollars saved at 12 months among only those surviving to 12 months	NA		NA		1,748	–401 to 3,112
Dollars saved at 6 months	NA		NA		629	–104 to 1,145
Dollars saved at 6 months among only those surviving to 6 months	NA		NA		416	–218 to 921
Including missing data using multiple imputation						
Patient sharing as continuous with top coding, using missing data	0.94	0.92 to 0.96	0.94	0.91 to 0.96	501	–729 to 1,334

Abbreviations: HR, hazard ratio; NA, not applicable.

* Estimates are fully adjusted for all patient, provider, and hospital characteristics listed in Table 1 (except substage unless otherwise noted) as well as diagnosis year and SEER site.

† Patients in top 5% of costs are excluded unless otherwise specified.

‡ Estimates report change for each additional patient shared per year, ranging from one patient and top coded at eight. Thus, for example, all-cause mortality and colon cancer–specific mortality decreased by 6% for each additional patient shared.

§ Estimates report change for each additional patient shared per year, ranging from one to 15 patients.

|| Sample restricted to those diagnosed from 2004 onward, for whom these data were available.

collaboration between physicians who care for patients with complex illnesses. In this setting, formal and informal systems may facilitate meaningful interaction between providers who regularly share patients, improving survival of those with cancer without increasing cost. It remains uncertain whether the implementation of policy creating integrated delivery systems, such as accountable care organizations and bundled payments, will encourage referrals within a limited pool of specialist providers, thereby providing the opportunity for providers to work together more frequently. Development of strategies intended to improve the care of those with complex cancers may benefit from supporting collaboration between specialists.

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

Collaboration Between Surgeons and Medical Oncologists and Outcomes for Patients With Stage III Colon Cancer

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Appendix

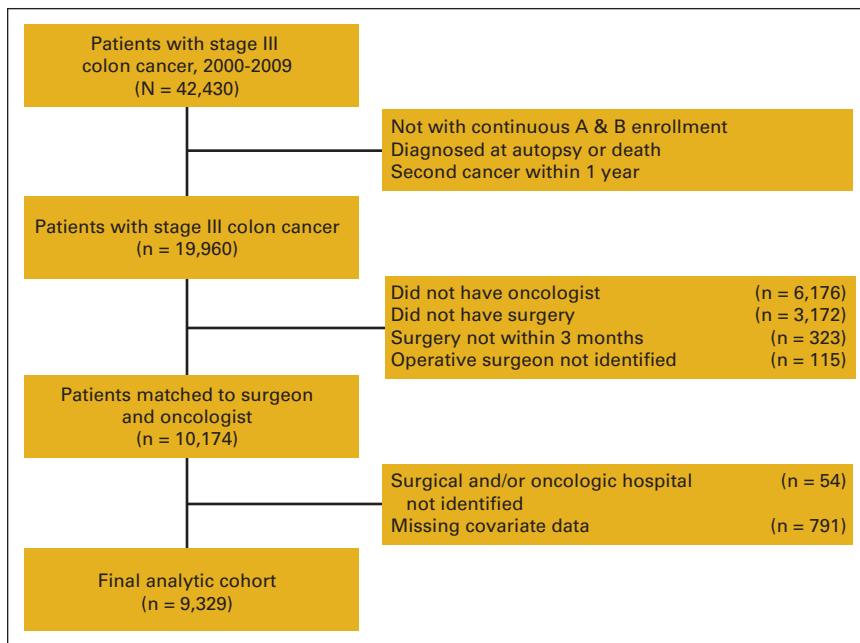


Figure A1. Flow chart of inclusions and exclusions for analytic cohort.