Original Article

Partnered Status and Receipt of Guideline-Concordant Adjuvant Chemotherapy Among Patients With Colon Cancer

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BACKGROUND: Partnered status is an independent predictor of clinical outcomes, including overall survival, among patients with cancer. However, the mechanisms by which partnered status impacts survival are not fully understood and to the authors' knowledge the associations between partnered status and the specific attributes of chemotherapy have not been studied to date. **METHODS:** The current study was an observational study of patients with resected American Joint Committee on Cancer (AJCC) stage III colon cancer diagnosed from 2008 through 2015 and recruited from an academic cancer center and 2 large community oncology practices. Outcome measures were specific attributes of adjuvant chemotherapy. Partnered status (partnered vs unpartnered) was the primary independent variable. Bivariate comparisons between independent variables and the primary outcomes were performed. Associations between partnered status and the outcomes also were analyzed using multivariable generalized estimating equations using a logit link. **RESULTS:** Data were collected from 436 patients. Of these patients, approximately 65% were from community oncology practices. Approximately 62% were partnered (married or living with a partner), and approximately 86% received adjuvant chemotherapy. Among these individuals, 87% received multiagent chemotherapy and 65% completed 6 months of therapy. Partnered patients were found to have a higher odds of completing chemotherapy (odds ratio, 1.98; 95% CI, 1.04-3.77). **CONCLUSIONS:** In this innovative investigation of the associations between partnered status and specific attributes of curative-intent chemotherapy, approximately 35% of patients terminated chemotherapy early. Having a partner increased the odds of completing therapy, which may be one mechanism through which having a partner improves disease-specific outcomes among patients with colon cancer. Identifying those aspects of partner support that can be reproduced with community or clinical personnel may help unpartnered patients to complete the recommended course of curative-intent chemotherapy. ***Cancer* 2019;125:4232-4240**. © *2019 American Cancer Society*.

KEYWORDS: adjuvant chemotherapy, colonic neoplasms, completion of therapy, marriage.

INTRODUCTION

Patients who have a partner, whether married or not, have been shown to have better cancer-specific outcomes compared with unpartnered patients.[1,2] Improved cancer-specific survival has been demonstrated for married patients diagnosed with the 10 most common cancers.[3] To our knowledge, the mechanisms by which marital status impacts survival are not fully understood,[4,5] although the protective effect of being partnered on cancer-specific survival is greater than the published survival benefit of chemotherapy for multiple cancers, including colorectal cancer.[3]

A study of adherence to specific treatment guidelines in a single, prevalent cancer such as colon cancer is one method for investigating this issue and identifying aspects of care to target for intervention and improvement. The National Comprehensive Cancer Network guidelines for stage III colon cancer recommend a defined course of multiagent, adjuvant chemotherapy after surgical resection, based on a survival advantage attributed to this approach.[6] The purpose of the current study was to investigate the possibility that specific attributes of adjuvant chemotherapy in patients with stage III colon cancer, including receipt of chemotherapy, receipt of multiagent versus single-agent therapy, and completion of the guideline-recommended course of chemotherapy, differ by partnered status.

MATERIALS AND METHODS

The current study was an observational study of patients aged 21 to 80 years who were diagnosed with resected American Joint Committee on Cancer (AJCC) stage III colon cancer between 2008 and 2015. Exclusion criteria included rectal primary tumor, nonadenocarcinoma histology, and second active malignancy. Patient data were

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abstracted from an academic cancer center and 2 community oncology practices within the Michigan Cancer Research Consortium. Eligible patients were identified via tumor registries at each site. Diagnosis and stage of disease were verified by review of pathology and radiology records. The primary outcomes and independent variables were obtained by exhaustive review of inpatient and outpatient digital and paper medical records, including records from medical oncology, surgery, primary care, laboratory, and radiology. Medical record review was conducted by 4 to 5 trained abstractors at each site using a standardized codebook with frequent checks for accuracy. Data were deidentified and entered into an electronic database by a research assistant; data analysis and interpretation were performed in a blinded fashion. All study protocols were approved by the institutional review boards of the University of Michigan and St. Joseph Mercy Hospital.

Primary Outcome Variables

There were 3 primary outcome variables: 1) receipt of adjuvant chemotherapy; 2) receipt of multiagent chemotherapy; and 3) completion of a 6-month course of chemotherapy. Receipt of adjuvant chemotherapy was ascertained from medical records and coded as a binary (yes vs no) variable. To assess multiagent versus single-agent chemotherapy, we considered only the first dose of chemotherapy to measure therapeutic intent. Receipt of single-agent or multiagent chemotherapy was recorded as a binary (single-agent vs multiagent) variable. When the patients in the current study were diagnosed and treated, the recommended duration of adjuvant chemotherapy for all patients with stage III colon cancer was 6 months. To determine whether a patient completed a 6-month course, the number of days between the first and last administered doses was calculated, which was a method used in previous studies.[7] An interval of 154 days was used as the cutoff value because a complete and timely course of leucovorin, 5-fluoroucracil, and oxaliplatin (FOLFOX) consists of 12 doses administered every 14 days, spanning 154 days between the 1st and 12th dose.

Independent Variables

We considered both clinical and nonclinical independent variables. The main independent variable of interest, partnered status, was categorized as a binary variable, with a partner defined as a spouse or significant other living in the same household as the patient. Information regarding partnered status was found in clinicians' notes, the demographics section of the medical record, and patient intake forms. Clinical variables included the number of comorbid conditions at the time of diagnosis (0-1 vs ≥2), surgical complications (yes vs no), and American Joint Committee on Cancer T and N classifications. Surgical complications were assessed by review of outpatient notes and inpatient hospital records. Both major complications that required readmission and/or another surgery or procedure and minor complications that did not require readmission were considered in the definition of a surgical complication. Nonclinical variables included age at diagnosis (<60 years, 60-70 years, or >70 years), sex (male vs female), and self-identified race (white, black, or other). Area-level socioeconomic status (SES) was determined using the patient's zip code and a validated 6-measure composite score.[8] Insurance status at diagnosis was recorded as private, Medicare, Medicaid/state-provided, or none. To account for provider-level and practice-level variation, deidentified provider and practice information were collected for each patient.

Statistical Analyses

Bivariate comparisons between independent variables were performed using chi-square tests for the primary outcomes. The outcomes also were analyzed using multivariable generalized estimating equations (GEEs) using a logit link. The GEEs used a compound symmetry correlation structure with clustering by provider and robust standard errors to explore the marginal effects of partnered status while adjusting for patient-level covariates. Potential interactions between sex and partnered status were assessed for all outcomes and demonstrated no significant associations.

To address missing data for some abstracted variables, we conducted multiple imputations under the assumption that data were missing at random. In a secondary analysis, we computed average adjusted probabilities (predictive margins) of the completion of each of the outcomes at selected levels of age, sex, and partnered status for the current study sample. All independent variables other than age, sex, and partnered status were left as originally recorded. Finally, as a sensitivity analysis to reduce bias due to any covariate imbalance, we used propensity score methods to address potential confounding. Propensity scores were estimated using a multivariable logistic regression model of patients' partnered status, given the observed covariates of age, sex, race, and area-level SES. Once estimated, the propensity scores were grouped into quintiles. The quintiles then were added as an additional factor to the GEE logistic regression in the current study to model the completion of chemotherapy as a function of partnered

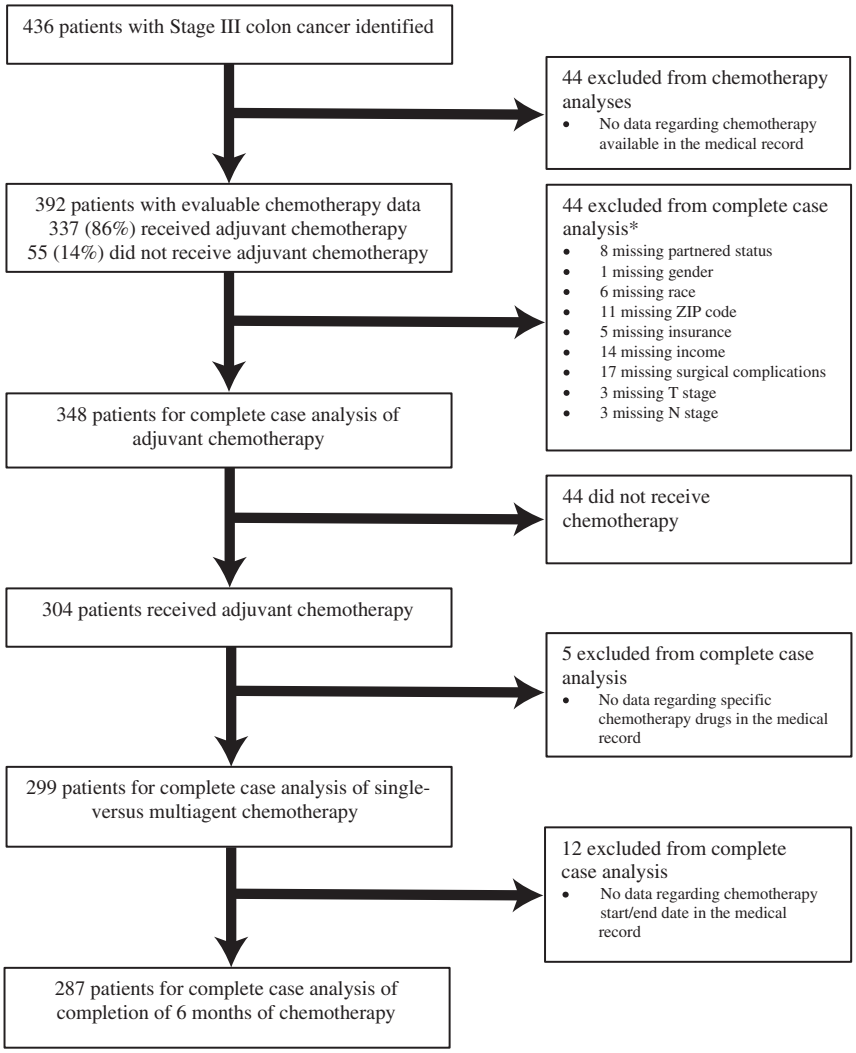

Figure 1. Flow of patients into the study and the availability of complete case data. *A patient could have data missing for >1 covariate.

status. Stata statistical software (version 14.2) was used to calculate the average adjusted probabilities via the margins command. SAS statistical software (version 9.4) was used for all other analyses. All statistical tests were 2-sided with confidence at the 95% level.

RESULTS

Study Population and Data Completeness

The study flow diagram is shown in Figure 1. In total, 436 patients who were diagnosed with stage III colon cancer between 2008 and 2015 met the inclusion criteria. Nearly two-thirds of patients (62%) were partnered. A total of 50 patients (11%) were widowed and were categorized with other unpartnered patients for these analyses. The majority of patients (65%) were treated in community oncology practices (Table 1). Data were missing due to a lack of information in patient medical records, with the percentage of missing values ranging from 0.5% for sex to 10% for receipt (or nonreceipt) of adjuvant chemotherapy. Overall, approximately 80% of cases were available for complete case multivariable regression analysis of receipt of chemotherapy. Of those who received chemotherapy, 299 patients (86%) and 287 patients (82%), respectively, were available for complete case analysis of the receipt of multiagent versus single-agent chemotherapy and chemotherapy completion. Results based on multiple imputation were similar to those of complete case analysis. Consequently, we have shown GEE results

TABLE 1. Patient Demographics (N = 436) and Bivariate Analyses of the 3 Primary Outcomes

			Among Those Who Received Adjuvant Chemotherapy			
	Receipt of Adjuvant Chemotherapy (N = 392 Patients With Evaluable Data)		Receipt of Single-Agent Versus Multiagent Chemotherapy (N = 331 Patients With Evaluable Data)		Completion of 6 Months of Chemotherapy (N = 314 Patients With Evaluable Data)	
Patient Characteristic (No.; %)	Received Adjuvant Chemotherapy No. (% Received)	*P*	Received Multiagent Chemotherapy No. (% Received)	*P*	Completed 6 Months of Chemotherapy No. (% Completed)	*P*
Overall (436; 100)	337 (86)		287 (87)		204 (65)	
Partnered status		.02		.20		.03
Unpartnered (157; 36)	108 (69)		88 (56)		54 (34)	
Married/partnered (269; 62)	223 (83)		193 (72)		147 (55)	
Missing data (10; 2)						
Age, y		<.01		<.01		.03
<60 (173; 40)	153 (88)		138 (80)		103 (60)	
60-70 (122; 28)	90 (74)		81 (66)		53 (43)	
>70 (141; 32)	94 (67)		68 (48)		48 (34)	
Sex		.30		.13		.76
Male (227; 52)	170 (75)		140 (62)		103 (45)	
Female (207; 47)	166 (80)		146 (71)		101 (49)	
Missing data (2; 0.5)						
Race		.04		.58		.65
White (340; 78)	271 (80)		231 (68)		164 (48)	
Black (76; 17)	51 (67)		45 (59)		31 (41)	
Other (13; 3)	10 (77)		7 (54)		7 (54)	
Missing data (7; 2)						
Area-level SES, tertile		<.01		.15		.13
Low (151; 35)	102 (68)		87 (58)		58 (38)	
Medium (128; 29)	101 (79)		90 (70)		69 (54)	
High (138; 32)	125 (91)		102 (74)		72 (52)	
Missing data (19; 4)						
Health insurance		<.01		<.01		.03
Private (182; 42)	155 (85)		142 (78)		104 (57)	
Medicare (200; 46)	145 (73)		112 (56)		75 (38)	
Medicaid/state-provided (34; 8)	21 (62)		18 (53)		14 (41)	
None (15; 3)	12 (80)		11 (73)		8 (53)	
Missing data (5; 1)						
No. of comorbid conditions		<.01		<.01		.81
0-1 (197; 45)	169 (86)		152 (77)		103 (52)	
≥2 (239; 55)	168 (70)		135 (56)		101 (42)	
Surgical complications		<.01		.54		.62
No (308; 71)	261 (85)		224 (73)		161 (52)	
Yes (98; 22)	64 (65)		52 (53)		38 (39)	
Missing data (30; 7)						
T classification		.70		.54		.27
T1-T2 (67; 15)	51 (76)		43 (64)		36 (54)	
T3 (265; 61)	207 (78)		175 (66)		122 (46)	
T4 (100; 23)	76 (76)		68 (68)		45 (45)	
Missing data (4; 1)						
N classification		.50		.91		.73
N1 (285; 65)	220 (77)		186 (65)		135 (47)	
N2 (146; 34)	115 (79)		100 (68)		69 (47)	
Missing data (4; 1)						
Study site		.02		.03		.39
Academic cancer center (151; 35)	123 (81)		102 (68)		79 (52)	
Community oncology practice 1 (189; 43)	160 (85)		133 (70)		93 (49)	
Community oncology practice 2 (96; 22)	54 (56)		52 (54)		32 (33)	

Abbreviation: SES, socioeconomic status.

using complete case data and have noted points at which significance differs. Multiple imputation results are included in Supporting Table 1.

Receipt of adjuvant chemotherapy

Of the 392 patients for whom information regarding chemotherapy was available in the medical record,

TABLE 2. Analyses of the 3 Primary Outcomes Using Multivariable Generalized Estimating Equations With Logit Link: Complete Case Data

			Among Those Who Received Adjuvant Chemotherapy			
	Receipt of Adjuvant Chemotherapy N = 348		Receipt of Single-Agent Versus Multiagent Chemotherapy N = 299		Completion of 6 Months of Chemotherapy N = 287	
Patient Characteristic	Received Adjuvant Chemotherapy OR (95% CI)	*P*	Received Multiagent Chemotherapy OR (95% CI)	*P*	Completed 6 Months of Chemotherapy OR (95% CI)	*P*
Partnered status		.46		.18		.04
Unpartnered	Referent		Referent		Referent	
Married/partnered	1.29 (0.65-2.58)		1.82 (0.76-4.38)		1.98 (1.04-3.77)	
Age, y		<.001		.06		.29
<60	Referent		Referent		Referent	
60-70	0.12 (0.03-0.52)		1.12 (0.42-2.97)		0.70 (0.40-1.22)	
>70	0.05 (0.01-0.21)		0.30 (0.10-0.91)		0.57 (0.28-1.15)	
Sex		.08		.02		.37
Male	Referent		Referent		Referent	
Female	2.14 (0.91-5.03)		2.32 (1.16-4.62)		1.28 (0.75-2.18)	
Race		.18		.45		.60
White	Referent		Referent		Referent	
Black	0.49 (0.20-1.17)		0.66 (0.21-2.06)		1.21 (0.58-2.54)	
Other	0.40 (0.12-1.36)		0.39 (0.09-1.75)		2.38 (0.36-15.51)	
Area-level SES, tertile		<.01		.17		.17
Medium	Referent		Referent		Referent	
High	3.56 (1.54-8.35)		0.50 (0.22-1.14)		0.52 (0.25-1.07)	
Low	0.92 (0.45-1.91)		0.71 (0.20-2.51)		0.65 (0.31-1.37)	
Health insurance		.16		.15		.30
Private	Referent		Referent		Referent	
Medicare	0.83 (0.35-1.96)		0.41 (0.18-0.92)		0.72 (0.38-1.34)	
Medicaid/state-provided	0.36 (0.14-0.92)		0.60 (0.12-2.85)		1.53 (0.43-5.52)	
None	0.37 (0.04-3.89)		1.17 (0.14-9.57)		2.17 (0.42-11.20)	
No. of comorbid conditions		.15		.22		.65
0-1	Referent		Referent		Referent	
≥2	0.35 (0.08-1.45)		0.66 (0.33-1.29)		1.20 (0.55-2.61)	
Surgical complications		<.001		.40		.34
No	Referent		Referent		Referent	
Yes	0.27 (0.16-0.48)		0.67 (0.27-1.70)		0.78 (0.46-1.30)	
T classification		.92		.14		.12
T1-T2	Referent		Referent		Referent	
T3	0.80 (0.28-2.29)		0.97 (0.41-2.26)		0.48 (0.22-1.03)	
T4	0.81 (0.15-4.35)		2.31 (0.58-9.23)		0.48 (0.22-1.02)	
N classification		.66		.70		.96
N1	Referent		Referent		Referent	
N2	0.89 (0.51-1.53)		0.88 (0.47-1.65)		1.01 (0.58-1.77)	

Abbreviations: OR, odds ratio; SES, socioeconomic status.

337 (86%) received adjuvant chemotherapy. There was a nonsignificant trend toward an earlier initiation of adjuvant chemotherapy in partnered patients compared with unpartnered patients (77.8 days vs 86.3 days; $P = .11$). In unadjusted analyses, patients who were partnered, younger, or white; with 0 to 1 comorbid conditions; with a higher area-level SES; with private insurance; without surgical complications; and from the academic cancer center or community oncology practice 1 were found to be significantly more likely to receive adjuvant chemotherapy (all $P < .05$) (Table 1). After adjustment, older patients (aged 60-70 years: odds ratio [OR], 0.12 [95% CI, 0.03-0.52]; aged >70 years: OR, 0.05 [95% CI, 0.01-0.21]), those with surgical complications (OR, 0.27; 95% CI, 0.16-0.48), and those with a lower area-level SES (low SES: OR, 0.92 [95% CI, 0.45-1.91]; high SES: OR, 3.56 [95% CI, 1.54-8.35]) were found to have lower odds of receipt of adjuvant chemotherapy (Table 2). Although marginally statistically significant in complete case analysis ($P = .08$), women had higher odds of the receipt of adjuvant chemotherapy (OR, 2.06; 95% CI, 1.04-4.09) when using multiply imputed data (see Supporting Table 1).

Receipt of multiagent chemotherapy

Of the 331 patients with available information regarding the specific chemotherapy regimen given, 287 (87%) received multiagent chemotherapy with their first dose.

TABLE 3. Differential Benefit of Being Partnered for Each Attribute of Guideline-Concordant Adjuvant Chemotherapy

Patient Profile	Receipt of Adjuvant Chemotherapy			Receipt of Multiagent Chemotherapy			Completion of 6 Months of Chemotherapy		
	Unpartnered Achieving Outcome, %	Partnered Achieving Outcome, %	Differential Benefit of Being Partnered,% (95% CI)	Unpartnered Achieving Outcome, %	Partnered Achieving Outcome, %	Differential Benefit of Being Partnered, % (95% CI)	Unpartnered Achieving Outcome, %	Partnered Achieving Outcome, %	Differential Benefit of Being Partnered, % (95% CI)
Woman aged <60 y	98.4 (96.3 to 100)	98.7 (96.8 to 100)	0.4 (−0.5 to 0.7)	91.5 (83.4 to 99.6)	95.1 (89.2 to 100)	3.6 (−1.9 to 9.0)	58.1 (42.5 to 73.7)	71.7 (59.2 to 84.2)	13.3 (0.2 to 26.3)
Man aged <60 y	96.7 (93.0 to 100)	97.4 (94.0 to 100)	0.7 (−1.1 to 2.5)	83.0 (72.5 to 93.4)	89.6 (82.1 to 97.0)	6.6 (−3.5 to 16.6)	49.7 (32.4 to 67.0)	64.3 (52.9 to 75.6)	14.4 (−0.3 to 29.1)
Woman aged 60-70 y	90.0 (81.1 to 98.8)	91.8 (83.3 to 100)	1.8 (−3.0 to 6.7)	92.3 (84.0 to 100)	95.6 (90.9 to 100)	3.2 (−2.7 to 9.2)	47.8 (33.1 to 62.5)	62.5 (49.1 to 75.9)	15.0 (0.1 to 28.7)
Man aged 60-70 y	82.6 (73.3 to 91.8)	85.4 (77.0 to 93.8)	2.8 (−4.9 to 10.6)	84.4 (70.5 to 98.3)	90.5 (84.0 to 97.0)	6.1 (−5.0 to 17.2)	39.5 (24.8 to 54.1)	54.3 (44.4 to 64.1)	15.8 (0.9 to 30.6)
Woman aged >70 y	80.9 (70.8 to 91.1)	83.9 (74.3 to 93.6)	3.0 (−5.2 to 11.2)	77.5 (65.6 to 89.4)	85.8 (74.6 to 97.0)	8.3 (−3.4 to 19.9)	33.4 (19.6 to 47.2)	47.8 (33.5 to 62.1)	15.7 (1.4 to 29.9)
Man aged >70 y	69.9 (54.7 to 85.0)	73.9 (62.1 to 85.7)	4.1 (−7.2 to 15.3)	61.7 (42.2 to 81.1)	73.5 (57.2 to 89.7)	11.8 (−0.06 to 29.2)	26.3 (13.1 to 39.4)	39.4 (28.5 to 50.3)	16.2 (1.2 to 31.1)

Data were derived from primary analyses based on multivariable logistic regression modeling. Average adjusted probabilities were calculated using preselected values of age, sex, and partnered status as shown. Race, area-level socioeconomic status, health insurance, number of comorbid conditions, surgical complications, and T and N classifications were included in the model as covariates using their original values.

On unadjusted analyses, patients who were younger, had private insurance, had 0 to 1 comorbid conditions, and from the academic cancer center or community oncology practice 1 were more likely to receive multiagent chemotherapy (all $P < .01$ except for study site, which was found to have a P value of .03) (Table 1). After adjustment, female patients had higher odds of the receipt of multiagent chemotherapy (OR, 2.32; 95% CI, 1.16-4.62) (Table 2). The results did not differ substantially between complete case and multiple imputation analyses.

Completion of chemotherapy

Of the 314 patients for whom information regarding chemotherapy start and end dates was available, 204 (65%) completed the course. The median duration of chemotherapy was 156 days. In unadjusted analyses, patients who were partnered, younger, and had private insurance were more likely to complete chemotherapy (all $P < .05$). After adjustment, partnered patients were found to have increased odds of chemotherapy completion (OR, 1.98; 95% CI, 1.04-3.77) (Table 2). To ensure that results were not biased by the 154-day indicator of completion, intervals of 146 to 151 days also were evaluated with no relevant changes noted in outcomes. Because there are fewer days (147 days) in a complete course of capecitabine plus oxaliplatin (CAPOX) compared with in a course of FOLFOX, a sensitivity analysis was performed excluding the 7 patients who received CAPOX, without a significant change in results noted. The results did not vary meaningfully between complete case and multiple imputation analyses.

Population-averaged estimates and propensity score analysis

The average predicted probabilities for the receipt of each of the components of chemotherapy for select age and sex profiles are shown in Table 3. Across all ages and both sexes, partnered patients had a 13% to 16% higher probability of completing 6 months of chemotherapy compared with unpartnered patients. In the propensity score analysis, the association between partnered status and the completion of chemotherapy remained statistically significant ($P = .05$) and unchanged (OR, 2.0 [95% CI, 1.0-3.9] vs OR, 2.0 [95% CI, 1.0-3.8]) after multivariable adjustment for all covariates as well as propensity quintile.

DISCUSSION

In the current observational study of 436 patients diagnosed with stage III colon cancer, with approximately

65% recruited from community oncology practices, we found that the majority of patients received adjuvant, multiagent chemotherapy in concordance with guidelines. However, the early cessation of chemotherapy was common: approximately 35% of patients did not complete the guideline-recommended course of curative-intent adjuvant chemotherapy. It is interesting to note that nonclinical factors that have been shown to be associated with the differential receipt of cancer care, including age, race, and SES, were not found to be associated with the early cessation of chemotherapy in the current innovative study that also adjusted for partnered status to investigate specific attributes of curative-intent chemotherapy. Being partnered was found to be protective against the early cessation of adjuvant chemotherapy, even after adjusting for other important clinical and sociodemographic variables.

There are 2 main theories for the protective effect of being partnered on survival: 1) economic/financial support; and 2) social/emotional support.[5] At least 2 studies of marital status and clinical outcomes among patients with cancer have failed to find an association between marital status, SES, and disease-specific outcomes.[9,10] Although the patients in the current study who resided in the highest tertile of area-level SES were more likely to receive adjuvant chemotherapy, we did not find significant associations between area-level SES and the receipt of multiagent therapy or the completion of therapy.

Therefore, it appears likely that partnered status is associated with the completion of chemotherapy via social and emotional support mechanisms. Although we were unable to identify these attributes in the current study, we hypothesized that partners provided the emotional and social support necessary for patients to cope with the physical side effects of chemotherapy. Partners might have provided tangible support such as transportation to and from appointments or help with household responsibilities.[11] In a prior study of caregivers of patients with colorectal and lung cancers, caregivers reported that they watched for side effects of treatment and helped the patient decide when to call a physician.[12] Therefore, it is plausible that the partners of the patients in the current study may have helped patients to identify and address clinical symptoms such as oxaliplatin-related neuropathy, thereby reducing the possibility that patients withdrew from chemotherapy early due to untreated side effects. A prior study of patients with prostate cancer found that spouses often valued treatment more than the patients themselves did, and were more willing to accept the adverse side effects of treatment as a tradeoff for more years of life for the patient.[13] Having a partner may have encouraged the patients in the current study to continue and complete curative-intent chemotherapy, even if the patient would have preferred to stop treatment early.

The higher odds of receiving multiagent chemotherapy noted among women in the current study is intriguing and was unexpected. In patients with advanced cancer, women have demonstrated a more accurate understanding of their prognosis and treatment intent compared with men.[14] It is possible that the women in the current study had a better understanding of the curative intent of adjuvant chemotherapy and the survival benefit associated with multiagent chemotherapy compared with single-agent chemotherapy.

Older studies have demonstrated a clear detriment to cancer-specific and overall survival when a 6-month course of adjuvant, single-agent fluoropyrimidine was not completed.[7,15] The study, which was performed in the modern era of combination therapy with oxaliplatin, should be viewed in parallel with recent analyses from the International Duration Evaluation of Adjuvant Chemotherapy (IDEA) collaboration. This study was designed to assess the noninferiority of 3 months of combination chemotherapy compared with 6 months. Noninferiority was not achieved, although subgroup analyses suggested that 3 months of oral CAPOX was noninferior for patients with low-risk stage III disease.[16] Thus, the 2018 National Comprehensive Cancer Network guidelines included options for 3 to 6 months of adjuvant chemotherapy for patients with low-risk disease.[6] All the patients in the current study were diagnosed and treated before these recent changes: 6 months of chemotherapy would have been the guideline-recommended course. Furthermore, we found a difference in the completion of guideline-concordant care based on partnered status, an important nonclinical factor that may persist even with shorter durations of therapy. Therefore, the findings of the current study are relevant to clinicians and patients today.

Multiple clinical implications can be drawn from the findings of the current study. Future efforts should focus on interventions and support for patients at risk of early cessation of curative-intent chemotherapy. Clinicians could use anticipatory strategies, such as psychosocial needs assessment and distress screening,[17] and include questions regarding partnered status and the availability of support from a partner.[18] Once identified, unpartnered patients could receive encouragement to help complete chemotherapy from clinic-based or community-based lay navigators.[19,20] Programs that

provide patients with individualized support from trained oncology nurses, such as the private insurer–based Cancer Support Program,[21] are another resource clinicians can leverage to help unpartnered patients complete chemotherapy. In addition, electronic symptom-monitoring systems that ascertain chemotherapy-related symptoms and report them to the clinical care team[22] potentially can be used to reduce the possibility that unpartnered patients withdraw from chemotherapy early due to unaddressed side effects. Finally, the current study findings have underscored the important role that partners play in patient care. Prior work has suggested that partners themselves may require more recognition and support from the clinical care team. Clinicians should recognize the patient-partner dyad as the unit of care, provide partners with the information and education needed to understand the care plan, briefly assess partners' needs, and suggest appropriate resources for support.[23]

There are several limitations to the current study that warrant mention. Although the geographic generalizability of the results may be limited because we studied patients treated in 1 state, the majority of patients in the current study were recruited from community oncology practices, reflecting the fact that the majority of oncology care in the United States is delivered in community settings. Although the current study did include a representative sample of black patients, there were a limited number of other racial and ethnic minority patients and we were unable to draw conclusions based on ethnicity. Because some patients completed chemotherapy outside of the practice in which they initiated treatment, we could not reliably ascertain the number of doses received or dose delays that may have occurred. However, our method of ascertaining the completion of chemotherapy using the first and last date of administration is one that has been used in previously published studies.[7] To address chemotherapy data that were missing due to some patients having received chemotherapy at a different institution from the institution at which their surgery was performed or being lost to follow-up after surgery, we conducted multiple imputations under the assumption that data were missing at random. Finally, the current study was not designed to assess survival outcomes but instead investigated specific details of curative-intent chemotherapy by partnered status to identify areas of care that potentially may impact patient outcomes and can be targeted for intervention in future studies.

There are potential confounding factors that we were unable to identify herein that warrant further investigation. These include distance to the treatment center and whether or not a patient had children. In addition, future studies should incorporate qualitative data from patients and their partners to identify specific attributes of the patient-partner relationship, such as length and quality of the relationship and the role that partners play in patient-provider encounters, that may be associated with the completion of chemotherapy. In addition, information regarding other family members or friends who provide instrumental or other support to patients during treatment could be collected.

Despite these limitations, the findings of the current study suggested that partnered status plays an independent role in the attributes of adjuvant chemotherapy, specifically completion of the guideline-recommended course. Recognition by clinicians and practices that unpartnered patients are at risk of premature chemotherapy cessation may provide opportunities for early intervention with practice-based and lay resources to increase the likelihood that all patients benefit from high-quality, guideline-concordant cancer care.

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AUTHOR CONTRIBUTIONS

Christine M. Veenstra: Conceptualization, methodology, investigation, writing–original draft, writing–review and editing, and visualization. **Sarah T. Hawley:** Conceptualization, methodology, and writing–review and editing. **M. Chandler McLeod:** Methodology, software, formal analysis, writing–review and editing, and visualization. **Mousumi Banerjee:** Methodology, formal analysis, and writing–review and editing. **Jennifer J. Griggs:** Conceptualization, methodology, investigation, writing–original draft, writing–review and editing, and visualization.

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