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RESEARCH ARTICLE

Prevalence, Predictors, and Patient Outcomes Associated with Physician Co-management: Findings from the Los Angeles Women's Health Study

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Background. Physician co-management, representing joint participation in the planning, decision-making, and delivery of care, is often cited in association with coordination of care. Yet little is known about how physicians manage tasks and how their management style impacts patient outcomes.

Objectives. To describe physician practice style using breast cancer as a model. We characterize correlates and predictors of physician practice style for 10 clinical tasks, and then test for associations between physician practice style and patient ratings of care.

Methods. We queried 347 breast cancer physicians identified by a population-based cohort of women with incident breast cancer regarding care using a clinical vignette about a hypothetical 65-year-old diabetic woman with incident breast cancer. To test the association between physician practice style and patient outcomes, we linked medical oncologists' responses to patient ratings of care (physician $n = 111$; patient $n = 411$).

Results. After adjusting for physician and practice setting characteristics, physician practice style varied by physician specialty, practice setting, financial incentives, and barriers to referrals. Patients with medical oncologists who co-managed tasks had higher patient ratings of care.

Conclusion. Physician practice style for breast cancer is influenced by provider and practice setting characteristics, and it is an important predictor of patient ratings. We identify physician and practice setting factors associated with physician practice style and found associations between physician co-management and patient outcomes (e.g., patient ratings of care).

Key Words. Quality of care, physician practice style, physician co-management, patient ratings of care, breast cancer care, provider network restrictions

Recent work has described health care as fragmented, with an opaque structure and operating rules (Sofaer 2009). Patients with multiple chronic conditions may be at highest risk for this fragmented care. Yet little is known about how physicians caring for the same patient typically manage tasks. Without care coordination—efforts to integrate the highly technical, highly differentiated health system—patients may needlessly experience gaps in treatment or, at the other end of the spectrum, redundant or unnecessary care.

Many have touted patient-centered medical homes as a means of improving patients' health care experiences (Colwill 2010). However, even the best medical homes may have little or no influence on what occurs when patients are referred into the "medical neighborhood," for example, seeking care from specialist physicians (Pham 2010).

No single physician practice style has been identified as optimal across all aspects of care. However, for certain tasks associated with cancer diagnosis and treatment, co-management, where two or more physicians actively collaborate in caring for patients with regular communication and consultation, may be the best practice style to support continuity and coordination of care. While the prevalence of co-management between pediatricians and specialists has been studied (Forrest et al. 1999), the prevalence, predictors, and patient outcomes associated with physician co-management among specialists have not been reported.

Coordinated care has been strongly advocated as a means of improving care of multiple chronic conditions (Starfield et al. 2005; Stille et al. 2005; Smith, Allwright, and O'Dowd 2007), including cancer (Committee on Quality of Health Care in America, Institute of Medicine, Institute of Medicine 2001; Hewitt, Greenfield, and Stovall 2005; Schrag et al. 2006; Aiello Bowles et al. 2008) and survivorship care (Ganz and Hahn 2008; Hong et al. 2009). However, most studies report that coordinated care is not standard, that the current health care system is fragmented, and that poor communication among providers caring for the same patient is prevalent (Gandhi et al. 2000;

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Coleman et al. 2002, 2006; Earle and Neville 2004; Pham et al. 2007; O'Malley et al. 2009). While there is growing recognition of the importance of communication and collaboration among physicians in enhancing continuity of care, to date, most work has focused on describing collaboration between a primary care doctor and a patient (Carrier, Gourevitch, and Shah 2009), or between generalists and specialists (Starfield et al. 2005; Smith, Allwright, and O'Dowd 2007, 2008; Hong et al. 2009). A study of specialists' practice style in the management of patients receiving treatments from multiple specialists could further inform the evolving study of physician communication and care coordination in health care delivery.

Breast cancer often involves treatment planning and delivery from at least three different specialists: medical oncologists, radiation oncologists, and surgeons. Depending on the tumor characteristics and other patient attributes, different specialists may be involved in treating patients. Little is known about if or when one of the specialists acts as lead in providing breast cancer care (e.g., surgeon for lumpectomy only, medical oncologist if prolonged adjuvant treatment is involved). Patients with multiple providers may be at risk for discontinuities in care (Coleman et al. 2002; Ayanian et al. 2005; Aiello Bowles et al. 2008; Sofaer 2009). For example, as patients transition from one specialist and treatment (e.g., surgical resection) to another (e.g., radiation and/or chemotherapy), if providers operate independently with no integrated plan of care, vulnerable patients, particularly those suffering adverse effects associated with treatment, may be adversely affected (Coleman et al. 2002). With all of these considerations, breast cancer is a model condition for the study of prevalence and predictors of physician practice style (Kahn et al. 2002), and the relationship between physician practice style and patient-level outcomes.

Here, we describe self-reported physician practice style of specialists associated with 10 clinically prevalent tasks in breast cancer care. We, then, test if physician practice style is associated with patient-level outcomes. We believe the study of physician practice style and its links to patient outcomes reveals pathways to improve the coordination of care for breast cancer and other conditions involving multiple specialty providers.

OBJECTIVES

In this study, we queried physicians delivering care to a population-based cohort of women with incident breast cancer about their usual practice style

for 10 prevalent clinical tasks associated with the management of a hypothetical patient with incident breast cancer. Building on earlier work by Hadley et al. 1999; and Reschovsky, Hadley, and Landon 2006, we hypothesize that physician characteristics (e.g., medical specialty), practice setting characteristics (e.g., solo practice vs. medical group or HMO), physician reimbursement (fee for service vs. salary or capitated arrangements), and structural characteristics (e.g., restrictions to referrals) may be associated with variations in physician practice styles used to manage prevalent clinical tasks.

Based on our study of physician and structural characteristics, we developed several hypotheses. Given differences in medical training, we would expect less co-management and fewer referrals from medical oncologists compared with radiation oncologists and surgeons. With greater proximity to other specialists, we expect more frequent reports of co-management or referrals in medical groups and HMOs compared with solo practice settings. If providers face restrictions to referrals, and are limited in their ability to select physician consultants and clinicians, they may be more inclined to perform tasks themselves. In a separate set of analyses, we test for associations between physician practice styles and patient outcomes (e.g., patient ratings of care) for four clinical tasks. We believe co-management will be associated with higher patient ratings of care for these tasks. We believe this is the first study describing the prevalence of physician practice styles, identifying the predictors and correlates of physician co-management among cancer specialists and the relationship between physician practice style and patient outcomes.

METHODS

Provider-Level Data Source

As part of the Los Angeles Women's (LAW) Health Study, using previously tested methods for identifying patients' providers (Kahn et al. 2007), we asked a population-based cohort of women with incident breast cancer about their care and the providers who delivered that care. From the provider names and contact information, we initially identified 747 physicians, confirming names and addresses for 477 physicians (64 percent). We mailed the final, self-administered survey instrument to physicians between April and October of 2004, including 175 medical oncologists, 75 radiation oncologists, and 227 surgeons. The research team obtained 348 surveys from physicians associated with 298 unique office addresses, for a final response rate of 77 percent (63 percent for

medical oncologists, 88 percent for radiation oncologists, and 75 percent for surgeons) (Tisnado et al. 2008, 2009). We excluded one physician who did not complete questions about specialty physician practice style. The sample for the provider-level analysis was 347 physicians. For the patient outcomes analyses, we limited our provider sample to patients associated with medical oncologists only (*n* for patients = 411, *n* for providers = 111).

Patient-Level Data Source

We used patient self-report data from the LAW Study, a population-based, longitudinal, telephone health survey of women with breast cancer 50 years and older in Los Angeles County (Chen et al. 2008; Yoon et al. 2008a; Yoon et al. 2008b; Chen et al. 2009). Ninety-minute computer-assisted telephone interviews were conducted in English and Spanish. The sample for the survey was drawn from a census of incident breast cancer cases diagnosed March through November 2000 identified by Rapid Case Ascertainment (RCA) of the Los Angeles County Cancer Surveillance Program (LAC CSP) (Pearson et al. 2002). The LAC CSP staff screened pathology reports in all LAC hospitals at least monthly to identify incident cancers and enter relevant information (e.g., type of cancer, surgery, patient contact information) into a central database. Cancer researchers can then petition to use the information collected by RCA for research purposes. To minimize respondent burden, the LAC CSP did not release information pertaining to Asian American women 50–59 years of age and more than 75 years of age for this study because these women had already participated in another study.

A total of 2,745 patients were initially identified by RCA from 103 hospitals. Of these women, 1,269 completed the baseline telephone interview for a response rate of 64 percent. The baseline survey was conducted a mean of 223 days after diagnosis (median 185 days, interquartile range, 159–255). The response rate for the follow-up survey was 79 percent. A flow chart showing how the analytic sample was derived can be found in Yoon et al. (2008a). We restricted the patient-level sample to women who could be linked to their medical oncologist from whom we had provider survey data (n = 411).

Dependent Variables

Provider-Level Dependent Variable. The specifications for the provider-level dependent variable are derived from physicians' descriptions of their typical management of 10 tasks associated with 3 clinical domains for a hypothetical

patient (Table 2). The first domain represents *initial consultation*: that is, establishment of goals for cancer treatment and prognosis; assessment of patient preferences; and determination of the initial course of cancer treatment. The second domain represents physician *decision-making for each patient*, that is, decisions about type of breast surgery; possible use of radiation therapy; or possible use of chemotherapy. The third domain addresses *treatment of symptoms and comorbidities:* that is, prescribing opiates for pain; evaluation and treatment of cancer-related arm symptoms such as lymphedema; depressive symptoms; and management of non-cancer-related comorbidities (e.g., diabetes).

For each clinical task, physicians selected one of four response options to describe their practice style: I provide this care myself without much input from another clinician; I co-manage or decide jointly about this care with another clinician; I refer patients to another clinician for this aspect of care; I am not involved in this aspect of care. We categorize physician style as *independent* if physicians reported completing tasks without much input from another clinician, and as *co-managing* if the respondent indicated he or she would decide jointly about care with another clinician. Physicians' responses did not suggest that specialists typically referred patients or did not handle tasks. Our goal here was not to characterize one practice style as more appropriate than another but to describe alternative styles physicians report for typically managing tasks.

Patient-Level Dependent Variable. The patient-level dependent variable is an overall score averaging responses associated with six items from the patient interview, adapted from CAHPS hospital survey (Marshall et al. 2001). Please see Appendix B for items. The interview asked: Did your provider explain enough about the risks and benefits of each diagnostic procedure and treatment? Did your provider take into account all of your medical problems when providing your care? Response options for each of the six items included Excellent, Very Good, Good, Fair or Poor, and they were scored from 100 (Excellent) to 0 (Poor).

Independent Variables

Provider-Level Independent Variables. Physician independent variables included physician demographic characteristics (age, gender); specialty type (medical oncologist, radiation oncologist, surgeon); and physician practice

characteristics (working full- or part-time; physician volume, defined as physician-reported number of new cancer patients in the last month).

Physician compensation methods and financial incentives. Building on examples from the literature (Hadley et al. 1999; Reschovsky, Hadley, and Landon 2006), we asked physicians about the percentage of patients covered by payment sources: Medicare, Medicaid, or, private health insurance (for each payment source, we asked if it was fee-for-service or managed care) or if the patient was uninsured. We also asked about payment mechanisms (e.g., salary, salary with bonuses, fee-for-service reimbursement, and capitation or pre-paid reimbursement). From physician report of proportion of payment sources and mechanisms, we derived measures of salary or fee-for-service reimbursement, dichotomized as low or high ($<$ vs. ≥ 50 percent). Capitation or prepaid reimbursement was dichotomized as any or none. In addition, we queried physicians if they ever had any financial incentives to increase practices or services versus none (e.g., we asked medical oncologists if they received financial incentives for the use of parenteral chemotherapy or growth factor injections in the office) (Tisnado et al. 2008).

Practice setting characteristics. We asked physicians to describe their practice. Practice setting was categorized as solo practice (reference group); county government or medical school or university; staff/group model HMO; or medical group. We also asked physicians about the number of full-time physicians in their practice: 1, 2–5, 6–15, 16–24, 25–49, or 50 or more. Because of small numbers of observations in some of the practice size responses, we indicated large practice size as 50 or more full-time physicians.

Physicians were asked whether they experienced barriers to arranging high-quality referrals for their patients, including the following: provider network restrictions imposed by a health plan, medical group, or IPA; lack of established professional relationships with high-quality providers; or because Medicaid is not accepted by high-quality providers. We also queried physicians about tumor board involvement, deriving a measure indicating weekly or monthly tumor board attendance versus less frequent attendance (Scher et al. 2011).

Patient-Level Independent Variables. In the analyses testing for associations between physician practice style and patient-level outcomes, patient-level controls include age, race/ethnicity, marital status, tumor stage (stage 0, 1 or 2 as reference vs. stage 3 or stage 4) and number of comorbid conditions.

Analytic Methods

Provider-Level Analytic Methods. In the analyses of specialty physician practice style, we fit population-average panel-data models using generalized estimation equations (Liang and Zeger 1993) to estimate how often physicians reported co-managing tasks, adjusting for multiple questions associated with each provider. We ranked the four response options reflecting varying degrees of physician involvement in managing each task: *independent or provision of care without much input from others; co-managing or joint decision-making with another physician; referring to another physician for care; or no involvement in care.* To test whether our results were dependent on response option order, we conducted sensitivity analyses switching co-management and referral. Results were consistent, indicating that our results were robust across ordering schemes.

Tests for correlations showed salary was highly correlated with measures of practice setting (physician practices in an HMO or big practice variables; 0.47 and 0.46, respectively), so the variable was excluded from the multivariate analyses. Sensitivity analyses tested a priori hypothesized interactions between physician characteristics; practice setting and practice size; and between physician compensation methods, financial incentives, and practice settings (Conrad and Christianson 2004). No statistically significant terms were found.

Patient-Level Analytic Methods. In the linked patient-provider-level analyses, we used multilevel mixed-effect linear models to predict patient ratings of care, while controlling for multiple patients clustering within medical oncologists. We conducted analyses with and without providers who reported not managing tasks; the results were the same. To simplify presentation, we present the results excluding those who reported not managing tasks.

Table 1: Provider Self-Report of Physician and Office Characteristics

Variable	*All N = 347*	*Medical Oncologist N = 111*	*Radiation Oncologist N = 66*	*Surgeon N = 170*
Physician demographics				
Mean physician age in years and SD (range)	52 SD 9.3 (34–79)	53 SD 8.6 (35–79)	49 SD 9.9 (34–78)	53 SD 9.2 (35–77)
Physician gender				
Male	82%	76%	79%	87%
Physician race/ethnicity				
Non-Hispanic White	66%	64%	65%	69%
Non-Hispanic Black	3%	3%	3%	8%
Hispanic	5%	3%	3%	2%
Asian	20%	23%	24%	16%
Other	6%	7%	5%	5%
Physician volume				
Mean number of new cancer patients during last month and SD (range)	20 SD 21 (0–180)	28 SD 29 (2–180)	31 SD 16 (10–100)	10 SD 8 (0–55)
Physician working full-time or part-time in patient care				
Physicians working ≤ 30 hours in direct patient care	13%	15%	13%	12%
Practice type[‡]				
Solo	30%	24%	8%	42%
County or medical school or university	8%	12%	9%	5%
HMO	18%	16%	13%	21%
Medical group	45%	50%	70%	32%
Practice size*				
Large practice (50 or more full-time physicians in main practice)	17%	15%	4%	23%
Financial incentives and payment				
Physician reported any financial incentives to expand clinical practices or services to patients[†]	21%	39%	9%	11%
Physician reported predominantly payment on a salary basis	46%	53%	57%	36%
Physician reported predominantly fee-for-service payment*	32%	25%	22%	40%
Physician reported receiving any capitated payment	16%	20%	15%	14%
Barriers to referrals				
Provider reported barriers to referral of high-quality providers because of:				
Provider network restrictions	21%	25%	23%	17%
Lack of established relationship with high-quality provider	8%	9%	8%	7%

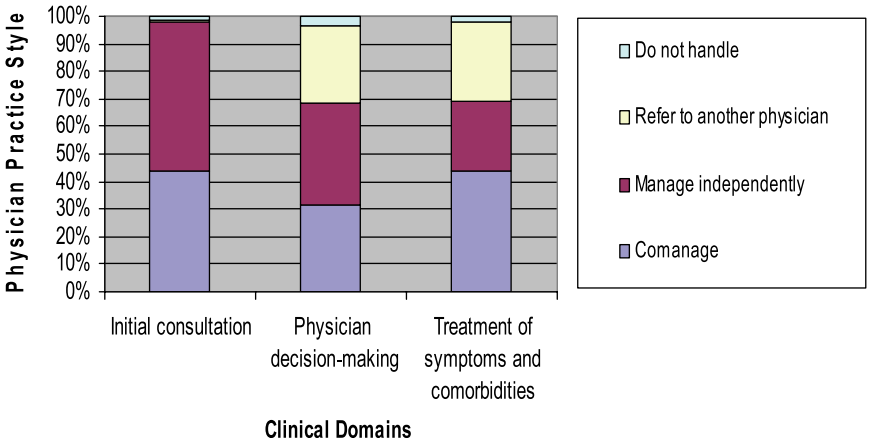
continued

Table 1. *Continued*

Variable	*All N = 347*	*Medical Oncologist N = 111*	*Radiation Oncologist N = 66*	*Surgeon N = 170*
Medi-Cal was not accepted by high-quality provider	38%	47%	39%	31%
Tumor board participation				
Weekly or monthly tumor board participation	84%	88%	99%	75%

*$p < .05$;†$p < .01$;‡$p < .001$.

Figure 1: Prevalence of Physician Co-Management by Domain



RESULTS

Provider-Level Descriptive Results

Among the 347 physician respondents, 32 percent were medical oncologists, 19 percent were radiation oncologists, and 49 percent were surgeons (Table 1). The mean age of physicians was 52 years (SD: 9.3 years); 82 percent were male, and two-thirds were Caucasian. Physicians reported 20 new cancer patients during the last month, on average. Thirteen percent of physicians reported working part-time (30 hours or less per week).

Table 2: Physician Practice Style Items for 10 Clinical Tasks by Specialty

Variable	*All* *N = 347 (%)*	*Medical Oncologist* *N = 111 (%)*	*Radiation Oncologist* *N = 66 (%)*	*Surgeon* *N = 170 (%)*
Domain I. Initial consultation				
a. Establish goals for cancer treatment‡				
I manage	49	76	24	36
I co-manage	48	24	74	59
I refer	2	0	0	4
I do not handle	1	0	2	1
b. Assess patient preferences‡				
I manage	62	82	35	55
I co-manage	37	18	64	43
I refer	0	0	0	0
I do not handle	1	0	1	2
c. Determine the initial course of cancer treatment ‡				
I manage	57	74	17	57
I co-manage	40	25	80	39
I refer	2	1	0	2
I do not handle	1	0	3	2
Domain II. Physician decision-making				
d. Decide about type of breast surgery‡				
I manage	39	12	3	72
I co-manage	47	65	68	26
I refer	12	22	21	1
I do not handle	2	1	8	1
e. Decide about possible use of radiation‡				
I manage	22	17	68	9
I co-manage	63	68	32	70
I refer	15	15	0	20
I do not handle	0	0	0	1
f. Decide about possible use of chemotherapy‡				
I manage	37	93	3	4
I co-manage	39	6	47	63
I refer	23	1	47	32
I do not handle	1	0	3	1
Domain III. Treatment of Symptoms and comorbidities				
g. Prescribe opiates for pain*				
I manage	72	90	53	64
I co-manage	22	10	41	25
I refer	5	0	5	9
I do not handle	1	0	2	2
h. Evaluate and treat cancer-related arm symptoms†				
I manage	27	34	12	27
I co-manage	44	42	38	47

continued

Table 2. *Continued*

Variable	All N = 347 (%)	Medical Oncologist N = 111 (%)	Radiation Oncologist N = 66 (%)	Surgeon N = 170 (%)
I refer	28	23	50	23
I do not handle	1	1	0	3
i. Evaluate and treat depressive symptoms‡				
I manage	17	37	7	4
I co-manage	29	51	20	14
I refer	46	12	68	67
I do not handle	8	0	5	15
j. Manage non-cancer-related comorbidities such as diabetes‡				
I manage	8	14	0	6
I co-manage	24	42	1	19
I refer	62	43	91	66
I do not handle	6	1	8	9

*$p < .05$;†$p < .01$;‡$p < .001$.

Provider-Level Bivariate Results by Domain of Care and Provider Specialty

Across the domains, radiation oncologists reported co-managing more (4.6 of 10 tasks), followed by surgeons (4.0 tasks) and medical oncologists (3.5 tasks) (Figure 1). Medical oncologists reported independently managing 5 of 10 tasks.

For the initial consultation domain (Table 2), all physicians reported either independently managing or co-managing tasks. Medical oncologists frequently reported independently managing these tasks, for example, without much input from other physicians, while radiation oncologists frequently reported co-managing these tasks.

In the decision-making domain, the vast majority of physicians reported independently managing decisions about treatments within their own specialty, but they reported co-managing patients or referring patients for decisions about treatments delivered by other specialists.

In the treatment of symptoms and comorbidities domain, physician reports of practice style varied. Most physicians (72 percent) reported independently prescribing opiates for pain. Medical oncologists varied in reports of how they treated arm symptoms associated with lymphedema: 42 percent reported co-managing care, 34 percent reported independently managing care, and 23 percent reported referring the patient to another clinician for treatment. Approximately half the surgeons and radiation oncologists reported referring patients with lymphedema to another clinician for treat-

ment. For the treatment of depressive symptoms, half of medical oncologists (46 percent) said that they referred patients to another clinician for treatment, and 37 percent said that they would independently manage care. In contrast, two-thirds of surgeons and radiation oncologists said that they referred patients for treatment of depressive symptoms.

For treatment of non-cancer-related comorbidities (e.g., diabetes), medical oncologists were equally likely to report co-managing care (42 percent) or referring (43 percent) patients to other clinicians for treatment. In contrast, most surgeons (66 percent) and almost all (91 percent) radiation oncologists reported referring patients for treatment of non-cancer-related comorbidities. Eight percent of radiation oncologists and 9 percent of surgeons reported that they would not perform this task at all.

Provider-Level Multivariate Results

Physician Characteristics. As shown in Table 3, older physicians were less likely to co-manage or refer patients (Coefficient: −0.003, 95% CI: −0.006, −0.0004, $p < .05$). Consistent with differences in specialist training and expertise, physician specialty was a significant predictor of physician practice style. Compared with medical oncologists (reference group), radiation oncologists and surgeons reported co-managing or referring significantly more tasks across all three domains (Coefficient: 0.493, 95% CI: 0.416, 0.570, $p < .001$ for radiation oncologists; and coefficient for surgeons: 0.307, 95% CI: 0.239, 0.376, $p < .001$).

Practice Setting Characteristics. Physicians in HMOs report co-managing or referring more tasks compared with physicians in solo practice (Coefficent: −0.150, 95% CI: −0.251, −0.049, $p < .01$). Physicians who reported having (any) financial incentives were less likely to report co-managing or referring patients (Coefficient: −0.080, 95% CI: −0.150, −0.010, $p < .05$). Physicians who reported that provider network referrals imposed by a health plan, medical group, or IPA are barriers to high-quality referrals reported less co-management or referral of patients to other physicians (Coefficient: −0.200, 95% CI: −0.266, −0.135, $p < .001$).

Patient-Level Descriptive Results

The patients include women ranging from ages 50 to 99. Forty-one percent were age 50–59, 17 percent were age 60–64, 26 percent were age 65–74, and

Table 3: Multivariate Analysis of Specialty Physician Practice Style Associated with 10 Clinical Tasks [1]

Variable	*Specialty Physician Practice Style Associated with 10 Clinical Tasks Coefficient (95% Confidence Interval)*
Physician demographics	
Age	**−0.003* (−0.006, −0.0004)**
Male	**−0.125 (−0.054, 0.079)**
Physician specialty	
Medical oncologist	Reference
Radiation oncologist	**0.493‡ (0.416, 0.570)**
Surgeon	**0.307‡ (0.239, 0.376)**
Physician volume	
Mean number of new cancer patients during last month	−0.000 (−0.002, 0.001)
Full-time or part-time	
Part-time: physicians working ≤ 30 hours in direct patient care	0.046 (−0.028, 0.120)
Practice type	
Solo	Reference
County or medical school or university	0.004 (−0.099, 0.108)
HMO	**−0.150† (−0.251, −0.049)**
Medical group	0.047 (−0.251, 0.112)
Practice size	
Large practice (50 or more full-time physicians in main practice)	−0.067 (−0.152, 0.017)
Financial incentives and payment	
Physician reported any financial incentives to expand clinical practices or services to patients†	**−0.080* (−0.150, −0.010)**
Physician reported predominantly fee-for-service payment	−0.022 (−0.083, 0.040)
Physician reported receiving any capitated payment	0.072 (−0.003, 0.147)
Barriers to referrals	
Provider reported barriers to referral of high-quality providers because of:	
Provider network restrictions	**−0.200‡ (−0.266, −0.135)**
Medi-Cal was not accepted by high-quality provider	0.035 (−0.022, 0.092)
Tumor board participation	
Weekly or monthly tumor board participation	−0.056 (−0.127, 0.015)

Note. Statistically significant coefficients appear in bold.
[1]Coefficients were derived from population-averaged panel-data models using generalized estimating equations.
*$p < 0.05$;†$p < .01$;‡$p < .001$.

16 percent were 75 years or older (Table 4). The sample is mostly Non-Hispanic White (74 percent), with 8 percent Non-Hispanic Black women, and 13 percent Hispanic women. Eight percent of women were English-speaking Hispanics (e.g., completed the survey in English), and 5 percent were Spanish-

Table 4: Characteristics of Women from the Los Angeles Women's Health Study Associated with 111 Medical Oncologists (n = 411)

Patient-Level Variables	
Age	
Age 50–59	41%
Age 60–64	17%
Age 65–74	26%
Age 75–99	16%
Race/ethnicity	
Non-Hispanic White	74%
Non-Hispanic Black	8%
Hispanic, English-speaking	8%
Hispanic, Spanish-speaking	5%
Other race/ethnicity	5%
Breast cancer tumor stage	
Stage 0, 1, or 2 or no stage information	92%
Stage 3	6%
Stage 4	2%
Marital status	
Married	83%
Never married	7%
Divorced or separated	20%
Number of comorbid conditions	2
Mean number and SD (range)	SD 1.6 (0–8)
Patient ratings of care	80 points
Mean score and SD (range)	SD 23.4 (0–100)

speaking Hispanic women. Five percent of the sample is categorized as "Other" race/ethnicity. Most of the women (94 percent) had breast cancer tumors with the following stages: 0, 1, 2, or no stage information. Eight percent could be described as late-stage, 6 percent with Stage 3, and 2 percent with Stage 4 tumors. Many women in our sample were married (83 percent), 20 percent identified themselves as divorced or separated, and 7 percent reported that they were never married. The average number of comorbid conditions was 2 (SD: 1.6, range: 0–8), and patient ratings of care averaged around 80 points (SD: 23.4 points, range: 0–100 points).

Patient-Level Results: Multi-Level Multivariate Analysis of Patient Ratings of Care

In multivariate analyses of patients' ratings of care provided by their medical oncologists, controlling for patient-level, physician-level, and practice setting characteristics, we found associations between medical oncologist practice style and patient ratings of care (Table 5). We found similar results in bivari-

Table 5: Multi-Level Multivariate Analyses of Patient Ratings of Care (Provider $n = 111$, Patient $n = 411$)[1]

	Patient Ratings of Care			
Clinical Task Associated with Breast Cancer Care	*Decision-Making About Type of Breast Cancer Surgery Coefficient (95% Confidence Interval)*	*Decision-Making About Possible Use of Radiation Coefficient (95% Confidence Interval)*	*Evaluation and Treatment of Depressive Symptoms Coefficient (95% Confidence Interval)*	*Evaluation and Treatment of Arm Symptoms, e.g., Lymphedema Coefficient (95% Confidence Interval)*
Provider-level variables				
Physician demographics				
Age	−0.3 (−1.2, 0.7)	−0.2 (−1.1, 0.7)	−0.2 (−1.1, 0.8)	−0.2 (−1.2, 0.7)
Male	0.1 (−6.3, 6.5)	−1.7 (−8.2, 4.8)	−2.7 (−9.3, 3.9)	−2.7 (−9.2, 3.8)
Physician volume				
Mean number of new cancer patients during last month (range)	−0.1 (−6.6, 6.5)	0.8 (−5.8,7.3)	0.3 (−6.3, 6.9)	0.8 (−5.9, 7.4)
Full-time or part-time				
Part-time: physicians working ≤30 hours in direct patient care	0.5 (−9.1, 10.1)	0.8 (−8.8, 10.4)	1.2 (−8.5, 10.9)	0.4 (−9.2, 9.9)
Practice type				
Solo	Reference	Reference	Reference	Reference
County or medical school or university	7.0 (−3.5, 17.4)	6.4 (−3.9, 16.7)	2.1 (−8.6, 12.8)	2.3 (−8.2, 12.8)
HMO	6.2 (−5.8, 12.7)	5.0 (−6.7, 16.6)	−1.0 (−13.2, 11.1)	1.3 (−10.4, 13.0)
Medical group	5.8 (−2.4, 13.9)	6.0 (−2.0, 13.9)	2.7 (−5.6, 11.0)	3.4 (−4.8, 11.5)
Practice size				
Large practice (50 or more full-time physicians in main practice)	3.4 (−5.9, 12.7)	2.8 (−6.3, 12.0)	0.4 (−8.8, 9.7)	1.1 (−8.0, 10.3)

continued

Table 5. *Continued*

Clinical Task Associated with Breast Cancer Care	*Patient Ratings of Care*			
	Decision-Making About Type of Breast Cancer Surgery Coefficient (95% Confidence Interval)	*Decision-Making About Possible Use of Radiation Coefficient (95% Confidence Interval)*	*Evaluation and Treatment of Depressive Symptoms Coefficient (95% Confidence Interval)*	*Evaluation and Treatment of Arm Symptoms, e.g., Lymphedema Coefficient (95% Confidence Interval)*
Financial incentives and payment				
Physician reported any financial incentives to expand clinical practices or services to patients	−3.9 (−10.8, 3.0)	−4.3 (−11.1, 2.4)	−2.8 (−9.5, 3.9)	−0.8 (−7.6, 5.9)
Physician reported predominantly fee-for-service payment	4.0 (−2.9, 10.4)	3.0 (−3.4, 9.3)	3.6 (−2.8, 10.0)	2.9 (−3.9, 9.7)
Physician reported receiving any capitated payment	1.3 (−6.4, 9.1)	0.9 (−6.7, 8.5)	−0.4 (−7.4, 5.4)	−1.4 (−9.1, 6.2)
Barriers to referrals				
Provider reported barriers to referral of high-quality providers because of:				
Provider network restrictions	−1.1 (−7.6, 5.3)	−1.9 (−8.2, 4.5)	−1.0 (−7.4, 5.4)	0.6 (−5.9, 7.1)
Medi-Cal was not accepted by high-quality provider	−1.8 (−11.5, 7.9)	−2.4 (−8.2, 3.5)	−2.3 (−8.3, 3.6)	−0.3 (−6.2, 5.5)
Tumor board participation				
Weekly or monthly tumor board participation	−1.8 (−11.4, 7.9)	−2.4 (−12.0, 7.3)	−1.0 (−10.9, 8.8)	−1.8 (−11.8, 8.1)
Physician practice style				
Physician manages task without input from other clinicians	4.9 (−5.9, 15.6)	4.5 (−4.4, 13.4)	−4.5 (−10.6, 1.7)	**−7.8* (−14.4, −1.1)**
Physician co-manages task	Reference	Reference	Reference	Reference
Physician refers task to another clinician	**−8.4* (−15.2, −1.6)**	**−10.9* (−18.1, −3.6)**	**−13.1† (−21.5, −4.6)**	−4.0 (−10.3, 2.4)
Patient-level variables				

continued

Table 5. *Continued*

Clinical Task Associated with Breast Cancer Care	*Patient Ratings of Care*			
	Decision-Making About Type of Breast Cancer Surgery Coefficient (95% Confidence Interval)	*Decision-Making About Possible Use of Radiation Coefficient (95% Confidence Interval)*	*Evaluation and Treatment of Depressive Symptoms Coefficient (95% Confidence Interval)*	*Evaluation and Treatment of Arm Symptoms, e.g., Lymphedema Coefficient (95% Confidence Interval)*
Age				
Age 50–59	Reference	Reference	Reference	Reference
Age 60–64	4.5 (−5.0, 14.0)	4.2 (−5.1, 13.6)	3.0 (−6.5, 12.4)	4.4 (−5.0, 13.9)
Age 65–74	5.9 (−8.7, 20.5)	4.8 (−9.6, 19.3)	5.1 (−6.5, 19.6)	5.9 (−8.5, 20.2)
Age 75–99	4.1 (−19.1, 27.3)	2.7 (−20.2, 25.6)	2.0 (−21.0, 25.0)	5.2 (−17.6, 28.0)
Patient race/ethnicity				
Non-Hispanic White/English-speaking Hispanic	Reference	Reference	Reference	Reference
Non-Hispanic Black	−4.8 (−13.4, 3.9)	−5.0 (−13.5, 3.6)	−7.1 (−15.7, 1.6)	−4.5 (−13.3, 4.2)
Spanish-speaking Hispanic	−1.1 (−11.7, 9.6)	−1.5 (−12.3, 9.2)	−1.1 (−11.7, 9.5)	−0.1 (−10.7, 10.6)
Stage of breast cancer tumor				
Stage 0, 1, or 2	Reference	Reference	Reference	Reference
Stage 3	4.0 (−5.9, 13.9)	3.2 (−6.6, 13.0)	3.5 (−6.3, 13.3)	3.5 (−6.3, 13.2)
Stage 4	−7.5 (−24.9, 10.0)	−7.4 (−24.7, 10.0)	−6.0 (−23.4, 11.4)	−7.2 (−24.4, 10.1)
Marital status				
Married	Reference	Reference	Reference	Reference
Never married	6.5 (−3.1, 16.2)	6.4 (−3.3, 16.0)	7.6 (−2.0, 17.2)	7.0 (−2.6, 16.5)
Divorced or separated	−0.3 (−6.2, 5.6)	−0.1 (−6.0, 5.7)	−0.2 (−6.1, 5.7)	−0.9 (−6.8, 4.9)
Number of comorbid conditions	−0.5 (−2.1, 1.1)	−0.5 (−2.0, 1.1)	−0.3 (−1.8, 1.3)	−0.3 (−1.9, 1.3)

Note.[1]Coefficients were derived from population-averaged panel-data models using generalized estimating equations.
Statistically significant coefficients appear in bold.
*$p < .05$;†$p < .01$;‡$p < .001$.

ate analyses shown in Appendix C. For the decision-making domain, patients whose medical oncologists reported referring patients for decision-making about surgery and/or possible use of radiation, rather than co-managing care, had lower ratings of care (Coefficient: −8.3, 95% CI: −15.1, −1.4, $p < .05$ for surgery and −10.8, 95% CI: −18.1, −3.6, $p < .05$ for radiation).

In the domain for treatment of symptoms and comorbid conditions, patients whose medical oncologists reported referring patients with depressive symptoms had lower ratings of care (Coefficient: −13.2, 95% CI: −21.7, −4.8, $p < .01$), compared with medical oncologists who reported co-managing care. Patients whose medical oncologists reported caring for arm symptoms themselves without other clinicians' involvement had lower ratings of care (Coefficient: −7.8, 95% CI: −14.4, −1.1, $p < .05$) compared with medical oncologists co-managing arm symptoms with another clinician.

DISCUSSION

We surveyed 1,269 patients and 347 physicians identified as providers filling key roles by a population-based cohort of women with incident breast cancer in Los Angeles County. We described specialty physician practice styles in performing 10 tasks, and then identified predictors and correlates of physician practice style in breast cancer care. In unadjusted and adjusted analyses, we found variations exist in report of specialty physician practice style. As hypothesized, physician specialty (radiation oncology and surgical specialty versus medical oncology), practice setting (HMO versus solo practice), and structural characteristics (e.g., physician report of having provider network restrictions imposed by health plans, medical groups or IPAs) were associated with physician practice style.

Among specialty differences, we observed that medical oncologists report independently managing more tasks (e.g., without input from other clinicians). Medical oncologists, who are typically boarded in internal medicine, may be more comfortable managing tasks associated with comorbid conditions compared with radiation oncologists and surgeons. Medical oncologists may certainly provide effective care without input from other clinicians, but more specialized physicians may be less able to provide all needed care. This is particularly important since evaluations of comorbidities (e.g., diabetes) are often limited in the setting of initial cancer management and survivorship

(Rosenblatt et al. 1998; Earle et al. 2003; Earle and Neville 2004; Snyder et al. 2009).

As for practice setting differences, compared with physicians in solo practice, physicians in HMOs appear to co-manage or refer more tasks. This is consistent with physicians in integrated health settings having greater access to other clinicians (e.g., physical therapists for lymphedema, mental health providers for depression, and other internists for diabetes care). Another possible explanation is that physicians in these settings receive some sort of institutional support for co-management or referral compared with physicians in solo practice.

We did not find a difference in practice styles for physicians in medical groups. Perhaps similar financial structures or incentives cause physicians in medical groups to act more similarly to physicians in solo practice than expected. Physicians who reported either financial incentives to expand clinical practices, or services or barriers to referrals because of provider network restrictions, were more likely to report handling tasks themselves (vs. co-managing or referring tasks to other physicians).

The association between financial incentives and physician practice style has been documented in the literature (Grumbach et al. 1998; Hadley et al. 1999), although our findings provide additional insights. Physicians responsive to incentives may perform tasks on their own because they consciously or unconsciously believe they will financially benefit from doing more, and work with other clinicians less. Others have identified provider network restrictions as barriers to coordination of care among generalists and specialists (Grumbach et al. 1998; O'Malley et al. 2009). These restrictions on referrals are imposed by health plans, medical groups, or IPAs to contain costs and encourage collaboration among in-network providers. However, our findings suggest that if a plan's provider network differs from a physician's referral base, physicians may manage more tasks on their own, without input from other clinicians. Monitoring the impact of restrictions on specialty physician practice style may help avoid unintended clinical consequences.

In addition to our analysis of specialty physician practice style, we conducted an analysis exploring the potential relationship between medical oncologists' practice style and patient-level outcomes (e.g., patient ratings of care). As we noted earlier, we do not see co-management as the ideal style for all 10 tasks studied here, so we limited our analysis to tasks where co-management could plausibly be argued as most appropriate (e.g., decision-making about type of breast surgery and/or possible use of radiation; management of depression; and management of lymphedema). For these four tasks, patients

consistently assigned higher ratings to physicians who co-managed these tasks rather than utilizing other practice styles, demonstrating a clinically and statistically significant link between use of the physician practice style of co-management and patient-reported quality of care ratings.

As we noted earlier, the nature and causes of fragmentation of the health care are increasingly being examined (Sofaer 2009). Patterns of redundant specialty care have been demonstrated as patients with chronic disease frequently saw multiple generalists and specialists in different settings (Starfield et al. 2005; Kahn et al. 2007; Pham et al. 2007). Here, we describe how physicians interact in managing patients with complex diseases. Future studies should focus on physicians' goals and expectations in patient co-management (Chen and Yee 2009; Forrest 2009).

Two barriers to physician co-management include financial and workforce issues. Pham et al. (2009) assert that the current health care delivery system places the burden of coordination of care on the primary care provider, without financial support of efforts needed to successfully coordinate care. From our work here, we believe that future studies on *specialty* physician reimbursement should also include incentives for time spent communicating and collaborating with other physicians. As the oncologist shortage emerges (Erikson et al. 2007), specialty physicians may be less willing or able to take time needed to co-manage care.

LIMITATIONS

The study is an observational cross-sectional analysis of data collected in Los Angeles County in 2004. We used clinical vignettes to identify differences in physicians' approaches to a standardized patient (Dresselhaus et al. 2004). The use of clinical vignettes may be associated with physicians' selection of socially desirable responses (Landon et al. 2001). However, we offered multiple responses options to physicians consistently avoiding a "correct" response, to lessen the possibility of social desirability bias. In addition, we did not validate physician report of any financial incentives to expand clinical practices or services to patients. Physicians may have under-reported financial incentives because they gave socially desirable (e.g., altruistic) responses. Nevertheless, we found no evidence of systematic bias in our responses, and physicians did respond affirmatively to questions about the presence of financial incentives that may impact their practice.

CONCLUSIONS

Within a few months of receiving a breast cancer diagnosis, many patients receive treatments from multiple providers. In these circumstances, where co-management could be expected to make a significant difference in patients' experiences, our study found variation in physician practice style. To further understand the clinical relevance of this variation, we analyzed the relationship between physician practice style and patient outcomes. Our analyses found a positive relationship between physician co-management and patient ratings of care. This type of research provides much needed evidence about the relationship between physician practice style and patient outcomes, which is critical, as efforts to improve quality of health suggest that better outcomes are associated with better coordination of care.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Appendix SA2: Description of Samples for the Los Angeles Women's Health Study Patient and Provider Surveys.

Appendix SA3: Patient Ratings of Care Measure.

Appendix SA4: Multi-level, Bivariate Results Testing Associations between Physician Practice Style and Patient Ratings of Care.

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