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Physician-Reported Barriers to Referring Cancer Patients to Specialists: Prevalence, Factors, and Association with Career Satisfaction

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Abstract

Background—Quality care for patients with cancer often requires access to specialty providers, but little is known about barriers to referring cancer patients for specialized care. Referral barriers may also lessen physician career satisfaction. We aimed to determine factors associated with these barriers and whether greater barriers are associated with low career satisfaction.

Methods—In this cross-sectional study, we studied 1,562 primary care physicians (PCPs) and 2,144 specialists responding to the multi-regional Cancer Care Outcomes Research and Surveillance Consortium Physician Survey. We assessed the prevalence of physician-reported

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barriers to referring cancer patients (restricted provider networks, pre-authorization requirements, patient inability to pay, lack of surgical sub-specialists, excessive patient travel time) for more specialized care. We averaged the five items to calculate a barrier score. We used multivariable linear regression to determine physician and practice setting characteristics associated with the barrier score, and multivariable logistic regression to analyze the association of the barrier score with physician career satisfaction.

Results—Three in five physicians reported always, usually, or sometimes encountering any barrier to cancer patient specialty referrals. In adjusted analyses of PCPs and specialists, international medical graduates, physicians practicing in solo or government-owned practices, or who had <90% patients in managed care plans had higher barrier scores than others ($P<.05$). High barrier scores were associated with lower physician career satisfaction among PCPs and specialists ($P<.05$).

Conclusions—Many physicians experience barriers to specialty referral for cancer patients. Uniform systems for providing and tracking timely referrals may enhance care and promote physician career satisfaction.

Keywords

Delivery of Health Care; Job Satisfaction; Neoplasms; Referrals and Consultation

Introduction

Quality care for patients with cancer often requires access to specialty providers. Patients who do not receive specialty care in a timely manner are more likely to have poor outcomes and report low satisfaction with care.[1,2] Furthermore, impediments to specialty referral may delay treatment in patients with cancer, a disease in which timeliness can be a critical determinant of survival and quality of life.[3,4] Studies have shown that patient characteristics such as financial constraints[5,6] and excessive travel time[7–10] are barriers to managing the cancer itself. However, little is known about physician and practice characteristics that may pose barriers to physicians in referring their cancer patients for more specialized care.

In addition, barriers to referring cancer patients to specialists may frustrate physicians caring for cancer patients. Surveys have documented that 28–53% of U.S. physicians across specialties report symptoms of burnout.[11–13] We hypothesize that barriers to referring cancer patients to specialists may be associated with physician career dissatisfaction.

We assessed the prevalence of, and physician and practice characteristics associated with, physician-reported barriers to referring cancer patients for more specialized care by primary care physicians (PCPs) and specialists, and also assessed the association of referral barriers with physician-reported career satisfaction.

Methods

Study participants

Data were collected through the physician survey component of the Cancer Care Outcomes Research and Surveillance (CanCORS) Consortium,[14] a national observational study of over

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10,000 patients diagnosed with lung or colorectal cancer from 2003–2005.[15,16] This demographically representative, population-based cohort included patients from Northern California, Los Angeles County, North Carolina, Iowa, Alabama, or one of five integrated health care systems.[17] Of 6,871 physicians identified by study patients as having a key role in their cancer care, 65% responded. We restricted the sample to 1,562 PCPs (internists, family physicians, general practitioners, geriatricians) and 2,144 specialists (surgeons, medical oncologists, radiation oncologists, other medical specialists) who met criteria described in Figure 1.

Although Veterans Affairs (VA) was included as a CanCORS site, VA physicians practice in a uniform health care system with distributed sites, and in our sample were systematically different from other CanCORS providers in ways central to analyses. For example, 81% of staff VA physicians practiced in hospitals vs. 14–30% of physicians in other sites. Accordingly, we present analyses excluding VA physicians. Sensitivity analyses including VA physicians showed that VA affiliation was not significantly associated with referral barriers or career satisfaction. Survey data collection procedures were approved by human subjects committees at participating institutions.[14]

Barriers to specialist referral

Dependent variable—Physicians were asked on the survey, "How often does each factor listed below prevent you from referring your patients with cancer to the provider of your choice for more specialized care?" 1) Restricted provider networks; 2) Pre-authorization requirements; 3) Patient lack of ability to pay; 4) Lack of surgical sub-specialists; and 5) Excessive patient travel time. Response options were provided using a five-point Likert scale: 1=Never, 2=Rarely, 3=Sometimes, 4=Usually, 5=Always. After calculating high inter-item reliability across the five items (Cronbach's alpha=0.81), we incorporated all items into a single score (range 1–5) by summing individual scores, then dividing this sum by the number of barrier items to which each physician responded. Logarithmic transformation of this barrier score yielded similar results in multivariable analyses. We present analyses using the non-transformed score.

Independent variables—Physician and practice characteristics hypothesized to be associated with barriers were included in multivariable modeling if they 1) showed a significant ($P<.05$) relationship with the barrier score in bivariate analysis of variance testing, and 2) were not highly correlated with other independent variables (Pearson's $r<.35$) (Table 1). Age and gender were included because we considered them relevant.

Statistical analysis—We used multivariable linear regression to estimate the independent effects of physician and practice characteristics on physician-reported barriers to referring cancer patients for more specialized care. Results are reported as β-coefficients, representing a higher or lower barrier score along the original 5-point Likert scale compared with the reference. For example, a β-coefficient of -1 corresponds to a one-step reduction on the Likert scale, e.g. "rarely" to "never." Separate models were estimated for PCPs and specialists. Item non-response rate was <3% of observations for all variables except practice size and percent patients in managed care plans, which were 6% and 9%, respectively. We

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used multiple imputation to account for missing data for independent variables in all analyses.[18] Analyses were performed using Stata 12.

Physician career satisfaction

Measuring career satisfaction—Physicians were asked, "Thinking very generally about your satisfaction with your overall career in medicine, would you say that you are currently:" 1=Very dissatisfied, 2=Somewhat dissatisfied, 3=Neither satisfied nor dissatisfied, 4=Somewhat satisfied, 5=Very satisfied. We created a dichotomous dependent variable of very or somewhat satisfied vs. not.

Statistical analysis—We used multivariable logistic regression to estimate the independent effect of the barrier score on physician career satisfaction. We included all independent variables meeting criteria for the barriers model, and a variable indicating whether the physician's income was likely to increase from referring patients to specialists. Separate models were estimated for PCPs and specialists. To adjust for potential selection effects in estimating the association of higher (3.0–5.0) barrier scores vs. lower (<3.0) barrier scores, we applied inverse probability weights derived from doubly robust propensity scores to participants with lower barrier scores. These weights were incorporated in logistic regression models for physician career satisfaction, yielding doubly robust estimates of the association.[19] Since this approach did not alter results compared with an unweighted model, we used the standard regression results, from which we computed the predicted probability of being very or somewhat satisfied for each respondent, holding all other variables at their observed values. We report the average of these predicted probabilities.

Results

Characteristics of cohort

Compared with PCPs, specialists were more often male, >60-years-old, and board-certified; and more likely to teach, practice in hospitals or multi-specialty office settings, have proportionately fewer patients in managed care plans, and report income increases from referring patients (Table 1). Specialists were less often in solo practice.

Prevalence of barriers to referral

Three in five physicians reported always, usually, or sometimes encountering at least one barrier to specialist referral for cancer patients. Physicians reported always, usually, or sometimes encountering barriers associated with restricted provider networks (42%), preauthorization requirements (34%), patient inability to pay (34%), excessive patient travel time (28%), and lack of surgical sub-specialists (13%) (Figure 2). The overall mean barrier score was 2.0 (median 2.0, SD 0.72).

Factors associated with barriers to referral in multivariable analysis

Among both PCPs and specialists, proportion of patients in managed care plans was the variable most strongly associated with higher barrier score (Table 2). Compared with physicians who reported a high (90–100%) proportion of patients in managed care plans, physicians with intermediate (30–89%) or low (<30%) proportion of managed care patients

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had higher barrier scores (β=0.46 for both PCPs and specialists for intermediate; and β=0.28 for PCPs and β=0.46 for specialists for low; *P*<.05 for all). Results were similar when we excluded respondents who reported 90–100% patients in managed care plans, when we removed the managed care variable from the model, and when we calculated the barrier score using only barriers commonly associated with managed care (restrictions on providers and pre-authorization requirements).

Among both PCPs and specialists, international medical graduates (IMGs) had higher barrier scores than United States/Canadian graduates (β=0.34 and 0.28, respectively; both *P*<.01), as did physicians in solo vs. hospital practices (β=0.20 and 0.21; *P*=.02 and *P*<.01), and those in government-owned practices (β=0.36 and 0.27; *P*<.01 and *P*=.01). Greater availability of medical records was associated with lower barrier scores (β=−0.08 and −0.04; both *P*<.01).

Among PCPs, non-board-certified physicians had higher barrier scores than those who were (β=0.17; *P*<.01), as did physicians in community health center (CHC) vs. hospital-based practices (β=0.34; *P*=.01) and those in practices with <20 physicians (β=0.13; *P*<.01). Physicians age 60+ years had lower barrier scores than those 40–59 (β=−0.15; *P*<.01).

Among specialists, physicians age <40 years vs. 40–59 had higher barrier scores (β=0.10; *P*=.01), as did medical or radiation oncologists vs. surgeons (β=0.31 and 0.38; both *P*<.01), and those in single specialty office vs. hospital practices (β=0.10; *P*<.01). Other medical specialists reported fewer barriers (β=−0.10; *P*<.01) than did surgeons.

Career satisfaction

Eighty-one percent of PCPs and 87% of specialists reported being very or somewhat satisfied with their careers (*P*<.01) (Table 1).

After adjustment, physicians with higher (4.0–5.0) referral barrier scores were less likely to be very or somewhat satisfied with their careers than those with lower (1.0–1.9) scores (65% vs. 84% among PCPs and 71% vs. 88% among specialists; both *P*<.01) (Table 3). Variables significantly (*P*<.05) associated with higher likelihood of being very or somewhat satisfied included age <40 or 60+ years vs. 40–59 years, medical or radiation oncologist vs. surgeon, teaching medical students or residents, greater medical record availability, and reporting income increases from referring patients (Table 3).

Among PCPs, solo office practice setting was associated with lower likelihood of being very or somewhat satisfied vs. hospital practice (*P*<.01).

Among specialists, barrier scores 3.0–3.9 and 4.0–5.0 compared with 1.0–1.9 were associated with lower likelihood of being very or somewhat satisfied (both *P*≤.04). Medical and radiation oncologists were more satisfied than surgeons (*P*=.04 and <.01, respectively).

Discussion

Among 1,562 PCPs and 2,144 specialists caring for patients with cancer, three in five physicians reported always, usually, or sometimes encountering at least one barrier to

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referring cancer patients for more specialized care. In multivariable analyses of both cohorts, most variables significantly associated with barriers were related to practice setting. Referral barriers were significantly associated with lower physician career satisfaction.

Barriers to referrals for more specialized care

Providers reported experiencing each of the five barriers, although the frequency varied by the specific barrier. The most frequently reported barriers were provider network restrictions and pre-authorization requirements, policies that were originally developed to control use of services and reduce unnecessary costs. A trend toward easing these restrictions emerged when limited access to specialists tainted public sentiment toward managed care.[20] There is a current trend towards more restrictive physician networks in some insurance products available in state and federal exchanges, and in some contracts of Accountable Care Organizations (ACOs) with health plans. It will be important that physicians maintain the ability to refer patients to high-quality providers. While patient-centered medical homes and neighborhoods are intended to enhance access and coordinated care between referring physicians and specialty consultants, these programs' organizational and payment models are still developing, so their actual impact on referrals is not yet known.[21] This is an important research area that needs additional investigation.

In adjusted analyses, several physician and practice characteristics were associated with physicians' report of barriers to referral. PCPs and specialists with a high proportion of patients in managed care plans had lower barrier scores than those with a low or intermediate proportion, consistent with previous studies,[22,23] but seemingly contradictory to our aforementioned finding that the two most frequently reported barriers were originally developed by managed care organizations. These physicians may practice in integrated settings with streamlined referral systems, in-network specialists, and insured patients. Conversely, we found that physicians in solo or small practices were more likely to report barriers to specialist referral than those in hospital-based or larger practices. Further research exploring these findings is warranted.

The least frequently reported barriers were lack of surgical subspecialists and excessive patient travel time. Literature regarding surgical subspecialist availability is sparse, but extensive centralization of cancer surgery has resulted in increased patient travel time,[10] which may hinder access to quality cancer care. Longer travel time has been correlated with more advanced stage at cancer diagnosis and suboptimal or non-receipt of cancer treatment.[7,9,24,25] However, in our study, excessive travel time was not reported to be an important barrier to specialist referral. While this finding may reflect poor communication between clinicians and patients, evidence shows that distance issues are sufficiently discussed,[26] suggesting that our finding is valid.

Government practice ownership was associated with more reported barriers to specialist referral. Since VA physicians were excluded from the cohort, we assumed that the remaining physicians who reported government ownership practiced at public hospitals and/or clinics, which are more likely to serve patient populations of low socioeconomic status.[27] Our finding may reflect these physicians' cancer patients' compromised access to specialized care. Among PCPs, CHC practice setting was associated with greater report of

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barriers to referral than hospital practice setting, which may reflect financial and transportation barriers faced by the patient population, and that fewer physicians may be willing to see uninsured, under-insured, or Medicaid patients.

Greater availability of medical records, likely a marker for access to information technology,[28] was associated with lower report of referral barriers. Physicians who reported high availability of medical records may practice with an electronic health record (EHR) and/or electronic referral system, which potentially facilitate care coordination.[29,30] Given growing interest in improving the coordination of primary and specialty care, especially through ACOs and patient-centered medical homes,[31] our data suggest that implementation of information technology may serve as a strategy for reducing barriers to specialist referral for cancer patients.

Among PCPs, IMGs reported more barriers to specialist referral than United States/Canadian graduates. IMGs are more likely to practice in Health Professional Shortage Areas (HPSAs), and HPSA residents are more likely to be uninsured and have less healthcare access, which may explain our finding.[32,33] Furthermore, studies have suggested IMGs lack sufficient communication training and face isolation during residency, which may influence their referral networks.[34,35]

Career satisfaction

Physicians caring for cancer patients reported being generally satisfied with their careers. Specialists were more likely to be satisfied than PCPs, consistent with recent evidence.[11] Physicians who reported more referral barriers reported lower career satisfaction. This may be an indicator of the increased stress, time, and energy physicians experience in navigating barriers to referrals, as well as the frustration accompanying a physician's inability to work autonomously and provide high-quality care.[36] The potential ramifications of physician dissatisfaction and burnout are serious, as they may impact patient care and physician mental health, wellness, and workforce retention.[11,37–41]

Strengths/limitations

Strengths of our study include large sample size, geographic diversity of respondents, and inclusion of physicians directly involved in cancer care across multiple specialties. However, our self-reported data may be subject to selection bias and socially desirable response bias. Also, the data did not allow adjustment for physicians' clustering within shared practices. Clustering adjustment was limited to study site fixed effects. It is also unknown whether barriers perceived by physicians correlate with those perceived by their patients; this may an area of further research. Finally, we used a single item to assess physician satisfaction; additional research looking at related topics such as physician burnout could provide a broader picture of the impact of referral barriers on physicians.[11]

Conclusions

PCPs and specialists in large, highly-managed care practices, which likely had established strategies to facilitate referrals across disciplines, reported fewer barriers to referring cancer patients for more specialized care than did physicians in small practices or with fewer

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managed care patients. High barrier scores were associated with lower physician career satisfaction. Integrated, uniform systems for providing timely referrals may promote cancer patient care and physician career satisfaction.

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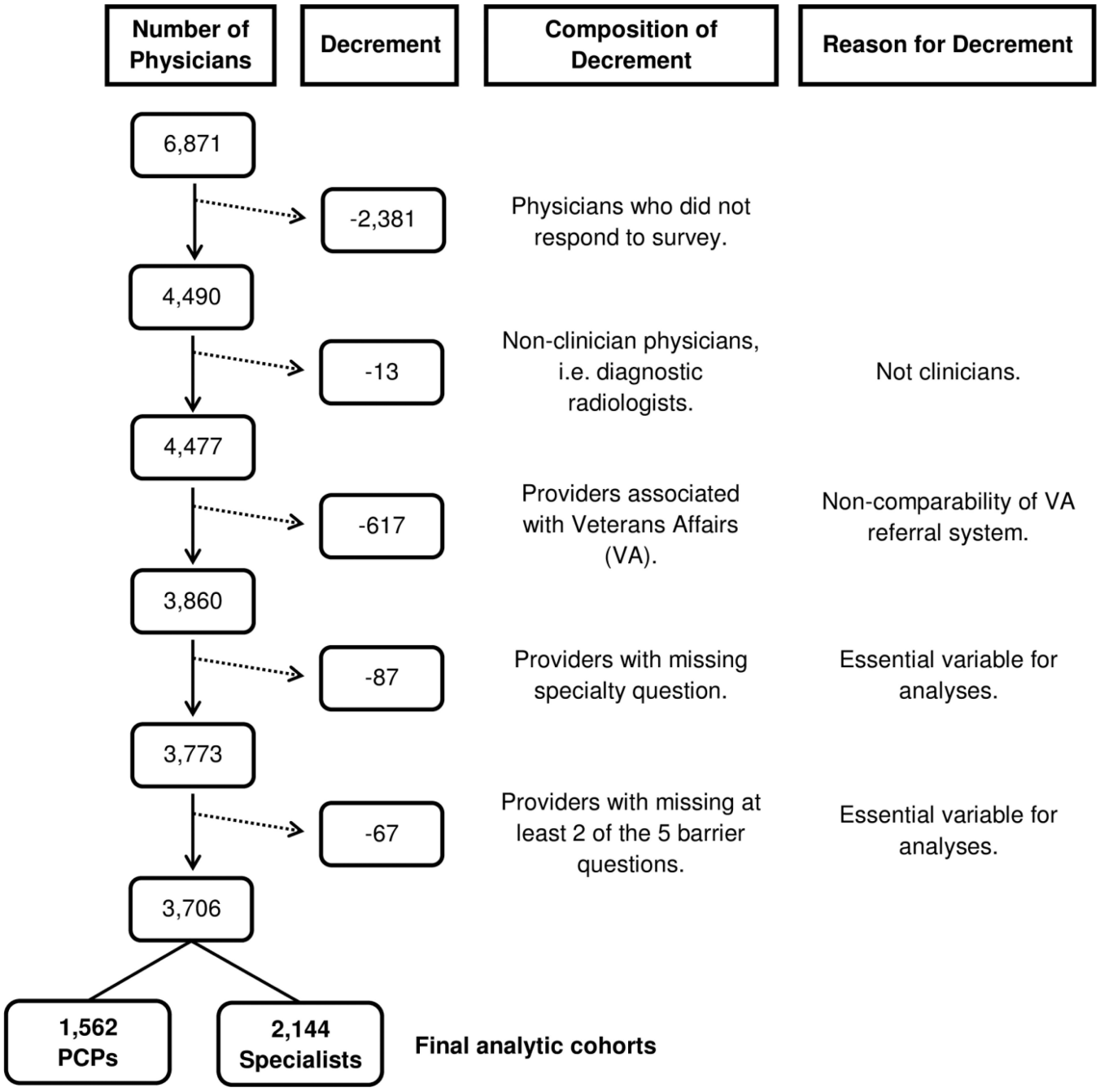

Figure 1. Selection of Analytic Cohorts

Flowchart describes selection of two cohorts, PCPs and specialists (defined in Methods), for multivariable analyses of barriers to referring cancer patients for more specialized care. For physician career satisfaction analyses, 51 additional physicians (26 PCPs and 25 specialists) who did not respond to the career satisfaction question were excluded, yielding 1,536 PCPs and 2,119 specialists.

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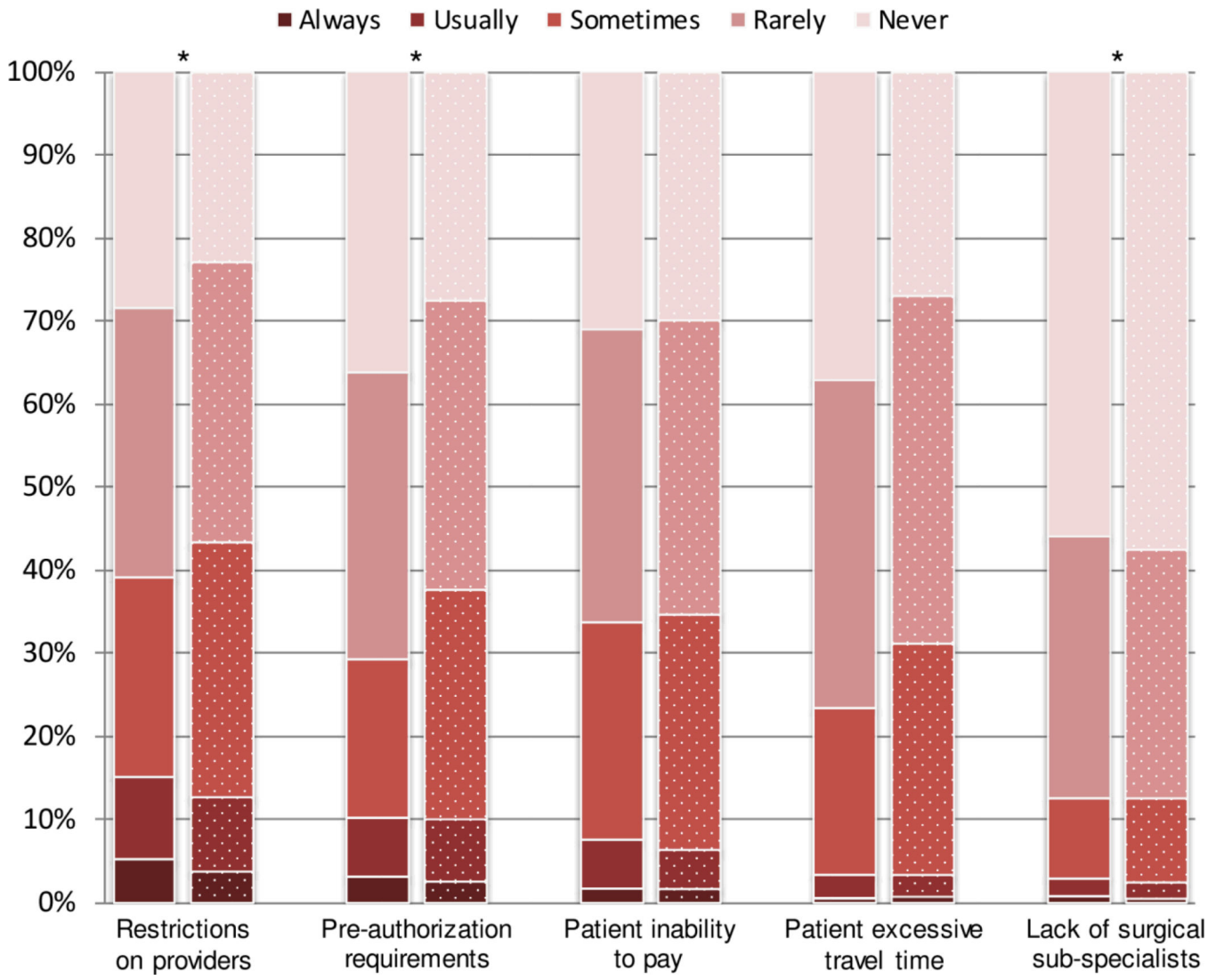

Figure 2. Distribution of Physician-Reported Barriers to Referring Cancer Patients for Specialized Care

Bar graph shows distribution of the five referral barriers. Solid bars represent PCPs, and dotted bars, specialists.

*P<.01 using chi-square test.

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Table 1

Characteristics of Physicians Caring for Patients with Lung and/or Colorectal Cancer

	No. of Patients (%)		
	Primary Care Physician n=1,562	Specialty Physician n=2,144	*P*[a]
Physician characteristics			
Gender			<.01
Male	1,201(77)	1,861(87)	
Female	361(23)	283(13)	
Age			<.01
<40 years	267(17)	327(15)	
40–59 years	1,067(68)	1,422(66)	
60+ years	228(15)	395(18)	
Specialty			-
Surgeon		841(39)	
Medical oncologist		493(23)	
Radiation oncologist		223(10)	
Other medical specialist		587(27)	
International medical graduate			.99
Yes		333(16)	
No	1,321(85)	1,811(85)	
Board-certified			<.01
Yes	1,406(90)	2,014(94)	
No	156(10)	130(6)	
Teaching medical students/residents			<.01
Yes	525(34)	1,031(48)	
No	1,037(66)	1,113(52)	
Practice characteristics			
Practice setting			<.01
Hospital	126(8)	869(41)	
Office			
Solo	353(23)	299(14)	
Single-specialty	397(25)	588(27)	
Multi-specialty	566(36)	330(15)	
Other	82(5)	27(1)	
Community health center	38(2)	30(1)	
Government-owned practice			.92
Yes	33(2)	44(2)	
No	1,528(98)	2,099(98)	

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	No. of Patients (%)		
	Primary Care Physician n=1,562	Specialty Physician n=2,144	p^a
Practice size (# physicians)			.34
<20	1,152(74)	1,738(81)	
20+	410(26)	406(19)	
% patients in managed care plans			.02
<30%	407(26)	602(28)	
30–89%	743(48)	1,092(51)	
90–100%	413(26)	450(21)	
# medical record components always available[b]			.32
0	14(<1)	5(<1)	
1	23(1)	7(<1)	
2	39(3)	33(2)	
3	119(8)	126(6)	
4	167(11)	255(12)	
5	234(15)	407(19)	
6	964(62)	1,311(61)	
Income increase from referring patients			<.01
Yes	15(1)	47(2)	
No	1,521(99)	2,072(98)	
Data collection site			<.01
Cancer Research Network—5 HMOs[c]	202(13)	179(8)	
Northern California—8 counties	340(22)	565(26)	
State of Alabama	210(13)	326(15)	
Los Angeles County	409(26)	562(26)	
State of Iowa	235(15)	205(10)	
State of North Carolina—22 counties	166(11)	307(14)	
Physician experiences			
Barrier score			<.01
1.0–1.9	716(46)	852(40)	
2.0–2.9	657(42)	1011(48)	
3.0–3.9	152(19)	234(11)	
4.0–5.0	27(1)	23(1)	
Career satisfaction	<.01		
Very satisfied	623(40)	1,053(49)	
Somewhat satisfied	644(41)	798(37)	
Neither satisfied nor dissatisfied	100(6)	75(4)	
Somewhat dissatisfied	158(10)	183(9)	
Very dissatisfied	37(2)	35(2)	

[a] Differences between PCPs and specialists were tested using Wilcoxon-Mann-Whitney for ordinal variables and chi-square for categorical variables.

[b] Medical record components include cancer surgery operative, chemotherapy treatment plan or summary, radiation therapy treatment plan or summary, general medicine, radiology imaging, and pathology notes/reports.

[c] Health Maintenance Organization

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Table 2

Factors Associated with Barriers to Specialist Referral, Stratified by Specialty Type, Adjusted.

	Primary Care Physician n=1,562		Specialist Physician n=2,144	
	β-coefficient[a]	95% CI	β-coefficient[a]	95% CI
Male gender	0.03	−0.06, 0.11	0.07	−0.02, 0.15
Age				
<40 years	−0.02	−0.11, 0.07	0.10	0.02, 0.18
40–59 years	Reference		Reference	
60+ years	−0.15	−0.25, −0.04	−0.04	−0.11, 0.03
Specialty				
Surgeon			Reference	
Medical oncologist			0.31	0.23, 0.39
Radiation oncologist			0.38	0.28, 0.48
Other medical specialist			−0.10	−0.17, −0.03
International medical graduate	0.34	0.25, 0.44	0.28	0.20, 0.35
Not board-certified	0.17	0.05, 0.29	0.05	−0.06, 0.16
No teaching medical students/residents	0.04	−0.03, 0.11	0.04	−0.02, 0.10
Practice setting				
Hospital	Reference		Reference	
Office				
Solo	0.20	0.03, 0.36	0.21	0.11, 0.31
Single-specialty	0.06	−0.09, 0.21	0.10	0.03, 0.18
Multi-specialty	−0.03	−0.18, 0.11	−0.05	−0.15, 0.04
Other	−0.04	−0.24, 0.15	0.01	−0.25, 0.26
Community health center	0.34	0.08, 0.60	0.12	−0.10, 0.35
Government-owned practice	0.36	0.11, 0.61	0.27	0.06, 0.47
Small practice size (<20 physicians)	0.13	0.04, 0.23	0.04	−0.04, 0.11
Percent patients in managed care plans				
<30%	0.28	0.16, 0.41	0.46	0.31, 0.61

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	Primary Care Physician n=1,562		Specialist Physician n=2,144	
	β-coefficient[a]	**95% CI**	**β-coefficient[a]**	**95% CI**
30–89%	0.46	0.36, 0.56	0.51	0.39, 0.63
90–100%	Reference		Reference	
Availability of medical record components	−0.08	−0.10, −0.05	−0.04	−0.07, −0.01
Data collection site				
Cancer Research Network—5 HMOs	Reference		Reference	
Northern California—8 counties	−0.08	−0.21, 0.05	−0.06	−0.17, 0.05
State of Alabama	0.00	−0.16, 0.16	−0.07	−0.21, 0.06
Los Angeles County	0.06	−0.07, 0.18	0.05	−0.06, 0.16
State of Iowa	0.14	−0.01, 0.29	−0.02	−0.16, 0.12
State of North Carolina—22 counties	0.13	−0.29, 0.02	−0.10	−0.23, 0.02

[a] β-coefficients represent a higher or lower barrier score compared with the reference, and correspond to the original five-point Likert scale, e.g. −1.0 may correspond to “never” compared with “rarely.”

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Table 3

Predicted Probabilities of Being Very/Somewhat Satisfied with Career, Stratified by Specialty Type, Adjusted.

	Primary Care Physician n=1,536			Specialist Physician n=2,119		
	Predicted probability	**95% CI**	***P*[a]**	**Predicted probability**	**95% CI**	***P*[a]**
Barrier score[b]						
1.0–1.9	84.2%	82.2–86.2	Reference	88.1	86.3–89.9	Reference
2.0–2.9	82.3%	80.2–84.4	.19	86.1	84.2–88.0	.09
3.0–3.9	80.4%)	76.2–84.5	.11	84.0	80.3–87.7	.04
4.0–5.0	65.1%	51.6–78.6	<.01	70.9	58.4–83.4	<.01
Gender						
Male	82.1%	80.6–83.7	.22	86.3	84.9–87.8	.23
Female	84.2%	81.2–87.2	Reference	88.0	85.3–90.7	Reference
Age						
<40 years	85.4%	82.2–88.5	.02	88.8	86.2–91.5	.02
40–59 years	81.3%	79.6–83.0	Reference	85.5	83.8–87.2	Reference
60+ years	85.3%	82.4–88.2	.02	88.5	86.0–91.0	.03
Specialty						
Surgeon				84.2	81.7–86.7	Reference
Medical oncologist				88.3	85.4–91.2	.04
Radiation oncologist				91.8	88.1–95.5	<.01
Other medical specialist				86.4	83.6–89.2	.26
International medical graduate						
Yes	83.7%	80.6–86.7	.47	87.3	84.6–90.0	.52
No	82.4%	80.8–83.9	Reference	86.4	84.9–87.9	Reference
Board-certified						
Yes	83.1%	81.7–84.6	Reference	86.8	85.3–88.2	Reference
No	78.4%	73.4–83.4	.07	83.3	78.9–87.7	.12
Teaching medical students/residents						

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	Primary Care Physician n=1,536			Specialist Physician n=2,119		
	Predicted probability	95% CI	P^a	Predicted probability	95% CI	P^a
Yes	86.3%	84.3–88.3	Reference	88.9	87.3–90.6	Reference
No	80.8%	79.1–82.6	<.01	84.3	82.3–86.3	<.01
Practice setting						
Hospital	85.3%	82.8–87.8	Reference	86.9	84.6–89.2	Reference
Office						
Solo	78.7%	75.2–82.3	<.01	86.4	80.0–86.7	.09
Single-specialty	85.2%	82.7–87.7	.95	87.9	85.6–90.1	.57
Multi-specialty	84.1%	81.5–86.7	.51	87.2	84.4–89.9	.88
Other	74.0%	65.7–82.3	.01	79.0	71.4–86.7	.049
Community health center	84.1%	73.5–92.5	.65	86.0	77.7–94.3	.83
Government-owned practice						
Yes	84.1%	74.6–93.6	.75	88.1	80.5–95.7	.69
No	82.6%	81.2–84.0	Reference	86.5	85.1–88.0	Reference
Practice size (# physicians)						
<20	82.7%	81.1–84.4	.79	86.6	85.0–88.1	.98
20+	82.2%	78.9–85.5	Reference	86.5	83.5–9.5	Reference
% patients in managed care plans						
<30%	84.1%	81.5–86.7	.20	87.4	85.1–89.7	.36
30–89%	82.5%	80.5–84.5	.53	86.4	84.6–88.2	.67
90–100%	81.2%	78.0–84.5	Reference	85.7	82.7–88.7	Reference
# medical record components always available						
0–3	75.8%	71.2–80.3	Reference	81.1	77.0–85.2	Reference
4–6	83.6%	82.2–85.1	<.01	87.0	85.6–88.5	<.01
Income increase from referring patients						
Yes	95.2%	89.8–100.0	<.01	96.4	92.3–100.0	<.01
No	82.5%	81.1–83.9	Reference	86.3	84.8–87.8	Reference
Data collection site						

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	Primary Care Physician n=1,536			Specialist Physician n=2,119		
	Predicted probability	95% CI	P^a	Predicted probability	95% CI	P^a
Cancer Research Network—5 HMOs	83.3%	79.1–87.5	Reference	87.0	83.3–90.7	Reference
Northern California—8 counties	84.0%	81.5–86.5	.78	87.4	85.2–89.7	.85
State of Alabama	85.4%	82.1–88.8	.46	89.1	86.3–91.8	.39
Los Angeles County	80.7%	78.1–83.4	.31	84.9	82.5–87.3	.31
State of Iowa	81.6%	77.5–85.7	.56	86.0	82.4–89.5	.67
State of North Carolina—22 counties	81.2%	77.4–85.1	.48	85.3	82.1–88.6	.49

[a] Significance values obtained from multivariable logistic regression.

[b] A higher barrier score reflects higher frequency of reporting barriers to specialist referral.