The Role of Physician Professional Networks in Physicians' Receipt of Pharmaceutical and Medical Device Industries' Payments

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BACKGROUND: Financial relationships between physicians and the pharmaceutical and medical device industries are common, but the factors associated with physicians receiving payments are unknown.

OBJECTIVE: The objective of this study is to evaluate the influence of physicians' professional networks' characteristics on the receipt of payments among physicians.

DESIGN: Network analysis of cross-sectional data

PARTICIPANTS: US physicians who shared Medicare patients with other physicians in 2015 (*N*=357,813).

EXPOSURE (INTERVENTION): Proportion of a physician's professional network that received industry payments and other network characteristics including number of physician connections, how central the physician is within the network, and the tightness of the referral network in which a physician is located.

MAIN OUTCOME MEASURES: Relative risk of receiving industry payments. We used modified Poisson regression to control for confounding by gender, time since graduation, practice size, and practice setting (teaching hospital vs. not). We included dummy variables for specialty and hospital referral region level.

KEY RESULTS: The proportion of a physician's peers in their professional network that received payments was strongly associated with receipt of pharmaceutical or device industry payments by the physician (top vs bottom quartile aRR=1.28, 95%CI=1.25–1.31). Physician's centrality within a network had a small positive effect on receiving payment (top vs bottom quartile aRR=1.02, 95%CI=1.01–1.04). Network density also had a small negative association with receipt of payment (top vs bottom quartile aRR=0.97, 95%CI=0.96–0.98).

CONCLUSIONS: Network characteristics, particularly the receipt of payments among physicians one shares patients with, are associated with whether a physician receives payments. This finding has implications for institutional regulation of industry payments to physicians and demonstrates how institutional policy may impact not only the physicians within the institution but also physicians outside of the institution.

Received February 4, 2020
Accepted April 3, 2021
Published online April 26, 2021

J Gen Intern Med 36(7):1858–66
DOI: 10.1007/s11606-021-06802-9

INTRODUCTION

Financial relationships between physicians and the pharmaceutical and medical device industries have become increasingly commonplace within the United States (US). A 2009 Institute of Medicine report suggested that such relationships represent conflicts of interest that threaten the "quality of patient care and the public's trust in medicine."[1] However, patients often are not concerned if physicians receive money from industry.[2,3] Scientific investigation has given increasing credence to such concerns, suggesting that financial relationships with industry influence physician behavior in potentially inappropriate ways. Physicians with industry relationships interpret clinical trial results more favorably[4] and are more likely to recommend specific drugs when writing clinical practice guidelines.[5] Additionally, industry payments may directly influence patient care by increasing physicians' prescription of higher-cost, brand-name, and/or inappropriately used pharmaceuticals.[6–11] Even small gifts (e.g., $20 meals) have been associated with increased prescribing of a company's drugs.[9]

The Open Payments Provision of the Affordable Care Act (also known as the "Sunshine Act") mandated public reporting of all financial payments between the pharmaceutical and medical device industries and US physicians and teaching hospitals. Industry payments valued as low as $10 are included in this public record, which is reported annually and made available for free download by the Centers for Medicare and Medicaid Services (CMS).[12]

Prior research has focused on how receiving industry payments impacts physician behavior. However, the literature has largely failed to explore which physicians receive payments outside of studies that examine physicians' specialty and demographics.[13,14] We hypothesize that physicians' caring for the same patient, shown in referral networks, may influence physicians receiving industry payments. Based on evidence suggesting that physicians who share patients are more likely to have a recognized professional relationship, we measure physicians' referral networks using shared patient relationships from claims.[15–17]

Physicians' role in networks may influence receipt of industry payment in many ways. First, physicians may be more likely to accept industry payments if their peers also accept industry payments due to social norms. Alternatively, physicians who accept payments from industry may choose to work in practices that encourage receipt of industry funds (i.e., homophily). Second, if physicians are important within a network, then industry may target them since they may be able to influence their colleagues' behavior. Influence can be measured in network analysis as how central an individual is within a network. Additionally, any individual physician may be less likely to be targeted by industry in dense, tightly connected networks because information would already spread quickly in such networks. Despite the importance of the social environment, little to no research has explored the influence of physicians' referral network on receiving payments from industry. This study uses established methods from the network sciences to examine how network characteristics influence the receipt of payments among physicians.

METHODS

Data Sources

Industry Payments. Open Payments data contains all transfers of financial value greater than $10 from US drug and device manufacturers to physicians and teaching hospitals. Payments are categorized as "general payments," including gifts, consultancy/speaker fees, meals, and travel; "research payments," including any payments associated with preclinical research, FDA phases I–IV trials, or investigator-initiated studies; and "ownership interests," including stocks, bonds, and partnership. Each financial transaction includes descriptors such as date, type of payment, industry payer, and recipient physician/hospital.[12] For this study, we examined the association of general payments only and any further reference to industry payments exclusively refers to general payments received in 2015.

Physician Compare. CMS publicly releases data on physicians' characteristics as part of the Physician Compare initiative.[18] We used this information for physician characteristics including gender, practice size, graduation year, and location. We used the 2017 Physician Compare file as it contains information about physician characteristics recorded in 2015.

Physician Shared Patient Networks. We used CMS Physician Shared Patient Patterns (PSPP) files.[19] These records were created by CMS and constructed with Medicare claims housed in the CMS Integrated Data Repository to identify physician-patient sharing networks. Each physician sharing relationship is recorded within the data by counting the number of shared patients over a 30-day window and the number of unique patients within a 30-day window. These counts are aggregated over the course of the year. CMS includes only physician pairs that shared 11 or more unique patients over the course of a year.

Linking Between Datasets. We obtained data from all sources for calendar year 2015 and linked across all datasets. First, we linked the Open Payments data to the CMS National Plan and Provider Enumeration System (NPPES), a record of the full universe of providers billing CMS, to identify the quality of the overall linkage. Because there is no common physician identifier between the Open Payments data and all other files, including NPPES, we used the recorded provider name and practice location (state, city, and zip code) to link datasets similar to the methods described by DeJong et al.[9] We then merged this data to the Medicare Physician Compare file and Physician Shared Patient Patterns data using the National Provider Identifier (NPI) (see Appendix Figure A). This resulted in a dataset that includes physicians that do and do not receive industry payments.

Measures

Primary Outcome. The primary outcomes for this study were the receipt of any payments from industry in 2015. Additionally, we also examine if results are consistent at a higher threshold of receipt of payments of $100 or more as this likely suggests a stronger relationship between the physician and industry.

Identifying Physician Networks. Using the Physician Shared Patient Patterns, we created physician-to-physician networks, which connect each physician to each other through shared patients. When there are any shared patients between two physicians, this is referred to as a "tie" between the two physicians. We created geographically based physician networks within hospital referral regions (HRR).[20,21] We dropped any observations where the ties between physicians spanned two HRRs. This resulted in 309 geographically based physician networks. After networks were created, we dropped physicians that had less than two ties with another physician since transitivity (a network metrics that measures density) requires more than one tie for calculation (N=45,938, 11% of physicians).

Network-Based Metrics

Degree. The strength, or value, of the tie can be determined by assessing the number of patients the physicians shared. We assess how connected a physician is by summing the number of ties a physician had, weighted by the value of these ties, to determine the "valued degree" (i.e., if a physician shared 12 patients with each of 4 other physicians, the total degree for that physician would be 48).

Betweenness Centrality. To quantify a physician's centrality and influence within her network, we calculated the betweenness centrality. Betweenness centrality is measured by counting the number of times a physician is on the shortest path between the other physicians, divided by all the shortest paths between all the physicians within a network. In the social network literature, individuals who are highly central in a network are often considered to be more influential.[22] Therefore, we hypothesize the highly central individuals will be more likely to be targeted by industry due to their influential nature.

Transitivity. Also known as the clustering coefficient, transitivity describes the density or tightness of a network. It is calculated by examining the proportion of a physician's peers that share patients with each other, with larger numbers indicating increased clustering.[23] Tight networks may allow for faster spread of information; therefore, we expect that industry will not have to target as many people within tight networks since the information will spread rapidly by just targeting a few physicians.

Peer Receipt of Payments. For each physician, we measured the commonality of industry payments among his/her peers, calculated as the proportion of physicians to whom the index physician had ties who received any payments or payments greater than or equal to $100 from industry.[24] We hypothesize that peer receipt of payments will be associated with physicians' acceptance of payments from industry for many reasons. First, physicians may choose to work with other physicians who are similar to themselves (i.e., homophily). Peers accepting or failing to accept industry payments may also result in a social norm that results in a physician being willing to accept or reject an industry payment.

Covariates. We also measured the following covariates: physician gender, physician specialty, time since graduation, practice size, and practice setting (teaching hospital vs other settings). Specialty was based on recorded specialty in the Physician Compare data. We identified teaching hospitals based on CMS data and hand-matched the list to the Physician Compare–derived hospital and/or institutional association for each physician.[18] Previous research has found that academic hospitals are associated with industry payments and therefore included in the analysis. Other information outside of practice size and practice setting was not available and therefore could not be included in the analysis. Time since graduation and practice size were broken into categorical variables to allow for non-linear relationships between the outcome and the variable.

Statistical Analysis

In order to determine the association between a physician's network characteristics and the receipt of industry payments, we first examined the unadjusted relationship between network characteristics and receipt of payments. We defined quartiles within each HRR for all network metrics (degree, betweenness centrality, transitivity, and percent of connected physicians receiving payments) and treated the quartiles as categorical variables. We used a modified Poisson model to estimate the adjusted relative risk of receiving industry payments. Additionally, we used predictive marginal standardization to generate the predicted probability of receiving industry payments.[25] We included a series of dummy variables for HRR and physician specialty and adjusted for all previously listed covariates. Additionally, we clustered standard errors at the HRR level.

Sensitivity Analysis

Examining the Heterogeneity of Network Effects by Specialty. We conducted sensitivity analyses to examine if broad physician specialty (generalist (family practice, general practice, geriatric medicine, hospitalist, and internal medicine specialties), surgeon (cardiac surgery, colorectal surgery, general surgery, hand surgery, maxillofacial surgery, oral surgery, orthopedic surgery, plastic and reconstructive surgery, surgical oncology, thoracic surgery, and vascular surgery), and specialist (all other specialties)) changed the overall relationships between network-based metrics and receipt of industry payments. To do this, we included dummies for a broad categorization of physician specialty and interacted broad specialty with network-based metrics using a modified Poisson model and then used predictive marginal standardization to generate the predicted probability of receiving industry payments.

Robustness of Peer Effect. We are interested in the influence of peers on a provider, for example, how physician A's behavior influences physician B. Because peers influence one another, the issue we are concerned with is that physician B influences physician A at the same time that physician A influences physician B. This is called "reflection" in the network literature.[26] We consider two ways to break the influence of physician B on physician A. First, by lagging physician A's payments, there is still influence of physician A's payments last period on physician B's this period, but temporally physician B's payments in this period should not affect physician A's payments in the earlier year.[27] In the analysis, we implemented this concept by examining how the prior year's peers' receipt of payments impacts a physician in the current year.

Second, we attempted to identify peers that are not connected to physician B. Assume last year, physician A and B worked in different areas, and physician A worked with physician C. Physician A and C influence one another, but physician C never meets physician B. If physician C received payments from industry, in the next year, physician C's receipt of payments would be indirectly transmitted to physician B, via physician A. However, since physician C was never "exposed" to physician B, it is impossible for physician B's behavior to impact physician C. We implemented this by examining physicians that have moved in the prior year (determined by a changing billing zip code) to investigate how their peers from the prior year influence payments in this year.[28] We treated peers' prior year payments as an instrumental variable and used two-stage residual inclusion model for our instrumental variable analysis.[29] We dichotomized proportion of peers receiving a payment as in the top or bottom half for the instrumental variable analysis (Table 1).

Table 1 Descriptive Characteristics Overall and by Receipt of Pharmaceutical or Device Industry Payments

	Any receipt of pharmaceutical or device industry payments		
	No payments	Payment	*P*-value
N	136,287	221,526	
Male	69.20%	78.67%	<0.001
Graduation year	1992.9 (11.4)	1990.9 (11.0)	<0.001
<1985	27.66%	32.79%	<0.001
1986–1994	23.73%	26.48%	
1995–2001	20.67%	20.73%	
2002+	27.93%	20.00%	
Teaching hospital	6.59%	7.79%	<0.001
Practice size			
0–20	21.57%	28.86%	<0.001
21–119	21.93%	22.84%	
120–439	16.94%	17.02%	
440+	39.56%	31.28%	
Network characteristics			
Degree	39.07 (62.24)	38.53 (51.17)	0.005
Quartile 1	29.40%	24.64%	<0.001
Quartile 2	23.37%	24.80%	
Quartile 3	22.78%	25.63%	
Quartile 4	24.45%	24.92%	
Betweenness centrality	5959.55 (43670.29)	4213.46 (30381.01)	<0.001
Quartile 1	27.23%	23.61%	<0.001
Quartile 2	24.96%	24.94%	
Quartile 3	23.38%	26.11%	
Quartile 4	24.43%	25.34%	
Transitivity (clustering coef)	0.69 (0.28)	0.69 (0.26)	0.31
Quartile 1	26.39%	24.21%	<0.001
Quartile 2	22.42%	26.49%	
Quartile 3	25.15%	26.22%	
Quartile 4	26.04%	23.08%	
% 1st degree ties with payments	51.14%	59.97%	<0.001
Quartile 1	31.65%	22.65%	<0.001
Quartile 2	25.14%	24.23%	
Quartile 3	22.04%	26.72%	
Quartile 4	21.17%	26.40%	
% 1st degree ties with payments >100	34.05%	42.40%	<0.001
Quartile 1	31.24%	22.47%	<0.001
Quartile 2	25.61%	24.83%	
Quartile 3	22.35%	26.09%	
Quartile 4	20.80%	26.61%	

Note: Degree is how connected a physician is, which was calculated by summing the number of ties a physician had with other physicians and then weighted by the value of these ties by the number of patients. Betweenness centrality quantifies a physician's centrality and influence within her network; it is measured by counting the number of times a physician is on the shortest path between the other physicians, divided by all the shortest paths between all the physicians within a network. Transitivity, also known as the clustering coefficient, is calculated by examining the proportion of physician's peers that share patients with each other, with larger numbers indicating increased clustering

RESULTS

Of 357,813 included physicians, we found that 62% received a payment of any value and 45% received total payments of at least $100 from industry (Table 2). We found that physicians receiving payments were more likely to be men, were from relatively smaller practices, were older, and were more likely to practice at a teaching hospital (Table 1). When looking at network characteristics, we found that those who received payments were more likely to have many ties, more likely to have high betweenness centrality in the network, and less likely to be part of dense network (based on transitivity) but were much more likely to have peers that received industry payments (Table 1).

The adjusted results show many physician characteristics were associated with payment receipt (Table 3). We found many physician characteristics associated with an increased risk of receiving payments including gender (men's aRR=1.10, 95%CI=1.09–1.11), practices size (aRR=0.87, 95%CI=0.86–0.89 when comparing physicians who practice in groups of 0–20 to groups over 440 physicians), age (aRR=0.94, 95%CI=0.93–0.95 when comparing those graduating before 1985 to those who graduated 2002 and after), and working at a teaching hospital (aRR=1.02, 95%CI=1.01–1.03).

We found that network characteristics were associated with receiving payments. First, we found a large significant positive association between peers receiving pharmaceutical or device industry payments and receipt of pharmaceutical or device industry payments for the physician (top quartile aRR=1.28, 95%CI=1.25–1.31 with the bottom quartile of proportion of peers receiving payments as the reference). When examining the predicted probabilities of receiving payments, we saw a consistent dose-response relationship between the proportion of peers that receive payments and the physician herself receiving payments (Fig. 1): from 54% in the bottom quartile to 69% in the top quartile. We did not find a consistent association between the number of ties a physician had and receiving payments. When examining transitivity (i.e., network density), we observed a consistent negative association; however, moving from

Table 2 Receipt of Pharmaceutical or Device Industry Payments Among Included Physicians

		Any receipt of pharmaceutical or device industry payments		
	Overall	No payments	Payment	*P*-value
N	357,813	136,287	221,526	
Total payments, mean (SD)	$2789 (34,079)	$0	$4506 (43,223)	<0.001
Total payments, median	$59	$0	$324	<0.001
Received any payment	61.91%	0	100.00%	<0.001
Received over $100 in payments	45.31%	0	73.18%	<0.001

Table 3 Association Between Receipt of Pharmaceutical or Device Industry Payments and Physician and Network Characteristics

	Any payments	Payments > $100*
	Adjusted risk ratio	Adjusted risk ratio
Male	1.10 (1.09, 1.11)	1.16 (1.14, 1.18)
Practice size		
0–20	Reference	Reference
21–119	0.95 (0.93, 0.96)	0.90 (0.89, 0.92)
120–439	0.91 (0.89, 0.93)	0.86 (0.84, 0.88)
440+	0.87 (0.86, 0.89)	0.84 (0.82, 0.86)
Graduation year		
<1985	Reference	Reference
1986–1994	1.02 (1.02, 1.03)	1.06 (1.05, 1.07)
1995–2001	1.00 (1.00, 1.01)	1.03 (1.02, 1.04)
2002+	0.94 (0.93, 0.95)	0.96 (0.94, 0.97)
Teaching hospital, %	1.03 (1.00, 1.05)	1.03 (1.00, 1.05)
% 1st degree ties with payments		
Quartile 1	Reference	
Quartile 2	1.12 (1.11, 1.14)	
Quartile 3	1.22 (1.19, 1.24)	
Quartile 4	1.28 (1.25, 1.31)	
% 1st degree ties with payments >100		
Quartile 1		Reference
Quartile 2		1.18 (1.17, 1.20)
Quartile 3		1.33 (1.30, 1.36)
Quartile 4		1.45 (1.41, 1.50)
Network characteristics		
Degree		
Quartile 1	Reference	Reference
Quartile 2	1.01 (1.00, 1.02)	1.02 (1.01, 1.04)
Quartile 3	1.00 (0.98, 1.01)	1.00 (0.98, 1.02)
Quartile 4	0.98 (0.97, 1.00)	0.97 (0.94, 0.99)
Betweenness centrality		
Quartile 1	Reference	Reference
Quartile 2	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)
Quartile 3	1.01 (1.00, 1.02)	1.01 (1.00, 1.03)
Quartile 4	1.02 (1.01, 1.04)	1.03 (1.01, 1.04)
Transitivity		
Quartile 1	Reference	Reference
Quartile 2	1.00 (0.99, 1.01)	0.99 (0.98, 1.00)
Quartile 3	0.98 (0.97, 0.99)	0.96 (0.95, 0.98)
Quartile 4	0.97 (0.96, 0.98)	0.96 (0.94, 0.97)

*Note: Models also included dummy variable for the hospital referral region and specialty of the provider. Standard errors clustered at the hospital referral region. *The outcome in this model is receipt of payments of $100 or more as this likely suggests a stronger relationship between the physician and industry. Additionally, we only examine receipt of payments > $100 for this analysis*

the top to bottom quartile only changed the predicted probability of receiving a payment by 1.8% (top quartile aRR=0.97, 95%CI=0.96–0.98). We found that betweenness centrality was associated with a slight increase in the probability of receiving payments, when comparing the bottom quartile to the top two quartiles (top quartile aRR=1.02, 95%CI=1.01–1.04). Again, the predicted probability when moving from the top to bottom quartile only increased the predicted probability of receiving a payment by 1.5 percentage points. All of these results were consistent when we treated receipt of payments over $100 as the outcome with the exception of the number of connections where we observed a significant small, negative association between the number of ties a physician had and receiving payments of at least $100 when comparing the top to the bottom quartiles (top quartile aRR=0.97, 95%CI=0.94–0.99, p-value<0.01).

We examined if the association between networks effects was consistent when specialty was broadly categorized into a generalist, surgeon, or specialist (Fig. 2). We found that as degree of connectiveness increased, payments to generalists generally decreased, while when comparing the lowest and higher quartiles, surgeons and specialist probability of receiving payments increased. Betweenness centrality had no statistically significant effects or very small effects across providers. For transitivity (i.e., network density), we again observed heterogeneity. First, we did not observe any associations between transitivity quartiles and payments for surgeons. However, for generalists, as transitivity increased, the risk of receiving payments decreased. Specialist risk of receiving payments seems to have an inverted U-shaped association, with those in the 2nd and 3rd quartiles of transitivity having the highest risk and those in the 1st and 4th quartiles of transitivity having the lowest risk of receiving payments.

Consistent with the primary analyses, we found a large significant positive association between peers receiving payments and receipt of payments for the physician. However, we find the largest increase among generalists.

We also tested the robustness of peer effects estimate since the current results may suffer from the reflection problem. We examined how the prior year's peers' receipt of payments impacts a physician in the current year and compared proportion of peers receiving a payment as in the top or bottom half. The relative risk for the proportion of over half of peers receiving payments was 1.14 (95%CI=1.13–1.14) when only looking at ties from the prior year.

Additionally, when only examining physicians that have moved in the prior year, which ensures that prior year peers in another area is unlikely to influence the physician in the current year. Again, we compared proportion of peers receiving a payment as in the top or bottom half. The relative risk for the proportion of over half of peers receiving payments was 1.14 (95%CI=1.11–1.16).

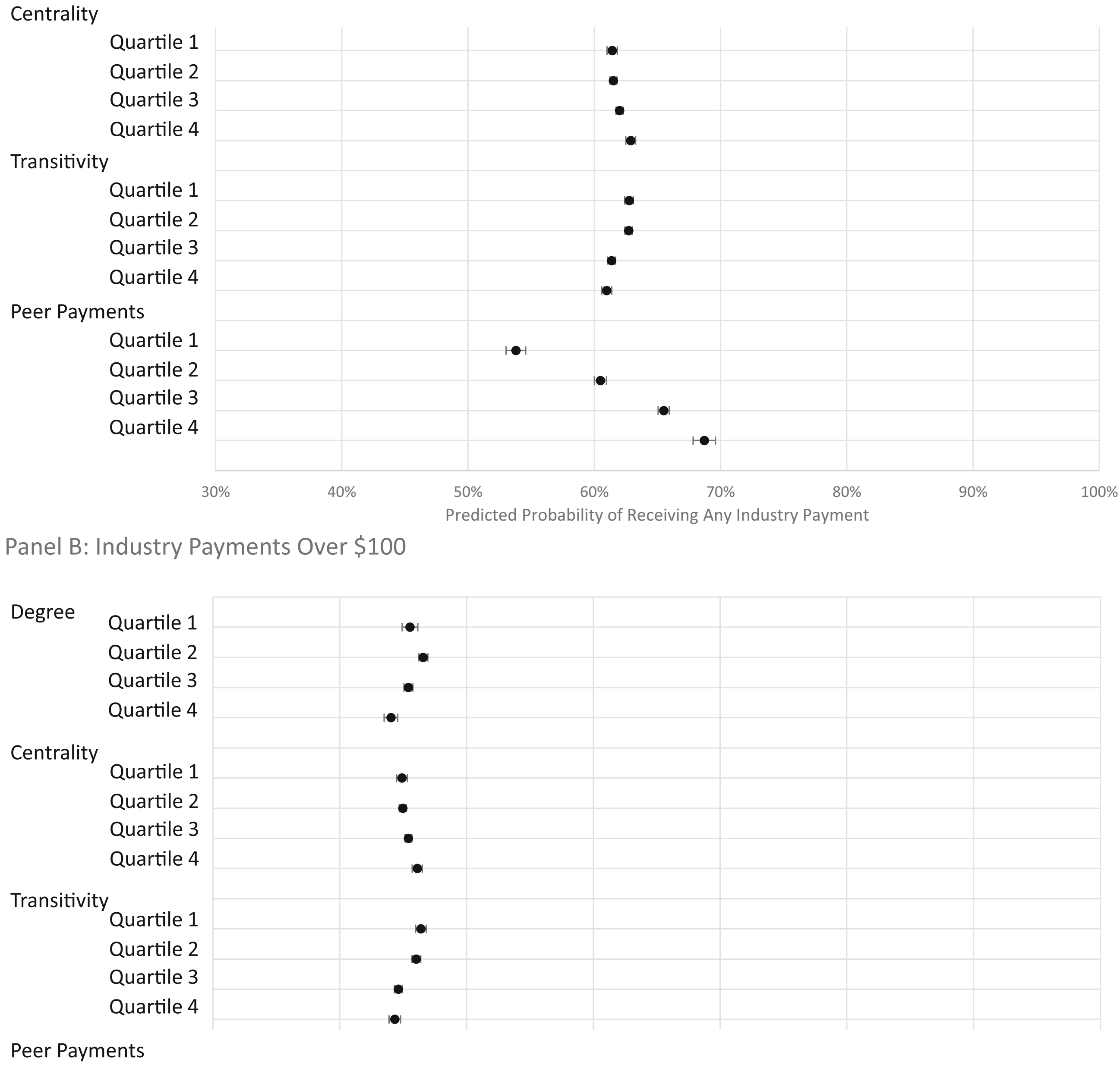

Figure 1 Adjusted predicted probability of industry payments. Note: Predicted probabilities generated using marginal standardization based on model estimates.

DISCUSSION

Our results suggest that physicians' network characteristics may be an important determinant of whether physicians receive industry payments. Physicians' direct ties had the largest association with the receipt of payments. We tested this relationship to try to overcome reflection bias and found similar results. Moreover, we found the largest association for generalists. We found that other network characteristics also associated with receiving payments. First, as physicians became more central, they were more likely to receive payments, and as the tightness of a network increased, physicians were less likely to receive payments. However, these relationships were relatively small in magnitude. Counter to our hypothesis, we did not find a consistent association with the number of physician ties, as measured by degree, and receipt of payments. When looking at broad specialty, for generalists, we found that as their number of connections increased, the probability that they received payments decreased. However, specialist and surgeons were more likely to receive payments if they were not in the lowest quartile (or lowest half for surgeons) of degree connections suggesting that among physicians that are not generalists, there is a potential threshold number of connections which increases the likelihood of receiving industry payments. In addition to network characteristics, consistent with prior work, we found that men, those in small practices, older physicians, and those in teaching hospitals were more likely to receive payments.[30]

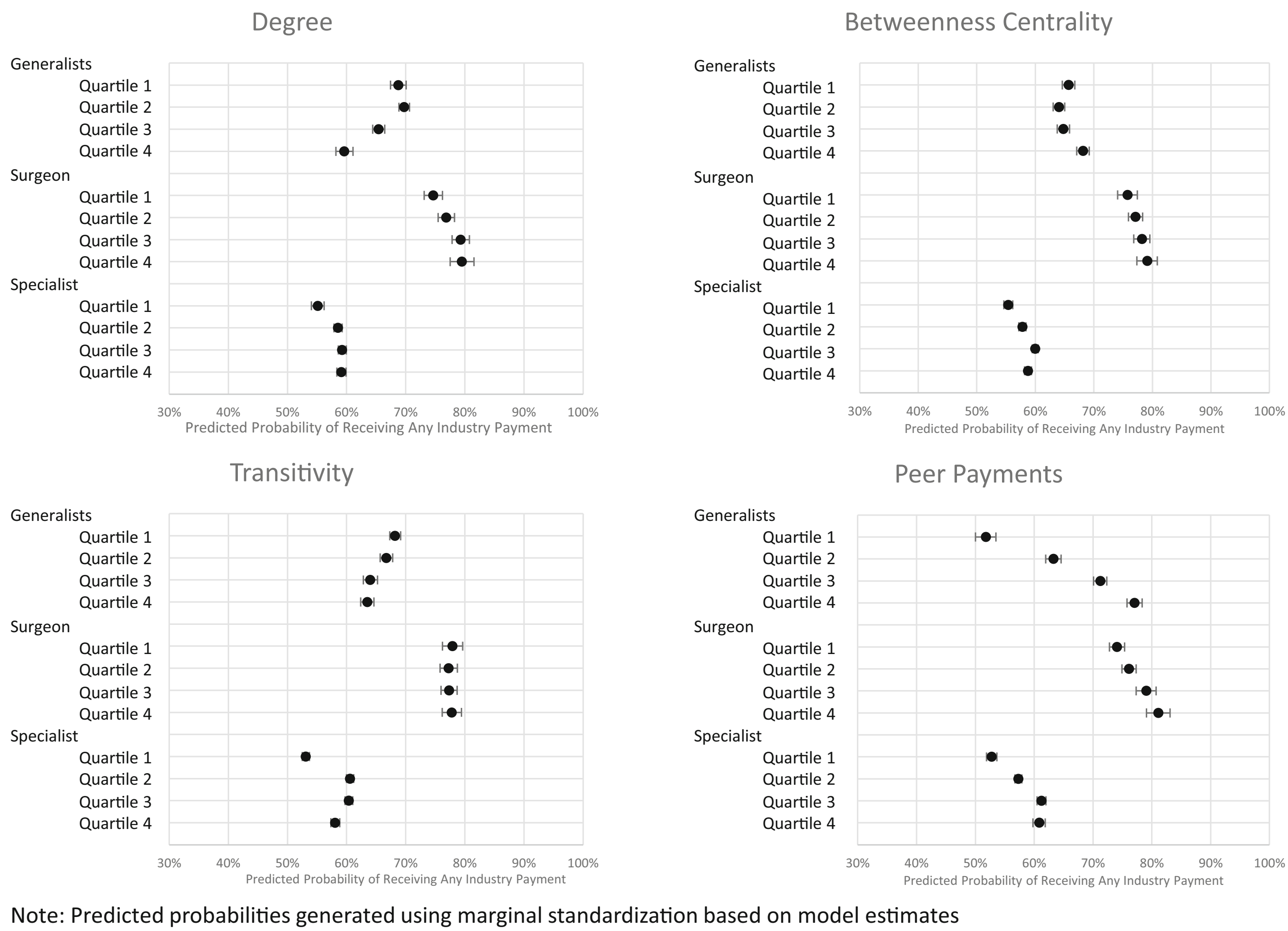

Figure 2 Adjusted predicted probability of industry payments by broad specialty. Note: Predicted probabilities generated using marginal standardization based on model estimates.

Prior work has documented that payments influence prescribing[1]; however, there is little work that has documented what influences who receive payments. Prior work has examined some factors, such as the strength of a hospital's conflict of interest policy, and has found that conflict of interest policy is not associated with receiving payments.[30]

This study has several limitations. First, our study relied on Open Payments data for identification of receipt of payments which may may underreport physicians' receipt of payments.[31] Second, we constructed our physician networks based on Medicare data; therefore, the networks of physicians may vary when including non-Medicare patients. However, this data is unique in its completeness of capturing all Medicare interactions, whereas prior work has had to construct networks based on much smaller geographic samples.[15–17] Third, we created networks based on physician sharing a patient within a 30-day timeframe. Recent work has tested if networks should be constructed from all mutual patients between physicians, or from the subset of mutual patients treated by both physicians for related health conditions; both approaches were found to be reasonable and can be used for network analysis.[32] Fourth, we do not capture many physician characteristics that may be relevant such as a physician's reputation, physical proximity between physicians, and friendships between physicians. Additionally, we did not include other professional networks, such as medical group affiliation, medical school or residency training, that may influence physicians. However, prior research has found that shared patients are the most important factor in prior research examining prescribing.[33] Fifth, we only have data on shared patients when there are at least 11 patients. We believe that this should accurately capture most relationships as prior research has found when physicians share 8 or more patients then there is an over 75% chance of physicians having a validated information sharing relationship.[34] Therefore, requiring at least 11 shared patients increases the probability that physicians have a true information sharing relationship. Moreover, we are not able to identify if connected physicians are jointly targeted by industry payments, such as providing multiple physicians a meal at the same time. However, we found consistent results when looking at higher thresholds of payments which would likely exclude this particular scenario (a meal provided to multiple physicians at one time). Finally, we require that physicians have more than 1 connection in order to calculate transitivity and therefore the results cannot be generalized to these individuals.

Our study illustrates the complexity of the relationship between network characteristics and industry payments. This study does not identify the causal mechanism underlying this association; it is not clear whether industry preferentially targets opinion leaders or well-connected physicians, or if more important and well-connected physicians more actively seek out and secure payments. However, our clearest findings suggest that the receipt of payments among physicians one shares patients with is positively associated with whether a physician chooses to receive payments. This finding has implications that if an institution changes rules around whether physicians can receive industry payments and these policies changes actually result in physicians not receiving industry payments, this may impact not only the physicians within the institution but also physicians outside of the institution that are professionally connected to physicians within the organization. Future research is needed to examine what policies and procedures can be implemented that actually change physicians' receipt of industry payments.

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Supplementary Information *The online version contains supplementary material available at https://doi.org/10.1007/s11606-021-06802-9.*

Declarations:

As all data is publicly accessible, this research is considered exempt from IRB approval. Dr Winn is supported by the National Center for Research Resources, the National Center for Advancing Translational Sciences, and the office of the Director, National Institutes of Health, through Grant Number KL2TR001438 and had no role in any aspect of the study.

Conflict of Interest: *Dr Winn has provided consulting for pending litigation for Takeda not related to this study. All other authors have no conflicts of interests.*

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