Why Do Physicians Vary So Widely in Their Referral Rates?

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OBJECTIVE: To determine which physician practice and psychological factors contribute to observed variation in primary care physicians' referral rates.

DESIGN: Cross-sectional questionnaire-based survey and analysis of claims database.

SETTING: A large managed care organization in the Rochester, NY, metropolitan area.

PARTICIPANTS: Internists and family physicians.

MEASUREMENTS AND MAIN RESULTS: Patient referral status (referred or not) was derived from the 1995 claims database of the managed care organization. The claims data were also used to generate a predicted risk of referral based on patient age, gender, and case mix. A physician survey completed by a sample of 182 of the physicians (66% of those eligible) included items on their practice and validated psychological scales on anxiety from uncertainty, risk aversiveness, fear of malpractice, satisfaction with practice, autonomous and controlled motivation for referrals and test ordering, and psychosocial beliefs. The relation between the risk of referral and the physician practice and psychological factors was examined using logistic regression. After adjustment for predicted risk of referral (case mix), patients were more likely to be referred if their physician was female, had more years in practice, was an internist, and used a narrower range of diagnoses (a higher Herfindahl index, also derived from the claims data). Of the psychological factors, only greater psychosocial orientation and malpractice fear was associated with greater likelihood of referral. When the physician practice factors were excluded from the analysis, risk aversion was positively associated with referral likelihood.

CONCLUSIONS: Most of the explainable variation in referral likelihood was accounted for by patient and physician practice factors like case mix, physician gender, years in practice, specialty, and the Herfindahl index. Relatively little variation was explained by any of the examined physician psychological factors.

KEY WORDS: Primary health care; physician's practice patterns; referral and consultation.
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Research from both the United Kingdom[1] and the United States[2] has demonstrated that primary care physicians exhibit wide variation in their referral rates. In a previous report we found that case-mix-adjusted referral rates varied from less than 5% of patients referred per year to more than 60%, and also that the referral rates were stable over time and across diagnostic categories.[3] Thus, these variations reflect a relatively stable behavior that is likely to have a significant impact on the access of patients of primary care physicians to specialists. However, relatively little is known about the factors that drive these differences.[4]

Patient characteristics, beyond the specific clinical problem, affect the likelihood of being referred.[5–7] In addition, physician and practice characteristics, such as specialty,[8,9] reimbursement,[10] and time pressure,[2] are reported to affect referral rates. Taken together, however, few of these factors have been found to account for much of the observed variation in referral rates. In part, this limitation reflects the small sample sizes involved in most studies, so estimates of true referral rates are unstable,[11] and results have not been reproducible. More recently, attention has focused on psychological factors that affect this physician behavior.[12,13] Psychological factors, such as risk aversion, tolerance of uncertainty, psychosocial orientation, autonomous and controlled motivation for test ordering, and patient centeredness, have been associated with physician behaviors and patient outcomes,[14–21] but very little of this research has examined the relation to physician referral behavior.

To address this limitation, we examined the relation between referral likelihood and physician factors, focusing on practice and psychological factors. We obtained referral data from a large managed care organization (MCO) to obtain stable estimates of the true contribution of physician factors to referral likelihood.[11] The database also allowed adjustment for patient factors including age, sex, and case mix.

METHODS

Database Sample

The investigation was conducted in the Rochester, NY metropolitan area using the claims database of the largest local MCO. Approximately 500,000 persons (over 50% of the local population) are enrolled in the MCO. The MCO employs an independent practitioner association (IPA) model, in which neither primary care physicians (PCPs) nor specialists are capitalized. No financial incentives are

linked directly to referrals. Each patient is assigned to a PCP, and over 95% of local PCPs participate in the IPA. The database study sample comprised adults, 25 to 64 years old, enrolled in the MCO, who were assigned to a PCP (457 family physicians and internists) during 1995. Visits to obstetrician/gynecologists (also defined as primary care physicians in the MCO) for obstetric and gynecologic problems were excluded. These exclusion criteria resulted in a sample of approximately 243,000 adult patients. Physician specialty, age, and sex were derived from a database maintained by the IPA.

Measures from Database

A referral was defined as at least one visit to a physician specialist. In the MCO, all visits to specialists require referrals by the PCP. No financial incentives are linked directly to referrals. The PCP's *observed referral rate* was defined as the proportion of the PCP's patients seen by the PCP that were referred to and seen by a specialist during the year. Patients were assigned to a PCP if they made a majority of their visits to that PCP; in cases of ambiguity, the recorded assignment by the MCO was used. An empirical Bayes approach[22,23] (SAS System for Mixed Models, SAS Institute, Cary, NC, 1996) was used to adjust the referral rate for case mix (using the ambulatory care groups [ACG] system[23]), age, and gender. The ACG case-mix system assigns patients to 105 mutually exclusive categories based on age, gender, and the diagnoses accumulated by the patient over the year. Each category includes clusters of diagnoses and conditions grouped together according to their likelihood of persistence, and together the categories are designed to explain the maximum amount of variance in ambulatory utilization and charges.[23,24] Details of the methodology used to derive the referral rates have been presented in detail elsewhere.[3] We used the ambulatory diagnostic groups (ADGs), the diagnostic building blocks of the ACG system,[23] because they explained more of the variation in referral rate and resource use than the ACG indicators, as was found by Salem-Schatz et al.[2]

In addition to the referral rate measures, we developed a *predicted risk of referral* estimated by a patient-level logistic regression across the whole sample (predicted referral risk is a function of age, age × age, gender, and dummy variables for each case-mix indicator).

The claims data were also used to derive a Herfindahl index for each physician. The Herfindahl index, which was used as a measure of physicians' experience in specific diagnostic areas, has been found to be a valid measure of the degree of specialization exhibited by physicians.[25] Prior research has suggested that physicians with more expertise in specific areas also have higher referral rates to specialists practicing in their area of expertise.[26,27] The Herfindahl index measures the extent to which the physician's diagnoses are concentrated in one or more diagnostic categories. The index is the sum of the squared shares of the diagnostic categories used by the

physician. A score of 1 means only 1 diagnostic category is used (extreme specialist), whereas if all categories are used equally, the score approaches 0 (extreme generalist). For this analysis, we used diagnostic categories defined by the major *International Classification of Diseases*, *Ninth Revision*, *Clinical Modification* (*ICD-9-CM*) chapters of the diagnoses recorded by the physician over each 1-year period, averaged over the 2 years.

Physician Survey

Physicians were offered $50 to encourage participation in a mailed survey. The survey was sent to primary care physicians (internists and family physicians) in the IPA who had at least 100 patients in the MCO in 1995 to 1996 and did not report an area of specialization that resulted in referrals from other physicians; 274 physicians met these eligibility criteria. Survey responses were obtained from 182 physicians (66% of those eligible). Survey data on all sampled physicians included demographics (age and gender) and practice characteristics including specialty (family practice or internal medicine), time in practice (current site, any site), practice intensity (sessions and patients per week), and group size (solo or not, and number of partners).

The questionnaire included several psychometric scales, each with a Likert response alternative of 5 to 7 choices. Physician satisfaction was measured using a scale developed by Linn et al.[28] The original 13-item scale was augmented by 3 questions specifically about satisfaction with consultants. Cronbach's α for the scale in this sample was .87, and a higher score indicates more satisfaction. Physicians' anxiety due to uncertainty was assessed with 3 items selected from the scales developed by Gerrity et al. to measure physicians' reactions to uncertainty.[29,30] Cronbach's α for the scale in this sample was .76, and a higher score indicates more anxiety. Attitude toward risk in life in general was assessed using a 6-item scale adapted by Pearson et al.[16] from the Jackson personality inventory.[31] The scale was found to predict the likelihood of physicians admitting patients with chest pain.[16] Cronbach's α in this sample was .84, and a higher score indicates more risk seeking (less risk aversion). Both the physicians' anxiety due to uncertainty and the physicians' risk attitude scales made adjusted, independent contributions to predicting resource use in a Medicare HMO.[17] A shortened 8-item version of the Physician Psychosocial Belief Scale[32] was included. The questions include items like, "I do not focus on psychosocial problems until I have ruled out organic disease," and "Patients will reject the idea of my dealing with psychosocial issues." Levinson and Roter found that physicians' scores on this scale correlated with their communication behaviors during audiotaped encounters.[33] Cronbach's α in this sample was .84, and a higher score indicates more psychosocial orientation. A 6-item scale to measure malpractice concern, in part focusing on consultation behavior,

was developed by one of the authors (GCW). It included items like, "Sometimes I ask for consultant opinions primarily to reduce my risk of being sued," and "Relying on clinical judgment rather than on technology to make a diagnosis is becoming riskier from a medicolegal perspective." Cronbach's α was .84, and a higher score indicates more malpractice fear. Two scales, also developed by one of the authors (GCW), assessed the extent to which the physician's motivation for ordering tests or referring to specialists is controlled (7 items) or autonomous (4 items). Each item started with the stem, "The reasons I order diagnostic tests or refer my patients to specialists is…" Items about controlled motivation included phrases such as, "because my reputation is at stake with each decision I make," and "because my patients would be upset if I didn't." Items about autonomous motivation included phrases such as, "because it helps me fully understand what is causing my patients' problem," and "because it's in my patients' best interests." The validity and reliability of these scales and constructs have been demonstrated in previous studies.[18–21] In this sample, Cronbach's α was .83 for the controlled scale and .82 for the autonomous scale. A higher score on each scale indicates more controlled and more autonomous motivation, respectively. Further details about all these scales, including their factor structures, are available from the authors.

Complete survey and database information was available on 173 physicians. Compared with physicians who had complete survey and database information, the remaining physicians were not significantly different in gender, average age of patients in the database (45 years), or observed or adjusted referral rates. The following statistically significant differences were found: physicians with complete data were younger (50 vs 54 years), were more likely to be family physicians (34% vs 20%), had slightly lower expected referral rates (0.38 vs 0.39), had more patients enrolled in the MCO (544 vs 400), and had a lower Herfindahl index (0.12 vs 0.13) than physicians with incomplete data.

Analyses

Referral likelihood was examined with logistic regression analyses conducted at the patient level. The generalized estimating equation (GEE) approach was used, with an exchangeable working correlation, to account for the clustering of observations within physician.[34] In each analysis, the patient's referral status (referred or not) was the dependent variable. All analyses included the patient's predicted risk of referral as an independent variable. A backward elimination regression approach was used, retaining variables with $P < .15$, to select a set of physician practice variables: age (years), sex (male or female), specialty (family physician or internist), years in practice, solo practice (or not), number of partners, sessions per week, patients per week, and Herfindahl index. Further analyses exploring the role of the psychometric variables were conducted including: all the psychometric scale scores, in addition to the significant physician practice variables; a backward elimination approach, retaining variables with $P < .15$; and a set of analyses excluding the physician practice variables.

Table 1. Distributions of Main Variables of Interest*

Variable	Mean	SD	Minimum	Maximum
Observed referral rate	0.38	0.12	0.01	0.69
Adjusted referral rate	0.40	0.10	0.02	0.65
Physician age	46.88	9.21	32.82	72.99
Percent female physicians	19			
Percent family physicians	34			
Percent solo practice	28			
Number of partners	3.38	7.16	0.00	70.00
Years in practice	15.74	8.76	3.00	43.00
Years in current practice	12.87	8.76	1.00	43.00
Sessions per week	7.77	1.72	1.00	11.00
Patients per week	101.00	34.38	32.00	250.00
Herfindahl index	0.12	0.02	0.08	0.20
Malpractice fear (1–5)	3.31	0.84	1.33	5.00
Autonomous motivation (1–7)	6.03	0.89	2.75	7.00
Controlled motivation (1–7)	2.87	1.08	1.00	6.00
Anxiety from uncertainty (1–6)	3.40	1.17	1.00	5.67
Psychosocial beliefs (1–5)	4.22	0.55	1.33	5.00
Risk seeking (1–5)	3.03	0.94	1.00	6.00
Physician satisfaction (1–5)	3.59	0.48	2.38	4.81

For each of the psychometric scales, a higher score means more of the attribute; the numbers in parentheses represent the range of possible scores for the scale. For Herfindahl index, a higher score means a narrower range of diagnoses used. The referral rate units are patients referred per patients seen by the primary care provider.

Table 2. Adjusted Relations Between Referral of Patients and Physician Practice and Psychological Risk Factors*

	Odds Ratio (95% Confidence Interval)		
Risk Factor	Practice Factors Only	Practice and All Psychological Factors	Practice and Statistically Significant Psychological Factors
Predicted referral probability	4.51 (4.29 to 4.75)	4.50 (4.28 to 4.73)	4.53 (4.31 to 4.75)
Female physician	1.17 (1.05 to 1.31)	1.26 (1.12 to 1.41)	1.21 (1.08 to 1.36)
Family physician	0.70 (0.62 to 0.80)	0.72 (0.64 to 0.81)	0.72 (0.63 to 0.81)
Years in practice	1.06 (1.00 to 1.11)	1.09 (1.03 to 1.15)	1.07 (1.01 to 1.12)
Herfindahl index	1.09 (1.02 to 1.16)	1.11 (1.04 to 1.18)	1.14 (1.07 to 1.20)
Autonomous motivation		0.99 (0.93 to 1.06)	
Controlled motivation		0.99 (0.94 to 1.05)	
Risk seeking		0.96 (0.91 to 1.01)	
Anxiety from uncertainty		0.98 (0.93 to 1.04)	
Physician satisfaction		0.95 (0.90 to 1.01)	
Psychosocial orientation		1.06 (1.00 to 1.14)	1.05 (1.00 to 1.12)
Malpractice fear		1.05 (0.99 to 1.11)	1.06 (1.01 to 1.12)

Each column represents a separate logistic regression. For the dichotomous variables (physician gender and specialty), the odds ratios reflect the association between the referral of patients and the presence of the risk factor compared with its alternative. For the other, continuous variables, the odds ratios reflect the association between the referral of patients and a change of 1 SD in the level of the risk factor.

RESULTS

Table 1 shows, at the physician level, the distributions of the main variables of interest. About 40% of patients were referred each year, and case-mix adjustment produced relatively little change on the range of referral rates (2%–65%). Both the observed and case-mix-adjusted referral rates exhibited moderate correlations with a number of the physician practice variables (older physicians, internists, solo practitioners, physicians practicing longer, and longer in their current practice, those with more sessions per week, and physicians with higher Herfindahl indices all referred more). Of the psychological variables, only risk aversion was associated with a higher referral rate.

The results of the GEE logistic regression analyses are shown in Tables 2 and 3. After adjustment, the only physician practice variables that were associated with a greater probability of referral were being a female physician, being in practice longer, being an internist, and having a higher Herfindahl index (using a narrower range of diagnoses). In contrast to the moderate effects associated with the physician practice variables, of the psychological variables, only psychosocial orientation exhibited any statistically significant association ($P = .04$); patients of more psychosocially oriented physicians were more likely to be referred. The associations with malpractice fear was borderline significant ($P = .08$); there was a trend for patients of physicians with higher levels of malpractice fear to be more likely to be referred. Excluding the nonsignificant psychological variables had little impact on the parameter estimates or confidence intervals of the remaining variables. The analyses excluding the physician practice variables were similar (Table 3), except that risk aversiveness was the most important psychological variable; patients of risk averse physicians were more likely to be referred ($P = .005$).

DISCUSSION

Our previous results suggested that physician referral rates represent a physician behavior that is stable across time and diagnostic categories.[3] This study suggests that most of the physician contribution to referral likelihood is related to physician practice factors like physician gender, years of practice, specialty, and Herfindahl index. The psychological measures examined in this study explained relatively little of the variability in referral likelihood. In the models that included the physician practice factors, only 2 of the psychological variables exhibited effects with borderline statistical significance. The odds ratios for the effects of the psychological factors were all close to 1, and the confidence intervals were narrow (Table 2), suggesting it is unlikely that any important effects were missed. In the models that excluded the physician practice factors, risk aversion exhibited a moderate effect, suggesting its effects are mediated by physician practice factors. Other analyses suggest that this effect reflects stylistic differences between family physicians and internists.[35]

The relations between referral likelihood and case mix, physician gender, and specialty are consistent with prior research.[1,2,36] The greater referral likelihood of patients with more specialized physicians (higher Herfindahl index) is consistent with prior research suggesting that physicians with more expertise in an area may refer patients more often than other physicians.[26,27]

Studies have demonstrated effects of physician psychological factors, including those measured in this study, on patient outcomes, particularly costs and satisfaction.[14–21] In analyses not reported here, we found associations between some of the measured psychological factors and some other variables in the claims database, such as costs generated and coding of mental health diagnoses. Thus, it is unlikely that the limited associations

Table 3. Adjusted Relations Between Referral of Patients and Physician Psychological Factors*

	Odds Ratio (95% confidence Interval)	
Risk Factor	All Psychological Factors	Statistically Significant Psychological Factors
Predicted referral probability	4.45 (4.22 to 4.69)	4.45 (4.23 to 4.69)
Autonomous motivation	1.02 (0.96 to 1.08)	
Controlled motivation	0.97 (0.92 to 1.03)	
Risk seeking	0.93 (0.89 to 0.98)	0.93 (0.89 to 0.98)
Anxiety from uncertainty	1.04 (0.98 to 1.10)	
Physician satisfaction	1.03 (0.97 to 1.09)	
Psychosocial orientation	1.05 (0.98 to 1.12)	1.05 (1.00 to 1.11)
Malpractice fear	1.04 (0.99 to 1.10)	

Each column represents a separate logistic regression. The odds ratios reflect the association between the referral of patients and a change of 1 SD in the level of the risk factor.

observed between psychological factors and referral likelihood reflect simply a measurement problem. There was, however, some evidence of a "ceiling" phenomenon for the autonomous motivation and psychosocial beliefs scales; physicians had, on average, very high scores, with little room for variance above the average.

It remains possible that the psychological factors would exhibit a stronger relation with more specific kinds of referrals, an effect that is lost in the general tendency to make referrals. However, getting reliable estimates of referral likelihoods for specific kinds of referrals would require a much larger database than even the one used in this study.[11] Referrals for specific conditions are relatively rare,[26] and linking a sufficiently large database to physician-identified reasons for referral is likely to be difficult. It is also possible that other domains of the measured psychological constructs, especially reactions to anxiety[30] and self-determination theory,[20] explain some of the unexplained referral variability. The results obtained apply to those physicians enrolled in the study. Although the physicians in the study were similar in some respects to other local physicians, the extent to which these findings generalize to other primary care physicians is unknown. Finally, it is also possible that unmeasured patient characteristics such as patient preferences, socioeconomic status, or prior relationship with a specialist affect referral likelihood. We conclude, however, that currently available psychological measures do not provide robust explanations for a critical physician behavior, one that has significant implications for patients' access to specialty care.

REFERENCES

1. Roland MO, Bartholomew J, Morrell DC, McDermott A, Paul E. Understanding hospital referral rates: a user's guide. BMJ. 1990;301:98–102.

2. Salem-Schatz S, Moore G, Rucker M, Pearson SD. The case for case-mix adjustment in practice profiling: when good apples look bad. JAMA. 1994;272:871–4.

3. Franks P, Zwanziger J, Mooney C, Sorbero M. Variations in primary care physician referral rates. Health Serv Res. 1999;34: 323–9.

4. Nutting PA, Franks P, Clancy CM. Referral and consultation in primary care: do we understand what we're doing? J Fam Pract. 1992;35:21–3.

5. Ludke RL. An examination of the factors that influence patient referral decisions. Med Care. 1982;20:782–96.

6. Rothert ML, Rovner DR, Elstein AS, Holzman GB, Holmes MM, Ravitch MM. Differences in medical referral decisions for obesity among family practitioners, general internists, and gynecologists. Med Care. 1984;22:42–55.

7. Metcalfe DH, Sischy D. Patterns of referral from family practice. J Fam Pract. 1974;1:34–8.

8. Cherkin DC, Rosenblatt RA, Hart LG, Schneeweiss R, LoGerfo J. The use of medical resources by residency-trained family physicians and general internists. Is there a difference? Med Care. 1987;25:455–69.

9. Shortell SM, Vahovich SG. Patient referral differences among specialties. Health Serv Res. 1975;10:146–61.

10. Mayer TR. Family practice referral patterns in a health maintenance organization. J Fam Pract. 1982;14:315–9.

11. Moore AT, Roland MO. How much variation in referral rates among general practitioners is due to chance? BMJ. 1989; 298:500–2.

12. Wilkin D, Dornan C. General Practitioner Referrals to Hospital: A Review of Research and Its Implications for Policy and Practice. Manchester, UK: Centre for Primary Care Research, Department of General Practice, University of Manchester; 1990.

13. Clancy CM, Lanier D, Grady ML. Conference Summary Report. Research at the Interface of Primary and Specialty Care. Rockville, Md: Agency for Health Care Policy and Research; 1996. Publication AHCPR 96-0034.

14. Grol R, Whitfield M, De Maeseneer J, Mokkink H. Attitudes to risk taking in medical decision making among British, Dutch and Belgian general practitioners. Br J Gen Pract. 1990;40:134–6.

15. Zaat JOM, van Eijk JTM. General practitioners' uncertainty, risk preference, and use of laboratory tests. Med Care. 1992;30: 846–54.

16. Pearson SD, Goldman L, Orav EJ, et al. Triage decisions for emergency department patients with chest pain: do physicians' risk attitudes make the difference? J Gen Intern Med. 1995; 10:557–64.

17. Allison JJ, Kiefe CI, Cook EF, Gerrity MS, Orav EJ, Centor R. The association of physician attitudes about uncertainty and risk taking with resource use in a Medicare HMO. Med Decis Making. 1998;18:320–9.

18. Williams GC, Deci EL. Internalization of biopsychosocial values by

medical students: a test of self-determination theory. J Pers Soc Psychol 1996;70:767–9.

19. Williams GC, Wiener MW, Markakis KM, Reeve J, Deci EL. Medical students' motivation for internal medicine. J Gen Intern Med. 1994;9:327–33.

20. Ryan RM, Connell JP. Perceived locus of causality and internalization: examining reasons for acting in two domains. J Pers Soc Psychol 1989;57:749–61.

21. Williams GC, Deci EL. The importance of supporting autonomy in medical education. Ann Intern Med. 1998;129:303–8.

22. Miller ME, Hui SL, Tierney WM, McDonald CJ. Estimating physician costliness: an empirical Bayes approach. Med Care. 1993; 31:YS16–YS28.

23. Weiner JP, Starfield BH, Steinwachs DM, Mumford LM. Development and application of a population-oriented measure of ambulatory care case-mix. Med Care. 1991;29:452–72.

24. Starfield B, Weiner J, Mumford L, Steinwachs D. Ambulatory care groups: a categorization of diagnoses for research and management. Health Serv Res. 1991;26:53–74.

25. Franks P, Clancy CM, Nutting PA. Defining primary care: empirical analyses of the National Ambulatory Medical Care Survey. Med Care. 1997;35:655–68.

26. Reynolds GA, Chitnis JG, Roland MO. General practitioner outpatient referrals: do good doctors refer more patients to hospital? BMJ. 1991;302:1250–2.

27. Calman NS, Hyman RB, Licht W. Variability in consultation rates and practitioner level of diagnostic certainty. J Fam Pract. 1992; 35:31–8.

28. Linn LS, Yager J, Cope D, Leake B. Health status, job satisfaction, job stress, and life satisfaction among academic and clinical faculty. JAMA. 1986;254:2775–82.

29. Gerrity MS, DeVellis RF, Earp JA. Physicians' reactions to uncertainty in patient care: a new measure and new insights. Med Care. 1990;28:724–36.

30. Gerrity M, White K. Physicians' reactions to uncertainty: refining the constructs and scales. Motivation and Emotion. 1995;19: 175–91.

31. Jackson DN. Jackson Personality Inventory Manual. Goshen, NY: Research Psychologists Press; 1975.

32. Ashworth CD, Williamson PR, Montano D. A scale to measure physician beliefs about psychosocial aspects of patient care. Soc Sci Med. 1984;19:1235–8.

33. Levinson W, Roter D. Physicians' psychosocial beliefs correlate with their patient communication skills. J Gen Intern Med. 1995; 10:375–9.

34. Liang KY, Zeger SL. Regression analysis for correlated data. Annu Rev Public Health. 1993;14:43–68.

35. Fiscella K, Franks P. Risk aversion and costs: comparisons of family physicians and general internists. J Fam Pract. 2000; 49:12–6.

36. Franks P, Clancy CM. Referrals of adult patients from primary care: demographic disparities and their relationship to HMO insurance. J Fam Pract. 1997;45:47–53.

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