Patient Referral Differences Among Specialties

by Stephen M. Shortell and Stephen G. Vahovich

Data from the Seventh Periodic Survey of Physicians are examined for differences in referral rates among five major medical specialties. Referral rates for each specialty are regressed against physician-related and patient-related predictor variables. On the basis of Freidson's distinction between "colleague-dependent" and "client-dependent" specialties, the hypothesis tested is that physician-related variables explain more of the variance in referral rates of colleague-dependent than of client-dependent specialists. Although this use of Freidson's classification is not strongly supported by the results, the variables found to correlate with referral differences suggest that public policies aimed to increase access to care may produce a reduction in continuity of care as an unintended second-order effect.

Existing national health insurance proposals are primarily directed toward improving the accessibility of medical care through removal of financial barriers and possible restructuring of organizational relationships. Relatively little attention has been given to the possibility of unintended consequences or second-order effects of such proposals. Foremost among possible consequences is an effect on the continuity of medical care.

For present purposes continuity is defined as the extent to which medical care services are received as part of a coordinated sequence of events consistent with the needs of patients. This sequence is determined by interaction between patients and providers. The physician's decision to treat the patient, refer the patient to another physician or health agency, or admit the patient to the hospital is at the center of the issue of continuity of care. Greater demand for medical care without a concomitant increase in supply or productivity of services will likely force physicians to choose between working longer hours or referring more patients to other sources of care. Since there is an additional demand for coordination between the providers and/or agencies each time a referral takes place, the likelihood of the patient "falling into the cracks" will be increased. Thus, while financial accessibility of care may improve for a great proportion of the population, the continuity with which services are rendered may decline.

Address communications and requests for reprints to Stephen M. Shortell, Ph.D., Department of Health Services, School of Public Health and Community Medicine, University of Washington, Seattle, WA 98195.

In order to begin to address the stated issue, it is useful to examine the current referral behavior of physicians—in particular, differences in referral rates across specialties. As indicated, the decision to refer is influenced by a number of physician and patient variables. A framework for considering the various physician and patient variables as they affect referral rates is provided by Freidson's classification of medical specialties as client-dependent versus colleague-dependent [1].

Freidson argues that specialties can be arranged on a continuum from client-dependent to colleague-dependent on the basis of the way they attract patients. Since primary care physicians such as general practitioners and internists depend heavily on patient self-referral they must be particularly sensitive to patient viewpoints, expectations, and standards. Therefore they might be expected to have prescription habits that differ from those of specialists, to be more attentive to patient convenience (e.g., by reducing office waiting time), and to spend more time with each patient. In contrast, surgical and other specialists are heavily dependent on primary care physicians for patients and therefore must be more sensitive to the expectations and practice habits of these physicians.

It is important to emphasize that the way in which physicians attract patients is a *continuum* and that the terms "client-dependent" and "colleague-dependent" describe extreme types. A general practitioner in solo practice in an isolated rural area probably comes closest to the client-dependent type, whereas the hospital-based radiologist or pathologist comes closest to the colleague-dependent type. These examples suggest the important modifying role played by organization of practice. Thus primary care physicians in a group practice where patients are attracted by the reputation of the group may be less client-dependent than their counterparts in solo practice. Although Freidson did not intend his classification as a basis for explaining differences in referral rates, the present article nevertheless attempts to use his scheme as a plausible framework for the empirical study of such differences.

From the distinction between client-dependent and colleague-dependent physicians, one may expect to find patient variables the most important predictors of referral rates for client-dependent physicians and physician variables the most important predictors of rates for colleague-dependent specialists.

If primary care physicians are in fact particularly sensitive to patient characteristics, including patient age, sex, race, and ability to pay for care, then for this physician group, patient characteristics should be important determinants of the course of treatment, including the decision to refer. In contrast, for specialists, referral decisions should be more a function of personal and practice characteristics such as whether the physician is board certified, demand on his time, types of ancillary personnel available, and organization of practice. For this physician group, it is expected that patient characteristics will be somewhat less important determinants of referral than physician and practice-related characteristics. (This does not imply that colleague-dependent physicians treat their patients with any less respect than do client-dependent physicians, but, rather, that patients may be ex-

Table 1. Characteristics of All U.S. Patient Care Physicians, All PSP-7 Respondents, and Study Subsample

Characteristic	All physicians (N = 182 007)	All PSP-7 respondents (N = 4932)	Study subsample (N = 1393)
Specialty			
General practice	27.6%	19.6%	24.3%
Internal medicine	15.9	17.9	19.0
Surgery	24.7	30.2	29.6
Pediatrics	5.5	6.7	7.0
Obstetrics-gynecology	7.5	7.6	7.5
Other specialties	13.6	16.5	12.6
Unclassifiable	5.4	1.5	...
Age			
⩽39	20.2	25.8	27.3
40–49	31.7	35.0	34.1
50–59	25.1	23.9	25.0
60–69	16.2	12.5	11.6
⩾70	6.8	2.8	2.0
Board certification status			
Board certified	45.7	55.4	54.3
Not certified	54.3	44.6	45.7
Type of practice			
Solo	61.3	31.0	35.5
Partnership	19.2	29.3	30.7
Informal arrangement	4.1	5.8	6.2
Group	15.3	32.6	27.6
Unclassifiable	0.1	1.4	...
Census division			
New England	6.5	5.2	5.4
Middle Atlantic	20.2	15.6	16.5
East North Central	17.1	14.8	13.0
West North Central	6.8	7.8	7.3
South Atlantic	13.5	11.9	11.5
East South Central	4.8	6.7	6.1
West South Central	8.2	8.7	8.0
Mountain	4.2	5.8	6.2
Pacific	17.2	23.3	26.1
Unclassifiable	0.1	0.2	...
U.S. possessions	1.4	...	...

pected to exert somewhat less influence over the referral decisions of colleague-dependent physicians.)

If these assumptions are true, physician variables should explain more of the variance in referral rates for colleague-dependent specialists such as surgeons, whereas patient variables should be more important in explaining variations in referral rates for such client-dependent physicians as general practitioners and internists. (Internists are placed on the client-dependent

end of the continuum because 159 of the 178 included in this study did not have a subspecialty.) Patient and physician variables should be about equally important in explaining differences in referral rates for obstetrician-gynecologists and pediatricians, who can be ranked somewhere near the middle of the continuum. Obstetrician-gynecologists and pediatricians are not considered quite as client-dependent as general practitioners because they regularly receive referrals from general practitioners and internists, and pediatricians are of course heavily dependent in turn on obstetrician-gynecologists.

On the basis of Freidson's framework and data collected from the American Medical Association's Seventh Periodic Survey of Physicians [2], differences in referral rates are examined across medical specialties. The findings suggest additional questions of relevance to public policy.

The Sample

The Seventh Periodic Survey of Physicians (PSP-7) drew on a stratified random sample of U.S. physicians. The primary stratification was based on type of practice. The usable response rate was 55.2 percent (N = 5,085), of which 4,932 physicians were in direct patient care.

Several screening criteria were established to eliminate deviant members of the sample population. Respondents were excluded if their primary activity was not direct patient care (this eliminated administrators, medical teaching and research staff, local, state, or federal government employees, and inactive physicians); if they reported that they referred 50 percent or more of their patients to other physicians, either inside or outside their practices; if they had been in practice for over 73 years; if they had spent less than 27 weeks in practice in 1970; if they spent less than six or more than 80 total practice hours or direct care hours per week; and if they reported fewer than 11 visits or more than 303 visits per week. The remaining subsample consisted of 1,393 respondents.

A comparison of this subsample with PSP-7 direct patient care respondents and all U.S. patient care physicians is presented in Table 1. The comparison reveals that respondents in the total sample and members of the screened subsample are somewhat younger than the average for the total U.S. population of patient care physicians and are somewhat more likely to be board certified. The differences by type of practice are due to the sampling scheme, which oversampled nonsolo forms of practice. Virtually no differences exist between the total sample of respondents and the screened subsample on any of the background variables.

For present purposes the analysis includes only those physicians engaged in general and family practice, internal medicine specialties (general internal medicine, allergy, cardiology, gastroenterology, and pulmonary diseases), surgical specialties (general surgery, neurosurgery, ophthalmology, otolaryngology, orthopedic surgery, plastic surgery, urology, and thoracic surgery), pediatrics (including pediatric allergists and cardiologists), and obstetrics-gynecology.

The Model

Referral rate was measured by each respondent's report of the percentage of patients referred to other physicians, whether inside or outside the respondent's practice. Referral rates are viewed as a function of several clusters of variables. Specifically:

$$R = a + \mathbf{B}_i\mathbf{MD} + \mathbf{B}_j\mathbf{PAT} + U$$

where R = percentage of patients a physician refers
a = constant (intercept)
$\mathbf{B}_i\mathbf{MD}$ = vector of physician variables, i = 1, . . . , m
$\mathbf{B}_j\mathbf{PAT}$ = vector of patient variables, j = 1, . . . , n
U = error term

Individual variables are listed and defined in Table 2. All variables expressed in monetary units were deflated using the relevant regional cost of living index (determined by the physician's location) to avoid geographic price differences. Indexes used are those shown as "total budget" figures in the *Handbook of Labor Statistics, 1971* [3].

Physician Variables

Physicians were grouped according to specialty, experience and qualification variables, type of practice, and market-related variables.

For estimation of the coefficients for specialty choice in the total sample, pediatrics was treated as the omitted category. Since there is some evidence [4] to support the fairly common assumption that medical specialists (for example, pediatricians) are more active initiators of referrals than surgical specialists, negative signs were expected for the coefficients (parameter estimates) of surgery (SURG) and obstetrics-gynecology (OBGYN). Because of the nature of the specialty and from results obtained in previous studies [5], the coefficients of general practice (GP) and internal medicine (IM) were expected to be positive.

Among the experience-qualifications variables, YR7 represents the first seven years of practice, the period in a physician's career when he is attempting to establish himself. There is less incentive for him to refer his patients to other physicians during this period than during the middle years (8 to 29 years' experience, the period held constant here), when his practice is well established. Thus the parameter estimate of YR7 was expected to be negative. YR30 represents the later years of the physician's career, during which the physician's age and health may curtail his activity; the physician may also desire greater leisure [6,7]. Consequently, one would expect more referrals and a positive coefficient for YR30.

Predicting the effect of specialty board certification status (BOARD) is difficult. Physicians with advanced medical education are presumably better able to treat difficult cases and may therefore refer fewer patients than do less qualified physicians. Conversely, physicians with advanced training are

Table 2. Definitions of Variables

Dependent variable referral rate	Percentage of patients referred to other physicians
Physician variables	
YR7	Equals 1 if physician has seven or fewer years in medicine; otherwise zero.
YR30	Equals 1 if physician has 30 or more years in medicine; otherwise zero.
BOARD	Equals 1 if physician has American specialty board certification; otherwise zero.
FMG1	Equals 1 if physician received his medical education in an English-speaking country other than the United States or in northern or western Europe; otherwise zero.
FMG2	Equals 1 for other foreign-educated physicians; otherwise zero.
SOLO	Equals 1 if physician spends 50 percent or more of his time in solo practice; otherwise zero.
GROUP	Equals 1 if physician spends 50 percent or more of his time in a group of six or more members; otherwise zero.
MEDANC	Medical ancillary personnel (registered and licensed practical nurses, nurses aides; x-ray, medical, and laboratory technicians) as a proportion of total ancillary personnel including pharmacists, secretaries, receptionists, bookkeepers, etc.
HOSVIS	Physician's hospital visits as a proportion of his total visits per week.
OTHMD	Ratio of total number of physicians not in the physician's specialty to number of physicians in his specialty, by state.
FEE	Current usual fee (deflated) for initial office visit.
WAIT	Average time (in minutes) a patient must wait to see the physician after he arrives for a scheduled appointment.
GP, IM, SURG, OBGYN	Equals 1 if physician derives 50 percent or more of his medical income from general practice, internal medicine, surgery, or obstetrics-gynecology.
Patient variables	
UNDER15	Percentage of physician's patients under 15 years of age.
OVER65	Percentage of physician's patients over 65 years of age.
15K	Percentage of physician's patients with annual income greater than $15,000 (deflated).
INSUR	Percentage of physician's gross medical income derived from insured fee-for-service practice.
MEDICAID	Percentage of physician's patients enrolled in Medicaid.
WHITE	Percentage of physician's patients who are white.
FEMALE	Percentage of physician's patients who are female.

apt to see only the most seriously ill patients and hence may be more—rather than less—inclined to seek consultation. A third possibility is that as better diagnosticians they discover more illness, which may lead to more frequent referral.

Since the quality of foreign medical education is considered inferior by some physicians, the status of foreign medical graduates in the U.S. medical community may be lower than that of U.S. medical graduates. Freeborn and Darsky found a weak but positive relationship between referrals and overall influence of physicians in the medical community [8]. In general, physicians of lower status are more concerned than others with the loss of patients and income that may result from the referral process [9]. Foreign-educated physicians would thus be expected to refer fewer patients than U.S. medical graduates. Because language difficulties and racial or ethnic characteristics may further influence physician status, graduates of medical schools in non-English-speaking countries or non-European countries (FMG2) may have even less status and make fewer referrals than medical graduates from English-speaking or western and northern European countries (FMG1). One would therefore expect the parameter estimate for FMG1 to be negative and that for FMG2 to be even more so.

Practice characteristics may play an important role in determining referral rates. Membership in two-to-five-man practices was used as the omitted category for practice size in this analysis. Physicians in group practices of six or more members (GROUP), having more readily available opportunities for consulting opinions, were expected to refer more frequently and therefore generate a positive parameter estimate for the GROUP variable. Solo physicians (SOLO) have relatively less access to consulting services, so that the parameter estimate of SOLO was expected to be negative.

The variable MEDANC was introduced to account for the influence of factor substitution on referral rates. Because medical ancillary personnel are closer substitutes for physicians than are other ancillary personnel, it was assumed that the larger the proportion of medical ancillaries to total ancillary personnel per physician in the practice, the greater would be the physician's capacity and the lower his referral rate.

The variable HOSVIS, the proportion of hospital visits to total patient visits, was used as a proxy measure for case severity. Presumably the greater the proportion of seriously ill patients a physician sees, the greater the percentage of referrals.

The market characteristics of the physician's practice location was expected to influence referral rates. The variable OTHMD is a measure of the availability of consulting physicians in the physician's state. (For most physicians the market area is smaller than the entire state, so this variable is only an approximation.) It is reasonable that a scarcity of consulting physicians in the market area would impede the referral process; the parameter estimate of OTHMD was expected to be positive.

High fees may be expected in market areas characterized by excess demand; the latter may also be associated with higher referral rates. Thus the variable

FEE was expected to have a positive parameter. Similarly, patient waiting time (WAIT), representing a type of nonprice rationing [10] that reflects demand pressure on the physician, should be positively related to the physician's referral rate.

Patient Variables

Age, sex, race, and ability to pay for service are the patient variables employed. A physician seeing two patients with exactly the same type and severity of illness may refer one and not the other because of the patient's socioeconomic characteristics. The variables INSUR, 15K, and MEDICAID represent patient ability to pay. It was assumed that a physician is more likely to refer a patient when he need not consider financial constraints in prescribing treatment. Medicaid eligibility not only removes some financial constraints, but also brings more low-income group members into the physician's office. The greater frequency and severity of illness among these patients [11] suggests that the variable MEDICAID should have the most positive parameter estimate among these three financial variables.

Data from the National Center for Health Statistics show that, in general, whites have longer life spans, more physician visits per person per year, and fewer hospital admissions as a proportion of their total visits than nonwhites [12]. More frequent medical care and a lower incidence of serious illness for whites implies that the higher the percentage of whites among a physician's patients (represented by the variable WHITE), the lower his referral rate; the parameter estimate should be negative. Similarly, because of the heavy utilization related to well-child care [12], and from previous findings [5], a negative sign was expected for the parameter of UNDER15. The parameter estimate for OVER65 was expected to be positive because this age group has more restricted activity days and bed disability per person, as well as more hospital episodes per person, than any other age group [11]. A positive sign was expected for the estimated parameter of FEMALE because, in general, females have a higher physician visit rate per person [12] and a greater number of restricted activity days and bed disability days per person than males [11].

Results

Single Variables

The means and standard deviations for all of the variables for all specialty classifications are presented in Table 3. Contrary to conventional wisdom, the differences in referral rates between specialties are relatively small. Also contrary to expectation, surgical specialists appear, from the raw data, to refer somewhat *more* than general practitioners, pediatricians, or obstetrician-gynecologists. Thus, even though previous data [13] have shown that surgical specialists receive a high percentage of their patients on referral (43 to 72 percent), present data indicate that they also rank relatively high as exporters

Table 3. Mean Values and Standard Deviations (in Parentheses) of Variables Used in Regression Equations

FEE is expressed in dollars, WAIT in minutes, and OTHMD in number of physicians; all other figures are percentages.

Variable	Pooled sample N = 799*	Specialty				
		GP N = 197	IM N = 178	SURG N = 297	PED N = 70	OBGYN N = 77
Referral rate	12.5 (11.6)	10.1 (8.9)	16.4 (13.3)	12.4 (12.4)	9.4 (8.9)	11.7 (8.8)
YR7	10.4 (30.5)	9.6 (29.6)	11.8 (32.3)	9.8 (29.7)	†	10.4 (30.7)
YR30	15.5 (36.2)	17.3 (37.9)	12.4 (33.0)	17.5 (38.1)	12.9 (33.7)	13.0 (33.8)
BOARD	55.6 (49.7)	14.2 (35.0)	51.7 (50.1)	75.1 (43.3)	81.4 (39.2)	75.3 (43.4)
FMG1	7.8 (26.8)	7.6 (26.6)	7.3 (26.1)	7.7 (26.8)	7.1 (25.9)	7.8 (27.0)
FMG2	5.1 (22.1)	5.6 (23.0)	2.8 (16.6)	6.1 (23.9)	5.7 (23.4)	5.2 (22.3)
SOLO	35.4 (47.9)	46.7 (50.0)	31.5 (46.6)	33.3 (47.2)	(24.3) (43.2)	30.0 (46.1)
GROUP	29.4 (45.6)	19.3 (40.0)	37.1 (48.4)	33.0 (47.1)	31.4 (46.8)	22.1 (41.8)
MEDANC	27.3 (43.9)	27.3 (44.4)	25.2 (43.2)	24.6 (42.0)	42.6 (48.9)	33.3 (46.8)
HOSVIS	26.8 (20.3)	15.3 (12.0)	32.1 (18.1)	35.2 (23.6)	10.7 (7.8)	21.6 (9.4)
OTHMD	†	3.3 (1.65)	5.4 (1.75)	3.3 (.84)	15.9 (2.37)	13.6 (1.72)
FEE	15.9 (9.40)	10.67 (4.64)	21.84 (12.43)	16.24 (8.56)	11.09 (4.68)	17.99 (6.51)
WAIT	21.7 (16.9)	26.7 (18.9)	18.5 (13.8)	20.5 (16.9)	19.8 (13.6)	22.6 (18.4)
UNDER15	19.2 (23.7)	24.0 (13.4)	5.7 (9.1)	15.1 (13.2)	†	†
OVER65	27.1 (19.7)	24.6 (15.6)	37.9 (20.5)	31.6 (17.5)	†	†
15K	18.9 (16.1)	14.8 (12.8)	21.7 (18.0)	20.2 (16.4)	20.0 (18.0)	18.4 (15.9)
INSUR	55.7 (27.0)	45.6 (23.7)	55.0 (25.5)	68.2 (24.5)	†	55.3 (21.7)
MEDICAID	11.4 (11.7)	12.6 (12.2)	9.0 (10.8)	12.0 (10.4)	12.0 (17.3)	11.0 (12.2)
WHITE	85.6 (17.9)	†	88.5 (13.6)	83.9 (18.8)	†	†
FEMALE	†	62.3 (9.5)	58.5 (9.7)	54.6 (11.4)	50.8 (3.4)	†

* N for pooled sample is less than the sum of Ns for the specialties because individuals were deleted from analysis if a value was missing for any variable.

† Variable omitted.

of patients. The extent to which this finding simply represents advice to patients that they return to their original doctor for followup care, as opposed to further referrals to other specialists, cannot be determined from the present data. Such a distinction should clearly be made in the design of future studies.

Plots of the data and residuals from preliminary regressions indicated that the natural logarithm transformation of referral rates best met the assumptions of normality [14]. Parameter estimates and their statistical significance are presented in Table 4.

First, it should be noted that when other variables are taken into account, surgeons do seem to refer somewhat less frequently than other specialists. The coefficient of SURG is negative, but it is not significant.

In general, the estimated parameters of YR7 and YR30 are consistent with the hypothesized relationship—phyicians with few years of experience refer a lower percentage of their patients than physicians in the middle years of their careers, while older physicians refer more. These results, however, are statistically significant in the predicted direction only for surgeons. The only other significant coefficient, that for pediatricians, is opposite to that predicted: for whatever reason, older pediatricians are less likely to refer their patients than those in the middle of their careers.

The coefficient for BOARD is positive and significant at the 10-percent level for pediatricians. This is consistent with the arguments that board certified pediatricians may see more seriously ill children requiring greater consultation or that they may detect more illness leading to greater rates of referral.

The negative signs obtained for most parameter estimates for FMG2 suggest that physicians educated in non-English-speaking countries refer a lower percentage of their patients than U.S. medical graduates. The coefficient is significant for internists. This lends some support to the hypothesized relationship and is consistent with the results of other investigators [8]. The predicted negative relationship between referral rates and foreign education is not clearly evident for FMG1; however, it may be that physicians trained in other English-speaking or western and northern European countries are assimilated more quickly into the American medical community to the extent that their referral rates do no substantially differ from those of U.S. medical graduates.

The practice size dummy variable GROUP is significant at the five-percent level or better in the pooled and two specialty equations and has the hypothesized sign, suggesting that physicians in large group practices refer a greater proportion of their patients than physicians in two-to-five-man practices. The estimated parameters of SOLO, negative for most specialties and significant at the 10-percent level for surgery, suggest that solo physicians refer fewer patients than physicians in two-to-five-man practices. This agrees with earlier findings [9].

The signs of the parameter estimates of MEDANC are inconsistent across specialties and are not significant at the five-percent level. The coefficients of HOSVIS, the proxy measure of case severity, are significant at the one-

Table 4. Unstandardized Regression Coefficients and Their Standard Errors (in Parentheses)

Variable	Pooled sample N = 799††	Specialty				
		GP N = 197	IM N = 178	SURG N = 297	PED N = 70	OBGYN N = 77
YR7	–0.084	–0.036	–0.157	–0.422†	**	0.194
	(0.099)	(0.211)	(0.209)	(0.167)		(0.288)
YR30	0.077	0.174	0.170	0.020	–0.527*	–0.210
	(0.085)	(0.163)	(0.198)	(0.135)	(0.271)	(0.283)
BOARD	0.019	0.257	§	§	0.475*	–0.231
	(0.071)	(0.175)			(0.256)	(0.213)
FMG1	0.074	–0.182	–0.209	0.136	–0.091	0.098
	(0.112)	(0.226)	(0.260)	(0.189)	(0.354)	(0.333)
FMG2	–0.109	0.073	–0.966†	–0.084	0.330	0.412
	(0.136)	(0.266)	(0.405)	(0.207)	(0.585)	(0.416)
SOLO	–0.113	0.044	§	–0.211*	§	–0.342
	(0.073)	(0.142)		(0.123)		(0.225)
GROUP	0.243‡	0.443†	0.224	0.308†	0.127	–0.207
	(0.077)	(0.177)	(0.142)	(0.126)	(0.190)	(0.235)
MEDANC	–0.008	0.194	–0.218	–0.154	0.370*	0.076
	(0.070)	(0.139)	(0.165)	(0.121)	(0.196)	(0.196)
HOSVIS	0.519‡	–0.813	0.127	0.664‡	1.75	0.251
	(0.178)	(0.571)	(0.396)	(0.241)	(1.26)	(0.963)
OTHMD	**	0.074†	0.022	§	§	0.009
		(0.037)	(0.038)			(0.052)
FEE	–0.001	0.040‡	0.005	–0.012*	0.035*	§
	(0.004)	(0.014)	(0.006)	(0.006)	(0.020)	
WAIT	0.001	–0.002	0.007	0.002	–0.023‡	0.007
	(0.002)	(0.003)	(0.005)	(0.003)	(0.010)	(0.005)
UNDER15	–0.002	0.009*	–0.010	–0.007	**	**
	(0.003)	(0.005)	(0.008)	(0.004)		
OVER65	0.004†	0.010†	0.002	0.005	**	**
	(0.002)	(0.004)	(0.004)	(0.003)		
15K	0.002	–0.001	–0.002	0.004	–0.001	0.012†
	(0.002)	(0.005)	(0.004)	(0.003)	(0.006)	(0.007)
INSUR	0.002*	§	0.003	0.004*	**	–0.001
	(0.001)		(0.003)	(0.002)		(0.004)
MEDICAID	0.007†	–0.004	–0.001	0.011†	0.022‡	0.010
	(0.003)	(0.005)	(0.006)	(0.005)	(0.006)	(0.008)
WHITE	–0.001	**	0.002	–0.001	**	**
	(0.002)		(0.005)	(0.003)		
FEMALE	**	0.003	–0.003	0.001	0.069†	**
		(0.007)	(0.007)	(0.005)	(0.033)	
GP	–0.122	...	...	...	...	...
	(0.220)					
IM	0.132	...	...	...	...	...
	(0.253)					
SURG	–0.243	...	...	...	...	...
	(0.229)					
OBGYN	0.028	...	...	...	...	...
	(0.267)					
CONSTANT	1.81	0.715	1.99	1.55	–2.50	1.88
R^2	0.13	0.17	0.12	0.21	0.43	0.22
F	5.29‡	2.11‡	1.27	4.06‡	3.56†	1.24

Table 4. Continued

* Significant at the 10% level.
† Significant at the 5% level.
‡ Significant at the 1% level.
§ Not entered in the stepwise regression because the F value was < 0.01.
** Variable omitted because of irrelevance or because of multicolinearity.
†† N for pooled sample is less than the sum of Ns for the specialties because individuals were deleted from analysis if a value was missing for any variable.

percent level for the pooled and surgery equations, and the signs are positive in all equations but one. These results support the hypothesis that the larger the proportion of seriously ill patients, the greater the physician's referral rate.

As expected, the parameter estimates for OTHMD are positive, being significant for general practice. Thus, for general practitioners at least, the greater the number of other kinds of physicians available, the greater the likelihood of referral.

The parameter estimates for FEE suggest that general practitioners and pediatricians who charge higher fees refer more patients. The reverse is true for surgeons. Except for pediatricians, the coefficients of WAIT are not significant. The negative coefficient for pediatricians is opposite to that predicted and difficult to interpret; in the absence of time series data, the relationship between referral rates and waiting time is difficult to pinpoint. For example, longer waiting times could be a result of lower referral rates.

With regard to patient variables, 15K, a measure of ability to pay, shows mixed results as to the signs of its coefficients and is significant only for obstetrics-gynecology. Another financial variable, INSUR, has positive and significant coefficients for the pooled equation and for surgeons. The coefficients of MEDICAID (which represents both financial and case-severity factors) are positive and significant in the pooled equation and for surgeons and pediatricians. These results tend to support the hypothesized relationship—the greater the proportion of patients with ability to pay, the more likely the physician is to have a high referral rate.

The coefficients of WHITE are not significant. FEMALE is positive and significant for pediatricians; the larger the percentage of female patients a pediatrician has, the higher the referral rate.

The positive and significant parameter estimates for OVER65 in the pooled equation and for general practitioners suggests that the larger the percentage of patients 65 years of age and older, the higher the physician's referral rate. The parameter estimate for UNDER15 is positive and significant for general practitioners and negative but not significant for other physicians.

Variable Clusters Compared

It was anticipated that patient variables would explain more of the variance in referral rates for general practitioners and internists, that physician variables would be more important for surgeons, and that patient and physician

variables would be about equally important for pediatricians and obstetrician-gynecologists. Within the confines of the current model, one way of assessing the relative importance of the two clusters of variables is to examine the percentage of variance each explains. Another strategy is to examine the distribution across specialties of significant variables in each cluster.

Table 5 shows the percentage of explained variance for each specialty that is explained by each variable cluster. The MD cluster accounts for the effects of all the physician variables on referral rate, and the PAT cluster accounts for the effects of all the patient variables. Table 5 indicates that the physician variables are indeed the more important predictors of referral rates for surgeons, as expected; contrary to expectation, however, physician variables seem to be more important than patient variables for general practitioners as well. This relationship is observed regardless of which cluster is entered first into the regression. When the physician variables were entered into the surgeons' equation first, they accounted for 80 percent of the total variance explained; patient variables accounted for the remainder. When the patient variables were forced to enter first, the MD cluster still accounted for 57 percent of the total explained variance in surgeons' referrals. For general practitioners the importance of the MD cluster was even more insensitive to order of entry of the clusters.

Table 5. Percentage of Explained Variance Accounted for by the Two Clusters MD and PAT, for Each Specialty

Variable cluster	Specialty				
	SURG	GP	IM*	PED	OBGYN*
MD (entered first)	80	79	76	50	38
PAT	20	21	24	50	62
MD	57	77	67	35	44
PAT (entered first)	43	23	33	65	56

* Total variance explained for these specialties by all variables is 12% for IM and 22% for OBGYN. These values are not significantly different from zero.

Except for pediatricians, the model explains relatively little of the variation in referral rates. For internists and obstetrician-gynecologists, in fact, the variance explained—12 percent and 22 percent, respectively—is not significantly different from zero. Therefore the meaningfulness of the results for IM and OBGYN in Table 5 is doubtful. It is clear, however, that the IM column offers no support for the hypothesis that patient variables are more important than physician variables to the referral rates of internists. It was expected that physician and patient variables would be approximately equal in importance to referral rates of pediatricians and obstetrician-gynecologists. When the MD cluster was entered first into the pediatrician equation those variables did in fact account for 50 percent of the total explained variance. When the

Table 6. Number of Variables in the Two Clusters Statistically Significant for Each Specialty

Variable cluster	Specialty				
	SURG	GP	IM	PED	OBGYN
MD	5	3	1	5	0
PAT	2	1	0	2	1

PAT cluster was entered first, however, patient variables accounted for 65 percent of the total explained variance. This reversal is attributable to the fact that a single patient variable, MEDICAID, accounted for 20 percent of the total variance in pediatricians' referral rates. For obstetrician-gynecologists the results must be regarded as ambiguous because of the small amount of total variance explained.

Table 6 displays a summary count of significant variables from each cluster drawn from Table 4. It was expected that the greatest number of statistically significant physician variables would be found for surgeons, the fewest for general practitioners and internists, and an intermediate number for obstetrician-gynecologists. This pattern is not clearly observable; five physician variables are significant for surgeons (YR7, SOLO, GROUP, HOSVIS, and FEE), but five are also significant for pediatricians (YR30, BOARD, MEDANC, FEE, and WAIT). Three physician variables are significant for general practitioners (GROUP, FEE, and OTHMD), and one is found for internists (FMG2). None of the physician variables is significant for obstetrician-gynecologists.

With regard to patient variables, the classification suggests that more variables should be significant for general practitioners and internists than for the other three specialties. Only one variable is significant for general practitioners, however—OVER65—and none is significant for internists, while two (MEDICAID and INSUR) are significant for surgeons, two for pediatricians (MEDICAID and FEMALE), and one for obstetrician-gynecologists (15K). Since these comparisons are across rather than within specialties, the unstandardized regression coefficients form the appropriate basis for comparison [15]. For comparison of the relative importance of individual predictors within the same specialty, the standardized coefficients are appropriate. In the present case, the rank order of the standardized regression coefficients conforms almost exactly with the ordering of the t values of the unstandardized regression coefficients, which can be found from Table 4 by dividing the coefficients by their respective standard errors.

Discussion

The results do not strongly support this use of Freidson's classification as a paradigm for the investigation of physician referral rates. It is possible that the way that physicians acquire their patients (the basis of Freidson's classi-

fication) is not as straightforwardly related to their referral behavior as was assumed in the present work. Given the level of abstraction of some of the measures, however (for example, physician self-report of patient characteristics rather than data from medical records or patient encounter forms), and the cross-sectional nature of the data, the low R^2 values obtained in some cases—the small amounts of total variance explained—are not surprising.

The findings nevertheless allow some conclusions that have important implications for the impact of changes in the delivery of medical care. Both general practitioners and surgeons in large group practices (GROUP) refer more often than those in solo practices or two-to-five-person arrangements. Third-party coverage (MEDICAID) is associated with more frequent referrals by pediatricians and surgeons. Greater case severity (HOSVIS) leads to more frequent referrals by surgeons. Both third-party coverage and the recent increase in group practices are influenced by public policy [16]; the present results indicate that as these factors increase each will contribute to a further increase in referrals. Further, if it is true that the increased demand for medical care expected as a result of national health insurance coverage will come mostly from those groups currently in poorest health [17], then the general level of case severity will increase. This will in turn lead to increased referrals.

The effect of such policy-induced increases in referral rates deserves careful assessment. It is commonly believed that continuity is better in group than in solo practice; that if referrals are needed they can be accomplished more easily among physicians associated in the same practice, with easier transfer of the medical record and easier communication between the physicians involved. To what extent such benefits are actually derived is questionable, especially when the majority of current group practices are single-specialty rather than multiple-specialty types.

The present study must be viewed as exploratory and its findings as only suggestive. Some of the variables related to differences in referral rates have been indicated, however, and they clearly suggest that public policy manipulation of these variables is likely to lead to increased rates of referral, with possibly detrimental effects on the continuity of care delivered. Further work attempting to specify such second-order effects of national health insurance proposals and similar policies is needed, particularly to clarify the complex interrelationships between access, use, cost, continuity, and quality of care.

Acknowledgments. The authors wish to express their appreciation to the staff of the American Medical Association's Center for Health Services Research and Development and to Odin Anderson, Center for Health Administration Studies, University of Chicago, for comments and suggestions on an earlier draft of this article.

REFERENCES

1. Freidson, E. Client control and medical practice. *Am J Sociol* 65:374 Jan. 1960.
2. Warner, J. and P. Aherne (eds.). *Profile of Medical Practice.* Chicago: Center for Health Services Research and Development, American Medical Association, 1974.
3. U.S. Department of Labor, Bureau of Labor Statistics. *Handbook of Labor Statistics, 1971,* Table 130. Washington, DC: U.S. Government Printing Office, 1971.
4. Owens, A. How do you rate on referrals? *Med Econ* 50:194 Jan. 22, 1973.
5. Penchansky, R. and D. Fox. Frequency of referral and patient characteristics in group practice. *Med Care* 8:368 Sept.–Oct. 1970.
6. Vahovich, S. G. *Physician Supply Responses.* Chicago: Center for Health Services Research and Development, American Medical Association, 1974.
7. Sloan, F. A. Physician supply behavior in the short run: An analysis of 1960 and 1970 census data. *Ind Labor Relat Rev* 28:549 July 1975.
8. Freeborn, D. and B. Darsky. A study of the power structure of the medical community. *Med Care* 12:1 Jan. 1974.
9. Shortell, S. M. *A Model of Physician Referral Behavior: A Test of Exchange Theory in Medical Practice,* pp. 17–22. Research Series No. 31. Chicago: Center for Health Administration Studies, University of Chicago, 1972.
10. Sloan, F. A., J. E. Cleckner, and J. B. Wayne. Non price rationing of physician's services. Working paper, Health Economics Project, University of Florida, 1973.
11. U.S. Department of Health, Education, and Welfare. *Vital and Health Statistics from the National Health Survey.* National Center for Health Statistics. Series 10, No. 79. Washington, DC: U.S. Government Printing Office, 1973.
12. U.S. Department of Health, Education, and Welfare. *Physician Visits Volume and Interval Since Last Visit from the National Health Survey.* National Center for Health Statistics. Series 10, No. 75. Washington, DC: U.S. Government Printing Office, 1972.
13. *National Disease and Therapeutic Index.* Ambler, PA: Lea, 1968.
14. Draper, N. R. and H. Smith. *Applied Regression Analysis,* pp. 86–91. New York: Wiley, 1966.
15. Blalock, H. M. Causal Inferences, Closed Populations, and Measures of Association. In H. M. Blalock (ed.), *Causal Models in the Social Sciences,* p. 145. Chicago: Aldine, 1972.
16. Newhouse, J. P., C. Phelps, and W. Schwartz. Policy options and the impact of national health insurance. *New Engl J Med* 290:1345 June 13, 1974.
17. Andersen, R. and J. Newman. Societal and individual determinants of medical care utilization in the United States. *Milbank Mem Fund Q* 51:95 Winter 1973.