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Public Policy and Managerial Impact Section

How Do HMOs Achieve Savings? The Effectiveness of One Organization's Strategies

*Ann Barry Flood, Allen M. Fremont, Kinam Jin, David M. Bott,
Jiao Ding, and Robert C. Parker, Jr.*

Objective. To examine how a group practice used organizational strategies rather than provider-level incentives to achieve savings for health maintenance organization (HMO) compared to fee-for-service (FFS) patients.

Data Sources/Study Setting. A large group practice with a group model HMO also treating FFS patients. Data sources were all patient encounter records, demographic files, and clinic records covering 3.5 years (1986–1989). The clinic's procedures to record services and charges were identical for FFS and HMO patients. All FFS and HMO patients under age 65 who received any outpatient services during approximately 100,000 episodes of the seven study illnesses were eligible.

Study Design. Using an explanatory case design, we first compared HMO and FFS rates of resource utilization, in standardized dollars, which measured the impact of organizational strategies to influence patient and provider behavior. We then examined the effect of HMO insurance and organizational measures to explain total outpatient use. Key variables were standardized charges for all outpatient services and the HMO's strategies.

Principal Findings. Patient and provider behavior responded to organizational strategies designed to achieve savings for HMO patients; for instance, HMO patients used midlevel providers and generalists more often and ER and specialists less often. Overall HMO savings, adjusted for case mix, were explained by the specialty of the physicians the patients first visited and appeared to affect patients with average health more than others.

Conclusion. Organizational strategies, without resort to differential financial incentives to each provider, resulted in lower rates of outpatient services for HMO patients. Savings from outpatient use, especially for common diseases that rarely require hospitalization, can be substantial.

Key Words. Managed care/HMO, financial incentives, organizational strategies, episodes of care, resource utilization

Health maintenance organizations (HMOs), and managed care more broadly, offer two auspicious promises: lower costs and better health. These promises first gained widespread attention in the 1970s, bolstered by federal legislation designed to facilitate development of HMOs and by early research reporting that HMO patients' outcomes are at least as good as the outcomes of their fee-for-service (FFS) counterparts while HMOs spend less—especially by reducing hospitalizations (Dorsey 1983; Hlatky et al. 1983; Luft 1978, 1981; Manning et al. 1984; Wolinsky 1980).

Because these promises were widely accepted, most research comparing HMOs and FFS addressed the question, *How do HMOs achieve savings?* by examining differences in average rates of the services HMO and FFS patients received, for example, visits or hospitalizations, adjusted for health (Kralewski 1996; Martin et al. 1989; Miller and Luft 1994; Stearns, Wolfe, and Kindig 1992; Udvarhelyi et al. 1991; Hellinger 1996). The presumption underlying this approach was that knowing how HMOs save money requires understanding how providers deploy services differently when confronted with an HMO patient.

One reason why researchers focused on explaining differences in services was that policymakers were basing health policy on the assumption that HMOs spend less than FFS care because providers react to financial incentives. FFS incentives, they presumed, push expenses higher than may be necessary by rewarding use of the most profitable combination of services, even when a positive impact on health is unlikely to occur. In contrast, HMO incentives encourage using the lowest-cost approach to achieve satisfactory health outcomes. Moreover, most usually assumed further that these incentives operate primarily at the provider level (that each doctor is motivated

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to use the least costly resources when treating HMO patients and the most profitable when treating FFS patients.

In reality, the financial risk associated with HMO care is almost always borne by a group of providers or an insurance organization (Hillman, Pauly, and Kerstein 1989; Gold, Nelson, Lake, et al. 1995). It is the group or organization, rather than the individual provider, that is motivated to deliver the least costly care to achieve an acceptable outcome. Therefore, in order to truly understand how HMOs achieve their savings, it is crucial to identify the strategies that successful organizations use to achieve their lower costs.

Two general hypotheses guide this study:

Hypothesis One. Organizational strategies that encourage desirable behavior among HMO patients and providers will result in lower resource utilization of services and in greater use of generalists for HMO patients.

Hypothesis Two. Controlling for disease and case mix, lower total resources for HMO episodes are largely explained by the provider's specialty (which reflects organizational strategies rather than provider-level incentives). A related sub-hypothesis is that HMO practice style varies by patient health.

METHODS

STUDY DESIGN, PATIENT POPULATION, AND MEASURES

We use an explanatory case design based on the experience of approximately 100,000 patients under age 65. The sample consisted of all consecutive patients being treated for an episode of any of seven illnesses at Carle Clinic Association of Urbana, Illinois during the 3.5-year study period. This large group practice with its 220 providers representing 30 specialties offers an unusual opportunity to study the impact of organizational strategies.

Although owning their own group model HMO, the Clinic's providers treated both FFS and HMO patients—a situation typical for HMOs in the 1990s (Bernstein and Bernstein 1996; Group Health Association of America 1994). Also typical of many HMOs (Gold, Nelson, Lake, et al. 1995), the Clinic remunerated its physicians based primarily on services rendered without regard to patient insurance. However, because of their system for remuneration, the Clinic used identical procedures to inventory services for all patients and initially recorded the uniform Clinic "charge" for a given type of

service, regardless of provider or patient insurance. Thus, the approximately 1.5 million encounter records during the study period provided identical information for all HMO and FFS services on the CPT-4 code (Clauser, Fanta, and Finel 1984), its associated standard Clinic charge, the service-provider, the HMO-assigned physician if any, and up to 12 diagnostic codes for office-based services. To remove the effect of year, we also standardized all charges to 1990 dollars using the Clinic's actual annual changes during the study period.

Because prices of each type of service do not vary by provider, insurance, or study year, comparisons of HMO and FFS rates reflect differences only in the quantity and mix of services used, not differences in prices paid. In this setting, we can ignore several explanations for any differences in resources spent because HMO and FFS data were recorded identically; HMO and FFS patients had access to the same physicians and the same facilities; and providers, at the individual level, had identical financial incentives.

Rationale for Using Episodes of Acute Diseases

The unit of analysis on which to compare resources used, particularly when treatment crosses sites and involves multiple providers and services, is a theoretical and methodological challenge (cf. Hornbrook, Hortado, and Johnson 1985; Wingert, Kralewski, and Lindquist 1995). We used an episode of illness as the basic unit of analysis, capturing all visits and services ordered by any Clinic providers during the course of treating several common problems. Our primary focus was on *outpatient* services: visits (including emergency room [ER] visits not resulting in hospitalization), procedures, and radiological and laboratory services. We also captured other care delivered by a Clinic provider, that is, in any hospital, nursing home, or other settings, so that we could take such use into account in analyzing outpatient care. The choice and definition of study diseases and the episode length were based on advice from an expert panel of physicians, representative Clinic physicians, Clinic administrators and data recorders, and preliminary analyses of the database. We used a fixed-length model to define each episode, basing the length—from four to six weeks—on the typical clinical course of the acute disease plus time needed to capture follow-up care. We restricted our analyses to acute diseases in order to minimize the possibility that FFS patients (facing no financial disadvantage) would use non-Clinic providers whose services would not therefore be captured in our database. We reasoned that patients were unlikely to switch or supplement their care during the short course of a common, non-life-threatening disease. Where such outside use occurred, our data

underestimated the true FFS resources used and therefore underestimated any "savings" for HMO care.

Creating Episodes of Illness: Patient Eligibility and Data Sources

From January 1, 1986 through June 30, 1989, all patients treated as in- or outpatients by any Clinic provider were eligible for inclusion. Three sources of data were used. Demographic files provided patients' sex, age, and insurance status during the episode. Clinic records provided information about the HMO's strategies and the degree, specialty, and practice location for each provider. Encounter records provided information about the date, charges, and provider for all services used during the episode; they were also used to create measures reflecting the patient's health based on diagnostic information and evidence of poorer health established by receipt of any hospitalization or major outpatient procedure.

To create an episode, we searched the encounter records for any of the study's primary diagnoses associated with an office visit or special service (e.g., audiology test or physical therapy). Once identified, we collected information on all professional services rendered to the patient during the requisite length of the episode. For office visits and special services, we counted the number of events and summed their associated charges for each service-provider. Thus we know if the service was provided by the assigned physician (for HMO patients), the first provider (for all patients), additional providers with the same or different specialties, midlevel providers, or ER providers. We also recorded professional charges associated with outpatient procedures and in- or outpatient laboratory and radiological services. Nonambulatory services such as hospitalization, nursing home visits, or home care were recorded but were relatively rare given the study diseases chosen. Outpatient prescription drugs, available only for HMO patients, were not analyzed here.

Table 1 displays for each study disease the International Classification of Disease [ICD-9-CM] (1992) codes used to define primary and secondary diagnoses, the episode length, and the number of episodes analyzed, as well as the number of physicians who were first-providers during any episode. The study diseases were selected because they were among the most common diseases treated with outpatient care at the Clinic and because they involved multiple ages, both genders, several organ systems, and a variety of specialties. Analyzing the data separately for each study disease offered two advantages. We could control for the basic disease and check for consistency in patterns across a set of common acute illnesses.

Table 1: Basic Descriptors of Diseases: Diagnoses, Length, and Number of Episodes in Study

<i>Study Disease</i>	<i>Importance to Define Episode</i>	<i>ICD-9-CM Codes*</i>	<i>Length of Episode</i>	<i># Final Episodes < 65 yrs.</i>	<i># MDs</i>
Peptic ulcer	Primary	531.0–533.9	6 weeks	1,125	90
	Secondary	537.0 537.3 553.3 560.9 578.9 868.0			
Esophagitis	Primary	530.1	6 weeks	2,592	106
	Secondary	537.0 537.3 553.3 560.9 578.9 868.0			
Gastritis	Primary	535.0–536.9	6 weeks	6,161	122
	Secondary	537.0 537.3 553.3 560.9 578.9 868.0			
Low back pain	Primary	724.5 846.0	6 weeks	10,484	137
	Secondary	447.6 715.0–715.9			
Eczema	Primary	692.9	4 weeks	16,748	126
	Secondary	477.0–477.9 493.9 684 695.3 757.39			
Acute otitis media†	Primary	382.9 V721	4 weeks	26,863	116
	Secondary	462.0 465.0 465.9 473.9 486.0			
Bronchitis	Primary	466.0 487.1	4 weeks	29,904	125
	Secondary	277.0 462.0 463.0 465.0 465.9 466.1 473.9 486.0 493.9			

*These ICD-9-CM codes reflected actual usage at Carle Clinic. We selected codes imprinted on the billing forms and then verified that they captured all usage by consulting with the head of medical records and clinicians from different divisions at Carle and by analyzing a sample of electronic billing records.

† We analyze *acute* otitis media, defined by excluding patients with \geq three episodes within 6 months, \geq four within 12 months, or \geq five total.

As noted in Table 1, the final number of episodes per study disease ranged from 1,125 (peptic ulcer) to 29,904 (bronchitis). We eliminated episodes whose data were time-censored, that is, where the episode began within the first or last four to six weeks of the study period (6.7 percent of all episodes created), had unidentified first providers (2.2 percent), involved Medicare or Medicaid patients (30.6 percent), or began with a consultation CPT-4 code (2.4 percent). Medicare patients were dropped because their HMO plan had a very different benefit structure and the charges were Medicare's allowable charges rather than the Clinic's standard charges. Medicaid patients were dropped because none had HMO insurance.

In order to examine whether the four- to six-week length captured all care for the study diseases, we performed patient-level analyses of the length of time between episodes and the frequency of repeated episodes. Only otitis media exhibited evidence of significant repetition. We removed patients with an indication of chronic otitis media, based on the number of episodes within a specified time frame (Bluestone and Klein 1988). We analyzed the remaining 60.8 percent of otitis episodes, accounting for 86.9 percent of the patients.

TWO TYPES OF ANALYSES

To examine Hypothesis One: the effectiveness of the Clinic's HMO strategies, we created measures of resource usage corresponding to the desired behavioral change for each strategy and compared rates used for HMO and FFS episodes of each disease. The strategies are described in the next section, and their corresponding measures are summarized in Table 3 (further on). To examine whether these strategies resulted in lower total outpatient expenditures for HMO patients, we used regression to adjust for within-disease patient health factors when comparing HMO and FFS expenditures and examined (1) whether the effect of HMO insurance was constant across different levels of illness and (2) whether the effect of having HMO insurance was explained by the types of specialties patients first visited.

ORGANIZATIONAL STRATEGIES AND THEIR MEASURES

Some of the organization's strategies focused on financial incentives and unobtrusive controls such as the convenience of various services for patients, while other strategies used rules, normative comparisons, and praise or reprimand to promote desirable responses in providers.

The financial incentives aimed at HMO patients required them to pay \$10 for each visit to a physician, which was waived for services provided by midlevel providers or expanded to \$50 if services were provided in the ER. The Clinic's HMO also encouraged HMO patients to see generalists, which it accomplished in three ways. First, all HMO patients had to select a "gatekeeper" physician from among a designated pool of Clinic providers. This strategy encouraged the use of generalists by eliminating patient self-referrals and excluding most subspecialties from the designated pool. Second, although the pool included subspecialists (e.g., oncologists and cardiologists), newly enrolled patients found that generalists—particularly family practitioners—were readily available while subspecialists' practices were usually full. And finally,

HMO patients tended to prefer to be treated at branch clinics, where generalists practiced.

This third factor had other implications as well. The Clinic expanded its branch clinics to seven during the early 1980s, in part to encourage membership in its HMO as well as to ensure referrals to its main clinic for specialist care. The convenience of branch clinics is a double-edged sword for patients. While the distance they travel to the branch for office visits is reduced, their total distance and inconvenience is increased when they need services available only at the main clinic, such as specialist care or specialized procedures. While few have compared utilization patterns at branch versus main clinics, some have studied the effect of inconvenience of access, often measured by distance, as a predictor of lower use (cf. Gold 1981; Goodman et al. 1997). We use branch to indicate easier access to generalists and more difficult access to main clinic specialty care.

Although this HMO did not use provider-level financial incentives to influence providers, it used other organizational strategies to influence their behavior. First, HMO patient records were easily identified by markers on their charts that were designed to ensure prospective collection of copayments. Through mechanisms such as educational appeals to practice cost-effectively, monitoring and feedback of rates of services, and praise or reprimand for exceptional performance, the HMO encouraged physicians to exercise control over costly resources. Although clearly identified as originating from the HMO, the educational appeals focused on the general philosophy of providing cost-effective choices for all patients regardless of insurance. In contrast, specific feedback, such as rates of specific services per member per month and letters of praise or reprimand for providers' performance in managing their patients' care, was restricted to HMO patient care. Another strategy was to encourage providers to assume direct oversight of most of their patients' care and especially to avoid overusing specialists.

STATISTICAL METHODS

To test for differences in disease-specific rates of services used to treat HMO or FFS patients, we used Pearson's χ^2 for rates based on dichotomous variables and student's *t*-test for rates based on counts or sums. When adjusting for within-disease differences, we used multiple regression. We used the natural logarithm of total resources in standardized 1990 dollars in regressing total outpatient resources in order to minimize the effect of outlier cases as well as to control for year, provider, and insurance.

RESULTS

Table 2 displays basic differences in patients across each study disease. As expected, the mean total outpatient resources expended during an episode varied considerably by disease. Mean expenditures varied threefold, ranging from \$68 for eczema to \$271 for ulcer. In contrast, the mean number of visits varied little; while the maximum observed ranged from 5 for ulcer to 16 for low back pain, the mean number of visits per episode was slightly above one.

Approximately half of the episodes across all study diseases involved HMO-insured patients. The means for health-related factors, used when adjusting for within-disease differences in the health of patients, varied predictably across the diseases. For example, the mean age for patients under age 65 reflected that acute otitis media most typically occurred among the very young while bronchitis and eczema included both young and older patients.

Hypothesis One. *Do HMO Organizational Strategies Affect Outpatient Resources?*

Table 2: Basic Characteristics of Study Patients by Disease Episodes

	<i>Peptic Ulcer</i>	<i>Esopha- gitis</i>	<i>Gastritis</i>	<i>Low Back Pain</i>	<i>Acute Eczema</i>	<i>Otitis Media</i>	<i>Bron- chitis</i>
<i>Outpatient Resources Per Episode</i>							
Mean total \$ (in standardized 1990 \$) includes visits*, tests, and procedures	271.07	246.27	194.80	187.16	68.08	77.12	69.54
Mean total no. of visits [maximum per episode]	1.20 [5]	1.29 [7]	1.28 [8]	1.32 [16]	1.16 [7]	1.22 [6]	1.18 [9]
<i>Patient Characteristics During Episode</i>							
Insurance: % insured by HMO	54	46	53	52	63	47	57
Health-related factors (case mix):							
Mean age (maximum: 64.9 years)	42.75	37.63	37.68	38.01	23.94	11.04	24.34
Sex (% female)	53	59	61	57	65	66	66
Mean no. secondary diagnoses	.04	.07	.02	.01	.04	.20	.32
Mean no. unrelated diagnoses	1.30	1.23	0.99	0.45	0.33	0.32	0.48
Mean no. prior episodes, same disease	.31	.36	.36	.36	.31	.47	.39
% with any outpatient procedure	11	7	4	1	1	1	0
% with any related hospitalization	8	5	3	1	0	0	1

* Visits consisted of office services (CPT-4 codes 90000-80, 90500-699; 99058-64, 99160-74) and special services (90701-99056, 99065-140, 99175-99).

To examine the effect of the organizational strategies to try to influence patient or provider behavior, we compared the rates of services used by HMO and FFS patients. Table 3 summarizes organizational strategies used by the Clinic's HMO either to reward cost-effective usage or to discourage ineffective uses by patients and providers. It also displays related rates of utilization by HMO and FFS patient episodes.

Table 3: Comparing HMO and FFS Utilization by HMO Organizational Strategies

		<i>Ulcer</i>		<i>Esophagitis</i>	
		<i>FFS</i>	<i>HMO</i>	<i>FFS</i>	<i>HMO</i>
		<i>n = 515‡</i>	<i>n = 610</i>	<i>n = 1,409</i>	<i>n = 1,183</i>
<i>HMO Organizational Strategies to Affect Appropriate Use</i>	<i>Corresponding Episode-Level Utilization Rates for FFS and HMO Patients</i>				
	<i>• Aimed at Patients</i>				
Use copays to influence use:	<i>• Aimed at Patients</i>				
1. Lower if midlevel provider	% used midlevel provider	1.4	3.6	1.1	3.5*
2. Higher if ER	% used ER	7.0	4.6	5.2	5.5
Encourage generalist care	% ever visited adult medicine, family practice, or pediatrician	67.6	86.7*	73.3	83.4*
Branch and cost-effective strategies:					
1. More generalists at branches	% used branch	37.7	59.3*	34.6	51.3*
2. Less convenient access	Mean no. of different days to receive all services during episode	2.5	2.3	2.2	2.5*
Encourage use of assigned primary care MD	For HMO only, % visited assigned provider during episode	—	70.5	—	72.7
	<i>• Aimed at Providers</i>				
Encourage cost-effective ancillary services	Mean \$ spent on radiology, lab, or outpatient procedures	275.5	147.1*	188.7	150.7
Encourage cost-effective no. visits	Mean no. of visits	1.2	1.2	1.3	1.3
Encourage primary provider to give care:					
1. Less cross-coverage	% used cross-coverage†	1.0	8.4*	1.5	9.8*
2. Fewer specialists	% visited specialist (except ER) any time during episode	27.6	11.0*	24.1	14.5*
3. Fewer referrals	% visited specialist (except ER) after initial visit	1.9	4.1	1.9	5.6*

* Indicates that differences between HMO and FFS episodes were significant at $p \leq .001$. Tests for significance were based on χ^2 for percentages and t -tests for means.

† Cross-coverage was defined as care by a provider with the same specialty as the HMO gatekeeper or as the first MD seen for FFS.

‡ n = number of episodes.

Consistent with the organizational incentives for patients, the rates in Table 3 show that HMO patients used midlevel providers more often (significant for five), the ER less often (significant for five), and generalists and branch clinics more often (significant for all), and that they spent more days receiving their care (significant for six, although significantly fewer for back pain). Interestingly, HMO patients did not always see their assigned

<i>Gastritis</i>		<i>Back Pain</i>		<i>Eczema</i>		<i>Otitis Media</i>		<i>Bronchitis</i>	
<i>FFS</i>	<i>HMO</i>	<i>FFS</i>	<i>HMO</i>	<i>FFS</i>	<i>HMO</i>	<i>FFS</i>	<i>HMO</i>	<i>FFS</i>	<i>HMO</i>
n = 2,918	n = 3,243	n = 5,081	n = 5,403	n = 6,271	n = 10,477	n = 14,157	n = 12,706	n = 12,881	n = 17,023
2.7	6.8*	4.3	4.5	5.2	7.5*	2.2	5.3*	7.2	11.4*
9.7	6.2*	7.7	4.2*	8.9	3.9*	11.7	7.9*	13.2	7.4*
77.0	88.0*	55.0	87.5*	72.7	80.3*	86.6	90.8*	84.4	912.6*
52.3	58.1*	45.5	64.4*	40.0	43.6*	33.8	38.0*	57.5	54.8*
2.1	2.4*	2.4	2.3*	1.6	1.8*	1.7	1.9*	1.6	1.7*
—	71.4	—	68.6	—	57.7	—	59.5	—	59.7
154.7	118.0*	136.3	111.5*	22.1	27.3	32.1	23.7*	24.9	26.7
1.3	1.3	1.4	1.3	1.2	1.2	1.3	1.2*	1.2	1.1*
1.1	11.5*	1.4	13.6*	1.3	13.1*	5.0	22.9*	3.3	19.9*
14.6	7.3*	40.1	11.4*	20.6	19.5	3.6	3.1	3.6	2.7*
0.6	2.0*	2.8	9.0*	1.9	18.3*	1.2	1.8*	0.3	1.0*

physician, ranging from only 58 percent of eczema episodes to 73 percent for esophagitis.

The bottom of Table 3 focuses on strategies to influence provider behavior. Ancillary services were less expensive for HMO episodes (significant in four diseases), but had little effect on visits (significantly fewer for two diseases). HMO episodes experienced significantly higher rates of cross-coverage (significant for all), were less likely to see a specialist (defined as a medical subspecialist or surgeon) at any time during the episode (significant for five diseases), but were more likely to be referred to a specialist (where referral to a specialist required a prior visit to another type of physician) (significant for six diseases).

Overall these results support Hypothesis One, but some results deserve discussion. We argued that the convenience of branch clinics is coupled with greater inconvenience for the patient in receiving specialty care at the main clinic. This may explain why HMO patients typically required *more* days total to receive all services during an episode, despite receiving the same or *fewer* visits and ancillary services. The patterns of avoiding the gatekeeper and using specialists, referrals, or cross-coverage may in part reflect more complex but responsive behavior in view of the HMO's strategies to encourage appropriate provider use. HMO patients might not have seen their assigned gatekeeper physician because (1) they visited midlevel providers instead; (2) their assigned physicians sometimes referred them to specialists without a visit; and (3) cross-coverage within the same division was common for urgently requested visits and, using our definition, was more easily identified among the HMO patients. Further, FFS patients' easier direct access to subspecialists included inappropriate contacts, leading to higher rates of subspecialist care and lower rates of referral by generalists.

Hypothesis Two. *Does HMO Insurance Affect Overall Outpatient Resources?*

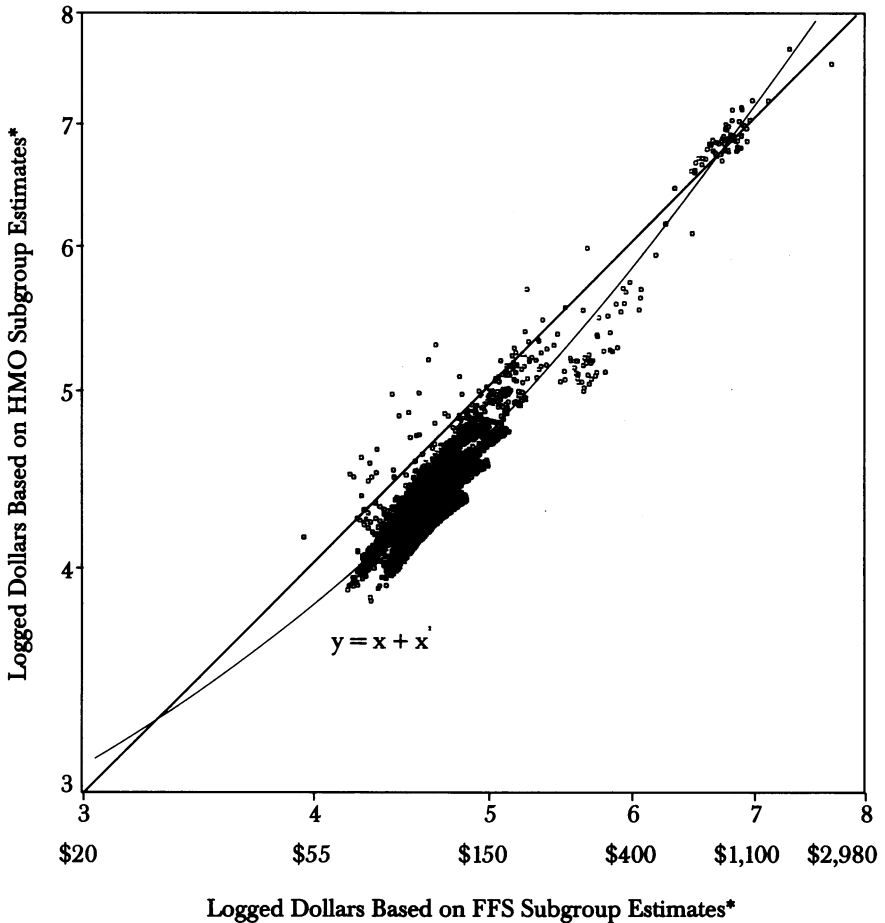
We examine next whether organizational strategies, or HMO insurance per se, resulted in lower total outpatient expenditures. Although disease-specific episodes provide the most important adjustment for health, we also adjusted for within-disease health when comparing HMO and FFS expenditures. Health-related factors included basic demographic variables and evidence of other or more serious disease (see Table 4 further on.)

To model the effect of within-disease health indicators on outpatient resources, we used insurance to create two subgroups and regressed outpatient resources (in 1990 logged dollars) on patient health for each subgroup. These regressions yielded two estimates of outpatient resources for each episode:

resources typically received by FFS or HMO patients, given the patient's particular health attributes and the study disease being investigated.

Figure 1 shows a comparison of these estimates for back pain. The coordinates for each square (a specific HMO episode) represent two estimates: if it had received the care pattern for FFS (X-axis) or for HMO (Y-axis). If the episode's estimates reflected the identical impact of health-

Figure 1: Comparing HMO and FFS Patterns of Outpatient Resource Use for Back Pain; Estimates Compared for 5,403 HMO Episodes



*Based on Resources of Standardized 1990 Dollars (Logged) on Health Factors by Insurance Subgroup.

related factors regardless of insurance, then each square should be aligned along the diagonal—reflecting only the conclusion that greater resources are spent on “sicker” patients.

As readily observed in Figure 1, a strong overall trend indicated that patients with poorer health were receiving more total resources regardless of their insurance. However, also apparent is that most squares fell below the diagonal, indicating that disproportionately more resources would have been spent for the same patient with an episode of back pain if the patient had had FFS insurance. For back pain and for all six other diseases, HMO patients received statistically significantly fewer outpatient resources, controlling for health and study disease ($p \leq .0001$, based on paired t -tests, comparing HMO and FFS estimates for each episode).

We also tested whether this effect was linear for each disease, that is, whether or not having HMO insurance reduced resource use by a constant amount, depending only on patients' health. Figure 1 also displays the curvilinear fit line for back pain, regressing the FFS-based estimate and its square on the HMO-based estimate for all HMO episodes. Curvilinear effects of insurance were significant for all seven diseases ($p \leq .00001$ for the coefficient for each squared term).

For all diseases, these results suggest that the effect of having HMO insurance was not a simple reduction of resources, *directly proportionate* to those needed because of the patient's specific disease and health-related factors. Instead the effect of HMO insurance varied, depending on how sick the patient was. Our estimates suggest that FFS and HMO patterns of care tended to be similar at both extremes of health; that is, the healthiest and the sickest patients received similar care, with some evidence that the sickest HMO patients tended to receive *more* resources than the sickest FFS patients. The differences in care, that is, the “savings” observed for episodes of treating HMO patients with a specific disease, appear to occur primarily when treating patients with “average” overall health problems.

Last, we use three models to regress total outpatient resources on HMO insurance, controlling for (1) nothing else, (2) patient health-related factors, and (3) patient health *and* the specialty of the physician first seeing the patient, that is, one important factor underlying many of the HMO's strategies to influence costs. Table 4 presents results for low back pain; tables for all diseases are available upon request.

Model 1 corresponds to the total observable effect of HMO care on outpatient resources, regardless of whether the effect is due to the insurance per se and/or to differences in the health of HMO patients, in who treated

Table 4: Three Models of Impact of HMO Insurance on Outpatient Resource Use; Regression on 1990 Standardized Dollars (Logged) for Care of Back Pain ($n = 10,484$)

	<i>Model 1: HMO Alone beta and sig.</i>	<i>Model 2: Adjust for Case Mix beta and sig.</i>	<i>Model 3: Add 1st Provider's Specialty beta and sig.</i>
<i>Patient Characteristics at Episode</i>			
Insured by HMO (compared to FFS)	-.120***	-.126***	-.031***
<i>Health-related factors (case mix)</i>			
Age		.131*	.047
Age ²		-.029	.030
Sex		-.017	-.009
No. secondary diagnoses		.093***	.087***
No. unrelated diagnoses		.142***	.162***
No. prior episodes of same disease		-.006	-.003
Presence of outpatient procedure		.226***	.220***
Related hospitalization episode		-.015	-.015
Hospital-diagnosis interaction		-.022	-.024*
Time trend by quarter		-.002	.003
<i>F</i> and significance of adjusting for case mix		121.896***	
<i>Specialty of Physician First Visited (compared to adult medicine)</i>			
Family practice and pediatricians			-.041***
Specialty that can be HMO-assigned doctor			.073***
Specialty that cannot be HMO-assigned doctor			.163***
Surgeons			.186***
Emergency Room physicians			.053***
<i>F</i> and significance of adjusting for provider specialty			160.110***
<i>F</i> and significance of entire equation	152.305***	126.258***	143.431***
Total R^2	.014	.117	.180

* $p \leq .01$; ** $p \leq .001$; *** $p \leq .0001$.

them, or in unmeasured confounders (Davis 1985; Stolzenberg 1980). Model 1 in Table 4 shows that the overall effect of having HMO insurance resulted in the patient receiving significantly fewer outpatient resources for back pain than with FFS care. This finding was also significant for four other diseases (all except eczema and bronchitis).

Model 2 adjusts for patient health-related factors on outpatient resources as well as HMO insurance. We tested for the significance of adding the set of health-related factors by examining the change in F compared

to F in Model 1. For back pain and for all other study diseases, this set of factors added significantly ($p \leq .0001$) to the explanatory power of the overall equation for predicting resources used. Using Model 2 (adjusting for patient health), HMO insurance predicted that patients received significantly fewer resources for treatment of back pain, esophagitis, eczema, and acute otitis media.

In Model 3, we added the specialty of the physician first visited during the episode. Based on the change in F from Model 2, specialty added significantly to the overall prediction of resources for all diseases (Table 4). After controlling for health and insurance, family practitioners and pediatricians spent significantly less for back pain than did adult medicine (internists, GPs) while surgeons, ER physicians, and specialists spent significantly more. This general pattern for providers' specialty held across all seven diseases.

Of particular interest is what happened to the standardized coefficient (*beta*) for the HMO in Model 3 in contrast to the other models. For back pain, inclusion of the provider's specialty in Model 3 reduced the magnitude of the *beta* for HMO considerably in comparison to Models 1 and 2. This same pattern, significant reduction in the HMO's explanatory contribution in Model 3 compared to the other models, held across all seven diseases; in fact, the HMO became insignificantly different from FFS in Model 3 for all diseases except back pain. These results suggest that HMO insurance did not have a direct effect on resources (for instance, by influencing each physician to treat HMO patients differently), but instead reduced use by organizational strategies (by influencing who treated HMO patients).

COMMENTS

Our study yielded three important findings. First, the HMO influenced patient and provider behavior by using patient-oriented and physician-oriented strategies to reduce care. As intended, HMO patients with the same disease as their FFS counterparts made more use of lower-cost providers (more midlevel providers and generalists), avoided higher-cost providers (fewer specialists and ER visits), and received arguably more cost-effective services (less expensive ancillary services and more selective use of specialists).

Second, besides affecting rates of use, we found for all seven diseases that HMO care used fewer expenditures—expressed as total outpatient dollars and adjusted for within-disease health, that is, case mix. For all seven diseases, we found evidence that the HMO's effect on expenditures was curvilinear,

varying by patients' health. Our results suggest that most of the savings occurred for the patients with average health and that the healthiest and sickest patients tended to receive the same total outpatient resources regardless of insurance.

Third, we found evidence that having HMO insurance did not reduce case mix-adjusted expenditures by influencing each physician to treat HMO and FFS patients differently. Instead our results suggested that this effect occurred via HMO strategies that influenced *which* physicians treated HMO patients. The impact of organizational strategies may have been observed precisely *because* this setting did not reward physicians differently at the individual level. In any case, our results suggest that HMOs can achieve significant outpatient savings without requiring each provider to change his or her clinical decisions depending on patient insurance.

Are these outpatient savings significant? Some have argued that outpatient savings are not important—that managed care achieves its savings by reducing inpatient care, especially by having fewer hospitalizations—and that nothing else much matters because hospitalizations are so costly. How can policymakers and administrators best judge how important these outpatient “savings” truly are?

To address this question in our setting, we focused on the four study diseases with the *most* hospitalizations overall (bronchitis, acute otitis media, esophagitis, and gastritis) in order to better estimate inpatient resources, controlling for case mix, from our data. Our standardized 1990 inpatient costs were independent of insurance and included daily room and other hospital charges *and* all associated professional fees.

HMO patients were hospitalized less often, so perhaps we should focus on how much a forgone hospitalization would have cost: \$5,456 on average for these four diseases. Yet to take into account that most patients were never hospitalized for these diseases regardless of insurance, the per-episode rate may be more instructive: our average per-episode savings for these four diseases was \$5.27 for inpatient care compared to \$10.26 for outpatient care—leading to twice the overall savings from outpatient costs. For patients under 65 with these four problems in our setting during this 3.5-year period, these per-episode savings summed to \$321,820 for outpatient charges versus \$165,367 for inpatient hospital and professional fees. Since most problems never lead to hospitalization, perhaps it is time to rethink where the greatest overall savings may reside.

The key strengths of this study relate to the unusual opportunities to examine the independent effect of organizational strategies, above and

beyond the method through which providers were reimbursed. Because the encounter data were collected and priced identically for all patients, regardless of provider or insurance, and were standardized to 1990 dollars, the capacity to truly compare services for HMO and FFS patients is exceptional. Because the physicians' incentives were identical for HMO and FFS patients at the provider level, we can ignore this potential influence on services delivered. Likewise, because HMO and FFS patients could visit the same physicians and use the same facilities, we avoid biases plaguing others' comparisons of HMO and FFS rates involving different providers and facilities.

Another strength is the usefulness of these encounter data to construct episodes of acute illnesses commonly treated in ambulatory settings and to adjust for within-disease case mix. Using short episodes maximized the comparability of HMO and FFS care because neither set of patients was likely to seek out-of-Clinic care during this short period. Any remaining biases due to incomplete capturing of FFS care caused us to understate FFS care so that our results would underestimate true expenditure reductions under HMO insurance.

The explanatory case design of our setting brings limitations too. When the researcher has little opportunity to exert control, such designs are especially well suited to take advantage of controls built into the setting. However, they do not permit statistically sound generalizability to other settings, for example, to a population of patients, other providers or group practices, or other HMOs (Yin 1994). Our patient population, although it represents 100,000 episodes of acute illnesses involving 1.5 million provider encounters, did not include those insured under Medicaid or Medicare and was predominantly white, middle-income, and living in a small urban area. Our providers included many family practitioners and a variety of specialists not available in many group practices. This HMO represented specific solutions for passing financial risk to its providers and for strategies to reduce costs. Since these encounters occurred in the late 1980s, the estimates do not reflect new medical practices or new market pressures. Drug use was not analyzed because comparably complete data were not available for FFS patients. Because we chose diseases treated primarily in outpatients, we did not focus on diseases with high rates of hospitalization or compare usage of preventive or maintenance services, nor did we capture patients who never came to the Clinic. Although we had a large and complex database, we may not have compensated fully for health differences between HMO and FFS patients or for other variables that might have led HMO patients to prefer midlevel providers or generalists. Our findings of reduced expenditures do not reflect

“true savings” based on actual prices paid by insurers or on out-of-pocket expenditures paid by patients.

Perhaps most importantly, we cannot address whether lower resource use was related to differences in satisfaction or to outcomes of care. Especially because of increased concerns about public loss of trust in the doctor-patient relationship under managed care (Emanuel and Dubler 1995; Mechanic and Schlesinger 1996), it will be important to understand whether HMO organizational strategies lead to more cost-effective care or simply to lower costs with less satisfactory or lower-quality outcomes.

Our results suggest that the promises of HMOs require neither physician-specific incentives, nor alterations in the clinical decisions of each practitioner, nor asking individual clinicians to practice two-tiered medicine. Instead cost-effective care can be the outcome of a process in which appropriate financial incentives for providers and patients and system features, together with provider and patient acculturation, come together. In an era of increasing enthusiasm to encourage HMOs and managed care, it is imperative to develop a more sophisticated understanding of the ways in which HMO incentives truly work to achieve their savings and to learn to appreciate the power of complex organizations and systems to design and create desirable results.

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