

## SPECIAL ARTICLE

POTENTIAL EFFECTS OF MANAGED CARE ON SPECIALTY PRACTICE AT A UNIVERSITY  
MEDICAL CENTERJOHN E. BILLI, M.D., CHRISTOPHER G. WISE, PH.D., M.H.A., ELIZABETH A. BILLS, B.S.,  
AND RITA L. MITCHELL, M.P.H.

**Abstract Background.** The growth of managed care presents a challenge to academic medical centers, because the demand for the services of specialists is likely to continue decreasing. We estimated the number of enrollees the University of Michigan Medical Center would need in its health maintenance organization (HMO) system in order to provide revenue equivalent to the total revenue it received for professional specialty care in 1992.

**Methods.** Rates of utilization and payment were based on the medical center's experience with managed care in 1992 in its independent practice association HMO, in which 25,000 members had capitated coverage and received primary and all specialty care from university physicians, and 15,000 members received primary care and most specialty care from physicians outside the university. We assumed that persons not enrolled in Medicare were all enrolled in managed-care plans. Primary care activity was excluded from the calculations of expense, revenue, and numbers of faculty members.

**Results.** If all specialty services were provided by the

university to HMO members, all the 21 specialties examined except obstetrics and gynecology and emergency services would require an enrollment of more than 250,000 to support the 1992 level of professional revenue and maintain the number of faculty members. If university services were provided only for referrals from a loosely affiliated network of community physicians in the HMO system, all the 19 specialties examined except plastic surgery would require an HMO enrollment of more than 1 million. In a combined model in which all specialty services were provided to 100,000 HMO members and network referrals were provided to 500,000 members, substantial changes in faculty composition would be needed in all the departments studied.

**Conclusions.** Because of the large number of HMO members required, unless other changes occur, it is unrealistic to expect that the University of Michigan Medical Center could create an HMO or network large enough to support the specialty practice of the current number of faculty members at the 1992 level of financing. (N Engl J Med 1995;333:979-83.)

THE growth of managed care presents a particular challenge for academic medical centers, because demand for the services of specialists is likely to continue to decrease.<sup>1</sup> In addition, managed-care plans often send patients to community hospitals at reduced cost.<sup>2</sup> If academic medical centers are to maintain a high level of referrals to specialists, they will need to serve a larger population.

Income from faculty practice plans accounted for 32.4 percent of the total revenue of U.S. medical schools in fiscal year 1991. Since 1989, this income has increased substantially both in dollars and as a percentage of overall revenues, and it represents the largest share of the funding of medical schools.<sup>3</sup> We used three models to estimate the number of enrollees a large academic medical center would need in its health maintenance organization (HMO) system in order to preserve the current level of revenue for specialists. Our analysis excluded the revenue of primary care physicians at the medical center.

In one model (the all-services model), we asked, "How many enrollees are needed in managed-care plans to support the revenue of specialists if the academic medical center provides all specialty services to

the HMO enrollees?" In this model, all specialty services would be provided at the academic medical center.

In the second model (the network model), we asked, "How many people are needed in managed-care plans if the academic medical center provides only referral services to the members of the HMO?" In this model, referrals to specialists come only from a loosely affiliated network of community providers within the HMO system.

In the third model (the combined model), we asked, "How many people are needed in managed-care plans if the academic medical center provides all specialty services to 100,000 members of the HMO and only referral services to the remaining members?"

## METHODS

## Study Setting

This study was carried out in 1993 at the University of Michigan Medical Center, which includes a medical school and several university hospitals. In 1992, 700 full-time physicians on the medical school faculty (equivalent to 400 full-time clinicians) provided specialty services exclusively at the medical center as members of the medical school faculty practice. Full-time equivalents of clinical work were estimated for these faculty members on the basis of clinical work as reported in faculty logbooks required by the federal government and from records of liability insurance.

The 888-bed medical center includes a medical-surgical hospital for adult patients, a women's hospital, a hospital for pediatric and neonatal care, an eye hospital, and psychiatric and inpatient rehabilitation units. It also includes a large outpatient facility and 12 satellite clinics. In 1992, physicians at the medical school provided care for patients during more than 34,500 inpatient stays and 770,000 outpatient

From the Office of the Dean (J.E.B., C.G.W., E.A.B., R.L.M.) and the Department of Internal Medicine (J.E.B.), University of Michigan Medical School, Ann Arbor. Address reprint requests to Dr. Billi at the Office of the Dean, M7300 Medical Science I Bldg., University of Michigan, Ann Arbor, MI 48109-0624.

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visits. The revenue from the faculty group practice accounted for 41 percent of the medical school's overall revenue of \$327 million in 1992 and was included in the university budget.

An independent practice association HMO was established at the university in 1986. In 1992, approximately 40,000 people were enrolled, 95 percent of whom lived in the primary service area, consisting of the five counties where the HMO was licensed to operate. The network of providers consisted of nearly 1000 specialists, 400 primary care physicians, and 18 hospitals. There were an average of 70.6 hospital admissions and 309 inpatient days annually per 1000 enrollees.

Rates of utilization and payment in the all-services model were based on the medical center's experience with managed care in its capitated HMO. The 25,000 enrollees in the capitated plan signed up with primary care physicians at the university, and all their specialty services were provided by physicians at the medical center. The university medical center received fully capitated payment for all services provided to this group.

In the network model, rates of utilization and payment were based on the 1992 experience with managed care involving the 15,000 members of the same HMO who signed up with primary care physicians outside the university and were referred for specialty care, usually to specialists in the community. Only tertiary care services were provided at the medical center.

In the combined model, the first two models were both used to estimate how large a network would be needed if the medical center provided all specialty services for 100,000 members and only referral services for the remaining members. In each of the three models, we estimated how many enrollees in managed care would be needed in order to maintain a level of revenue equivalent to the total received in 1992 by specialists.

### Assumptions of the Study

We assumed that everyone not enrolled in Medicare would be enrolled in the managed-care plans. We excluded Medicare enrollees and Medicare-associated revenues from both the revenue target for the faculty group practice and the estimates of the number of managed-care enrollees needed to support that target. We assumed that payments would be made at the rate standard in the region for a managed-care business. Our calculations used the university HMO's rates of payment, which are essentially identical to those in the professional fee schedule of Blue Cross–Blue Shield of Michigan, which is used for traditional insurance and managed care. Most other payers in the state use this schedule with minor variations. We assumed that the number of members of the clinical faculty would not change and that there would be no further changes in rates of utilization or payment.

Since we included all non-Medicare revenue in the models, the models include Medicaid revenue (5.1 percent), as well as revenue from Blue Shield (31.2 percent), commercial payers (38.5 percent), preferred-provider organizations (5.9 percent), and self-pay and other insurance (19.3 percent). Each of these groups has different utilization and reimbursement characteristics. We did not attempt to use our models to determine how each would fare under managed care; instead, we included the effects on reimbursement and the size of the population in the models as if the entire population had the same utilization and reimbursement characteristics that we found in our experience with managed care.

### Exclusions

In the calculations of expense, revenue, and numbers of faculty members, primary care activity was excluded. Therefore, no results are provided for family practice and the results shown for internal medicine, pediatrics, and obstetrics and gynecology reflect only the activity of specialists. In 1992, less than 10 percent of the members of the clinical faculty were primary care physicians. No results are given for psychiatry, because payment for psychiatric services was made differently from payment in all the other specialties; therefore, it could not be modeled. In the all-services model, we have included results for

**Table 1. Sample Calculation in the Model in Which All Specialty Services Were Provided to HMO Enrollees, Using the Example of Anesthesiology.**

Specialty payment per member per month (payment rate) = $\frac{\$ \text{ from HMO to specialty}}{\text{No. of enrollees}} = \frac{\$39,871}{25,235} = \$1.58$
Number of managed-care enrollees needed = $\frac{\text{All specialty revenue}}{\text{Specialty payment rate}} = \frac{\$744,533}{\$1.58} = 471,223$ enrollees

pediatrics and pediatric surgery, because all pediatric specialty care in the entire HMO was referred to the medical center. There were no pediatric specialists in the network outside the university; for this reason, no results for pediatrics or pediatric surgery could be provided in either the network model or the combined model.

### Analysis

An example of the calculations made in the all-services model is shown in Table 1 for one specialty, anesthesiology. We first calculated the payment per member per month (the payment rate) for each specialty, by dividing the HMO payments per month to that specialty by the number of enrollees. For example, in the all-services model for anesthesiology, \$39,871 was paid per month for services to 25,235 enrollees, or \$1.58 per enrollee per month.

Then, for each specialty, we divided the actual 1992 non-Medicare net revenue by the payment rate to derive the number of managed-care enrollees needed to maintain a level of clinical revenue equivalent to that in 1992, if all revenue were to come from patients enrolled in managed-care plans. For anesthesiology, this number was the overall non-Medicare revenue (\$744,533 per month) divided by the managed-care revenue for the specialty (\$1.58 per member per month), or 471,223 people.

We compared the HMO payment rates in the all-services model with the rates reported in the Warren survey<sup>4</sup> (Table 2), an annual, proprietary survey of the payment rates of approximately 450 HMOs and managed-care plans throughout the United States. For specialties for which comparative data were available, the university's payment rates were very similar to those in the survey. The few differences may be due to differences in the way the specialties were aggregated by respondents to the Warren survey, differences in regional reimbursement rates, or differences in utilization rates.

The number of covered enrollees needed to maintain the 1992 level of revenue of professional specialists was inversely proportional to the specialty-specific payment rates we used. For example, in the case of anesthesiology, doubling the payment rate from \$1.58 to \$3.16 per member per month reduced by half the number of covered enrollees needed (from 471,223 to 235,612). Our results can be compared with those obtained in other settings by comparing the payment rates in those settings with the rates we used.

We followed the same analytic steps in the network model, except that instead of using the specialty payments from the university's own capitated HMO population to calculate the payment rates, we used the payments for referrals to university specialists from the network. There was a lower specialty-specific payment rate in the network model than in the all-services model, primarily because of the lower rate of referral to university specialists. In the case of anesthesiology, the payment rate in the network model was \$0.58, as compared with \$1.58 in the all-services model; as a result, 1.28 million enrollees (744,533 divided by 0.58) were needed to maintain the 1992 revenue in that specialty.

In the combined model, we first calculated the revenue that would be derived from providing all specialty services to 100,000 members and did so by multiplying the payment rate for each specialty in the all-services model by 100,000. For anesthesiology, this yielded \$158,000. Then we calculated the revenue needed from network referrals and did so by subtracting the revenue for 100,000 enrollees from the total revenue needed per month in the specialty. For anesthesiology, this left a total of \$586,000 to be made up from referrals. Finally, to determine the number of managed-care enrollees needed to provide that revenue from referrals, we divided the revenues needed from referrals by the network payment rate. In the case of anesthesiology,

**Table 2. Estimated Monthly Payment Rates in the All-Services Model of the University HMO, as Compared with the Rates Reported by Respondents to the Warren Survey, According to Specialty.**

SPECIALTY	UNIVERSITY HMO	WARREN SURVEY*	DIFFERENCE
	<i>dollars</i>		
Anesthesiology	1.58	1.78	0.20
Dermatology	0.61	0.34	0.27
Emergency medicine	1.20	Not available	—
Internal medicine	3.48	Not available	—
Neurology	0.33	0.29	0.04
Obstetrics and gynecology	3.08	2.37	0.71
Ophthalmology	0.67	0.66	0.01
Otolaryngology	0.82	0.55	0.27
Pathology	0.66	Not available	—
Pediatrics	0.46	Not available	—
Physical medicine	0.36	Not available	—
Radiation oncology	0.46	Not available	—
Radiology	2.08	2.44	0.36
Surgery	2.88	2.82	0.06

\*Data were obtained from the Warren survey.<sup>4</sup>

this meant dividing the \$586,000 by \$0.58 per member per month; the result was that about 1,010,000 managed-care enrollees would be required. We then repeated this process for each specialty and for the sections of surgery.

In each model, we calculated the number of managed-care enrollees needed per full-time equivalent of specialty clinical faculty members. This was accomplished by dividing the number of enrollees needed in each specialty by the number of full-time-equivalent clinical faculty members in the specialty in 1992. In a final analysis, we estimated the number of clinical faculty members needed to provide,

first, all specialty services for 100,000 managed-care enrollees and, second, all specialty services for 100,000 managed-care enrollees plus network referrals for 500,000 enrollees. These estimates were made by dividing the total number of enrollees by the number of managed-care enrollees for each member of the clinical faculty.

**RESULTS**

The total number of managed-care enrollees and the number of such enrollees per member of the clinical faculty needed to support the 1992 level of professional revenue in each of the three models we studied are shown in Table 3, according to specialty. In the all-services model only two specialties, obstetrics and gynecology (with 157,179 managed-care enrollees) and emergency services (with 168,797 managed-care enrollees), required fewer than 250,000 enrollees to support the 1992 level of professional revenue; internal medicine required 409,163 enrollees, general surgery 595,583, neurosurgery 1,463,046, thoracic surgery 1,600,464, and pediatrics 2,010,943. The number of managed-care enrollees required for specialty care per full-time clinical faculty member ranged from 6940 for internal medicine to 10,091 for obstetrics and gynecology, 54,702 for general surgery, and 466,844 for vascular surgery.

In the network model, eight specialties — dermatology, internal medicine, neurology, pathology, radiation oncology, radiology, emergency services, and thoracic surgery — required more than 4 million managed-care enrollees apiece. Dermatology, pathology, radiation oncology, emergency services, thoracic surgery, and vascular surgery all required more than 500,000 enrollees in managed-care plans per clinical faculty member.

**Table 3. Managed-Care Enrollees Needed to Maintain the 1992 Level of Professional Specialty Revenue at the University.\***

SPECIALTY	ALL-SERVICES MODEL		NETWORK MODEL		COMBINED MODEL	
	NO. OF ENROLLEES	NO. PER FACULTY MEMBER	NO. OF ENROLLEES	NO. PER FACULTY MEMBER	NO. OF ENROLLEES†	NO. PER FACULTY MEMBER
Anesthesiology	471,223	13,351	1,283,677	36,365	1,111,263	31,485
Dermatology	275,116	47,460	4,195,523	723,366	2,770,523	477,940
Internal medicine	409,163	6,940	5,273,652	89,460	4,084,763	69,284
Neurology	591,712	57,434	4,881,626	473,944	4,156,626	403,459
Obstetrics and gynecology	157,179	10,091	2,847,706	182,780	1,135,942	72,928
Ophthalmology	563,041	40,405	1,714,714	123,095	1,510,169	108,373
Otolaryngology	363,087	63,110	1,984,875	345,196	1,538,209	267,364
Pathology	542,099	30,213	11,926,176	664,781	9,826,176	547,646
Pediatrics	2,010,943	33,138	Not available	Not available	Not available	Not available
Physical medicine	387,785	32,576	1,163,356	97,761	963,356	80,927
Radiation oncology	530,013	106,128	6,095,155	1,221,474	5,045,155	1,010,225
Radiology	357,972	7,913	5,727,550	126,604	4,227,550	93,450
Emergency services	168,797	25,869	5,063,910	775,484	2,163,910	331,630
General surgery	595,583	54,702	3,527,684	323,938	3,035,376	278,788
Neurosurgery	1,463,046	268,252	2,560,330	469,785	2,485,330	455,690
Orthopedic surgery	526,099	62,986	2,008,743	240,568	1,726,925	206,752
Pediatric surgery	2,124,289	531,604	Not available	Not available	Not available	Not available
Plastic surgery	801,691	152,997	865,826	165,234	857,826	163,710
Thoracic surgery	1,600,464	289,561	4,201,219	759,714	4,038,719	730,698
Urology	533,151	98,084	1,821,600	334,853	1,579,933	290,661
Vascular surgery	837,294	466,844	1,196,134	668,231	1,153,277	643,024

\*See the Methods section for a detailed explanation of the models.

†Assumes that all specialty services for 100,000 enrollees are provided by the academic medical center.

In the combined model, the network needed to maintain the 1992 level of professional revenue ranged in size from a low of approximately 1 million enrollees for anesthesiology, obstetrics and gynecology, physical medicine, and plastic surgery, to almost 10 million for pathology. Approximately 4 million enrollees were required by internal medicine, neurology, radiology, and thoracic surgery to maintain the 1992 level of revenue. For each clinical faculty member, the requirements ranged from a low of 31,485 enrollees for anesthesiology to a high of 1,010,225 enrollees for radiation oncology.

Figure 1 shows the percentage of overall revenue that comes from providing all specialty services to 100,000 managed-care enrollees, with the remaining revenue to be made up from network referrals. In the combined model, most specialties needed to obtain roughly 75 percent of their revenue from network referrals; only in emergency services and obstetrics and gynecology could more than half the total necessary revenue be earned by providing all specialty services to 100,000 enrollees.

Table 4 shows the actual numbers of clinical faculty members at the university in 1992 and the numbers of faculty members needed to provide either all specialty services for 100,000 managed-care enrollees or all specialty services for 100,000 managed-care enrollees plus network referrals for 500,000 enrollees. If other factors are held constant, substantial reductions in the size of the faculty would be required in every specialty examined, with the largest reductions in internal medicine,

radiology, anesthesiology, and pathology. Many reductions would be by more than half.

## DISCUSSION

The medical center would need a very large group of enrollees in managed care to support the 1992 level of revenue from the specialty faculty practice if all non-Medicare patients were to enroll in the HMO. This would still be the case if 100,000 HMO members were enrolled under a contract in which all specialty services were provided by the medical center.

We made a number of assumptions in this analysis. For example, we excluded Medicare enrollees and Medicare-associated revenues from both the revenue target for the group practice and the estimates of the number of managed-care enrollees needed to support that target. Medicare reimbursement constitutes approximately 21 percent of the net revenue of U.S. medical schools.<sup>5</sup> The distribution or redistribution of this revenue will have a substantial effect on academic centers. It is likely that Medicare payment levels will continue to be reduced in response to pressure to reduce the federal budget and that the enrollment of beneficiaries in managed-care plans will be encouraged, in which case the scenarios we present should be considered conservative.

We excluded from this analysis the effects on payment rates or utilization of any new risk-sharing agreements among the specialties or between the medical center and the medical school. Such arrangements may become more common as more academic medical centers negotiate at-risk or capitated contracts. We also did not take into account the differing abilities of physicians and institutions participating in referral networks to provide primary, secondary, and tertiary care.

Nor did we include any future changes in utilization in the model. Predicting the financial consequences of any such changes is difficult, partly because there are various forms of payment for services. Many HMOs still use a discounted fee-for-service model to reimburse physicians, according to which decreased use of services decreases physicians' revenue. Other HMOs reimburse physicians with fixed, capitated payments, in which case decreased use of services would not affect net revenues but might decrease costs, resulting in an increase in net income.

Our analysis excluded revenue and expense for primary care. Under managed care, the demand for primary care increases, whereas the demand for specialty care decreases.

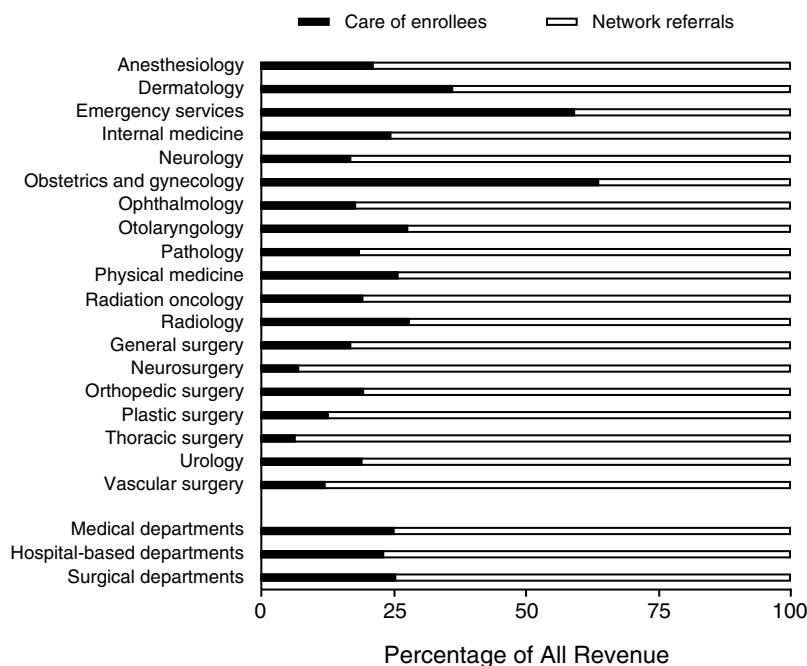


Figure 1. Earnings by Specialists as a Percentage of All Revenue in a Managed-Care Plan That Provides All the Specialty Care for 100,000 Enrollees.

Solid bars indicate the revenue from the specialty care provided to the 100,000 enrollees. The open area remaining in each bar indicates the revenue from specialty care that must be made up from network referrals.

Table 4. Actual Number of Full-Time-Equivalent Clinical Faculty Members at the University in 1992, as Compared with the Estimated Number Needed to Provide Managed-Care Services or Network Referrals.

SPECIALTY	NO. OF ACTUAL CLINICAL FACULTY MEMBERS	NO. NEEDED TO SERVE 100,000 ENROLLEES	NO. NEEDED TO SERVE 100,000 ENROLLEES AND PROVIDE NETWORK REFERRALS FOR 500,000 OTHERS
Anesthesiology	35.3	7.5	21.2
Dermatology	5.8	2.1	2.8
Internal medicine	59.0	14.4	20.0
Neurology	10.3	1.7	2.8
Obstetrics and gynecology	15.6	9.9	12.6
Ophthalmology	13.9	2.5	6.5
Otolaryngology	5.8	1.6	3.0
Pathology	17.9	3.3	4.1
Pediatrics	60.7	3.0	Not available
Physical medicine	11.9	3.1	8.2
Radiation oncology	5.0	0.9	1.4
Radiology	45.2	12.6	16.6
Emergency services	6.5	3.9	4.5
General surgery	10.9	1.8	3.4
Neurosurgery	5.5	0.4	1.4
Orthopedic surgery	8.4	1.6	3.7
Pediatric surgery	4.0	0.2	Not available
Plastic surgery	5.2	0.7	3.7
Thoracic surgery	5.5	0.3	1.0
Urology	5.4	1.0	2.5
Vascular surgery	1.8	0.2	1.0

es. This means that providers of specialty care face a much greater financial risk under managed care than do primary care providers. Specialists accounted for more than 90 percent of the faculty members of the university medical center at the time of this study.

Our results suggest that it is unrealistic to expect that the medical center will be able to create an HMO or network large enough to support the specialty care activity of the number of specialists on the clinical faculty in 1992 or their 1992 level of financing. Even if the academic medical center provided all specialty services for 100,000 people enrolled in managed-care plans, the combined model shows that most departments would require more than 1 million enrollees in the network, or 10 percent of Michigan's population, to support their current level of professional revenue. There are similar implications for the recruitment of primary care physicians and the acquisition of their practices. For example, if one assumes that there are between 2000 and 3000 HMO enrollees per primary care physician,<sup>1,6</sup> the practices of 530 to 800 primary care physicians would have to be acquired in order to

preserve the current level of revenue of thoracic surgeons under the all-services model, or else the surgeons would have to be part of a network containing 1300 to 2000 primary care physicians. These extremely ambitious goals may be attainable by a very small number of academic medical centers or specialties that face very little competition, but not by most. The situation may be even worse for academic medical centers that do not operate their own HMOs and therefore participate only in referral networks.

Academic medical centers may possibly find some short-term relief by redistributing funds from the teaching hospital to the clinical faculty group practice, lobbying for increased federal funds for graduate medical education and research, abandoning or downplaying teaching and research in order to focus on clinical efficiency, or leaving patient care to efficient staff-model HMOs. We believe none of these options to be adequate as a remedy for the underlying problem.

Most academic medical centers will not be able to have a group of patients or a network of primary care physicians large enough to maintain their 1992 level of revenue for professional specialty care. A more reasonable option may be for academic medical centers to reconsider the distribution of their clinical faculty members. The traditional emphasis on tertiary care by specialists may need to change to reflect the growing demand of the marketplace for more providers of primary and secondary care.

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