

Special Article

PRIMARY CARE PHYSICIANS' EXPERIENCE OF FINANCIAL INCENTIVES  
IN MANAGED-CARE SYSTEMS

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**ABSTRACT**

**Background** Managed-care organizations' use of financial incentives to influence the practice of primary care physicians is controversial. We studied the prevalence and effects of these incentives.

**Methods** We surveyed a probability sample of primary care physicians practicing in the largest urban counties in California in 1996. The physicians were asked about the types of incentives they encountered, the amount of income that was keyed to incentives, their experience of pressure in their practices, and the ways in which such pressure affected patient care.

**Results** Data were analyzed for 766 physicians involved in managed-care systems. Thirty-eight percent of these physicians reported that their arrangements with the managed-care system included some type of incentive in the form of a bonus. Fifty-seven percent of the physicians reported that they felt pressure from the managed-care organization to limit referrals (17 percent said they believed such pressure compromised patient care), and 75 percent felt pressure to see more patients per day (24 percent believed such pressure compromised patient care). The physicians who reported that their financial arrangements included an incentive based on referrals were more likely than others to have felt pressure to limit referrals in a manner that compromised care (adjusted odds ratio, 2.5; 95 percent confidence interval, 1.2 to 5.0), and physicians with an incentive based on productivity were more likely to have felt a pressure to see more patients that they believed compromised care (adjusted odds ratio, 2.1; 95 percent confidence interval, 1.2 to 3.8). The physicians whose health care systems used incentives keyed to productivity were less likely than others to be very satisfied with their practices (adjusted odds ratio, 0.4; 95 percent confidence interval, 0.2 to 0.6), whereas those whose systems included incentives related to the quality of care or patients' satisfaction were more likely to be very satisfied (adjusted odds ratio, 1.8; 95 percent confidence interval, 1.1 to 3.0).

**Conclusions** Many managed-care organizations include financial incentives for primary care physicians that are indexed to various measures of performance. Incentives that depend on limiting referrals or on greater productivity apply selective pressure to physicians in ways that are believed to compromise care. Incentives that depend on the quality of care and patients' satisfaction are associated with greater job satisfaction among physicians. (N Engl J Med 1998;339:1516-21.)

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**M**ANAGED-CARE organizations use a variety of strategies to influence the practice styles of primary care physicians. One of the most controversial of these methods is the use of financial incentives, particularly incentives designed to encourage physicians to limit services, such as referrals to specialists.<sup>1,2</sup> Such financial incentives usually take the form of bonuses paid over and above the physician's base income from fee-for-service payments, capitation, or salary. The bonus payments are often drawn from surpluses in risk pools funded by "withholds" — that is, funds deducted from physicians' base payments or otherwise reserved under contracts in which physicians bear financial risk.<sup>3</sup>

The few studies that have examined the use of financial incentives in managed-care organizations have shown that such incentives are relatively common.<sup>4-6</sup> Most previous studies, however, have not evaluated the performance factors that contribute to how bonuses are determined or the actual amount of income physicians derive from bonuses.<sup>7</sup> The perspective of the physician is important for understanding how financial incentives are perceived by physicians and how they affect clinical practice.

We surveyed primary care physicians in California in order to investigate financial incentives from the physician's point of view. Our objectives were to determine the frequency and amount of bonuses, the categories of physicians' performance that determined the size of bonuses, and the effect of incentives on physicians' perceptions of their practice environments and the care they provided.

**METHODS**

**The Study Sample**

Our data were derived from a 1996 survey conducted with the use of a mailed, self-administered questionnaire. The study pop-

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ulation consisted of primary care physicians practicing in the 13 largest urban counties of California. These counties contain 79 percent of California's primary care physicians and 78 percent of the state's population. The physicians were identified from the American Medical Association's Physician Masterfile. They were eligible for inclusion if they were active in patient care, were not currently in training, and identified themselves as primary care physicians (with specialties in family practice, general practice, general internal medicine, general pediatrics, or obstetrics-gynecology). We used a multifactorial sampling strategy that oversampled physicians who were members of minority groups and that sampled predetermined numbers of physicians from each of the 13 study counties, with the result that the physicians in the larger counties were underrepresented in the final sample.<sup>8</sup>

Multiple attempts were made to contact by mail, by telephone, or in person physicians who did not respond to the survey. Physicians whom we identified as having retired, moved out of state, or died or who indicated a main practice specialty other than primary care were considered ineligible and were excluded from the sample. Among the physicians who responded to the survey, those who were not in an office-based practice with either at least one contract with a health maintenance organization (HMO) or independent practice association (IPA) or in a group-model or staff-model HMO were excluded.

### The Questionnaire

The questionnaire included several items about financial incentives. The questionnaire defined incentives as "bonus payments, withheld payments, or any other similar incentives over and above your base salary, capitation, or fee-for-service income payments." As this definition indicates, our focus was on incentives other than those inherent in the base unit of payment (whether fee for service, capitation, or salary). Physicians were asked if their arrangements included any type of bonus for meeting targets in terms of performance. Those who answered in the affirmative were then asked to identify the factors used to calculate the bonus from the following list: referral of patients to specialists or use of laboratory or other ancillary services; use of hospital services by inpatients; the prescription of drugs; the quality of care as measured by audits; patients' ratings of their satisfaction with the care they received; exclusivity of the physician's contract with the IPA or other practice group; and productivity (number of patient visits per day).

Because bonuses calculated on the basis of the quality of care and those based on patients' satisfaction were closely related, both in terms of the nature of the incentive and in terms of their prevalence as reported by the physicians, we combined these two categories to create a single variable measuring whether the physicians' arrangements included an incentive related to quality or satisfaction. We also asked whether the physicians' overall bonuses were based on their individual performance, the performance of the group as a whole, or a combination of individual and group performance. The physicians were also asked to specify the percentage of their net practice income that was earned in the form of bonuses and the amount of additional income they could have earned if they had earned the full amount of income at risk under the incentive arrangement.

The questionnaire also asked about types of pressure the physicians experienced in the following areas of their practices: pressure to "limit the number of referrals," pressure to "see a large number of patients each day," and pressure to "limit what I tell patients about treatment options." The physicians were asked to rate each item on a scale of 1 to 3, with 1 indicating that they did not experience such pressure, 2 indicating that they experienced it but that it did not compromise care, and 3 indicating that they experienced such pressure and that it did compromise care. The survey also included items about the physicians' overall degree of satisfaction with their practices, the characteristics of the practices, the numbers and types of patients served, demographic characteristics of the physicians, and net income from the practice.

### Statistical Analysis

Descriptive data were assumed to be representative of the entire population of practicing physicians in the primary care specialties in the 13 counties after the results were weighted according to response rate and sampling probability. Multivariate models were used to adjust the results for various characteristics of the physicians and their practices. In models that predicted the presence of specific incentives according to whether the physician was part of a group-model or staff-model HMO or an office-based managed-care program, we used logistic-regression analysis that included the practice setting as well as variables for the physician's specialty, sex, and age.

Logistic-regression models were also used to examine the association between several types of financial incentive and the physicians' experience of pressure related to practice patterns. Regression models were analyzed for each of the three types of pressures (to limit referrals, to see more patients, and to limit what patients were told), with the outcome variable defined as pressure that compromised care. Because there was considerable correlation among the various financial incentives, we selected three types of incentive to include as predictors in the models: incentives not to refer patients, incentives based on quality or satisfaction, and incentives based on productivity. These incentives were not highly correlated with one another, and the incentives based on referral and productivity targeted the performance of physicians in areas specified in the questions about pressure.

All models included all three types of incentive as predictive variables. The models also included as predictive variables the specialty of the physician (family practice, general internal medicine, general pediatrics, or obstetrics-gynecology), the physician's age, sex, and race or ethnic group, whether or not the physician was board-certified, the type of practice setting (solo office practice, an office with 2 to 10 physicians, an office with 11 or more physicians, or a group-model or staff-model HMO), and the percentage of patients in the practice who were uninsured, insured by Medicaid, or enrolled in HMOs. A logistic-regression model that included these variables was also used to analyze their relation to a high degree of satisfaction with the practice. All reported P values are two-sided.

### RESULTS

Of the original sample of 1600 physicians, 1336 were ultimately determined to be eligible for inclusion in the study. Completed surveys were returned by 947 physicians (response rate, 71 percent). The respondents and nonrespondents did not differ significantly according to age, sex, race or ethnic group, or specialty. Among the respondents, 766 were either in office-based practices with at least one contract with an HMO or IPA (576 respondents [75 percent]) or worked in a group-model or staff-model HMO (190 respondents [25 percent]), and these physicians are the subject of this study. (In California, almost all the physicians in the latter category work in one of the facilities of the Kaiser Permanente HMO.) The 181 survey respondents who were not involved with an HMO or IPA were excluded from the analysis. Table 1 shows the characteristics of the physicians in the study and their practices.

Nearly 40 percent of all the respondents reported that their contracts with managed-care organizations included some form of incentive (Table 2). Similar proportions of physicians in office-based practices and group-model or staff-model HMOs faced incentives indexed to their use of referrals and

**TABLE 1.** CHARACTERISTICS OF THE 766 PHYSICIANS IN THE STUDY.\*

CHARACTERISTIC	VALUE
Age (yr)	49±10
Female sex (%)	24
Race or ethnic group (%)	
Black	11
Asian	27
Hispanic	17
White	43
Other	3
Specialty (%)	
Family practice	29
General internal medicine	27
General pediatrics	22
Obstetrics-gynecology	22
Board-certified (%)	81
Practice setting (%)	
Solo office practice	36
Office with 2-10 physicians	24
Office with ≥11 physicians	15
Group-model or staff-model HMO	25
Principal method of payment (%)	
Salary	54
Capitation	32
Fee for service	14
Percentage of patients in HMOs	56±34
Type of insurance of patients (%)	
Private	63±30
Medicaid	13±22
Medicare	17±22
Uninsured	5±8

\*Plus-minus values are means ±SD. Because of rounding, percentages may not total 100.

**TABLE 2.** FINANCIAL INCENTIVES REPORTED BY PHYSICIANS, ACCORDING TO TYPE OF INCENTIVE AND PRACTICE SETTING.

FOCUS OF INCENTIVE	OVER-ALL*	GROUP-MODEL OR STAFF-MODEL HMO (N=190)	OFFICE-BASED (N=576)	ADJUSTED ODDS RATIO (95% CI)†
	percent			
Use of referrals	14	14	15	0.8 (0.5-1.1)
Use of hospital services	19	17	15	1.2 (0.7-2.1)
Use of prescriptions	17	17	10	1.9 (1.2-3.1)
Quality of care	18	31	11	3.8 (2.4-5.8)
Patients' satisfaction	21	45	10	7.9 (5.1-12.1)
Productivity	18	19	19	0.9 (0.5-1.4)
Exclusivity of contract	7	—	7	—
Any incentive	38	55	29	2.8 (1.9-4.0)

\*Overall percentages have been weighted to represent the total population of primary care physicians in the areas we studied.

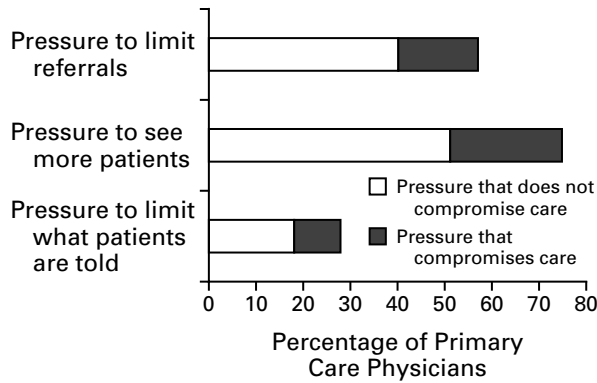
†Odds ratios represent the odds that the incentive would be present among the physicians in group-model or staff-model HMOs as compared with the odds among the physicians in office practice, with adjustment for specialty, sex, and age. CI denotes confidence interval.

hospital services and to productivity, although physicians in group-model or staff-model HMOs were somewhat more likely to be in an arrangement that involved an incentive linked to their patients' use of prescription drugs (adjusted odds ratio for such an incentive as compared with office-based physicians, 1.9; 95 percent confidence interval, 1.2 to 3.1). A much higher proportion of the physicians working in group-model or staff-model HMOs reported incentives related to the quality of care (adjusted odds ratio, 3.8; 95 percent confidence interval, 2.4 to 5.8) and to patients' satisfaction (adjusted odds ratio, 7.9; 95 percent confidence interval, 5.1 to 12.1). Among the office-based physicians in managed-care arrangements (those not in staff-model or group-model HMOs), physicians with a larger proportion of their patients enrolled in HMOs were significantly more likely to report that they faced financial incentives keyed to the quality of care or patients' satisfaction ( $P<0.001$ ), productivity ( $P=0.03$ ), or the use of hospital care ( $P=0.002$ ), but not to the referral of patients ( $P=0.10$ ) or the use of prescription drugs ( $P=0.08$ ) (data not shown).

Among physicians who reported incentives, the majority (58 percent) indicated that calculation of the bonus was based on a combination of their individual performance and the performance of the physician group as a whole. Fifteen percent of physicians who reported that their arrangements included incentives said that bonuses were based exclusively on their individual performance.

The median net practice income of the survey respondents was \$130,000. Physicians whose arrangements included financial incentives reported that they earned a median of 7 percent of their net practice income (interquartile range, 5 to 10 percent) from these bonuses. Seven percent of net income represents approximately \$10,500. Among physicians who reported bonuses, physicians paid predominantly by fee-for-service methods received a greater share of their income through bonuses (mean, 17 percent) than did physicians paid predominantly by capitation (6 percent,  $P<0.001$ ) or salary (9 percent,  $P=0.03$ ). When asked how much more income they could have earned had they received the maximal amount of money at risk under incentive arrangements, 38 percent of physicians who reported incentives were unable to specify a dollar amount. Of those who indicated an amount, the median value was \$2,000 (interquartile range, 0 to \$10,000).

Many physicians reported experiencing pressure in their practice, and many said that they believed such pressure compromised the quality of care they were able to provide (Fig. 1). Fifty-seven percent (95 percent confidence interval, 53 to 61 percent) reported that they felt pressure to limit the number of referrals they authorized; 17 percent (95 percent confidence interval, 14 to 20 percent) believed this pres-



**Figure 1.** Percentage of Physicians Who Reported Pressure in Their Practices, According to Type of Pressure.

Results have been weighted in such a way as to represent the total population of primary care physicians in the areas studied.

sure was sufficiently severe to compromise the quality of care. Seventy-five percent (95 percent confidence interval, 72 to 78 percent) felt pressure to see more patients per day; 24 percent (95 percent confidence interval, 21 to 27 percent) believed this pressure compromised patient care. A lower but substantial percentage of physicians (28 percent; 95 percent confidence interval, 25 to 31 percent) reported that they felt pressure to limit what they told patients about treatment options.

When we examined the association between a physician's report of the presence of a financial incentive and the physician's experience of pressure related to practice, we found that the presence of incentives predicted pressure in a very specific manner (Table 3). The presence of an incentive indexed to the referral of patients was associated with the perception that pressure to limit referrals compromised care (adjusted odds ratio, 2.5; 95 percent confidence interval, 1.2 to 5.0). However, an incentive related to referrals was not significantly associated with the experience of pressure to see more patients (adjusted odds ratio, 1.2; 95 percent confidence interval, 0.7 to 2.2) or to limit what patients were told about treatment options (adjusted odds ratio, 1.9; 95 percent confidence interval, 0.7 to 5.2). On the other hand, the presence of an incentive based on productivity was associated with physicians' feeling pressure to see more patients each day that they believed compromised care (adjusted odds ratio, 2.1; 95 percent confidence interval, 1.2 to 3.8), but not with pressure to limit referrals (adjusted odds ratio, 1.1; 95 percent confidence interval, 0.5 to 2.1) or limit the information given to patients about treatment options (adjusted odds ratio, 0.8; 95 percent confidence interval, 0.3 to 2.2). Incentives related to the quality of

**TABLE 3.** ASSOCIATION BETWEEN FINANCIAL INCENTIVES AND PRESSURE PERCEIVED AS COMPROMISING CARE, ACCORDING TO THE TYPE OF PRESSURE.

FOCUS OF INCENTIVE	ADJUSTED ODDS RATIO (95% CI)*		
	PRESSURE TO LIMIT REFERRALS	PRESSURE TO SEE MORE PATIENTS	PRESSURE TO LIMIT WHAT PATIENTS ARE TOLD
Limitation of referrals	2.5 (1.2–5.0)	1.2 (0.7–2.2)	1.9 (0.7–5.2)
Productivity	1.1 (0.5–2.1)	2.1 (1.2–3.8)	0.8 (0.3–2.2)
Quality of care or patients' satisfaction	0.7 (0.3–1.6)	0.9 (0.5–1.5)	1.6 (0.5–4.8)

\*Odds ratios represent the odds that pressure compromising care would be felt by physicians who reported the particular type of financial incentive, as compared with the odds among those who did not report the incentive. Results have been adjusted for the physician's specialty, sex, age, race or ethnic group, board certification, and practice setting, as well as for the race or ethnic group and insurance status of the patients. CI denotes confidence interval.

care or patients' satisfaction were not significantly associated with pressure related to practice in these three areas.

Additional characteristics of the practices that were included in the regression models were associated with the reported experience of pressure. As compared with solo practitioners, physicians in staff-model or group-model HMOs felt less pressure to limit referrals in a way that they felt compromised care (adjusted odds ratio, 0.3; 95 percent confidence interval, 0.1 to 0.8) or to limit what they told patients about treatment options in a way that compromised care (adjusted odds ratio, 0.2; 95 percent confidence interval, 0.0 to 0.6), but they also felt greater pressure to see more patients (adjusted odds ratio, 2.7; 95 percent confidence interval, 1.3 to 5.6). Physicians whose practices included a higher proportion of patients enrolled in HMOs felt more pressure to limit referrals (adjusted odds ratio, 1.1; 95 percent confidence interval, 1.0 to 1.2 for each absolute increase of 10 percent in the proportion of patients who were enrolled in HMOs), but not more pressure to see more patients or to limit what they told patients.

Overall, 49 percent of the respondents reported that they were very satisfied with their practices. In analyses of crude data, physicians were less likely to be very satisfied if they reported greater pressure to limit referrals ( $P=0.001$ ), see more patients ( $P=0.001$ ), or limit what they told patients ( $P=0.01$ ). In the logistic-regression models that included all three types of incentive, physicians with an incentive based on productivity were less likely than others to be very satisfied (adjusted odds ratio, 0.4; 95 percent confidence interval, 0.2 to 0.6), and those with an incentive based on quality or satisfaction were

more likely to be very satisfied (adjusted odds ratio, 1.8; 95 percent confidence interval, 1.1 to 3.0). The incentive based on referrals was negatively but non-significantly associated with satisfaction on the part of the physician (adjusted odds ratio, 0.7; 95 percent confidence interval, 0.4 to 1.2).

### DISCUSSION

Nearly 40 percent of primary care physicians affiliated with managed-care organizations in urban California were aware of some type of financial incentive in their practices, over and above the basic method of remuneration. About half these physicians indicated that such incentives depended on their performance in restraining the use of referrals or hospital services. Ratings based on the quality of care and patients' satisfaction were cited as factors in the calculation of bonuses as often as incentives based on the use of referrals and hospital services.

Some critics of incentives have warned that bonuses constitute a growing share of physicians' net income, putting physicians at risk for a substantial loss of income if they do not perform in a manner that rewards them with bonus payments.<sup>2</sup> Although they were in the minority, some of the physicians we studied appeared to face incentives that would lead to substantial changes in income depending on whether the physician earned the full amount of a possible bonus or none of it. Of physicians whose managed-care programs include bonuses and who reported both the amount of bonus they earned and the additional amount that was at risk but not earned, 13 percent reported that the total amount of income at risk was more than \$40,000. Over one third of physicians who reported facing incentives could not specify the full amount of income that was involved in bonus payments, suggesting that many physicians may not truly know the extent to which they are at financial risk. A recent study found a similar lack of awareness among physicians with regard to related features of their managed-care contracts.<sup>9</sup>

Financial incentives appeared to influence physicians' experience of undesirable pressure in their practices selectively, depending on the type of incentive. Our findings suggest that bonuses based on the limitation of referrals and on productivity heighten physicians' "performance anxiety" and their perceptions that care may be compromised in these areas, whereas bonuses based on the quality of care and patients' satisfaction may promote a more satisfying practice environment.

Physicians' experience of financial incentives and pressure related to their practices differed according to practice settings. Physicians in more traditional group-model or staff-model HMOs (primarily Kaiser Permanente in California) were much more likely than office-based physicians in network and IPA-model HMOs to report that their contracts specified

a bonus that depended on the quality of care and patients' satisfaction. After adjustment for incentives, physicians in group-model or staff-model HMOs were the least likely to report feeling pressure to limit referrals or to restrict what they told patients about treatment options; however, they were the most likely to report feeling pressure to see more patients per day. Physicians in traditional, nonprofit HMOs may be less apt to feel that their sense of clinical autonomy is compromised with respect to communicating with patients and referring them for specialty care, but at the cost of some greater sacrifice of control over their own schedules.

Our study is limited by its reliance on physicians' own reports. We did not scrutinize contracts to corroborate their reported financial arrangements. We suspect that physicians in our study tended to underreport the existence of financial incentives, probably because these physicians may not clearly recognize the types of incentives in effect. Earlier studies of HMOs and IPAs have found that the majority of such plans make use of incentives targeted to limitations on the use of referrals and hospital services.<sup>4,10</sup> In some cases, such incentives may be poorly defined or may be negligible in relation to the physician's overall income and therefore be imperceptible to the physician. A bonus based on such aspects of practice as referrals and use of ancillary care may also be subsumed in the base capitation payment that a primary care physician receives from a managed-care organization and therefore not be recognized by the physician as a bonus.

This limitation suggests a need for caution in interpreting our data on the prevalence of incentives. However, a strength of our study is that we evaluated incentives as they are perceived by practicing physicians. An incentive that is not recognized by a physician is the health policy equivalent of the familiar philosophical question "If a tree falls in the forest and no one hears it, does it make a sound?" If an incentive applies to a physician but the physician does not notice it, can the incentive be expected to alter the physician's behavior? Our study suggests that when physicians do notice particular types of incentives, their perception of the conditions of their practices changes in measurable and not altogether agreeable ways.

A related limitation of our study is that we did not measure actual practice patterns and patient outcomes. We cannot determine whether physicians who reported greater pressure to limit referrals were actually less likely to refer patients for specialty care, or whether their patients received inferior care. We did ask physicians to report the number of encounters they had with patients and the hours they worked during a representative week. Physicians who indicated that they felt pressure to see more patients reported more office visits per hour — a mean of 2.7, 3.2, and 3.7 for physicians reporting scores of 1 (no pres-

sure experienced), 2 (pressure experienced but did not compromise care), and 3 (pressure experienced that compromised care), respectively;  $P < 0.001$  — a finding that supports the validity of our measures.

Although several studies have compared the use of services and patients' outcomes in fee-for-service and capitated care,<sup>7</sup> very few have measured the effects of bonuses beyond the base unit of payment to groups of physicians. One study of HMOs found that some types of incentive were associated with lower rates of visits to a physician and a greater likelihood that the HMO would be profitable.<sup>11</sup> A more recent study found no association between use of bonuses as incentives and rates and costs of visits to physicians, although 90 percent of the physicians sampled were compensated by salary without any bonuses.<sup>12</sup>

Final judgment about the wisdom of financial incentives may need to await the results of studies that measure their effects on the quality of care and on patients' outcomes. However, the outcome for physicians is also an important consideration. High-quality care is unlikely to flourish in an environment that leaves physicians demoralized and leads many to believe that the standards of care have been compromised. Our results suggest that the goal of providing high-quality care may be better approached by the use of limited financial incentives based on the quality of care and patients' satisfaction than incentives that reward physicians for restricting access to specialty care or for squeezing in a greater number of visits per day. Policies that emphasize the former approach may enhance satisfaction with the U.S. health care system on the part of both patients and their physicians.

Dr. Grumbach and Dr. Bindman were Robert Wood Johnson Foundation Generalist Physician Faculty Scholars at the time this study was conducted. This work was also supported by a grant (1U76-MB-1001) from the Bureau of Health Professions of the Health Resources and Services Administration of the Public Health Service.

*We are indebted to Dr. Alicia Fernandez and Dr. Jennifer Haas for helpful comments and to Michelle Won for administrative assistance.*

## REFERENCES

1. Kassirer JP. Managed care and the morality of the marketplace. *N Engl J Med* 1995;333:50-2.
2. Woolhandler S, Himmelstein DU. Extreme risk — the new corporate proposition for physicians. *N Engl J Med* 1995;333:1706-8.
3. Bodenheimer TS, Grumbach K. Capitation or decapitation: keeping your head in changing times. *JAMA* 1996;276:1025-31.
4. Gold MR, Hurley R, Lake T, Ensor T, Berenson R. A national survey of the arrangements managed-care plans make with physicians. *N Engl J Med* 1995;333:1678-83.
5. Remler DK, Donelan K, Blendon RJ, et al. What do managed care plans do to affect care? Results from a survey of physicians. *Inquiry* 1997;34:196-204.
6. Grumbach K, Coffman J, Vranizan K, Blick N, O'Neil EH. Independent practice association physician groups in California. *Health Aff (Millwood)* 1998;17(3):227-37.
7. Hellinger FJ. The impact of financial incentives on physician behavior in managed care plans: a review of the evidence. *Med Care Res Rev* 1996;53:294-314.
8. Bindman AB, Grumbach K, Vranizan K, Jaffe D, Osmond D. Selection and exclusion of primary care physicians by managed care organizations. *JAMA* 1998;279:675-9.
9. Simon CJ, Emmons DW. Physicians earnings at risk: an examination of capitated contracts. *Health Aff (Millwood)* 1997;16(3):120-6.
10. Hillman AL. Financial incentives for physicians in HMOs: is there a conflict of interest? *N Engl J Med* 1987;317:1743-8.
11. Hillman AL, Pauly MV, Kerstein JJ. How do financial incentives affect physicians' clinical decisions and the financial performance of health maintenance organizations? *N Engl J Med* 1989;321:86-92.
12. Conrad DA, Maynard C, Cheadle A, et al. Primary care physician compensation method in medical groups: does it influence the use and cost of health services for enrollees in managed care organizations? *JAMA* 1998;279:853-8.