Capitation Payment, Length of Visit, and Preventive Services: Evidence From a National Sample of Outpatient Physicians

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Objective: To test the hypothesis that capitation payment to physicians reduces the length of physician-patient encounters but increases use of preventive and health counseling services.

Study Design: Cross-sectional analysis of data from the National Ambulatory Medical Care Survey of outpatient physicians and their office staff (1997 and 1998).

Patients and Methods: A random national sample of 46,320 ambulatory care visits was used. Weight-adjusted multivariate regression techniques were utilized to examine the effects of capitation on duration of physician visit and number of preventive and health counseling services.

Results: Physicians spent 5.6% less time ($P < .01$) with patients in capitated plans than with those in noncapitated plans. The effect of payment method on length of visit was 3.5 times stronger among physicians receiving only capitated payment, compared with physicians receiving only noncapitated payment. Patients in capitated plans were 17% more likely to receive health counseling services ($P < .01$) than patients in noncapitated plans. Patients under capitation were 3% more likely to receive preventive services compared to patients in non-health maintenance organizations, noncapitated plans ($P < .05$).

Conclusions: Capitation is associated with a modest decrease in the amount of time physicians spend with their patients and with increased receipt of preventive and health counseling services, on average. These trends are driven by physicians who receive capitated payment predominantly. Physicians with a mix of patients from capitated and noncapitated plans spend approximately equal time with each type of patient, which reflects an ethic of impartiality in medical judgment.

(Am J Manag Care 2002;8:332-340)

Managed care organizations use a variety of physician payment methods, including capitation, to encourage health promotion and cost savings.[1-3] A number of physician surveys have reported that capitation and other managed care payment methods adversely affect medical judgment and quality of care,[4-8] a frequent complaint being that managed care forces physicians to spend too little time with their patients.[7-9] However, opinion surveys and self-reported behavior, although good measures of physician attitudes, may not reflect actual patient care behavior and outcomes, as the questions in these surveys were directed toward finding problems with managed care.[10] Relatively little evidence is available about the actual impact of different methods of physician payment on physician behavior and quality of care.[11]

Several studies have examined the effects of different types of health insurance on quality of care and physician behavior.[10,12] However, these studies investigated system-level differences and did not isolate the specific impact of physician payment methods from other influences of managed care on physician behavior.[11] Studies that did explore this specific component of managed care usually examined its impact only on costs or resource utilization, not on indicators of quality.[13-17] Moreover, such studies were usually based on just a few health plans and a limited number of physicians in a single geographic area,[11,15,17,18] and most examined differences among different physicians but failed to explore the effects within individual physicians' practices, through differences in how individual physicians treated different patients.[11,14,19] Finally, some studies

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Portions of this article were presented as a panel presentation at the Academy for Health Services Research and Health Policy annual meeting, June 10, 2001. This study was funded by university sources and by an unrestricted educational grant from the Westwood Squibb Foundation.

are not clearly relevant to the current US healthcare system because they are more than 10 years old[19] or were performed in other countries.[13,20,21]

Although capitation payment to physicians has been shown to reduce resource utilization, the studies also demonstrate that patients in capitated systems receive equivalent quality of care and have comparable health outcomes.[10-13] There are several possible interpretations for these findings: (1) capitation may work efficiently to reduce only wasteful use of resources without compromising quality of care; (2) reductions in some resources may lower quality in some respects, but this may be offset by other features of managed care, such as increased health promotion; (3) previous studies were not sufficiently sensitive to measure impact on quality; and (4) differing forms of capitation and many degrees of risk may have variable effects on physician behavior.

Time spent during patient encounters in physician offices, although not a direct measure of quality of care provided to a patient, is strongly associated with several leading indicators of quality, and has therefore been used as a proxy for quality of care.[22,23] Increased time predicts increased patient satisfaction,[22,24] reduces malpractice claims,[25] and is associated with various improved process measures of care and, to a limited extent, with improved patient outcomes.[9,23]

Previous studies of the relationship between visit duration and payment or insurance factors have examined only system-level effects of health maintenance organization (HMO) versus indemnity insurance or only salaried versus fee-for-service payment methods.[19,21,26,27] Although many of these studies were conducted more than 20 years ago, they found that payment and insurance factors were significant, although in somewhat surprising ways. In general, patients under indemnity insurance had longer visits than did patients under HMO insurance[21,27]; however, the length of all visits has increased modestly over the past 10 years, and the difference between HMO and non-HMO patients has therefore lessened in recent years.[26] Salaried physicians were found to spend more time with patients than those paid fee-for-service, regardless of the type of insurance.[19] Few data are available regarding the separate effect of capitation payment on visit duration and whether the method of payment influences the amount of time a physician spends with different patients when the physician is paid under different methods.

Several relationships are plausible between capitation payment to physicians and time spent with patients. Capitation takes numerous forms; some place physicians at risk only for their own time and effort, whereas others place physicians at risk for expenses of medication, hospitalization, or specialist referrals.[28,29] More global forms of capitation could induce physicians to spend more, not less, time in an effort to avoid the expenses of medication, hospitalization, or specialist referrals. Capitation directed primarily to physicians' own time and effort, however, would be expected to have the opposite effect. All forms of capitation reward physicians for having healthier patients and thus encourage spending more time on health promotion efforts. All of these theoretical effects of capitation payment may be offset or altered by other incentives and motivations, such as physicians' ethical and professional desire to adopt a uniform practice style, and the fact that most physicians paid by capitation also receive other forms of payment, including fee-for-service, from other patients.

This study was designed to examine the impact that capitation payment to physicians has on physician behaviors related to quality of care. The primary outcome measure was the amount of time spent with patients. We tested the hypothesis that capitation reduces the amount of time physicians spend with patients but increases the number of health promotion efforts, relative to practice under other payment methods. The secondary hypothesis was that, for physicians who treat both types of patients, these effects would be observed both within an individual physician's patient population, as well as between physicians with different mixes of capitated and noncapitated payments.

···METHODS ···

Data Source

The National Ambulatory Medical Care Survey (NAMCS) was a national probability sample survey conducted by the Division of Health Care Statistics, National Center for Health Statistics and the Centers for Disease Control and Prevention. The NAMCS provided data on patients' office visits from a national sample of office-based physicians. The basic sampling unit was the patient-physician office visit. For each visit, the physician or a member of the physician's staff provided information about the length of the visit, characteristics of the patient, reason for the visit, diagnoses, and tests or procedures performed. Only nonfederally employed office-based physicians listed in the directories of the American Medical Association and the American

Osteopathic Association were sampled in the NAMCS. Only physicians engaged primarily in patient-care activities were surveyed, whereas those engaged primarily in research, teaching, or administration were excluded. Anesthesiologists, pathologists, and radiologists were excluded from the NAMCS because of lack of patient contact in the office setting. The NAMCS excluded house, nursing home, administrative (paying the bills, insurance paperwork), and hospital visits, unless the physician's private office was located on hospital grounds.

The NAMCS utilized a multistage probability design encompassing probability samples of primary sampling units (PSUs), physician practices within PSUs, and patient visits within practices. The physicians randomly chosen to participate in the survey were randomly assigned 1 week during which a systematic random sample of visits was taken. The characteristics of the office visit were entered onto a survey form by the physician and office staff. The sampling rate varied from 100% in small practices to 20% in large practices. In 1997 and 1998, 1247 and 1226 physicians, respectively, participated in the study and returned 24,715 and 23,339 patient visit record forms, respectively. These were representative of the estimated 787 million and 829 million total ambulatory office visits nationwide in 1997 and 1998, respectively. The patient visit forms elicited information on patient personal characteristics as well as information on insurance and interactions (eg, time spent, health counseling, tests ordered) during the office visit. Each office visit record was assigned a "patient visit weight" to make the sample population representative of the total number of office visits in the United States. Statistics produced in the NAMCS were estimated through a multistage estimation procedure in order to render results that reflected all office visits. Further details on the NAMCS sampling, generalizability, and weighting are presented elsewhere.[30]

Study Variables

Outcome Variables. The chief outcome variable in the study was the length of time of the physician office visit in minutes, which was recorded in the patient survey forms. We excluded visits for which the duration was recorded 0 or more than 120 minutes. Visits of 0 minutes lacked clinical meaning and visits longer than 120 minutes were a small nonrepresentative subset of the visits (2% in 1997 and 1% in 1998), which, apart from being rationally questionable, also had the potential to skew the results considerably.

To examine the content of the physician-patient encounter, we used indices for health counseling and preventive services recommended during the physician-patient encounter as secondary outcome variables. The health counseling index was created from questions pertaining to ambulatory patient counseling and education in the survey. The health counseling variables on the 1997/1998 NAMCS patient record sheet were diet/nutrition, exercise, human immunodeficiency virus/sexually transmitted disease transmission, family planning/contraception, prenatal instruction, breast self-examination instruction, tobacco use/exposure, growth/development, mental health, stress management, skin cancer prevention, and injury prevention. To calculate the health counseling index, each patient visit was assigned 1 point for each of the variables applied to the physician-patient encounter, with a maximum index score of 12 for any single visit.

The preventive examination index was created from the responses to questions on standard preventive care and examinations performed in the 1997/1998 NAMCS patient record sheet. The preventive examination variables were breast, pelvic, rectal, skin, vision, and hearing examinations, glaucoma screening, blood pressure reading, cholesterol level, Papanicolaou test, prostate-specific antigen level, and screening mammogram. To calculate the preventive examination index, each patient visit was assigned 1 point for each of the preventive examination variables applied to the physician-patient encounter. Although each test was not relevant to every patient visit, this index score indicated the overall level of preventive services in a representative random population.

Predictor Variables. To simplify the interpretation of the analyses, certain predictor variables were dichotomously created from the original data set. Patient encounters that the participating physician indicated were capitated (survey question: "Is this a capitated visit?") were identified as such, whereas patient visits identified as noncapitated, unknown, or blank were identified as noncapitated. The survey did not collect information on other types of payment. An analogous procedure was used to ascertain HMO enrollment (survey question: "Does this patient belong to an HMO?") and whether the patient was new or established (survey question: "Have you or anyone in your practice/department seen this patient before?"). We also categorized patients as white or nonwhite, and metropolitan or nonmetropolitan. Although the NAMCS categorized physicians into 15 specialty groups, our study used

only 2 categories—primary care physicians (internal medicine, family practice, pediatrics) and specialists. Age and the number of medications prescribed in the visit were treated as continuous variables.

Statistical Analyses

Bivariate and multivariate analyses of the NAMCS data for the years 1997 and 1998 were conducted using the STATA® software.[31] All analyses were weighted with the NAMCS sampling weights. The unit of analysis for all principal analyses was the individual patient visit.

Bivariate statistics (1-way analysis of variance and the Bonferroni test for multiple comparison adjustment) were used to compare length of physician visits across the predictor variables.[31] The effect of patient capitation on the length of a patient-physician encounter was estimated using log-linear ordinary least squares regression (OLS).[32] The highly skewed distribution of the length of physician-patient encounter (in minutes) (Shapiro-Wilk statistic W = 0.84; z = 22.00; $P < .001$)[33] was improved slightly by log transformation of the data (Shapiro-Wilk statistic W = 0.99; z = 13.95; $P < .001$). The regression analysis controlled for the effects of age, gender, race, metropolitan residence, patient status, and physician specialty. The parameter estimates obtained from regressing log-transformed costs on covariates were interpreted using the correction proposed by Halvorsen and Palmquist with a modification by Kennedy.[34,35] We also conducted additional tests suggested by Manning to determine whether log transformation caused any heteroskedasticity (variance of the error terms correlated with 1 or more explanatory variables) problems and used generalized least squares to obtain efficient regression estimates.[36]

We used 3 variables to determine patients' need for extra time and preventive or counseling services, based on the approach used in an earlier analysis from the same data source to study the impact of managed care on physician behavior.[27] These variables were number of medications prescribed during the visit, multiple diagnoses, and HMO enrollment (differences at the practice, but not the patient, level were detected using the 1993 to 1996 NAMCS data). We adjusted the standard errors of the regression estimates for clustering (with physician as clustering unit) and heteroskedasticity.

Weighted Poisson regression models were used to estimate the effects of capitation on health counseling and preventive services. We calculated incidence rate ratios (IRRs) for the number of occurrences (counts) of health counseling and preventive services for each predictor variable.[37] These models were also adjusted for clustering and heteroskedasticity. There were no collinearity problems detected in all OLS estimations.

Finally, sensitivity analyses were conducted by examining the association between the proportion of capitated patient visits within a physician's practice and the average length of visit, as well as receipt

Table 1. Descriptive Statistics for Study Variables

Variables	Mean	SD	Range
Outcome variables			
Length of physician visit (minutes)	18.1	10.9	1 – 110
Receipt of health counseling (%)	28.3	—	—
Receipt of preventive services (%)	59.9	—	—
Health counseling index	0.47	0.92	0 – 10
Preventive services index	0.98	1.23	0 – 10
Predictor variables			
Age	42.7	25.0	0 – 100
Female (%)	60.1	—	—
White race (%)	85.6	—	—
Specialist physician (%)	52.7	—	—
Metropolitan location (%)	81.1	—	—
Established patient (%)	86.2	—	—
Patients with multiple diagnoses (%)	16.1	—	—
HMO enrollment (%)	29.1	—	—
No. of medications	1.38	1.53	0 – 6
Patient in capitated plan (%)	12.6	—	—

n = 46,320 visits.
HMO = health maintenance organization.

Table 2. Duration of Patient-Physician Encounter Across Predictor Variable Changes

Predictors	Duration of Visit (SD) (min)	
	Predictor = 1 (yes)	Predictor = 0 (no)
Patient in capitated plan	16.4 (9.03)*	18.4 (11.1)
Age ≥ 65 years	18.4 (10.6)	18.0 (11.0)
Age ≤ 12 years	15.4 (8.82)	18.6 (11.2)
White patient	18.2 (10.1)	17.8 (11.0)
Female patient	18.1 (10.9)	18.2 (10.9)
Specialist physician	19.4 (12.3)	17.0 (9.32)
Metropolitan location	18.3 (11.1)	17.4 (10.0)
Established patient	17.5 (10.1)	22.2 (14.1)
No. of medications >4	19.7 (11.0)	18.0 (10.9)
Patients with multiple diagnoses	19.8 (11.1)	17.8 (10.0)
HMO enrollment	17.6 (10.1)	18.3 (11.2)

*Results for all predictors, except female patient, are significant at $P < .05$ (1- way analysis of variance and the Bonferroni multiple comparison test).
HMO = health maintenance organization.

Table 3. Effects of Capitation on Duration of Patient-Physician Encounter

Predictor Variable	Natural Log of Visit Duration (SE)
Patient in capitated plan*	–0.057 (0.021)†
Patient in noncapitated HMO*	0.018 (0.021)
Age	0.0069 (0.00094)†
Age-squared	–0.000060 (9.8 x 10-6)†
White patient	–0. 0014 (0.02)
Female patient	–0.00049 (0.0083)
Specialist physician	0.0081(0.0025)†
Metropolitan location	0.032 (0.025)
Established patient	–0.19 (0.017)†
No. of medications	0.014 (0.0041)†
Patients with multiple diagnoses	0.091 (0.015)†
Year dummy (1998 = 1, 1997 = 0)	0.022 (0.020)
Intercept	2.67 (0.041)†
R^2	0.050

Regression model is log-linear ordinary least squares.
*Omitted comparison group consists of patients in non-HMO, noncapitated plans.
†$P < .01$
HMO = health maintenance organization.

of preventive and health counseling services, to determine whether there was a difference in length of time spent with patients in capitated versus noncapitated plans among physicians who received different forms of payment.

···RESULTS ···

Data on Study Variables

Descriptive statistics for the study variables are outlined in **Table 1**. The mean length of a physician-patient encounter was 18.13 minutes. Although nearly 60% of the visits included some type of preventive service, only 28% included health counseling. Nearly 13% of the visits were capitated and 29% were with patients enrolled in an HMO. For visits with HMO patients, 31% were capitated, but not all capitated visits were with HMO patients. Because capitation also exists under some Medicaid and other government programs, 3% of visits with non-HMO patients also were capitated. In results not shown, 47% of the physicians had at least some capitated visits.

Relationship of Visit Duration to Study Variables

Table 2 outlines the comparisons for length of the physician-patient encounter with different values of the predictor variables. Visits with patients in capitated plans were 2.02 minutes shorter than with patients in noncapitated plans. Visits were longer with older adults and shorter with children. Longer visits were also experienced by white patients, those in metropolitan areas, new patients, patients treated by a specialist physician, and non-HMO–enrolled patients. Increase in number of medications and multiple diagnoses were also associated with longer visits. No gender effects were observed in the bivariate analyses.

Effect of Capitation on Visit Duration, Health Counseling, and Preventive Services

After the effects of other predictor variables were controlled for and with

use of the corrections in interpreting log-retransformed estimates noted earlier, capitation was associated with a reduction of 5.6% (log-retransformed parameter estimate of -0.057) in the patient-physician encounter (**Table 3**). Being an established patient was associated with a reduction of 17.3% (approximately 3 minutes) in the duration of the patient-physician encounter. Each additional medication prescribed was associated with an increase of 1.4%, and having multiple diagnoses was associated with an increase of 9.5% in the duration of the patient-physician encounter, respectively. For patients with noncapitated payment, HMO enrollment had no effect on length of visit.

Patients in capitated plans were 17% more likely to receive counseling or education services ($P < .01$) than those in noncapitated plans (**Table 4**). Patients in capitated plans and HMO patients in noncapitated plans were 3% and 4% more likely, respectively, to receive preventive services compared to non-HMO patients in noncapitated plans ($P < .05$). Other factors associated with an increased probability of receiving health counseling and preventive services included female gender, increased age, increase in number of medications prescribed, and having multiple diagnoses. Living in metropolitan areas, being an established patient, and seeing a specialist physician were associated with a lower likelihood of receiving preventive services.

In the sensitivity analyses described in the methods section (detailed results not shown), we found a reduction of 3.5 minutes in average length of visit among physicians with 100% capitated visits, after adjustment for the effects of other variables, compared with physicians with 0% capitated visits ($P = .001$; n = 1617). We also found significant increases in the receipt of preventive services (IRR = 2.34; 95% CI: 2.22 to 2.47) and health counseling services (IRR=1.70; 95% CI: 1.63 to 1.76) among physicians with 100% capitated visits, after adjustment for the effects of other variables, compared with physicians with 0% capitated visits.

Among visits to physicians with 20% or more of their visits capitated (n = 269), we found no difference in the length of the patient-physician encounter for patients in capitated or noncapitated plans (β coefficient = -0.62; $P = .154$), after adjustment for the effects of other predictor variables. We also found no difference in receipt of preventive services (IRR = 1.03; 95% CI: 1.00 to 1.06) and a small reduction in health counseling services (IRR = 0.90; 95% CI: 0.86 to 0.94) between capitated plan versus noncapitated plan patients of physicians with 20% or more capitation.

··· DISCUSSION ···

Many factors affect the amount of time physicians spend with patients. Our bivariate analysis shows that visit duration, as recorded in the NAMCS, is related to a patient's medical needs. Physicians spent significantly more time with new patients, older patients, patients with multiple diagnoses, and patients who received more than 4 prescriptions. However, the analysis also revealed a number of troubling or puzzling relationships that require further examination. Shorter visits were associated with capitation payment, HMO enrollment, nonwhite race, and rural location. Multiple regression analysis eliminated the visit duration effect for

Table 4. Effects of Capitation on Receipt of Health Counseling and Preventive Services

Predictor Variable	Health Counseling IRR (95% CI)	Preventive Services IRR (95%CI)
Patient in capitated plan*	**1.17 (1.12, 1.21)**†	**1.03 (1.00, 1.06)**
Patient in noncapitated HMO*	1.02 (0.99, 1.06)	**1.04 (1.01, 1.06)**
Age	**1.02 (1.02, 1.03)**	**1.05 (1.05, 1.06)**
Age-squared	**1.00 (1.00, 1.00)**	**1.00 (1.00, 1.00)**
White patient	1.01 (0.97, 1.05)	1.02 (0.99, 1.04)
Female patient	**1.13 (1.10, 1.16)**	**1.33 (1.30, 1.35)**
Specialist physician	**0.80 (0.80, 0.81)**	**0.82 (0.82, 0.82)**
Metropolitan location	**0.90 (0.87, 0.92)**	**0.92 (0.90, 0.94)**
Established patient	**0.87 (0.83, 0.90)**	**0.87 (0.85, 0.89)**
No. of medications	**1.07 (1.06, 1.08)**	1.00 (0.99, 1.01)
Multiple diagnoses	**1.48 (1.43, 1.53)**	**1.23 (1.20, 1.26)**
Year dummy	1.00 (0.97, 1.03)	**0.98 (0.96, 0.99)**

Regression models are Poisson.
*Omitted comparison group consists of patients in non-HMO, noncapitated plans.
†Bolding indicates statistical significance ($P \leq .05$).
HMO = health maintenance organization.

HMOs, race, and location, but the association for capitation payment held.

In our multiple regression analysis, we found that, on average, physicians spent 1 minute less (5.6% less time) with patients for whom they are paid capitation than with patients under other payment methods, after adjustment for patient demographics, physician specialization, number of medications and diagnoses, and other factors. The physician capitation component of HMOs, not other aspects of managed care, was the primary driver of visit duration, because the duration effect persisted even after adjustment for HMO enrollment and because HMO enrollment did not have a significant effect in the regression analysis. This is consistent with and helps expand on previous studies that have found both that HMO patients have somewhat shorter visits than do indemnity patients,[26] and that salaried HMO physicians devote more time to patients than do physicians who are paid fee-for-service either by indemnity or by HMO insurance.[19] Also consistent with these earlier studies is our observation that the structure of physician payment has a separate and stronger effect than does type of insurance. However, we were not able to directly compare different types of capitation or capitation with salary. Instead, the only comparison allowed by this survey was all forms of capitation versus all other payment methods. We found the effect of capitation on visit duration to exist mainly at the extremes, ie, among physicians working predominantly under capitation arrangements or predominantly with noncapitation plans. A 3.5-fold decrease in visit duration was present for physicians who saw only patients in capitated plans (1 minute), compared with physicians who saw only patients in noncapitated plans (3.5 minutes). Similarly, preventive and health counseling services were increased substantially among patients of physicians who were mostly capitated. For physicians with at least 20% of patients paying capitation, we found that capitation had no significant effect on visit duration and preventive services, indicating that physicians who received mixed types of payment did not differentiate among patients with respect to visit duration or prevention. These contrasting results initially appear inconsistent, but they reveal a deeper pattern that is somewhat reassuring.

Commentators have articulated a principle of impartiality or consistency in medical judgment[38-40] according to which different physicians may ethically adopt different practice styles, partly in response to available resources; however, physicians should not vary their clinical behavior according to the nature or source of payment from different patients. This ethic encourages physicians to provide the same standard of care to all patients regardless of financial considerations, while recognizing inevitable differences in clinical judgment, shaped in part by the economic environment. According to this view, a spillover effect should be expected in the practice of physicians with mixed sources or types of payment.[11,27,40,41] If such physicians use the same standard of practice for all patients, fee-for-service incentives should counterbalance capitation incentives, and the net effect should be intermediate to that expected were all patients in one plan type or the other. Our results are consistent with this prediction.

With regard to health promotion activities, we found, in accordance with our hypothesis and with findings in studies from Medicaid populations,[42,43] that patients under capitation received more preventive and health counseling services, after other relevant variables were controlled for. Also, in agreement with other studies,[44-47] we found that HMO enrollees received a few more preventive services, regardless of the method of physician payment. The influence of each factor (capitation or HMO enrollment) remained even after controlling for the other factor, suggesting that capitation payment reinforced other structural or management features of HMOs that contribute to greater health promotion.

Aside from managed care factors, we found health counseling and prevention services to be related appropriately to determinants such as first patient visit and number of medications and diagnoses. Minor discrepancies appear between health counseling and prevention, but the overall patterns are largely consistent. Some differences are difficult to interpret without more information or detailed analysis. Of particular note is the substantial increase in health promotion services for visits with women; a possible explanation could be that our index of preventive services contained more items relevant to women than to men.

This study should be considered only an initial exploration of these issues, and caution should be exercised in interpreting our findings because of a number of limitations. First, a 1-minute (5.6%) reduction in the length of visit, although statistically significant in a large sample, is not an unambiguous indicator of decreased quality. For example, we measured only the duration of the visit and not other time that physicians might spend with patients outside of visits, for instance on the phone.

Also, we did not measure health outcomes or patient satisfaction, so we were unable to determine whether a 1-minute reduction in visit time was harmful or clinically significant; if not clinically relevant, then the reduction in time could be considered improved efficiency. Second, comparisons of this sort require accurate case-mix adjusters, because disease and condition severity differ predictably across different types of insurance and payment arrangements. Although we used several case-mix adjusters, it is possible that the modestly reduced visit length we observed was the result of unmeasured lesser severity or complexity in visits with patients under capitation, rather than of the different payment incentive. In addition, because of limited variables available in the NAMCS data set, our analysis did not control for all the physician characteristics that might affect visit duration. The survey data (and the study variables) may also be subject to reporting bias and inaccuracies. Finally, our measure of capitation payment was somewhat imprecise. The measure, at best, determined which patients generated some form of capitation payment for the physician's group. The measure did not determine how individual physicians within a group were compensated, nor did it distinguish among different types of capitation or among other types of payment incentives that create financial risk for physicians. These and other factors merit further study to determine whether the capitation effects we observed here are real, how consequential they are, and whether similar effects result from other payment methods that create financial risk for physicians.

In conclusion, by examining individual patient encounters from a nationally representative sample, we determined the impact that capitation payment to physicians has on duration of physician-patient encounters and on the provision of health promotion services. Using these limited process measures of quality, we found that capitation has both potentially beneficial and potentially harmful effects. Capitation modestly decreases the amount of time physicians spent with their patients on average but also increases the frequency of health counseling and preventive services, after other relevant factors are controlled for. This appeared to result from physicians who are mostly capitated spending 20% less time with their patients, compared with physicians who are not capitated at all. Also, we found that physicians appeared to respond ethically to capitation incentives by treating patients consistently, despite varying methods of payment.

Acknowledgments

The authors would like to acknowledge David Mechanic, PhD, and 3 anonymous peer-reviewers for their review and comments that resulted in the final version of this manuscript. The authors would also like to acknowledge the assistance provided by Sachin Bhardwaj, BS, in manuscript preparation and Fabian Camacho, MS, for programming assistance.

··· REFERENCES ···

1. Robinson JC. Blended payment methods in physician organizations under managed care. JAMA 1999;282:1258-1263.

2. Gold M, Nelson L, Lake T, Hurley R, Berenson R. Behind the curve: A critical assessment of how little is known about arrangements between managed care plans and physicians. Med Care Res Rev 1995;52:307-341.

3. Bodenheimer TS, Grumbach K. Capitation or decapitation: Keeping your head in changing times. JAMA 1996;276:1025-1031.

4. Sulmasy DP, Bloche MG, Mitchell JM, Hadley J. Physicians' ethical beliefs about cost-control arrangements. Arch Intern Med 2000;160:649-657.

5. Jewett J, Hibbard J, Englemann S, Tusler M. The implications of plan design options for Medicare beneficiaries. Med Care Res Rev 2000;57:464-490.

6. Grumbach K, Osmond D, Vranizan K, Jaffee D, Bindman AB. Primary care physicians' experience of financial incentives in managed-care systems. N Engl J Med 1998;339:1516-1521.

7. Hadley J, Mitchell JM, Sulmasy DP, Bloche MG. Perceived financial incentives, HMO market penetration, and physicians' practice styles and satisfaction. Health Serv Res 1999;34(1 Pt 2):307-321.

8. Pantilat SZ, Chesney M, Lo B. Effect of incentives on the use of indicated services in managed care. West J Med 1999;170:137-142.

9. Ludmerer KM. Time to Heal: American Medical Education from the Turn of the Century to the Era of Managed Care. Oxford, UK: Oxford University Press; 1999.

10. Dudley RA, Miller RH, Korenbrot TY, Luft HS. The impact of financial incentives on quality of health care. Milbank Q 1998;764:649-686.

11. 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.

12. Berwick DM. Payment by capitation and the quality of care. N Engl J Med 1996;335:1227-1231.

13. Chaix-Couturier C, Durand-Zaleski I, Jolly D, Durieux P. Effects of financial incentives on medical practice: Results from a systematic review of the literature and methodolgical issues. Int J Quality Health Care 2000;12:133-142.

14. 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;21:86-92.

15. Stearns SC, Wolfe BL, Kindig DA. Physician responses to fee-for-service and capitation payment. Inquiry 1992;29:416-425.

16. 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;279:853-858.

17. Josephson GW, Karcz A. The impact of physician economic incentives on admission rates of patients with ambulatory sensitive conditions: An analysis comparing two managed care structures

and indemnity insurance. Am J Manag Care 1997;3:49-57.

18. Lurie N, Christianson J, Finch M, Moscovice I. The effects of capitation on health and functional status of the Medicaid elderly: A randomized trial. Ann Intern Med 1994;120:506-511.

19. Wolinsky FD, Marder WD. Spending time with patients: The impact of organizational structure on medical practice. Med Care 1982;20:1051-1059.

20. Holloway PJ, Lennon MA, Mellor AC, Coventry P, Worthington HV. The capitation study. 1. Does capitation encourage "supervised neglect"? Br Dent J 1990;168:119-121.

21. Mechanic D. The organization of medical practice and practice orientations among physicians in prepaid and nonprepaid primary care settings. Med Care 1975;13:189-204.

22. Howie JG, Porter AM, Heaney DJ, Hopton JL. Long to short consultation ratio: A proxy measure of quality of care for general practice. Br J Gen Pract 1991;41:48-54.

23. Davidoff F. Time. Ann Intern Med 1997;127:483-485.

24. Gross DA, Zyzanski SJ, Borawski EA, Cebul RD, Strange KC. Patient satisfaction with time spent with their physician. J Fam Pract 1998;47:133-137.

25. Levinson W, Roter DL, Mullooly JP, Dull VT, Frankel RM. Physician-patient communication. The relationship with malpractice claims among primary care physicians and surgeons. JAMA 1997;277:553-559.

26. Mechanic D, McAlpine D, Rosenthal M. Are patients' office visits with physicians getting shorter? N Engl J Med 2001;344:198-204.

27. Glied S, Zivin J. How do doctors behave when some (but not all) of their patients are in managed care? J Health Econ 2002;21:
337-353.

28. Hall MA. Motivating physicians through financial incentives: An agency theory perspective. In: Spece R, Buchanan A, Shimm M, ed. Physician Conflicts of Interest. New York: Oxford University Press; 1997.

29. Pearson SD, Sabin JE, Emanuel EJ. Ethical guidelines for physician compensation based on capitation. N Engl J Med 1998;339:689-693.

30. National Center for Health Statistics. National ambulatory medical care survey (NAMCS). Hyattsville, MD: National Center for Health Statistics; 1997.

31. STATA Statistical Software. Version 5.0. College Station, TX; 2000. Stata Corporation.

32. Greene WH. Econometric Analysis. 3rd ed. Englewood Cliffs, NJ: Prentice Hall; 1997.

33. Shapiro S, Wik M. An analysis of variance test for normality (complete samples). Biometrika 1965;52:591-611.

34. Halvorsen R, Palmquist R. The interpretation of dummy variables in semilogarithmic equations. Am Econ Rev 1980;70:474-475.

35. Kennedy P. Estimation with correctly interpreted dummy variables in semilogarithmic equations. Am Econ Rev 1981;71:801-801.

36. Manning WG. The logged dependent variable, heteroskedasticity, and retransformation problem. J Health Econ 1998;17:283-295.

37. Selvin S. Practical Biostatistical Methods. Belmont, CA: Duxbury Press; 1995.

38. Hall MA. Managed care medical ethics: A dose of realism. Ann Intern Med 1998;128:395-402.

39. Hillman A. Mediators of patient trust. JAMA 1998;280:1703-1704.

40. Reinhardt UE. The economist's model of physician behavior. JAMA 1999;281:462-465.

41. Baker L. Association of managed care market share and health expenditures for fee-for-service Medicare patients. JAMA 1999;281:432-437.

42. Carey T, Weis K, Homer C. Prepaid versus traditional Medicaid plans: Effects on preventive health care. J Clin Epidemiol 1990;43:1213-1220.

43. Lave JR, Ives DG, Traven ND, Kuller LH. Evaluation of a health promotion demonstration program for the rural elderly. Health Serv Res 1996;31:261-281.

44. Bernstein AB, Thompson GB, Harlan LC. Differences in rates of cancer screening by usual source of medical care. Data from the 1987 National Health Interview Survey. Med Care 1991;29:196-209.

45. Merkel PA, Caputo GC. Evaluation of a simple office-based strategy for increasing influenza vaccine administration and the effect of differing reimbursement plans on the patient acceptance rate. J Gen Intern Med 1994;9:679-683.

46. Retchin SM, Brown B. The quality of ambulatory care in Medicare health maintenance organizations. Am J Public Health 1990;80:411-415.

47. Udvarhelyi IS, Jennison K, Phillips RS, Epstein AM. Comparison of the quality of ambulatory care for fee-for-service