Managed Care Organization and the Quality of Diabetes Care

The Translating Research Into Action for Diabetes (TRIAD) study

CATHERINE KIM, MD, MPH[1,2]
DAVID F. WILLIAMSON, PHD[3]
CAROL M. MANGIONE, MD, MSPH[4]
MONIKA M. SAFFORD, MD[5]
JOSEPH V. SELBY, MD, MPH[6]
DAVID G. MARRERO, PHD[7]
J. DAVID CURB, MD, MPH[8]
THEODORE J. THOMPSON, MS[3]
K.M. VENKAT NARAYAN, MD, MSC, MBA[3]
WILLIAM H. HERMAN, MD, MPH[9,10]
THE TRIAD STUDY GROUP*

OBJECTIVE — To examine the association between the organizational model and diabetes processes of care.

RESEARCH DESIGN AND METHODS — We used data from the Translating Research into Action for Diabetes (TRIAD), a multicenter study of diabetes care in managed care, including 8,354 patients with diabetes. We identified five model types: for-profit group/network, for-profit independent practice association (IPA), nonprofit group/network, nonprofit IPA, and nonprofit group/staff. Process measures included retinal, renal, foot, lipid, and HbA_{1c} testing; aspirin recommendations; influenza vaccination; and a sum of these seven processes of care over 1 year. Hierarchical regression models were constructed for each process measure and accounted for clustering at the health plan and provider group levels and adjusted for participant age, sex, race, ethnicity, diabetes treatment and duration, education, income, health status, and survey language.

RESULTS — Participant membership in the model types ranged from 9% in nonprofit IPA models to 38% in nonprofit group/staff models. Over 75% of participants received most of the processes of care, regardless of model type. However, among for-profit plans, group/network models provided on average more processes of care than IPA models (5.5 vs. 4.7, $P < 0.0001$), and group/network models generally increased the probability of receiving a process by ≥10 percentage points. Among nonprofit plans, no effect of model type was found.

CONCLUSIONS — Among for-profit plans, group/network models provided better diabetes processes of care than IPA models. Although reasons are speculative, this may be due to the clinical infrastructure available in group models that is not available in IPA models.

Diabetes Care 27:1529–1534, 2004

From the [1]Department of Internal Medicine, Division of General Internal Medicine, University of Michigan, Ann Arbor, Michigan; the [2]Department of Obstetrics & Gynecology, Division of General Internal Medicine, University of Michigan, Ann Arbor, Michigan; the [3]Division of Diabetes Translation, Centers for Disease Control and Prevention, Atlanta, Georgia; the [4]Department of Medicine, Division of General Internal Medicine and Health Services Research, David Geffen School of Medicine at UCLA, Los Angeles, California; the [5]Department of Internal Medicine, Division of General Internal Medicine, University of Medicine and Dentistry of New Jersey, Newark, New Jersey; the [6]Division of Research, Kaiser Permanente, Oakland, California; the [7]Department of Medicine, Indiana University School of Medicine, Indianapolis, Indiana; the [8]Pacific Health Research Institute, Honolulu, Hawaii; the [9]Department of Internal Medicine, Division of Endocrinology and Metabolism, University of Michigan, Ann Arbor, Michigan; and the [10]Department of Epidemiology, University of Michigan, Ann Arbor, Michigan.

Address correspondence and reprint requests to Catherine Kim, MD, MPH, 300 North Ingalls Building, Room 7C13, Ann Arbor, MI 48109. E-mail: cathkim@umich.edu.

Received for publication 25 February 2003 and accepted in revised form 25 March 2004.

*A list of the members of the Translating Research into Action for Diabetes (TRIAD) Study Group can be found in the online appendix.

Additional information for this article can be found in an online appendix at http://care.diabetesjournals.org.

Abbreviations: IPA, independent practice association; TRIAD, Translating Research into Action for Diabetes.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

The quality of health care for patients with diabetes has been found to be low across multiple health systems (1–3). A recent report by the Institute of Medicine (4) argues that the gap between biomedical knowledge and health care delivery is primarily due to health system organizational factors. One such factor is the physician organizational model. Theoretically, shared infrastructure, such as office space, in some physician organizational models could support ancillary facilities, such as laboratories, or coordinated clinical services, such as disease-management programs, which in turn could improve quality of care. Group/staff models consist of physician groups with shared infrastructure and who are salaried employees of a single health plan. Group/network models consist of physician groups with shared infrastructure who contract with multiple health plans. Independent practice association (IPA) models consist of independent physician practices that contract with an IPA, which in turn contracts with multiple health plans, and as such share minimal infrastructure. Direct contracting models consist of independent physician practices that contract directly with multiple health plans and also share minimal infrastructure.

The Translating Research into Action for Diabetes (TRIAD) study is a multicenter, prospective cohort study designed to examine the associations between managed care structure and organization and the processes and outcomes of diabetes care (5). Within the TRIAD study, we compared the quality of diabetes care across health maintenance organization model types. Because existing clinical infrastructure can be used for quality improvement, we hypothesized that physician groups in either staff model (group/staff) or network model health plans (group/network) would provide better care than IPAs, which commonly are organized for contracting purposes only.

RESEARCH DESIGN AND METHODS

— The TRIAD study has been previously described (5). In brief, six Translational Research Centers collaborate with 10 health plans and 68 provider groups that serve ~180,000 people with diabetes. The health plans are geographically and ethnically diverse (Hawaii, California, Texas, Indiana, Michigan, New Jersey, and Pennsylvania). The study protocol was reviewed and approved by the institutional review boards at all six Translational Research Centers.

Study population

Health plan and provider group characteristics were assessed using standardized interviews of health plan and provider group medical directors and leadership personnel. These interviews assessed profit status, existing clinical infrastructure, and contracting arrangements. Based on these interviews, provider group models were classified into three types of models: group/staff models, group/network models, and IPA/direct-contracting models. Profit status was defined at the health plan level as for profit or nonprofit. In the TRIAD study, each for-profit and nonprofit model type was represented in more than one geographic area, except for the one for-profit health plan that contracted with both medical groups and IPAs in a single geographic area.

TRIAD's study population consisted of a random sample of adults with diabetes within the 10 health plans. All participants provided informed consent. Study participants were ≥18 years of age, dwelled in the community, spoke English or Spanish, were continuously enrolled in the health plan for at least 18 months, were not pregnant, and had at least one claim for health services during the previous 18 months. Participants were sampled from provider groups that had at least 50 participants with diabetes enrolled in the health plan. Recruitment was completed in September 2001, and baseline data collection was completed in 2003. Information from participants was obtained with a survey that was administered either by computer-assisted telephone interview or in writing, by medical record reviews, and through administrative data. Of contacted eligible people, 91% responded to the survey. If individuals who we were unable to contact had the same rate of eligibility as those contacted and were counted in the denominator, the survey response rate would be 69%. Survey questions assessed sociodemographic characteristics, recommended diabetes care services received, general health status, symptom and quality of life assessment, and satisfaction with care (7–9) among other variables. We examined data from the participants for whom medical records were available to document diabetes processes of care (n = 8,354). These participants were similar to the TRIAD population as a whole for the variables included in our analyses. Multiple nurse reviewers reviewed the medical records; 5% of records were abstracted in a double-blind fashion; that is, reviewers were not aware of which subjects were selected for double abstraction. Interrater reliability (κ) for the main process-of-care measures derived from medical record data ranged from 0.86 to 0.94 among sites.

Outcome measures

Quality of diabetes care was measured by seven process measures assessed over a 12-month period: dilated retinal exams, urine microalbumin/protein testing, foot exams, lipid and HbA_{1c} testing, recommendation to take aspirin or current aspirin use, receipt of influenza vaccination, and the unweighted sum of these seven measures as a continuous variable ranging from 0 (no services delivered) to 7 (all services delivered). We also examined the levels of three intermediate outcomes: the percentage of patients with HbA_{1c} <8%, the percentage of patients with LDL cholesterol <130 mg/dl, and the percentage of patients with systolic blood pressure <140 mmHg.

Regarding the process measures, no "gold standard" exists aside from direct observation (9), and different sources may report different performance rates for the same measure (10). For dilated retinal exams, foot exams, and recommendation to take aspirin or aspirin use, either medical record documentation or self-report was accepted. For receipt of influenza vaccinations, self-report was used. Other measures relied on documentation in the medical record alone. When we chose risk factor cutoffs, we chose cutoffs for blood pressure control and LDL that were most likely to be adopted at the time of baseline data collection and were also more likely to be achieved. Current recommendations have set these cut points lower (11). Systolic and diastolic blood pressures were highly collinear, and we chose to report on systolic blood pressure.

Statistical analysis

We examined the relationship between organizational model and processes of care by estimating the percentage-point difference between model types in the predicted probability of receiving each process of care ("risk difference") using hierarchical logistic regression models. These models were constructed using an SAS Glimmix Macro with penalized quasi-likelihood estimation method, with random intercepts for health plans and provider groups, to account for the clustered study design (health plan, provider group, and participant levels) and the correlation among participant characteristics within health plans and provider groups. We used similar models to assess risk factor levels. When we examined the sum of the seven process measures, we used a similar hierarchical linear regression model (SAS Proc Mixed). These models allow for the simultaneous effect of profit status at the health plan level and model type at the provider group level. In adjusted models, we also included participant age, sex, race or ethnicity, income, education, current diabetes treatment and duration of diabetes, self-reported health status, and language of the survey (English or Spanish).

Missing values for covariates from the patient survey were imputed singly using the transcan function in S-Plus (12). Each covariate is predicted as a function of all other covariates. No exposure-of-interest or outcome variables were imputed, i.e., no health plan, provider group, or diabetes process of care information was imputed. The imputation model used restricted cubic splines to model continuous variables, and imputed values are constrained to be in the same range as nonimputed values. We did not correct P values for multiple comparisons due to the observational nature of the study (13).

Comparison of risk differences between for-profit and nonprofit plans yielded inconsistent results that were <10 percentage points in magnitude and not statistically significant (results not shown). Due to our limited number of health plans (n = 10), we used the method described by Smith and Bates (14) to conduct a confidence limit analy-

Table 1—*Participant characteristics by organizational model type and health plan profit status.*

	For-profit health plan (n = 4)		Nonprofit health plan (n = 6)		
Characteristic	Group/network	IPA*	Group/network	IPA*	Group/staff
Provider groups (n)	15	8	10	17	18
Managed care experience (years)	15	15	9	15	51
Participants (n)	1,013	1,248	2,203	757	3,133
Mean age (years)	66	64	57	63	61
Women (%)	54	54	61	51	49
Race or ethnicity (%)					
White non-Hispanic	28	46	49	64	38
Black non-Hispanic	5	29	32	11	8
Hispanic	63	18	3	4	14
Asian or Pacific Islander	0	3	10	14	27
Other	4	4	8	7	13
Education (%)					
8th grade or less	30	12	10	7	6
Some high school	12	15	21	12	9
High school/GED	24	31	30	31	29
Some college	23	26	22	32	34
4-year college graduate	6	8	9	10	11
>4-year college degree	4	8	8	8	11
Annual household income (%)					
<$15,000	46	32	50	30	16
$15,000–39,000	33	34	22	35	34
$40,000–74,999	16	20	15	21	31
>$75,000	5	13	12	14	19
Interview conducted in Spanish (%)	13	4	0	0	2
Diabetes duration (mean years)	13	14	12	13	12
Diabetes treatment (%)					
Diet and exercise only	5	4	5	5	13
Oral medication only	72	68	52	61	61
Insulin only	10	15	27	23	16
Insulin and oral medication	12	13	15	11	10
Health status (%)					
Excellent	6	5	4	4	4
Very good	18	19	16	16	19
Good	41	42	33	42	42
Fair	29	29	34	31	29
Poor	6	5	13	7	7
Charlson comorbidity index (mean)	1.8	2.0	2.4	2.5	2.4

*Includes IPA and direct-contracting models.

sis to determine a limit on the likely magnitude of any actual effect between for-profit and nonprofit organizations. Such an analysis can be used in lieu of a post hoc power calculation. We found that in our sample there was a <5% probability that nonprofit plans performed any process of care at a level of ≥10 percentage points than for-profit plans.

RESULTS — The characteristics of participants by organizational model type and profit status are shown in Table 1. Due to significant interaction between health plan profit status and organizational model, we present model type stratified by profit status (Table 1). Among for-profit plans, participants in group/network models were older, more likely to be Hispanic, less educated, poorer, less likely to use insulin, and had lower comorbidity but worse self-reported health status than participants in IPA models (Table 1). Among nonprofit plans, participants in group/network models were younger; more likely to be women, black, less educated, and poorer; more likely to use insulin; and more likely to report worse health status than participants in other models. All group/staff models provided care for nonprofit health plans. The provision of processes of care was generally in excess of 75% across all model types (Table 2).

Fully adjusted risk differences between model types in the predicted probability (percentage points) of receiving processes of care are shown in Table 2. Results adjusted only for clustering were similar to results adjusted for clustering and participant covariates (online appendix Table 2*A* [available at http://care.diabetesjournals.org]). A risk difference of "10" between a group/network model and an IPA model means that out of 100

Table 2—*Percentage differences and 95% CIs in performance of processes of care by health plan profit status and provider group model type, adjusted for clustering and patient-level covariates.*

	For-profit health plans (group/network − IPA)	Nonprofit health plans (group/network − IPA)	Nonprofit health plans (Group/staff − IPA)
Dilated eye exam	81 − 71 = 10 (3–18)*	79 − 75 = 4 (−7 to 15)	81 − 75 = 6 (−12 to 23)
Urine protein check	81 − 60 = 21 (10–31)*	76 − 77 = −1 (−17 to 15)	86 − 77 = 9 (−10 to 27)
Foot exam	91 − 82 = 10 (4–16)*	87 − 82 = 6 (−7 to 19)	84 − 82 = 2 (−14 to 19)
Lipid check	75 − 62 = 13 (4–21)*	59 − 65 = −6 (−22 to 10)	70 − 65 = 6 (−28 to 39)
HbA_{1c} check	91 − 84 = 6 (1–12)*	87 − 84 = 2 (−6 to 11)	87 − 84 = 2 (−17 to 21)
Aspirin advice	45 − 45 = 0 (−6 to 7)	60 − 55 = 6 (−12 to 23)	60 − 55 = 5 (−14 to 25)
Influenza vaccine	73 − 58 = 15 (8–23)*	67 − 66 = 2 (−12 to 15)	69 − 66 = 3 (−13 to 19)
Composite (mean)	5.5 − 4.7 = 0.7 (0.4–1.0)*	5.1 − 5.0 = 0.0 (−0.3 to 0.3)	5.3 − 5.0 = 0.3 (−0.5 to 1.0)
HbA_{1c} <8%	37 − 39 = −2 (−8 to 5)	48 − 47 = 0 (−6 to 8)	50 − 47 = 3 (−21 to 27)
LDL <130 mg/dl	27 − 29 = −2 (−9 to 5)	26 − 26 = 0 (−7 to 6)	30 − 26 = 4 (−11 to 18)
Systolic blood pressure <140 mmHg	46 − 42 = 3 (−3 to 10)	39 − 42 = −3 (−9 to 4)	47 − 42 = 5 (−7 to 18)

Data are percentage difference (95% CI). Percentages and differences are rounded up. *Significant difference between for-profit group/network and for-profit IPA models at $P < 0.001$, except for dilated eye exam, lipids, and HbA_{1c}, which were significant at $P < 0.01$, $P < 0.01$, and $P = 0.027$, respectively. No significant differences between other model types existed.

patients in each model type, 10 more patients in the group/network model will have a process of care checked than in the IPA model. More participants in for-profit group/network models received each diabetes process of care than participants in for-profit IPA models, with the exception of recommendations to take aspirin. On average, group/network models delivered diabetes processes of care to a greater proportion of their patients than IPA models ($P < 0.0001$). Also, the effect of the group/network model usually exceeded 10 percentage points, with the exception of aspirin recommendations and measurement of HbA_{1c}.

Among nonprofit plans, differences in the quality of diabetes care between group and IPA models were smaller and differences in rates of performance did not reach statistical significance (Table 2). Among nonprofit plans, group/staff models did not differ from other models. When we compared similar model types by profit status, no differences existed between for-profit and nonprofit IPA models or between for-profit and nonprofit group/network models. We found no association between risk factor levels and organizational model type (Table 2).

When we constructed an adjusted model that did not include self-reported health status, we found little change in the risk differences. We used the Charlson index to adjust for comorbidity (15) in a sensitivity analysis but found little change in the results, so the Charlson index was not included as an adjuster in the final models.

CONCLUSIONS — Recent reports (4) of the gap between biomedical knowledge and actual health services delivery have spurred interest in the organizational determinants of superior quality of care. The process of care or quality of care may differ significantly by organizational model. Among the for-profit health plans in this sample, group/network models are more likely to deliver diabetes processes of care than IPA models, with the group/network effect often exceeding 10 percentage points. These percentage differences in process measures translate into large numbers of participants because 71 million people were enrolled in managed care in 2002 (16,17).

There are several explanations for the difference in processes of care observed between group/network and IPA models contracting with for-profit health plans. The availability and completeness of information captured by the electronic data system may be superior in group models (19). Medical groups may include multiple specialists, diabetes educators and nutritionists hired by the group, and a shared disease-management program, and these features may facilitate care that requires specialist referral, such as dilated eye exams, or access to diabetes-specific ancillary services, such as education. It is possible that higher quality care management strategies, such as diabetes disease-management programs, are more often implemented by group models than IPAs, although a recent survey (18) of provider groups found that the actual number of care-management strategies was similar between these two types of provider groups. Similarly, it is possible that group models have a more cohesive organizational culture that promotes better clinical practices, although studies (19,20) examining this association have had conflicting results.

Group/network model enrollees had a lower socioeconomic status and were more often of minority race than other model types, and these characteristics have been previously associated with poorer diabetes process of care in other reports (21,22). We expected that group/network models might be at a disadvantage due to residual confounding from these patient characteristics. Instead, we observed that risk differences between model types did not change after adjustment for characteristics, and group/network models provided superior process of care before and after adjustment. This suggests that the factors that mediate the relations between model type and process of care are effective even among traditionally disadvantaged patient populations. In our study, the difference in diabetes process of care between IPA and medical groups was observed only in for-profit health plans. Although explanations are strictly speculative, it is possible that IPAs contracting with for-

profit plans may be under greater pressure to reduce costs and less motivated to provide comprehensive diabetes care than IPAs that contract with nonprofit health plans.

There are several explanations as to why relatively large differences between model types existed for assessment of retinopathy, proteinuria, lipids, and performance of influenza vaccinations, but were reduced for HbA_{1c} measurement and nonexistent for aspirin assessment. Diabetes management has traditionally focused on optimizing HbA_{1c}, and this message has been reinforced by studies (23) documenting the benefit of superior control in patients with type 1 diabetes. It may be that recommendations for glucose management had more time to disseminate than recommendations to optimize other aspects of diabetes care; overall rates of measurement of HbA_{1c} were generally high. Aspirin assessment was generally lower across all model types, and this may be due to the relatively recent recommendations to prescribe aspirin in patients with diabetes (24,25), along with perceptions of decreased efficacy (26) or increased side effects (27). There are several explanations as to why organizational model type was not associated with improved risk factor levels. Our analysis was cross sectional, and there may have been inadequate time for the organizational model to effect risk factor levels. Also, it may be that any relationship between health system structure and risk factor levels is overpowered by patient-level biological variation and adherence to medication.

Our analysis had a number of strengths compared with previous studies. We were able to use uniform methods of data collection across multiple health systems and to adjust for participant demographics, comorbidities, and health status. Previous examination (28) of quality-of-care indicators using Health Plan Employer Data and Information Set data have found that less integrated physician organizations, such as IPAs, may provide lower quality of care than group/staff models. However, such databases have few quality measures that address care for the chronically ill (29,30), who may be especially vulnerable to poorer quality of care (31,32) and may be biased by selective disclosure of Health Plan Employer Data and Information Set information and voluntary participation (33). Comparisons of health plans have not always adjusted for the socioeconomic or health status of individual members or data collection techniques between health plans (28,33). Other studies (31,34) examining the organizational model have been unable to include clinical measures of quality. Also, prior studies have focused on group/staff versus IPA models, with little information on group/network models.

Our analyses have several limitations. Our sample of health plans was not randomly selected from all U.S. health plans with diabetic patients, and thus our results may not be directly applicable to the larger population of health plans. Although our findings are applicable to processes of diabetes care in a managed care population, they may not extend to other chronic illnesses or to the fee-for-service environment. Also, we only examined a limited set of diabetes process-of-care measures and risk factors. While accepted by quality organizations (1), these measures have limitations in that they may not capture management strategies (10) and may not necessarily be appropriate for all individuals with diabetes. For example, performance of annual dilated eye examinations in participants with excellent HbA_{1c} measures may not represent optimal resource use (35). Finally, our work was not able to address whether organizational structure effects are mediated through physician characteristics (such as specialty) or other provider group characteristics (such as incentives or diabetes care strategies) because we felt that these different research questions were beyond the scope of the present study. This does not invalidate the finding that model type seems to be associated with diabetes process of care because there may be certain model types that are more conducive to such important interventions, such as disease-management programs. However, further investigation is needed on how other health systems and physician characteristics interact with organizational structure could provide insight into the reasons why structure appears to be associated with specific diabetes processes of care.

As the health care market continues to evolve, the optimal role of market forces and the ideal structure of health care organization in health care delivery will need to be reassessed. We have found that medical groups that have contracts with health plans may be better equipped to provide recommended processes of care than IPAs contracting with this same type of plan. Future investigations should determine whether such associations are mediated through health system structure or presence of diabetes resources and whether the association between organizational model and process is confirmed using different types of quality measures.

Acknowledgments— TRIAD was funded by the Centers for Disease Control and Prevention (U48/CCU516410-02). C.K. was funded by an American Diabetes Association Junior Faculty Award.

The results of this study were presented at the May 2003 Society for General Internal Medicine meeting in Vancouver, Canada.

References

1. Fleming B, Greenfield S, Engelgau M, Pogach L, Clauser S, Parrott M: The Diabetes Quality Improvement Project: moving science into health policy to gain an edge on the diabetes epidemic. *Diabetes Care* 24:1815–1820, 2001
2. Saadine J, Engelgau M, Beckles G, Gregg E, Thompson T, Narayan K: A diabetes report card for the United States: quality of care in the 1990s. *Ann Intern Med* 136: 565–574, 2002
3. Meigs J, Stafford R: Cardiovascular disease prevention practices by U.S. physicians for patients with diabetes. *J Gen Intern Med* 15:220–228, 2000
4. Institute of Medicine: *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, D.C., National Academy Press, 2001
5. TRIAD Study Group: The Translating Research into Action for Diabetes (TRIAD) study: a multicenter study of diabetes in managed care. *Diabetes Care* 25:386–389, 2002
6. Ware J Jr, Kosinski M, Keller SD: A 12-item short-form health survey: construction of scales and preliminary tests of reliability and validity. *Med Care* 34:220–233, 1996
7. Brazier J, Jones N, Kind P: Testing the validity of the Euroqol and comparing it with the SF-36 health survey questionnaire. *Qual Life Res* 2:169–180, 1993
8. Agency for Health Care Policy and Research: *CAHPS 2.0 Survey and Reporting Kit*. Rockville, MD, AHCPR, 1998
9. Peabody J, Luck J, Glassman P, Dresselhaus T, Lee M: Comparison of vignettes, standardized patients, and chart abstraction: a prospective validation study of 3 methods for measuring quality. *JAMA* 283:1715–1722, 2000
10. Kerr E, Krein S, Vijan S, Hofer T, Hayward R: Avoiding pitfalls in chronic disease

quality measurement: a case for the next generation of technical quality measures. *Am J Manag Care* 7:1033–1043, 2001
11. American Diabetes Association: Clinical practice recommendations 1999 (Position Statement). *Diabetes Care* 22 (Suppl. 1):S1–S114, 1999
12. S-PLUS. 6.1 ed. Seattle, WA, Insightful, 2002
13. Rothman K: No adjustments are needed for multiple comparisons. *Epidemiology* 1:43–46, 1990
14. Smith A, Bates M: Confidence limit analyses should replace power calculations in the interpretation of epidemiologic studies. *Epidemiology* 3:449–452, 1992
15. Charlson M, Pompei P, Ales K, MacKenzie C: A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chron Dis* 40: 373–383, 1987
16. *The InterStudy Competitive Edge 13.2, Part I: HMO Directory*. St. Paul, MN, Interstudy Publications, 2003
17. *The Interstudy Competitive Edge 13.2, Part II: HMO Industry Report*. St. Paul, MN, Interstudy Publications, 2003
18. Casalino L, Gillies R, Shortell S, Schmittdiel J, Bodenheimer T, Robinson J, Rundall T, Oswald N, Schauffler H, Wang M: External incentives, information technology, and organized processes to improve health care quality for patients with chronic diseases. *JAMA* 289:434–441, 2003
19. Shortell S, Jones R, Rademaker A, Gillies R, Dranove D, Hughes E, Budetti P, Reynolds K, Huang C: Assessing the impact of total quality management and organizational culture on multiple outcomes of care for coronary artery bypass graft surgery patients. *Med Care* 38:207–217, 2000
20. Shortell S, Zazzali J, Burns L, Alexander J, Gillies R, Budetti P, Waters T, Zuckerman H: Implementing evidence-based medicine: the role of market pressures, compensation incentives, and culture in physician organizations. *Med Care* 39 (7 Suppl. 1):I62–I78, 2001
21. Brown AF, Gross AG, Gutierrez PR, Jiang L, Shapiro MF, Mangione CM: Income-related differences in the use of evidence-based therapies on older persons with diabetes mellitus in for-profit managed care. *J Am Geriatr Soc* 51:665–670, 2003
22. Hargraves JL, Cunningham PJ, Hughes RG: Racial and ethnic differences in access to medical care in managed care plans. *Health Serv Res* 36:853–868, 2001
23. DCCT Research Group: The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 329:977–986, 1993
24. American Diabetes Association: Aspirin therapy in diabetes (Position Statement). *Diabetes Care* 24 (Suppl. 1):S62–S63, 2001
25. American Diabetes Association: Aspirin therapy in diabetes (Position Statement). *Diabetes Care* 23 (Suppl. 1):S61–62, 2000
26. Colwell J: Aspirin for primary prevention of cardiovascular events in diabetes (Editorial). *Diabetes Care* 26:3349–3350, 2003
27. Chew E, Klein M, Murphy R, Remaley N, Ferris F: Effects of aspirin on vitreous/preretinal hemorrhage in patients with diabetes mellitus: Early Treatment Diabetic Retinopathy Study report no. 20. *Arch Opthalmol* 113:52–55, 1995
28. Himmelstein D, Woolhandler S, Hellander I, Wolfe S: Quality of care in investor-owned vs. not-for-profit HMOs. *JAMA* 282:159–163, 1999
29. Born P, Simon C: Patients and profits: the relationship between HMO financial performance and quality of care. *Health Aff (Millwood)* 20:167–174, 2001
30. Ware JJ, Bayliss M, Rogers W, Kosinsky M, Tarlov A: Differences in 4-year health outcomes for elderly and poor, chronically ill patients treated in HMO and fee-for-service systems: results from the Medical Outcomes Study. *JAMA* 276: 1039–1047, 1996
31. Tu H, Reschovsky J: Assessments of medical care by enrollees in for-profit and nonprofit health maintenance organizations. *N Engl J Med* 346:1288–1293, 2002
32. McCormick D, Himmelstein D, Woolhandler S, Wolfe S, Bor D: Relationship between low quality-of-care scores and HMOs' subsequent public disclosure of quality-of-care scores. *JAMA* 288:1484–1490, 2002
33. Blustein J, Hoy E: Who is enrolled in for-profit vs. nonprofit Medicare HMOs? *Health Aff (Millwood)* 19:210–220, 2000
34. Safran D, Rogers W, Tarlov A, Inui T, Taira D, Montgomery J, Ware J, Slavin C: Organization and financial characteristics of health plans: are they related to primary care performance. *Arch Intern Med* 160: 69–76, 2000
35. Vijan S, Hofer T, Hayward R: Cost-utility analysis of screening intervals for diabetic retinopathy in patients with type 2 diabetes mellitus. *JAMA* 283:889–896, 2000