Is Integration in Large Medical Groups Associated With Quality?

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Objective: To test the relationship between the presence of recommended chronic care model systems and the degree of integration among large medical groups.

Study Design: Cross-sectional survey in 2007 completed by medical directors of medical groups nationally with at least 100 physicians and a range of medical services and who had also participated in the National Survey of Physician Organizations.

Methods: We recruited 111 medical directors among 123 who were eligible. The survey asked about the medical group's structural, financial, and functional aspects of integrated care, as well as the presence and use of practice systems for chronic disease care as measured by the Physician Practice Connections–Readiness Survey (PPC-RS). The analysis tested the association between integration measures and the presence of practice systems, controlling for medical group attributes.

Results: Ninety-seven completed surveys were returned (89.0% of 109 medical directors eligible). Measures of integration and practice systems varied widely among the medical groups. The total PPC-RS score correlated with each measure of integration but most highly with functional integration ($r = 0.53$, $P < .01$). The strongest PPC-RS component score correlations were for delivery systems redesign ($r = 0.27$-0.52, $P < .01$) and for decision support ($r = 0.21$-0.46, $P < .05$). Adjusting for organizational characteristics had little effect on these relationships.

Conclusion: As measured by these scales, integration seems to be related to the presence of practice systems components of the chronic care model, although simply having the potential for integration (structure and finance) is much less strongly related than evidence of functional integration.

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For author information and disclosures, see end of text.

We are in a period of great ferment about what kinds of insurance coverage, payment approaches, and care delivery systems might best address concerns about the cost and quality of US healthcare.[1-4] A recurring theme is that fragmentation in the care systems is largely to blame.[5] Some policy leaders have looked to large care systems as the answer in the belief that coordination of services across multiple units of care should lower costs and improve quality.[6] The quality transformation of the Veterans Health Administration and the apparent higher quality produced by large staff-model or group-model systems like Kaiser Permanente are often used as examples of what can be done in systems large enough to organize care across the continuum.[7-9]

This ability to coordinate functions and activities across separate operating units is called integration, and it can occur vertically (owning or contracting for physician services, hospital services, urgent care, rehabilitation, and long-term care centers) or horizontally (creating multihospital systems).[10] However, Shortell[11,12] demonstrated that horizontal integration added little value in quality or costs. This insight led to a greater interest in vertical integration that truly connects functions across organizations, and various models have been described.[7,13-16]

The most practical model came from the Health Systems Integration Study (HSIS), which defined an *integrated delivery system* as "a network of organizations that provides or arranges to provide a coordinated continuum of services to a defined population and is willing to be held clinically and fiscally accountable for the outcomes and health status of the population served."[10(p468)] The HSIS studied 3 major types of integration, namely, functional, physician/systems, and clinical. Except for this model from the HSIS, integration has not been measured, and the relationship between integration and quality or cost of care has not been tested, to our knowledge.

Because many care delivery organizations want to know how to improve care quality and cost for longitudinal episodes of care and because it seems logical that a multicomponent integrated organization would have greater opportunities to do that, we studied this relationship among large medical groups nationally. We adopted the definition by the HSIS[10] of integrated delivery systems (given in the preceding paragraph) and developed an operational set of measures of integration based on that definition.

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In the absence of a standardized set of quality performance measures across the nation for comparison, we had to rely on an upstream process measure, namely, the presence of organized processes of care or practice systems. Casalino et al[17] called these care management processes in their National Survey of Physician Organizations. For the present study, we used the Physician Practice Connections–Readiness Survey (PPC-RS) from the National Committee for Quality Assurance to measure these systems.[18] The PPC-RS scores have been shown to be associated with process and outcome measures of diabetes care quality in 40 Minnesota medical groups, and a version of this instrument has become the main assessment device for medical homes.[19] Our hypothesis was that the presence of practice systems would be directly proportional to the degree to which a large medical group was integrated.

Take-Away Points

Large (≥100 physicians) medical groups that have integrated patient care across separate parts of their care systems have more practice systems for quality care. We found the following:

- Considerable variation in the degree to which these groups exhibit structural, financial, or functional integration;
- Similarly large variation in the presence of practice systems that implement the chronic care model domains;
- Significant correlation between each domain of integration and the extent of practice systems, but greatest ($r = 0.53$, $P < .01$) for functional integration; and
- Strongest correlations for the chronic care model domains of delivery systems redesign, decision support, and self-management support.

METHODS

To be eligible for this study, medical groups had to have at least 100 physicians, including primary care, and have completed the National Survey of Physician Organizations (described in the preceding paragraph). Although the size choice was arbitrary, large groups generally have greater resources and capability to integrate care. There were 132 medical groups that seemed to meet these criteria. However, during the recruitment process, 8 groups were found to be ineligible, and 2 groups in the pool had merged. Of the remaining 123 medical groups, 111 medical directors agreed to complete and return the surveys, for a participation rate of 90.2%.

The PPC-RS was developed by the National Committee for Quality Assurance to assess the presence of practice systems that implement the chronic care model (CCM) by Bodenheimer et al.[20] Using the CCM and a Six Sigma analysis of office practice as the basis for creating structural and process measures of systems in office practice, the PPC was developed with an expert panel and a literature review. Its survey questions were subsequently tested for reliability, best respondent, and validity against on-site audits and standardized quality measures.[18,19] In addition to documenting the presence of individual practice systems, the PPC-RS (research version) produces an overall score and a score for 5 of 6 domains of the CCM (health systems, delivery systems redesign, clinical information systems, decision support, and self-management support). A somewhat modified version, the PPC–Patient-Centered Medical Home Survey Tool, has been adopted by all 4 primary care professional associations and by the Patient-Centered Primary Care Collaborative as the main measure of qualifying practices as a medical home.[21]

To create integration measures for this study, we relied on the aforementioned definition of integrated delivery systems to develop items measuring structural, functional, and financial aspects of integration. Details about these measures and their psychometric properties are available in a Technical Appendix from the corresponding author. Briefly, the development of integration composite scores was based on an assessment of patterns of bivariate association among items, assessment of internal consistency reliability, and examination of the factor structure of the items in exploratory dichotomous factor analysis of the tetrachoric correlation matrix. The final approach was also tested qualitatively among an advisory committee of medical directors, who agreed that it was understandable and had good face validity.

The final survey also included a few questions to describe the organization (eg, ownership, number of practice sites, and number of physicians) and was conducted as a mailed questionnaire in late 2007 to the medical directors who had agreed to participate in this study. Follow-up consisted of 2 e-mail reminders and subsequent telephone calls by those of us who had performed the original recruiting (LIS and NT). A few medical groups were contacted to obtain information that was missing or conflicting on the questionnaire.

The degree of integration was summarized in 3 separate scales for each domain of structure, function, and finance. The 9 items in the structure domain ask whether the organization provides (directly or indirectly through contractual arrangements) subspecialty, hospital inpatient, emergency department, rehabilitation center, skilled nursing facility, home health, pharmacy, and palliative or hospice care in addition to primary care. The 5 finance items ask whether the organization assumed financial risk for most patients for professional services, hospital services, ancillary services, durable medical equipment, and injectables. The 9 new survey items comprising the functional integration index measured coordination of care across different service units in the areas of appointment

scheduling, clinical information systems, service notification, care protocols, service lines, performance measurement and reporting, and quality improvement. The information technology interoperability score from the National Survey of Physician Organizations constitutes the 10th item in the unit-weighted functional integration score.

Each domain was represented by a score that reflected the proportion of component items reported to be present in an individual medical group, where 100 reflected the presence of all items and 0 reflected none. The domains seemed to represent conceptually different features, and that was verified by our analysis of the component questions through factor analysis. Therefore, it would have been inappropriate to combine them in an overall score. Internal consistency reliability was as follows: $\alpha = .82$ for the structural index, $\alpha = .92$ for financial risk, and $\alpha = .80$ for the functional index. The PPC-RS was scored in a similar way, with a score for each of 5 domains representing the proportion of component items reported to be present and with 100 as the highest score possible. However, in this case there is conceptual similarity among domains, so a total score is calculated as the mean of 5 domain scores.

The analysis first described the mean and variance of medical group scores in each domain of integration and the PPC-RS, as well as the total PPC-RS score. Pearson product moment correlations were calculated between these integrations and the PPC-RS scores. Finally, a linear multiple regression analysis was performed predicting the total PPC-RS score from each integration domain and then with adjustment for covariates of total number of physicians, percentage of primary care physicians, whether insurance for most patients was provided through a group's own plan, American Medical Association (AMA) region, percentage of Medicaid patients, and ownership. This study was reviewed, approved, and monitored by the appropriate institutional review board.

RESULTS

Among 111 medical directors who agreed to complete the survey, 99 surveys were returned, but 1 survey was removed from the analytic sample because the respondent did not offer primary care, and another survey was removed because the organization did not deliver medical services. This resulted in an analytic data file of 97 medical groups, for an adjusted response rate of 89.0% (97 of 109) or 80.2% (97 of 121) of the eligible groups contacted. Their locations were widely distributed across the United States, with 5 to 8 medical groups each in 7 of 9 AMA regions but with 22 in the northeast central region and 27 in the Pacific region. The organizational characteristics of these medical groups are listed in **Table 1**. Most were owned by the physicians or by a health system, and only 14.4% had most of their patients covered by a single insurance plan. There was considerable variation in the number of physicians and care sites. There was also great variation in the proportion of physicians in primary care and the proportion of patients covered by various types of insurance. Although almost all medical groups had some patient record data in an electronic form, only 36.1% had complete paperless electronic medical records. There was a high degree of variation among these groups in the extent to which they reported having the practice systems constituting the domains of the CCM. Only the healthcare organization domain was consistently present to a high degree.

Responses to the integration domains are given in **Table 2**, demonstrating a substantial degree of variation among these large medical groups. Most of the groups provided at least 6 of 9 service types in the structure domain, but only 40.2% assumed any financial risk (eg, for professional services). Groups providing fewer than half of 9 service types had lower financial risk scores than those providing 5 or more service types (financial risk means of 11.2% vs 36.8%; $t_{1,95} = 3.26$, $P = .002$). Groups providing fewer than half of the service types also had slightly lower functional integration scores than those providing 5 or more services (functional integration means of 42.3 vs 52.9; $t_{1,83} = 1.73$, $P = .09$).

Associations between integration composites and the PPC-RS systems composites are given in **Table 3**. Each measure of integration was significantly associated with the total PPC-RS score and with at least 3 domain scores, but the strongest relationships for the PPC-RS domains were with the functional index of integration. The healthcare organization and clinical information systems domains were the most poorly related to integration.

Table 4 gives the results of linear regression analyses predicting the PPC-RS total score from each integration domain separately, while controlling for several covariates. The magnitude of the regression coefficient and R^2 is substantially reduced in the adjusted model for the financial score but less so for the structural and functional integration scores. These adjusted coefficients remain significant ($P < .05$) for structural and functional integration but not for the financial domain ($P = .28$).

The strong relationship between practice systems and functional integration is most easily seen in the **Figure**. A least squares regression line drawn through this scatterplot demonstrates that medical groups with more practice systems clearly tend to be at the higher end of the functional integration composite. Comparing medical groups in the lowest and highest quartiles on each of the integration scores showed a mean difference in the PPC-RS total scores of 12 for structure, 8 for finance, and 22 for function.

Table 1. Characteristics of 97 Medical Groups

Characteristic	Value
Ownership, %	
Physicians	38.1
Hospital/health systems	43.3
Insurance plan	2.1
Joint ownership	2.1
Other (nonprofit foundation, government, cooperative)	14.4
Health insurance for most patients through, %	
Our own health plan	10.3
A contract with a single health plan	4.1
Contracts with many plans	85.6
No. of patient care sites, mean (SD) [range; 25th, 50th, 75th percentiles]	31 (33) [2-150; 10, 16, 40]
No. of full-time equivalent physicians, mean (SD) [range; 25th, 50th, 75th percentiles]	
Primary care	171 (332) [5-2500; 60, 100, 180]
Specialty	277 (469) [3-3500; 55, 114, 320]
% in primary care	46.6 (23) [1-97; 30, 43, 60]
Total physicians	447 (786) [43-6000; 145, 217, 444]
Proportion of patient insurance types, mean (SD) [range; 25th, 50th, 75th percentiles], %	
Commercial	52.6 (24) [0-95; 40, 55, 71]
Medicare risk	8.2 (12) [0-65; 0, 5, 10]
Medicare fee-for-service	19.6 (15) [0-56; 8, 20, 31]
Medical assistance	10.3 (12) [0-75; 2, 7, 12]
Uninsured	10.3 (12) [0-55; 1, 3, 5]
Other	4.1 (9) [0-61; 0, 0, 3]
American Medical Association region, %	
Midwest	32.0
South	19.6
Northeast	12.4
West	36.1
Medical record systems, %	
Paper only	4.1
Paper and some electronic order/data	23.7
Electronic and separate order/data	29.9
Electronic that handles all functions	36.1
Other	5.2
PPC-RS scores, mean (SD) [range; 25th, 50th, 75th percentiles]	
Health systems	82.3 (31.0) [0-100; 67, 100, 100]
Delivery systems redesign	46.3 (22.2) [0-100; 28, 47, 61]
Clinical information systems	58.4 (16.9) [14-94; 47, 56, 71]
Decision support	58.2 (25.2) [6-100; 38, 59, 81]
Self-management support	47.6 (23.7) [0-100; 29, 50, 65]
Total	58.5 (17.1) [16-98; 50, 60, 70]

PPC-RS indicates Physician Practice Connections–Readiness Survey; SD, standard deviation.

Table 2. Descriptive Summary of the Integration Composites and Constituent Items of 97 Medical Groups

Structure[a]	
Item stem: Does your organization provide the following services, either directly itself or indirectly through contractual arrangements with other organizations?	**% Yes**
Primary care	100.0
Most subspecialty care	72.2
Hospital inpatient	81.4
Emergency department	60.8
Rehabilitation center	56.7
Skilled nursing facility	50.5
Home health	43.3
Pharmacy	51.5
Palliative or hospice	45.4
Finance[b]	
Item stem: Does your organization assume financial risk for most of your patients for	**% Yes**
Professional services	36.1
Hospital services	26.8
Ancillary services	32.0
Durable medical equipment	16.5
Function[c]	
Item stems	**% Yes**
Can a staff member in one of the service units access the appointment schedule in a different type of service unit so as to determine how soon an appointment might be available?	52.9
Can such a staff member actually make an appointment in a different service unit without going through staff in that unit?	27.1
Do most of your physicians automatically receive timely (≤48 h) notification when their patients receive care in a different service unit connected to your organization (eg, hospital or emergency department)?	56.5
Across ≥2 of the service units, has your organization established protocols or service agreements that specify which services each unit should provide to patients with particular symptoms (eg, acute chest pain or chronic back pain)?	49.4
Similarly, across ≥2 of the service units, has your organization established protocols or service agreements that specify exactly how patients with particular symptoms or conditions should be transferred from one service unit to the other (so as to maintain continuity of care)?	45.9
Has your organization established service lines for particular conditions that include clinicians from different departments operating as a virtual or separate administrative unit with budgetary authority (eg, breast disease, cardiovascular disease)?	49.4
Does your organization measure the quality of care for total episodes of illness across ≥2 service units (eg, total acute myocardial infarction care across clinic, emergency department, hospital, and rehabilitation center)?	42.4
Are these across-unit performance measures reported to overall organization leaders?	42.4
Does your organization have coordinated quality improvement projects for patient care issues that use specific methods (eg, lean, Six Sigma, or Plan, Do, Study, and Act) and are conducted across multiple service units?	70.6
National Survey of Physician Organizations information technology interoperability score, mean	**62.5**

SD indicates standard deviation.
[a]Mean (SD), 62.4% (28.5%); range, 11.1%-100.0%; 25th, 50th, 75th percentiles, 44%, 67%, 89%.
[b]Mean (SD), 27.8% (38.8%); range, 0.0%-100.0%; 25th, 50th, 75th percentiles, 0%, 0%, 60%.
[c]Mean (SD), 49.8% (26.0%); range, 0.0%-100.0%; 25th, 50th, 75th percentiles, 28%, 48%, 70%.

Table 3. Association Between Integration Composites and Physician Practice Connections–Readiness Survey Systems Composites

Integration Composite	Pearson Product Moment Correlations					
	Total Systems Score	Health Systems	Delivery Systems Redesign	Clinical Information Systems	Decision Support	Self-Management Support
Structure	0.30[a]	0.15	0.38[a]	0.08	0.23[b]	0.23[b]
Finance	0.29[a]	0.24[b]	0.27[a]	0.07	0.21[b]	0.19
Function	0.53[a]	0.21	0.52[a]	0.25[b]	0.46[a]	0.50[a]

[a] $P < .01$.
[b] $P < .05$.

Table 4. Unadjusted and Adjusted Regression Analysis Results for Integration Composites in the Prediction of the Physician Practice Connections–Readiness Survey Total Systems Composite

Integration Composite	Unadjusted Model[a]		Adjusted Model[b]		
	Unstandardized Regression Coefficient (SE)	R^2 Total	Unstandardized Regression Coefficient (SE)	R^2 for Integration Composite	R^2 Total
Structure	0.18 (0.06)[c]	0.09	0.15 (0.06)[d]	0.05	0.34
Finance	0.13 (0.04)[c]	0.08	0.05 (0.05)	0.01	0.30
Function	0.34 (0.06)[c]	0.28	0.30 (0.06)[c]	0.20	0.49

[a] Linear regression with a single integration composite.
[b] Linear multiple regression with a single integration composite and covariates of total number of physicians, percentage of primary care physicians, whether insurance was provided through group's own plan, American Medical Association region, percentage of Medicaid patients, and ownership.
[c] $P < .01$.
[d] $P < .05$.

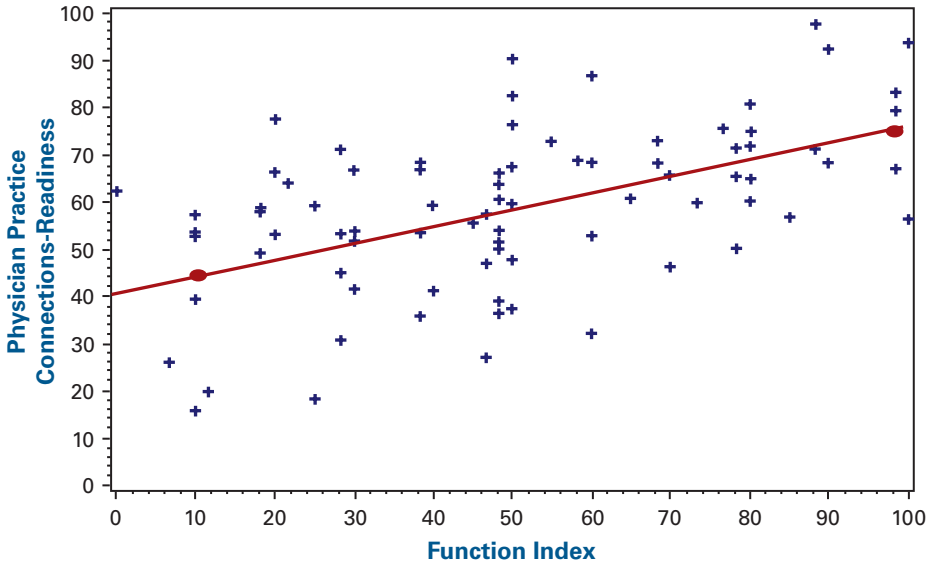
DISCUSSION

This approach to measuring structural, financial risk, and functional aspects of integration produces scores with substantial variation among these large medical groups. Moreover, these scores correlate well with the presence of CCM systems. Although previous findings demonstrated that the PPC-RS scores correlate well with process and outcome performance measures for diabetes care quality,[19] further work is needed to be more confident that these systems scores are a valid measure of performance for various chronic conditions.

A study of association between integration and quality was conducted by Mehrotra et al.[22] They demonstrated that large integrated medical groups were more likely than individual practice associations to have an electronic medical record, quality improvement programs, and higher preventive services rates on 4 measures. However, these groups did not have higher scores on asthma control medications or β-blocker use after heart attacks. Unfortunately, the authors' definition of integrated medical groups was limited to "centralized organizations in which physicians are employees or participants in a partnership arrangement."[22(p826)] Casalino[23] noted that these findings may simply reflect large size rather than any relationship between integration and quality. Gillies et al[24] also found an association between health plans that contracted with staff- and group-delivery systems and their scores on Health Employer Data and Information Set measures. To date, the only other published study to test associations between structure and quality performance measures is that by Keating et al,[25] who found only small and marginally significant differences in diabetes care quality among 135 Minnesota practices based on financial arrangements or involvement in health plan programs.

Shortell and Hull wrote that "[e]arly evidence suggests that organized delivery systems that are more integrated have the potential to provide more accessible coordinated care across the continuum…than less integrated delivery forms."[26(p101)] One approach to better coordination of care is to organize

Figure. Scatterplot of Total Physician Practice Connections–Readiness Survey and Function Scores



care delivery around conditions or service lines rather than by medical specialty, as has traditionally been the case. Parker et al[27] described this development and identified challenges in this approach, including decision-making blocks and difficulties in providing service line managers with sufficient authority. Another approach is to implement the practice systems that are identified and measured in the PPC-RS used for this study. The PPC was developed primarily to evaluate the implementation of the CCM by Bodenheimer et al,[20] a model that is also relevant for preventive services and for care of complex patients.[28-30] However, if it can be shown that fragmentation between sites of care produces lower quality and higher cost, it will be necessary to implement the CCM and systems integration across health systems operating units and not just within them.

This approach has important limitations. The main limitation is that, in the absence of a common set of performance measures, we used the reported presence of practice systems as a surrogate measure of quality. When a standardized set of performance metrics becomes available at the level of medical groups, it will be important to substantiate the demonstrated relationships. Across medical groups with a standardized measure of performance, our surrogate measure of practice systems is correlated with process and outcome measures of quality of care for diabetes,[19] but neither the correlations nor the systems survey is perfect.[18,19] However, the PPC-RS has been validated, and it is the primary tool for verifying whether a medical practice can be considered a medical home for various demonstration projects. Some investigators might be concerned that the functional integration composite also measures systems aspects of organization. Although the latter systems measures (Table 2) address agreements or protocols across organizational units rather than processes within a single unit, it is possible that a medical group with practice systems internally might also be more likely to enter into such agreements across units. The findings would have been stronger if the PPC-RS measured not only the presence of systems but also the frequency and intensity of use, but it does not, and we believed that the respondent burden of adding such questions would have been too great. Finally, the findings might apply only to groups as large as those in this study. Further research is needed to investigate the frequency and effects of virtual or contractual integration by the much smaller groups that provide most US healthcare.

This demonstration of a relationship between integration and quality provides support for encouragement of integration. Further studies and reactions to these measures of integration are needed, as are other studies of the relationship using various measures of the 6 dimensions of quality identified by the Institute of Medicine, namely, safety, timeliness, effectiveness, efficiency, equity, and patient-centeredness.[1] The fact that structural integration has a much weaker relationship to systems than does functional integration reaffirms the importance of going beyond assembling units providing various types of care. One must also work at making that assemblage function in a coordinated way. This is an area where selected case studies of medical groups with high and low levels of functional integration might be instructive. While our results suggest that functional integration (in particular) seems to be associated with higher process management scores, further work is needed on how different types of physician organizations might be able to achieve functional integration and how functional integration in turn might be associated with better outcomes of care in terms of quality and cost.

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REFERENCES

1. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century.* Washington, DC: National Academy Press; 2001.

2. Committee on Identifying Priority Areas for Quality Improvement, Institute of Medicine. Priority areas for national action: transforming health care quality. In: Adams K, Corrigan JM, eds. Washington, DC: National Academy Press; 2003.

3. Bodenheimer T. High and rising health care costs, part 1: seeking an explanation. *Ann Intern Med.* 2005;142(10):847-854.

4. The impending collapse of primary care medicine and its implications for the state of the nation's health care: A report from the American College of Physicians. January 30, 2006. http://www.txpeds.org/u/documents/statehc06_1.pdf. Accessed May 26, 2009.

5. Fisher ES, Staiger DO, Bynum JP, Gottlieb DJ. Creating accountable care organizations: the extended hospital medical staff. *Health Aff (Millwood).* 2007;26(1):w44-w57.

6. Crosson FJ. The delivery system matters. *Health Aff (Millwood).* 2005;24(6):1543-1548.

7. Jewell D. Learning from Kaiser (part 2): is integration the answer? *Br J Gen Pract.* 2004;54(505):571-573.

8. Feachem RG, Sekhri NK, White KL. Getting more for their dollar: a comparison of the NHS with California's Kaiser Permanente. *BMJ.* 2002;324(7330):135-141.

9. Perlin JB, Kolodner RM, Roswell RH. The Veterans Health Administration: quality, value, accountability, and information as transforming strategies for patient-centered care. *Am J Manag Care.* 2004;10(11, pt 2):828-836.

10. Gillies RR, Shortell SM, Anderson DA, Mitchell JB, Morgan KL. Conceptualizing and measuring integration: findings from the Health Systems Integration Study. *Hosp Health Serv Adm.* 1993;38(4):467-489.

11. Shortell SM. The evolution of hospital systems: unfulfilled promises and self-fulfilling prophesies. *Med Care Rev.* 1988;45(2):177-214.

12. Shortell SM. Revisiting the garden: medicine and management in the 1990s. *Front Health Serv Manage.* 1990;7(1):3-32.

13. Lukas CV, Holmes SK, Cohen AB, et al. Transformational change in health care systems: an organizational model. *Health Care Manage Rev.* 2007;32(4):309-320.

14. Lin BY, Wan TT. Analysis of integrated healthcare networks' performance: a contingency-strategic management perspective. *J Med Syst.* 1999;23(6):467-485.

15. Brickman R, Axelrod R, Roberson D, Flanagan C. Clinical process improvement as a means of facilitating health care system integration. *Jt Comm J Qual Improv.* 1998;24(3):143-153.

16. Shortell SM, Anderson DA, Gillies RR, Mitchell JB, Morgan KL. Building integrated systems: the holographic organization. *Healthc Forum J.* 1993;36(2):20-26.

17. Casalino L, Gillies RR, Shortell SM, et al. External incentives, information technology, and organized processes to improve health care quality for patients with chronic diseases. *JAMA.* 2003;289(4):434-441.

18. Scholle SH, Pawlson LG, Solberg LI, et al. Measuring practice systems for chronic illness care: accuracy of self-reports from clinical personnel. *Jt Comm J Qual Patient Saf.* 2008;34(7):407-416.

19. Solberg LI, Asche SE, Pawlson LG, Scholle SH, Shih SC. Practice systems are associated with high-quality care for diabetes. *Am J Manag Care.* 2008;14(2):85-92.

20. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness: the chronic care model, part 2. *JAMA.* 2002;288(15):1909-1914.

21. Sepulveda MJ, Bodenheimer T, Grundy P. Primary care: can it solve employers' health care dilemma? *Health Aff (Millwood).* 2008;27(1):151-158.

22. Mehrotra A, Epstein AM, Rosenthal MB. Do integrated medical groups provide higher-quality medical care than individual practice associations? *Ann Intern Med.* 2006;145(11):826-833.

23. Casalino LP. Which type of medical group provides higher-quality care? *Ann Intern Med.* 2006;145(11):860-861.

24. Gillies RR, Chenok KE, Shortell SM, Pawlson G, Wimbush JJ. The impact of health plan delivery system organization on clinical quality and patient satisfaction. *Health Serv Res.* 2006;41(4, pt 1):1181-1199.

25. Keating NL, Landrum MB, Landon BE, et al. The influence of physicians' practice management strategies and financial arrangements on quality of care among patients with diabetes. *Med Care.* 2004;42(9):829-839.

26. Shortell SM, Hull KE. The new organization of the health care delivery system. *Baxter Health Policy Rev.* 1996;2:101-148.

27. Parker VA, Charns MP, Young GJ. Clinical service lines in integrated delivery systems: an initial framework and exploration. *J Healthc Manag.* 2001;46(4):261-275.

28. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. *JAMA.* 2002;288(14):1775-1779.

29. Wagner EH, Austin BT, Davis C, et al. Improving chronic illness care: translating evidence into action. *Health Aff (Millwood).* 2001;20(6):64-78.

30. Glasgow RE, Orleans CT, Wagner EH. Does the chronic care model serve also as a template for improving prevention? *Milbank Q.* 2001;79(4):579-612, iv-v. ■