

## Group Practice Strategies to Manage Pharmaceutical Cost in an HMO Network

Kimberly A. Galt, PharmD; Eugene C. Rich, MD; John E. Krlewski, PhD;  
Paul D. Turner, PhD; Terence S. Bernhardt, BA; Bryan Dowd, PhD;  
Roger Feldman, PhD; and Andrea de Vries

**Objective:** To evaluate the prevalence of various pharmaceutical cost management strategies used by group practices within a managed care network and their relationship to drug costs among enrollees.

**Strategies Studied:** Care management (gatekeeping, practice profiling, practice guidelines, case management), techniques for maintaining clinic medication records, and policies regulating physician interaction with pharmaceutical sales representatives (PSRs).

**Study Design:** Cross-sectional survey of primary care group practice organizations (n = 103) affiliated with Blue Cross Blue Shield of Minnesota in early 1996.

**Methods:** Multivariate linear regression analysis was performed on corresponding claims data for members continuously enrolled in these practices from January 1 to December 31, 1995 (n = 76,387), using the patient as the unit of analysis.

**Results:** Substantial variation in strategy prevalence was observed; this variation was thought to influence pharmaceutical costs. Seventy-six percent of practices had medication lists in outpatient medical records, 53% had policies limiting pharmaceutical detailing, and 44% had patients assigned to primary care gatekeepers; however, only 10% used outpatient nurse case managers. Use of outpatient nurse case managers ( $P < .010$ ), primary care physician gatekeeping ( $P < .002$ ), policies to control pharmaceutical detailing ( $P < .001$ ), and medication lists and outpatient charts ( $P < .001$ ) was found to be independently associated with lower pharmaceutical expenditures. Significant colinearity was found between group size and the strategies studied.

**Conclusions:** Significantly lower pharmaceutical costs per member per year were observed in the groups reporting primary care gatekeeping, outpatient medication records, outpatient case managers, and policies regarding physician interactions with PSRs.

(*Am J Manag Care* 2001;7:1081-1090)

The rising cost of prescription drugs is becoming a great concern for patients, physicians, and managed care organizations. Since 1993, prescription drug costs have risen by at least 12% per year, at a time when overall health expenditure growth has been no more than 6% per year.<sup>1</sup> Authorities project prescription drug costs to continue to increase by at least 10% a year for the next decade.<sup>1,2</sup>

In the face of this problem, a variety of strategies have been developed by managed care plans and pharmaceutical benefit managers to control drug costs. These strategies include restricted formularies, physician practice profiling, drug utilization review, and disease management programs.<sup>3-5</sup> Managed care organizations also have introduced financial incentives for physicians to manage pharmaceutical costs.<sup>6</sup> However, there is little previous research focused on the effectiveness of practice-based strategies in controlling prescription drug costs.

From the Center for Practice Improvement and Outcomes Research, Creighton University, Omaha, NE (KAG, ECR, PDT); Division of Health Services Research and Policy, University of Minnesota, Minneapolis, MN (JEK, BD, RF); Blue Cross Blue Shield of Minnesota, St. Paul, MN (TSB); and Health Care Informatics, Highmark Blue Cross Blue Shield, Pittsburgh, PA (AD).

This research was funded by Blue Cross Blue Shield of Minnesota, the Blue Cross Foundation of Minnesota, St. Paul, and the Creighton University Health Future's Foundation Center for Practice Improvement and Outcomes Research Project.

Address correspondence to: Kimberly A. Galt, PharmD, Associate Professor of Pharmacy Practice, Co-Director, Center for Practice Improvement and Outcomes Research, Creighton University/St. Joseph Hospital, 601 N 30th St, Suite 5850, Omaha, NE 68131. E-mail: kgalt@creighton.edu.

A variety of care management techniques have been demonstrated to be effective in controlling other aspects of medical cost. For example, primary care physician gatekeeping has been demonstrated to reduce costs in some settings.<sup>7,8</sup> Several studies have documented that physician profiling is associated with improved clinical practice, including lower costs for patients with capitated coverage.<sup>8-10</sup> Practice guidelines have been widely proposed to improve medical practice, including the appropriateness of drug therapy<sup>11</sup>; in many cases, these guidelines promote the use of lower-cost drugs for common problems.<sup>12</sup> In recent years, case management programs for patients with high-cost diseases also have been introduced; several of these have been demonstrated to improve the process as well as lower the cost of care.<sup>13-15</sup>

In addition to these administrative interventions common to managed care, other administrative and organizational factors in medical practice can influence the cost of pharmaceuticals. Many authorities have urged that better office record keeping would enhance pharmaceutical care by physicians.<sup>16,17</sup> Many health plans and accrediting organizations now expect primary care offices to maintain separate medication lists in the patient records.<sup>18-20</sup> These approaches to office-based management are being recommended to improve the quality of care; however, they also increase the opportunity for cost reduction through improved drug therapy management. The advent of electronic medical records offers the potential for even more sophisticated uses of these medication lists to improve drug therapy.<sup>21-25</sup> This would be expected to further reduce the cost of care.

Physician interactions with pharmaceutical sales representatives (PSRs) may be another factor in the cost of drug therapy for patients. Pharmaceutical companies spend approximately \$1 billion each year on marketing to physicians.<sup>26</sup> Studies have suggested that physicians who have more frequent interactions with PSRs write more expensive prescriptions for common problems.<sup>27,28</sup> Professional organizations have developed guidelines regarding physician interactions with PSRs,<sup>29,30</sup> and several teaching hospitals have developed policies regulating local physician interaction with sales representatives.<sup>31,32</sup> However, little is known regarding the policies that medical group practices have in place to guide physician interactions with sales representatives.

Our study addresses these issues by evaluating the effects of various strategies used by group practices

within a managed care network on the costs of drug therapy. We describe the prevalence of various care management strategies (gatekeeping, practice profiling, practice guidelines, and case management), as well as techniques for maintaining clinic medication records and policies regulating physician interaction with PSRs. We then evaluate the relationship of these strategies to the cost of providing pharmaceuticals to enrollees in a managed care network.

---

... METHODS ...

### Study Population

The population for this study was group practices accepting financial and administrative responsibility for primary care services for enrollees in managed care plans of Blue Cross Blue Shield of Minnesota (BCBSM). To be eligible for the study, the group practices had to have at least 200 members continuously enrolled in 1995. We identified 129 primary care practices in the upper Midwest that met these criteria.

### Data Sources and Variables

*Survey Process.* Characteristics of primary care management in these practices were obtained by using a mailed survey instrument. The development of this instrument has been described in previous reports.<sup>8,33</sup> Surveys were mailed to both medical directors and administrators. The medical directors' questionnaires mainly focused on the management of primary care in these practices. The administrators' questionnaires focused on issues such as ownership, governance, sources of revenue, physician incentive plans, and administrative control. Surveys were conducted between July 15 and October 15, 1996. Nonrespondents received telephone follow-up and multiple mailings. Out of the 129 organizations, 112 of the medical directors (86.8%) and 116 (89.9%) of the administrators provided usable responses. The number of group practices for which both the medical director and the administrator responded was 103, resulting in an effective survey response rate of 79.8% for the study. These surveys included items relevant to 3 hypothesized group practice strategies to control pharmaceutical utilization: care management strategies, office pharmaceutical record keeping, and policies on physician interaction with PSRs. Other confounding approaches to reducing pharmaceutical costs (eg, formularies, therapeutic algorithms or protocols) were the same across practices.

*Care Management Strategies.* Data on care management strategies were acquired through the med-

ical directors' survey. The medical directors' questionnaire obtained data on approaches such as gate-keeping by primary care physicians, practice profiling of physicians on outpatient pharmaceutical costs, and practice guidelines for telephone care of common conditions (eg, antibiotics for simple urinary tract infection, use of outpatient case managers).

*Office Pharmaceutical Record Keeping.* The medical directors' survey also obtained information on medical record keeping related to pharmaceuticals; medical directors indicated whether their medical records usually contained a pharmacy record of medications. The administrators' survey provided information on office medical record systems, documenting which clinics had systems to provide computerized drug profiles of patients.

*Policies on Physician Interaction with Pharmaceutical Sales Representatives.* The administrators' survey also documented the presence or absence of any policies regulating visits by PSRs to the group practice. For those practices that had policies with respect to pharmaceutical detailing, the administrators were asked to indicate which of several specific policies were present (ie, PSRs are not allowed to make visits at the clinic, not allowed to call on individual doctors, not allowed to leave samples, not allowed to leave gifts, allowed to visit only during specific times).

*Administrative Data and Cost Measurement.* For those members eligible for this study, resource utilization data were abstracted from the BCBSM administrative claims history database for 1995. Enrollees were included in this study if they were continuously enrolled through 1995, were younger than 65 years, and were assigned to 1 of the 103 group practice organizations. Members also had to have a pharmaceutical benefit and some expenditures in order to have pharmaceutical costs observed in this study. A total of 76,387 BCBSM enrollees met these criteria and were included in this analysis. The measure of resource utilization was pharmaceutical cost per member per year (PMPY), estimated from the allowed ingredient cost plus the dispensing fee. Rebates were not included in the pharmaceutical cost calculation.

*Control Variables.* Several control variables were included in our analyses. Enrollee characteristics obtained from the BCBSM database included age, sex, ambulatory care group (ACG), and enrollee insurance characteristics. Version 3 of the ACG was used for this study. The ACG is a method of case-mix measurement for application in populations, based

primarily on a categorization of morbidity on the dimensions of duration, severity, differentiation, and etiology in ambulatory care populations.<sup>34</sup> Relevant categories of insurance were derived from the literature and from discussions with the BCBSM underwriting and contracting staff. Details on the development of these variables are described in a previous report.<sup>8</sup>

The characteristics of the physicians in the practices were obtained from credentialing data at BCBSM. From these data we were able to determine a number of organizational characteristics related to the physicians. These included the size of the group practice (number of full-time physicians), the proportion of male physicians in the group, the average number of years of clinical experience per physician in the group (as determined by year of graduation from medical school), and the proportion of physicians who were in primary care (number of general internal medicine, general pediatrics, family practice, or general practice physicians divided by the total number of physicians in the group). Previous research has shown these variables to be associated with differences in the cost or progress of outpatient care.<sup>8</sup>

Another group practice characteristic observed in this study was the percentage of the practice's revenue derived from different payment methods. The percentages were calculated from information provided by the administrators. Administrators provided an estimate of the proportion of total group practice income earned through all income sources. These contracts were characterized as billed charges, fee-for-service using health plan fee schedules, capitation, and so forth. A "financial risk index" was constructed to summarize the types of contracts held by each group practice. Each type of contract was rated on a scale of 1 to 8, reflecting the financial risk to the group practice. The highest financial risk (8) was assigned to full-risk capitation; the lowest financial risk (1) was assigned to contracts where the health plan paid billed charges for the group. For each group practice, the financial risk index was calculated by the weighted average of the multiplicand of the proportion of income earned from each type of contract and the risk rating given each contract type. See **Table 1** footnote for a detailed explanation of the financial risk index.

#### **Data Analysis**

We applied descriptive statistics to summarize information on the strategies used by group practices relevant to controlling pharmaceutical costs.

Using the Mann-Whitney *U* test, we evaluated the association between group practice size and the various pharmaceutical cost management strategies in place at the group practices.

We also conducted multivariate linear regression analyses to determine the relationship to pharmaceutical cost of various clinic characteristics relevant to the management of primary care. The dependent variable was the natural logarithm of pre-

scription drug cost per member per month; therefore, only members using some prescription drugs were included in these analyses (n = 76,387). We used the natural logarithm of dollar cost instead of raw dollars as the dependent variable because previous research indicates that health plan enrollee costs are not normally distributed.<sup>35</sup> Ideally, the analysis of strategy impact on outpatient pharmaceutical costs also could include those patients who had no pharmaceutical costs. However, it is unlikely that the strategies used would be focused on discontinuing needed medication. Rather, the strategies used are likely to improve the cost effectiveness of treatment selection, a likely medical care goal of physicians. Therefore, inclusion of the no-drug-use population was not likely to substantially enhance our analysis.

In this multivariate modeling we used individual enrollees as the unit of analysis. Variance in patient demographics was accounted for through 8 categories of enrollee age and gender (Table 2). We accounted for variance related to diagnosis and comorbidity through ACGs.<sup>36</sup> This analysis used a separate dummy variable for 50 of 52 ACGs; previous work demonstrated this approach had the best explanatory power.<sup>8</sup> Ambulatory care group 51 (ungroupable) and ACG 52 (no diagnosis codes available) were combined as the reference category (selected because they were low-cost groups associated with a reasonable volume of enrollees). We explored the possibility of colinearity among the independent variables to determine potential problems in the multivariate modeling. A high degree of colinearity was observed between the variable organizational size and several of the other independent variables (eg, gatekeeping, outpatient case management). Therefore, organizational size was eliminated from the multivariate analysis. Consequently, the regression model was specified to evaluate whether the natural log of patient prescription drug cost was a function of care management techniques (eg, gatekeeping, guidelines), pharmaceutical detailing, or office medication records, controlling for patient characteristics (eg, age, sex, ACG) and group practice organization characteristics (percentage of primary care physicians, physician experience, physician gender, profit or not-for-profit status, and financial risk index). Resultant coefficients also reflect group size, to some extent, and must be interpreted with this understanding. Because of multiple comparisons, we used  $P < .01$  as our standard for reporting statistical significance for all of our analyses.<sup>37</sup>

**Table 1.** Organizational Characteristics (n = 103)

Characteristic	Value
<b>Mean (Median)</b>	
Size (No. of full-time physicians)	29.8 (9.0)
% Primary care physicians	78.7 (87.0)
% Male physicians	76.5 (80.0)
Physician experience (y)	18.1 (18.3)
Financial risk index*	3.0 (2.8)
<b>Frequency (%)</b>	
Urban location	64 (62)
For-profit organization	62 (60)

\*Scale for financial risk index: 8 = full-risk capitation of all doctor and inpatient services; 7 = capitation for doctors' services with some risk sharing for hospital costs; 6 = full capitation for all physician services only; 5 = full capitation for primary care physician services only; 4 = fee-for-service with hold-back provision or target rates with settlement at the end of the year or adjustment during the next year; 3 = discounted or negotiated fee-for-service negotiated specifically with your clinic; 2 = fee-for-service based on a general fee schedule not specific to your clinic; 1 = billed charges (fee-for-service).

**Table 2.** Characteristics of Enrollees (n = 76,387)

Enrollee Characteristic	No. of Enrollees (%)
Age of males (y)	
0-2	1345 (2)
3-14	7793 (10)
15-44	14,705 (19)
45-64	10,154 (13)
Age of females (y)	
0-2	1204 (2)
3-14	7328 (9)
15-44	21,812 (29)
45-64	12,046 (16)

... RESULTS ...

**Description of Group Practices**

The characteristics of the 103 primary care group practices whose medical directors and administrators responded to the survey are displayed in Table 1. Although the median size of the group was 9, there were a number of large group practices in this study; indeed, 26 of the group practices had more than 25 physicians and the largest group had 392 physicians. Most of the practices were predominantly composed of primary care physicians (median of 87% primary care physicians). The median financial risk index for these groups was only 2.8, with a range of 1.3 to 6.4.

Table 3 presents information on the presence of various care management techniques and the use of office medication records in these group practices. Forty-four percent of the clinics maintained primary care gatekeeping wherein patients were routinely asked to select a primary care physician to coordinate their care and manage referrals. Forty percent of practices profiled the outpatient drug utilization of individual physicians, 34% of practices used guidelines in telephone management of patients, and 10% used outpatient case managers. Larger group practices were significantly more likely to use gatekeeping, guidelines, and outpatient case managers ( $P = 0.000, 0.000,$  and  $P < .008,$  respectively, by the Mann-Whitney  $U$  test). Only 9 group practices had computerized office medical record systems with patient drug profiles in place. However, 76% of medical

directors reported there were usually drug lists in the outpatient medical records.

Table 4 presents information on policies regarding physician interactions with PSRs in these group practices. A majority of medical directors reported having some policy regarding these interactions. For those groups that had some policy in place, the most common was limiting PSR

**Table 3.** Care Management Techniques and Office Medication Records (n = 103)

Management Strategy	No. of Practices in Which Implemented (%)	Association With Larger Group Practice Size*
Gatekeeping	45 (44)	Increased ( $P = .000$ )
Profiling—outpatient drug utilization	41 (40)	No ( $P > .01$ )
Guidelines—telephone management	35 (34)	Increased ( $P = .000$ )
Outpatient case management	10 (10)	Increased ( $P = .008$ )
Computerized patient drug profiles	9 (9)	No ( $P > .01$ )
Drug list in outpatient medical records	78 (76)	No ( $P > .01$ )

\*Mann-Whitney  $U$  test.

**Table 4.** Policies on Physician Interaction with Pharmaceutical Sales Representatives (n = 103)

Policy	No. of Practices in Which Implemented (%)	Association with Larger Group Practice Size
<b>Any policy on PSRs</b>	55 (53)	No ( $P > .01$ )
<b>Specific policy</b>		
No calling on individual physicians	23 (22)	No ( $P > .01$ )
No clinic visit	1 (1)	No ( $P > .01$ )
No samples	2 (2)	No ( $P > .01$ )
No gifts	8 (8)	No ( $P > .01$ )
Specific visitation times	43 (42)	No ( $P > .01$ )
Other	9 (9)	No ( $P > .01$ )
<b>Multiple policies</b>	23 (22)	No ( $P > .01$ )

PSR = pharmaceutical sales representative.

interactions to specific visitation times. Twenty-two percent of the practices had multiple policies. There was no association between policies on physician interaction with PSRs and the size of the group practice.

Table 2 presents the characteristics of the 76,387 enrollees. Fifty-six percent were female; the most common age group for both men and women was

15 to 44 years. The most common type of health insurance was the point-of-service product.

**Multivariate Analyses**

Results from the multiple linear regression analyses are presented in Table 5.<sup>38</sup> The analysis demonstrated that several strategies relevant to pharmaceutical cost management were indeed associated with lower pharmaceutical expenditures PMPY.

Group practices that used outpatient nurse case managers had significantly lower costs ( $P = .01$ ). Group practice efforts to have patients identify primary care physician gatekeepers also were associated with lower costs ( $P < .002$ ). Group practices that maintain medication lists in the outpatient charts had significantly lower costs ( $P < .001$ ). It is noteworthy that group practices that reported having policies on physician interaction with PSRs also had lower pharmaceutical expenditures PMPY ( $P < .001$ ).

Interestingly, 1 strategy used by group practices was associated with increased pharmaceutical expenditures. Those group practices that reported profiling physicians regarding outpatient drug utilization had significantly higher pharmaceutical expenditures PMPY ( $P < .001$ ).

Since organizations with any policies on physician interaction with PSRs had significantly lower pharma-

**Table 5.** Association of Selected Organizational, Clinic, and Patient Characteristics with Pharmaceutical Expenditures\*

Characteristics	Drug Costs (Log) (β Coefficient)	Significance Level (P Value)
<b>Organizational characteristics</b>		
% Primary care	-.065	.042
Profit/not-for-profit status	.010	.741
% Male physicians	-.360	< .00 <sup>†</sup>
Average practice experience/physician (y)	.009	< .001 <sup>†</sup>
Urban location	.075	< .001 <sup>†</sup>
Financial risk index <sup>‡</sup>	.013	.039
<b>Clinic characteristics</b>		
Care management techniques		
Gatekeeping	-.039	.002 <sup>†</sup>
Outpatient drug use profiling	.054	< .001 <sup>†</sup>
Telephone management guidelines	.028	.047
Outpatient case management	-.054	.010
Physician interaction with PSRs		
Policies in place	-.058	< .001 <sup>†</sup>
Office medical records		
Computerized drug profiles	-.015	.486
Medical records contain drug lists	-.088	< .001 <sup>†</sup>
<b>Patient characteristics<sup>§</sup></b>		
Patient sex and age (y) <sup>  </sup>		
Male 0-2	-.013	.812
Male 3-14	.135	< .001 <sup>†</sup>
Male 15-44	.457	< .001 <sup>†</sup>
Male 45-64	1.05	< .001 <sup>†</sup>
Female 0-2	-.113	.050
Female 15-44	.864	< .001 <sup>†</sup>
Female 45-64	1.31	< .001 <sup>†</sup>
Patient insurance <sup>¶</sup>		
Point-of-service product	-.017	.394
Point-of-service and CMM product	-.048	.067
Point-of-service and drug product	.137	< .001 <sup>†</sup>

CMM = comprehensive major medical; PSR = pharmaceutical sales representative.

\*Overall regression model:  $F = 345.7$ ;  $P < .001$ ;  $R^2 = .24$ .

<sup>†</sup>Significant association based on the a priori criterion of  $P < .01$ .

<sup>‡</sup>For a definition of this index, see Table 1.

<sup>§</sup>Coefficients for the 52 dummy variable-ambulatory care groups are not shown.

<sup>||</sup>Dummy variable "female age 3 to 14" was used as the reference category.

<sup>¶</sup>Dummy variable "traditional product" was used as the reference category.

ceutical costs, we further analyzed these data to evaluate whether some policies were more strongly associated with lower cost than others. In this model, we evaluated each of the 5 specific policies reported and described in Table 4. We included the other variables in the model as before (enrollee characteristics, organizational characteristics, care management techniques, and office medical records). This analysis revealed that 2 specific policies approached (but did not reach) our chosen definition for statistical significance ( $P < .01$ ). Clinics that reported having policies prohibiting PSRs from calling on individual physicians had a trend toward lower pharmaceutical expenditures ( $P = .027$ ). Also, those clinics that reported having policies discouraging PSRs from calling on individual physicians (eg, outside a specific visitation time) had a trend toward lower pharmaceutical expenditures PMPY ( $P = .023$ ).

The relative influence of these strategies on pharmaceutical cost varies somewhat depending not only on the actual coefficient observed, but also on the specification of the independent variable. For a categorical variable such as “drug lists in outpatient medical records,” the association with pharmaceutical costs may be calculated using the following formula:  $e^{(\text{coefficient} - \text{standard error}/2 \times \text{coefficient})} - 1$ .<sup>39</sup> Using this calculation and the observed median drug charges of \$100.00 PMPY, patients cared for by organizations that have clinic medication lists have 8.3% (\$8.30 PMPY) lower pharmaceutical expenditures; those that have policies related to pharmaceutical detailing have 5.6% (\$5.60 PMPY) lower expenditures. Similarly, patients of practice organizations that use outpatient case managers have 5.2% (\$5.20 PMPY) lower pharmaceutical expenditures, while patients in practices that designate primary care physician gatekeepers have 3.8% (\$3.80 PMPY) lower costs for outpatient pharmaceuticals PMPY.

### ... DISCUSSION ...

Our data show considerable variation across primary care clinics in the application of various strategies relevant to managing pharmaceutical costs. Most clinics have some policies on physician interactions with PSRs. A large majority of sites have drug lists in their outpatient medical records, and almost half encourage patients to identify primary care physicians to serve as gatekeepers. Use of guidelines for telephone management, use of case managers, and the maintenance of computerized patient drug profiles are uncommon strategies in

these groups. The most intriguing findings relate to the association of these various pharmaceutical cost management strategies with actual pharmaceutical costs of the enrollees in this health maintenance organization (HMO) network. Multivariate analyses revealed lower prescription drug costs for patients cared for by group practice organizations that used outpatient nurse case managers, identified primary care physician gatekeepers, maintained medication lists in the outpatient charts, and had policies on physician interactions with PSRs.

The finding that primary care gatekeeping is associated with lower prescription costs is not surprising. Coordination of treatment is a hallmark of the clinical practice of primary care medicine.<sup>40</sup> Examples abound of redundant or conflicting medications prescribed to patients who receive care from multiple specialized physicians.<sup>41,42</sup> These problems often lead to an increase in prescription drug costs as well as risks of additional pharmaceutical and nonpharmaceutical healthcare costs related to managing iatrogenic effects.<sup>43,44</sup> The management of polypharmacy is a particular area of emphasis for primary care geriatrics, where physicians are most likely to be treating patients who require multiple medications and multiple specialist consultations.<sup>45,46</sup>

The findings with respect to office medical records are interesting and, on the whole, encouraging. It should come as no surprise that computerized patient drug profiles are infrequent in these group practices. The administrative databases common to medical groups (patient registration, appointment keeping, and billing) do not systematically capture prescription drugs. Furthermore, comprehensive electronic medical records remain uncommon in medical group practices generally (and in those included in this study). Therefore, these practices cannot easily generate a computerized drug profile for patients. Nonetheless, in a substantial majority of group practices, the physicians and staff maintain patient drug lists in their medical records.

Even more encouraging is the finding that patients of practices maintaining drug lists have lower pharmaceutical costs. For years, various authorities including the Joint Commission on Accreditation of Health Care Organizations have emphasized the importance of complete outpatient medication lists. The potential value of these lists for improved coordination of pharmaceutical care, encouraging patient adherence to medications, optimizing dosing strategies, and minimizing adverse effects in polypharmacy are often cited.<sup>17-24</sup>

The relative paucity of outpatient case management in these group practices is, perhaps, to be expected. At the time these clinics were surveyed, case management programs were more commonly used by HMOs<sup>47,48</sup> or for contract care of special populations.<sup>49-51</sup> There had been few reports of chronic ambulatory disease management programs in the nongeriatric population. These were largely for patients with diabetes, and these were often located at academic health centers.<sup>52</sup> Furthermore, the revenue from the practice organizations we studied was predominantly derived from modified fee-for-service rather than capitation programs. Therefore, there may have been limited financial incentives for these practices to use outpatient case managers. Not surprisingly, only the larger group practices in our study had case managers for ambulatory patients. Nonetheless, practices that did use outpatient case managers were associated with lower prescription drug costs for their HMO members.

Perhaps the most intriguing findings relate to group practice policies regulating physician interaction with PSRs. Teaching hospitals have reported a variety of policies regarding interactions between residents and sales representatives.<sup>53</sup> Institutions that maintain accredited continuing medical education programs must follow strict guidelines regarding the use of sales support in formal education.<sup>54</sup> Several professional organizations have published policies on physician interactions with sales representatives.<sup>29,30</sup> Although it is clear that the pharmaceutical industry expends substantial resources to interact with physicians in ambulatory practice,<sup>39</sup> there are few studies describing the effects of these interactions.

Our data reveal that over half of the group practices surveyed had some policy in their clinic regarding physician interaction with PSRs. Most policies related to managing the times when PSRs might visit physicians or limiting visits to groups rather than to individual physicians. Very few clinics reported more stringent policies, such as not accepting sample medications or prohibition of gifts by sales representatives. Nonetheless, the presence of these modest policies was associated with lower prescription drug costs for patients.

Several limitations should be considered when interpreting these results. A fundamental limitation derives from the fact that the cost data for this study came from 1995, while the surveys reflected clinic characteristics in early 1996. Therefore, readers must take great care in ascribing a causal relationship to clinic characteristics associated with

increased cost. For example, a clinic that recognized a cost problem during 1995 might have subsequently introduced a pharmacotherapy cost management strategy (observed in our 1996 survey). One such cost problem could be our finding that clinics profiling physician drug utilization had higher prescription drug costs for their patients. Alternatively, group practices that did not have a problem with pharmaceutical expenditures may have elected not to focus on this aspect of practice profiling. In either case, we might observe the reported association between the presence of such profiles and higher prescription drug costs.

Colinearity was observed between organizational size and several of the pharmaceutical cost management strategies. Therefore, the coefficients observed for each of these strategies also reflect group size to some extent. A possible explanation for the confounded relationship between group practice size and the effect of the strategies is professional culture of the practice.<sup>55</sup> Physicians who join larger group practices may be more willing or able to support the resources required to implement cost management strategies. Larger groups also may have a more cost-conscious culture due to a greater degree of practitioner peer pressure to contain costs or a stronger medical leadership. Whatever the reasons, we did not study the impact of the medical culture in this project. This finding further suggests a conservative approach to claiming that the strategies actually caused the observed decrease in outpatient pharmaceutical costs. Studies that prospectively evaluate the impact of such strategies on outpatient pharmaceutical costs are needed to determine the true cause-effect relationship, controlling for group size in the design.

An additional limitation of our study derives from the fact that it was conducted in the relatively unusual environment of the upper Midwest. HMOs have long been prominent in Minnesota, and this region remains 1 of the most advanced managed care markets in the continental United States. It should be noted, however, that more than 30% of the enrollees lived in rural areas, where intensively managed health plans are a relatively recent phenomenon. Minnesota also is characterized by a long tradition of group-style medical practice. Less well-established group practices or newer forms of organizing physicians (such as group practices without walls) may not be as effective in implementing care management strategies.

Another limitation is imposed by the quasi-experimental nature of this research. The pharmaceutical

cost management strategies under study were not assigned randomly to physician practices. Instead, group practices chose whether they wished to adopt particular strategies. Thus, the results we report are only measures of association between the presence of these strategies and cost per member for practices that chose to adopt these strategies. We cannot conclude that applying a specific care management technique to an unselected group practice would produce the same results we observed for group practices that chose voluntarily to adopt it. Further, a future research model that includes a hierarchical design to more rigorously describe the relationship between overall healthcare costs and pharmaceutical costs may be even more revealing than this current analysis.

Nonetheless, our study reveals considerable variability in the application of pharmaceutical cost management strategies across primary care group practices in the upper Midwest. These variations are associated with significant and potentially important differences in the costs of prescription drugs for patients cared for by these clinics. In particular, primary care gatekeeping, use of outpatient medication record lists, use of outpatient case managers, and the presence of policies on physician interaction with PSRs were associated with lower prescription drug costs for patients of these group practices.

The results of this study were based on data obtained in 1995 and 1996. Since the time of the study, several financial environmental changes have taken place. With the rapid escalation of direct-to-consumer advertising and prescription drug costs, as well as decreasing clarity of financial risk for physician practices in relationship to drug costs, the strategies studied may be even more relevant to contributing toward cost-effective prescribing. This study provides additional insight into the possible benefit of incorporation of such strategies into group practices.

... REFERENCES ...

1. **Smith S, Heffler S, Freeland M.** The next decade of health spending: A new outlook. The National Health Expenditures Projection Team. *Health Aff* 1999;18(4):86-95.
2. **Mehl B, Santell JP.** Projecting future drug expenditures—1998. *Am J Health Syst Pharm* 1998;55:127-136.
3. **Gold M, Joffe M, Kennedy TL, Tucker AM.** Pharmacy benefits in health maintenance organizations. *Health Aff* 1989;8(3):182-190.
4. Rx needed for ailing pharmaceutical industry [Industry Surveys]. *Health Care* September 9, 1993.
5. **US Dept of Health and Human Services.** *Medicaid Drug Use Review Demonstration Projects. Report to Congress.* Washington, DC: US Government Printing Office; 1994.
6. **Hillman AI, Pauly MV, Escarce JJ, et al.** Financial incentives and drug spending in managed care. *Health Aff* 1999;18(2):189-200.
7. **Forrest CB, Starfield B.** The effect of first contact care with primary care clinicians on ambulatory health care expenditures. *J Fam Pract* 1996;43:40-48.
8. **Rich EC, Kralewski J, Feldman R, Dowd B, Bernhardt TS.** Variations in the management of primary care. *Arch Intern Med* 1998;158:2363-2371.
9. **Greco PJ, Eisenberg JM.** Changing physicians' practices. *N Engl J Med* 1993;329:1271-1274.
10. **Berg AO, Atkins D, Tierney W.** Clinical practice guidelines in practice and education. *J Gen Intern Med* 1997;12(suppl 2):S25-S33.
11. **Katz DA, Griffith JL, Beshansky JR, Selker HP.** The use of empiric clinical data in the evaluation of practice guidelines for unstable angina. *JAMA* 1996;276:1568-1574.
12. **Flood AB, Fremont AM, Jin K, Bott DM, Ding J, Parker RC.** How do HMOs achieve savings? The effectiveness of one organization's strategies. *Health Serv Res* 1998;33(1):79-99.
13. **Friedhoff SG.** Intensive case management of high-risk patients in a family medicine residency setting. *J Am Board Fam Pract* 1999;12(4):264-269.
14. **Cunningham LG, Koen MJ.** Improving patient care delivery with integrated case management. *Health Finance Manage* 1996;50(12):34-35.
15. **Aubert RE, Herman WH, Waters J, et al.** Nurse case management to improve glycemic control in diabetic patients in a health maintenance organization. A randomized, controlled trial. *Ann Intern Med* 1998;129(8):605-612.
16. **Bates DW, Cullen DJ, Laird N, et al.** Incidence of adverse drug events and potential adverse drug events. Implications for prevention. *JAMA* 1995;274(1):29-34.
17. **Bleich HL, Beckley RF, Horowitz GL, et al.** Clinical computing in a teaching hospital. *N Engl J Med* 1985;321(12):756-764.
18. **Woodward B.** The computer-based patient record and confidentiality. *N Engl J Med* 1995;333(21):1419-1422.
19. **Joint Commission on Accreditation of Health Care Organizations.** Special report on sentinel events. *Jt Comm Perspect* 1998;18(6):19-33, 36-42.
20. *Guidelines for Medical Record Review.* Omaha, NE: Mutual of Omaha Companies Managed Health Care Programs; December 1998.
21. **Zastrow R.** Computer-based patient records. *N Engl J Med* 1996;334(17):1140.
22. **Chin HL, Krall MA.** Successful implementation of a comprehensive computer-based patient record system in Kaiser Permanente Northwest: Strategy and experience. *Effective Clin Pract* 1998;1(2):51-60.
23. **West SL, Strom BL, Freundlich B, Normand E, Koch G, Savitz DA.** Completeness of prescription recording in outpatient medical records from a health maintenance organization. *J Clin Epidemiol* 1994;47(2):165-171.
24. **Tang PC, LaRosa MP, Gorden SM.** Use of computer-based records, completeness of documentation, and appropriateness of documented clinical decisions. *J Am Med Inf Assoc* 1999;6(3):245-251.
25. **Ornstein SM, Jenkins RG, Lee FW, et al.** The computer-based patient record as a CQI tool in a family medicine center. *Jt Comm J Qual Improv* 1997;23(7):347-361.
26. **IMS Health.** US pharmaceutical industry spent more than \$5.8 billion on product promotion in 1998. Available at: [http://www.imshealth.com/html/news\\_arc/04\\_21\\_1999\\_195.htm](http://www.imshealth.com/html/news_arc/04_21_1999_195.htm). Accessed April 21, 1999.
27. **Caudill TS, Johnson MS, Rich EC, McKinney WP.** Physicians, pharmaceutical sales representatives, and the cost of prescribing. *Arch Fam Med* 1996;5:201-206.

28. **Avorn J, Chen M, Hartley R.** Scientific versus commercial sources of influence on the prescribing behavior of physicians. *Am J Med* 1982;73:4-8.
29. **Council on Ethical and Judicial Affairs of the American Medical Association.** Gifts to physicians from industry. *JAMA* 1991;265:501.
30. **American College of Physicians.** Physicians and the pharmaceutical industry. *Ann Intern Med* 1990;112:624-626.
31. **Ferguson RP, Rhim E, Belizaire W, Egede L, Carter K, Lansdale T.** Encounters with pharmaceutical sales representatives among practicing internists. *Am J Med* 1999;107(2):149-152.
32. **Johnstone RE, Valenzuela RC, Sullivan D.** Managing pharmaceutical sales activities in an academic anesthesiology department. *J Clin Anesth* 1995;7(6):544-548.
33. **Kralewski JE, Rich EC, Bernhardt T, Dowd B, Feldman R, Johnson C.** The organizational structure of medical group practices in a managed care environment. *Health Care Manage Rev* 1998;23(2):76-96.
34. **Weiner JP, Starfield BH, Steinwachs DM, Mumford LM.** Development and application of a population-oriented measure of ambulatory care case-mix. *Med Care* 1991;29:452-472.
35. **Manning WG, Newhouse JP, Keeler EB, Leibowitz A, Marquis MS.** Health insurance and the demand for health care. *Am Econ Rev* 1987;77:251-277.
36. **Starfield B, Weiner J, Mumford L, Steinwachs D.** Ambulatory care groups: A categorization of diagnoses for research and management. *Health Serv Res* April 1991;26:53-74.
37. **Keppel G.** *Design and Analysis—A Researcher's Handbook*. 3rd ed. Englewood Cliffs, NJ: Prentice Hall; 1991:167.
38. **Kennedy PE.** Estimation with correctly interpreted dummy variables in semilogarithmic equations [letter]. *Am Econ Rev* 1981;71:801.
39. **Wolfe SM.** Why do American drug companies spend more than \$12 billion a year pushing drugs? Is it education or promotion? *J Gen Intern Med* 1996;11:637-639.
40. **Starfield BH.** *Primary Care: Concept, Evaluation and Policy*. New York, NY: Oxford University Press; 1992.
41. **Gupta S, Rappaport HM, Bennett LT.** Polypharmacy among nursing home geriatric Medicaid residents. *Ann Pharmacother* 1996;30:946-950.
42. **Williams BR, Nichol MB, Lowe B, Yoon PS, McCombs JS, Margolies J.** Medication use in residential care facilities for the elderly. *Ann Pharmacother* 1999;33:149-155.
43. **Cooper JW.** Adverse drug reaction-related hospitalizations of nursing facility patients: A 4-year study. *South Med J* 1999;92:485-490.
44. **Hanlon JT, Schmader KE, Koronkowski MJ, et al.** Adverse drug events in high risk older patients. *J Am Geriatr Soc* 1997;45:945-948.
45. **Lee RD.** Polypharmacy: A case report and new protocol for management. *J Am Board Fam Pract* 1998;11:140-144.
46. **Monane M, Monane S, Semla T.** Optimal medication use in elders. Key to successful aging. *West J Med* 1997;167:233-237.
47. **Pacala JT, Boulton C, Hepburn KW, et al.** Case management of older adults in health maintenance organizations. *J Am Geriatr Soc* 1995;43:538-542.
48. **Freund DA, Neuschler E.** Overview of Medicaid capitation and case-management initiatives. *Health Care Finance Rev* 1986;28(Spec No):21-30.
49. **Wimberley ET, Blazyk S.** Monitoring patient outcome following discharge: A computerized geriatric case-management system. *Health Soc Work* 1989;14:269-276.
50. **Florio ER, Rockwood TH, Hendryx MS, Jensen JE, Raschko R, Dyck DG.** A model gatekeeper program to find the at-risk elderly. *J Case Manage* 1996;5:106-114.
51. **Applebaum R, Mayberry P.** Long-term care case management: A look at alternative models. *Gerontologist* 1996;36:701-705.
52. **Lawler FH, Viviani N.** Patient and physician perspectives regarding treatment of diabetes: Compliance with practice guidelines. *J Fam Pract* 1997;44:369-373.
53. **Lurie N, Rich ED, Simpson DE.** Pharmaceutical representatives in academic medical centers: Interaction with faculty and housestaff. *J Gen Intern Med* 1990;5:240-243.
54. **AAMC Ad Hoc Committee on Misconduct and Conflict of Interest in Research.** Guidelines for faculty involvement in commercially supported continuing medical education. *Acad Med* 1992;67:618-621.
55. **Kralewski JE, Wingert TD, Barbouche MH.** Assessing the culture of medical group practices. *Med Care* 1996;34:377-388.