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Chronic Disease Medication Use in Managed Care and Indemnity Insurance Plans

Randall S. Stafford, Stephen M. Davidson, Harriet Davidson, Heidi Miracle-McMahill, Sybil L. Crawford, and David Blumenthal

Objective. To evaluate the impact of managed care on the use of chronic disease medications.

Data Source. Claims data from 1997 from two indemnity and three independent practice association (IPA) model managed care insurance plans.

Research Design. Cross-sectional analysis of claims data.

Data Collection. Adult patients with diabetes mellitus (DM, $n = 26,444$), congestive heart failure (CHF, $n = 7,978$), and asthma ($n = 9,850$) were identified by ICD-9 codes. Chronic disease medication use was defined through pharmacy claims for patients receiving one or more prescriptions for drugs used in treating these conditions. Using multiple logistic regression we adjusted for patient case mix and the number of primary care visits.

Principal Findings. With few exceptions, managed care patients were more likely to use chronic disease medications than indemnity patients. In DM, managed care patients were more likely to use sulfonylureas (43 percent versus 39 percent for indemnity), metformin (26 percent versus 18 percent), and troglitazone (8.8 percent versus 6.4 percent), but not insulin. For CHF patients, managed care patients were more likely to use loop diuretics (45 percent versus 41 percent), ACE inhibitors or angiotensin receptor blockers (50 percent versus 41 percent), and beta-blockers (23 percent versus 16 percent), but we found no differences in digoxin use. In asthma, managed care patients were more likely to use inhaled corticosteroids (34 percent versus 30 percent), systemic corticosteroids (18 percent versus 16 percent), short-acting beta-agonists (42 percent versus 33 percent), long-acting beta-agonists (9.9 percent versus 8.6 percent), and leukotriene modifiers (5.4 percent versus 4.1 percent), but not cromolyn or methylxanthines. Statistically significant differences remained after multivariate analysis that controlled for age, gender, and severity.

Conclusions. Chronic disease patients in these managed care plans are more likely to receive both inexpensive and expensive medications. Exceptions included older medications partly supplanted by newer therapies. Differences may be explained by the fact that patients in indemnity plans face higher out-of-pocket costs and managed care plans promote more aggressive medication use. The relatively low likelihood of condition-specific medications in both plan types is a matter of concern, however.

Key Words. Managed care, physician practice patterns, medication prescribing, chronic disease

There is substantial concern that incentives embedded in managed care (MC) will result in compromised quality of care (Druss et al. 2000). By shifting financial risk to the providers of care, the fear is that services may be withheld or delayed for economic reasons. The use of medications in the treatment of chronic medical conditions may be particularly susceptible to these forces because of the long-term need for costly therapy. If financial constraints cause key medications to be underused, then MC could result in reduced quality of care, especially for patients with chronic conditions. The growing elderly population and the promotion of MC for the Medicare population makes this a critical issue.

Measurement of quality of care across the national spectrum of MC plans through the Health Plan Employer Data and Information Set (HEDIS, National Committee for Quality Assurance 1999) and other measures suggest that many indicators fall short of expectation and vary substantially among plans. Although those results show apparent deficits for MC patients compared to a norm, it is not clear whether they are disadvantaged compared to non-MC patients. Past studies have reported a range of findings, with some noting superior quality of care in MC and others noting inferior quality (Miller and Luft 1994, 1997, 2002; Hellinger 1998). No consistent differences have been observed, although a predominance of findings is consistent with equal or somewhat better quality in MC. Likewise, there are no consistent differences in patterns of medication use, although several studies suggest greater medication use among chronic disease patients in MC. The reason for the latter finding may reflect higher levels of benefits available to MC members or lower out-of-pocket expenses associated with seeking this service (Sullivan 1999; Miller and Luft 2002).

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To answer continuing questions about patterns of medication use in MC, we have acquired and analyzed claims data from multiple health plans in a single market for patients with a range of chronic conditions. Consistent with widely held perceptions of MC (Hilzenrath 1997), we specifically test whether medication therapy for diabetes mellitus (DM), congestive heart failure (CHF), and asthma were less likely for MC patients and whether their adoption of newer therapies by MC patients was less rapid.

METHODS

Data Source

This study reports data from a midsize northeastern city with substantial MC penetration. As in most areas, employers arranged for much of the population's health insurance coverage and paid a portion of the employees' premiums. The MC organizations in this study were of the Independent Practice Association (IPA) model in which physicians belong to organizations (IPAs) that contract with the MC plans on their behalf. Both the MC plans and the IPAs were at financial risk, in that expenditures in excess of premium revenues would result in fiscal deficits. Similar to indemnity arrangements, however, payments were made by the MC plans to physicians and other providers based on claims for services rendered. Many of the same physicians cared for both MC and indemnity patients. In addition to two large private MC plans, residents were covered by a large indemnity plan and by MC and non-MC Medicare plans. Although the state's Medicaid program was not included in the study, the data are otherwise representative of the region's insured population.

The study uses records of paid medical and pharmacy claims from all five plans (three MC and two indemnity) for 1997. Of the three managed care plans, one was a risk-based Medicare plan, and the other two were employer-based plans. Of the indemnity plans, one was a Medicare plan, including Medigap supplement, while the other was an employer-based plan. For all insurers, including the MC plans, individual providers and pharmacies were paid on the basis of claims submitted. Three separate pharmaceutical benefits managers processed pharmacy claims. By aggregating claims records from the five plans, we constructed a complete record of services received by members in the sample. Because the large number of within-type variations in coverage, including those for pharmacy benefits, made it infeasible to examine the effects of individual insurance policy characteristics (e.g., by the amount of a

policy's deductible), data were aggregated by the two plan types (i.e., MC and indemnity insurance). All patients covered by managed care plans faced no deductible before being eligible for services under their plans and usually paid only modest copayments out-of-pocket for each service received and prescription filled. In contrast, patients covered by indemnity plans faced out-of-pocket patient payments of several hundred dollars for deductibles as well as coinsurance for each service used, including prescriptions.¹

Our principal outcome was the pattern of disease-specific medications received by patients with diagnoses of DM, CHF, and asthma. Both physicians' prescribing and patients' prescription-filling behavior influence these patterns. Diabetes mellitus, CHF, and asthma were chosen because these chronic conditions are highly prevalent, contribute substantially to health care costs, and disease management (especially medication use) plays a key role in determining health outcomes. The role of medications differs for each condition. Diabetes mellitus management focuses on the prevention of acute decompensation and of long-term complications through a variety of potentially substitutable or combinable medications that lower blood sugar. Congestive heart failure management is focused on symptom relief and prevention of decompensation through medications that maintain adequate function of a failing heart through a variety of mechanisms. Asthma symptom alleviation and the prevention of flare-ups are achieved through medications that either reduce airway inflammation or directly reverse airway constriction. We identified adult (18 years or older) members of plans in our sample who had a diagnosis of asthma, DM, or CHF based on *International Classification of Disease Codes-Ninth Revision (ICD-9)* diagnoses on medical claims.² Both inpatient and outpatient claims were included in this process and members could be included in more than one diagnosis category.

To simplify the analysis, we included only members who were covered for the full year by either an MC plan or an indemnity plan. This yielded 26,444 members with DM, 7,978 with CHF, and 9,850 with asthma. Indemnity plans had 10,440 members with DM, 5,103 with CHF, and 1,981 with asthma. Managed care plans had 16,004 members with DM, 2,875 with CHF, and 7,869 with asthma. Distribution of members by gender was similar for indemnity (42 percent male) and managed care plans (46 percent male). Indemnity members were more likely to be older than 65 years old (73 percent) compared to managed care members (26 percent, $p < 0.001$). Correspondingly, disease severity was greater among indemnity members than those in managed care. The mean health status score using the Diagnostic Cost Group software (DxCG, Inc. 1999) was 5.47 (standard deviation 9.44) for

indemnity members and 2.66 (standard deviation 5.73) for those in managed care.

For each chronic disease, we used drug names and Generic Product Identifier (GPI) drug codes (MediSpan, Indianapolis, IN) on outpatient pharmacy claims to identify disease-specific classes of medications that figure prominently in chronic disease management. For DM, we examined insulin, sulfonylureas (first and second generations), metformin, and troglitazone. For CHF, we examined loop diuretics, beta-blockers, angiotensin-converting enzyme (ACE) inhibitors/angiotensin-2 receptor blockers (ARBs), and digoxin. For asthma, we examined use of inhaled and systemic corticosteroids, short- and long-acting beta-agonists, cromolyn sodium (and related compounds), methylxanthines, and leukotriene modifiers. We calculated the proportion of patients with each disease obtaining one or more prescriptions for these medication classes during 1997.

Statistical Analyses

We compared the use of these medications by chronically ill persons with MC and indemnity coverage. Unadjusted proportions of members who received specific classes of medication were calculated separately for those in indemnity and MC plans. Unadjusted odds ratios and 95 percent confidence intervals were calculated comparing the proportion of indemnity patients to MC patients receiving each drug class at least once during the year. Odds ratios above 1.00 reflect greater likelihood of use among MC compared to indemnity patients.

Because patient factors affect whether they receive specific medications, we used logistic regression modeling to adjust the comparisons for several potential confounders: age, gender, health status or risk, number of primary care visits, and specific comorbidities. Risk-adjustment information was derived from the Diagnostic Cost Groups methodology (DxCg, Inc. 1999). Logistic regression models were developed for each medication class controlling for age, gender, number of primary care visits, the presence of specific comorbidities defined by DxCg condition categories, and the health risk score derived from the DxCg methodology (representing future predicted resource use). In each of these three disease-specific models, age was defined in the categories of <30, 30–45, 46–60, 61–74, and 75+ years. The number of primary care visits were grouped as 0, 1, 2, 3–4, 5–6, 7–8, 9–10, 11–20, and 21+ visits in 1997. The health risk score was that derived using ICD-9 codes from all inpatient and direct contact outpatient encounters to

predict health care resource use with the DxCG concurrent risk model. These risk scores were categorized into five strata for the regression analysis. This DxCG model also identified each member's status on a range of hierarchical condition categories (HCCs).³

Because of the disproportionate number of elderly with indemnity insurance, we also analyzed the patterns of medication use rates separately for patients younger than age 65 and those aged 65 and older as proxies for commercial plans and Medicare, respectively.

RESULTS

With few exceptions, MC patients were more likely to use chronic disease medications than indemnity patients with the selected chronic diseases (Table 1). The difference in medication use in MC compared to indemnity plans was greater for newer medications. However, for both MC and indemnity plans a substantial fraction of patients with these three chronic conditions used no condition-specific medications.

Medications for Diabetes Mellitus

For patients with DM, those enrolled in MC plans were more likely to receive medications for their DM. Although this pattern applied to both older and newer medications, the magnitude of the differences was greater for newer medications. Second generation sulfonylureas were more likely to be used by patients in MC (42 percent versus 37 percent, $p < 0.001$), but not by the small numbers still using first-generation sulfonylureas (1.3 percent versus 1.5 percent, $p = \text{NS}$). The differential between MC and indemnity was even more substantial for newer agents. Metformin was a third more likely to be used by MC patients (26 percent) compared to indemnity patients (18 percent, $p < 0.001$). Similarly, troglitazone was 38 percent more likely in MC (8.8 percent) than in indemnity (6.4 percent, $p < 0.001$). While insulin use was slightly higher in MC patients (23 percent) compared to indemnity (21 percent, $p = 0.02$), this difference disappeared in multivariate analysis that adjusted for patient case mix ($p = \text{NS}$). Aside from the case of insulin, the other findings of higher medication use remained statistically significant in multivariate analysis. As with the unadjusted analysis, the largest differential was noted for metformin (adjusted odds ratio 1.29, 95 percent CI 1.21–1.39).

Table 1: Percent of People with Three Chronic Illnesses Using Particular Medications, by Managed Care and Indemnity Insurance, 1997

	Managed Care		Indemnity		Unadjusted Odds Ratio (95% CI)*	Adjusted Odds Ratio† (95% CI)
	(N)	%	(N)	%		
Diabetes Mellitus						
Sulfonylureas 1 st s	211	1.3	166	1.5	0.82 (0.67-1.01)	1.08 (0.86-1.36)
Sulfonylureas 2 nd s	6,687	42	3,861	37	1.22 (1.16-1.28)	1.22 (1.15-1.29)
Metformin	4,190	26	1,877	18	1.61 (1.52-1.72)	1.29 (1.21-1.39)
Troglitazone	1,411	8.8	674	6.4	1.40 (1.27-1.54)	1.21 (1.08-1.34)
Insulin	3,607	23	2,209	21	1.08 (1.02-1.15)	1.01 (0.94-1.08)
Total	16,004	100	10,440	100		
Congestive Heart Failure						
Loop diuretics	1,292	45	2,091	41	1.17 (1.07-1.29)	1.15 (1.04-1.28)
ACE inhibitors	1,323	46	1,917	38	1.41 (1.29-1.55)	1.15 (1.04-1.28)
ARBs	120	4.1	163	3.1	1.32 (1.03-1.67)	1.11 (0.84-1.45)
Beta-blockers**	664	23	797	16	1.62 (1.44-1.82)	1.38 (1.21-1.57)
Carvedilol	62	2.1	56	1.1	1.98 (1.38-2.85)	1.18(0.76-1.82)
Digoxin	931	32	1,640	32	1.01 (0.91-1.11)	0.97 (0.87-1.08)
Total	2,875	100	5,103	100		
Asthma						
Inhaled corticosteroids	2,708	34	591	30	1.23 (1.10-1.37)	1.33 (1.18-1.50)
Systemic corticosteroids	1,415	15	309	16	1.18 (1.03-1.35)	1.31 (1.13-1.53)
Short-acting beta-agonists	3,310	42	653	33	1.47 (1.33-1.63)	1.38 (1.23-1.55)
Long-acting beta-agonists	786	9.9	172	8.6	1.16 (0.98-1.38)	1.18 (0.98-1.43)
Leukotriene modifiers	429	5.4	82	4.1	1.33 (1.04-1.70)	1.33 (1.02-1.72)

continued

Table 1: Continued

	Managed Care		Indemnity		Unadjusted Odds Ratio (95% CI)*	Adjusted Odds Ratio† (95% CI)
	(N)	%	(N)	%		
Cromolyn	383	4.8	90	4.5	1.07 (0.85–1.36)	1.04 (0.81–1.34)
Methylxanthines	723	9.1	180	9	1.01 (0.85–1.20)	1.24 (1.02–1.50)
Total	7,869	100	1,981	100		

*CI indicates confidence interval.

†Adjusted odds ratios for the likelihood of specific chronic disease medications being prescribed in managed care versus indemnity health plans, adjusted for patient age, sex, number of primary care visits, risk score category calculated using a Diagnosis Cost Group (DxCG) model and selected comorbidities identified via the DxCG model. Odds ratios above 1.00 reflect more likely use among managed care patients compared to indemnity patients.

§Sulfonylureas 1st refers to first-generation medications in this class, while Sulfonylureas 2d refers to second-generation medications in this class.

***Excluding carvedilol.

Medications for Congestive Heart Failure

For CHF patients, too, those in MC plans were more likely to receive a range of medications, including both older and, especially, newer medications. Patients enrolled in MC plans showed greater use of loop diuretics (45 percent) compared to patients in indemnity plans (41 percent, $p < 0.001$). The use of ACE inhibitors or ARBs was more likely in MC (49 percent) compared to indemnity (40 percent, $p < 0.001$). The use of beta-blockers (including carvedilol) in MC (25 percent) was greater than in indemnity (16 percent) by a similar magnitude ($p = 0.001$). However, use of digoxin, an older medication, was the same in MC patients (32 percent) and indemnity patients (32 percent, $p = \text{NS}$). In multivariate analysis to adjust for patient case mix, MC was independently associated with higher rates of medication use for these medications at $p < 0.001$, with the exception of loop diuretics ($p = 0.003$) and digoxin (NS). As with the unadjusted analysis, the largest differential was noted for beta-blockers (adjusted odds ratio 1.38, 95 percent CI 1.21–1.57). Given the prominence of ACE inhibitors in clinical guidelines, their use was relatively low in both MC and indemnity patients with CHF.

Medications for Asthma

For asthma patients, as well, those covered by MC plans were more likely to use medications. As with CHF and DM, increased medication use in MC was most dramatic for newer drugs, but applied to some older drugs, as well. The chance of an asthma patient receiving inhaled corticosteroids was greater in MC (34 percent) compared to indemnity (30 percent, $p < 0.001$). Similarly, systemic corticosteroids were more likely in MC (18 percent) than in indemnity (16 percent, $p < 0.02$). As a mainstay of treatment, short-acting beta-agonists were more likely in MC (42 percent) compared to indemnity (33 percent, $p < 0.001$). Among newer medications, long-acting beta-agonists were used more frequently by MC patients (9.9 percent) than by indemnity patients (8.6 percent, $p = 0.05$). The newest class of medications, leukotriene modifiers, was 32 percent more common in MC (5.4 percent) compared to indemnity (4.1 percent, $p = 0.01$). No differences were found for cromolyn sodium and its relatives (4.8 percent in MC versus 4.5 percent in indemnity, $p = \text{NS}$) or for methylxanthines (9.1 percent in MC versus 9.0 percent in indemnity, $p = \text{NS}$). After multivariate analysis to adjust for potential case-mix differences, these findings persisted with the largest differences between MC and indemnity patients noted for leukotriene modifiers (AOR 1.33, 95 percent CI 1.02–1.72). Given the first-line status that clinical guidelines accord to

inhaled steroids and inhaled short-acting beta-agonists, their overall use was relatively low in both MC and indemnity patients.

Analysis of Drug Groupings and by Patient Age

Table 1 shows that for almost all medications for all three diagnoses, patients with MC coverage were consistently more likely to use the drugs than those with indemnity insurance. To determine whether those differences are explained in part by the way the data were analyzed, we grouped similar medications that could substitute for one another and also analyzed results separately for patients younger than age 65 and those aged 65 and older. Table 2 shows the results for the grouped medications. In every case, the probability that MC patients would use the drugs was higher than that for indemnity patients, and the odds ratios (adjusted for age, gender, and severity) remained statistically significant.

We also analyzed the patterns of medication use for our three clinical conditions separately for patients who were younger than 65 years and 65 years or older. For each age group, patients with managed care plans were more likely to have received chronic disease medications (Table 3). In general,

Table 2: Percent of People with Three Chronic Illnesses Using Particular Groups of Medications, by Managed Care and Indemnity Insurance, 1997

			<i>Comparison</i>	
	<i>Managed Care %</i>	<i>Indemnity %</i>	<i>Unadjusted Odds Ratio (95% CI)</i>	<i>Adjusted Odds Ratio (95% CI)</i>
Diabetes				
1 st or 2 ^d sulfonylureas	42.7	38.2	1.20 (1.14–1.26)	1.22 (1.15–1.29)
All noninsulin hypoglycemics* (Number)	63.0 (16,004)	56.4 (10,440)	1.31 (1.25–1.38)	1.35 (1.28–1.44)
CHF				
ACE/ARB	48.8	39.5	1.45 (1.33–1.60)	1.18 (1.06–1.31)
Carvedilol or beta-blockers (Number)	24.6 (2,875)	16.2 (5,103)	1.68 (1.50–1.88)	1.41 (1.24–1.60)
Asthma				
Asthma “controllers”** (Number)	39.2 (7,869)	33.2 (1,981)	1.29 (1.17–1.44)	1.40 (1.24–1.57)

*All noninsulin hypoglycemics: Sulfonylureas 1st and 2d, Metformin, Rezulin, and ACE/ARB. Asthma “controllers” are claims for inhaled steroids, cromolyn, leukoriene, and long-acting beta-agonists.

Adjusted models are the same as in the first analyses presented in Table 1.

Table 3: The Percent of People with Three Chronic Illnesses Using Prescription Medications, by Managed Care and Indemnity Health Insurance and by Age, 1997

	<i>Younger Than Age 65</i>		<i>Aged 65 and Older</i>	
	<i>Managed Care</i>	<i>Indemnity</i>	<i>Managed Care</i>	<i>Indemnity</i>
Diabetes Mellitus				
(Number of members)	(11,015)	(3,249)	(4,989)	(7,191)
Sulfonylureas 1 ^{st†}	0.9	0.6	2.4	2.0
Sulfonylureas 2 ^{d†}	41.4	31.1***	42.7	39.6***
Metformin	29.1	18.8***	19.8	17.6**
Troglitizone	9.7	7.0***	6.9	6.2
Insulin	25.3	21.1***	16.5	21.2***
Any DM medication	74.6	58.1***	66.8	66.3
Congestive Heart Failure				
(Number of members)	(1,041)	(455)	(1,834)	(4,648)
Loop diuretics	42.8	31.2***	46.2	41.9**
ACE inhibitors	52.6	37.8***	42.3	37.5***
ARBs	6.1	3.3*	3.1	3.2
Beta-blockers [§]	25.5	16.7***	21.8	15.5***
Carvedilol	3.9	1.5*	1.2	1.1
Digoxin	31.1	24.8*	33.1	32.9
Any CHF medication	72.0	52.1***	63.1	56.4***
Asthma				
(Number of members)	(7,401)	(1,344)	(468)	(637)
Inhaled corticosteroids	34.4	29.0***	35.3	31.6
Systemic corticosteroids	17.8	14.9**	20.5	17.1
Short-acting beta-agonists	42.6	33.9***	34.0	31.1
Long-acting beta-agonists	10.0	7.9*	10.3	10.4
Leukotriene modifiers	5.5	3.9*	4.5	4.6
Cromolyn	5.0	4.8	2.8	4.1
Methylxanthines	9.0	8.0	12.4	11.5
Any asthma medication	56.9	45.5***	53.9	48.2

*Statistically significant between managed care and indemnity at $p < 0.05$.

**Statistically significant between managed care and indemnity at $p < 0.01$.

***Statistically significant between managed care and indemnity at $p < 0.001$.

[†]Sulfonylureas 1st refers to first-generation medications in this class, while Sulfonylureas 2d refers to second-generation medications in this class.

[§]Excluding carvedilol.

the magnitude of the managed care versus indemnity differences was smaller for patients 65 years or older. This pattern, in addition to the relatively smaller sample sizes for older patients with asthma meant that fewer managed care versus indemnity differences were statistically significant for older patients.

DISCUSSION

Contrary to public perception, the use of medications for chronic diseases was consistently more likely in patients covered by MC plans compared to those covered by indemnity plans. Although this generalization applied to the vast majority of medications that were examined, it was more pronounced for newer medications. For example, MC patients with asthma were 32 percent more likely to use leukotriene modifiers than indemnity patients and metformin in DM was 44 percent more common in MC compared to indemnity insurance. These patterns were consistent across DM, CHF, and asthma patients. The few exceptions included insulin, first generation sulfonylureas, digoxin, cromolyn, and methylxanthines, all of which are older medications whose use has been partly supplanted by newer therapies. Our multivariate analysis generally reduced the magnitude of the observed MC versus indemnity differences.

Our findings are consistent with past studies comparing medication use in MC and indemnity plans. In Miller and Luft's three reviews (1994, 1997, 2002), studies concerned with medication use or chronic disease management presented a mixed picture, but with relatively few studies showing worse treatment or outcomes in MC patients. Specific individual studies suggest that use of chronic disease medications was either equivalent (Coffey et al. 1995) or more likely (McCormick et al. 1999; Glied 1997) in patients with MC coverage. Our results also are consistent with speculation that practice differences in MC may be related to characteristics of coverage, especially comparative cost-sharing provisions, which lower the barriers to utilization for MC patients compared to indemnity patients. Our finding of markedly increased probability of using newer therapies in MC appears to be unique.

Medication Use as a Potential Quality Indicator

The relationship between patterns of medication use and quality of care is complex. While this study lacks the detailed clinical data that would allow definitive assessment of this relationship, some tentative conclusions about quality may be possible. In some cases, the medications we studied are

recommended therapy and their increased use in MC is a likely associated with higher quality. For example, the use of ACE inhibitors in congestive heart failure is strongly recommended as first-line pharmacotherapy (Agency for Health Care Policy and Research 1994). For some other medications, increased use in MC could suggest higher quality, but only indirectly. For example, the finding of greater inhaled steroid use among MC patients may indicate better quality, with the caveat that the DxCG methodology may not adequately control for severity between MC and indemnity patients with asthma. In contrast, the greater use of newly released medications in MC may not necessarily indicate higher quality. More rapid adoption of new medications may offer patients the latest technology, but may also mean abandoning well-established medications in favor of less fully proven medications.

For CHF, clinical guidelines in existence before 1997 (Agency for Health Care Policy and Research 1994; Committee on the Evaluation and Management of Heart Failure 1995) suggest ACE inhibitors as first-line medications, with the addition of diuretics and then digoxin for patients with continued symptoms. More recent guidelines (e.g., Hunt et al. 2001) remain consistent with this approach. These recommendations are based on a survival benefit for ACE inhibitors not present for diuretics and digoxin alone. Beta-blockers recently have been recommended as an additional first-line agent, again based on a survival benefit (Lee and Spencer 2001; Gombert-Maitland, Baran, and Fuster 2001). Our findings indicate that use of these recommended medications is lower for indemnity patients. Use of digoxin, now recommended to play a subsidiary role in treatment (Haji and Movahed 2000; Hunt et al. 2001), is similar among MC and indemnity patients.

A direct assessment of the quality of DM care from drug prescribing patterns is not possible with our data. Because adequate blood sugar control infrequently results from diet alone and not consistently from sulfonylureas alone (Luna and Feinglos 2001), MC patients' greater probability of using medications, especially metformin and troglitazone, may increase the likelihood of adequate blood sugar control than treatment regimens without these medications. However, the serious adverse effects of troglitazone and its subsequent exit from the market (Gale 2001) demonstrate that the newest medications, with less well-characterized risks and benefits, may also produce adverse clinical outcomes.

For asthma, current treatment guidelines recommend the use of inhaled steroids for patients with more than mild asthma (National Heart, Lung and Blood Institute 1997; Georgitis 1999). These inhalers are often combined with

the use of control agents such as inhaled beta-agonists. While other agents may be useful in treatment, the greater use of inhaled steroids among MC patients may represent better quality of care. In contrast, we found no significant differences between MC and indemnity patients for methylxanthines, a class that may be less optimal for the treatment of adult asthma.

Potential Explanations

Our findings are surprising because it appears that not only are MC patients more likely to use medications than indemnity patients, but also they are more likely to use the newest, least established, most expensive medications. If MC plans exercised control over medication use, as many believe, one would expect them to be slower to adopt relatively unproven, new medications, especially because they are more expensive. Because this appears not to be the case, the question is what accounts for our results. Potential explanations include the following:

1. Higher out-of-pocket costs for indemnity patients may inhibit both drug-seeking behavior during physician visits and the filling and refilling of prescriptions.
2. Managed care patients also face lower financial barriers to seeking physician services and may, therefore, have more opportunities to obtain prescription medications than patients with indemnity coverage.
3. Rather than placing barriers to physician prescribing, these MC plans may have used formal or informal disease management activities to encourage use of medications found in published guidelines in the hope of avoiding higher downstream costs resulting from untreated illness.
4. Although physicians are paid fee-for-service in both plans and, thus, have no financial incentive to alter treatment, they may treat indemnity and managed care patients differently.

Without further analysis, it is difficult to gauge the extent to which each of these factors contributed to the differences we observed. The benefit structure of managed care and disease management programs may translate into differences in medication use through several mechanisms, including a higher probability of physician visits, a greater willingness of physicians to prescribe indicated medications, and a greater willingness of patients to fill the prescriptions they receive. To the extent that they result in higher costs for MC plans, it follows that to offer more generous coverage for medications,

offsetting savings must accrue from other sources. These savings may come from lower rates of hospitalization, shorter lengths of stay, and lower rates of emergency room visits.

The relationship between insurance type and the use of chronic disease medications is similar for patients younger than age 65 years and aged 65 and older (roughly equivalent to patients eligible for Medicare). However, the increased use of medications associated with managed care plans was of greater magnitude and more likely to be statistically significant in patients younger than age 65 years. The less prominent differences for those 65 years or older may reflect the smaller deductibles for Medicare indemnity patients.

Limitations

Several limitations with our analysis need to be acknowledged. Our results may not be fully generalizable because they were derived from a single health care market in 1997. Other geographic markets could potentially have MC plans that operate differently than the ones we have examined. Given the rapid flux in health care systems, our findings from 1997 may not reflect current MC practices. We have used medical claims data to identify individuals with DM, CHF, and asthma, rather than objective diagnostic information. Additional clinical information would have helped to verify the claims-based diagnoses and to provide additional severity information for case-mix adjustment. For several of the medications we investigated, the appropriateness of medication use may depend on disease severity.

Our outcomes were based simply on whether or not one or more prescriptions for specific drugs were filled; we did not consider such issues as medication dose, patient adherence, or continuity of treatment. While unmeasured case-mix differences could affect our results, past evidence that MC patients tend to be healthier than indemnity patients (Hellinger 1998) makes it less likely that such differences would result in greater MC medication use. On the other hand, there may be limited instances in which sicker patients have contraindications that make the use of some medications less likely.

Similarly, we were unable to determine if some patients had alternative medication payment sources so that their medication use went unaccounted for. This may well be of greater importance for indemnity plan patients because services used before the deductibles have been met may not be included in the claims data. While this is a potentially serious problem for all claims-based research, we believe it does not affect the results reported here.

First, only a very small percentage of patients in each diagnosis group used no services in 1997 (the range was from 1.6 percent to 4.2 percent). In other words, almost everyone met the deductible. Second, the outcome reported in the paper is the proportion of eligibles that used prescription medications during the year in question, not the amount of their use.

Implications

The perception that MC plans withhold expensive services from its members does not appear to be supported by our research. While there may be areas of clinical practice where this phenomenon does operate, it appears not to have been the case with chronic disease medications in this market provide an empirical basis for poor performance as the basis for a “backlash” against MC. Since 1997, an increased proportion of Americans are now enrolled in decentralized Preferred Provider Organizations (PPOs) in part due to this backlash. The findings cannot necessarily be generalized to newer MC arrangements, but should prompt additional assessment of care for persons with chronic illnesses in organizational arrangements that provide more flexibility for consumers.

Our study also suggests the need for studies in other markets, as well as research to more fully define the mechanisms that work to create the observed MC versus indemnity differences in medication use. Although we have speculated about possible mechanisms, other studies that seek to isolate the explanation for our findings will have important policy implications.

NOTES

1. Copayments are a fixed amount (say, \$10) each time a service (e.g., a physician office visit) is used. Coinsurance, in contrast, is a percentage (say, 20 percent) of the approved payment for each service. Coinsurance, especially when patients must also pay a deductible before they are eligible for services to be covered, usually results in substantially higher out-of-pocket payments than copayments.
2. The following codes were used to define the three conditions. Diabetes mellitus was defined by ICD-9 codes 250, 357.2, 362.0, or 648.0. Congestive heart failure was defined by ICD-9 codes 425.4, 428, 398.91, 402.11, 402.91, 404.01, 404.11, 404.02, 404.13, 404.93, or 996.83. Asthma was defined as patients with ICD-9 codes of 493.0, 493.1, or 493.9, but lacking any other ICD-9 code indicating chronic obstructive pulmonary disease, emphysema, or chronic bronchitis (491, 492, 493.2, 494, 496, 506.4 or 506.9).
3. The following parameters were included in the regression models. The models for DM medications made use of the following HCC groupings as covariates: Coronary

Artery Disease (low, moderate, and high cost, separately; HCCs 50, 51, and 52), CHF (HCC048), Diabetes Mellitus (low, moderate, and high cost, separately; HCCs 13,14, and 15), Depression (HCC 33), Renal Failure (HCCs 76,77, and 78 together), and Skin Ulcers (HCC 91). The CHF medication regression models used: Heart Disease (HCC 54), Coronary Artery Disease (low, moderate, and high cost, separately; HCCs 50, 51, and 52), CHF (HCC 48), Diabetes Mellitus (low, moderate, and high cost, separately; HCCs 13,14, and 15), Cardiac Arrest (HCC 46), Arrhythmia (HCCs 49, 56, separately), Valvular Disease (HCC 53), Other Heart Condition (HCC 55), Depression (HCC 33). The asthma medication regression models employed Asthma (HCC 70), COPD (HCC 64), Pneumonia (HCC 65, 66, and 67 together), Pulmonary Fibrosis (HCC 68), Other Lung Disease (HCC 71), and Depression (HCC 33).

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