Medicaid Prescription Formulary Restrictions and Arthritis Treatment Costs

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Objectives. We used the Arizona Medicaid program as a model to examine the consequences of the relative restrictiveness of nonsteroidal anti-inflammatory drug (NSAID)–preferred drug lists on health care use and costs for Medicaid enrollees with arthritis.

Methods. In a retrospective, cross-sectional study of Medicaid enrollees with rheumatoid arthritis or osteoarthritis, we used data from the Arizona HealthQuery database and generalized linear regression models to estimate the effect of the restrictiveness of formularies on the association between number of NSAID drugs covered and the number of emergency department visits, ambulatory physician visits, hospital stays, and total health expenditures.

Results. For plans with NSAID formularies that were more restrictive, enrollees with rheumatoid arthritis experienced 22% fewer ambulatory visits and 29% more hospitalizations, and enrollees with osteoarthritis experienced 38% fewer ambulatory visits and 52% more hospitalizations. These plans spent an additional $935 for medical care and prescription drugs annually per enrollee with rheumatoid arthritis.

Conclusions. Formularies that are more restrictive significantly change the patterns of health care and prescription drug use and may have unintended consequences in terms of more frequent and, for those with rheumatoid arthritis, more expensive medical care. (*Am J Public Health.* 2008;98:1300–1305. doi:10.2105/AJPH.2007.118133)

Arthritis and other rheumatic diseases are the leading cause of disability in the United States. Rheumatoid arthritis affects 3 million adults, and osteoarthritis affects over 21 million adults.[1] Arthritis is the eighth most costly medical condition.[2] Spending on hospitalizations, ambulatory visits, and prescription drugs is twice as high for persons with arthritis than for those with other chronic conditions and more than 8 times higher than for those with no chronic conditions.[3]

Rheumatoid arthritis is an autoimmune inflammatory disease that targets the joints. Aggressive treatment with pharmaceutical drugs can slow the progression of joint degeneration and help control symptoms. Nonsteroidal anti-inflammatory drugs (NSAIDs) and corticosteroids are often prescribed for pain management of rheumatoid arthritis. Traditionally, disease-modifying antirheumatic drugs (DMARDs) have been prescribed to slow rheumatoid arthritis's progression. Since 1998, biological response modifiers (BRMs), drugs that stimulate the body's response to infection and disease, have been used as an alternative to DMARDs to treat rheumatoid arthritis.

Osteoarthritis is a degenerative, rather than autoimmune, joint disease. Treatment for osteoarthritis is limited and includes the use of NSAIDs, analgesics, and topical creams to alleviate symptoms including joint swelling and pain. Although rheumatoid arthritis and osteoarthritis are two different diseases affecting the joints, NSAIDs are commonly used for pain management in both diseases. In 1998, the Food and Drug Administration (FDA) approved the first cyclooxygenase–2 (COX-2) inhibitor, celecoxib, a subclass of NSAIDs, to help reduce pain and inflammation of arthritis while reducing gastrointestinal complications associated with older NSAIDs.[4] Since their introduction, NSAIDs have remained a mainstay for pain management.

Medicaid is an important source of health insurance for persons with arthritis. All state Medicaid programs include prescription drug benefits, even though states are not required to do so. Medicaid spending associated with prescription drugs doubled (from 5.6% to 12%[5]) between 1992 and 2002. State Medicaid programs have used prescription drug formularies and preferred drug lists to restrict access to more-expensive prescription medications and control rising prescription drug costs. Decisions regarding which drugs to include on a preferred drug list are based on the health plan's assessment of relative clinical benefit within a therapeutic class and judgment about the value to the state on the basis of total cost.[6] As of 2003, 29 state Medicaid fee-for-service programs had obtained legislative approval for a preferred drug list or were in the process of implementing such a list with expanded prior authorization.[6]

Although the purpose of formulary restrictions is to reduce prescription drug expenditures, they may have some unintended consequences. Studies of the consequences of preferred drug lists and prior authorization requirements for other drugs, such as statins and hypertensive medications, have shown that these mechanisms may encourage the substitution of lower cost alternatives that may not be therapeutic equivalents or may increase nonadherence, causing adverse events that ultimately increase medical care costs.[7–10] Research has shown that prior authorization requirements for NSAIDs and, specifically, COX-2 inhibitors have been successful in reducing NSAID use. Fischer et al.[11] found that a prior-authorization requirement for COX-2 inhibitors in state Medicaid programs reduced NSAID use by 15%. Smalley et al.[12] found that NSAID prescriptions decreased by 19% after the Tennessee Medicaid program implemented an NSAID prior-authorization program. The short- and long-term effects of prior-authorization requirements for arthritis medications on health outcomes, however, are not yet clear. One study examined the health impact of NSAID prior-authorization requirements, but results were limited to an 8-week follow-up period after implementing an NSAID brand name prior-authorization requirement, thus providing a very short-term picture of the consequences.[13]

Preferred drug lists often limit access to more expensive drugs or drugs that have entered the market more recently with less-proven clinical effectiveness as a way to control prescription drug spending. Lichtenberg[14] found that the average vintage (i.e., FDA approval year) of drugs used by Medicaid enrollees relative to non-Medicaid enrollees has increased in recent years and that the average age of pain medications, including valdecoxib, celecoxib, and rofecoxib, prescribed for Medicaid enrollees compared with non-Medicaid enrollees was more than 1.2 years older for Medicaid enrollees. Although this study provides some evidence that Medicaid preferred drug lists have had more restrictions on recent-vintage drugs, the consequences for health outcomes is not known, because the relative clinical effectiveness of individual drugs was not taken into consideration.

Preferred drug lists are a mechanism to reduce prescription drug spending, but increases in medical care may offset prescription drug savings. Most studies have not evaluated potential substitution effects (i.e., greater use of nonrestricted drugs or other nondrug health services) in a well-controlled manner.[15] It remains an important but unanswered question whether formularies that are more restrictive reduce or increase spending on medical care and prescription drugs.

We used the Arizona Medicaid program as a model to understand the impact of the relative restrictiveness of NSAID–preferred drug lists on health care use and costs for Medicaid enrollees with arthritis. Arizona has a long and well-established history of managed care, with a number of health plans, each of which is responsible for designing and managing its own preferred drug list. A single state with multiple Medicaid health plans is ideal for examining the effect of preferred drug list comprehensiveness on arthritis health care use.

METHODS

The Arizona Medicaid program, Arizona Health Care Cost Containment System (AHCCCS), covers adults 18 years and older with a household income less than or equal to 100% of the federal poverty level ($1533 per month for a family of 4 in 2003).[16] The AHCCCS covered approximately 639 000 children, 643 700 nondisabled adults 18 years and older and 110 800 persons who were blind or disabled in 2004.[17] AHCCCS included 13 managed care plans and a small fee-for-service plan.[18] Each of the health plans established and managed its own prescription formulary, and the fee-for-service formulary was established and managed by a pharmacy benefit management company.

Our study followed a cross-sectional design to examine the association between the comprehensiveness of NSAID prescription drug formularies and health care use for Medicaid beneficiaries with arthritis. The health care outcomes included ambulatory physician visits, emergency department visits, hospitalizations, and medical costs in the calendar year 2003. Although the sample included dually eligible Medicare–Medicaid beneficiaries, Medicare did not offer a prescription discount card or other prescription drug benefits during this period. The sample was limited to individuals 18 years and older who were continuously enrolled in a Medicaid-managed care plan for the entire year. We excluded 1 Arizona health plan because it did not provide coverage for the entire calendar year, and the fee-for-service plan because the number of enrollees with arthritis was too small. As a result, we included 7 acute health care plans and 5 long-term care plans.

AHCCCS data were obtained from the Arizona HealthQuery (AZHQ) database provided by Arizona State University. AZHQ is an integrated database of medical records from public and private data partners in Maricopa County and is a joint project of Arizona State University and St Luke's Health Initiatives. AZHQ includes claims data for services covered by AHCCCS and Medicare as well as detailed data for fee-for-service and managed Medicaid enrollees. *International Classification of Diseases Clinical Modification* (*ICD-9-CM*)[19] diagnosis codes were used to identify enrollees with a primary or secondary diagnosis of rheumatoid arthritis (*ICD-9-CM* code 714.0) or osteoarthritis (*ICD-9-CM* codes 715.00–715.98) on the basis of the *ICD-9-CM* diagnosis codes associated with physician office visit, outpatient hospital visit, emergency department visit, and hospitalization claims in the AZHQ.

To our knowledge, this was the first study to examine the relative restrictiveness of a preferred drug list, so no theoretical foundation for defining each prescription drug formulary as restrictive or lenient was available. We classified each health plan's formulary as either lenient or restrictive on the basis of the number of NSAIDs included. The threshold between lenient and restrictive formularies was empirically determined by examining the distribution of drugs covered across the 12 health plans. Lenient formularies included those with 12 or more unique drug choices, whereas restrictive formularies included those with fewer than 12 unique drugs choices. We used a sensitivity analysis to test whether the results were sensitive to the 12-drug threshold for a lenient formulary. We reran the regression models for a series of different quantity thresholds defining a lenient formulary.

We were specifically interested in health care use associated with osteoarthritis and rheumatoid arthritis and stratified the models by type of condition. We measured use by the number of ambulatory visits, including physician, clinic, and other outpatient visits; emergency department visits; and inpatient hospital stays with a primary or secondary *ICD-9-CM* diagnosis code of arthritis. Independent variables in the models included formulary restrictiveness (lenient and restrictive), whether the enrollee was in an acute or long-term care health plan, age (18–44 years, 45–54 years, 55–64 years, 65–74 years, or 75 years and older), race/ethnicity (White, non-Hispanic; Hispanic; Black; or other), geographic origin as a measure of access to care (proportion of the population residing in urban areas with 50 000 or more persons), and whether the enrollee had both rheumatoid arthritis and osteoarthritis or only 1 disease. An interaction term for the type of NSAID formulary (restrictive or lenient) and presence of both osteoarthritis and rheumatoid arthritis was included to control for potential differences in the incremental impact of formulary restrictiveness for those with both diseases.

A second model estimated total health care expenditures to quantify whether formulary restrictiveness was associated with medical care and prescription drug spending. Health care expenditures included the total amount

paid by Medicare and Medicaid for ambulatory and emergency department visits, hospital stays, and prescription drugs used to treat arthritis. The cost of BRMs administered in a physician's office or hospital outpatient setting were captured in the ambulatory care costs, whereas the cost of self-administered BRMs were captured in the prescription drug costs.

To account for the discrete nature of our data and skewed distribution, we used multivariate generalized linear models with Poisson distributions and log link functions to estimate the number of ambulatory physician visits, emergency department visits, and hospitalizations for persons with osteoarthritis and rheumatoid arthritis separately. Because our sample included all individuals with at least 1 service (ambulatory or emergency department visit or hospitalization) with either osteoarthritis or rheumatoid arthritis coded as a primary or secondary diagnosis code, nearly all individuals had 1 or more payments recorded in the AZHQ. We estimated total health care expenditures with a generalized linear model with a gamma distribution and log link function.[20]

RESULTS

Of the 12 health plans included in the study, 2 acute plans and 3 long-term care plans had NSAID formularies that we classified as lenient, representing 69% of enrollees with rheumatoid arthritis and 74% of enrollees with osteoarthritis. We classified the remaining plans as restrictive. Table 1 presents the enrollee characteristics for persons with rheumatoid arthritis and osteoarthritis. Of the 6918 enrollees, 14% had rheumatoid arthritis only, 78% had osteoarthritis only, and 7% had both rheumatoid arthritis and osteoarthritis. For those with rheumatoid arthritis enrolled in a health plan with a lenient formulary, average health care expenditures were $2089 compared with $2548 for those enrolled in a health plan with a restrictive formulary. For enrollees with osteoarthritis in a health plan with a lenient formulary, average health care expenditures were $1077 compared with $1098 for enrollees with a restrictive formulary.

TABLE 1—Characteristics of Medicaid Enrollees With Rheumatoid Arthritis and Osteoarthritis, by Restrictiveness of Preferred Drug List: Arizona, 2003

	Rheumatoid Arthritis		Osteoarthritis	
	Lenient PDL (N = 1036)	Restrictive PDL (N = 456)	Lenient PDL (N = 4377)	Arizona PDL (N = 1561)
No. of ambulatory visits, mean (SD)	3.48 (4.07)	2.61 (2.77)	1.90 (2.32)	1.31 (1.63)
No. of hospitalizations, mean (SD)	0.87 (2.15)	1.18 (1.93)	0.50 (1.55)	0.75 (1.58)
No. of emergency department visits, mean (SD)	0.15 (0.56)	0.12 (0.42)	0.07 (0.31)	0.08 (0.33)
Expenditures, $				
Total health care,[a] mean (SD)	2089 (4270)	2548 (5014)	1077 (3285)	1098 (2800)
Ambulatory, mean (SD)	740 (2614)	757 (3113)	243 (898)	200 (758)
Hospitalizations, mean (SD)	733 (2707)	822 (2823)	546 (2915)	594 (2482)
Emergency department, mean (SD)	92 (644)	152 (1084)	40 (578)	40 (540)
Prescription drug, mean (SD)	523 (1227)	817 (1807)	248 (722)	263 (726)
Both rheumatoid and osteoarthritis, %	33.3	36.6	7.9	10.7
Acute care plan, %	91.7	84.4	92.2	40.6
Men, %	16.4	17.3	25.8	26.7
Age, y, %				
< 45	28.1	25.6	17.9	16.7
45–54	25.6	22.8	23.3	23.3
55–64	24.6	24.3	24.6	26.7
65–74	12.0	12.1	17.7	17.0
≥ 75	9.8	14.9	16.6	16.3
Race/ethnicity, %				
White	52.3	48.9	54.9	51.1
Hispanic	38.3	40.6	34.6	33.9
Black	5.2	5.5	6.5	9.4
Other	4.2	5.0	4.1	5.6
Reside in urban area, %	36.7	67.8	37.2	66.1

Note. PDL = preferred drug list. Percentages are the proportion of enrollees in each category. Lenient PDLs were defined as formularies that included 12 or more unique drug choices; restrictive PDLs were formularies that included fewer than 12.
[a]Total health expenditures are the sum of expenditures for ambulatory visits, hospitalizations, emergency department visits, and prescription drugs.

Rheumatoid Arthritis

Table 2 summarizes the parameter estimates from the use and expenditure models for enrollees with rheumatoid arthritis. Restrictive NSAID formularies were associated with 22% fewer ambulatory visits (b = –0.251; 1 – exp[–0.251] = –22.2%), translating into 0.77 fewer ambulatory visits per enrollee than per enrollees with lenient formularies. A restrictive NSAID formulary was associated with 29% more hospitalizations (0.25 more hospital stays) per enrollee but no difference in emergency department use.

The models also tested for differences in use between those with rheumatoid arthritis only and those with rheumatoid arthritis and osteoarthritis. Having both osteoarthritis and rheumatoid arthritis was associated with 38% more ambulatory visits, 34% more hospital stays, and 61% more emergency department visits compared with individuals with rheumatoid arthritis only. The interaction between restrictive NSAID formularies and having both osteoarthritis and rheumatoid arthritis was insignificant.

Table 2 also presents results for health care spending. Enrollment in a health plan with a restrictive NSAID formulary was associated with 45% higher spending for medical and prescription drugs, translating into $935 more for those having a restrictive NSAID formulary, after demographic and health differences were controlled. Having both rheumatoid arthritis and osteoarthritis was associated with 45% higher health care spending than having rheumatoid arthritis only. For those with both rheumatoid arthritis and osteoarthritis,

TABLE 2—Results of Regression Models Predicting Number of Visits and Total Health Care Expenditures for Rheumatoid Arthritis: Arizona Medicaid Enrollees (n = 1492), 2003

	Ambulatory Visits, b (SE)	Hospitalizations, b (SE)	Emergency Department Visits, b (SE)	Expenditures, b (SE)
Restrictive NSAID formulary	−0.251** (0.045)	0.252** (0.074)	−0.354 (0.217)	0.370** (0.099)
Rheumatoid arthritis and osteoarthritis	0.320** (0.035)	0.294** (0.069)	0.479** (0.166)	0.372** (0.092)
Restrictive NSAID, rheumatoid arthritis, and osteoarthritis	−0.093 (0.068)	−0.104 (0.111)	−0.104 (0.323)	−0.540** (0.163)

Note. NSAID = nonsteroidal anti-inflammatory drug. A restrictive formulary was defined as one that included fewer than 12 unique drug choices. The reference category is lenient formulary and rheumatoid arthritis only. The generalized linear regression models for ambulatory visits, hospitalizations, and emergency department visits were fit with a Poisson distribution and a log link function. The generalized linear regression model for expenditures was fit with a gamma distribution and a log link function. All models were controlled for gender, age, race/ethnicity, geographic region of residence, and acute versus long-term care plan enrollment.
**$P \leq .01$.

having a restrictive NSAID formulary was associated with 42% lower expenditures than having a lenient formulary.

Osteoarthritis

Table 3 presents the results from the generalized linear regression models for enrollees with osteoarthritis. Restrictive NSAID formularies were associated with 38% fewer ambulatory visits related to the disease, translating into 0.71 fewer ambulatory visits per enrollee compared with those with formularies that are lenient. A restrictive NSAID formulary was associated with 52% more hospitalizations (0.26 more hospital stays) per enrollee but no difference in emergency department use.

Enrollees with both rheumatoid arthritis and osteoarthritis used significantly more services than did those with osteoarthritis only, including nearly 2.5 times more ambulatory visits and hospitalizations and over 3 times more emergency department visits. For those with rheumatoid arthritis and osteoarthritis, restrictive NSAID formularies were associated with fewer hospitalizations compared with those with formularies that are lenient.

Overall, total health care expenditures were similar between enrollees with restrictive and those with lenient NSAID formularies. For those with osteoarthritis and rheumatoid arthritis, health care expenditures were 86% higher than expenditures incurred by enrollees with osteoarthritis only.

TABLE 3—Results of Regression Models Predicting Number of Visits and Total Health Care Expenditures for Osteoarthritis: Arizona Medicaid Enrollees (n = 5938), 2003

	Ambulatory Visits, b (SE)	Hospitalizations, b (SE)	Emergency Department Visits, b (SE)	Expenditures, b (SE)
Restrictive NSAID formulary	−0.471** (0.029)	0.419** (0.041)	0.016 (0.122)	0.027 (0.045)
Rheumatoid arthritis and osteoarthritis	0.899** (0.029)	0.891** (0.057)	1.184** (0.137)	1.051** (0.080)
Restrictive NSAID, rheumatoid arthritis, and osteoarthritis	0.104 (0.059)	−0.212* (0.093)	−0.460 (0.270)	−0.150* (0.140)

Note. NSAID = nonsteroidal anti-inflammatory drug. A restrictive formulary was defined as one that included fewer than 12 unique drug choices. The reference category is lenient formulary and rheumatoid arthritis only. The generalized linear regression models for ambulatory visits, hospitalizations, and emergency department visits were fit with a Poisson distribution and a log link function. The generalized linear regression model for expenditures was fit with a gamma distribution and a log link function. All models were controlled for gender, age, race/ethnicity, geographic region of residence, and acute versus long-term care plan enrollment.
*$P \leq .05$; **$P \leq .01$.

Sensitivity Analysis

To test the robustness of our results to the inclusion of enrollees with either a primary or a secondary diagnosis of rheumatoid arthritis or osteoarthritis, we reestimated our models for enrollees with a primary diagnosis of 1 of the 2 conditions. The results were remarkably similar to the full set of results (Table 4). Restrictive NSAID formularies were associated with 16% fewer ambulatory visits and 35% more hospitalizations for those with rheumatoid arthritis, translating into 61% higher medical and prescription drug expenditures or $1448. For those with osteoarthritis, enrollees with restrictive formularies had 23% more ambulatory visits and 71% more hospitalizations, but there was no difference in expenditures.

DISCUSSION

We examined prescription formulary characteristics to assess whether the relative leniency of a Medicaid health plan's formulary related to NSAID coverage was associated with different patterns of health care use. Our findings indicate that restrictions on access to NSAIDs shifted care from the ambulatory to the inpatient setting for both rheumatoid arthritis and osteoarthritis. Differences were somewhat larger in percentage terms for those with osteoarthritis than for enrollees with rheumatoid arthritis, but the absolute differences in use were similar, because enrollees with rheumatoid arthritis used more medical care overall. After factoring in prescription drug expenditures, total expenditures were more than one third higher for enrollees with rheumatoid arthritis in health plans with more-restrictive formularies. For the 456 enrollees with rheumatoid arthritis in health plans with restrictive formularies, the additional spending associated with restrictive NSAID formularies translated into a net increase of $426 000 in costs for the health plans. Although the formulary restrictiveness did not affect total spending for those with osteoarthritis, it was associated with more hospitalizations, suggesting that lower ambulatory spending may have offset the increase in spending for hospital care. The medical use and expenditure results taken together suggest that restrictive formularies

TABLE 4—Results of Regression Models Predicting Number of Visits and Total Health Care Expenditures for Medicaid Enrollees with a Primary Diagnosis of Rheumatoid Arthritis (n = 1024) or Osteoarthritis (n = 2471): Arizona, 2003

	Ambulatory Visits, b (SE)	Hospitalizations, b (SE)	Emergency Department Visits, b (SE)	Expenditures, b (SE)
Rheumatoid arthritis models, restrictive NSAID formulary	–0.174** (.047)	0.298** (0.097)	–0.470 (0.300)	0.479** (0.115)
Osteoarthritis models, restrictive NSAID formulary	–0.263** (.040)	0.539** (.072)	0.318 (0.267)	0.015 (0.078)

Note. NSAID = nonsteroidal anti-inflammatory drug. A restrictive formulary was defined as one that included fewer than 12 unique drug choices. The reference category is lenient formulary and rheumatoid arthritis only. The generalized linear regression models for ambulatory visits, hospitalizations, and emergency department visits were fit with a Poisson distribution and a log link function. The generalized linear regression model for expenditures was fit with a gamma distribution and a log link function. All models were controlled for gender, age, race/ethnicity, geographic region of residence, and acute versus long-term care plan enrollment.
**$P \leq .01$.

significantly change the patterns of health care and prescription drug use and may have unintended consequences in terms of more frequent and, for those with rheumatoid arthritis, more expensive medical care.

Although employer-sponsored health plans can control costs by using a combination of the prescription drugs covered by a formulary and enrollee cost sharing (i.e., deductibles and copayments), the primary tool available to control costs for Medicaid plans is the formulary or preferred drug list. Our review of the prescription formularies showed that the newest and most expensive arthritis medications available on the market were often not included even on the most lenient Medicaid health plan formularies; thus the formularies that were more lenient had somewhat less expensive drugs and did not cover the gamut of arthritis drugs as do many private health plans.[14] From a clinical perspective, physicians may be more concerned with the availability of newer drugs than with the number of drugs covered. Although Lichtenberg's results suggest that the average vintage of NSAIDs covered by the Medicaid health plans has increased in recent years relative to the vintage of those covered by private plans, higher copayments for these drugs may have lessened their use.

Our findings suggest the importance of considering the effect on medical care use when a health plan determines the comprehensiveness of its prescription formulary, particularly for drugs used to manage chronic conditions. The Arizona Medicaid program relies on primary care gatekeeper physicians to provide routine medical care and make specialty care referrals. The homogeneity in the lack of prescription drug cost sharing strengthens these results.

The next step in disentangling the relation between formulary restrictiveness and health care use is to understand whether differences in use are directly related to NSAID formulary coverage or to more-general characteristics of health plans in which the comprehensiveness of the NSAID formulary is a proxy for broader institutional factors. It may be, for example, that health plans with restrictive coverage of NSAIDs have less comprehensive primary care physician networks or primary care physicians with less capacity to treat Medicaid enrollees or who are located in areas that are less accessible to enrollees. Although we could not quantify the extent to which each of the health plans used case management and disease management to help enrollees handle their arthritis, differences in use across health plans may have been the result of different case and disease management programs that were correlated with the number of NSAIDs covered by their respective formularies.

The comprehensiveness of the NSAID formulary may also be a proxy for the extent to which the formulary covers other drugs used to treat rheumatoid arthritis, such as more-expensive DMARDs and BRMs. If this is the case, we would expect enrollees with restrictive NSAID formularies to have lower prescription drug costs overall because of more restrictions on obtaining DMARDs and biological response modifiers. Our results, however, do not support this explanation, and prescription drug costs were nearly $300 higher for those with restrictive NSAID formularies. Future work should delve into the restrictiveness of the formularies for BRMs and DMARDs and examine how the relation between the restrictions on prescribing each of the 3 groups of drugs affects health care use and expenditures for people with rheumatoid arthritis.

Ultimately, interventions to reduce unnecessary hospitalizations and emergency department care depend on the underlying mechanism driving these differences. Although we found a strong relation between NSAID formulary restrictiveness and hospitalization rates, our data did not allow us to pinpoint the medical reasons for these differences. Future studies should explore whether enrollees with restrictive formularies have higher rates of joint replacement, for example, to better understand these differences.

Limitations

Despite the strengths of this study in providing a benchmark for the impact of prescription formulary restrictions on arthritis treatment in a well-established managed care environment, this study had 3 main limitations. The AHCCCS-managed care plans each manage their own prescription formulary; some plans were unable to provide the 2003 formulary, and consequently we used the 2005 formulary. A comparison of the available 2003 formularies with the 2005 formularies showed minimal differences in the number and type of covered drugs for the DMARDs and NSAIDs. Second, we counted the number of drugs covered by the health plan formulary or preferred drug list, rather than comparing the specific drugs covered. The logical next step in understanding the effect of formulary restrictions is to examine the extent to which restrictions on specific drugs are related to health care use and outcomes. A final limitation stems from changes in the available prescription drugs used to treat arthritis. Although several of the highest

cost arthritis drugs, such as Vioxx, have been removed from the market, new and expensive DMARDs have been introduced since 2003. Prior authorization may have covered more-expensive DMARD drugs, but this is not the same as being automatically covered or included on the formulary.

Conclusions

Despite these limitations, our analysis extends beyond previous research that has examined the impact of preferred drug lists by exploring differences in medical care. We have provided a methodology to examine the effect of formulary restrictions on health care use for chronic conditions more generally. It is critical that policymakers and health plan administrators understand how to most efficiently and cost effectively manage chronic conditions, particularly those that rely on maintenance drugs for treatment, while preserving the highest level of health status.

Although restrictions on access to NSAIDs are a powerful incentive to reduce use, increases in emergency department visits and hospitalizations may offset prescription drug cost savings. Our findings demonstrate the importance of weighing the costs and benefits associated with restrictions on formularies used to treat chronic conditions such as arthritis. ■

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Contributors

T.J. Johnson and S. Stahl-Moncada originated the study and drafted and revised the article. T.J. Johnson acquired the data and conducted the data analysis and interpretation. S. Stahl-Moncada assisted with the study design and data analysis.

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Human Participant Protection

This study was reviewed and approved as an exempt study by the Rush University Medical Center institutional review board.

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