OBJECTIVE: To assess an algorithm designed to make recommendations for step-wise prescribing of nonsteroidal anti-inflammatory (NSAID) drugs.

DESIGN: Retrospective review of the pharmacy and medical records of 1,604 patients over a three-year period.

SETTING: A physician staff-model managed care system with approximately 150,000 members in the southern United States (IHSHP).

MAIN OUTCOME MEASURES: Utilization of NSAIDs over a three-year period, per member per month (PMPM) cost, NSAID acquisition cost, costs of treating NSAID-related adverse events.

RESULTS: The utilization of NSAIDs per member per month for both brand-name and generic NSAIDs decreased significantly after implementation of the algorithm. The mean PMPM cost to the plan for NSAIDs also decreased significantly. However, while the NSAID acquisition cost for the plan decreased, the charges associated with treating NSAID-related adverse events showed an upward trend over the same period.

CONCLUSIONS: The algorithm urged physicians to encourage patients to use over-the-counter NSAID medications as initial treatment. To the extent that the algorithm reduced the physicians' and pharmacists' involvement in the pharmaceutical care of the patient, the algorithm may have exposed patients to risks associated with inappropriate self-medication. In addition, the decrease in NSAID costs may have been offset by the increases in costs associated with treating NSAID-related adverse events.

KEYWORDS: NSAIDs, algorithm, guideline, pharmaceutical care, self-medication, adverse events, medical data, pharmacy data

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An Assessment of the Effectiveness of a Nonsteroidal Anti-inflammatory Drugs Algorithm in an Integrated Health Care System

by Rahul M. Sasané, Marvin D. Shepherd, and Kenneth A. Lawson

Driven by financial considerations such as revenue shortfalls and budget deficits, health care organizations have tried many methods of limiting health care expenditures. With regard to prescription medications, a variety of cost-containment approaches, such as the use of protocols and guidelines, have been pursued. By encouraging physicians to prescribe less-expensive medications without sacrificing health outcomes, health care organizations can achieve considerable savings in drug costs. One category in which managed care organizations and other medical systems have devised increasing restrictions is nonsteroidal anti-inflammatory drugs (NSAIDs) and other analgesics. This study was conducted to evaluate the effectiveness of an NSAID algorithm (which also included an NSAID financial-disincentive program) in an integrated health care system. It should be noted that Cox-2 NSAIDs were not marketed during the period of analysis. Therefore, the term NSAIDs as used in this paper implies Cox-1 NSAIDs only.

The NSAID Algorithm

In order to provide appropriate, cost-effective therapy for musculoskeletal pain, the Drug Information Service in the Department of Pharmacy of an integrated health system health plan (IHSHP) prepared a class review of NSAIDs in March 1995. The Drug Information Service Center consulted with the divisions of rheumatology, gastroenterology, and nephrology. A literature review indicated that NSAID agents are, in large patient populations, clinically equivalent in efficacy, safety, and adverse-event profiles. Based on this review and the approval of the pharmacy and therapeutics committee of the IHSHP, a pharmacy/medical staff team took the following measures:

- Created an algorithm for the step-wise use of NSAIDs. This algorithm identified generic NSAIDs as the initial agents of choice or “preferred products” and others as “nonpreferred.” The nonpreferred NSAIDs were to be used in sequence only after failure, lack of efficacy, or intolerable adverse events with the drugs of initial choice (see Figure 1, page 150).
- Intervention X.: Educated physicians about the algorithm through meetings with primary care physicians and through the distribution of newsletters. The newsletters were distributed to health care practitioners and educational meetings were scheduled from July 1, 1995, forward. Finally:

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### The NSAID Algorithm

<table>
<thead>
<tr>
<th>Osteoarthritis/Rheumatoid Arthritis/Musculoskeletal Pain (otherwise healthy patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiate ibuprofen therapy* (adequate trial: max. dose up to 2,400 mg daily for two weeks)</td>
</tr>
<tr>
<td>ibuprofen failure (lack of efficacy or significant adverse effect)</td>
</tr>
<tr>
<td>naproxen therapy* (adequate trial: max. dose up to 1,500 mg daily for two weeks)</td>
</tr>
<tr>
<td>naproxen failure (lack of efficacy) naproxen failure (GI adverse events) naproxen failure (renal insufficiency)</td>
</tr>
<tr>
<td>indomethacin</td>
</tr>
<tr>
<td>nonacetylated salicylates</td>
</tr>
<tr>
<td>nabumetone</td>
</tr>
<tr>
<td>nabumetone</td>
</tr>
</tbody>
</table>

*Over-the-counter medication.

- Intervention X2: Implemented a financial disincentive one year after the physician-education programs went into effect. This disincentive increased out-of-pocket cost-sharing for patients requesting nonpreferred NSAIDs. Specifically, patients who elected to fill or refill prescriptions of nonpreferred NSAIDs were required to pay a standard copayment and any excess amount if the product cost exceeded $40.00.

The algorithm and the two interventions (X1 and X2) are hereafter referred to as the NSAID algorithm. A variety of mechanisms, such as written communication (in the form of quarterly newsletters), personal visits to satellite clinics, and group educational programs were used to continue and reinforce the use of NSAIDs preferred by the plan.

### Objectives and Research Design

The primary objective of this study was to evaluate the effectiveness of the NSAID algorithm from the perspective of the health plan by evaluating both medical and pharmacy claims data. The analysis took into consideration the total NSAID-related health care costs (both the pharmacy and the medical components) for NSAID users in the IHSHP over a three-year period. This three-year period was divided into three study phases:

- the period spanning July 1, 1994, through June 30, 1995, identified as phase I (or the preintervention phase);
- the period of physician education spanning July 1, 1995, through June 30, 1996, identified as phase II (educational phase); and
- the period from July 1, 1996, through June 30, 1997, identified as phase III (the financial disincentive phase).

While X1 was the only intervention implemented during phase II, its implementation continued along with that of X2 through phase III. The specific objectives of this study were to determine:

- the costs associated with NSAID use through the use of both pharmacy and medical claims data;
- the effectiveness of the algorithm based on the calculated savings or loss to the IHSHP associated with the implementation of the NSAID algorithm; and
- the costs of possible adverse events, including gastrointestinal (GI), renal, and hepatic/pulmonary/cardiac complications as evidenced by hospitalizations or emergency room visits that might be attributed to NSAID utilization.

No control group was included in the design because the NSAID algorithm was implemented throughout the health plan for all members with a prescription drug benefit rider. This quasi-experimental retrospective study is a modified pre-post design with two interventions, X1 and X2. Retrospective review of the pharmacy and medical records occurred after the implementation of both interventions.

Computerized pharmacy claims data (prescription fill/refill data) were used to evaluate utilization and exposure to treatment. Considerable literature supports the use of computerized pharmacy claims data as a reliable source of true drug exposure.1 Also, Steiner and Prochazka have concluded that prescription refill data may be used in population-based studies to evaluate utilization.2 In this study, prescription drug pharmacy records were obtained from the IHSHP.

### Inclusion and Exclusion Criteria

Inclusion criteria for the chart review were age (older than 12), enrollment in the IHSHP drug benefit program, and NSAID therapy, evidenced by the IHSHP pharmacy claims data. Health plan employees and their immediate family members were excluded because the copayment structure for those individuals was significantly different.

NSAID-related adverse events, particularly those involving the liver, kidneys, and the GI tract, were included in the analyses. Adverse GI events caused by a therapeutic agent are identified in the International Classification of Diseases, 9th Revision (ICD-9) code system by “e-codes” which accompany the ICD-9 code for the particular adverse event. In an effort to identify patients with renal events, a wide range of diagnostic codes related to renal failure was used, similar to the strategy used by Gutthann et al.3 The same strategy was used to identify patients with hepatic disorders.
An Assessment of the Effectiveness of a Nonsteroidal Anti-inflammatory Drugs Algorithm in an Integrated Health Care System

Data Analysis

The dependent variables in this study were the frequency of health care services used by patients and the charges incurred for those services. Drug costs used in the analyses were acquisition costs to the IHSHP pharmacy. Medical charges were indicated by the financial charges incurred by the patients. Comparisons were made on the frequency and costs of NSAID products and medical services, both in the aggregate as well as on a per-patient basis for the three observational periods. All costs incurred during the years 1994 through 1996 were adjusted using a rate of 5% to reflect 1997 dollar values.

The pharmacy claims and medical claims data from the IHSHP were merged. SPSS for Windows 8.0 software was used for data analysis on a Microsoft Windows 98 platform. An alpha level of 0.05 was used for inferential statistical tests.

Results

A total of 1,604 patients met the inclusion criteria. Of these, 1,055 (65.8%) were female and 549 (34.2%) were male. The mean age of the population was 50.41 years (s.d.=15.27). The median age was 50.36 years. The youngest patient was a 13-year-old female and the oldest was an 89-year-old male.

Information on dates of birth was not available for 33 patients, so their ages were not computed. Of the 1,571 patients with available dates of birth, 273 (17.4%) were 65 years of age or older; 167 of these patients (61.2%) were female.

Of the 32,820 prescriptions dispensed during the three-year period, 13,517 (41.2%) were for NSAID products. Table 1, page 152, illustrates the number of NSAID prescriptions dispensed by study phase as well as the mean number of prescriptions per member and costs per member.

The results show that the algorithm was effective in reducing the number of NSAID prescriptions PMPM. The results also demonstrate that the cost to the plan decreased by almost 67% from the preintervention phase compared to the year after the financial disincentive was implemented.

The results in phases II and III were significantly different. The implementation of intervention X1 continued through phase III along with that of educational component X2. Because the study design does not permit the effect of the financial-disincentive strategy to be dissociated from the educational intervention, it is difficult to attribute this effect to any one strategy. However, it seems that the financial-disincentive portion of the algorithm provided a greater impetus to reduce NSAID acquisition costs for the plan. The continued role of physician education is certainly a contributing factor.

In addressing the total NSAID-related health care costs, adverse events were determined by examining the ICD-9 codes of the patients. The ICD-9 manual, which was used to identify medical conditions, lists diagnosis codes for the GI tract, in addition to other conditions. Codes ranging from 530 (diseases of the esophagus) through 537.9 (diseases of the gastroduodenum) were used to identify GI events. No evidence of NSAID-induced renal or hepatic adverse events was found in the IHSHP population in the three years under review.

In the IHSHP medical claims database, 229 patient records (14.27%) indicated that the patients had experienced a GI adverse effect after receiving an NSAID prescription. The literature discussing adverse events attributable to NSAIDs indicates that 15%–25% of NSAID users develop GI-related adverse effects. Thus the study result (14.27%) falls within the range of past studies. Further analysis showed that 36 patients—11 in phase I (0.68% of the total), 14 in phase II (0.87%), and 11 in phase III (0.68%)—had a serious GI event, defined as either hemorrhage or perforation of the GI tract. While the configuration of the study design makes it difficult to attribute a cause-and-effect relationship between NSAIDs and the GI adverse events, it is reasonable to assume that at least some of the adverse events were attributable to NSAIDs. The incidence of serious GI events in these data (from 0.68% in phases I and III to 0.87% in phase II) falls well within the published literature values ranging from 0.02%–1.4%.

Of the 36 patients who experienced serious GI adverse events, 15 patients were hospitalized. The average charge per patient per hospitalization was $4,038.17 and the average length-of-stay was 3.53 days per patient.

Post-hoc Medical Chart Review

Medical charts of patients suffering from serious and nonseri-
ous GI adverse events were reviewed on a post-hoc basis. The charts were reviewed to see whether the attending physician had made a remark in the medical record indicating that the adverse event was NSAID-related. A sample of 33 charts from the 36 patients with serious GI adverse events, and 54 charts from a total of 217 with less-serious GI adverse events were evaluated. Only those charts available at the main clinic and hospital were obtained; charts from satellite or regional clinics were not part of the post-hoc analysis. The charts were not randomly selected; thus the process could potentially produce bias. Table 2, above, illustrates the results of this chart review.

Of the 36 patients who suffered serious GI adverse events, charts for 3 were not available. Charts from 9 of the 21 patients (42.86%) indicated that NSAID use was the cause of the serious GI complication. Sheets of medical records for specific dates were missing for 12 of the 33 patient records reviewed. Only one chart indicated that H. pylori was the cause of GI distress.

From a total of 217 patients who suffered less-serious GI adverse events, 54 charts (25%) were reviewed for the post-hoc research. Table 2 indicates that in the opinion of the attending physicians, four patients suffered from NSAID-related GI adverse events. No mention was made as to the cause of the GI distress in 23 charts. Data used for the retrospective study indicate GI-related ICD-9 codes in the medical records on specific dates. However, corresponding records were found to be missing from 27 of the 54 charts reviewed.

In addressing the issue of NSAID-related health care costs, the study used subset analyses for the utilization of antiulcer medications, H-2 receptor antagonist prescriptions (often prescribed for patients receiving NSAIDs), use of medical services, and the costs associated with GI adverse events after the first NSAID prescription. The prescription cost data for NSAIDs, H-2 receptor antagonists, and antiulcer drugs such as Prevacid, Prilosec, omeprazole, Carafate, sucralfate, and Cytotec obtained from these subset analyses, and the charge data for medical services, were aggregated to generate NSAID-related health care costs per phase (see Table 3, page 153). Medical events preceding the date of dispensing the first NSAID prescription (in this database) were disregarded. NSAID-related health care costs per phase were the sum of the cost of NSAID prescriptions, the cost

### Table 1: NSAID Prescriptions: Number Dispensed and Cost by Phase

<table>
<thead>
<tr>
<th>Phase</th>
<th>Number of Prescriptions (patients)</th>
<th>Percentage</th>
<th>Mean No. Rx (s.d.)</th>
<th>Mean PMPM Cost (s.d.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preintervention (July 1, 1994–June 30, 1995)</td>
<td>5,807 (n=1,604)</td>
<td>43.0%</td>
<td>0.30 (0.29)</td>
<td>$6.72 (13.07)</td>
</tr>
<tr>
<td>Physician education phase (July 1, 1995–June 30, 1996)</td>
<td>5,209 (n=1,181)</td>
<td>38.5%</td>
<td>0.37 (0.31)</td>
<td>$7.48 (14.58)</td>
</tr>
<tr>
<td>Disincentive phase (July 1, 1996–June 30, 1997)</td>
<td>2,501 (n=979)</td>
<td>18.5%</td>
<td>0.21 (0.17)</td>
<td>$2.25 (5.44)</td>
</tr>
<tr>
<td>Total</td>
<td>13,517</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: PMPM is per member per month. All differences between the phases for mean number of prescriptions PMPM and mean cost to the plan PM PM were statistically significant.

### Table 2: Results of Chart Reviews for Patients with GI Adverse Events

<table>
<thead>
<tr>
<th>Cause of GI Distress</th>
<th>Serious GI Adverse Events</th>
<th>Nonserious GI Adverse Events</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Total %</td>
</tr>
<tr>
<td>NSAIDs indicated as cause of GI event</td>
<td>9</td>
<td>27.3</td>
</tr>
<tr>
<td>No cause of GI event indicated</td>
<td>11</td>
<td>33.3</td>
</tr>
<tr>
<td>H. pylori indicated as cause of GI event</td>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>Dated material (record sheets) missing</td>
<td>12</td>
<td>36.4</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>100.0</td>
</tr>
</tbody>
</table>
of anti-ulcer prescriptions, the cost of H-2 receptor antagonist prescriptions, the charges for medical services for those with nonserious GI adverse events, and the charges for medical services for those with serious GI adverse events.

### Epidemiology of NSAID-Related Adverse Events

The adverse events commonly reported in the literature that are attributed to NSAIDs are those of the GI tract, kidney, cardiovascular system (elevation in blood pressure), and liver. The epidemiological values mentioned for renal as well as hepatic adverse events are based on a longer cumulative exposure to NSAIDs than the exposure duration for the IHSHP population in this study. For renal adverse events, the exposure is in the range of one event for every 100,000 patient-years. Also, for hepatic complications, the epidemiologic data suggest that 3.7 NSAID-related hepatic events occur for every 100,000 NSAID users. The analyzed data fall short of achieving these population-exposure numbers, because studying 1,604 patients over three years provides a sum of only 4,812 patient-years. In light of these epidemiological incidence rates, episodes of renal or hepatic adverse events were unlikely to be observed in the database. Hence, these events were not seen in the total NSAID-related health care costs. Table 3 shows the NSAID-related health care costs by phase.

Results from Table 3 show that a difference exists in NSAID-related health care costs when comparing the three phases. The major cost savings are attributable to the reduction in NSAID costs for the plan. However, an increase in charges associated with the adverse events-related utilization of medical services from phases I and II to phase III is evident: Charges for services utilized by those with nonserious GI adverse events increased by 58.69% when phase I ($25,820.42) and phase II ($40,975.29) were compared, and by 135% when phase I ($25,820.42) and phase III ($60,676.74) were compared. However, the charges for services used by the 36 patients with serious GI adverse events decreased by 7.97% when phase I ($28,283.15) and phase II ($26,028.86) were compared and by 37.47% when phase I ($28,283.15) and phase III ($17,686.67) were compared. Figure 2, page 151, provides a graphic illustration of savings accrued through reduced NSAID use and charges associated with serious and nonserious adverse events.

The final cost analysis of the NSAID algorithm as seen in Table 3 indicates that under the NSAID algorithm, total costs for phase III were $88,064.24 lower than total costs for phase I (the preintervention phase). It is noteworthy that NSAID-related health care costs decreased consistently from phase I through phase III.

To better understand the decrease in NSAID utilization and costs, the use of generic drugs was evaluated. For phase I, generic NSAID prescriptions were dispensed to 79.48% of the...
patients (n=1,275 of 1,604), compared to 83.23% of the patients in phase II (n=983 of 1,181), and 90.50% of the patients in phase III (n=866 of 979). The mean number of generic prescriptions dispensed PMPM was 0.26 (s.d.=0.27) during phase I, 0.32 PMPM (s.d.=0.29) in phase II, and 0.21 PMPM (s.d.=0.16) in phase III. These differences were statistically significant when any two phases were compared.

In evaluating the use of generic NSAIDs by phase, a mean ratio of generic prescriptions to total NSAID prescriptions dispensed was calculated. The results showed that during phases I, II, and III, the utilization of generic NSAID prescriptions (as a proportion of total NSAID prescriptions) increased from 72% to 76% to 88%.

The cost of a supply of some over-the-counter (OTC) NSAIDs was lower than the copayment required for prescription NSAIDs. This could have driven some patients to use OTC NSAIDs. More important, the algorithm required that physicians recommend the use of OTC NSAIDs to their patients before providing prescription agents. Therefore, physician recommendations have potentially resulted in the use of OTC NSAIDs and hence reduced use of prescription agents, either generic or brand-name. Thus, reduced use of prescription NSAIDs may have potentially reduced the patient population identified through the prescription claims data.

**Discussion**

As intended, the NSAID algorithm was associated with a major decline in NSAID expenditures for the health care plan. This decline resulted from a reduction in the prescribing of NSAID drugs, and an increase in the proportion of generic NSAIDs as opposed to brand-name NSAIDs. Additionally, part of the decline in NSAID expenditures was attributable to a shift in cost from the health care plan to the patient.

The differential copayments caused some of this shifting of costs. A higher copayment was used for brand-name products than for generic products. This approach not only shifted the cost but also stimulated the use of generic products. The first step in the algorithm called for using OTC NSAID products instead of prescription NSAID products, shifting costs for patients. In fact, the data showed that there was a 39% reduction in the number of persons who received an NSAID prescription from phase I (1,604 patients) to phase III (979 patients). Using the number of NSAID prescriptions per member per month for phase III (0.21 PMPM), this translates into a decrease of approximately 1,575 NSAID prescriptions (0.21 x 625 x 12) in phase III; in cost terms, this is a savings of approximately $16,875 in NSAID products. Caution is advised in this prediction because it is possible that a subset of these patients may have a marginal need for pain management and thus may not require the average number of NSAID prescriptions.

An evaluation based only on pharmaceutical product spending would show that the algorithm was extremely successful in saving costs. Prescription NSAID expenditures decreased from $129,346 in phase I to $26,433 in phase III, a remarkable savings for the plan. However, this economic “silo” approach fails to examine all the costs associated with the algorithm.

The larger question is to what extent the algorithm affected the delivery of services. Have the guidelines shifted costs to other parts of the health delivery system? The results did show that nonserious and serious adverse event costs rose 44.8% from phase I ($54,103) to phase III ($78,364) even though the number of patients categorized with serious adverse events did not change from phase I (n=11) to phase III (n=11). However, as a percentage of patients who received prescribed NSAID products, the proportion of serious adverse events did increase slightly, from 0.7% to 1.1%.

An exploratory analysis of the data was conducted to see whether those patients who were recorded as having had a serious or nonserious adverse event received an NSAID prescription drug. During phase III, there were 11 serious adverse events; of the patients involved, only 3 received an NSAID prescription during phase III. During phase III there were 113 nonserious adverse events; 104 patients did not obtain a NSAID prescription drug based on the plan’s prescription drug record. It is not known how many of these patients shifted to OTC NSAID products because there is no documentation of OTC purchases. However, many may have used OTC NSAID products, given that that switch was the first step in the algorithm.

These exploratory results also show a reduction in the number of adverse reactions (both serious and nonserious) experienced by patients who received a prescription NSAID product. Only 3 patients had a serious adverse event and 9 had a nonserious event when taking a prescription NSAID product during phase III, down from 14 serious adverse events and 105 nonserious adverse events during phase II. Most likely, many patients who experienced a nonserious adverse event were taking an OTC NSAID product.

The graphical presentation of the costs shows a linear increase in adverse-event charges from phase I to phase III. This trend leads to the question of whether adverse-event charges will continue to grow with the use of the algorithm. Obviously, the plan needs to monitor this cost shift very closely. If the algorithm is to be successful, adverse event costs must soon level off or decline. It is important to bear in mind that adverse event costs may have been increasing independently of the algorithm; there is only one predata point (phase I) before implementation of the algorithm.

The literature on algorithms and practice guidelines indicates that health care institutions and organizations use these tools to achieve uniformity in the delivery of health care services. Obviously, one goal is to implement an algorithm that is cost effective and enhances or at least maintains the health of patients. The goal of uniformity is to remove variance in the delivery of services with the hope that the variance in health care...
care outcomes will also be reduced. If this is accomplished, an accompanying reduction in costs usually occurs.

With the rising trend in adverse event costs, it is questionable whether the variance in the delivery of health care services has been reduced. Examination of the algorithm provides some probable reasons for the possible increase in variance. First, because OTC NSAID products can be purchased from a variety of retail outlets, not only pharmacies, the involvement of a pharmacist may be limited, and in some instances even eliminated, in the health care delivery process. Even if patients did purchase their OTC NSAID products from a pharmacy, pharmacist monitoring and counseling may not have taken place. The probability of having the OTC NSAID recorded on the pharmacy's patient drug profile is also low. For practical purposes, the algorithm probably reduced the community pharmacist’s role in monitoring for adverse events and counseling patients on proper use of the product. This may increase the variance in patient health care outcomes.

Second, the health care plan cannot document what the patient has purchased and used when patients take OTC NSAIDs. In essence, drug-utilization review at the plan level is more difficult because the database is missing the OTC NSAID information. The health care plan has lost some control, which may increase the variance in health outcomes for patients. Lack of this documentation and information has effectively reduced the physician’s ability to monitor patient care. This loss of control applies not only to monitoring for adverse effects of NSAIDs, but also to monitoring for drug-drug interactions.

Obviously, confounding factors in this process are the lower dosage strengths of OTC NSAID products compared to prescription NSAID products, the extent to which physicians give OTC NSAID drug information to patients, and how patients accept and use the products. If patients are using lower doses because of the lower strength of the OTC product, the safety factor may be increased. However, if patients perceive that OTC products are safer than prescription products, they may use more of the OTC product than they would of a prescription NSAID. This scenario is more likely if the OTC product does not provide sufficient relief at lower doses.

Still another uncertainty exists concerning whether physicians recommend the same dosage for the OTC products as they do for prescription products. This raises questions about compliance, because lower strength dosage units will require patients to take multiple tablets and capsules of the OTC products to get the same effect as that of the prescription drug. Finally, patients may select different OTC products than those suggested by the physician because of personal preference, lower costs, availability from a retail outlet, or other reasons. The overall effect of all these possibilities has the potential for adding variance to the use of NSAID products.

The study did show that education alone (phase II) had minimal impact on physician prescribing of NSAID products. When financial disincentives for patients (phase III) were required, the change in prescribing behavior regarding brand-name NSAID use was more noticeable. However, for phase III, it was impossible to separate the effects of the education intervention from those of the financial disincentives; thus, education and the financial disincentive probably complemented each other.

The study could not determine if OTC NSAID use was the cause of the increasing trend in adverse event costs, primarily because there is no record of OTC NSAID use. Pharmacy claims data do not contain this information; consequently, this is one shortcoming of the study. Studies that evaluate algorithms that encourage the use of OTC products should employ a methodology that quantitatively measures OTC use.

References