

■ clinical contributions

*Vobs Award Winner: Multiple-Region Category*

# Improving Appropriate Prescription Drug Use to Best Practice: Supporting Evidence-Based Drug Use

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## Introduction: The Need for Best Practice Prescription Drug Use

The rapid rise in prescription drug cost is the fastest-growing driver of overall medical cost inflation. Pharmaceutical cost is anticipated to surpass hospital cost soon if left unchecked.<sup>1-3</sup> Rising medical cost presents a challenge to the Kaiser Permanente (KP) dues rate position with its purchasers, who demand price restraint without compromising quality or access to care. The pharmaceutical industry continues to introduce new, usually higher-cost drugs with aggressive marketing campaigns to providers and through direct-to-consumer advertising—activities which have increased demand for these newer and not always better drugs. These efforts have resulted in increased prescription drug use<sup>1-3</sup> and drug costs.

Other health plans use restrictive formularies, prescription preauthorization, and risk-sharing contracts to influence providers to reduce cost. The Permanente Medical Groups (PMG) support the practice of evidence-based medicine and have applied such evidence to develop clinical practice guidelines that are used by Permanente physicians and providers. Rather than drawing conclusions from intuition, clinical experience, and anecdotal cases of disease, evidence-based medicine applies results of clinical research to medical decision making.<sup>4</sup>

Leaders and clinicians at KP therefore decided to establish a new drug use management program that would focus on continuous improvement in clinical outcomes while managing best practice drug utilization. These leaders agreed that the best approach would primarily focus on clinical evidence rather than cost reduction.

## Project to Improve Appropriate Prescription Drug Use to Best Practice

The purpose of this project was to improve quality of care for KP members by increasing appropriate prescribing and reducing inappropriate drug use to enable application of those resources for other care of greater patient benefit. The goals were to apply the principles of Permanente Medicine to improve clinical

outcomes, provide the most appropriate care for members, and improve cost effectiveness.

Regional KP leadership commissioned the project in Summer 1999 as a collaborative effort between the two PMGs in California (SCPMG and TPMG) and Pharmacy Operations. The project was designed to build upon

**Table 1. KPSC Drug Utilization Action Team (DUAT) members**

**Cochairs and contact persons:**

Joel D Hyatt, MD; Assistant Associate Medical Director  
Richard Wagner, PharmD; Drug Use Management Leader

**Team members:**

Binesh Batra, MD; Gastroenterology Committee  
John Bigley, MD; Chief of Internal Medicine  
David Chandler, MD; Chief of Psychiatry  
Ed Curry, MD; Chief of Pediatrics  
Dale Daniel, MD; Regional P&T (Pharmacy and Therapeutics) Chair  
Tracy Fietz, RNP; Medical Group Administrator, West LA  
Matt Gerlach, Service Area Manager; Valleys Service Area  
Ken Gould, MD; Internal Medicine-Infectious Disease Committee Representative  
Margaret Kurohara, MD; Chief of Allergy  
Denis Matsuoka, PharmD; Drug Use Manager  
Paul Minardi, MD; Chief of Family Practice  
Mitch Pelter, PharmD; Clinical Operations Manager  
Rod St John, MBA; Project Manager  
Kumar Venkat, MD; Rheumatology Committee  
Rod Zolt, PharmD; Pharmacy Leader

**Table 2. KPNC Drug Utilization Group (DRUG) members**

**Cochairs and contact persons:**

Timothy J Batchelder, MD; Physician-in-Chief, Richmond  
Richard Wagner, PharmD; Drug Use Management Leader

**Team members:**

David Campen, MD; Medical Director, Drug Use Management  
Ambrose Carrejo, PharmD; Drug Use Manager  
Alvin Cheung, PharmD; Pharmacy Leader  
Patricia Conolly, MD; Regional Clinical Director, AACC  
William Elliott, MD; Formulary Committee Chair  
Carol Havens, MD; Director, Physician Education & Development  
Fred Hom, MD; Regional Pharmacy and Therapeutics Committee Chair  
Jenny Hong, PharmD; Clinical Operations Manager  
Sharon Levine, MD; TPMG Associate Executive Director  
Rachelle Mirkin, MPH; Regional Health Education  
Stacey Olvera, PharmD; Drug Use Management  
Dot Snow, MPH; Project Manager, DRUG  
William Strull, MD; Assistant Physician-in-Chief, San Francisco  
Joann Zimmerman, RN; Service Area Manager, South Bay

Table 3. Quality measures established to evaluate improvement toward best practice use of prescription drugs in Kaiser Permanente of California	
Initiative	Quality measures
Antibiotic	<ul style="list-style-type: none"> <li>Percentage of patients seen for selected viral infections<sup>a</sup> who received an antibiotic.</li> <li>Antibiotic utilization for selected viral infections<sup>a</sup> on a per-patient basis.</li> <li>Macrolide prescription mix (frequency of quinolone use compared with frequency of erythromycin use).</li> <li>Frequency of amoxicillin-clavulanate (Augmentin) use compared with frequency of amoxicillin use.</li> </ul>
Allergy drug	<ul style="list-style-type: none"> <li>Percentage of prescriptions for less-sedating antihistamines (LSA) for patients who have not received intranasal corticosteroids.</li> <li>Overall utilization of LSA.</li> </ul>
Arthritis drug	<ul style="list-style-type: none"> <li>KPSC: Number of COX-2 inhibitor prescriptions per 1000 eligible members per month. Eligible members were those aged &lt;65 years and who were in NSAID GI risk level 1 or 2.</li> <li>KPNC: Number of eligible members receiving COX-2 inhibitors and not prescribed nabumetone (Relafen). Eligible members were those aged &lt;65 years and who were in risk levels 1 through 3.</li> <li>Total COX-2 inhibitor utilization in patients aged ≥65 years and &lt;65 years.</li> </ul>

<sup>a</sup> Selected viral infection diagnoses were those associated with colds and flu, although the diagnostic codes varied by KP Region and by database.

Table 4. Cost measures established to evaluate improvement toward best practice use of prescription drugs in Kaiser Permanente of California	
Initiative	Cost measures
Antibiotic	<ul style="list-style-type: none"> <li>Change in overall cost of antibiotics during peak cold and flu season</li> <li>Macrolide prescription mix (quinolones vs erythromycin)</li> <li>Augmentin vs amoxicillin prescription mix</li> <li>Overall cost of antibiotics</li> </ul>
Allergy drug	<ul style="list-style-type: none"> <li>Percentage market share of LSA compared with percentage market share of LSA + intranasal corticosteroids</li> <li>Overall utilization of LSAs</li> <li>Market share and overall costs</li> </ul>
Arthritis drug	<ul style="list-style-type: none"> <li>Percentage market share of COX-2 inhibitors compared with all NSAIDs</li> </ul>

our strength in physician leadership to assume responsibility for appropriate drug use. Pharmacy Operations agreed to provide systematic decision-making and practice support tools and infrastructure. The formation of the KP Southern California (KPSC) Regional Drug Utilization Action Team (DUAT) (Table 1) and the KP Northern California (KPNC) Regional Drug Utilization Group (DRUG) (Table 2) soon followed. By early 2000, every medical center in both California KP Regions had

established local DUAT or DRUG committees. These structures and processes are now well established and integrated into the overall program.

The key objectives for DRUG and DUAT committees were:

- to implement regionwide and medical-center-based structures, processes, and support systems within SCPMG and TPMG that focused on appropriate use of medications;
- to improve patient quality of care by using an evidence-based approach to drug use management through physician involvement, education, decision-making and practice support tools, and performance feedback to physicians and providers;
- to decrease variation in prescribing patterns by promoting appropriate practices as determined by physician specialists; and
- to manage member resources cost-effectively.

### Implementation Strategies

Current literature indicates that organizational structure, automated decision support systems, and tools for individual feedback are the most effective methods to implement change.<sup>5-7</sup> The least effective methods are traditional continuing medical education, lectures, dissemination of guidelines or information, and general group feedback.<sup>8</sup> This project designed several implementation strategies on the basis of the most effective methods.

### Organizational Structure

Local DUAT and DRUG committees were formed at 30 medical centers throughout California (12 in KPSC, 18 in KPNC). They implemented regional initiatives, determined local priorities, and established local oversight and accountability processes. The committees included physician experts from each affected PMG specialty area; the physician chairperson from pharmacy and therapeutics committees; and pharmacy operations leaders.

### Automated Decision Support Systems and Tools

- POINT-MIM (Permanente online interactive network tools—measures and initiative monitor): A customized Web-based database created to support this project provides local access to current drug utilization data at the provider and member level. The tool provides data to plan the education and feedback to physicians about the clinical appropriateness of prescribing various targeted drugs.

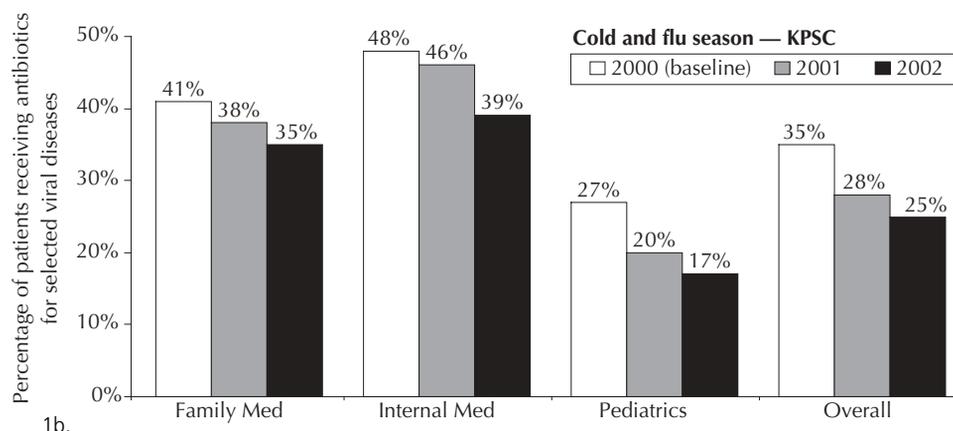
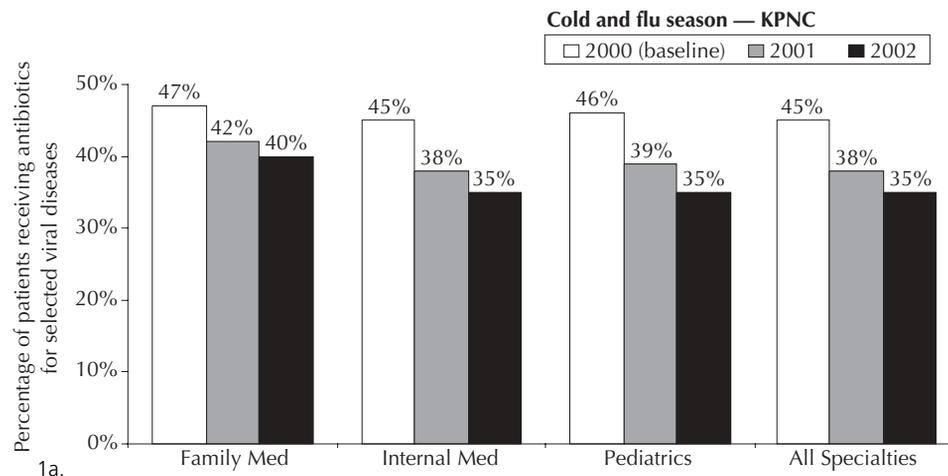


Figure 1a,b. Yearly cold and flu season trend in antibiotic prescribing for patients with selected viral diseases, by specialty group, for a) KPNC and b) KPSC. Selected viral diseases varied by region and by database.

This prompt enables discussion of clinical and patient-related information based on current Permanente clinical practice guidelines and recommendations.

- **PharmaFAX:** This decision support tool is designed to provide physicians with up-to-date, patient-specific recommendations and prompts for the targeted drug initiatives. The tool provides this information at the time of appointment, via fax, to inform physicians about their patients' prescribed medications. PharmaFAX currently includes recommendations regarding patient use of allergy, arthritis, and gastrointestinal drugs.
- **GI NSAID Risk Strategizer:**<sup>9</sup> POINT-MIM employs a tool that automatically categorizes patients by risk for appropriate use of NSAIDs, including the COX-2 inhibitor drugs. The tool was designed from research conducted at Stanford University.<sup>10</sup>
- **Outpatient Pharmacist Interventions:** For some initiatives, the POINT-MIM system provides im-

mediate information or patient assessment from which the outpatient pharmacist can call a physician when a new prescription for a targeted drug is received (eg, a COX-2 inhibitor). This prompt enables discussion of clinical and patient-related information based on current Permanente clinical practice guidelines and recommendations.

**Other Decision Support and Practice Tools**

- **Paycheck Messaging Service:** Short messages about DUAT and DRUG initiatives attached to physicians' biweekly paychecks.
- **DUAT Toolkits:** Specific processes, treatment algorithms, and practice tools used in better-performing KP medical centers were identified and

**The committees worked with experts to create clinical recommendations, set performance goals, prepare educational materials, and format performance feedback data.**

disseminated in the form of Successful Practices Toolkits to standardize best practices. DUAT Toolkits include Antibiotic, Allergy, GI, and Arthritis Drugs; and After-Hours Prescribing.

- Medical center consultative visits: All medical centers were visited by the Pharmacy Consultative Services Team (KPNC) or by Regional DUAT leaders (KPSC). They provided consultation to overcome barriers to drug use management efforts and shared successful practices that had been identified at other medical centers.
- DUAT/DRUG Teleconferences and Videoconferences: These media events featured Permanente clinical experts and DUAT/DRUG leaders who presented information about appropriate use of targeted medications and answered attendees' questions. These conferences were recorded (by audio, video, CD-ROM, and Intranet) and distributed to providers across the KP Regions.
- Physician specialists using peer-to-peer contact and counseling to champion best practices to primary physicians.
- Publications and other media: Partner News, Physician Web site, posters, flyers, OTC prescription pads, presentation starter packs (H<sup>2</sup> blockers).

**Project Budget**

- \$300,000 was allocated for personnel expenditures directly related to DRUG/DUAT activities for analytic support, computer programming, project management, meetings, and business administrative services.
- \$150,000 was allocated for nonpersonnel expenditures related to DRUG/DUAT activities, including direct mailings, printing, teleconferences, and videoconferences.

**Drug Use Management Initiatives**

The regional DUAT and DRUG committees selected several drug classes for utilization management. The criteria for selection included high cost, wide variation in utilization, and availability of less expensive and equally effective alternatives as well as support from clinical experts. The committees worked with experts to create clinical recommendations, set performance goals, prepare educational materials, and format performance feedback data. The drug classes include:

- Antibiotics used in the treatment of upper respiratory conditions, especially broad-spectrum antibiotics such as amoxicillin-clavulanate (Augmentin), newer macrolides, and quinolones;

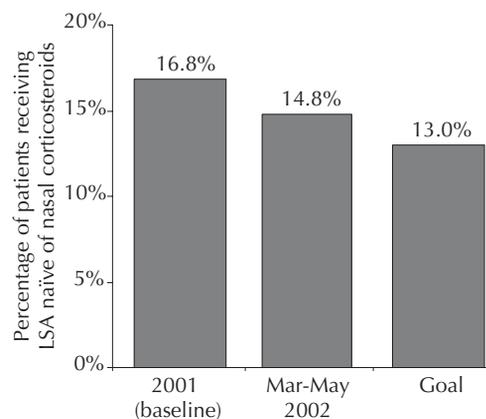


Figure 2. Trend in prescribing less-sedating antihistamine (LSA) to KPNC patients who have not received intranasal corticosteroid. Patients (unique medical record numbers) were aged ≥12 years and received at least 120-day supply of LSA but no intranasal corticosteroids within the past year.

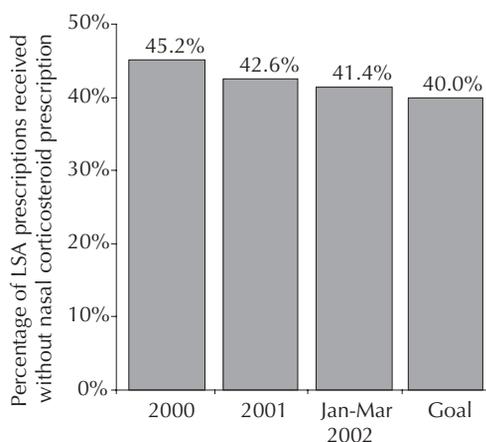


Figure 3. Trend in prescribing less-sedating antihistamine (LSA) to KPNC patients who have not received intranasal corticosteroid. Percentages based on no. of LSA prescriptions/no. of LAS + intranasal corticosteroid prescriptions.

- Antiviral medications, specifically Tamiflu (oseltamivir), Relenza (zanamivir), and amantadine;
- Allergy medications, specifically intranasal corticosteroids and less-sedating antihistamines (LSA);
- Arthritis medications, specifically COX-2 inhibitors and other nonsteroidal anti-inflammatory drugs (NSAIDs);
- Upper gastrointestinal tract medications, specifically H<sup>2</sup> receptor antagonists (H<sup>2</sup>RAs) and proton pump inhibitors (PPIs);
- Antidepressants, specifically selective serotonin reuptake inhibitors (SSRIs); and

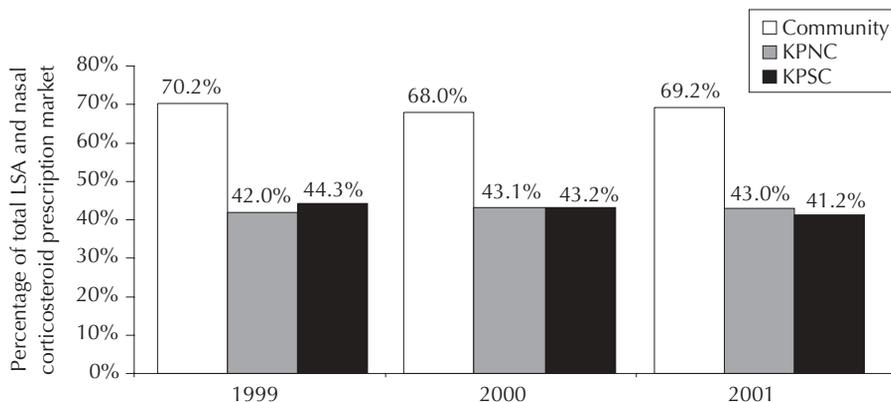


Figure 4. Graph shows trends in use of less-sedating antihistamines (LSA) compared with use of LSA and intranasal corticosteroids together (expressed as percentage of market share) for KP Regions and community (California health plans outside KP). Market share utilization data were based on no. of LSA prescriptions/no. of LSA + intranasal corticosteroid prescriptions.

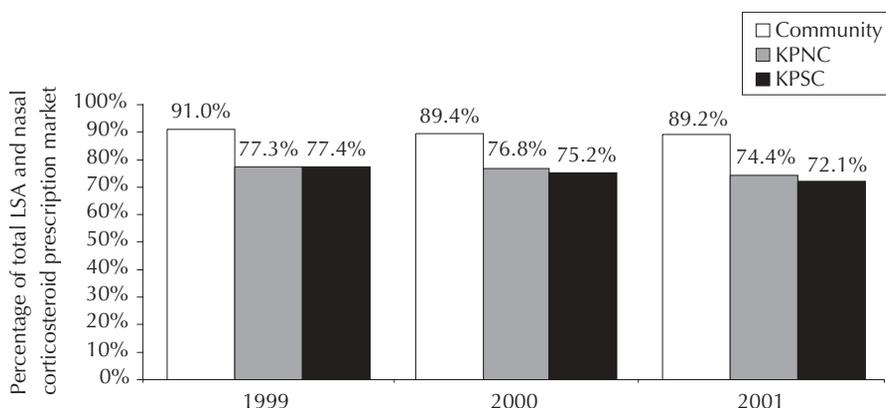


Figure 5. Graph shows percent of total less-sedating antihistamine (LSA) and intranasal corticosteroid costs attributable to LSA prescribed alone (expressed as percentage of market share) for KP Regions compared with community (California health plans outside KP).

**Our goal was to increase use of intranasal corticosteroid drugs among patients with chronic allergic rhinitis.**

- Antihyperlipidemic medications, specifically the statins (KPNC only).

We evaluated results for the following three drug use management initiatives:

**Antibiotic initiative:** During the 2001-2002 cold and flu season, each region had more than 400,000 visits for respiratory diagnoses that are usually viral in origin. Our initiative focused on reducing antibiotic use for these conditions to preserve antimicrobial activity of the antibiotics.

**Allergy drug initiative:** 185,000 patients in KPSC and 238,000 patients in KPNC were seen for allergic rhinitis in 2001. Current medical literature about chronic

allergic rhinitis supports the use of intranasal corticosteroids as the more effective treatment compared with the less-sedating antihistamines (LSA).<sup>11,12</sup> Our goal was to increase use of intranasal corticosteroid drugs among patients with chronic allergic rhinitis. The initiative focused on decreasing the percentage of patients who were repeatedly prescribed LSA without having an intranasal corticosteroid drug prescribed also.

**Arthritis drug initiative:** Sales of COX-2 inhibitor drugs began in early 1999. By mid-2000, the number of COX-2 inhibitor prescriptions dispensed at KP was increasing at the rate of approximately 12% per month. More than 20,000 patients in each KP Region are cur-

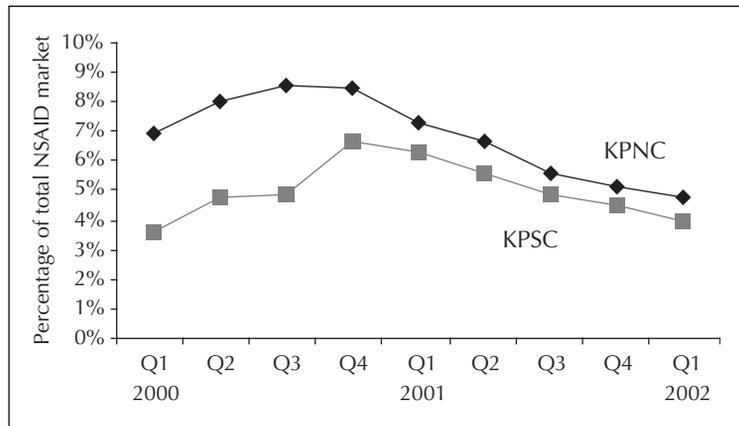


Figure 6. KP Regional trends in prescribing COX-2 inhibitors, expressed as percentage of total NSAID market.

rently being treated with a COX-2 inhibitor, such as celecoxib (Celebrex) or rofecoxib (Vioxx), or have received a new prescription for one during the past year. Current literature shows no benefit associated with the use of COX-2 inhibitors compared with use of alternatives, except in a subset of patients who may be at high risk for gastrointestinal bleeding.<sup>13</sup> The goal of the initiative was to reduce utilization by substituting other treatments for COX-2 inhibitors among low-risk patients.

### Methods of Project Evaluation Quality and Cost Measures

To evaluate improvement toward best practice in prescription drug use, quality and cost measures were established for each of the drug initiatives (Tables 3 and 4).

Goals were established for each measure by averaging results from the four best-performing medical centers in the region during the baseline year (KPSC) or by approval of the chiefs of service (KPNC). Industry comparisons were used as a reference.

### Data Collection and Analysis

Data were collected from linked, automated pharmacy systems and supplemented by KP administrative databases, including CARG/OPAS (Care Registration/Outpatient Appointment Scheduling), OSCR (Outpatient Summary Clinical Record), and PIMS (Pharmacy Information Management System). POINT-MIM was programmed to produce drug-initiative-specific reports. Reports could show results at a high level (eg, regional or medical center performance) or could focus on a specific department, specialty, clinician, or patient.

Analyses were completed for each drug initiative. Use of antibiotics to treat viral infections was evaluated by searching CDAP (Clinical Diagnosis and Procedure), ECS

(Encounter Coding System), and OSCR database encounter codes to identify patients who were seen for a defined list of respiratory tract conditions likely to be caused by viruses (details available upon request). Seasonal adjustments were made for use of allergy drugs and antibiotics on the basis of prior 3- to 5-year trends. Use of COX-2 inhibitors was evaluated by applying the risk stratification method (GI NSAID Risk Strategizer Tool).<sup>9</sup> For benchmark market share comparison, the POINT-Product Variance Tool was used to determine KP drug utilization and cost data. The source for external drug utilization and cost data was IMS Health (Fairfield, CT), a pharmaceutical industry market research firm.

## Results of Program Evaluation Decreased Antibiotic Use

Overall use of antibiotics and use of antibiotics for selected "viral" respiratory tract diagnoses during the cold and flu season decreased in both regions and across specialties for two consecutive years, without an increase in physician office visits or hospital admissions (Figure 1a,b). Antibiotic use was avoided in 65% (KPNC) and 75% (KPSC) of encounters with patients who had diagnoses that were probably viral in origin. The initiative reduced the cost for antibiotics by an estimated \$1.5 million.

### Improved Use of Allergy Drugs

The percentage of patients who received LSA prescriptions and who had not yet received a prescription for an intranasal corticosteroid decreased by 2% at KPNC (Figure 2) to 3.8% at KPSC (Figure 3). Utilization of LSA within KP continues to be about two thirds that of the community external to KP (Figure 4). The cost of LSA decreased by 2.9% (KPSC) to 5.3% (KPNC) between 1999 and 2001 (Figure 5).

### Improved Use of Arthritis Drugs

The upward trend in utilization of COX-2 inhibitors was reversed in both regions. In 1st Quarter 2002 market share of COX-2 inhibitors as a percentage of total NSAID market share had fallen to 1st Quarter 2000 levels at KPNC and was below 1st Quarter 2000 levels at KPSC (Figure 6). Use of COX-2 inhibitors in lower-risk patients was reduced 66% in KPNC (Figure 7) and 48% in KPSC (Figure 8). Total NSAID market share utilization of COX-2 inhibitors within KP was about 6% in 2001 and 4% in 2002 (Figure 6), far lower than the 45% rate seen outside KP (Figure 9). The rapid increase in cost for COX-2 inhibitors (as a percentage of total NSAID cost) was also reversed; this cost was about 40% lower than that of the community (Figure 10).

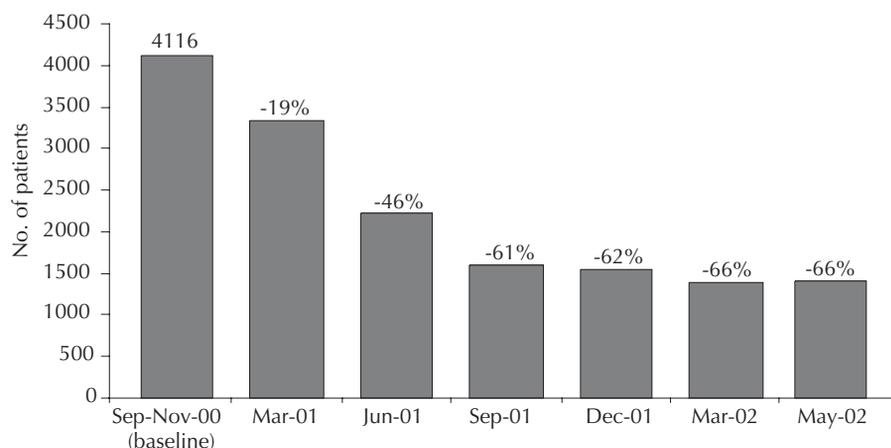


Figure 7. Trend in prescribing COX-2 inhibitors for patients in KPNC who are aged <65 years, at risk levels 1 through 3, and who have not been prescribed nabumetone (Relafen).

**Reducing inappropriate antibiotic use provides social, clinical, and economic benefits.**

**Comments**

**Initiative Results**

Our efforts to promote judicious use of antibiotics are consistent with the recommendations of the Centers for Disease Control & Prevention (CDC),<sup>14</sup> the World Health Organization (WHO),<sup>15</sup> the American Medical Association (AMA),<sup>16</sup> and the California Medical Association (CMA).<sup>17</sup> Reducing inappropriate antibiotic use provides social, clinical, and economic benefits. From a social perspective, reduced antibiotic use helps slow the rate at which bacteria develop antibiotic resistance. From a clinical perspective, reduced use improves quality of care by reducing probability of adverse events and by preserving the effectiveness of antibiotics for treating future infections. From an economic perspective, reduced antibiotic use preserves member resources by reducing unnecessary drug expenditures.

For patients with chronic allergic rhinitis, current medical literature supports use of intranasal corticosteroids instead of LSA.<sup>11,12</sup> We have achieved higher use of intranasal corticosteroids by reducing the number of patients prescribed LSA who have not also been prescribed intranasal corticosteroids, thus providing the most effective treatment of chronic allergic rhinitis.

Our efforts to promote appropriate use of arthritis drugs are focused on reserving the use of expensive COX-2 medications for patients at highest risk for gastrointestinal bleeding and on reducing the use of COX-2 inhibitor medications in patients who are at lower risk.

All these efforts have succeeded in improving clinical quality and cost effectiveness of our care. Best practice use of LSA and COX-2 inhibitors in 2001 resulted in more than \$100 million cost avoidance compared

with costs in California health plans outside KP. This result improves quality by allowing resources to be redirected to other forms of patient care.

**Project Innovation and Leadership**

The DUAT and DRUG efforts in this project demonstrated the following unique aspects:

- We established new KP Regional and local structures and processes that focused on appropriate drug use beyond traditional drug management strategies of formulary management, benefit design, and restricted use. These structures created local oversight and accountability.

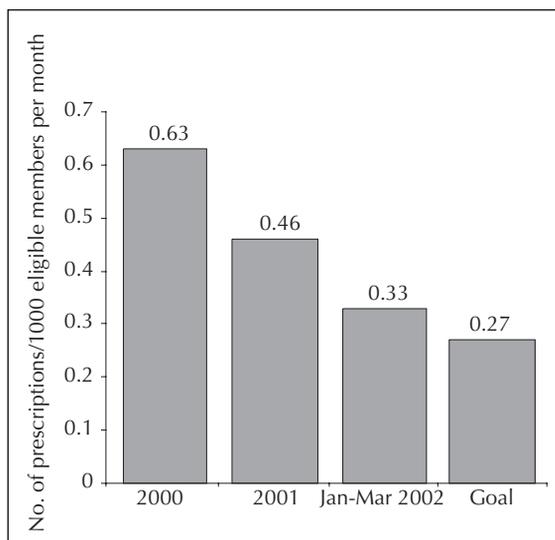


Figure 8. Trend in COX-2 inhibitor prescribing rate in KPSC. Eligible members are KPSC members aged <65 years and are at risk levels 1 or 2.

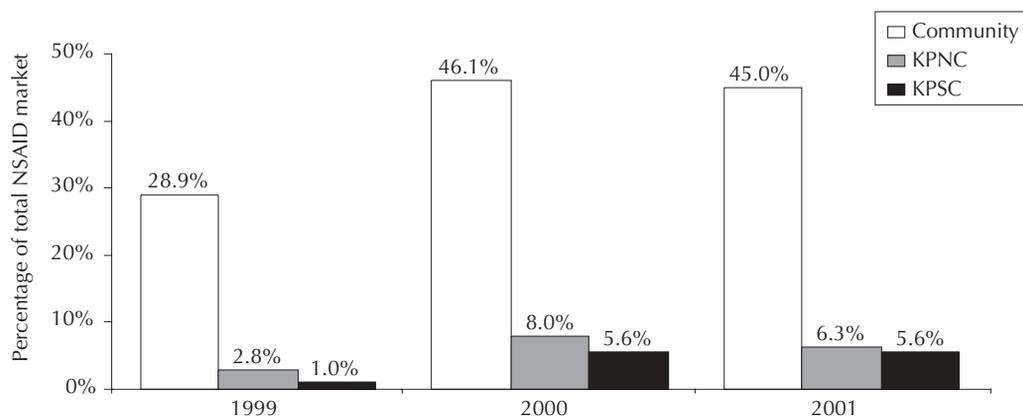


Figure 9. Trend in use of COX-2 inhibitors (expressed as percentage of total NSAID market) for KP Regions compared with community (California health plans outside KP).

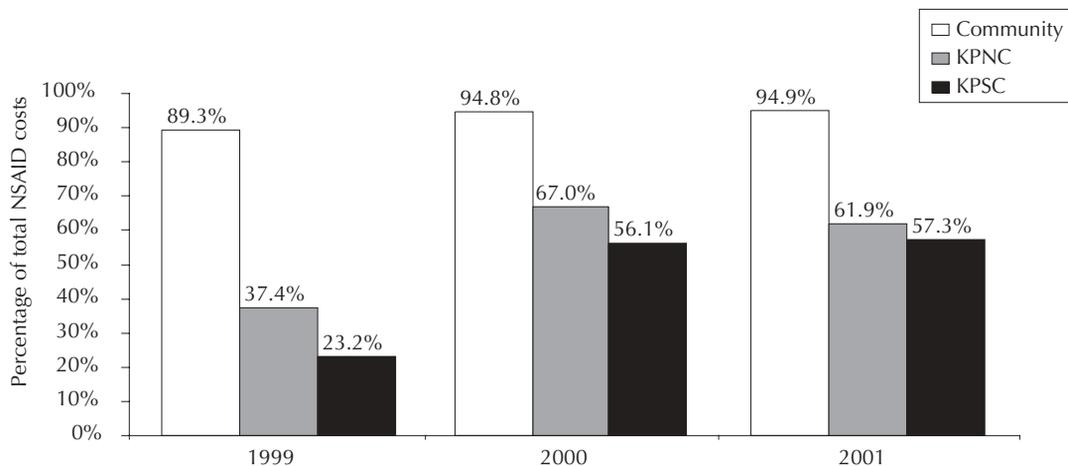


Figure 10. Trend in costs of COX-2 inhibitors (expressed as percentage of total NSAID costs) for KP Regions compared with community (California health plans outside KP).

- We designed, developed, and supported innovative and systematic clinical decision-making and practice support tools to help our clinicians make evidence-based clinical decisions.
- We demonstrated a strong partnership between the medical groups and pharmacy services.
- We shared and developed best practices through interregional collaboration in the form of periodic joint DUAT and DRUG teleconferences and reciprocal attendance at drug use conferences.
- We engaged specialist groups and clinical experts who provided leadership, advocacy, and direction for strategy development and implementation.
- We measured concurrent performance, sometimes enabling weekly feedback to physicians and providers, through database mining and reporting

tools. We tracked drug utilization trends, compared practice patterns among medical centers, and compared prescribing practice of individual physicians.

### Conclusion

The DUAT and DRUG project success in improving clinicians' prescribing patterns toward best practice depended largely upon multidisciplinary collaboration. The results testify to effectiveness of the project design. Interregional collaboration between KPNC and KPSC allowed us to leverage resources and to share successful practices. We combined the most successful methods of behavior change by providing evidence-based education, initiative-specific clinical and decision support tools, appropriate measurement, and timely feedback.

Transferability of the DUAT/DRUG model is demonstrated by full adoption of the DRUG and DUAT structures and processes in two KP Regions and at 30 KP medical centers. We believe that the DUAT/DRUG model will apply to additional drug use management opportunities in the future. ❖

#### Acknowledgments

We acknowledge the following teams for their continued assistance and support of DUAT (Table 1) and DRUG (Table 2): Medical-center-based committee chairs and members for implementing initiatives, monitoring, and follow-up; TPMG and SCPMG for supporting evidence-based medicine and striving for best practice; TPMG and SCPMG specialty chiefs and committees for providing leadership and advocacy for all the initiatives; Pharmacy Analytic Services for analyzing and providing accurate and timely reports; Pharmacy Drug Information Service for providing the evidence-based medical literature review; Drug Education Coordinators for managing local support of the initiatives; and Project Managers for supporting regional and local data analysis.

We also thank KP Consulting for their early business administrative support in 1999-2000, support which enabled initiation of the project.

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**... the DUAT/  
DRUG model  
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additional  
drug use  
management  
opportunities in  
the future.**