Direct-to-Consumer Advertising of COX-2 Inhibitors: Effect on Appropriateness of Prescribing

Michele M. Spence
Kaiser Permanente
Stephanie S. Teleki
RAND
T. Craig Cheetham
Kaiser Permanente
Stuart O. Schweitzer
University of California, Los Angeles
Mirta Millares
Kaiser Permanente

Spending on direct-to-consumer advertising (DTCA) of prescription drugs has increased dramatically in the past several years. An unresolved question is whether such advertising leads to inappropriate prescribing. In this study, the authors use survey and administrative data to determine the association of DTCA with the appropriate prescribing of cyclooxygenase-2 (COX-2) inhibitors for 1,382 patients. Treatment with either a COX-2 or a traditional nonsteroidal anti-inflammatory drug (NSAID) was defined as appropriate or not according to three different definitions of gastrointestinal risk. Patients who saw or heard a COX-2 advertisement and asked their physician about the advertised drug were significantly more likely to be prescribed a COX-2 (versus a NSAID, as recommended by evidence-based guidelines) than all other patients. Findings also suggest that some patients may benefit from DTCA. The authors discuss the need for balanced drug information for consumers, increased physician vigilance in prescribing appropriately, and further study of DTCA.

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During the past decade, pharmaceutical manufacturers have spent record amounts on direct-to-consumer advertising (DTCA) of prescription drugs. Spending levels have increased from an estimated $55 million in 1991 to $3.27 billion in 2003 (Wilkes, Bell, and Kravitz 2000; Humphreys and Boersig 2004). Evidence suggests that DTCA increases consumer demand for newer, more expensive drugs and that highly promoted drugs account for a substantial share of sales within their therapeutic class (National Institute for Health Care Management 1999, 2001; Levit et al. 2000; Zachry et al. 2002). Previous studies also have shown that patients' requests for heavily advertised drugs frequently result in prescriptions for those drugs, but the question remains whether such prescriptions are clinically appropriate (Mintzes et al. 2002; Aikin 2002; Weissman et al. 2003; Kravitz et al. 2005). The issue of appropriateness is crucial to the national debate about DTCA of prescription drugs (Batchlor and Laouri 2003).

We studied DTCA and appropriateness within the framework of nonsteroidal anti-inflammatory drugs (NSAIDs), a class of drugs that contains two subclasses: (1) traditional NSAIDs, such as ibuprofen and naproxen, and (2) a newer subclass known as *cyclooxygenase-2 inhibitors* (COX-2s). We focused on NSAIDs because these drugs are widely prescribed and because COX-2s have been heavily advertised, are more expensive than traditional NSAIDs, and are considered equally effective (not more effective) when compared with traditional NSAIDs for the treatment of pain and inflammation (National Institute for Health Care Management 2001; Emery et al. 1999; Morrison et al. 1999). We examined the impact of COX-2 DTCA on the likelihood of patients being prescribed either a COX-2 or a traditional NSAID according to evidence-based guidelines that recommend that the most appropriate use of COX-2s is among patients who are at high risk of gastrointestinal (GI) bleeding (Silverstein et al. 2000; Bombardier et al. 2000). Because of variation in patient response to treatment as well as in physician preferences, we used three different methods to identify GI bleeding risk.

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NEW CONTRIBUTION

This research provides an in-depth look at DTCA in a real-world setting. It addresses the issue of appropriateness within one class of drugs that have been heavily marketed to consumers. The relationship between patients' awareness of the advertisements, requests about advertised medications, and whether the prescribed medications were appropriate is explored using data from both surveys and administrative databases.

METHOD

This study was conducted at Kaiser Permanente (KP) Medical Care Program in Southern California, a nonprofit, group-model health maintenance organization (HMO) serving approximately three million members. The study was cross-sectional and included patients who were at least eighteen years old, were continuously enrolled in the health plan for at least one year, and had comparable prescription drug benefits during that time. Pharmacy databases were used to identify a stratified, random sample of 2,929 patients; half of these patients received a new prescription for celecoxib (brand name Celebrex) or rofecoxib (brand name Vioxx), and the other half received a new prescription for a traditional NSAID. To ensure that patients had interacted with a physician, the study included only those patients whose new prescription was filled within seven days of a physician office visit.

Data sources included survey responses and administrative database information. A mail survey was used to collect information on patient demographics, awareness of COX-2 DTC advertisements, and action resulting from such awareness. Patients received the survey three to six months after filling the initial prescription. The survey, available in English and Spanish, was mailed to patients in February 2001 and then was followed by a reminder postcard. Surveys were pilot tested on a group of KP patients (n = 9). The design and all procedures for this study were approved by the institutional review boards of KP Southern California and the University of California, Los Angeles.

MAJOR MEASURES

Patient awareness of COX-2 DTCA was measured by a series of survey questions. Patients were asked, "Have you ever seen or heard any advertisement for the drug Celebrex?" and "After you saw or heard the advertisement, did you ask your doctor about Celebrex?" Patients were asked the same questions about Vioxx. Responses were combined and grouped into two

TABLE 1 Appropriateness of Prescribing with Traditional NSAIDs and COX-2 Inhibitors, Assessed According to Three Methods of Defining Risk of Gastrointestinal Bleeding, 2001

	NSAID	*COX-2 Inhibitor*
Method 1: SCPMG clinical practice guideline		
SCORE levels 1–3	Appropriate (*n* = 528)	COX-2 instead of NSAID (*n* = 672)
SCORE level 4	NSAID instead of COX-2 (*n* = 18)	Appropriate (*n* = 121)
Method 2: Modified SCPMG clinical practice guideline		
SCORE levels 1–2	Appropriate (*n* = 423)	COX-2 instead of NSAID (*n* = 384)
SCORE level 3, 4	NSAID instead of COX-2 (*n* = 123)	Appropriate (*n* = 409)
Method 3: Laine criteria		
No criteria	Appropriate (*n* = 354)	COX-2 instead of NSAID (*n* = 273)
Met one or more criteria	NSAID instead of COX-2 (*n* = 206)	Appropriate (*n* = 549)

Source: Data from Kaiser Permanente Southern California/UCLA COX-2 DTCA Study.
Note: NSAID = nonsteroidal anti-inflammatory drug; COX-2 = cyclooxygenase-2; SCPMG = Southern California Permanente Medical Group; SCORE = Standardized Calculator of Risk for Events; DTCA = direct-to-consumer advertising.

categories: (1) saw or heard a COX-2 advertisement and asked a physician about the drug and (2) all others, which includes patients who did not see or hear an advertisement and those who saw or heard an advertisement but did not ask a physician about the drug.

The appropriateness measure was defined with respect to a patient's risk of GI bleeding. Patients were grouped into one of three categories: (1) prescribed a COX-2 instead of a traditional NSAID (i.e., not according to guideline), (2) prescribed a traditional NSAID instead of a COX-2 (i.e., not according to guideline), and (3) appropriately prescribed either a COX-2 or a traditional NSAID (i.e., according to guideline). Because clinical assessment may vary regarding severity of risk of GI bleeding, we used three different methods of defining this risk (see Table 1).

First, we used the definition of risk outlined in the clinical practice guideline endorsed by the Southern California Permanente Medical Group

(SCPMG), Method 1. This method uses the Standardized Calculator of Risk for Events (SCORE) tool, a scale developed by Stanford University researchers and validated in the KP population, to define GI risk (Singh 1998; Cheetham, Levy, and Spence 2003). The scale identifies patients at high risk for serious GI events associated with NSAID therapy (i.e., GI bleeding requiring hospitalization) on the basis of six factors. These factors include age, health status, type of arthritis, duration of prednisone use in past year, previous GI-related hospitalization, and previous GI side effects. Responses to the six factors are translated into one of four risk levels: level 1 indicates low risk, whereas level 4 indicates high risk for a NSAID-related GI event. According to the SCPMG guideline, patients at level 4 are at highest risk for a GI event and therefore are the most appropriate candidates for a COX-2; patients below level 4 are appropriately treated with a traditional NSAID (Kaiser Permanente 2001). With Method 1, patients at risk level 1, 2, or 3 are lower risk. If these patients received a traditional NSAID, they were classified as being appropriately prescribed according to the guideline. Only patients at risk level 4 who received a COX-2 were classified as being appropriately prescribed a COX-2.

For the second way of defining GI risk (Method 2), we allowed for a more liberal assessment of GI risk using the SCORE tool. In this method, patients at risk level 3 or 4 were considered at high risk for NSAID-related GI complications and were therefore the most appropriate candidates for a COX-2. Patients at risk levels 1 and 2 were classified as appropriately prescribed only if they received a traditional NSAID (versus a COX-2).

The third method for defining GI risk (Method 3) was based on criteria in a review article by Laine (2001). This method allowed for the most liberal assessment of GI risk. In Method 3, patients were considered at high risk for GI bleeding if they met one or more of the following criteria: history of ulcer or other GI event; older than age sixty-five; currently receiving anticoagulation therapy, corticosteroid therapy, or low-dose aspirin therapy; and history of severe rheumatoid arthritis. Method 3 classified patients as appropriately prescribed if they met at least one of the criteria and received a COX-2. Patients were also classified as appropriately prescribed if they did not meet any of the criteria and received a traditional NSAID.

The following covariates were also included in the analyses: patient age, gender, race, education, income, duration of membership in the health plan, health status (as measured by the chronic disease score), and relationship status (defined as living with spouse or partner, not living with spouse or partner, or not in a significant relationship). Patient chronic disease score was based on the measure developed by Clark et al. (1995) to assess disease severity. In addition, because prescribing patterns vary by physician characteristics (Eisenberg 1986), we included several covariates for the prescribing physician

in the analyses. These covariates included physician age, gender, race, specialty, practice location, and tenure with the SCPMG. All patient and physician covariates are listed in Table 2.

STATISTICAL ANALYSIS

Multinomial logistic regression, a variant of logistic regression that allows use of a dependent variable with more than two categories, was used to examine predictors separately for each of the three methods. All models met the assumptions of multinomial logistic regression. Neither an evaluation of a correlation matrix nor additional tests of the model available in STATA version 7.0 revealed issues of multicollinearity. Interactions of DTCA awareness—crossed first with patient race and then with patient education—were evaluated but were not found statistically significant. Analysis of survey nonrespondents also was conducted to detect any statistically significant difference from survey respondents.

RESULTS

The overall survey response rate was 47 percent (1,382 of 2,929 patients). The response rate for the COX-2 group was 55 percent (822 of 1,499 patients); the response rate for the traditional NSAID group was 39 percent (560 of 1,430 patients). These rates were within the range anticipated for mail surveys (Bourque and Felder 1995; Aday 1996).

Table 2 shows the distribution of all variables for the analysis sample. About 20 percent of patients asked their physician about a COX-2 after seeing or hearing an advertisement. In general, the sample tended to be female, non-Hispanic white, and well educated. Most patients had been a KP member for at least two years, and 46 percent were at least sixty-five years old. Prescribing physicians tended to be middle-aged, male, non-Hispanic white, and practicing primary care medicine; 69 percent had practiced at KP for at least four years.

APPROPRIATENESS OF PRESCRIPTION BY DTCA AWARENESS

For Method 1, 78 percent of patients who saw or heard a COX-2 advertisement and asked were prescribed a COX-2 (instead of an NSAID, as the guideline recommends), versus 43 percent of all other patients (see Table 3). Twenty-one percent of patients who saw or heard a COX-2 advertisement and asked their physician were appropriately prescribed, versus 55 percent of all other patients. Compared to Method 1, there were more patients in Method 2

TABLE 2 Demographic Characteristics and Survey Results for 1,382 Patients in COX-2 Direct-To-Consumer Advertising (DTCA) Study, 2001

Item	n	%[a]
Awareness of COX-2 DTCA		
Did not see or hear DTCA or ask physician	1,110	80.32
Saw or heard DTCA and asked physician	272	19.68
Patient age		
Younger than 65	742	54.16
65 or older	628	45.84
Patient gender		
Male	471	34.11
Female	910	65.89
Patient race		
Non-Hispanic white	868	64.01
Other	488	35.99
Patient education		
High school graduate or less	422	31.12
Some college	506	37.32
College graduate or more	428	31.56
Patient income		
Less than $40,000	635	50.80
$40,000 or more	615	49.20
Patient length of membership in health plan		
Less than 2 years	210	15.20
2 to less than 6 years	612	44.28
6 years or more	560	40.52
Patient chronic disease score (continuous variable)		
M (*SD*)	2.09	0.85
Median	1.98	
Range	0.72 to 5.08	
Patient relationship status		
Living with spouse or partner	917	69.10
Not living with spouse or partner or not in a significant relationship	410	30.90
Physician age		
Younger than 36	302	24.65
36 to less than 51	658	53.71
51 years or older	265	21.63

(continued)

TABLE 2 (continued)

Item	n	%[a]
Physician gender		
Male	860	70.20
Female	365	29.80
Physician practice specialty		
Primary care	959	78.29
Specialty care	266	21.71
Physician practice location in SCPMG		
Metro	212	17.31
Valleys	190	15.51
Tri-central	283	23.10
Inland Empire	190	15.51
Orange County and San Diego	350	28.57
Physician race		
Non-Hispanic white	677	55.27
Other	548	44.73
Physician length of tenure with SCPMG		
Less than 4 years	383	31.27
4 years or more	842	68.73

Source: Data from Kaiser Permanente Southern California/UCLA COX-2 DTCA Study.
Note: SCPMG = Southern California Permanente Medical Group; COX-2 = cyclooxygenase-2.
a. Numbers may not add up to 1,382 for each variable because of missing data.

(53 percent) and Method 3 (67 percent) who were appropriately prescribed after seeing or hearing a COX-2 advertisement and asking their physician.

FACTORS ASSOCIATED WITH APPROPRIATENESS OF PRESCRIPTION

Table 4 presents regression results for the effect of COX-2 DTCA awareness on appropriateness after controlling for patient and physician characteristics. Other variables that were statistically significant in at least one model are discussed below but not presented in Table 4.

For all three methods of defining risk of GI bleeding, awareness of DTCA and asking a physician were significantly associated with being prescribed a COX-2 instead of an NSAID, compared to being appropriately prescribed either a COX-2 or an NSAID. Using Method 1, the odds of being prescribed a COX-2 instead of an NSAID for patients who saw or heard a COX-2 advertisement and asked their physician about the advertised drug were four times the

TABLE 3 Awareness of COX-2 DTCA and Appropriateness of Prescribing with Traditional NSAIDs and COX-2 Inhibitors Assessed According to Three Methods of Defining Risk of Gastrointestinal Bleeding, 2001

	Awareness of COX-2 DTCA			
	Saw or Heard DTCA and Asked Physician		*Did not see or Hear DTCA or ask Physician*	
Method	*Number*	*%*	*Number*	*%*
Method 1: SCPMG guideline*				
Appropriately prescribed	57	21.43	592	55.17
NSAID instead of COX-2	2	0.75	16	1.49
COX-2 instead of NSAID	207	77.82	465	43.34
Column total	266	100.00	1,073	100.00
Method 2: Modified SCPMG guideline*				
Appropriately prescribed	141	53.01	691	64.40
NSAID instead of COX-2	6	2.26	117	10.90
COX-2 instead of NSAID	119	44.74	265	24.70
Column total	266	100.00	1,073	100.00
Method 3: Laine criteria*				
Appropriately prescribed	183	67.28	720	64.86
NSAID instead of COX-2	10	3.68	196	17.66
COX-2 instead of NSAID	79	29.04	194	17.48
Column total	272	100.00	1,110	100.00

Note: DTCA = direct-to-consumer advertising; SCPMG = Southern California Permanente Medical Group; NSAID = nonsteroidal anti-inflammatory drug; COX-2 = cyclooxygenase-2.
*$p < .01$.

odds for all other patients. Using Methods 2 and 3, the odds of being prescribed a COX-2 for patients who saw or heard a COX-2 advertisement and asked their physician were three times the odds for all other patients. For all three methods (i.e., no matter how stringently GI bleeding risk was defined), patients who asked their doctor about COX-2s after seeing or hearing an advertisement were more likely to be prescribed a COX-2.

Awareness of DTCA and asking a physician was not significantly associated with prescribing an NSAID (as the guideline recommends) instead of a COX-2, compared to appropriate prescribing of either an NSAID or COX-2, using Method 1. However, using Methods 2 and 3, the odds of being prescribed a traditional NSAID for patients who both saw or heard a COX-2

TABLE 4 Predicting Appropriateness of COX-2 and Traditional NSAID Prescriptions Using Three Methods of Defining Gastrointestinal Risk, Using Odds Ratios, 2001

Awareness of COX-2 DTCA	*Prescribed COX-2 Instead of NSAID vs. Appropriately Prescribed*		*Prescribed NSAID Instead of COX-2 vs. Appropriately Prescribed*	
	Odds Ratio	*95% Confidence Interval*	*Odds Ratio*	*95% Confidence Interval*
Method 1: SCPMG clinical practice guideline[a]				
Saw or heard DTCA and asked physician	4.03	(2.77–5.87)*	1.14	(0.23–5.66)
Method 2: Modified SCPMG clinical practice guideline[b]				
Saw or heard DTCA and asked physician	3.05	(2.09–4.46)*	0.15	(0.06–0.39)*
Method 3: Laine criteria[c]				
Saw or heard DTCA and asked physician	3.15	(1.93–5.14)*	0.15	(0.07–0.31)*

Source: Data from Kaiser Permanente Southern California/UCLA COX-2 DTCA Study.
Note: The reference group for each method is "did not see or hear DTCA or ask physician." Regressions predicted appropriateness of prescribing. Regression analyses included all covariates listed in Table 2. Covariates significant at $p < .01$ are discussed in the text. Values in parentheses are done so to convey that the odds ratio is significant. DTCA = direct-to-consumer advertising; NSAID = nonsteroidal anti-inflammatory drug; COX-2 = cyclooxygenase-2; SCPMG = Southern California Permanente Medical Group.
a. $p < .001$, $n = 1{,}026$, pseudo $R^2 = 0.11$.
b. $p < .001$, $n = 1{,}026$, pseudo $R^2 = 0.15$.
c. $p < .001$, $n = 1{,}054$, pseudo $R^2 = 0.24$.
*$p < .01$.

advertisement and asked their physician about the advertised drug were one-seventh the odds for all other patients. Patients who were exposed to DTCA and asked their physician were less likely to be prescribed a traditional NSAID instead of a COX-2, as recommended by the guideline. In other words, they were more likely to be appropriately prescribed a COX-2.

In all three methods, physician specialty was a significant predictor of being prescribed a COX-2 (instead of an NSAID, as the guidelines recommend). Patients treated by specialists were approximately twice as likely to be prescribed a COX-2 as patients treated by generalists.

Additional variables were significant predictors in at least one model. For Methods 2 and 3 only, patient age was a significant predictor. Older patients were less likely to be prescribed a COX-2 and more likely to be prescribed a

traditional NSAID. For methods 2 and 3, respectively, the odds of being prescribed a COX-2 (compared to being appropriately prescribed) for patients aged sixty-five years and older were one-quarter and one-tenth the odds for patients younger than sixty-five. Conversely, the odds of being prescribed a traditional NSAID for patients aged sixty-five years and older were four to five times the odds for patients younger than sixty-five. As expected, patients become more likely to be appropriate candidates for COX-2s with increasing age and therefore are less likely to be inappropriately prescribed a COX-2.

For Methods 2 and 3 only, the odds of being inappropriately prescribed a COX-2 (compared to being appropriately prescribed either a COX-2 or NSAID) for women were approximately twice the odds for men. Finally, for Method 1 only, sicker patients (i.e., those with higher chronic disease scores) were more likely to be prescribed a COX-2 instead of an NSAID.

ANALYSIS OF SURVEY NONRESPONDENTS

Survey nonrespondents and respondents were stratified by type of drug prescribed (COX-2 vs. traditional NSAID) and were compared with each other using available variables. Comparison of patients' age, gender, chronic disease score, and KP location showed that survey respondents and nonrespondents differed with respect to age. The mean age for survey respondents who received COX-2s was sixty-five, compared with fifty-nine for survey nonrespondents receiving these drugs. The mean age of survey respondents who received traditional NSAIDs was fifty-four, compared with forty-five for survey nonrespondents who received these drugs. This difference might be explained by the fact that older persons may be more likely to respond because they have more time to fill out surveys, are more interested in the topic, or both. From a statistical standpoint, survey respondents and nonrespondents in both drug groups also differed regarding chronic disease score, but these differences were not clinically meaningful; the average chronic disease score was approximately 2.0 for all groups included in comparisons.

DISCUSSION

We found that for all three methods, patients who saw COX-2 advertisements and asked their physician about COX-2s were more likely to be prescribed a COX-2 instead of an NSAID (compared to being appropriately prescribed either a COX-2 or an NSAID). This result indicates that DTCA may lead to inappropriate prescribing with costly medications. It has been suggested that one of the reasons for the divergence between routine medical

practice and evidence-based recommendations is the marketing of newer, more costly agents compared with virtually no marketing for older, off-patent drugs (Fischer and Avorn 2004). The results found here provide evidence that at least in the case of COX-2s, DTCA is related to use that is inconsistent with three versions of recommended guidelines.

We also found that patients who were exposed to DTCA and asked their physician were less likely to be prescribed a traditional NSAID when the guidelines recommend that a COX-2 would be the appropriate choice of medication. This was the case for Methods 2 and 3, which were based on more liberal definitions of risk of GI bleeding. According to these methods, more patients were considered appropriately treated with a COX-2. This finding that patients who were exposed to COX-2 DTCA and asked their physicians were less likely to be prescribed a traditional NSAID instead of a COX-2 is consistent with the argument that DTCA may inform consumers, encourage doctor-patient communication, and consequently result in better, more appropriate care (Aikin 2002).

Patients who saw specialists were twice as likely to be prescribed a COX-2 as those seen by generalists. Specialists typically see patients on a referral basis and may be more likely to use treatments beyond the standard approach. Another plausible explanation could be that patients who see specialists may be more active in pursuing and paying attention to health care; as such, they may be more likely to notice drug advertisements and to ask their physician about advertised drugs.

We also found that women were more likely to be prescribed a COX-2 instead of an NSAID than men. This finding is consistent with past research indicating that some men may feel uncomfortable discussing their health concerns with a physician (Sandman, Simantov, and An 2000). It may be that because women tend to be more communicative about treatment preferences, they may be more likely to receive a prescription than men. Finally, sicker patients were more likely to be prescribed a COX-2. Perhaps physicians were using discretion in prescribing COX-2s for their sicker patients, even though these patients were not necessarily appropriate candidates according to the guideline.

STUDY LIMITATIONS

This research—conducted at a single HMO—may not be generalizable to a broader population. However, KP provides extensive patient education as well as balanced drug information to its physicians in an effort to promote appropriate drug prescribing. Therefore, our study may potentially underestimate the impact of DTCA on prescribing behavior in the broader population.

Our sample response rate was less than optimal and raises the possibility of nonresponse bias. Recall bias is another potential limitation. Patients might not have accurately remembered or reported the chronology of their exposure to DTCA.

Another potential limitation is that we sampled only patients who had received a prescription for either a traditional NSAID or a COX-2; patients who may have been exposed to DTCA or asked their physicians about COX-2s (or both) but never received either a COX-2 or a traditional NSAID were not included in the study. However, we deliberately selected a population for which the decision had been made to treat with medication (i.e., not through lifestyle change or other nonpharmacologic treatment). This patient population is targeted by COX-2 promotional efforts; appropriate prescribing in this population was therefore expected to be affected most by DTCA.

We also did not examine the impact of DTCA on other health outcomes or within different therapeutic categories. Behavioral changes attributable to DTCA and the impact of this promotion on treatment cost, medical use, and adverse events are important areas of future research.

Finally, this study focused on the patient's perspective and did not account for exposure of physicians to promotional activities by the pharmaceutical industry. Future research should explore the complex relationship between patients' and physicians' exposure to drug promotion and appropriate prescribing of advertised drugs.

CONCLUSION

From a business perspective, this study is consistent with what is already well known by advertisers: DTCA is a successful method of generating prescriptions. From societal and medical perspectives, however, success may be weighed differently (Andersen and Davidson 2001). With rising health care costs and limited financial resources, promotional strategies used by drug manufacturers may be considered successful only if they result in clinically appropriate prescriptions of the advertised drugs.

Appropriateness is a difficult concept to define and measure. DTCA frequently promotes drugs used for conditions where the measurement of appropriateness is especially elusive: pain, heartburn, allergies, sexual dysfunction, and mental health–related disorders. For COX-2s, we found that DTCA is a factor associated with overuse regardless of the way GI risk–related appropriateness is defined. Patients' exposure to DTCA was consistently associated with overuse of COX-2s, potentially leading to a wasteful use of resources. When appropriateness was broadly defined, we found that DTCA

mitigates prescribing NSAIDs instead of COX-2s according to guideline, suggesting that some patients may benefit from such advertisements.

Our findings point to a need for balanced drug information and for both patients and physicians to be vigilant about the appropriateness of prescriptions for drugs that are heavily promoted to consumers. Our findings also raise questions regarding trade-offs. Are the potential benefits of DTCA worth the costs (in both human and financial terms) that may result from overuse? This is particularly relevant given that rofecoxib was withdrawn from the market by the manufacturer in September 2004 (Food and Drug Administration News 2004). A placebo-controlled trial for colon polyp prevention showed that use of rofecoxib increased patients' risk of cardiovascular disease (Merck Product News 2004). Is the public's health best served by marketing new drugs to consumers for which information on safety and efficacy is not well established? And once such information is known, are there more effective ways to inform patients who could appropriately benefit from new drug therapies without generating overuse? These are topics for future study.

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