Mass Media Release of Medical Research Results

An Analysis of Antihypertensive Drug Prescribing in the Aftermath of the Calcium Channel Blocker Scare of March 1995

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BACKGROUND: Disclosure of medical research results to the public creates tension between lay medical reporters and the medical profession.

OBJECTIVE: To explore the early effect of media attention on the risks associated with short-acting calcium channel blockers (CCBs) for treating hypertension after publication at a national meeting and following publication.

DESIGN: Time-series analysis of prescription claims data.

SETTING AND DATA SOURCE: National third-party pharmaceutical benefits manager.

PATIENTS: Employed or retired persons and their families, 18 years of age or older, receiving prescription benefits from 1 of 4 national companies that contracted with the pharmaceutical benefits manager exclusively for prescription drug coverage.

MEASUREMENTS: Prescription claims for antihypertensive drugs by fill date converted to a percentage of all cardiovascular drug claims. Data were grouped into weekly intervals before and immediately after the national release of negative information about CCBs on March 10, 1995 and following publication of the results on August 23, 1995.

RESULTS: The most prevalent antihypertensive drugs were diuretics (21% of cardiovascular prescription claims) and calcium channel blockers (19%). A 10% decline in prescriptions filled for CCBs occurred 4 weeks following the intense media attention. Only prescriptions for long-acting calcium channel blockers declined. Alpha-1-blocker prescriptions increased by approximately the same amount that prescriptions for CCBs declined, suggesting substitution of one drug for the other. Changes in diuretic or β -blocker prescriptions filled were not statistically significant. No immediate change in other cardiovascular drug classes occurred following journal publication.

CONCLUSIONS: Intense media publicity regarding a controversial study measurably and unpredictably changed prescription claims.

KEY WORDS: media; communication; hypertension; calcium channel blockers.

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The quality of lay media reporting of medical research has generated heated debate for many years. Additionally, the drawbacks and benefits of release prior to publication have been articulated on numerous occasions, yet few data support the strong positions taken.¹⁻⁷ In particular there are questions about the desirability of reporting results at medical research meetings. Lay journalists often prefer such venues for identifying upcoming trends in health care research. Similarly, professional societies often highlight important research at their conferences to attract media attention. The scientific medical community may inadvertently be inviting sensationalism, which has unknown effects on the public regarding health decisions and on the profession regarding care delivery.

Many medical journal editors believe the optimal timing for research dissemination is at the time of publication and after it has undergone peer review. There exists a policy, first articulated by Franz Ingelfinger ("the Ingelfinger Rule") according to which material will not be considered for publication if it has been previously submitted and published by the medical or popular media, with few exceptions.¹ This policy has been modified in recent years but is still widely applied. Editors assert that lay reporting quality is improved and more orderly, but this is unproven.

The rule has been relaxed for research presented at professional meetings to allow abstracts of research to be presented to colleagues. Medical journal editors have varying policies regarding whether lay media communication of the proceedings disqualifies journal publication, and this is confusing to would-be authors. Gathering information about the immediate medical consequences of mass media reporting would inform the debate surrounding timing and manner of research communication to the public.

In March 1995, Psaty and his colleagues presented a research paper entitled "The risk of incident myocardial infarction associated with anti-hypertensive drug therapies" at the American Heart Association Section on Cardiovascular Epidemiology Meeting.⁸ They found a statistically significant, dose-related increased risk of first myocardial infarction among patients with hypertension treated with calcium channel blockers (CCBs). At the time of presentation, the paper was under consideration for publication at a peer-reviewed medical journal. The article was published 6 months later.⁹ The findings were controversial. Media publicity of this research presentation was intense and generated many comments about the quality of reporting.¹⁰⁻¹⁵

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Calcium channel blockers are widely used, and reports in the media of potential harm would be expected to influence use. We used this incident to explore whether media coverage produced any early measurable effects on one aspect of health care consumption and delivery, specifically prescriptions filled for antihypertensive drugs. Our a priori hypotheses were that (a) prescriptions for calcium channel blockers would decrease in response to Psaty's negative report, and (b) prescriptions would increase for recommended first-line antihypertensives, such as diuretics and β -blockers.¹⁶ As a control, we also hypothesized that the early effect size would be smaller following manuscript publication if, as expected, it met with less coverage in the popular media.

METHODS

This retrospective cohort study was approved by the Institutional Review Board of Indiana University-Purdue University at Indianapolis and was funded by a contract with Caremark, Inc.

Setting

On March 10, 1995, Dr. Bruce Psaty and his co-workers presented case-control data suggesting that short-acting calcium channel blockers may increase the rate of myocardial infarction when used to treat hypertension.^{8,9} The investigators found an association of incident myocardial infarction in hypertensive individuals treated with short-acting CCBs compared with diuretics or β -blockers, but only in users of the highest doses of CCBs ($>30\text{mg/day}$ nifedipine; $>180\text{mg/day}$ diltiazem; $>240\text{mg/day}$ verapamil). They concluded that their results supported the contemporary Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC-V) recommendations for the use of diuretics and β -blockers as first-line therapy for hypertension.¹⁶ Only meeting attendees had knowledge of methodologic details. Dr. Psaty's presentation was followed by a prearranged press conference, which triggered immediate national press coverage. The Associated Press (AP) wire service was the predominant source, and except for the headline, was reported verbatim in major regional and local print media. *The Seattle Times* and *The New York Times* wrote independent articles.¹⁷⁻¹⁹

The lead paragraph in the AP wire story stated, "Six million Americans who are taking a class of drugs to lower blood pressure may instead be increasing their risk of heart attacks by 60 percent, researchers reported Friday." Only the independent articles reported absolute and relative risks.

Generic and some brand names of the calcium channel blocker class were named but without particulars of specific dosage forms or doses. The target audience was vague. Except for *The New York Times*, media accounts did not discuss the type of study, and a direct causal relationship was inferred.

The author and the American Heart Association (AHA) were deluged with phone calls from distraught patients and physicians.¹²⁻¹⁴ Patients also contacted their personal physicians, and some stopped their calcium channel blocker therapy unilaterally. All this prompted a second press conference and press releases by the AHA and the National Heart, Lung, and Blood Institute (NHLBI) to convey the results in context and to correct the impression of urgency. Subsequent AP reports and derived local reports also included caveats to allay public fear. These consisted primarily of reporting the findings in absolute as well as relative terms, attempting to put the research findings into context. The main message was "see your doctor." Nonetheless, the reporting continued to emphasize the findings as originally reported.

Regional and local reporting also described the impact on communities—panic, and burden on local health care. In Omaha, one patient was reportedly admitted to the hospital with a myocardial infarction attributed to unilateral cessation of a CCB.²⁰ In California, one physician received a death threat from a dissatisfied patient.²¹ In the medical literature, one physician documented increases in utilization—increases in phone calls and visits by concerned patients.²² An op ed piece that appeared in *The Washington Post* on March 26, 1995 summarized the previous 16 days of reporting this way: "What caused newspapers to overreact to the story and patients to panic is what often gets lost when journalists on deadline translate science: context and implications."¹⁴

The manuscript describing these findings was published in *JAMA* on August 23, 1995.⁹ The following week, a meta-analysis of randomized trials of nifedipine in the setting of recent myocardial infarction was published. Short-acting nifedipine was associated with a 3-fold increase in mortality compared to placebo.²³ A National Institutes of Health (NIH) alert was issued September 1, 1995 to warn physicians specifically regarding use of short-acting nifedipine in hypertension and in coronary artery disease.²⁴

In the Fall of 1995, source reporting was more contextually accurate.²⁵⁻²⁷ As in March, AP stories were reproduced verbatim, although *The New York Times* provided more detail. The target audience was clearly and unambiguously identified—those patients taking short-acting nifedipine. For the most part, a distinction was made between the 2 indications for use (i.e., hypertension and angina). Despite sensationalist headlines, the media communicated a better sense of the uncertainty of the information regarding actual patient risk and the controversy surrounding extrapolation of the data to long-acting nifedipine and all other calcium antagonists.

Media Intensity and Content

For this study, we searched the Lexis-Nexis database and the National Newspaper Index for stories on calcium channel blockers (keywords: heart attack or blood pressure or hypertension; calcium channel blocker or calcium

antagonist) for the period January through December, 1995. Lexis-Nexis searches only the main national and regional newspapers, and includes wire service reports. Additionally, individual major daily newspaper archives for the same time period were searched via their internet websites using the primary keyword "drug" and secondary keyword "heart."

Each story so identified was read by one of the investigators (MEB) to ensure that it pertained to either the American Heart Association Meeting of March 10, 1995, the publication of the peer-reviewed article in the August 23/30, 1995 issue of *JAMA*, the nifedipine trial meta-analysis published in the September 1, 1995 issue of *Circulation*, or the NIH press release of September 1, 1995. The websites often provided only headline and first paragraph content, but this was sufficient to determine relevance.

Source for Prescription Data

We identified prescription fills using the claims database from Caremark, Inc., a large national pharmaceutical benefits manager. The database was constructed prospectively for research purposes and contained claims from 4 selected nationwide employers. There were in excess of 1 million enrollees and 16 million annual claims from all 50 states, Canada, and some U.S. territories. Claims were received via mail-order pharmacy, retail pharmacists through a computerized link, or submitted directly by the enrollee. Beneficiaries used this pharmaceutical benefits manager exclusively for prescription needs. There was no co-payment, and Medicare beneficiaries received benefits regardless of whether they had Part B. There were no relevant formulary restrictions and no mandatory generic substitution requirements. Supplies of drugs dispensed were variable.

The database contained extensive information regarding specific drug products, including whether the product supplied was a brand name or generic form of a drug. Demographic data were seldom missing (0.004%). To validate the data entry, we searched for mismatches between patient gender and gender-specific drugs. Such drug-gender mismatches were extremely rare, far less than 1% of all prescriptions for these drugs. The rate was consistent with the expected occasional clinical use.

Subjects

Subjects were age 18 and older and were employees, families, or retirees with prescription benefits who filled at least 1 cardiovascular drug prescription between September 17, 1994 and March 8, 1996. We a priori defined cardiovascular drugs using the generic product indicator numbers 31 to 37 inclusive, and 39 (calcium channel blockers, β -blockers, angiotensin-converting enzyme [ACE] inhibitors, diuretics, α -1 blockers, the miscellaneous anti-hypertensive drugs reserpine, hydralazine, and clonidine,

as well as ganglionic blockers, nitrates, lipid-lowering drugs, antiarrhythmics, and digoxin). We did not distinguish between new prescriptions and prescription refills. Because the Caremark database did not include diagnoses, we used these drug data as proxies to identify a population of patients with essential hypertension or other indications for cardiovascular drug therapy.

Statistics

We studied an 18-month period beginning 6 months prior to the AHA meeting. Claims were grouped into weekly intervals by prescription fill date. A prescription fill week ran from Saturday to the following Friday, inclusive. The date of the American Heart Association meeting presentation, Friday, March 10, 1995, served as the index date.

The unit of analysis was weekly prescription claims of individual drugs expressed as percentage of total cardiovascular prescription claims. This method removed fluctuations due to enrollment. The denominator was chosen to represent the "at-risk" population, i.e., a population with hypertension or cardiovascular disease at risk of effects on their health care due to media coverage. We did not have patients' diagnoses or indications for drug use, and most drugs used to treat hypertension have additional indications. Combination drugs were allocated to each of their respective drug classes. Thus, a diuretic/ β -blocker combination was counted once as a diuretic and once as a β -blocker.

To test the hypothesis that media coverage has an early influence on prescribing, we performed time-series analysis by comparing actual and predicted claims prevalence immediately following the American Heart Association meeting (March 10, 1995). We were interested in examining the impact of coverage at a time when no other information was available to the public or much of the profession. We first ascertained media coverage. Using that information, we then chose to examine each of 4 weeks—a time period incorporating peak publicity, beginning with the index date. This time period was chosen before examining the long-term trend descriptive data. To establish a trend line for predictive purposes, we used weekly data beginning 6 months prior to March 10, 1995 and examined models of linear trend, linear trend with first-level autocorrelation, linear trend with fourth-level autocorrelation, and quadratic trend. The regression line was extrapolated for prediction of weekly claims post-event. Akaike's Information Criteria was used to decide line of best fit.²⁸ The quadratic trend and inclusion of non-zero autocorrelations into the regression model did not yield a superior fit of the data or change any of the subsequent results when compared to the simple linear trend. Thus, only the results from ordinary linear regression were presented. For comparison purposes, we performed a similar analysis following manuscript publication and the NHLBI statement. The index dates were August 23 and September 1, 1995, respectively. Two-sided 95% confidence intervals were calculated for trend line predictions. Observed data points

falling outside these 95% confidence interval limits were considered statistically significant. All analyses were performed with SAS Statistical software (SAS Institute, Inc., Cary, NC).

RESULTS

Media Content

Figure 1 shows the daily number of retrieved wire service and print reports relative to either the AHA meeting or the publication of the article in *JAMA*. The total volume of reports following the *JAMA* publication is substantially less than that following the AHA meeting, as would be expected, considering the media's preference for "news." Interestingly, the number of articles following the NHLBI warning statement of September 1, 1995 was also less than that following the AHA meeting, particularly in duration. To place the above media coverage in perspective, on March 10, 1995, Michael Jordan announced his first return to professional basketball. There were 502 citations in the first 2 days of the Jordan story—10 times more media coverage than the calcium channel blocker story. We note that our search strategy may not be all-inclusive, but it was uniformly applied to the events of interest.

Representative headlines from the wire services and major newspapers are listed in Table 1. On March 10, 1995, there were 7 wire service reports, but only 2, the *Seattle Times* story by Warren King and the Associated Press (AP) story by Paul Raeburn, were used as sources. AP was most commonly cited—46 citations in the first 48 hours, compared with 10 for the *Seattle Times* article and 5

for the *New York Times* version. Apart from the headline, most newspapers directly reproduced the AP wire service copy. Importantly, *The Washington Post* and *Los Angeles Times* were among these. *The New York Times* printed its story on Sunday March 12, 1995, but subsequently, the only national source of information was AP.

When the manuscript was published in *JAMA* in August 1995, coverage was limited to 5 brief stories on August 23. One week later, a few lines about the Psaty study were incorporated into coverage of the *Circulation* publication concerning the short-acting nifedipine meta-analysis and a simultaneous release of the NHLBI alert. Unlike the publicity following the AHA meeting, major coverage lasted 1 day, September 1, 1995 (Fig. 1). Also in contrast to March, we found no reports of public panic.

Subjects and Summary Claims Data

The mean age ($\pm$ SD) of subjects filling a cardiovascular prescription was 68.3 ± 11.4 years with a range of 18 to 101 years. A slight majority of prescriptions were for women (56.2%). On average, there were 22,000 cardiovascular drug claims per week; 75% of these were for agents potentially used as antihypertensives. Diuretics were the most frequently prescribed class ($20.8\% \pm 0.5\%$; 1 SD) followed closely by calcium channel blockers ($18.8\% \pm 0.8\%$). The average weekly number of prescription claims for short-acting CCBs was only $9.3\% \pm 1.4\%$ of all calcium blockers and $1.8\% \pm 0.3\%$ of all cardiovascular drugs. Short-acting nifedipine, the most controversial subgroup, comprised a very small fraction of all prescriptions (67 prescriptions per week; $6.0\% \pm 1.2\%$ of all nifedipine

FIGURE 1. Numbers of media citations with coverage of a study concerning risk of myocardial infarction with the use of calcium channel blockers (CCBs) for hypertension. Time zero is the date of the announcement of the study results to the medical and popular media at the annual meeting of the American Heart Association (AHA) meeting (black bars), the date of the release of the peer-reviewed publication of the study results in *JAMA* (open bars), or the date of the publication of the *Circulation* meta-analysis/National Heart, Lung, and Blood Institute (NHLBI) warning (hatched bars).

Table 1. Selected Representative Headlines From Wire Services and Major Newspapers Following the AHA Meeting 3/10/95, and Peer-reviewed Journal Publications (JAMA: August 23–30, 1995; Circulation: September 1, 1995) and the NHLBI press release of September 1, 1995

Coverage	Date	Source	Page	Headline
AHA meeting	3/10	Associated Press		"Widely Used Blood Pressure Drugs May Increase Heart Attack Risk," 670 words
	3/10	<i>The Seattle Times</i>	B1	"Risk Cited for Blood Pressure Drug—Chances Higher for Heart Attack," 493 words
	3/11	Associated Press		"Widely Used Blood Pressure Drugs May Increase Heart Attack Risk," 653 words
	3/11	<i>Chicago Sun-Times</i> (AP)	39	"Blood Pressure Drug Stirs Fears; Study Links Medicine to Higher Heart Attack Risk," 442 words
	3/11	<i>The Washington Post</i> (AP)	A8	"Drug for Blood Pressure Linked to Heart Attacks; Researchers Fear 6 Million are Imperiled," 670 words
	3/11	<i>Los Angeles Times</i> (AP)	A4	"Hazard Seen in Blood Pressure Drugs; Health: Patients Taking Calcium Channel Blockers May Be Increasing Their Risk for Heart Attack by 60%, Researchers Say," 394 words
	3/12	<i>The New York Times</i>	27	"Heart Attacks May Have Tie to Drug Type," 647 words
	3/13	Associated Press		"Patients Should Consult Doctors About Blood Pressure Medication," 551 words
	3/14	Associated Press		"Study Questions Safety of Certain Blood Pressure Drugs," 553 words
	3/14	<i>USA Today</i>	D8	"Try Other Blood Pressure Drugs First," 504 words
	3/16	Associated Press		"Doctors Urge Patients to Continue Taking Blood Pressure Medication," 953 words
	8/23	<i>The Wall Street Journal</i>	B8	"Hypertension Controversy is Re-ignited," 54 words
	8/23	<i>USA Today</i>	D1	"Comparing Drugs to Cut Heart Attacks," 154 words
Peer-reviewed journal coverage	8/31	Associated Press		"Study Says High Doses of Heart Drug Nearly Triple Death Rate," 785 words
	9/1	<i>The New York Times</i>	A1	"Agency Issues Warning for Drug Widely Used for Heart Disease," 1,823 words
	9/1	<i>Wall Street Journal</i>	B6	"National Heart Institute Warns Against Using High Doses of Blood Pressure Drug," 544 words
	9/1	<i>USA Today</i>	D10	"Warning Issued for Heart Drug Nifediprene (sic)," 185 words
	9/1	<i>The Washington Post</i> (AP)	A5	"Use of High Doses of Heart Drug Linked to Increased Death Rate," 714 words
	9/1	<i>Chicago Tribune</i> (AP)	21	"High Doses of Heart Drug Triples Patients' Death Rate, Study Says," 386 words
	9/1	<i>Los Angeles Times</i> (AP)	A30	"High Doses of Heart Medicine Raise Risk of Death, Study Finds," 668 words

AHA, American Heart Association; NHLBI, National Heart, Lung, and Blood Institute.

prescriptions; $1.6\% \pm 0.4\%$ of all CCB prescriptions). For comparison, U.S. pharmaceutical industry data estimated that in 1994, there were approximately 2.2 million prescriptions for short-acting nifedipine out of 26.7 million prescriptions for all nifedipine products (approximately 8%).²⁷ Our data would therefore appear to be representative of the U.S. population taking this medication.

Prescribing Trends over Time

Figures 2 and 3 describe the weekly patterns of prescription claims for each antihypertensive drug class and subgroups of calcium blockers. Formal trend analysis results appear in Table 2 and Figures 4 and 5 and compare observed and predicted claims for each of the 4 weeks following either the AHA meeting or the peer-reviewed

publications—the time encompassing the most intense publicity.

Calcium channel blocker prescription claims were essentially stable prior to March 10, 1995. Thereafter they dropped from 19.8% to 18% of all cardiovascular drugs prescribed (Fig. 2). Almost half of this decrement occurred within 4 weeks of the AHA meeting. The trendline predicted a marginal increase for the period commencing March 10 (Table 2; Fig. 4). The observed claims began to decline during the first week, and during the second week, were below the 95% confidence interval (CI). The effect was transient. The absolute effect size was small but nonetheless statistically significant.

We also examined trends in short-acting CCBs—the subject of Dr. Psaty's research. As expected, short-acting claims represented a very small proportion of total

FIGURE 2. Trends in the prescribing of cardiovascular drugs by type. The weekly percent of prescription claims by drug type was computed as the number of prescriptions for a specific drug class divided by the sum of all cardiovascular drugs times 100. Detailed data for periods of media coverage appear in Table 2 and Figures 4 and 5.

cardiovascular claims as well as total CCB claims. Over the 18-month study period, short-acting calcium channel blockers declined from 2% to 1.3% of all cardiovascular claims. The decrement during the greatest media coverage (0.1%) was not statistically significant (Table 2). These small changes were not accounted for by nifedipine (Fig. 3).

Figure 2 and Table 2 also depict weekly prescription claims for other antihypertensive drugs. The change in ACE inhibitors was less than 1% for 1 week only (nonsignificant) and was not sustained. Beta-blocker and diuretic claims changed very little over time. If anything, β -blockers decreased after the AHA meeting.

Prescription claims for α -blockers were actually declining prior to March 10th, but coincident with the mass media publicity in the aftermath of the AHA meeting, the rate increased from 2.8% to 4% of all cardiovascular prescription fills (Fig. 2). Weeks 3 and 4 exceed the upper 95% confidence intervals of predicted prescriptions (Table 2; Fig. 5). This rise lagged 1 week behind, but the increasing proportion of α -1 blocker claims otherwise mirrored the decline of the calcium channel blockers.

The immediate period following journal publication (4 weeks for *JAMA*, which was published as an unusual

2-week issue, and 3 weeks for *Circulation*) did not show any statistically significant deviation in observed claims from predicted claims for any drug group (data not shown). Extending the analyzed time period to 4 weeks following the *Circulation* publication did not affect the results. This is consistent with the interpretation that media coverage was causally associated with our observed prescription claim patterns because publicity in volume and duration following the manuscript publications was less than after the AHA meeting.

Expressing results using potential antihypertensives as the denominator, or as a ratio of CCBs to other antihypertensive agents, did not affect our findings (data not shown). If a lower level of certainty for real change was used (i.e., 90% CI), more data points for CCBs as a class were statistically significant but results were unaltered in the other categories.

DISCUSSION

Our results demonstrate that an early measurable change in prescription claims of some antihypertensive drugs occurred in close temporal association with media

FIGURE 3. Trends in the prescribing of calcium channel blocker subgroups. The weekly percent of prescription claims was computed as the number of prescriptions for a specific subgroup divided by the sum of all cardiovascular drugs times 100. Short-acting calcium channel blockers are short-acting nifedipine, diltiazem, and verapamil combined.

coverage of unpublished medical research presented at a scientific meeting. A modest but statistically significant drop in prescription claims for CCBs coincided with publicity about their potential adverse effects. The drop was almost entirely accounted for by longer-acting forms of this drug class. When peer-reviewed publication appeared 6 months later, the media coverage was less intense and contextually more accurate, and we did not observe statistically significant acute effects in prescription claims patterns. The above is consistent with a direct, albeit temporary, immediate media influence on prescribing and/or patient adherence. We could not measure the health consequences, but news reports suggest that some patients experienced harm. Our goal was to assess the immediate effect of the confusing and emotionally charged reporting of this presentation. Intuitively, one would predict that the adverse publicity would lead to a reduction in the use of CCBs. We confirmed these subjective beliefs.

Maclure et al. were unable to demonstrate any measurable influence of adverse media publicity on CCB prescribing.²⁹ We determined prescription claim rates in weekly intervals, whereas Maclure et al. measured pre-

scription claims in monthly intervals. The results in Table 2 show dissipation of the acute changes within a month, concurrent with the decline in publicity.

We anticipated that prescription fills for diuretics and β -blockers would increase as physicians reflected on alternative treatment options and on the JNC-V guidelines for treating hypertension.¹⁶ To our surprise, there were no changes in either of these drug classes over the short or long term (Fig. 2, Table 2). Instead, the truly unexpected finding was an increase in claims for the newer selective α -blockers, and the magnitude almost exactly mirrored the timing and rate of decline for CCBs. Furthermore, this increase was sustained (Fig. 2). Neither drug class has proven long-term efficacy in lowering adverse cardiovascular outcomes due to hypertension. In fact, α -blocker therapy may also be harmful, as evidenced by the early termination of that arm of the ALLHAT study.³⁰ We found no print evidence of α -blocker publicity to explain the sudden rise. It is unlikely that the increased use of α -blockers was due to contemporary journal publication—evidence of efficacy for prostatic hyperplasia was published either before the March 1995 focus of our study

Table 2. Observed and Predicted Prescription Claims as a Percentage of All Cardiovascular Drug Claims for Weeks 1–4 Following AHA Meeting of March 10, 1995

	Week 1		Week 2		Week 3		Week 4	
	Observed, <i>n</i>	Predicted, <i>n</i> (95% CI)	Observed, <i>n</i>	Predicted, <i>n</i> (95% CI)	Observed, <i>n</i>	Predicted, <i>n</i> (95% CI)	Observed, <i>n</i>	Predicted, <i>n</i> (95% CI)
Calcium channel blockers	19.3	19.8 (18.9 to 20.7)	18.8*	19.8 (18.9 to 20.7)	18.9*	19.8 (18.9 to 20.7)	19.3	19.8 (18.9 to 20.7)
β-blockers	13.3	13.6 (12.7 to 14.6)	13.7	13.6 (12.7 to 14.6)	13.7	13.7 (12.7 to 14.6)	14.1	13.7 (12.7 to 14.6)
ACE inhibitors	14.7	14.7 (14.0 to 15.5)	15.5*	14.8 (14.1 to 15.5)	14.7	14.8 (14.1 to 15.5)	14.3	14.8 (14.1 to 15.6)
α-Blockers	2.9	2.8 (2.4 to 3.3)	2.6	2.8 (2.4 to 3.3)	3.5*	2.8 (2.4 to 3.2)	3.8*	2.8 (2.4 to 3.2)
Diuretics	21.6	21.3 (20.4 to 22.2)	21.5	21.4 (20.5 to 22.2)	20.7	21.4 (20.6 to 22.3)	21.4	21.5 (20.6 to 22.3)
Miscellaneous	2.7	2.7 (2.4 to 3.0)	2.9	2.7 (2.4 to 3.0)	2.7	2.7 (2.4 to 3.0)	2.4*	2.7 (2.4 to 3.0)
Long-acting calcium channel blockers	17.4	17.7 (16.9 to 18.5)	16.7*	17.7 (16.9 to 18.5)	17.1	17.7 (16.9 to 18.5)	17.3	17.7 (16.9 to 18.5)
Short-acting calcium channel blockers†	2.0	2.1 (1.7 to 2.5)	2.1	2.1 (1.7 to 2.5)	1.8	2.1 (1.7 to 2.5)	1.9	2.1 (1.7 to 2.5)

* Data points beyond predicted 95% confidence interval (95% CI).

† Nifedipine, diltiazem, verapamil.

AHA, American Heart Association.

(i.e., in 1992 for terazosin³¹) or after that time (July 1995 for doxazosin^{32–33}), and there was no sudden increase in July 1995.

Our findings demonstrate media communication of medical research can have significant, unexpected and inappropriate effects on care. These consequences are of concern. In this case, newer long-acting CCBs were stopped when Dr. Psaty's research focused on the older short-acting agents—supposedly the subgroup of most concern for producing an adverse event. The potential danger of using short-acting nifedipine was ignored by the March 10th news cycle. The use of short-acting CCBs as a group declined a small amount over time; they comprised only 2% of total cardiovascular drug prescriptions, and there was actually little change in short-acting nifedipine (Fig. 3). The study evidence supported compliance with the contemporary JNC-V guidelines, but this was not communicated through the media. Instead of seeing rising claims for first-line drug therapies, we saw an increase in claims for α-blockers.

The magnitude of the change in our endpoint was modest and smaller than we expected, considering the media hype of the time—so great as to create some panic. Although the percentage of patients whose CCB prescriptions may have been changed was small, millions of patients were taking these drugs in 1995. Significant anxiety accompanied this change. Furthermore, there were anecdotal reports of patient harm. We could not measure harm in the population and other outcomes of relevance to society, i.e., health care utilization/costs. Anecdotal reports suggest these may have been important. Thus,

the true impact is unknown, and probably underestimated by our chosen surrogate measure.

During the CCB publicity, there were probably several factors occurring simultaneously. Patients were scared. Those who visited their physician may have decided not to fill a CCB prescription, and this may have accounted for a proportion of the decline. However, our observation that the increase in α-blocker claims mirrored the decrease in CCB claims suggests to us that most changes probably occurred at the prescribing level. There was no financial disincentive to submit a claim.

In local media, we read many interviews with physicians suggesting that they were confused and could not make informed decisions and counsel patients. Dr. Psaty had limited ability to speak with individual physicians. Thus, most physicians were reliant on the popular press for information. Media reports lacked sufficient detail of the study particulars, and they could only speculate about the level of evidence for harm. It was late March of 1995 when details were beginning to be communicated to physician groups. Under ordinary circumstances, physicians are conservative in implementing research findings.³⁴ However, our data suggest that many physicians changed therapy rather quickly, an interesting observation in itself. Patient pressure to change therapy may have been substantial. Today, the intensity of direct-to-consumer advertising of pharmaceuticals supports this viewpoint.

Both the media and the medical community should be concerned about the quality of health reporting, and both need to know the effects of health reporting (and

FIGURE 4. Plot of the observed and predicted percent of prescription claims for calcium channel blockers, as calculated in Figure 2, before and immediately after the AHA presentation on calcium channel blockers. Each point represents 1 week of claims. Actual prescribing of calcium channel blockers was below the predicted lower limit of the 95% confidence interval in the second week after the AHA presentation.

miscommunication) on the opinions and behaviors of the public, medical practitioners, and health care decision makers.³⁵ The clinical science journalist has a difficult task in reporting the essence of the research in an interesting fashion, concisely and accurately, but without misrepresenting its significance.

In addition to the lay public, researchers and physicians also rely on the mass media to keep abreast of important new developments.³⁶ Our results provide objective data supporting the premise that poor reporting has important undesirable and unpredictable consequences. To improve reporting quality, it is necessary to resolve the issue of prepublication release of research data to the public via the media, particularly in the setting of a research meeting. Clinicians represent part of the "public" that consumes information. To practice, they must have information that is either reported in detail or otherwise readily accessible. Our data cannot answer the question of whether physician and/or public response is independently influenced by intensity of coverage, poor-quality reporting, or timing relative to publication. We have only demonstrated that prescription claims failed to change when coverage was better, of shorter duration, and

coincided with usual professional communication vehicles. Our data provide credible evidence supporting the opinions of medical journal editors.¹⁻⁵

This study has important limitations. Most important, we did not know the indication for drug use, and could not precisely identify the population at risk. This reduces the specificity of our study for determining the effect on patients being treated for hypertension. However, media coverage failed to identify a clear target population, and consequences to other patient groups, such as those with angina, are also important to determine. We are confident that the media coverage alone caused the early change in prescription claims, but we are unsure of the specific patient population affected or the effect size.

Second, we had no true denominator because variability of raw data reflected enrollment of patients; thus, our data do not represent a population estimate of relative usage of various antihypertensive drugs. Nonetheless, our relative CCB claims figures correlate well with national prescription data.²⁷ Furthermore, a strength of this study is the size and scope of the database we used: the patients we studied are likely to be nationally representative of employed and retired persons, and their families, who have

FIGURE 5. Plot of the observed and predicted percent of prescription claims for α -1 blockers, as calculated in Figure 2, before and immediately after the AHA presentation on calcium channel blockers. Each point represents 1 week of claims. Actual prescribing of α -1 blockers was above the predicted upper limit of the 95% confidence interval for 2 of the weekly periods following the AHA presentation.

prescription coverage, which is an undoubtedly enormous population. This was not a longitudinal cohort study; we could not follow prescriptions for individual patients in time. We can therefore only speculate about drug-switching behaviors.

We used claims data as our outcome measure. A prescription claim is the last event in a sequence beginning with consultation between patient and physician, and ending with the claim submission. The intervening events—the decision whether and what to prescribe, and filling of the prescription claim—cannot be independently evaluated. Our data also do not capture patient adherence. These limitations would underestimate the true magnitude of public reaction to media reports about Psaty's study. Because of our data source, where there were no disincentives to file a claim, we feel the claims represent prescribing.

Finally, we are inferring causation on the strength of temporal association with media coverage. It is possible, but unlikely, that simultaneously there was a nationwide shift in prescribing due entirely to chance. We believe that our statistical techniques reasonably address this. By confining our analysis to the period immediately following the AHA meeting, we have reduced contamination from other potential sources of influence. We cannot say this

about the time period preceding the journal publications. Our extrapolation technique using data for the 6-month period after the AHA meeting should control for underlying trends.

We recognize that this was an unusual incident, but we are concerned that history could repeat itself. The consequences for individual patients and society are probably much greater than mere changes in prescription claims. We conclude that intense media publicity of a controversial study had an early measurable effect on prescription claims and, by inference, prescribing behavior. The decline in CCB use and the unexpected concomitant rise in the prescribing of α -blockers demonstrate that professional response to publicity can be unpredictable. The concern in regard to quality reporting of research results in the lay media is justified, and the issue of the timing of reporting relative to journal publication deserves further study.

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right to review this manuscript for consideration of proprietary interests. The opinions expressed herein do not necessarily represent those of Caremark, Inc. or those of the participating institutions. We thank Lisa Barnes, Patricia Cook, Maria Surface, and Bev Clark for their assistance in the preparation of this manuscript.

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