Aspirin Use Is Low Among United States Outpatients With Coronary Artery Disease

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Background—The goal of the present study was to assess national trends and patterns of aspirin use among outpatients with coronary artery disease. Although there is strong evidence that the use of aspirin reduces the risk of death and recurrent events in patients with coronary artery disease, current national patterns of aspirin use are unknown.

Methods and Results—We used data from the 1980 to 1996 National Ambulatory Medical Care Surveys. These surveys provide a nationally representative sample of physician activities during patient visits to physician offices. We evaluated the report of aspirin as a new or continuing medication in 10,942 visits to cardiologists and primary care physicians by patients with coronary artery disease. We evaluated trends in the use of aspirin for 1980 to 1996 and used logistic regression to identify independent predictors of aspirin use for 1993 to 1996. Aspirin use in outpatient visits by persons with coronary artery disease without reported contraindications increased from 5.0% in 1980 to 26.2% in 1996. Large increases occurred in the early 1990s. Independent predictors of aspirin use in 1993 to 1996 were male patient gender (29% versus 21% for females), patient age of <80 years (28% versus 17% for age of ≥80 years), and presence of hyperlipidemia (45% versus 24% for patients without hyperlipidemia; all comparisons P<0.001). Cardiologists (37%) were more likely to report aspirin use than were internists (20%), family physicians (18%), or general practitioners (11%; P<0.001). These effects persisted after we controlled for potential confounders with the use of logistic regression.

Conclusions—Although aspirin use in patients with coronary artery disease has increased dramatically, it remains suboptimum. Low rates of aspirin use and variations in use suggest a need to better translate clinical recommendations into practice. (Circulation. 2000;101:1097-1101.)

Key Words: aspirin ■ heart diseases ■ prevention

The use of aspirin is an effective and inexpensive therapy that greatly alters the course of coronary artery disease.1–6 Patients who take aspirin have lower rates of all-cause mortality, cardiovascular mortality, nonfatal myocardial infarction, and nonfatal stroke. Although the benefits of aspirin are most apparent in patients with acute myocardial infarction, long-term use is recommended for the secondary prevention of all forms of coronary artery disease.4,6 Despite this consensus, the results of past studies suggest that aspirin is inadequately used.

For US patients who were hospitalized due to myocardial infarction, between 60%7 and 84%8 receive aspirin.9–16 Similar rates of aspirin use during hospitalization for unstable angina17,18 have been noted. Aspirin use among hospitalized patients has been associated with prior aspirin use, cardiac procedures during hospitalization, concomitant use of β-blockers, male gender, younger patient age, white race, and care by cardiologists.7,10–13,16–18 Aspirin use has increased over time, with a prominent increase associated12–14 with the publication in 1988 of the results of the Second International Study of Infarct Survival.5

Less is known regarding aspirin use after hospitalization for coronary artery disease. Relatively high rates of aspirin use at 6 months after hospital discharge were noted in the British Action on Secondary Prevention through Intervention to Reduce Events (ASPIRE) study (86%)19 and the European Action on Secondary Prevention through Intervention to Reduce Events (EUROASPIRE) study (81%, which included other antiplatelet medications).20 In both studies, the rate of aspirin use was higher in association with revascularization or myocardial infarction. Aspirin use in outpatients is less likely than in hospitalized or recently hospitalized patients. In the Scandinavian Simvastatin Survival Study (4S), only 37% of randomized patients had been receiving aspirin.21 In the Atherosclerosis Risk in Communities (ARIC) study, aspirin use was noted in 53% of patients with a history of myocardial infarction and in 30% of those with a history of angina.22 Among general practitioners in London, 48% of clinic patients with coronary artery disease used aspirin.23 Aspirin use was noted in 63% of patients with coronary artery disease who were seen by Scottish general practitioners.24

The results of these past studies suggest that aspirin use in patients with coronary artery disease is less frequent than desirable, particularly in community settings. The low use of
aspirin in these settings may result from the less intense clinical attention received by outpatients compared with hospitalized patients. Practices in community settings, however, are likely to better represent the overall impact of secondary prevention efforts because hospitalized patients represent only a small proportion of all patients.

To investigate aspirin use in outpatients with coronary artery disease, we examined a representative sample of US physician office visits from 1980 through 1996. It was hypothesized that despite substantial increases in aspirin use, patterns of use in patients with coronary artery disease would remain suboptimum.

Methods
We used data from all National Ambulatory Medical Care Surveys (NAMCSs) conducted from 1980 through 1996 by the National Center for Health Statistics. The surveys from 1980, 1981, 1985, and 1989 to 1996 provide a representative sample of visits to US office-based physicians each year. The NAMCSs randomly select physicians on the basis of specialty and geographic area. For each participating physician (mean participation rate 72%), patient visits during a randomly selected week were sampled systematically. The survey includes 33,598 (1994) to 71,954 (1985) annual outpatient visits that were made to 1704 (1994) to 2879 (1985) physicians. For each selected patient visit, physicians completed encounter forms that detailed the clinical services that were provided, patient demographics, clinical diagnoses, and continuing and newly ordered medications. Available visit weights were used to extrapolate to national practice patterns and were modified to derive effective sample sizes for statistical testing.

Visits by patients with coronary artery disease were identified through the presence of International Classification of Diseases, Ninth Revision, Clinical Modification diagnostic codes $\text{ICD-9-CM}$ for coronary artery disease. For the present study, we identified 10,942 visits by patients with coronary artery disease that were made to primary care physicians or cardiologists, the latter physicians being the most likely to prescribe aspirin. Visits by 276 patients with reported contraindications for aspirin therapy were included, including patients with peptic ulcer disease, gastritis and duodenitis, other gastrointestinal bleeding, alcoholism, and cerebral hemorrhage. To describe recent patterns of aspirin use, we focused on the analysis of 3017 visits made by patients without contraindications between 1993 and 1996.

The principal measure of the study was the report of the use of aspirin as a new or continuing medication at visits by patients with coronary artery disease. The unit of analysis is the patient visit. Patients receiving aspirin were identified on the basis of the coding of generic or proprietary names for aspirin among as many as 8 possible medication codes associated with each visit. Non-narcotic combination analgesics containing aspirin also were considered aspirin therapy. The use of warfarin sodium, dipyridamole, sulfinpyrazone, ticlopidine, hydrochloride, and clopidogrel bisulfate was assessed similarly.

Because aspirin is available without a prescription, a potential exists for aspirin use to be underreported in NAMCS. To estimate the likely magnitude of underreporting, we examined the use of nonprescription analgesics in patients with osteoarthritis and of multivitamins in pregnant patients.

Annual data on visits by patients with coronary artery disease were evaluated for trends in aspirin use with the $\chi^2$ test for trend. The independent impact of physician and patient characteristics on patterns of aspirin use in 1993 to 1996 was assessed with the use of a multiple logistic regression model that included patient gender, patient age, physician specialty, insurance status, and clinical factors, including hypertension, smoking, obesity, diabetes mellitus, and hyperlipidemia. Adjusted odds ratios and 95% confidence intervals were calculated from this model. Statistical analyses were performed with SAS software (SAS Institute).

Results
The study sample of 10,942 visits is representative of an estimated 177 million annual office visits by US patients with coronary artery disease. Reported aspirin use among patients without contraindications increased from 5.0% of visits in 1980 to 26.2% in 1996 ($P<0.001$ for trend). The most dramatic increase was noted in the early 1990s (Figure).

The use of antithrombotic medications that could serve as alternatives to aspirin also increased modestly over time. Between 1980 and 1996, among patients not taking aspirin, warfarin use increased from 4.1% to 8.8% and dipyridamole use increased from 1.6% to 2.4%, whereas sulfinpyrazone use decreased from 1.0% to 0.0%. No patients in the sample were reported to be taking ticlopidine or clopidogrel. The proportion of patients taking 1 or more antithrombotic agents, including aspirin, increased from 11.4% in 1980 to 34.3% in 1996.

With the use of the most recent data (1993 to 1996) on visits by patients with coronary artery disease who have no contraindications for aspirin therapy (n=3017), potential predictors of aspirin use were investigated. Positive predictors of aspirin use were male patient gender (29% versus 21% for females, $P<0.001$), patient age of <80 years (28% versus 17% for age of ≥80 years, $P<0.001$), private insurance status (29% versus 23% for no private insurance, $P<0.001$), patients who smoked (34% versus 25% for nonsmokers, $P=0.007$), and patients with hyperlipidemia (45% versus 24% for patients without hyperlipidemia, $P<0.001$). In addition, aspirin use was more likely to be reported in visits to cardiologists (38%) than in visits to internists (21%), family physicians (18%), or general practitioners (12%; $P<0.001$ by $\chi^2$).

A multiple logistic regression model was used to describe the independent predictors of aspirin use in visits occurring in 1993 to 1996 (Table). This model confirmed the independent impact of age, gender, hyperlipidemia, and physician specialty. The effects of smoking and insurance status were no longer statistically significant in the multivariate analysis.

The use of other nonprescription medications for common clinical conditions was identified to assess the potential for...
underreporting of aspirin use in patients with coronary artery disease. In 1993 to 1996, multivitamin use was reported in 26% of visits by pregnant women to obstetrician/gynecologists. For patients presenting to primary care physicians with osteoarthritis in 1993 to 1996, 47% were reported to be taking analgesic medications, including 22% who were taking analgesics available without a prescription. For neither of these clinical situations is medication use as strongly compelling as it is with aspirin use in patients with coronary artery disease, suggesting that NAMCS is likely to capture a reasonably substantial proportion of nonprescription medication use.

**Discussion**

In the present study, we examined a representative sample of visits to physicians in the United States by patients with coronary artery disease, with a focus on visits to cardiologists and primary care physicians by patients in whom aspirin was not contraindicated. Although aspirin use increased dramatically from 1980 to 1996, the magnitude of this increase was less than expected. Even with the potential for the underreporting of aspirin use in NAMCS, the 26% rate noted in 1996 appears suboptimum in consideration of the substantial benefits of aspirin. This finding suggests that a considerable proportion of patients with coronary artery disease remain at an increased risk for adverse outcomes. The feasibility, safety, and efficacy of aspirin in a high proportion of patients with coronary artery disease have been demonstrated in many settings.1,2,5

Although past studies have reported comparatively higher rates of aspirin use in patients with coronary artery disease, most of these studies focused on selected patients whose use of aspirin might be higher than that in the physician office setting assessed here. Studies of hospitalized patients have shown higher rates, likely due to the focused clinical attention that these patients receive. Hospitalized patients, however, constitute a minority of all patients with coronary artery disease. Practices in community settings may be more likely to reflect the public health impact of secondary prevention efforts.

As with other studies,7,10–13,16–18 it was noted in the present study that aspirin use was not uniform across patient subpopulations. In particular, aspirin was less likely to be reported in patients >80 years old. Although aspirin therapy in the most elderly may carry an increased risk of complications, it is in this population that aspirin is likely to have the greatest absolute benefit. Aspirin use also was less likely in women, a finding consistent with the observation that women may receive less aggressive treatment of coronary artery disease.53,44 The greater recommended use of aspirin by cardiologists may indicate a greater propensity of cardiologists to prescribe aspirin, but it also may reflect clinical or process differences associated with referral to a specialist. These factors suggest specific barriers to the uniform and widespread adoption of aspirin therapy.

Several limitations of this analysis must be acknowledged. There is a potential for aspirin use to be underreported by both patients and their physicians because of its availability at low cost without a prescription. This possibility was quantified through the analysis of the use of other nonprescription medications for patients with common clinical conditions. Patterns of vitamin use during pregnancy and analgesic use for osteoarthritis suggest that NAMCS is likely to capture a reasonably substantial proportion of nonprescription medication use. The underreporting of aspirin may be offset by the overreporting of long-term aspirin use; within NAMCS, long-term use of aspirin was not distinguished from sporadic use. Due to the use of patient visits as the unit of analysis, our estimates may differ from a population-based assessment of
aspirin use. Although patients with reported contraindications were excluded, our sample may include patients with unreported contraindications. Given the inherent difficulties in the determination of patterns of aspirin use, the NAMCS data are likely to represent the best available source of national information.

This analysis suggests that aspirin use in patients with coronary artery disease has not become a widely disseminated practice in the United States. New health care system strategies are required to ensure adequate secondary prevention in patients with coronary artery disease. In particular, attempts to increase patient and physician awareness of the benefits of aspirin use may be necessary. In addition, systems of chronic disease management in which the use of nurses, other health care providers, or information systems complements the role of physicians also may be helpful.45,46 Finally, efforts to monitor and track the prevention practices of physicians may provide new incentives for quality care.47 The personal, societal, and financial burdens of preventable deterioration of patients with coronary artery disease suggest that a substantial investment in such strategies is warranted.

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