# Quality of Care for Acute Coronary Syndrome Patients With Known Atherosclerotic Disease

## Results From the Get With the Guidelines Program

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***Background***—Patients with prior atherosclerosis in 1 or more vascular territories (coronary, cerebrovascular, or peripheral arterial) who present with acute coronary syndromes have high cardiovascular risk and may benefit significantly from evidence-based therapies, yet whether these are used consistently is unknown.

***Methods and Results***—The Get With the Guidelines–Coronary Artery Disease database was queried to determine whether compliance with quality-of-care treatments for acute coronary syndrome patients was associated with the extent of prior vascular disease. A total of 143 999 patients enrolled at 438 sites between January 2000 and January 2008 were classified according to the absence (n=98 136; 68%) or presence of known preexistent atherosclerosis (before admission) in 1, 2, or 3 vascular territories (n=37 633 [26%], n=7369 [5%], and n=861 [0.6%], respectively). Overall in-hospital mortality was 5.3%, and mean length of stay was 5.6±6.7 days. Compared with patients without prior vascular disease, patients with prior vascular disease were older and had more comorbidities. They were less likely to undergo coronary revascularization and had longer duration of hospital stay and higher in-hospital mortality. After adjustment for clinical and hospital characteristics, compared with patients without prior vascular disease, patients with prior vascular disease had higher mortality and were less likely to receive 3 particular treatments (lipid-lowering therapy, smoking cessation counseling, and angiotensin-converting enzyme inhibitor for left ventricular dysfunction).

***Conclusions***—Compared with acute coronary syndrome patients without prior vascular disease, those with prior atherosclerosis had higher in-hospital mortality yet were paradoxically less likely to receive specific evidence-based acute coronary syndrome treatments, which can form the basis for targeted intervention. **(*Circulation*. 2009;120:560-567.)**

**Key Words:** peripheral vascular disease ■ stroke ■ coronary disease ■ acute coronary syndrome ■ quality assessment, healthcare



Atherosclerosis is a systemic process that can affect several vascular territories.[1,2] Patients with acute coronary syndrome (ACS) and known prior vascular disease have a high risk of early and late complications,[3–8] especially if they have atherosclerosis in more than 1 vascular bed,[7] and may derive significant benefit from aggressive evidence-based treatment. Limited data are available, however, on the degree to which these guideline-recommended therapies are used consistently in ACS patients with prior vascular disease.

**Clinical Perspective on p 567**

The American Heart Association Get With The Guidelines–Coronary Artery Disease (GWTG-CAD) Program has been collecting a large amount of information on the in-hospital management of ACS patient since 2000 and offers a unique opportunity to examine patterns of in-hospital ACS treatment. In the present study, the GWTG-CAD database was queried to determine outcomes and compliance with practice guidelines for ACS patients as a function of the presence and extent of prior vascular disease.

## Methods

### Patient Population

The GWTG-CAD database was the source of all patient data used in the present study. The GWTG is a registry and performance-improvement initiative undertaken by the American Heart Association to enhance guideline adherence among hospitalized patients with coronary artery disease (CAD). The design and scope of the

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GWTG-CAD program have been published previously.[9,10] GWTG uses a World Wide Web–based patient-management tool (PMT, Outcome Sciences Inc, Cambridge, Mass) to collect clinical data, provide decision support, and provide real-time online reporting features. Data collected included patient demographics, medical history, symptoms on arrival, results of laboratory testing, in-hospital treatment and events, discharge treatment and counseling, and patient disposition. Outcome Sciences, Inc (doing business as Outcome) is the data collection and coordination center for GWTG programs. The Duke Clinical Research Institute serves as the data analysis center and has an agreement to analyze the aggregate deidentified data for research purposes.

Between January 2000 and January 2008, a total of 332 050 patients were included in the GWTG-CAD database at 564 sites. We excluded patients without ACS (n=115 308); patients who left against medical advice, were transferred to a hospice, or were transferred to a different acute care hospital (n=19 769); patients enrolled with a >25% rate of missing medical history (n=45 224); and patients in whom the presence or absence of prior vascular disease was not recorded (n=7750). A total of 143 999 patients enrolled at 438 sites were included in the present study. All participating institutions were required to comply with local regulatory and privacy guidelines and to submit the GWTG protocol for review and approval by their institutional review board. Because data were used primarily at the local site for quality improvement, sites were granted a waiver of informed consent under the common rule.

### Definitions

Three types of prior vascular disease were analyzed in the present study: (1) CAD, defined as a history of ACS; (2) peripheral arterial disease (PAD), defined as a history of claudication or abnormal lower-extremity angiographic findings; and (3) cerebrovascular disease, defined as a history of stroke or transient ischemic attack. Patients were classified into 4 groups, depending on whether they had 0, 1, 2, or 3 prior affected vascular territories.

### Performance Measure Calculation

The performance measures included the following: (1) Discharge medications, including angiotensin-converting enzyme inhibitors or angiotensin receptor blockers, aspirin, β-blockers, and lipid-lowering medications; (2) aspirin use within 24 hours from admission; and (3) smoking cessation advice and counseling during the hospital stay. Compliance with treatments was analyzed with the cohort of patients eligible for the medication or counseling, after the exclusion of those patients who had a documented contraindication for the medication, were not eligible for counseling, or died during the index hospitalization.[9,10] The Medicare definitions for eligible patients receiving smoking cessation counseling, discharge aspirin, β-blockers, and angiotensin-converting enzyme inhibitor or angiotensin receptor blocker were used.[11] These include counseling for patients who have smoked in the past 12 months, aspirin and β-blockers for patients without contraindications, and ACE inhibitors for patients with left ventricular ejection fraction <40% and no contraindications. A composite performance measure gave credit for partial patient compliance, whereas a 100% compliance performance measure required that all appropriate medications and counseling were documented for individual patients.

### Statistical Analysis

Continuous parameters are presented as mean±1 SD or as medians with interquartile ranges. Categorical variables are reported as percentages. The baseline characteristics, performance of invasive procedures, quality-of-care measures, and outcomes of patients without prior vascular disease were compared with those of patients with prior vascular disease in 1, 2, or 3 territories. Comparisons between groups were performed with the Pearson $\chi^2$ test or the Kruskal-Wallis test, as appropriate.

Multivariable logistic regression analyses with generalized estimation equations[12] were performed to determine whether prior vascular disease was independently associated with invasive procedures, performance measures, and outcomes. The generalized estimation equation approach adjusted for patient demographics and baseline clinical status and took into account the clustering effect within hospitals. The regression model adjusted for the following covariates: Age, gender, body mass index, medical history (atrial fibrillation, atrial flutter, chronic obstructive pulmonary disease or asthma, diabetes mellitus, hyperlipidemia, hypertension, heart failure, anemia, implantation of a pacemaker or defibrillator, hemodialysis, renal insufficiency, alcohol, depression, and smoking), insurance, systolic blood pressure, cardiac diagnosis, and hospital characteristics. All tests were 2-sided, and $P<0.05$ was considered statistically significant. All analyses were performed with SAS software (version 9.1, SAS Institute, Cary, NC) by the Duke Clinical Research Institute (Durham, NC).

The authors had full access to and take full responsibility for the integrity of the data. All authors have read and agree to the manuscript as written.

## Results

### Patient Characteristics

Of the 143 999 ACS patients included in the study, 98 136 (68%) had no history of prior vascular disease, whereas prior vascular disease was present in any 1, any 2, or all 3 vascular territories in 37 633 (26%), 7369 (5%), and 861 (0.6%) patients, respectively. A history of ACS, PAD, or stroke was present in 21%, 9%, and 8% of the study population, respectively.

The baseline characteristics of the study patients are shown in Table 1. Overall in-hospital mortality was 5.3%, and mean length of stay was 5.6±6.7 days. Compared with patients without prior vascular disease, those with prior vascular disease were older, more likely to be white, and more likely to have hypertension, hyperlipidemia, and diabetes mellitus, but they were less likely to be current smokers (Table 1). They were also more likely to have both cardiac (heart failure and atrial fibrillation) and noncardiac (renal failure and chronic obstructive pulmonary disease) comorbidities and had lower left ventricular ejection fraction. They had higher systolic but lower diastolic blood pressure and lower total and low-density lipoprotein cholesterol. Patients with prior vascular disease were more likely to present with non–ST-segment elevation ACS rather than ST-segment elevation acute myocardial infarction, were less likely to undergo coronary revascularization, and had longer hospital stays and higher mortality (Table 1; Figure 1).

Patients with prior vascular disease had lower performance measures (Tables 2 and 3).[9,10] Among ST-segment acute myocardial infarction patients, compared with patients without prior vascular disease, those with prior vascular disease in 1, 2, and 3 territories had longer median door-to-needle times (62 versus 62 versus 69 versus 100 minutes, respectively; $P<0.001$) and door-to-balloon times (89 versus 94 versus 99 versus 114 minutes, respectively; $P<0.001$). After adjustment for clinical and hospital characteristics (Table 4), performance measures (except administration of aspirin and β-blockers) were lower in patients with prior vascular disease, and mortality was higher (Tables 3 and 4; Figure 2).

## Discussion

The present analysis shows that compared with ACS patients without prior vascular disease, those with known prior vascular disease are less likely to receive coronary revascu-

**Table 1. Baseline Characteristics and In-Hospital Outcomes of the Study Population Classified According to the Number of Prior Vascular Disease Territories**

| Variable | 0 (n=98 136) | 1 (n=37 633) | 2 (n=7369) | 3 (n=861) | *P* |
|---|---|---|---|---|---|
| Age, y | 65±14 | 69±13 | 72±12 | 73±10 | <0.001 |
| Men, % | 62 | 61 | 59 | 61 | <0.001 |
| Race, % | | | | | <0.001 |
| White | 75 | 76 | 77 | 80 | |
| Black | 7 | 8 | 8 | 7 | |
| Hispanic | 7 | 6 | 6 | 5 | |
| Asian | 3 | 3 | 3 | 2 | |
| Other/unknown | 8 | 7 | 6 | 6 | |
| Weight, kg | 83±21 | 81±21 | 78±20 | 78±20 | <0.001 |
| Body mass index, kg/m$^2$ | 29±7 | 28±7 | 28±7 | 27±7 | <0.001 |
| Hypertension, % | 64 | 72 | 79 | 82 | <0.001 |
| Hyperlipidemia, % | 41 | 47 | 51 | 55 | <0.001 |
| Diabetes mellitus, % | 21 | 28 | 35 | 37 | <0.001 |
| Smoking, % | 31 | 28 | 25 | 25 | <0.001 |
| Prior MI, % | 0 | 62 | 81 | 100 | <0.001 |
| Peripheral vascular disease, % | 0 | 20 | 62 | 100 | <0.001 |
| Prior stroke, % | 0 | 18 | 57 | 100 | <0.001 |
| Heart failure, % | 10 | 21 | 33 | 41 | <0.001 |
| Atrial fibrillation, % | 6 | 10 | 14 | 16 | <0.001 |
| Chronic obstructive pulmonary disease, % | 11 | 17 | 24 | 29 | <0.001 |
| Renal disease, % | | | | | |
| Dialysis | 1 | 3 | 6 | 9 | <0.001 |
| Insufficiency | 7 | 14 | 24 | 32 | <0.001 |
| Presentation diagnosis | | | | | <0.001 |
| ST-segment elevation MI | 11 | 7 | 5 | 4 | |
| Non–ST segment elevation MI | 18 | 19 | 23 | 28 | |
| Unstable angina | 9 | 10 | 7 | 5 | |
| Unspecified MI | 63 | 65 | 65 | 64 | |
| Systolic blood pressure, mm Hg | 123±20 | 124±21 | 126±22 | 128±22 | <0.001 |
| Diastolic blood pressure, mm Hg | 68±12 | 67±13 | 66±12 | 65±12 | <0.001 |
| Total cholesterol, mg/dL | 176±47 | 164±47 | 157±47 | 158±49 | <0.001 |
| HDL cholesterol, mg/dL | 39±13 | 38±13 | 38±13 | 39±13 | <0.001 |
| LDL cholesterol, mg/dL | 107±39 | 97±39 | 92±38 | 93±38 | <0.001 |
| Triglycerides, mg/dL | 159±126 | 152±119 | 149±118 | 142±98 | <0.001 |
| Ejection fraction, % | 49±14 | 45±15 | 43±15 | 42±15 | <0.001 |
| % of Patients <40 y old | 18 | 26 | 34 | 35 | <0.001 |
| Patient insurance, % | | | | | <0.001 |
| Medicaid | 6 | 8 | 10 | 13 | |
| Medicare | 35 | 46 | 57 | 61 | |
| Other | 36 | 25 | 1611 | 61 | |
| No insurance | 9 | 6 | 3 | 2 | |
| Missing | 14 | 15 | 13 | 12 | |
| Hospital characteristics | | | | | |
| Transferred from another hospital, % | 25 | 22 | 21 | 19 | <0.001 |
| Mean bed size | 402±240 | 398±246 | 400±256 | 396±262 | <0.001 |
| Surgery available, % | 85 | 83 | 82 | 80 | <0.001 |
| PCI available, % | 93 | 92 | 90 | 89 | <0.001 |
| Coronary revascularization, % | | | | | |
| PCI | 57 | 43 | 33 | 26 | <0.001 |
| CABG | 11 | 10 | 8 | 8 | 0.02 |
| In-hospital mortality, % | 4.7 | 6.6 | 8.9 | 9.1 | <0.001 |
| Length of stay, d | 5±6 | 6±7 | 7±8 | 8±9 | <0.001 |

MI indicates myocardial infarction; PCI, percutaneous coronary intervention; and CABG, coronary artery bypass graft surgery. Plus or minus values are mean±SD.

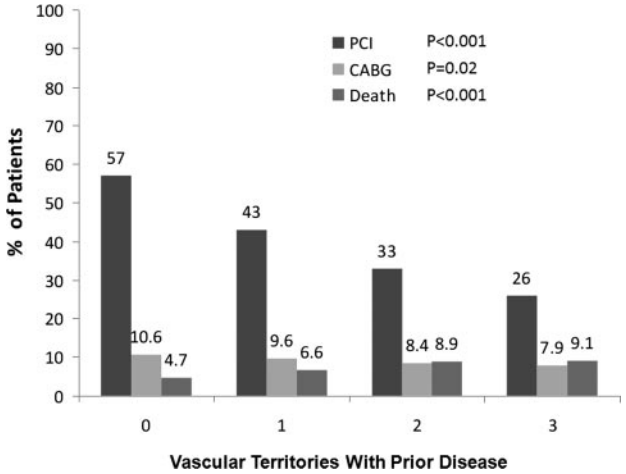


**Figure 1.** Use of coronary revascularization and in-hospital mortality in patients classified according to the presence of known prior vascular disease in 0, 1, 2, or 3 vascular territories. PCI indicates percutaneous coronary intervention; CABG, coronary artery bypass graft surgery; and Death, in-hospital mortality.

larization, have lower performance measures, and have higher mortality.

## High Risk of Patients With Prior Vascular Disease

Atherosclerosis is a systemic process that may affect several vascular beds.[1] Approximately 9% to 15% of ACS patients have PAD.[3,5,8] In the Global Registry of Acute Coronary Events (GRACE) registry, compared with ACS patients without prior PAD, prior PAD patients hospitalized with ACS were more likely to present with non–ST-segment elevation ACS and had a higher risk of death, myocardial infarction, and stroke.[5] GRACE registry patients who had both PAD and a history of stroke had an even higher risk,[7] which demonstrates the adverse impact of clinically manifest atherosclerosis in multiple arterial beds. Similar results were seen in the Orbofiban in Patients with Unstable Coronary Syndromes–Thrombolysis In Myocardial Infarction (OPUS-TIMI) 16 study,[3] in the Primary Angioplasty in Myocardial Infarction (PAMI) Database,[4] in a community study from Worcester, Mass,[8] and in a single-center study from Italy.[6] In the Clopidogrel for High Atherothrombotic Risk and Ischemic Stabilization, Management, and Avoidance (CHARISMA) trial, stable CAD patients with a history of myocardial infarction, PAD, or stroke had a high risk of cardiovascular events and appeared to derive benefit from prolonged clopidogrel administration.[13]

In the REduction of Atherothrombosis for Continued Health (REACH registry), 19% of enrolled patients with a history of cardiovascular disease had polyvascular disease,[14] and those patients had a significantly increased risk of cardiovascular events during follow-up. After 1 year, the incidence of the composite end point of cardiovascular death, myocardial infarction, stroke, or hospitalization for atherothrombotic events was 12.58% for patients with 1 symptomatic arterial disease location, 21.14% for patients with 2, and 26.27% for patients with 3 ($P<0.001$ for trend).[15]

In the Can Rapid risk stratification of Unstable angina patients Suppress ADverse outcomes with Early implementation of the ACC/AHA guidelines (CRUSADE) quality-improvement initiative, prior vascular disease was present in 48.9% of patients (significantly more than the 32% of patients in the present study). Prior polyvascular disease increased the risk of in-hospital adverse events (both ischemic and bleeding).[16]

In the present study, patients with prior vascular disease had high in-hospital mortality; the more extensive the prior vascular disease, the higher the mortality. Although this could be accounted for in part by other high-risk clinical characteristics of those patients (older age; a higher prevalence of heart failure, atrial fibrillation, and chronic obstructive pulmonary disease; and lower left ventricular ejection fraction, as shown in Table 1), the association remained significant after multivariable adjustment, which suggests that prior vascular disease carries independent prognostic value. The longer duration of hospitalization in patients with prior vascular disease in the present study further attests to their higher complexity and risk.

## Use of Coronary Revascularization

Although patients with prior monovascular or polyvascular disease had higher in-hospital mortality, they were less likely to undergo coronary revascularization in the present study (Figure 1). This has been described in ACS patients with PAD and stroke in the GRACE registry,[7] as well as in a

**Table 2. Use of Guideline-Recommended Therapies According to Number of Prior Disease Vascular Territories**

| Performance Measure* | 0 (n=98 136) | 1 (n=37 633) | 2 (n=7369) | 3 (n=861) | *P* |
|---|---|---|---|---|---|
| Aspirin within 24 h from admission, % | 92 | 92 | 92 | 92 | 0.10 |
| LDL-C >100 mg/dL and appropriate lipid-lowering therapy | 89 | 83 | 79 | 77 | <0.001 |
| Smoking cessation counseling | 90 | 88 | 85 | 79 | <0.001 |
| % With left ventricular dysfunction receiving ACEI or ARB, % | 82 | 79 | 74 | 78 | <0.001 |
| Aspirin at discharge, % | 96 | 96 | 96 | 95 | <0.001 |
| $\beta$-Blocker at discharge, % | 94 | 94 | 95 | 95 | 0.22 |
| Composite performance measure, % | 81 | 79 | 78 | 77 | <0.001 |
| Defect-free compliance, % | 81 | 79 | 78 | 77 | <0.001 |

LDL-C indicates low-density lipoprotein cholesterol; ACEI, angiotensin-converting enzyme inhibitor; and ARB, angiotensin receptor blocker.
*In patients with appropriate indication and without any contraindications.

**Table 3. Unadjusted and Adjusted Odds Ratios (95% Confidence Interval) for Mortality and Secondary Prevention Measures in Patients With Prior Disease in 1, 2, or 3 Vascular Territories**

| | Unadjusted* No. of Vascular Territories With Known Disease | | | Adjusted*† No. of Vascular Territories With Known Disease | | |
|---|---|---|---|---|---|---|
| End Point | 1 | 2 | 3 | 1 | 2 | 3 |
| In-hospital mortality | 1.35 (1.28–1.43) | 1.73 (1.59–1.88) | 1.75 (1.43–2.13) | 1.12 (1.07–1.18) | 1.22 (1.12–1.33) | 1.15 (0.93–1.41) |
| *P* | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.19 |
| Aspirin within 24 h from admission | 0.95 (0.91–1.00) | 0.92 (0.84–1.00) | 0.87 (0.71–1.08) | 1.07 (0.99–1.15) | 1.10 (0.96–1.27) | 1.11 (0.82–1.51) |
| *P* | 0.06 | 0.05 | 0.20 | 0.10 | 0.17 | 0.51 |
| LDL-C >100 mg/dL and appropriate lipid-lowering therapy | 0.71 (0.66–0.77) | 0.57 (0.49–0.65) | 0.52 (0.32–0.84) | 0.85 (0.78–0.93) | 0.81 (0.69–0.95) | 0.79 (0.46–1.33) |
| *P* | <0.001 | <0.001 | 0.008 | <0.001 | 0.0081 | 0.37 |
| Smoking cessation counseling | 0.83 (0.79–0.87) | 0.63 (0.57–0.70) | 0.48 (0.35–0.66) | 0.95 (0.89–1.02) | 0.79 (0.70–0.89) | 0.64 (0.45–0.92) |
| *P* | <0.001 | <0.001 | <0.001 | 0.15 | <0.001 | 0.015 |
| Patients with left ventricular dysfunction receiving ACEI or ARB | 0.84 (0.79–0.90) | 0.65 (0.58–0.72) | 0.74 (0.58–0.96) | 0.96 (0.90–1.02) | 0.81 (0.73–0.90) | 1.04 (0.80–1.35) |
| *P* | <0.001 | <0.001 | 0.02 | 0.15 | <0.001 | 0.76 |
| Aspirin at discharge | 0.89 (0.85–0.93) | 0.85 (078–0.93) | 0.79 (0.65–0.98) | 0.98 (0.93–1.04) | 1.02 (0.92–1.14) | 1.00 (0.77–1.30) |
| *P* | <0.001 | <0.001 | 0.03 | 0.49 | 0.67 | 0.99 |
| $\beta$-Blocker at discharge | 0.97 (0.94–1.02) | 0.91 (0.91–1.07) | 1.04 (0.81–1.32) | 1.03 (0.98–1.09) | 1.08 (0.98–1.19) | 1.13 (0.87–1.48) |
| *P* | 0.21 | 0.79 | 0.78 | 0.18 | 0.14 | 0.36 |
| Defect-free measure | 0.90 (0.87–0.93) | 0.81 (0.77–0.85) | 0.78 (0.69–0.88) | 0.97 (0.94–1.00) | 0.93 (0.88–0.98) | 0.93 (0.81–1.06) |
| *P* | <0.001 | <0.001 | <0.001 | 0.054 | 0.0068 | 0.25 |

LDL-C indicates low-density lipoprotein cholesterol; ACEI, angiotensin-converting enzyme inhibitor; and ARB, angiotensin receptor blocker.

*Comparison with patients without prior vascular disease (0 vascular territories with known disease).

†Adjusted for age, gender, body mass index, insurance, medical history, systolic blood pressure, cardiac diagnosis, hospital characteristics, and clustering within hospitals.



community study from Worcester, Mass.[8] In the PAMI database, ST-segment elevation acute myocardial infarction patients with prior PAD were less likely to undergo coronary angioplasty (86% versus 91%, $P=0.007$) than those without prior PAD or stroke.[4] In the OPUS-TIMI 16 trial, despite a higher incidence of left main or 3-vessel CAD among patients with prior PAD or stroke, cardiac catheterization and coronary revascularization were performed at a similar rate to that of other patients.[3]

Although the exact reasons for the lower coronary revascularization rates among ACS patients with prior monovascular or polyvascular disease cannot be determined accurately in retrospect, potential explanations include the lack of revascularization options in patients with diffuse or multivessel CAD, the reluctance of physicians to treat patients with prior vascular disease aggressively owing to difficulties in vascular access and higher risk of cardiac and extracardiac complications,[4] and the presence of multiple comorbidities (Table 1). In the 2007 American College of Cardiology/American Heart Association guidelines on the treatment of non–ST-segment elevation ACS,[17] prior CAD (percutaneous coronary intervention within the prior 6 months or prior coronary artery bypass graft surgery) favored an early invasive approach. Although prior CAD is a component of currently used ACS risk-stratification tools, such as the TIMI (Thrombolysis In Myocardial Infarction),[18] PURSUIT (Platelet glycoprotein IIb/IIIa in Unstable angina: Receptor Suppression Using Integrilin Therapy),[19] and GRACE[20] risk scores, a history of stroke or PAD is not included, although their presence could be easily ascertained by history.

## Performance Measures

The present study is the first to systematically examine multiple performance measures in a large group of patients with known atherosclerotic disease. We found that patients with prior atherosclerotic disease, despite having significantly higher risk, were less likely to receive lipid-lowering therapy, smoking cessation counseling, and angiotensin-converting enzyme inhibitor or angiotensin receptor blockers for left ventricular dysfunction than patients without known prior vascular disease; however, they were equally likely to receive aspirin (both at 24 hours and at discharge) and $\beta$-blockers at discharge. This is similar in part to the CRUSADE registry, in which patients with the highest risk of mortality were less likely to receive guideline-recommended therapies and interventions, although the latter study did not specifically examine patients with known atherosclerotic disease.[21] In the database for the PAMI studies, patients with prior PAD or stroke were less likely to receive $\beta$-blockers.[4] In the OPUS-TIMI 16 study, patients with extracardiac vascular disease were less likely to receive $\beta$-blockers and, in spite of a higher incidence of hypercholesterolemia, did not receive lipid-lowering agents more often.[3] In contrast, in the GRACE registry, no significant differences in the use of evidence-based therapies was seen between patients with prior PAD or stroke, although the use of appropriate therapies was subop-

**Table 4. Multivariable Model for Mortality**

| Parameter | Odds Ratio | 95% Confidence Interval | *P* |
|---|---|---|---|
| Polyvascular atherosclerosis | | | |
| Any 1 vs none | 1.12 | 1.07–1.18 | <0.0001 |
| Any 2 vs none | 1.22 | 1.12–1.33 | <0.0001 |
| All 3 vs none | 1.15 | 0.93–1.41 | 0.19 |
| Age, per 5-year increase | 1.22 | 1.20–1.23 | <0.0001 |
| Gender, female vs male | 1.07 | 1.03–1.12 | 0.001 |
| Body mass index, per 5-unit increase | 0.97 | 0.95–0.99 | 0.0015 |
| Insurance | | | |
| Medicaid vs none | 1.04 | 0.90–1.20 | 0.6353 |
| Medicare vs none | 0.98 | 0.86–1.11 | 0.7196 |
| Other vs none | 0.85 | 0.75–0.97 | 0.0159 |
| Systolic blood pressure, per 10-unit increase | 0.88 | 0.86–0.89 | <0.0001 |
| Bed size, per 100-bed increase | 1.03 | 0.97–1.09 | 0.3437 |
| Comorbidities | | | |
| Chronic or recurrent atrial fibrillation | 1.10 | 1.04–1.17 | 0.0023 |
| Atrial flutter | 0.79 | 0.51–1.23 | 0.3042 |
| Chronic obstructive pulmonary disease or asthma | 1.18 | 1.12–1.25 | <0.0001 |
| Diabetes mellitus | | | |
| Insulin treated | 1.37 | 1.20–1.58 | <0.0001 |
| Non–insulin treated | 1.15 | 1.03–1.28 | 0.0096 |
| Insulin use not documented | 1.23 | 1.17–1.30 | <0.0001 |
| Hyperlipidemia | 0.63 | 0.60–0.66 | <0.0001 |
| Hypertension | 0.87 | 0.83–0.92 | <0.0001 |
| Implantable cardioverter defibrillator | 1.25 | 0.88–1.79 | 0.2122 |
| Heart failure | 1.34 | 1.26–1.43 | <0.0001 |
| Anemia | 1.10 | 0.90–1.35 | 0.3320 |
| Pacemaker | 0.88 | 0.66–1.17 | 0.3885 |
| Dialysis | 1.99 | 1.77–2.23 | <0.0001 |
| Renal insufficiency | 1.53 | 1.43–1.64 | <0.0001 |
| Alcohol | 1.12 | 1.01–1.23 | 0.0292 |
| Depression | 1.09 | 0.88–1.35 | 0.4426 |
| None of the above | 0.85 | 0.79–0.92 | <0.0001 |
| Cardiac diagnosis | | | |
| Confirmed AMI: STEMI vs UA | 5.53 | 4.65–6.58 | <0.0001 |
| Confirmed AMI: non-STEMI vs UA | 3.00 | 2.54–3.55 | <0.0001 |
| Unspecified AMI vs UA | 3.85 | 3.28–4.51 | <0.0001 |
| Hospital: heart transplants | 1.19 | 0.68–2.08 | 0.5378 |
| Nonacademic vs academic | 1.28 | 1.01–1.61 | 0.0414 |
| Noninterventional vs interventional | 0.94 | 0.63–1.39 | 0.7576 |
| Region | | | |
| Midwest vs West | 0.91 | 0.69–1.21 | 0.5235 |
| Northeast vs West | 0.89 | 0.65–1.22 | 0.4716 |
| South vs West | 1.01 | 0.79–1.28 | 0.9667 |
| Site traits | | | |
| No residents vs resident | 0.93 | 0.73–1.18 | 0.5453 |
| No surgery vs surgery | 1.27 | 0.82–1.96 | 0.2886 |
| Non-PTCA vs PTCA | 1.11 | 0.86–1.42 | 0.4123 |

AMI indicates acute myocardial infarction; STEMI, ST-segment elevation acute myocardial infarction; UA, unstable angina; and PTCA, percutaneous transluminal coronary angioplasty.

timal (<50% use of all indicated therapies) in all study groups.[7]

Why are physicians more likely to administer some therapies (aspirin and β-blockers) but not others (lipid-lowering therapy, smoking cessation counseling, and angiotensin-converting enzyme inhibitor or angiotensin receptor blocker) to patients with known atherosclerotic disease? Similar use of aspirin and β-blockers may be related to their wide acceptance as safe and efficacious treatments by both patients and physicians and to their ease of use and low cost. Lower use of the above-described 3 treatments may be due to more comorbidities, a concern for drug interactions, and higher cost. Perhaps there is also a sense of futility on the part of the

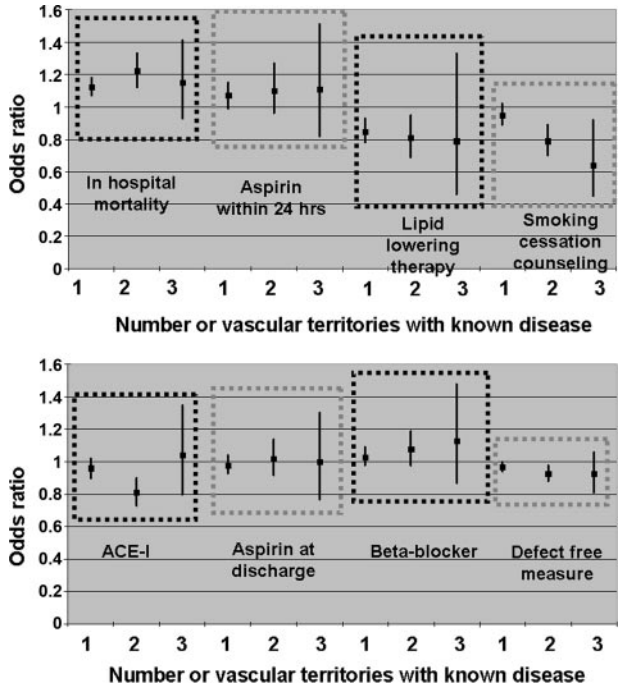


**Figure 2.** Adjusted odds ratios (95% confidence intervals) for mortality and secondary prevention measures in patients with known prior vascular disease in 1, 2, or 3 vascular territories compared with patients without prior vascular disease. ACE-I indicates angiotensin-converting enzyme inhibitor or angiotensin receptor blocker administered to patients with left ventricular dysfunction.

physician for further treatment of those patients with advanced atherosclerotic disease who continue to smoke or may not be compliant with their prescribed medications. As seen in Table 1, patients with prior atherosclerotic disease were less likely to be treated in centers with on-site cardiac surgery or coronary intervention in spite of their significantly higher baseline risk, which suggests that physicians (or the patients themselves) may elect to refrain from more aggressive invasive treatment. Socioeconomic factors could also play a significant role: Patients with prior atherosclerotic disease were significantly more likely to be on Medicaid (Table 1).

Yet, lower use of evidence-based treatments in patients with known atherosclerotic disease is counterintuitive, because higher-risk ACS patients are more likely to derive benefit from evidence-based therapies.[7] Even if the relative risk reduction from a treatment is similar for all risk groups, higher-risk patients will derive the highest absolute benefit (ie, number of events prevented).[22] The present study suggests that ACS patients with prior vascular disease are a high-risk group in which there is significant room for improving compliance with the above-identified treatments.

### Study Limitations

The GWTG-CAD database is voluntary and therefore may not be representative of the entire US practice. Complete data entry may not always be available; however, we did exclude from the study any population centers in which clinical data were <25% complete. We could not examine the additive role of knowledge of prior vascular disease to the current risk-stratification schemes, because some of the components of the TIMI and GRACE risk scores have not been recorded in the GWTG-CAD database. Patients may have had subclinical stroke or PAD that was not diagnosed before admission for ACS, which could have diluted the effect of prior vascular disease on outcomes. Although poor vascular access and socioeconomic status may have influenced the decision to proceed with coronary angiography and revascularization, this information was not available for analysis in the GWTG-CAD database.

### Conclusions

Compared with patients without prior vascular disease, those with prior vascular disease who present with ACS have a significantly higher risk of death or adverse cardiac events, have lower rates of coronary revascularization, and are less likely to receive the following 3 evidence-based treatments: (1) Lipid-lowering therapy, (2) smoking cessation counseling, and (3) use of angiotensin-converting enzyme inhibitor or angiotensin receptor blocker for left ventricular dysfunction. Patients with prior vascular disease may be an easily identifiable patient group that could derive significant benefit from targeted interventions that aim to improve ACS care.

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## CLINICAL PERSPECTIVE

Patients with prior atherosclerosis in 1 or more vascular territories (coronary, cerebrovascular, or peripheral arterial) who present with acute coronary syndromes have high cardiovascular risk. Whether those patients receive evidence-based therapies to a similar or lesser extent than those without prior atherosclerosis is unknown. To answer this question, we examined 143 999 patients participating in the Get With the Guidelines–Coronary Artery Disease database. Preexistent atherosclerosis in 1, 2, or 3 vascular territories was common (26%, 5%, and 0.6%, respectively). As expected, compared with patients without prior vascular disease, patients with prior vascular disease were older and had more comorbidities. They were less likely to undergo coronary revascularization and had longer duration of hospital stay and higher in-hospital mortality. After adjustment for clinical and hospital characteristics, compared with patients without prior vascular disease, those with prior vascular disease had higher mortality and were less likely to receive 3 guideline-recommended treatments (lipid-lowering therapy, smoking cessation counseling, and angiotensin-converting enzyme inhibitor for left ventricular dysfunction) but were equally likely to receive other treatments, such as aspirin and $\beta$-blockers. Patients with prior vascular disease who present with an acute coronary syndrome are an easily identifiable patient group that could derive significant benefit from interventions targeted to those 3 evidence-based treatments.

# Quality of Care for Acute Coronary Syndrome Patients With Known Atherosclerotic Disease: Results From the Get With the Guidelines Program

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