Comparisons of Guideline-Recommended Therapies in Patients With Documented Coronary Artery Disease Having Percutaneous Coronary Intervention Versus Coronary Artery Bypass Grafting Versus Medical Therapy Only (from the REACH International Registry)

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To evaluate current compliance with recommendations for medical therapy in patients with coronary artery disease (CAD), the relation between previous revascularization and use of guideline-recommended therapies was investigated. From 5,400 outpatient practices in 44 countries, we compared baseline characteristics and medical therapy of 40,450 patients with documented CAD (all with previous myocardial infarction, percutaneous coronary intervention [PCI], coronary artery bypass grafting [CABG], or angina pectoris) by previous revascularization status. Approximately 33% of patients had previous CABG, 33% had previous PCI, and 33% had no previous revascularization. Patients with previous CABG were older and often men and diabetic. Patients with previous PCI were the youngest. Guideline-recommended medical therapy use was significantly higher in those with previous revascularization. Antiplatelet therapy in medically managed patients was 80% versus 86% and 91% for those with previous CABG or PCI, respectively. Use of any lipid-lowering agent in those with previous CABG or PCI was 86% in the 2 groups versus 70% in patients who were medically managed. Angiotensin-converting enzyme inhibitors and angiotensin receptor blockers were used in similar ratios among groups. Previous revascularization appears to be associated with better use of guideline-recommended medical treatment. These trends were similar for patients from the United States versus everywhere else. In conclusion, use of evidence-based, guideline-recommended therapies in outpatients with CAD needs to improve, especially in medically managed patients. **(Am J Cardiol 2007;99:1212–1215)**

During the previous few decades, many new therapeutic agents have been methodically proved to decrease morbidity and mortality in patients with coronary artery disease (CAD). Drugs such as antiplatelet agents, β blockers, angiotensin-converting enzyme inhibitors, and statins have been shown to prevent myocardial infarction, stroke, and mortality. The professional guidelines have continued to evolve to reflect these advances and currently strongly recommend the use of these agents and others in patients with stable CAD and acute coronary syndromes.[1,2] The extent to which these therapies are employed and in what settings remain unknown. To identify patterns of use for evidence-proved therapies in patients with known CAD (an indication for each of these therapies), we stratified patients in the REduction of Atherothrombosis for Continued Health (REACH) Registry by whether or not they had undergone coronary revascularization.

Methods and Results

The design of the REACH Registry has been described elsewhere.[3] Briefly, it is an international registry done in 44

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Table 1
Baseline characteristics and treatment profiles of patients in the REduction of Atherothrombosis for Continued Health Registry with coronary artery disease

Variable	Previous CABG (34.4%, n = 13,907)	Previous PCI (31.5%, n = 12,759)	Medical Treatment Only (34.1%, n = 13,784)	p Value
Mean age (yrs)	70	66	69	<0.0001
Women	3,212 (23%)	3,535 (28%)	5,458 (40%)	<0.0001
Caucasian race	10,059 (77%)	7,834 (68%)	9,126 (71%)	<0.0001
Current smoker*	1,201 (8.9%)	1,846 (15%)	2,057 (15%)	<0.0001
Body mass index (kg/m^2)				0.003
Overweight (25–30)	5,792 (42%)	5,363 (43%)	5,532 (41%)	
Mild obesity (30–35)	2,860 (21%)	2,459 (19%)	2,733 (20%)	
Moderate obesity (35–40)	852 (6.2%)	807 (6.4%)	863 (6.4%)	
Morbid obesity (≥40)	419 (3.1%)	377 (3.0%)	451 (3.3%)	
Hypertension†	11,213 (81%)	9,838 (77%)	11,407 (83%)	<0.0001
Hypercholesterolemia‡	11,492 (83%)	10,393 (82%)	9,140 (66%)	<0.0001
Diabetes§	5,810 (42%)	4,422 (35%)	5,254 (38%)	<0.0001
Previous myocardial infarction	7,566 (54%)	6,920 (54%)	6,790 (49%)	<0.0001
Previous stable angina pectoris	5,967 (43%)	5,278 (41%)	8,851 (64%)	<0.0001

* At least 15 cigarettes per day.
† Patients currently treated for hypertension with medication.
‡ Patients currently treated for hypercholesterolemia with medication.
§ Patients treated with a hypoglycemic agent for type 1 or 2 diabetes or a history of diabetes.

Table 2
Treatment profiles of patients with coronary artery disease in the REACH Registry

Variable	Previous CABG (n = 13,907)	Previous PCI (n = 12,759)	Previous Medical Treatment (n = 13,784)	p Value
Aspirin	10,720 (77%)	10,486 (82%)	9,502 (69%)	<0.0001
≥1 antiplatelet*	11,976 (86%)	11,644 (91%)	10,936 (79%)	<0.0001
β Blocker	8,934 (64%)	8,351 (66%)	7,603 (55%)	<0.0001
Angiotensin-converting enzyme inhibitor	6,656 (48%)	5,877 (46%)	6,797 (50%)	<0.0001
Angiotensin receptor blocker	2,867 (21%)	2,677 (21%)	2,650 (19%)	0.009
Angiotensin-converting enzyme inhibitor or angiotensin receptor blocker	9,181 (66%)	8,304 (65%)	9,165 (66%)	0.0498
Statin or other lipid-lowering agent	11,978 (86%)	11,018 (86%)	9,685 (70%)	<0.0001
Statin	11,381 (82%)	10,425 (82%)	8,930 (65%)	<0.0001
Other lipid-lowering agent	1,927 (14%)	1,642 (13%)	1,341 (10%)	<0.0001
All 4 classes†	4,872 (35%)	4,778 (37%)	3,458 (25%)	<0.0001
≥3 of 4 classes†	5,474 (39%)	4,967 (39%)	5,038 (37%)	<0.0001
Oral anticoagulant	2,258 (17%)	1,226 (10%)	1,765 (13%)	<0.0001
≥1 antithrombotic agent	13,141 (95%)	12,044 (95%)	13,037 (95%)	0.78

* Includes aspirin, adenosine diphosphate receptor antagonists, or dipyridamole.
† Including (1) any antiplatelet agent, (2) β blockers, (3) an inhibitor of the renin-angiotensin system (angiotensin-converting enzyme inhibitor or angiotensin receptor blocker), and (4) a statin or other lipid-lowering agent.

countries of patients affected by atherothrombosis with a focus on the outpatient setting. Baseline characteristics of the population have also been published.[4] To qualify for entry in the registry, each patient had to be ≥45 years of age, sign informed consent, and have established CAD (n = 40,450), cerebrovascular disease (n = 18,992), peripheral arterial disease (n = 8,322), or ≥3 risk factors for atherothrombosis (n = 12,422). Exclusion criteria included current hospitalization, current participation in a clinical trial, or envisaged difficulties in attending follow-up. Entry occurred between 2003 and 2004.[4] The present study was limited to patients with established CAD at a single point in time (after 1-year follow-up visit), yielding a minor discrepancy in total CAD population from that reported at baseline.[4] Patients with CAD included a history of ≥1 of the following: stable angina (angina necessitating episodic or permanent use of medications), unstable angina, myocardial infarction, coronary angioplasty/stenting (percutaneous coronary intervention [PCI]), or coronary artery bypass graft (CABG) surgery (n = 40,450). Use of guideline-recommended therapies was stratified by previous revascularization procedure: those with a history of CABG (regardless of PCI history), those with a previous PCI but no CABG, and those with no history of any revascularization (medical management only). Medication use rates included all patients irrespective of contraindications/intolerance as captured by the registry. Patients in the United States were compared with those from the rest of the world. Results were compared using chi-square test with a 2-sided p value of 0.05 considered statistically significant.

Of the 68,236 patients in the registry, 40,450 had established CAD; 34% (13,907) of these had a previous CABG,

Table 3
Treatments for patients with coronary artery disease in the REACH Registry for the United States versus the rest of the world

	Previous CABG (n = 13,907)	Previous PCI (n = 12,759)	Previous Medical Treatment (n = 13,784)	p Value
No. of patients in United States	6,897	4,825	3,677	
≥1 antiplatelet*	5,813 (84%)	4,251 (88%)	2,712 (74%)	<0.0001
β Blocker	4,539 (66%)	3,169 (66%)	1,977 (54%)	<0.0001
Angiotensin-converting enzyme inhibitor	3,234 (47%)	2,220 (46%)	1,597 (44%)	0.005
Angiotensin receptor blocker	1,548 (23%)	1,036 (22%)	904 (25%)	0.002
Angiotensin-converting enzyme inhibitor or angiotensin receptor blocker	4,573 (66%)	3,117 (65%)	2,371 (65%)	0.07
Statin or other lipid-lowering agent	6,098 (89%)	4,294 (89%)	2,842 (77%)	<0.0001
Statin	5,707 (83%)	4,001 (83%)	2,571 (70%)	<0.0001
Other lipid-lowering agent	1,459 (21%)	1,003 (21%)	652 (18%)	<0.0001
Oral anticoagulant	1,215 (19%)	594 (13%)	603 (17%)	<0.0001
≥1 antithrombotic agent	6,542 (95%)	4,554 (95%)	3,473 (95%)	0.52
No. of patients outside United States	7,010	7,934	10,107	
≥1 antiplatelet*	6,163 (88%)	7,393 (93%)	8,224 (81%)	<0.0001
β Blocker	4,395 (63%)	5,182 (65%)	5,626 (56%)	<0.0001
Angiotensin-converting enzyme inhibitor	3,422 (49%)	3,657 (46%)	5,200 (52%)	<0.0001
Angiotensin receptor blocker	1,319 (19%)	1,641 (21%)	1,746 (17%)	<0.0001
Angiotensin-converting enzyme inhibitor or angiotensin receptor blocker	4,608 (66%)	5,187 (65%)	6,794 (67%)	0.02
Statin or other lipid-lowering agent	5,880 (84%)	6,724 (85%)	6,843 (68%)	<0.0001
Statin	5,674 (81%)	6,424 (81%)	6,359 (63%)	<0.0001
Other lipid-lowering agent	468 (7%)	639 (8%)	689 (7%)	0.001
Oral anticoagulant	1,043 (15%)	632 (8%)	1,162 (12%)	<0.0001
≥1 antithrombotic agent	6,599 (94%)	7,490 (95%)	9,594 (95%)	0.33

* Includes aspirin, adenosine diphosphate receptor antagonists, or dipyridamole.

32% (12,759) had a previous PCI only, and 34% (13,784) were managed medically with no history of revascularization. Of those patients with a history of CABG, 69% (9,628) had no previous PCI, whereas 31% (4,279) also had a history of PCI. Those with a history of CABG were older, more often men, and diabetic; patients with previous PCI were the youngest group. The largest proportion of women was in the group managed medically only (Table 1).

Use of guideline-recommended therapy was significantly greater in those with any previous revascularization (Table 2). However, in this population with established CAD, ~15% of patients with previous revascularization and >20% of those treated medically were not on any antiplatelet agent (including aspirin, adenosine diphosphate receptor antagonists, or dipyridamole). In addition, 15% to 20% were not on any lipid-lowering agent. Approximately 66% were on a β blocker and 66% were on an angiotensin-converting enzyme inhibitor or an angiotensin receptor blocker. These latter 2 agents were used in similar ratios among treatment groups and may not be indicated in every patient.[5]

Of the 4 evidence-based therapies in this population (antiplatelet agents, β blockers, inhibitors of the renin-angiotensin system, and statins or other lipid-lowering agents),[5] <40% received all 4, even in the better-treated groups of patients with a history of CABG or PCI (Table 2). Patients receiving only "medical management" were least likely to receive all of the proved pharmacologic therapies, with <37% obtaining 3 of the 4 listed therapies and barely 25% receiving an antiplatelet agent, a β blocker, an inhibitor of the renin-angiotensin system, and a lipid-lowering agent.

Most patients (76%) in the United States had a history of some revascularization (11,722 of 15,399), whereas 60% of patients in the remaining countries underwent revascularization (14,944 of 25,051). There were no significant differences in trends of treatments for patients in the United States compared with those from the rest of the world (Table 3). The medically managed patients in each group were less likely to have received guideline-recommended therapies.

Discussion

In this international registry subset of >40,000 patients with established CAD, previous revascularization appears to be associated with better use of guideline-recommended medical treatment. This is consistent with previous, smaller studies of local populations showing a direct correlation between invasive strategy for acute coronary syndrome and subsequent aggressive pharmacologic management.[6,7] However, even in the best-treated groups not all patients received the therapies the guidelines recommended for them; better adherence to evidence-based therapies is necessary to manifest the expected decreases in morbidity and mortality.

The discrepancy in treatments between patients with previous revascularization and those managed medically seems contradictory: those patients with CAD managed only with medications appear to be receiving the fewest evidence-based pharmacologic treatments. Furthermore, the most basic therapies, antiplatelet agents, are undervalued by 10% to 20% across groups and used less in patients with a history of CABG compared with those in the PCI group. Although further research is needed to determine for certain the reasons for this discrepancy, 2 possibilities exist: (1) treatment by cardiologists during and after revascularization

procedures increases the likelihood of the use of guideline-recommended therapies for CAD and/or (2) having a revascularization procedure increases the awareness of the CAD diagnosis to the patients and their physicians, thus increasing prescriptions for and adherence to therapies.[8]

We also observed a dramatic gender imbalance with regard to revascularization, as barely 1/4 of those in the CABG or PCI groups were women (vs nearly 40% of those managed medically). Given previous reports suggesting that women are less likely to receive effective, aggressive, invasive management for acute coronary syndrome,[9–13] these data warrant further investigation.

It is important to note that these analyses are limited by the fact that data on previous trials and subsequent discontinuation of medications are not available. Regardless of the reasons for inconsistencies in treatment rates, physicians need to be aware that patients with CAD without previous revascularization are less likely to receive treatments proved to decrease morbidity and mortality, particularly antiplatelet and lipid-lowering medications. In an era of evidence-based treatment and in a field ripe with clinical trials and undisputed evidence as to the efficacy of such treatments, use of guideline-recommended therapies needs to increase.

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