From the Society for Vascular Surgery

Participation in the Vascular Quality Initiative is associated with improved perioperative medication use, which is associated with longer patient survival

Randall R. De Martino, MD, MS,[a] Andrew W. Hoel, MD,[b] Adam W. Beck, MD,[c] Jens Eldrup-Jorgensen, MD,[d] John W. Hallett, MD,[e] Gilbert R. Upchurch, MD,[f] Jack L. Cronenwett, MD,[g] and Philip P. Goodney, MD, MS,[g] for the Vascular Quality Initiative, *Rochester, Minn; Chicago, Ill; Gainesville, Fla; Portland, Me; Charleston, SC; Charlottesville, Va; and Lebanon, NH*

Objective: **Medical management (MM) with antiplatelet (AP) and statin therapy is recommended for most patients undergoing vascular surgery and has been advocated by the Vascular Quality Initiative (VQI). We analyzed the effect of VQI participation on perioperative (preoperative and postoperative) MM use over time and the effect of discharge MM on patient survival.**

Methods: **We studied VQI patients treated with MM preoperatively and at discharge from 2005 to 2014, including all elective carotid endarterectomy/carotid stenting (n = 28,092), suprainguinal/infrainguinal bypass (n = 11,362), peripheral vascular interventions (n = 24,476), open/endovascular abdominal aortic aneurysm repair (n = 13,503), and thoracic endovascular aneurysm repair (n = 702). We examined trends of MM use over time, as well as the effect of duration of VQI participation on MM use. Multivariable logistic regression analysis was performed to identify factors associated with MM use. In addition, the Cox proportional hazards model was used to identify factors associated with 5-year survival.**

Results: **MM with AP and statin preoperatively and postoperatively across VQI centers improved from 55% in 2005 to 68% in 2009, with a subsequent overall decline to 62% by 2014, coincident with many new centers with lower MM rates joining VQI in 2010. Longer center participation in VQI was associated with improved perioperative MM overall. This was also noted across all procedure types, with MM increasing from 47% to 82% for aneurysm repairs and 69% to 83% for carotid procedures from 1 to 12 years of participation in VQI. After multivariable adjustment, centers in VQI ≥3 years were 30% more likely to have patients on MM (odds ratio, 1.3, 95% confidence interval [CI], 1.3-1.4). Importantly, discharge on AP and statin therapy was associated with improved 5-year survival, compared with discharge on neither medication (82% [95% CI, 81%-83%] vs 67% [95% CI, 62%-72%]), and an adjusted hazard ratio for death of 0.6 (95% CI, 0.5-0.7; $P < .001$). Discharge on a single medication was associated with intermediate survival at 5 years (AP only: 77% [95% CI, 75%-79%]; statin only: 73% [95% CI, 68%-77%]).**

Conclusions: **These data demonstrate that MM is associated with improved survival after a number of vascular procedures. Importantly, VQI participation improves the use of MM, demonstrating that involvement in an organized quality effort can affect patient outcomes. (J Vasc Surg 2015;61:1010-9.)**

From the Division of Vascular and Endovascular Surgery, Mayo Clinic, Rochester[a]; the Division of Vascular Surgery, Northwestern University Feinberg School of Medicine, Chicago[b]; the Division of Vascular Surgery and Endovascular Therapy, University of Florida College of Medicine, Gainesville[c]; the Department of Surgery, Maine Medical Center, Portland[d]; the Roper St. Francis Heart & Vascular Center, Charleston[e]; the Division of Vascular and Endovascular Surgery, University of Virginia, Charlottesville[f]; and the Section of Vascular Surgery, Dartmouth-Hitchcock Medical Center, Lebanon.[g]

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Reprint requests: Randall R. De Martino, MD, MS, Mayo Clinic, 200 First St SW, Rochester, MN 55905 (e-mail: demartino.randall@mayo.edu).

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Patients undergoing vascular surgical procedures often present with multiple cardiovascular morbidities. Up to 75% of patients with peripheral arterial disease (PAD) will ultimately die of cardiovascular causes.[1] Secondary treatment for cardiovascular disease in patients with PAD is based on medical management (MM). Multiple intersocietal consensus guidelines recommend treatment of patients with coronary artery disease (CAD) and symptomatic PAD with antiplatelet (AP) and 3-hydroxy-3 methyl-glutaryl-coenzyme A (statin) medications in addition to smoking cessation and blood pressure control.[1-6]

Despite these guidelines, only one-third of Americans with PAD are taking an AP or statin medication, or both, based on a recent National Health and Nutrition Examination Study. Lack of AP and statin therapy in these patients was associated with higher long-term mortality.[7] Further, there is wide variation in the use of AP and statin medications at the time of intervention for PAD, which

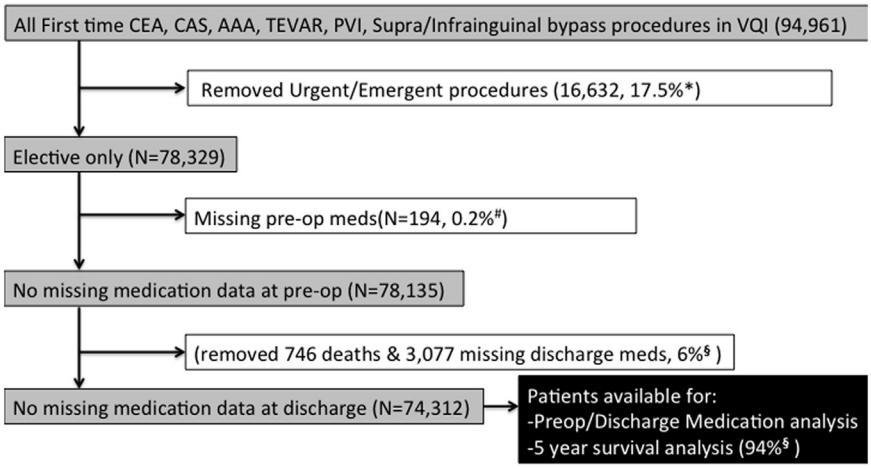

Fig 1. Identification of cases for analysis. *AAA,* Abdominal aortic aneurysm; *CAS,* carotid artery stenting; *CEA,* carotid endarterectomy; *PVI,* peripheral vascular intervention; *TEVAR,* thoracic endovascular aortic repair; *VQI,* Vascular Quality Initiative. *Proportion represents total urgent/emergency of all first time procedures. #Denominator is all eligible patients for analysis (elective first-time procedures). §Denominator is all patients available for perioperative analysis.

has also been associated with 5-year survival.[7] Moreover, despite improvement over time, there is variation by procedure and among centers in perioperative AP and statin usage.[8]

In 2011, the Society for Vascular Surgery launched the Vascular Quality Initiative (VQI) to improve the care and outcomes for patients with vascular disease.[9] Although variation exists in the use of MM with AP and statins, factors that may improve medication use, such as participation in the VQI, are not well described. The purpose of this study was to describe the utilization of AP and statin medications perioperatively and to understand factors associated with improved perioperative medication use across centers participating in VQI as well as the effect of MM on overall survival.

METHODS

Database. This is a retrospective analysis of data collected prospectively by the VQI, a nationwide quality improvement initiative developed originally in 2002 in New England[10] to improve outcomes of vascular procedures.[9] Registry data are compared with hospital claims in annual audits, and missing cases are retrieved to track all procedures.[10] Mortality data are supplemented by semiannual matching of registry data with the Social Security Death Index (SSDI).

Construction of analytic cohort. Because statin use at discharge was tracked beginning in 2005, all patients undergoing their first-time intervention in the VQI data set from 2005 to 2014 for carotid endarterectomy, carotid artery stenting, infrainguinal or suprainguinal arterial bypass, peripheral vascular interventions (PVIs), open or endovascular abdominal aortic aneurysm (AAA) repair (EVAR), and thoracic endovascular aortic repair (TEVAR) for aneurysmal disease (other TEVAR indications, such as trauma or dissection, were excluded) were identified. This yielded our initial cohort of 94,961 patients undergoing first-time procedures. These patients were selected because patients with these conditions meet the criteria outlined in multiple guidelines to support AP and statin use for patients with cerebrovascular disease and symptomatic PAD.[1,3-5,11]

Although aneurysmal disease carries no specified societal recommendations regarding medication treatment with AP and statin medications, most of these patients have indications for known coronary risk factors that support their use.[2] These factors include a history of CAD, hypertension, positive stress test result, prior coronary revascularization, a prior arterial bypass or peripheral intervention, or prior carotid revascularization. All TEVAR patients and 98.9% of AAA patients had at least one of these cardiovascular risk factors to recommend AP and statin use. Only 1.1% of AAA patients (n = 584) had none of these risk factors. As noted in our prior study, patients with none of these cardiac risk factors had similar survival and outcomes to AAA patients with cardiac comorbidities, and thus, they were included in the final study cohort.[8]

All cases were elective; urgent or emergency cases were excluded (3096 emergency, 12,843 urgent, and 693 missing urgency data). These exclusion criteria were designed to provide a cohort of patients with the potential to be prescribed AP and statin medications before elective surgery. Finally, 194 patients (0.25%) were removed from analysis for missing preoperative medication data. This resulted in 78,135 patients with preoperative data available (Fig 1). To analyze the use of AP and statins preoperatively and postoperatively, our final patient cohort excluded 746 (0.95%) who were not eligible for discharge medications because they died in-hospital and 3077 (3.9%) who were missing discharge medication data. This resulted in 74,312 patients with preoperative and postoperative medications for review (Fig 1).