Frequency of Care and Mortality Following an Incident Diagnosis of Peripheral Artery Disease in the Inpatient or Outpatient Setting: The ARIC (Atherosclerosis Risk in Communities) Study

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Background—Available health services data for individuals with peripheral artery disease (PAD) are often from studies of those eligible for or undergoing intervention. Knowledge of the frequency of care and mortality following an initial PAD diagnosis by setting (outpatient versus inpatient) is limited and represents an opportunity to provide new benchmark information.

Methods and Results—The purpose of this study was to characterize the frequency of care and mortality following an incident PAD diagnosis in the outpatient or inpatient setting using data from the ARIC (Atherosclerosis Risk in Communities) study cohort linked with Centers for Medicare and Medicaid Services fee-for-service claims data (2002–2012). Direct standardization was used to estimate age-standardized rates of encounters and mortality. PAD was defined by billing code in any claim position. We observed 1086 incident PAD cases (873 outpatient, 213 inpatient). At 1 year after diagnosis, participants diagnosed in the outpatient setting had 2.15 (95% confidence interval [CI], 2.10–2.21) PAD-related outpatient encounters per person-year, and 6.4% (95% CI, 4.8–8.1) had a PAD-related hospitalization. Conversely, participants diagnosed in the inpatient setting had 1.02 (95% CI, 0.94–1.10) PAD-related outpatient encounters per person-year, and 14.2% (95% CI, 9.3–18.7) had a PAD-related rehospitalization. One-year mortality was 7.1% (95% CI, 5.4–8.7) and 16.0% (95% CI, 11.0–21.1) among those diagnosed in outpatient and inpatient settings, respectively.

Conclusions—This study provides important data estimating frequency of care and mortality by the setting of initial PAD diagnosis. Individuals with PAD are frequent users of health care, and those diagnosed in the inpatient setting have high rates of rehospitalization and mortality. (J Am Heart Assoc. 2018;7:e007332. DOI: 10.1161/JAHA.117.007332.)

Key Words: Medicare • mortality • peripheral artery disease • population science • utilization

Peripheral artery disease (PAD) is a prevalent and disabling atherosclerotic disorder that disproportionately affects older adults.1–4 Up to 25% of patients with symptomatic PAD may progress to limb-threatening clinical manifestations that are associated with high healthcare costs and frequent PAD-related procedures.5–7 In particular, hospitalization costs associated with PAD-related revascularization and limb amputation procedures account for more than $11 billion annually in the United States and are similarly high in several European countries.8 Long-term health outcomes, including cardiac events and mortality, following these procedures are poor.8,9

Although the prognosis for patients following a PAD-related procedure is well described,10,11 little is known about the outpatient and inpatient clinical care and outcomes following an initial PAD diagnosis. In particular, postdiagnosis care for individuals with PAD—including initial diagnosis in the outpatient setting through clinic visits, admissions, and use of procedures—has not been described. Administrative claims data, which contain diagnostic and procedure codes from inpatient and outpatient encounters, provide an opportunity to estimate the frequency of PAD-related care from the healthcare setting of first diagnosis through follow-up care in both the outpatient and inpatient settings.
Clinical Perspective

What Is New?

- Through a large population-based cohort study linked with Medicare fee-for-services claims data, we provide accurate estimates of the frequency of care following a peripheral artery disease diagnosis by the location of the incident diagnosis in the outpatient or inpatient setting.
- Individuals diagnosed in the inpatient setting have high rates of rehospitalization and mortality.

What Are the Clinical Implications?

- Our findings provide a basis for the assessment of healthcare resource spending among peripheral artery disease patients and a comparison, by demographics and comorbid conditions, of disease trajectories associated with clinically manifest peripheral artery disease diagnosed in the inpatient or outpatient setting.

The primary objective of this study was to characterize the frequency of care for study participants following an incident PAD diagnosis in the outpatient or inpatient setting. Our secondary objective was to estimate mortality associated with an initial PAD diagnosis by setting of diagnosis (ie, outpatient or inpatient). To accomplish these aims, we used data from the biracial ARIC (Atherosclerosis Risk in Communities) study cohort linked with Centers for Medicare and Medicaid Services (CMS) claims data for the years 2000–2012.

Methods

Availability of data and material, as well as detailed policies for accessing ARIC data, can be found online (https://www2.cscc.unc.edu/aric/).

Study Population

The ARIC cohort study

The ARIC cohort, established to examine the etiology of atherosclerosis and its clinical manifestations, includes 15,792 participants (aged 45–64 years at baseline) enrolled between 1987 and 1989. The ARIC cohort was selected by probability sampling from 4 US communities: Washington County, Maryland; Forsyth County, North Carolina; the city of Jackson, Mississippi; and the suburb cities of Minneapolis, Minnesota. Other details about the study population have been published previously.

Those eligible for inclusion in this study were ARIC participants enrolled continuously for at least 2 years in Medicare Parts A and B through a fee-for-service (FFS) plan from 2000 to 2012. Data were collected on cohort participants at 5 clinic examinations and through annual follow-up telephone interviews. Information from ARIC visits 1 to 4, which occurred at 3-year intervals and concluded in 1999, is included in the present study. Information collected through the final telephone interview before diagnosis was used to define comorbid conditions.

Linkage of cohort data with administrative claims

Data for ARIC cohort participants were linked with CMS claims for the years 1991–2012 using a fnder file that included each participant’s social security number, sex, and date of birth. A total of 14,899 Medicare-eligible ARIC study participants were identified, of which 14,702 ARIC cohort identifiers (98.7% match) were matched successfully.

Information concerning ARIC study participant enrollment in FFS Medicare was obtained from monthly indicators of enrollment in Part A, Part B, and Medicaid buy-in available from annual CMS Medicare Beneficiary Summary files. Continuous enrollment periods were created to indicate uninterrupted CMS Medicare FFS coverage, defined as enrollment in CMS Medicare Part A and Part B and lack of enrollment in a Medicare Advantage (health maintenance organization) plan. Enrollment status before 2000 was not considered for this analysis. Study participants with missing enrollment information and those with continuous and exclusive Medicare Advantage enrollment were excluded from the study. Given limited representation, participants aged <65 years and those of race other than black or white were excluded. For study participants with >1 continuous FFS enrollment period (n=349), the longest FFS period was selected to give the best opportunity to capture relevant claims.

Demographics and comorbidities

Participant race, sex, education level, and family income were self-reported at the ARIC baseline visit (1987–1989). We used age at time of entry into the ARIC cohort and date of PAD healthcare event ascertained from the claims to calculate age at the time of the incident PAD event. Participant information regarding comorbid conditions was available from 4 ARIC clinic visits and annual telephone follow-up surveys. Comorbidity status was determined at the time of diagnosis. Diabetes mellitus was defined as self-reported history of physician-diagnosed diabetes mellitus at any of the 4 clinic visits or annual telephone survey, usage of diabetes mellitus medication during the 2 weeks before a visit, fasting blood glucose level ≥126 mg/dL, or nonfasting blood glucose ≥200 mg/dL. Kidney failure was defined as an estimated glomerular filtration rate <15.0 mL/min per 1.73 m² using the creatinine-based CKD-EPI (Chronic Kidney Disease Epidemiology Collaboration) equation and data from the 4 clinic visits. Hypertension was defined as systolic blood pressure...
≥140 mm Hg or diastolic blood pressure ≥90 mm Hg at any of the 4 clinic visits, use of antihypertensive medication during the 2 weeks before any of the clinic visits, or self-report in the annual follow-up interview. Hyperlipidemia was defined as total cholesterol ≥240 mg/dL at any of the 4 clinic visits or self-report in the annual follow-up interview. Smoking status was self-reported at each clinic visit and is defined as any history (current and former smokers) or no history (never smokers) for the purposes of this study. Body mass index was calculated as weight in kilograms divided by height squared (in meters) derived at ARIC visit 4 (1996–1998). Obesity was defined as body mass index ≥30.0. History of coronary heart disease, stroke, and heart failure before incident PAD diagnosis was based on self-report at baseline and adjudication of hospitalized events. Self-rated health via self-report questionnaire was defined as poor, fair, good, or excellent, and the lowest rating from any assessment until the time of PAD diagnosis was used. Adequate access to care was defined as any outpatient claim identified within 1 year of the incident PAD diagnosis date.

**Ascertainment of PAD encounters in the claims**

PAD-related outpatient office visits were identified (1) from the physician claims (carrier) files as claims with PAD-related diagnostic and billing codes for new and established office visits and preventive medicine visits and (2) from facility claims (outpatient) files as claims with PAD-related codes for visits to Federally Qualified Healthcare centers. Hospitalizations (eg, inpatient visits and procedures) were identified from the Medicare Provider Analysis and Review records. PAD occurrence was defined using the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* and Healthcare Common Procedure Coding System (HCPCS) adapted from previous PAD-related administrative studies (Table S1).[^15^-^17] Relevant PAD codes in any listed position were counted for inpatient and outpatient visits. Provider specialty codes were used to identify outpatient visits to primary care providers and cardiology visits. All discharge ICD-9-CM codes associated with the incident PAD hospitalizations were grouped into categories of comorbid conditions using definitions provided by the CMS Chronic Conditions Data Warehouse. Claim position was examined because of concerns about potential upcoding, in which a PAD-related code might be added to the end of a claim to increase billing.[^18]

**Cohort construction**

An incident inpatient PAD diagnosis was defined as a hospitalization with a PAD code in any of the 25 diagnosis or procedure positions at any time during the study period. An outpatient PAD diagnosis was defined as ≥2 claims within 12 consecutive months with a PAD-related ICD-9-CM; Current Procedural Terminology, Fourth Edition; HCPCS; or Federally Qualified Healthcare Revenue Center code in any of the 12 diagnosis positions or 6 procedure positions; the claims had to occur ≥1 day apart, and the incident date was defined as the date of the second claim.[^17] If a singular outpatient event preceded an inpatient event within 365 days, the event was classified as an inpatient PAD diagnosis with the incident event date as the inpatient date of discharge. Single PAD-related outpatient events occurring with no PAD-related hospitalizations or PAD-related outpatient events within 365 days were not considered incident PAD events.

A cohort was constructed of ARIC participants enrolled in Medicare as FFS beneficiaries who had an incident inpatient or outpatient PAD diagnosis. PAD cases detected in the first 2 years of enrollment (ie, a 2-year look-back period) were excluded as prevalent cases to minimize misclassification of incident events.[^19] This 2-year look-back method has been shown to reduce misclassification of incidence of chronic diseases to <10%.[^19] In addition, FFS eligibility for at least 2 years after the incident diagnosis was required to allow for adequate follow-up time. Consequently, the analytical study population included ARIC study participants with a PAD diagnosis from 2002 to 2010, with follow-up extending through an administrative censoring date of December 31, 2012.

**Statistical Analyses**

Direct standardization was used to estimate age-standardized rates of inpatient and outpatient encounters with 95% confidence intervals (CIs) following an initial PAD diagnosis. The denominator for rate estimates included cohort participants’ time in continuous FFS enrollment following an initial PAD diagnosis. Estimates were age-standardized to reflect the age, race, and sex distribution of the 2005 Medicare population aged ≥67 years. Age categories for standardization included 67 to 69, 70 to 74, 75 to 79, and ≥80 years at the time of PAD diagnosis. Estimates were calculated by initial-diagnosis setting (inpatient, outpatient) and within-diagnosis setting in strata of race and sex. CIs that did not overlap were determined to represent different estimates, although no formal statistical tests were performed.

Analyses for time to initial hospitalization (for outpatient PAD diagnosis) or rehospitalization (for inpatient PAD diagnosis) accounted for death as a competing risk using the cumulative incidence function.[^20][^21] Estimates were calculated by initial- and within-diagnosis settings stratified by race and sex. The end of follow-up was determined by death, enrollment in Medicare Advantage, or the date of December 31, 2012 (end of the study observation period). Beneficiaries’ death dates were obtained from the Master Beneficiary Summary File. Propensity score models were used to adjust...
for confounding in mortality estimates using standardized mortality ratio weighting\(^2\); estimates for individuals diagnosed with PAD in the inpatient setting were weighted to reflect the distribution of covariates among individuals diagnosed with PAD in the outpatient setting. Covariates included age, sex, race, income, education, diabetes mellitus, smoking history, hyperlipidemia, hypertension, obesity, coronary heart disease, stroke, heart failure, kidney failure, self-rated health, and adequate access to care in the year before diagnosis. The distribution of propensity scores was examined, and nonoverlapping propensity scores were trimmed from mortality analyses (n=21). All analyses were completed using SAS version 9.4 (SAS Institute). Written informed consent was obtained from all participants, and all ARIC field center institutional review boards approved the ARIC study.

### Results

The final analytic sample included 11 652 ARIC participants with 86 228 person-years of FFS enrollment time. The median length of the FFS enrollment period was 6.3 years. We observed 1086 incident diagnoses of PAD during the eligibility period (2002–2010), of which 873 (80.4%) were in the outpatient setting and 213 (19.6%) were in the inpatient setting. Table 1 describes participants’ demographics and comorbid conditions stratified by initial PAD diagnosis setting. Also included in Table 1 are similar data for ARIC participants who did not have a PAD diagnosis during the study observation period (n=10 566).

Participants with a PAD diagnosis were more likely than those without a PAD diagnosis to have hypertension (84% vs 73%), diabetes mellitus (20% vs 14%), smoking history (20% vs 15%), hyperlipidemia (47% vs 31%), obesity (57% vs 47%), end-stage renal disease (17% vs 11%), and self-rated health as poor, fair, good, or excellent (28% vs 22%).

### Table 1. Characteristics of FFS Participants Without an Incident PAD Diagnosis (n=10 566) and Those With an Incident PAD Diagnosis in the Outpatient Setting (n=873) or the Inpatient Setting (n=213): ARIC, 2002–2010

| PAD Status | Age at diagnosis, y, mean, SD | Median household income | Sex, female | Race, black | Diabetes mellitus* | Smoking history\(^a\) | Hyperlipidemia\(^i\) | Hypertension\(^i\) | Obesit\(^i\) | History of CHD\(^i\) | History of stroke\(^i\) | History of heart failure** | End-stage renal disease\(^i\) | Self-rated health, poor\(^\text{††}\) |
|------------|--------------------------------|-------------------------|-------------|-------------|-------------------|---------------------|---------------------|-------------------|--------|---------------------|---------------------|------------------------|-------------------------|-------------------|
| No PAD (n=10 566) | NA | 34.5 (33.6–35.4) | 53.8 (50.4–57.2) | 74.9 (4.9) | 74.4 (4.6) | 27.9 (27.1–28.8) | 27.3 (24.3–30.4) | 26.4 (20.6–32.9) | 20.0 (19.2–20.7) | 66.4 (65.5–67.3) | 70.9 (70.1–71.8) | 52.4 (51.4–53.4) | 39.8 (38.8–40.7) | 11.6 (11.0–12.2) |
| Outpatient Incident PAD (n=873) | 74.9 (4.9) | 53.8 (50.4–57.2) | 74.4 (4.6) | 27.9 (27.1–28.8) | 27.3 (24.3–30.4) | 26.4 (20.6–32.9) | 20.0 (19.2–20.7) | 66.4 (65.5–67.3) | 70.9 (70.1–71.8) | 52.4 (51.4–53.4) | 39.8 (38.8–40.7) | 11.6 (11.0–12.2) | 74.9 (4.9) | 74.4 (4.6) | 27.9 (27.1–28.8) | 27.3 (24.3–30.4) | 26.4 (20.6–32.9) | 20.0 (19.2–20.7) | 66.4 (65.5–67.3) | 70.9 (70.1–71.8) | 52.4 (51.4–53.4) | 39.8 (38.8–40.7) | 11.6 (11.0–12.2) |
| Inpatient Incident PAD (n=213) | 74.4 (4.6) | 53.8 (50.4–57.2) | 74.4 (4.6) | 27.9 (27.1–28.8) | 27.3 (24.3–30.4) | 26.4 (20.6–32.9) | 20.0 (19.2–20.7) | 66.4 (65.5–67.3) | 70.9 (70.1–71.8) | 52.4 (51.4–53.4) | 39.8 (38.8–40.7) | 11.6 (11.0–12.2) | 74.9 (4.9) | 74.4 (4.6) | 27.9 (27.1–28.8) | 27.3 (24.3–30.4) | 26.4 (20.6–32.9) | 20.0 (19.2–20.7) | 66.4 (65.5–67.3) | 70.9 (70.1–71.8) | 52.4 (51.4–53.4) | 39.8 (38.8–40.7) | 11.6 (11.0–12.2) |

Data are shown as percentage (95% confidence interval) except as noted. ARIC indicates Atherosclerosis Risk in Communities; CHD, coronary heart disease; FFS, fee-for-service; NA, not assessed; PAD, peripheral artery disease.

\(^a\)Diabetes mellitus is defined as self-reported history of physician-diagnosed diabetes mellitus at any of the 4 clinic visits, use of diabetes mellitus medication within 2 weeks before a visit, fasting glucose ≥126 mg/dL, or nonfasting blood glucose ≥200 mg/dL.

\(^i\)Smoking history is defined as any history or no history.

\(^\text{††}\)Self-rated health is defined as poor, fair, good, or excellent.

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versus 52%), diabetes mellitus (43% versus 20%), obesity (50% versus 40%), and an income of <$35 000 per year (54% versus 35%; Table S2). Characteristics by race and sex are presented for those diagnosed in the outpatient setting (Table S3) and the inpatient setting (Table S4).

Compared with those with incident PAD diagnosed in the outpatient setting, a larger proportion of study participants with incident PAD diagnosed in the inpatient setting reported a history of major circulatory system disorders, including coronary heart disease (25% versus 15%), stroke (17% versus 9%), and heart failure (36% versus 17%). Those with incident PAD diagnosed in the outpatient setting were more likely to be female (58% versus 47%) and have a history of diabetes mellitus (47% versus 26%) and hypertension (88% versus 70%) compared with those with incident PAD diagnosed in the inpatient setting. There was no difference in participant age at time of diagnosis between diagnosis settings. Although representing a small proportion of all study participants, those with an incident inpatient diagnosis were more likely to undergo an endovascular or surgical procedure (19.8% versus 6.0%). Of the 213 participants with an incident PAD diagnosis, 34 had an endovascular or surgical procedure at the time of diagnosis. Eight participants presented for limb amputation. Of the 873 diagnosed in the outpatient setting, 52 had an endovascular or surgical procedure at the time of diagnosis. No study participants presented for limb amputation in the outpatient setting.

Among the 213 participants diagnosed with PAD in the inpatient setting, 37 (17%) were hospitalized with a primary diagnosis of PAD (Table 2). A PAD-related code was present in the first 3 or 5 positions, respectively, in 71 (33%) and 110 (52%) of the 213 incident hospitalizations. Participants diagnosed with PAD in the inpatient setting frequently had a concomitant code (Table S5) for ischemic heart disease (39%), diabetes mellitus (24%), chronic kidney disease (17%), heart failure (17%), and atrial fibrillation (12%). For 38% (81/213) of the incident PAD hospitalizations, the primary discharge diagnosis was a circulatory system–related condition (including PAD). Respiratory conditions (10%), digestive system diseases (9%), musculoskeletal diseases (7%), and neoplasms (7%) were the most common noncardiovascular disease primary discharge diagnoses.

### Table 2. Primary Diagnoses and Comorbid Conditions for Incident PAD Hospitalizations: ARIC Study, 2002–2010 (n=213)

| Primary Discharge Diagnosis Grouped by ICD-9-CM Chapter | Inpatient Incident PAD |
|--------------------------------------------------------|------------------------|
| Diseases of the circulatory system (390–459)            | 81                     |
| PAD-related code in primary position                    | 37                     |
| Non-circulatory system disorders (001–389, 580–999, V01–V89, E800–E999; procedures 00–99) | 132                     |
| Comorbid conditions and procedures* (ICD-9-CM code[s]) |                        |
| Ischemic heart disease                                  | 83                     |
| Myocardial infarction                                   | 7                      |
| Atrial fibrillation                                     | 26                     |
| Heart failure                                           | 36                     |
| Stroke                                                  | 13                     |
| Chronic kidney disease                                  | 37                     |
| Diabetes mellitus                                       | 51                     |

ARIC indicates Atherosclerosis Risk in Communities; ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; PAD, peripheral artery disease. *ICD-9-CM codes for each condition and procedure are listed in Table S3.

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Cumulative 1-year incidence of first PAD-related and first all-cause hospitalization among those with PAD diagnosed in the outpatient setting was 6.4% (95% CI, 4.8–8.1) and 32.2% (95% CI, 29.0–35.2), respectively (Table 3). Incidence of first PAD-related hospitalization and all-cause hospitalization did not differ by sex or race.

Figure 1. Age-standardized rates of race- and sex-specific peripheral artery disease (PAD)-related outpatient encounters (per person-year) following a PAD diagnosis by diagnosis setting: ARIC (Atherosclerosis Risk in Communities) study, 2002–2012. Estimates are standardized to the 2005 Medicare population. CI indicates confidence interval.

Figure 2. Age-standardized rates of race- and sex-specific outpatient primary care encounters (per person-year) and cardiology encounters following a peripheral artery disease diagnosis by diagnosis setting: ARIC (Atherosclerosis Risk in Communities) study, 2002–2012. Estimates are standardized to the 2005 Medicare population. CI indicates confidence interval.
Overall age-standardized mortality following diagnosis of PAD was 1.02 (95% CI, 0.94–1.10) with an age-standardized rate of 1.02 (95% CI, 0.94–1.10). Median time to first PAD-related visit was significantly lower (465 days) among those with a PAD diagnosis in the first 3 positions on the incident inpatient record. Age-standardized rates of PAD-related outpatient encounters per person-year among black and white patients were 1.52 (95% CI, 1.28–1.74) and 0.90 (95% CI, 0.82–0.99), respectively. The highest rates of non-PAD-related outpatient encounters were for primary care providers (7.43 visits per person-year; 95% CI, 7.21–7.64; Figure 2). The age-standardized rate of non-PAD-related cardiology care was 2.29 (95% CI, 2.17–2.40) encounters per person-year (Figure 2). Outpatient cardiology encounters per person-year were 1.76 (95% CI, 1.53–2.0) among black patients and 2.32 (95% CI, 2.20–2.45) among white patients.

Cumulative incidence of first PAD-related and first all-cause rehospitalization at 1 year among those with PAD diagnosed in the inpatient setting was 14.2% (95% CI, 9.3–18.7) and 43.4% (95% CI, 36.3–49.7), respectively (Table 4). We did not observe significant differences in the rates of the cumulative incidence of all-cause re-hospitalizations by sex or race.

Mortality Following Incident PAD Diagnosis

Overall age-standardized mortality following diagnosis of PAD in any setting was 8.9% (95% CI, 7.2–10.5) at 1 year after diagnosis (Table 5). Propensity score–adjusted mortality at 1 year (Figure 3) was 6.3% (95% CI, 4.8–7.7) and 14.7% (95% CI, 9.9–19.3) among those with incident outpatient and inpatient PAD diagnoses, respectively. Propensity score–

Table 3. Age-Standardized* Cumulative Incidence of First PAD and All-Cause Hospitalizations (95% CI) at 1 Year and 2 Years Following Incident PAD Diagnosis Among Participants Diagnosed in the Outpatient Setting: ARIC Study (2002–2012)

| Outpatient Incident PAD (n=873) | First PAD Hospitalization At 1 y | First PAD Hospitalization At 2 y | First All-Cause Hospitalization At 1 y | First All-Cause Hospitalization At 2 y |
|-------------------------------|--------------------------------|--------------------------------|---------------------------------------|---------------------------------------|
| Overall                       | 6.4 (4.8–8.1)                  | 9.5 (7.6–11.5)                  | 32.2 (29.0–35.2)                      | 48.4 (44.9–51.6)                      |
| Black                         | 7.6 (4.2–10.9)                 | 10.7 (6.7–14.6)                 | 38.3 (31.8–44.2)                      | 52.6 (45.7–58.6)                      |
| White                         | 6.0 (4.1–7.8)                  | 9.1 (6.8–11.3)                  | 29.8 (26.2–33.3)                      | 46.8 (42.7–50.5)                      |
| Male                          | 9.0 (6.0–11.8)                 | 11.8 (8.4–15.0)                 | 35.3 (30.2–40.0)                      | 49.4 (44.0–54.3)                      |
| Female                        | 4.6 (2.7–6.4)                  | 7.9 (5.5–10.2)                  | 29.9 (25.8–33.8)                      | 47.6 (43.0–51.8)                      |

ARI indicates Atherosclerosis Risk in Communities; CI, confidence interval; PAD, peripheral artery disease.

*Standardized to reflect age, race, and sex distribution of the 2005 Medicare population; age strata included 67–69, 70–74, 75–79, and ≥80 y.

Discussion

This study is among the first to examine the frequency of healthcare encounters following a PAD diagnosis and to present findings by setting of the initial PAD diagnosis. We found that in a population of Medicare beneficiaries, most incident PAD was initially diagnosed in the outpatient setting. PAD-related hospitalizations at 1 year were rare among those with an incident outpatient PAD diagnosis. Outpatient encounters with primary care providers, cardiologists, and PAD-related visits were relatively frequent compared with national rates published by the National Ambulatory Medical Care Survey, the only study identified that presented encounter rates in the Medicare population. Few differences for follow-up encounters were observed in stratified analyses, although we did observe that black patients experienced lower rates of follow-up cardiology encounters compared with white patients. Participants with an inpatient incident PAD diagnosis had a poorer short-term prognosis and a higher rate of all-cause rehospitalization than those diagnosed in the outpatient setting.

Characteristics and existing comorbid conditions of ARIC study participants with PAD identify risk factors similar to those noted in other studies of PAD; however, the rich covariate detail available in the ARIC study, from clinic visits, interviews, and self-report questionnaires, provided supplemental data that are often unavailable to health services researchers. In comparison to a recent claims-based study, we identified a higher prevalence of risk factors, such as diabetes mellitus (43% versus 16%) and hypertension (84% versus 54%), among those with PAD. We further confirmed the findings of a German study that identified an inverse association between income and PAD incidence and extended this association to our US-based study.
Socioeconomic disparities in the development of PAD are similar to disparities observed in the development of other cardiovascular diseases and suggest a need for more interventions targeted toward those with low incomes.

Although guidelines concerning appropriate timing of healthcare encounters following an incident PAD diagnosis have not been established, most guideline recommendations for care following a hospitalized cardiovascular event suggest contact with a provider within 6 weeks.27,28 The observed long median time to first PAD-related outpatient visit following an incident diagnosis in the inpatient setting (465 days among those with a PAD code in the first 3 positions) suggests that those with an inpatient PAD diagnosis may constitute a population of individuals not receiving appropriate postacute care.29

Although we observed that study participants with inpatient PAD diagnoses had fewer postdiagnosis PAD-related outpatient encounters, our findings suggest that those with an incident PAD diagnosis in either setting are high users of outpatient healthcare services overall. In comparison to a census-based Medicare-aged general population (including all diagnoses) derived from a National Ambulatory Health Care Survey (NAMCS), participants with a PAD diagnosis identified in the present study had, on average, 2 times the number of postdiagnosis outpatient encounters per person-year (31.6 versus 14.4).23 The ARIC study participants with a PAD diagnosis also experienced more than twice the rate of encounters per person-year with primary care providers than the general population of the NAMCS, possibly because of the coexisting comorbidity burden.

Previous studies have suggested that diagnosis of CVD in the inpatient setting, compared with the outpatient setting, portends worse outcomes.30,31 Results of the current study extend this observation to PAD. We found that mortality, as well as the proportion of patients with hospitalizations, was higher among participants with a PAD diagnosis in the inpatient setting compared with the outpatient setting. Although participants from these 2 settings of diagnosis differ significantly by a variety of comorbid conditions, and their respective risk profiles are likely drive much of the observed mortality gap, findings from our study suggest that identification of PAD in the outpatient setting is favorable with respect to existing comorbidity burden and survival. The mortality gap might be due to the early detection of the disease in the outpatient setting; however, claims data do not include information about disease severity—an important area of potential future research.

Table 4. Age-Standardized* Cumulative Incidence of First PAD and All-Cause Hospitalizations (95% CI) at 1 Year and 2 Years After Incident PAD Diagnosis Among Participants Diagnosed in the Inpatient Setting: ARIC Study (2002–2012)

| Table 5. Mortality at 1 Year and 2 Years After Incident PAD Diagnosis in the Outpatient (n=873) or Inpatient (n=213) Setting: ARIC Study, 2002–2010 |

| 1-y Mortality (95% CI) | 2-y Mortality (95% CI) |
|------------------------|------------------------|
| Age-Standardized Model* | Full Model† | Age-Standardized Model* | Full Model† |
| Overall (n=1086) | 8.9 (7.2–10.5) | 7.8 (6.1–9.2) | 16.6 (14.4–18.7) | 15.1 (13.0–17.2) |
| Incident outpatient (n=873) | 7.1 (5.4–8.7) | 6.3 (4.8–7.7) | 15.3 (12.9–17.6) | 13.7 (11.4–15.9) |
| Incident inpatient (n=213) | 16.0 (11.0–21.1) | 14.7 (9.9–19.3) | 21.5 (15.8–27.2) | 19.9 (14.3–25.5) |
Of note, participants diagnosed with PAD in the inpatient setting in our study had mortality comparable to an analysis that examined death among ARIC participants after incident heart failure hospitalization. PAD, however, remains under-studied, and awareness of it remains poor in comparison to other cardiovascular diseases. Although PAD can be a later stage disease that presents after other cardiac events such as myocardial infarction and stroke, only 25% of all participants diagnosed with PAD in our study had existing atherosclerotic cardiovascular disease. Consequently, many patients present with PAD as their first atherosclerotic cardiovascular disease event, and identifying these patients earlier and better managing progression of their disease could be beneficial in delaying myocardial infarction, stroke, and other major circulatory system disorders.

Strengths and Limitations

While our observations regarding differences in postdiagnosis PAD-related follow-up care by diagnosis setting are meaningful, several factors could influence these findings. First, nearly half of the inpatient incident PAD diagnoses included a PAD code in the 11th position or beyond, implying that PAD was only a distal cause of the hospitalization or that the PAD code represented prevalent disease. Second, the greater prevalence of diabetes mellitus and hypertension—chronic comorbid conditions that may necessitate frequent outpatient follow-up—identified among participants diagnosed with PAD in the outpatient versus the inpatient setting suggests that the 2 groups of study participants with a PAD diagnosis may utilize health care differently. Finally, our assessment of postdiagnosis follow-up care was constrained for the inpatient setting by a relatively high proportion of participants discharged to a nursing home (13%), where follow-up specialty care is unlikely.

Because this analysis was based on inpatient and outpatient provider visits among CMS Medicare enrollees in FFS programs, our estimates are not generalizable to Medicare beneficiaries enrolled in managed care programs, who have been reported to be healthier than those in FFS. Generalizability of this study is further limited because our estimates reflect cohort survivors in a closed cohort. Administrative claims data reflect billing practices, and diagnostic coding found in claims data is not always accurate in relation to documented diagnoses or procedures. Last, our comparison of mortality by setting is limited by challenges in our inability to control for residual confounding because of our use of administrative claims. Although supplementing the administrative data with cohort information should help mitigate confounding bias, we have no information for important clinical factors, such as anatomical disease or symptomatic severity.

An important strength of this study is the inclusion of outpatient as well as inpatient clinical encounters in the assessment of the frequency of encounters following an incident PAD diagnosis. Furthermore, prior studies have provided limited information about the healthcare encounters for individuals with PAD, stratified by the setting of healthcare delivery (inpatient versus outpatient). These estimates are age-standardized, and look-back periods for incidence are in accordance with recent recommendations, providing further strength for this study.

Conclusions

This study addresses an important gap in existing literature by providing accurate estimates of the frequency of care following a PAD diagnosis by the location of the incident diagnosis in the outpatient or inpatient setting. Individuals with PAD are high users of healthcare services and experience high postdiagnosis mortality. Our findings provide a basis for the assessment of healthcare resource spending among PAD patients and a comparison, by demographics and comorbid conditions, of disease trajectories associated with clinically manifest PAD diagnosed in the inpatient or outpatient setting.
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Disclosures
None.

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SUPPLEMENTAL MATERIAL
Table S1. International Classification of Diseases, Ninth Revision (ICD-9-CM), Current Procedural Terminology, 4th edition (CPT-4), Healthcare Common Procedure Coding System (HCPCS), and Federally Qualified Healthcare Revenue Center (FQHC) codes used to identify peripheral artery disease and provider specialty visits in claims.

| Code Type               | Codes                                                                 |
|-------------------------|------------------------------------------------------------------------|
| ICD-9-CM                | 249.70, 249.71, 250.70, 250.71, 250.72, 250.73, 440.20, 440.21, 440.22, 440.23, 440.24, 440.29, 440.30, 440.31, 440.32, 440.4, 440.8, 440.9, 443.1, 443.22, 443.81, 443.89, 443.9, 444.22, 444.81, 445.02 |
|                         | * 38.08, 38.16, 38.18, 38.38, 38.48, 39.25, 39.29, 39.49, 39.50, 39.56, 39.57, 39.58, 39.90, 84.10, 84.12, 84.13, 84.14, 84.15, 84.16, 84.17, 84.18, 84.3, 84.91 |
| HCPCS/CPT-4             | 27295, 27590, 27591, 27592, 27594, 27596, 27598, 27599, 27880, 27881, 27882, 27888, 27889, 28800, 28805, 28810, 28810, 28820, 28825, 35221, 35226, 3526, 35286, 35302, 35303, 35304, 35305, 35306, 35331, 35351, 35355, 35361, 35363, 35371, 35372, 35381, 35452, 35454, 35455, 35456, 35457, 35472, 35473, 35474, 35480, 35481, 35482, 35483, 35485, 35490, 35491, 35492, 35493, 35495, 35500, 35521, 35533, 35537, 35538, 35539, 35540, 35541, 35546, 35548, 35549, 35551, 35556, 35558, 3556, 35565, 35566, 35583, 35585, 35587, 35621, 35623, 35646, 35647, 35651, 35654, 35656, 35661, 35663, 35665, 35666, 35671, 35681, 35682, 35700, 35875, 35876, 35879, 35881, 35883, 35884, 35903 |
|                         | * 35683, 35686, 35571, 72191, 72198, 73706, 73725, 74175, 74185, 75630, 75631, 75635, 75710, 75711, 75712, 75716, 75717, 75718, 93922, 93924, 93925, 93926, 93978, 99201, 99202, 99203, 99204, 99205, 99211, 99212, 99213, 99214, 99215, 99216, 99241, 99242, 99243, 99244, 99245, 99385, 99386, 99387, 99397, 99398, 99399, 99397 |
| Revenue Center Codes    | *0320,0321,0322,0323,0324,0329,0360,0361,0370,0371,0372,0379,0402,0490,0499,0510,0517,0519,0520,0521,0610,0616,0710,0760,0761,0762,0769,0921 |
| Provider Specialty Codes| Primary Care Provider 01, 08, 11, 50, 70 |
* Must be accompanied with a PAD-related ICD-9-CM code
### ICD-9-CM Diagnosis Codes for PAD: Definitions

| Description                                                                 | Code  |
|----------------------------------------------------------------------------|-------|
| Atherosclerosis:                                                            |       |
| of native arteries of the extremities                                      | 440.2x|
| of bypass graft of the extremities                                        | 440.3x|
| of other specified arteries                                                | 440.8x|
| Generalized and unspecified atherosclerosis:                               |       |
| arteriosclerotic vascular disease NOS                                      | 440.9x|
| Peripheral vascular disease, unspecified                                   | 443.9x|
| Chronic total occlusion of artery of the extremities                       | 440.4 |
| Arterial embolism and thrombosis of lower extremity                       | 444.22|
| Embolism and thrombosis of iliac artery                                   | 444.81|
| Atheroembolism of lower extremity                                         | 445.02|
| Diabetes with peripheral circulatory disorders, Type II or unspecified type, not stated as uncontrolled | 250.70|
| Diabetes with peripheral circulatory disorders, Type I (Juvenile type), not stated as uncontrolled | 250.71|
| Diabetes with peripheral circulatory disorders, Type II or unspecified type, uncontrolled | 250.72|
| Diabetes with peripheral circulatory disorders, Type I (Juvenile type), uncontrolled | 250.73|

### ICD-9-CM Surgical/Intervention Procedure Codes for PAD: Definitions

| Description                                                                 | Code  |
|----------------------------------------------------------------------------|-------|
| Amputation of lower limb                                                   | 84.1x |
| Amputation not otherwise specified                                         | 84.91 |
| Aorta-iliac-femoral bypass                                                 | 39.25 |
| Other (peripheral) vascular shunt or bypass                               |       |
| Incision of lower limb arteries                                            |       |
| Description | Code |
|-------------|------|
| Repair blood vessel lower extremity; direct | 35226 |
| with vein graft | 35256 |
| with graft other than vein | 35286 |
| Thromboendarterectomy, including patch graft, if performed; superficial femoral artery | 35302 |
| popliteal artery | 35303 |
| tibioperoneal trunk artery | 35304 |
| tibial or peroneal artery, initial vessel | 35305 |
| each additional tibial or peroneal artery | 35306 |
| Thromboendarterectomy, with or without patch graft; abdominal aorta (35331); iliac (35351); iliofemoral (35355); combined aortoiliac (35361); combined aortoiliofemoral (35363); common femoral (35371); deep (profunda) femoral (35372); femoral and/or popliteal, and/or tibioperoneal (35381) | 35331 35351 35355 |
| Three-way Code | Long Description |
|----------------|----------------|
| 35361          | In-situ vein bypass; |
|                | aortofemoral-popliteal (only femoral-popliteal portion in-situ) |
|                | femoral-popliteal |
|                | femoral-anterior tibial, posterior tibial, or peroneal artery |
|                | popliteal-tibial, peroneal |
| 35363          | Bypass graft, with vein; |
|                | axillary-femoral |
|                | axillary-femoral-femoral |
|                | aortoiliac |
|                | aortobi-iliac |
|                | aortofemoral |
|                | aortobifemoral |
|                | aortoiliac or bi-iliac |
|                | aortofemoral or bifemoral |
|                | aortoiliofemoral, unilateral |
|                | aortoiliofemoral, bilateral |
|                | aortofemoral-popliteal |
|                | femoral-popliteal |
|                | femoral-femoral |
|                | ilioiliac |
|                | iliofemoral |
|                | femoral-anterior tibial, posterior tibial, peroneal artery or other distal vessels |
|                | popliteal-tibial,-peroneal artery or other distal vessels |
| Procedure                                                                 | Code  |
|--------------------------------------------------------------------------|-------|
| Percutaneous:                                                            |       |
| aortic                                                                   |       |
| iliac                                                                    |       |
| femoral-popliteal                                                        |       |
| tibioperoneal trunk and branches                                          |       |
| Transluminal peripheral atherectomy, Open:                               |       |
| aortic                                                                   |       |
| iliac                                                                    |       |
| femoral-popliteal                                                        |       |
| tibioperoneal trunk and branches                                          |       |
| Transluminal balloon angioplasty, percutaneous;                          |       |
| tibioperoneal trunk and branches, each vessel                            |       |
| aortic                                                                   |       |
| iliac                                                                    |       |
| femoral-popliteal                                                        |       |
| Bypass graft, with other than vein;                                      |       |
| axillary-femoral                                                          |       |
| axillary-popliteal or –tibial                                             |       |
| aortoiliac                                                               |       |
| Procedure                                                                 | Code  |
|---------------------------------------------------------------------------|-------|
| aortobi-iliac                                                             | 35623 |
| aortoiliac or bi-iliac                                                    | 35637 |
| aortofemoral or bifemoral                                                 | 35638 |
| aortofemoral                                                              | 35641 |
| aortofemoral-popliteal                                                    | 35646 |
| axillary-femoral-femoral                                                  | 35647 |
| femoral-popliteal                                                         | 35651 |
| femoral-femoral                                                           | 35654 |
| ilioiliac                                                                 | 35656 |
| iliofemoral                                                               | 35661 |
| femoral-anterior tibial, posterior tibial, or peroneal artery              | 35663 |
| popliteal-tibial or -peroneal artery                                      | 35665 |
| femoral-popliteal                                                        | 35666 |
| femoral-femoral-popliteal                                                | 35667 |
| Exploration, reoperation, femoral-popliteal or femoral (popliteal) -anterio tibial, posterior tibial, peroneal artery or other distal vessels, more than one month after original operation (List separately in addition to code for primary procedure) | 35700 |
| Exploration (not followed by surgical repair), with or without lysis of artery; | 35721 |
| femoral artery                                                            | 35741 |
| popliteal artery                                                          |       |
| Thrombectomy of arterial or venous graft, with revision of arterial or venous graft | 35876 |
| Revision, lower extremity arterial bypass, without thrombectomy, open;    | 35879 |
| with vein patch angioplasty                                               |       |
| with segmental vein interposition                                         | 35881 |
| Revision, femoral anastomosis of synthetic arterial bypass graft in groin, open; |       |
| Procedure Description                                                                 | Code  |
|--------------------------------------------------------------------------------------|-------|
| with non autogenous patch graft (e.g., Dacron, ePTFE, bovine pericardium)            | 35883 |
| with autogenous vein patch graft                                                    | 35884 |
| Primary percutaneous transluminal mechanical thrombectomy, noncoronary, arterial     |       |
| or arterial bypass graft, including fluoroscopic guidance and intra procedural        |       |
| pharmacological thrombolytic injection(s);                                          |       |
| initial vessel                                                                       |       |
| second and all subsequent vessel(s) within the same vascular family (List separately| 37184 |
| in addition to code for primary mechanical thrombectomy procedure)                  |       |
|                                                                                      | 37185 |
| Secondary percutaneous transluminal thrombectomy (e.g., non primary mechanical,      |       |
| snare basket, suction technique), noncoronary, arterial or arterial bypass graft,    |       |
| including fluoroscopic guidance and intra procedural pharmacological thrombolytic    |       |
| injections, provided in conjunction with another percutaneous intervention other than|       |
| primary mechanical thrombectomy (List separately in addition to code for primary     |       |
| procedure)                                                                            | 37186 |
|                                                                                      |       |
| Transcatheter placement of an intravascular stent(s), (except coronary, carotid, and|       |
| vertebral vessel), percutaneous;                                                    |       |
| initial vessel (37205)                                                              | 37205 |
| each additional vessel (List separately in addition to code for primary procedure)  | 37206 |
|                                                                                      |       |
| Transcatheter placement of an intravascular stent(s), (except coronary, carotid, and|       |
| vertebral vessel), open;                                                            |       |
| each additional vessel (List separately in addition to code for primary procedure)  | 37208 |
|                                                                                      |       |
| Disarticulation;                                                                    |       |
| of hip                                                                               | 27295 |
| at knee                                                                              | 27598 |
| of ankle                                                                            | 27889 |
| Amputation, thigh, through femur, any level                                         | 27590 |
immediate fitting technique including first cast
open, circular (guillotine) 27591
leg, through tibia and fibula 27592
with immediate fitting technique including application of first cast 27880
open, circular (guillotine) 27881
ankle, through malleoli of tibia and fibula (e.g., Syme, Pirogoff type procedures), with 27882
plastic closure and resection of nerves
foot; midtarsal (e.g., Chopart type procedure) 27888
transmetatarsal 28800

| Description                                                                 | Code  |
|----------------------------------------------------------------------------|-------|
| Aortography:                                                               |       |
| abdominal plus bilateral iliofemoral lower extremity, catheter, by serialography, radiological complete procedure | 75630 |
|                                                                             | 75631 |
| Angiography, extremity, unilateral, radiological supervision and interpretation | 75710 |
| complete procedure                                                         |       |
|                                                                             | 75711 |
| bilateral; by serialography, complete procedure                            | 75712 |
| radiological                                                               |       |
|                                                                             | 75716 |
| without serialography; complete procedure                                  | 75717 |
| by serialography, complete procedure                                       |       |
|                                                                             | 75718 |
| Arterial duplex of the lower extremities,                                   |       |
| unilateral                                                                  | 93925 |
| bilateral                                                                  | 93926 |
### CT Angiogram Abdomen with & w/o contrast
- Pelvis: 74175
- Lower Extremity: 73706
- Abdominal aorta and bilateral iliofemoral lower extremity runoff: 75635

### MRA abdomen images from the diaphragm to the umbilicus or iliac crest
- Pelvis: 74185

### Lower extremity w/ or w/o contrast
- 73725

### Non-invasive physiologic studies of lower extremity arteries, single level, bilateral
- At rest and following treadmill stress testing, complete bilateral study: 93922, 93924

### Other PAD-related codes: Definitions

| Description                                                                 | Code   |
|----------------------------------------------------------------------------|--------|
| Chronic total occlusion of artery of the extremities                      | 440.4  |
| Arterial embolism and thrombosis of lower extremity                       | 444.22 |
| Embolism and thrombosis of iliac artery                                   | 444.81 |
| Atheroembolism of lower extremity                                         | 445.02 |
| Diabetes with peripheral circulatory disorders, Type II or unspecified type, not stated as uncontrolled | 250.70 |
| Diabetes with peripheral circulatory disorders, Type I (Juvenile type), not stated as uncontrolled | 250.71 |
| Diabetes with peripheral circulatory disorders, Type II or unspecified type, uncontrolled | 250.72 |
| Diabetes with peripheral circulatory disorders, Type I (Juvenile type), uncontrolled | 250.73 |
| Endarterectomy, abdominal arteries                                         | 38.16  |
Table S2. Characteristics of fee-for-service participants without an incident PAD diagnosis (N=10,566) and those with an incident PAD diagnosis in the outpatient (N=873) or inpatient setting (N=213). The Atherosclerosis Risk in Communities Study, 2002-2010.

| PAD status          | No PAD       | Positive PAD |
|---------------------|--------------|--------------|
| (N=10,566)          | (N=1086)     |              |
| Mean Age at Diagnosis, SD | NA          | 74.8 (4.8)   |
| Sex, % Female       | 57.4 (56.4, 58.3) | 55.5 (52.5, 58.5) |
| Race, % Black       | 27.9 (27.1, 28.8) | 27.1 (24.4, 29.7) |
| Median household income, % | | |
| Low (<$35,000)      | 34.5 (33.6, 35.4) | 54.1 (50.5, 57.0) |
| Mid ($35,000-$49,999) | 19.4 (18.7, 20.2) | 18.9 (16.3, 21.6) |
| High (≥ $50,000)    | 46.1 (45.2, 47.1) | 27.1 (24.4, 29.7) |
| Education, < High School, % | 22.2 (21.4, 23.0) | 28.2 (25.4, 31.1) |
| Diabetes*, %        | 20.0 (19.2, 20.7) | 43.0 (39.6, 46.4) |
| Smoking History†, % | 66.4 (65.5, 67.3) | 68.6 (65.8, 71.4) |
| Hyperlipidemia‡, %  | 70.9 (70.1, 71.8) | 75.3 (72.8, 77.9) |
| Hypertension§, %    | 52.4 (51.4, 53.4) | 84.1 (81.8, 86.3) |
| Obesity#, %         | 39.8 (38.8, 40.7) | 50.1 (47.1, 53.1) |
| History of CHD**, % | 11.6 (11.0, 12.2) | 17.2 (14.7, 19.5) |
| History of Stroke††, % | 8.3 (7.8, 8.9) | 11.0 (9.0, 12.9) |
| History of Heart Failure††, % | 16.2 (15.5, 16.9) | 21.0 (18.5, 23.6) |
| End Stage Renal Disease§§ | 0.7 (0.5, 0.9) | 0.4 (0.2, 0.7) |
| Self-Rated Health, Poor## | 27.0 (26.1, 27.8) | 28.7 (25.7, 31.6) |

*Diabetes defined as self-reported history of physician-diagnosed diabetes at any of the four clinic visits or diabetes medication during two weeks prior to visit or fasting glucose ≥ 126 mg/dl fasting or a nonfasting blood glucose ≥ 200 mg/dl; † Smoking History is defined as any history or no history; ‡ Hyperlipidemia defined as total cholesterol ≥ 240 mg/dl; § Hypertension defined as
systolic blood pressure \( \geq 140 \) mm Hg or diastolic blood pressure \( \geq 90 \) mm Hg or antihypertensive medication usage during two weeks prior to any of the four clinic visits; 

# Obesity defined as body mass index \( \geq 30 \) kg/m\(^2\); 

** History of CHD (coronary heart disease) defined as history of myocardial infarction, coronary revascularization during any time during follow-up but prior to incident PAD diagnosis date; 

†† History of stroke defined as prevalent or incident stroke prior to incident PAD diagnosis date; 

‡‡ History of Heart Failure defined as prevalent or incident heart failure prior to incident PAD diagnosis date; 

§§ End-stage renal disease defined as eGFR <15.0 mL/min/m\(^2\) using the CKD-EPI equation; 

## Self-rated health defined as poor, fair, good, excellent
Table S3. Characteristics of fee-for-service participants with an incident PAD diagnosis in the outpatient (N=873) by sex and race. The Atherosclerosis Risk in Communities Study, 2002-2010.

|                  | Incident Outpatient PAD |
|------------------|-------------------------|
|                  | Females | Males | Black | White |
| Median household income, % |         |       |       |       |
| Low (<$35,000)   | 62.2    | 42.2  | 81.4  | 43.4  |
| Mid ($35,000-$49,999) | 18.3    | 20.4  | 8.9   | 23.1  |
| High (≥ $50,000) | 19.5    | 37.3  | 9.7   | 33.5  |
| Education, < High School, % | 30.6    | 24.9  | 45.8  | 21.6  |
| Mean age at diagnosis, SD     | 74.9 (4.9) | 75.1 (4.9) | 73.5 (4.8) | 75.5 (4.8) |
Table S4. Characteristics of fee-for-service participants with an incident PAD diagnosis in the inpatient (N=213) by sex and race. The Atherosclerosis Risk in Communities Study, 2002-2010.

| Characteristics                      | Females | Males | Black | White |
|--------------------------------------|---------|-------|-------|-------|
| Median household income, %           |         |       |       |       |
| Low (<$35,000)                       | 69.7    | 42.5  | 80.4  | 45.8  |
| Mid ($35,000-$49,999)                | 12.1    | 22.1  | 10.7  | 20.0  |
| High (≥ $50,000)                     | 18.2    | 35.4  | 8.9   | 34.2  |
| Education, < High School, %          | 28.3    | 28.3  | 43.6  | 23.1  |
| Mean age at diagnosis, SD            | 74.4 (4.7) | 74.4 (4.5) | 73.9 (4.6) | 74.6 (4.6) |
Table S5. International Classification of Diseases, Ninth Revision (ICD-9-CM to identify concomitant diseases.

| Disease                  | Codes                                                                 |
|--------------------------|------------------------------------------------------------------------|
| Ischemic heart disease   | 410.00, 410.01, 410.02, 410.10, 410.11, 410.12, 410.20, 410.21, 410.22, 410.30, 410.31, 410.32, 410.40, 410.41, 410.42, 410.50, 410.51, 410.52, 410.60, 410.61, 410.62, 410.70, 410.71, 410.72, 410.80, 410.81, 410.82, 410.90, 410.91, 410.92, 411.0, 411.1, 411.81, 411.89, 412.0, 413.0, 413.1, 413.9, 414.00, 414.01, 414.02, 414.03, 414.04, 414.05, 414.06, 414.07, 414.12, 414.2, 414.3, 414.4, 414.8, 414.9 |
| Myocardial infarction    | 410, 410.0, 410.00, 410.01, 410.11, 410.31, 410.41, 410.51, 410.61, 410.71, 410.81, 410.91 |
| Atrial fibrillation      | 427.31, 427.32                                                        |
| Heart failure            | 398.91, 402.01, 402.11, 402.91, 404.01, 404.11, 404.91, 404.13, 404.93, 428, 428.0, 428.1, 428.20, 428.21, 428.22, 428.23, 428.30, 428.31, 428.32, 428.33, 428.40, 428.41, 428.42, 428.43, 428.9 |
| Stroke                   | 430, 431, 433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.00, 434.01, 434.10, 434.11, 434.90, 434.91, 435.0, 435.1, 435.3, 435.8, 435.9, 436, 997.02 |
| Chronic kidney disease   | 016.00, 016.01, 016.03, 016.04, 016.05, 016.06, 095.4, 189.0, 189.9, 223.0, 236.91, 249.40, 249.41, 250.40, 250.41, 250.42, 250.43, 271.4, 274.10, 283.11, 403.01, 403.11, 403.91, 404.02, 404.03, 404.12, 404.13, 404.92, 404.93, 440.1, 442.1, 572.4, 580.0, 580.4, 580.81, 580.89, 580.9, 581.0, 581.1, 581.2, 581.3, 581.81, 581.89, 581.9, 582.0, 582.1, 582.2, 582.4, 582.81, 582.89, 582.9, 583.0, 583.1, 583.2, 583.4, 583.6, 583.7, 583.81, 583.89, 583.9, 584.5, 584.6, 584.7, 584.8, 584.9, 585, 585.1, 585.2, 585.3, 585.4, 585.5, 585.6, 585.9, 586, 587, 588.0, 588.1, 588.81, 588.89, 588.9, 591, 753.12, 753.14, 753.15, 753.16, 753.17, 753.19, 753.20, 753.21, 753.22, 753.23, 753.29, 794.4 |
| Diabetes mellitus        | 249.00, 249.01, 249.10, 249.11, 249.20, 249.21, 249.30, 249.31, 249.40, 249.41, 249.50, 249.51, 249.60, 249.61, 249.70, 249.71, 249.80, 249.81, 249.90, 249.91, 250.00, 250.01, 250.02, 250.03, 250.10, 250.11, 250.12, 250.13, 250.20, 250.21, 250.22, 250.23, 250.30, 250.31, 250.32, 250.33, 250.40, 250.41, 250.42, 250.43, 250.50, 250.51, 250.52, 250.53, 250.60, 250.61, 250.62, 250.63, 250.70, 250.71, 250.72, 250.73, 250.80, 250.81, 250.82, 250.83, 250.90, 250.91, 250.92, 250.93, 357.2, 362.01, 362.02, 362.03, 362.04, 362.05, 362.06, 366.41 |