Supplemental Methods - ICD-9 and CPT-4 Procedure Codes Utilized

ICD-9:

00.55, 05.23, 38.08, 38.18, 38.38, 38.48, 38.68, 38.88, 39.25/1-39.25/9, 39.29/2-39.29/6, 39.29/9, 39.31, 39.49/1-39.49/9, 39.50/2-39.50/5, 39.56-39.58, 39.59/9, 39.79, 39.90, 84.10-84.19, 99.10.

CPT-4:

27290, 27295, 27590-27592, 27598, 27880-27882, 27888, 27889, 28124, 28150, 28153, 28800, 28805, 28810, 28820, 28825, 34201, 34203, 35221, 35226, 35251, 35256, 35281, 35286, 35302-35306, 35331, 35351, 35355, 35361, 35363, 35371, 35372, 35381, 35452, 35454, 35456, 35459, 35470, 35472-35474, 35481-35483, 35485, 35491-35493, 35495, 35521, 35533, 35537-35541, 35546, 35548, 35549, 35551, 35556, 35558, 35563, 35565, 35566, 35570, 35571, 35582, 35583, 35585, 35587, 35621, 35623, 35637, 35638, 35641, 35646, 35647, 35651, 35654, 35656, 35661, 35663, 35665, 35666, 35671, 35681-35683, 35685, 35686, 35700, 35721, 35741, 35761, 35875, 35876, 35879, 35881, 35883, 35884, 37220-37235, 37184-37186, 37201, 37205-37209, 64809, 64818, 75896, 75897, 75900, 75960, 75962-75965, 75992, 75993.

Supplemental Methods – Chart Abstraction Variables and Procedure Classification

All chart abstraction beyond the initial ICD-9/CPT-4 search was via manual chart review. Demographic data collected included date of birth, last date of follow-up, vital status, and gender. Clinical data included indication for each procedure (highest Fontaine stage – asymptomatic, claudication, rest pain or tissue loss) and medical history at the time of the first procedure. Medical history included height, weight, smoking status, serum creatinine level, hematocrit level (≤30% vs >30%), prior coronary artery intervention, prior kidney transplant and the presence or absence of a prior diagnosis of hypertension, dyslipidemia, chronic obstructive pulmonary disease (COPD), coronary artery disease, diabetes mellitus, congestive heart failure, stroke/transient ischemic attack (TIA)/amaurosis and end-stage renal disease. These diagnoses were based on medical record documentation by providers managing the patient at the time of the first procedure. Smoking status was classified as never, former (quit over one year ago) or current. Rationale for major amputation as opposed to revascularization was obtained via chart review from notes by involved providers prior to major amputation.

Procedure characteristics were collected and classified similar to Hallett et al [1], with the exception that ankle-sparing amputations (eg, transmetatarsal) were considered minor amputations in the current study. Lumbar sympathectomy was included in our analysis to maintain continuity with the prior study by Hallett et al, though only 9 sympathectomy procedures were performed during our study period and none since 1997. Amputation revisions at the same level were excluded. Endovascular revascularizations (ENDO) consisted only of angioplasty in Hallett's study. In the current study, ENDO were classified first based on whether catheter-directed thrombolysis was performed, followed by

stenting, balloon angioplasty and finally "other" (cryoplasty, orbital atherectomy, laser atherectomy). Thrombolysis procedures spanning multiple days/sessions were counted as one procedure. Hybrid revascularizations (HYBRID) consisted of any combination of ENDO and open surgical revascularization (OPEN) techniques used on the same limb either during the same procedure or in a deliberately staged manner. OPEN procedures were classified based on whether a bypass was performed and, if not, as "other" (endarterectomy, patch angioplasty, Fogarty thrombectomy, valve lysis, sympathectomy).

Procedures involving more than one type of either ENDO or OPEN revascularization (eg, thrombolysis and angioplasty, endarterectomy and bypass) were considered "multimodal". Level of revascularization for OPEN was classified as in Hallett et al (suprainguinal, infrainguinal but suprageniculate and infrageniculate). ENDO were classified similarly (eg, iliac angioplasty/stenting as suprainguinal, posterior tibial angioplasty as infrageniculate) with the knee joint used to distinguish supra from infrageniculate. "Multilevel" procedures characterized revascularizations that involved more than one level of revascularization with classification based on the more dominant mode of revascularization if applicable (eg, aortobifemoral bypass with profundaplasty as suprainguinal and multilevel, iliac stenting and superficial femoral artery angioplasty as suprainguinal and multilevel). If only one mode of revascularization was performed at multiple levels, the revascularization was classified based on the most distal level (eg, angioplasty of the superficial femoral artery and the anterior tibial artery as infrageniculate and multilevel). HYBRID level of revascularization was determined by the most distal level of any ENDO or OPEN portion of the procedure.

Supplemental Table 1. Types of Procedures Excluded From the Cohort

Reason for Exclusion	Non-Amputation (n=1,812)	Major Amputation (n=54)	Minor Amputation (n=200)	Total (n=2,066)
Dialysis access	310	1	0	311 (15.1%)
Non-Olmsted County residency	211	1	0	212 (10.3%)
Trauma/burn	142	13	31	186 (9.0%)
Cardiothoracic surgery	155	1	0	156 (7.6%)
Renal	143	0	0	143 (6.9%)
Iatrogenic	95	2	0	97 (4.7%)
Abdominal aortic aneurysm	90	0	4	94 (4.5%)
Soft tissue (non-diabetic)	93	0	0	93 (4.5%)
Venous disease/intravenous thrombolytics	91	0	0	91 (4.4%)
Mesenteric/visceral	79	0	0	79 (3.8%)
Embolism (unrelated to atherosclerotic PAD)	61	4	0	65 (3.1%)
Diabetes (no PAD)	0	4	58	62 (3.0%)
Intra/extracranial cerebrovascular	55	0	0	55 (2.7%)
Benign toe problems (eg, bunion, syndactyly, hammertoe)	0	0	51	51 (2.5%)
Popliteal/femoral/tibial aneurysm	42	0	2	44 (2.1%)
Other orthopedic (eg, infected joint prosthesis)	0	12	5	17 (0.8%)
Cancer	2	8	6	16 (0.8%)

Supplemental Table 1. (Continued)

Reason for Exclusion	Non-Amputation (n=1,812)	Major Amputation (n=54)	Minor Amputation (n=200)	Total (n=2,066)
Radiation arteritis	14	0	0	14 (0.7%)
Nondiabetic microvascular (eg, vasculitis)	0	2	11	13 (0.6%)
Others (eg, vasopressor-related gangrene, Klippel-Trenaunay syndrome)	229	6	32	267 (12.9%)

PAD = peripheral arterial disease.

Supplemental Table 2. Analysis of Demographic Trends by Type of First Limb-Procedure

Characteristics	1990-1994	1995-1999	2000-2004	2005-2009	Trend *P*[a]
OPEN revascularization	**n=81**	**n=90**	**n=71**	**n=46**	
Age, mean (SD), years	69.1 (12.8)	68.7 (12.6)	65.3 (13.3)	67.3 (11.8)	.28
Male gender, no. (%)[b]	46 (56.8)	54 (60.0)	42 (59.2)	29 (63.0)	.48
Non-Caucasian race/ethnicity, no. (%)[b]	0 (0.0)	1 (1.1)	3 (4.2)	1 (2.2)	.12
Height, mean (SD), cm	167.1 (9.6)	167.1 (9.8)	169.5 (9.6)	169.2 (9.9)	.048
Weight, mean (SD), kg	72.7 (15.1)	75.7 (20.6)	77.4 (17.4)	79.9 (18.5)	.008
BMI, mean (SD), kg/m^2	25.9 (4.4)	26.9 (6.2)	26.9 (5.4)	27.7 (5.0)	.054
Smoking, no. (%)[b]					.69
Never	10 (12.3)	16 (17.8)	11 (15.5)	3 (6.5)	
Former	32 (39.5)	36 (40.0)	28 (39.4)	23 (50.0)	
Current	39 (48.1)	38 (42.2)	32 (45.1)	20 (43.5)	
Creatinine, mean (SD), mg/dL[c]	1.3 (1.0)	1.4 (0.8)	1.3 (0.9)	1.4 (1.2)	.47
Hematocrit $\leq$30%, no. (%)[b]	5 (6.2)	8 (8.9)	4 (5.6)	3 (6.5)	.82
Prevent III score, mean (SD)	2.4 (2.3)	2.7 (2.2)	2.3 (2.1)	2.5 (2.1)	.97
Prior coronary intervention, no. (%)[b]	10 (12.3)	21 (23.3)	18 (25.4)	10 (21.7)	.06
Functioning kidney transplant, no. (%)[b]	1 (1.2)	2 (2.2)	1 (1.4)	1 (2.2)	.79
Comorbidities, no. (%)[b]					
Dyslipidemia	32 (39.5)	42 (46.7)	49 (69.0)	37 (80.4)	<.001
Hypertension	51 (63.0)	70 (77.8)	57 (80.3)	39 (84.8)	.001

Supplemental Table 2. (Continued)

Characteristics	1990-1994	1995-1999	2000-2004	2005-2009	Trend *P*[a]
Diabetes mellitus	28 (34.6)	32 (35.6)	19 (26.8)	15 (32.6)	.88
Coronary artery disease	31 (38.3)	43 (47.8)	33 (46.5)	24 (52.2)	.07
Congestive heart failure	9 (11.1)	13 (14.4)	5 (7.0)	6 (13.0)	.84
Stroke/TIA/amaurosis	23 (28.4)	23 (25.6)	11 (15.5)	11 (23.9)	.25
COPD	18 (22.2)	26 (28.9)	16 (22.5)	10 (21.7)	.55
End-stage renal disease	3 (3.7)	2 (2.2)	2 (2.8)	2 (4.3)	.73
ENDO/HYBRID revascularization	**n=37**	**n=53**	**n=80**	**n=139**	
Age, mean (SD), years	67.5 (13.2)	69.3 (12.4)	68.7 (12.4)	67.4 (12.1)	.48
Male gender, no. (%)[b]	25 (67.6)	26 (49.1)	41 (51.3)	84 (60.4)	.71
Non-Caucasian race/ethnicity, no. (%)[b]	1 (2.7)	3 (5.7)	3 (3.8)	7 (5.0)	.42
Height, mean (SD), cm	167.0 (8.2)	165.1 (7.9)	167.9 (10.8)	169.2 (10.2)	.02
Weight, mean (SD), kg	78.6 (20.7)	74.1 (18.0)	77.2 (19.6)	81.7 (20.5)	.06
BMI, mean (SD), kg/m^2	28.0 (6.4)	27.1 (5.9)	27.2 (5.5)	28.3 (5.7)	.34
Smoking, no. (%)[b]					.12
Never	8 (21.6)	8 (15.1)	14 (17.5)	18 (12.9)	
Former	20 (54.1)	22 (41.5)	35 (43.8)	66 (47.5)	
Current	9 (24.3)	23 (43.4)	31 (38.8)	55 (39.6)	
Creatinine, mean (SD), mg/dL[c]	1.2 (0.3)	1.7 (2.1)	1.3 (0.9)	1.3 (1.2)	.36
Hematocrit ≤30%, no. (%)[b]	2 (5.4)	3 (5.7)	5 (6.3)	9 (6.5)	.72

Supplemental Table 2. (Continued)

Characteristics	1990-1994	1995-1999	2000-2004	2005-2009	Trend *P*[a]
Prevent III score, mean (SD)	2.3 (2.1)	2.5 (2.1)	2.4 (2.4)	2.1 (2.1)	.49
Prior coronary intervention, no. (%)[b]	9 (24.3)	11 (20.8)	25 (31.3)	47 (33.8)	.04
Functioning kidney transplant, no. (%)[b]	1 (2.7)	0 (0.0)	3 (3.8)	2 (1.4)	.99
Comorbidities, no. (%)[b]					
Dyslipidemia	13 (35.1)	27 (50.9)	52 (65.0)	109 (78.4)	<.001
Hypertension	28 (75.7)	35 (66.0)	64 (80.0)	121 (87.1)	.009
Diabetes mellitus	17 (45.9)	25 (47.2)	26 (32.5)	51 (36.7)	.26
Coronary artery disease	16 (43.2)	23 (43.4)	38 (47.5)	69 (49.6)	.26
Congestive heart failure	6 (16.2)	9 (17.0)	11 (13.8)	18 (12.9)	.45
Stroke/TIA/amaurosis	8 (21.6)	11 (20.8)	18 (22.5)	23 (16.5)	.33
COPD	6 (16.2)	10 (18.9)	16 (20.0)	29 (20.9)	.72
End-stage renal disease	0 (0.0)	3 (5.7)	1 (1.3)	6 (4.3)	.43
Major amputation	**n=25**	**n=26**	**n=15**	**n=8**	
Age, mean (SD), years	76.2 (11.1)	75.8 (10.6)	70.1 (19.7)	77.8 (8.6)	.76
Male gender, no. (%)[b]	13 (52.0)	18 (69.2)	7 (46.7)	4 (50.0)	.76
Non-Caucasian race/ethnicity, no. (%)[b]	0 (0.0)	0 (0.0)	0 (0.0)	1 (12.5)	.20
Height, mean (SD), cm	168.0 (11.3)	166.9 (11.8)	169.0 (9.6)	168.8 (12.1)	.83
Weight, mean (SD), kg	68.8 (22.7)	71.7 (20.3)	71.9 (15.7)	72.5 (15.6)	.62
BMI, mean (SD), kg/m^2	24.1 (6.1)	25.6 (5.9)	25.4 (6.0)	25.6 (6.2)	.49

Supplemental Table 2. (Continued)

Characteristics	1990-1994	1995-1999	2000-2004	2005-2009	Trend *P*[a]
Smoking, no. (%)[b]					.09
Never	8 (32.0)	8 (30.8)	7 (46.7)	5 (62.5)	
Former	11 (44.0)	12 (46.2)	7 (46.7)	2 (25.0)	
Current	6 (24.0)	6 (23.1)	1 (6.7)	1 (12.5)	
Creatinine, mean (SD), mg/dL[c]	1.5 (1.0)	1.8 (1.3)	1.6 (0.7)	0.8 (0.3)	.14
Hematocrit ≤30%, no. (%)[b]	8 (32.0)	8 (30.8)	3 (20.0)	3 (37.5)	.65
Prevent III score, mean (SD)	5.2 (1.5)	5.5 (1.6)	6.3 (1.9)	5.5 (1.9)	.19
Prior coronary intervention, no. (%)[b]	4 (16.0)	6 (23.1)	3 (20.0)	2 (25.0)	.70
Functioning kidney transplant, no. (%)[b]	0 (0.0)	0 (0.0)	4 (26.7)	0 (0.0)	.052
Comorbidities, no. (%)[b]					
Dyslipidemia	6 (24.0)	7 (26.9)	10 (66.7)	7 (87.5)	<.001
Hypertension	14 (56.0)	20 (76.9)	12 (80.0)	5 (62.5)	.36
Diabetes mellitus	11 (44.0)	18 (69.2)	9 (60.0)	3 (37.5)	.81
Coronary artery disease	16 (64.0)	16 (61.5)	9 (60.0)	2 (25.0)	.08
Congestive heart failure	10 (40.0)	14 (53.8)	4 (26.7)	3 (37.5)	.78
Stroke/TIA/amaurosis	10 (40.0)	13 (50.0)	8 (53.3)	3 (37.5)	.90
COPD	6 (24.0)	8 (30.8)	3 (20.0)	2 (25.0)	.68
End-stage renal disease	1 (4.0)	3 (11.5)	2 (13.3)	0 (0.0)	.97
Minor amputation	**n=36**	**n=28**	**n=32**	**n=21**	

Supplemental Table 2. (Continued)

Characteristics	1990-1994	1995-1999	2000-2004	2005-2009	Trend *P*[a]
Age, mean (SD), years	70.6 (13.8)	66.8 (16.2)	67.7 (14.8)	68.0 (15.0)	.64
Male gender, no. (%)[b]	20 (55.6)	20 (71.4)	22 (68.8)	13 (61.9)	.77
Non-Caucasian race/ethnicity, no. (%)[b]	1 (2.8)	1 (3.6)	2 (6.3)	3 (14.3)	.09
Height, mean (SD), cm	166.0 (9.9)	170.7 (10.9)	171.6 (13.0)	172.8 (10.1)	.03
Weight, mean (SD), kg	77.8 (20.6)	75.9 (17.3)	82.1 (25.5)	93.0 (30.8)	.006
BMI, mean (SD), kg/m^2	28.1 (6.6)	26.0 (4.7)	27.5 (7.3)	31.1 (10.2)	.051
Smoking, no. (%)[b]					.002
Never	18 (50.0)	13 (46.4)	9 (28.1)	5 (23.8)	
Former	14 (38.9)	12 (42.9)	14 (43.8)	9 (42.9)	
Current	4 (11.1)	3 (10.7)	9 (28.1)	7 (33.3)	
Creatinine, mean (SD), mg/dL[c]	1.3 (0.5)	2.0 (1.3)	2.1 (1.9)	1.7 (1.8)	.23
Hematocrit $\leq$30%, no. (%)[b]	5 (13.9)	10 (35.7)	5 (15.6)	7 (33.3)	.36
Prevent III score, mean (SD)	4.8 (1.5)	5.1 (1.9)	4.6 (1.3)	5.2 (2.2)	.89
Prior coronary intervention, no. (%)[b]	7 (19.4)	5 (17.9)	10 (31.3)	4 (19.0)	.49
Functioning kidney transplant, no. (%)[b]	2 (5.6)	2 (7.1)	1 (3.1)	1 (4.8)	.48
Comorbidities, no. (%)[b]					
Dyslipidemia	7 (19.4)	11 (39.3)	18 (56.3)	15 (71.4)	<.001
Hypertension	22 (61.1)	24 (85.7)	29 (90.6)	21 (100.0)	<.001
Diabetes mellitus	31 (86.1)	18 (64.3)	23 (71.9)	16 (76.2)	.51

Supplemental Table 2. (Continued)

Characteristics	1990-1994	1995-1999	2000-2004	2005-2009	Trend *P*[a]
Coronary artery disease	15 (41.7)	15 (53.6)	16 (50.0)	10 (47.6)	.59
Congestive heart failure	10 (27.8)	3 (10.7)	8 (25.0)	5 (23.8)	.99
Stroke/TIA/amaurosis	6 (16.7)	9 (32.1)	1 (3.1)	5 (23.8)	.99
COPD	4 (11.1)	4 (14.3)	7 (21.9)	1 (4.8)	.79
End-stage renal disease	0 (0.0)	3 (10.7)	4 (12.5)	2 (9.5)	.19

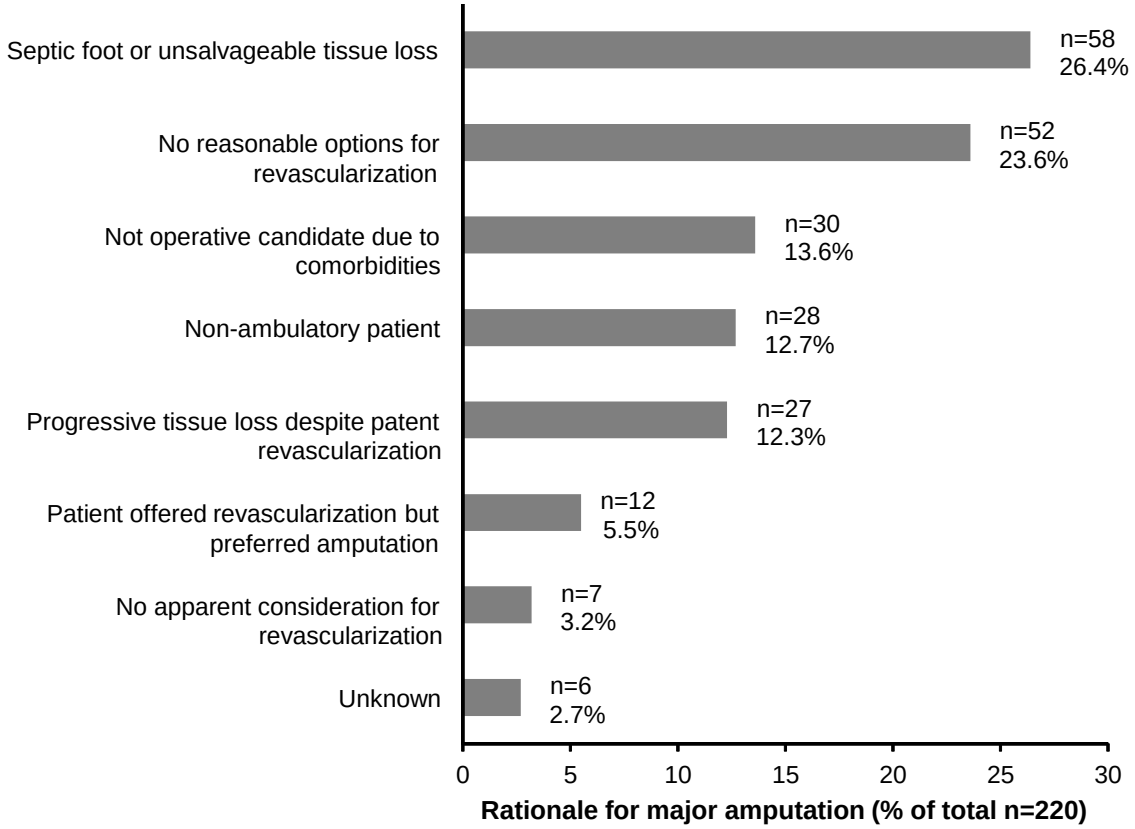
BMI = body mass index; COPD = chronic obstructive pulmonary disease, ENDO = endovascular revascularization; TIA = transient ischemic attack.

[a] Calculated using unadjusted regression models (linear regression for continuous characteristics, logistic regression for binary characteristics, and cumulative logistic regression for the ordinal characteristic, smoking). Calendar year was defined as a continuous variable between 0 (1990) and 19 (2009).

[b] Percentages have been rounded and may not total 100.

[c] To convert serum creatinine to μmol/L, multiply values by 88.4.

Supplemental Figure 1. Rationale for Major Amputation as Opposed to Revascularization[a]



[a] Rationale for major amputation was ranked from highest to lowest severity as: 1) septic foot or unsalvageable tissue loss, 2) non-ambulatory patient, 3) not operative candidate due to comorbidities, 4) no reasonable options for revascularization, 5) progressive tissue loss despite patent revascularization, 6) patient offered revascularization but preferred amputation, and 7) no apparent consideration for revascularization. This ranking was used in a cumulative logistic model to assess changes in rationale over time. The 6 patients with unknown rationale were not included in the model

Supplemental Table 3. Type and level of revascularization for all revascularizations

Revascularizations	No. / Denominator (%)
Open	689
Bypass	564 / 689 (81.9%)
Multimodal	235 / 564 (41.7%)
Suprainguinal	272 / 564 (48.2%)
Multilevel	105 / 272 (38.6%)
Infrainguinal but suprageniculate	74 / 564 (13.1%)
Multilevel	10 / 74 (13.5%)
Infrageniculate	218 / 564 (38.6%)
Multilevel	39 / 218 (17.9%)
Other	125 / 689 (18.1%)
Multimodal	34 / 125 (27.2%)
Suprainguinal	10 / 125 (8.0%)
Multilevel	0 / 10 (0.0%)
Infrainguinal but suprageniculate	70 / 125 (56.0%)
Multilevel	22 / 70 (31.4%)
Infrageniculate	36 / 125 (28.8%)
Multilevel	30 / 36 (83.3%)
Sympathectomy alone	9 / 125 (7.2%)
Endovascular	611

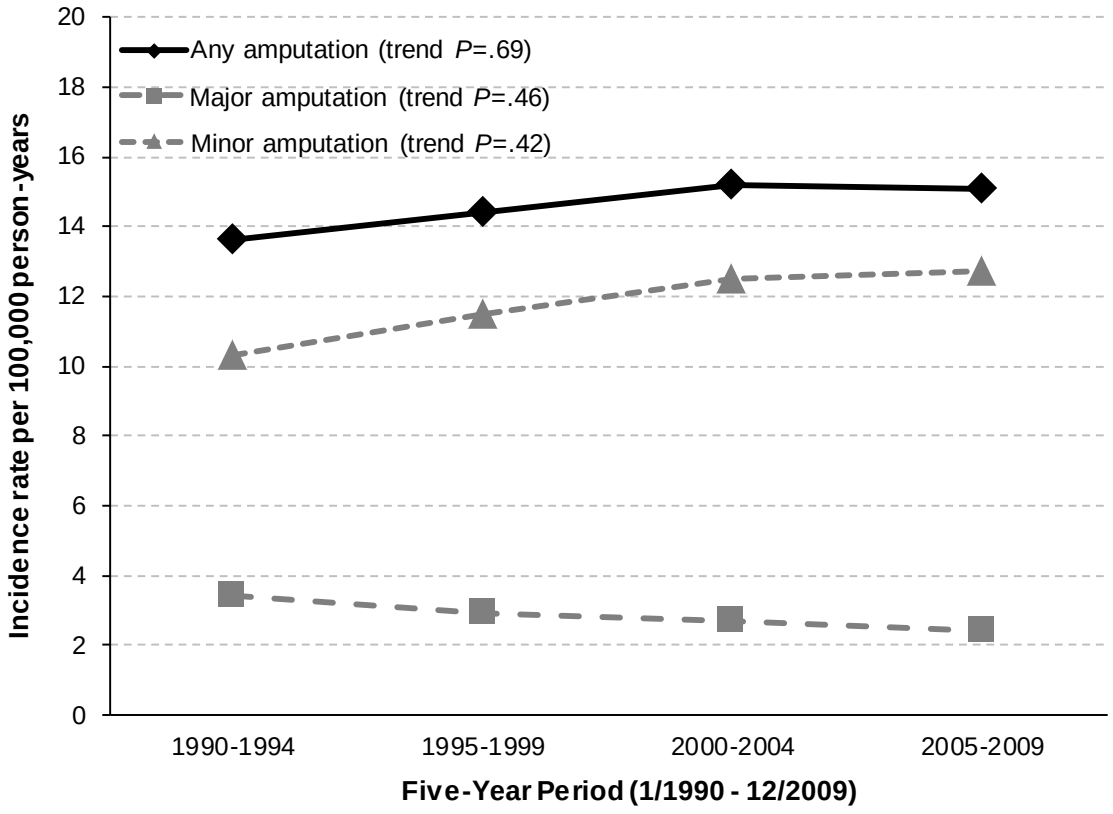
Supplemental Table 3. (Continued)

Revascularizations	No. / Denominator (%)
Catheter-directed Thrombolysis	56 / 611 (9.2%)
Multimodal	39 / 56 (69.6%)
Suprainguinal	5 / 56 (8.9%)
Multilevel	0 / 5 (0.0%)
Infrainguinal but supragenicular	17 / 56 (30.4%)
Multilevel	6 / 17 (35.3%)
Infrageniculate	34 / 56 (60.7%)
Multilevel	31 / 34 (91.2%)
Stent	300 / 611 (49.1%)
Multimodal	300 / 300 (100.0%)
Suprainguinal	242 / 300 (80.7%)
Multilevel	12 / 242 (5.0%)
Infrainguinal but supragenicular	56 / 300 (18.7%)
Multilevel	13 / 56 (23.2%)
Infrageniculate	2 / 300 (0.7%)
Multilevel	2 / 2 (100.0%)
Balloon Angioplasty	254 / 611 (41.6%)
Multimodal	9 / 254 (3.5%)
Suprainguinal	51 / 254 (20.1%)

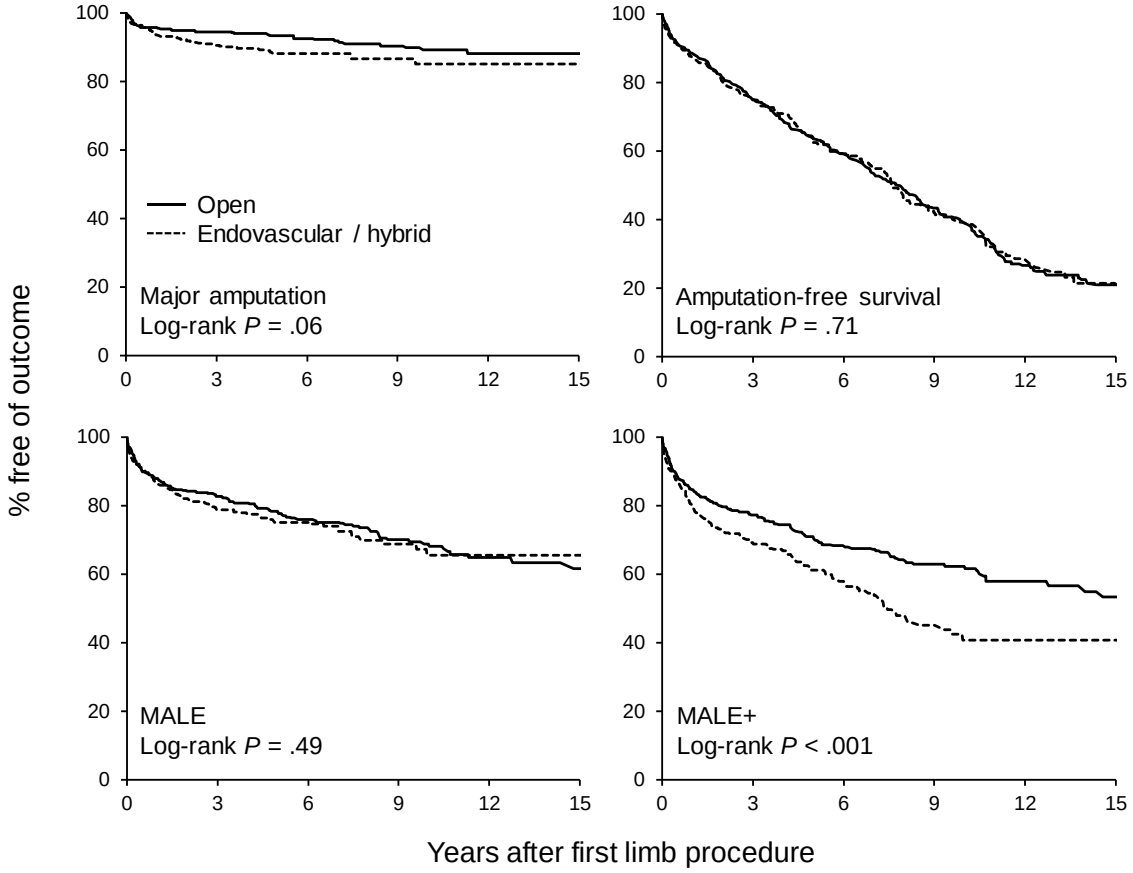
Supplemental Table 3. (Continued)

Revascularizations	No. / Denominator (%)
Multilevel	0 / 51 (0.0%)
Infrainguinal but supragenicular	112 / 254 (44.1%)
Multilevel	6 / 112 (5.4%)
Infrageniculate	91 / 254 (35.8%)
Multilevel	55 / 91 (60.4%)
Other	1 / 611 (0.2%)
Multimodal	0 / 1 (0.0%)
Suprainguinal	0 / 1 (0.0%)
Infrainguinal but supragenicular	1 / 1 (100.0%)
Multilevel	0 / 1 (0.0%)
Infrageniculate	0 / 1 (0.0%)
Hybrid	74
Multimodal	74 / 74 (100.0%)
Suprainguinal	5 / 74 (6.8%)
Multilevel	0 / 5 (0.0%)
Infrainguinal but supragenicular	38 / 74 (51.4%)
Multilevel	31 / 38 (81.6%)
Infrageniculate	31 / 74 (41.9%)
Multilevel	31 / 31 (100.0%)

Supplemental Figure 2. Amputation Trends Among Non-PAD Patients/Etiologies Who Were Excluded From the Cohort



Supplemental Figure 3. Overall Kaplan-Meier Curves for Outcomes Following Revascularization by the Initial Mode



Supplemental References

1 Hallett JW, Jr., Byrne J, Gayari MM, Ilstrup DM, Jacobsen SJ, Gray DT. Impact of arterial surgery and balloon angioplasty on amputation: a population-based study of 1155 procedures between 1973 and 1992. *Journal of vascular surgery.* 1997;25(1):29-38.