

Research article

Diabetes, Prior Amputation, and Tissue Loss as Predictors of Limb Loss in Peripheral Arterial Disease: A Retrospective Cohort Study with Longitudinal Progression Analysis

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Abstract: Amputation is the most feared outcome of peripheral arterial disease (PAD), yet the trajectory from revascularization to limb loss is rarely captured in single-center data. We analysed a hospital registry to identify predictors of amputation, its impact on recovery-related outcomes, and, using same-patient readmission linkage, direct evidence of progression from a non-amputation admission to a later amputation. Retrospective cohort study of 646 consecutive admissions to a university-affiliated vascular surgery department (January 2022–July 2026). After excluding 52 aneurysm admissions, 594 admissions in 541 patients with occlusive arterial disease were analysed. Comorbidities and procedures were extracted from ICD-10 and procedure codes; amputations were classified as major or minor. Same-patient admissions were linked to build per-patient sequences. Predictors of amputation were assessed by univariable tests and multivariable logistic regression. Amputation occurred in 81/594 admissions (13.6%: 1.7% major, 11.1% minor, 0.8% reamputation). Fontaine stage IV tissue loss was the strongest correlate (25.0% vs 1.2–0% in stages II–III, OR=37.3, $p<0.001$). On multivariable analysis, diabetes (OR=3.39, 95% CI 1.92–5.98, $p<0.001$) and prior amputation (OR=2.51, 95% CI 1.35–4.69, $p=0.004$) independently predicted amputation; age, sex, residence and cardiovascular comorbidity did not. Amputation was associated with longer stay (median 19.1 vs 7.1 days, $p<0.001$) and more frequent ICU use (29.6% vs 13.6%, $p<0.001$). Among 45 readmitted patients without amputation at their first admission, 5 (11.1%) required one later (median 70 days); all 5 were diabetic and had received endovascular therapy initially. Diabetes and prior amputation – not age or cardiovascular comorbidity – were the dominant predictors of limb loss, and amputation nearly tripled length of stay. A re-admission-linked signal identified diabetic patients progressing from endovascular re-vascularization to amputation within weeks to months, supporting structured post-procedural surveillance and multidisciplinary diabetic-foot pathways.

Keywords: peripheral arterial disease; amputation; diabetes mellitus; chronic limb-threatening ischemia; length of stay; recovery; retrospective cohort study

1. Introduction

Peripheral arterial disease (PAD) affects more than 200 million people worldwide and its prevalence continues to rise with population ageing and the growing burden of diabetes (1). At the severe end of its spectrum, chronic limb-threatening ischemia (CLTI) carries a substantial risk of amputation and death, and its management has been standardized by the Global Vascular Guidelines, which recommend individualized selection between endovascular, open surgical and hybrid revascularization according to patient risk, limb severity graded by the Wound, Ischemia, and foot Infection (WIFI) classification, and the anatomical pattern of disease described by the TASC II consensus [2-4].

Diabetes mellitus modifies this picture substantially. Diabetic patients develop a more distal, heavily calcified pattern of arterial disease and carry a several-fold higher risk of amputation than non-diabetic patients with otherwise comparable disease [5,6]. Tissue loss itself is not a static endpoint: a growing body of evidence from large administrative cohorts shows that a minor amputation is frequently only the first step in a trajectory toward further, more proximal limb loss. In a Medicare-based analysis, roughly one in four diabetic patients with a prior minor amputation required a major amputation within five years, a six-fold increase in risk compared with patients without that history [7], a population-based English cohort of over 22,000 patients similarly found an 10.7% one-year ipsilateral progression rate from minor to major amputation, rising further by three years [8]. Amputation of one limb also raises the risk to the other: population-based studies report a 2.4-fold increase in contralateral major amputation and elevated mortality after an initial amputation, with frailty, gangrene, emergency admission and prior revascularization identified as contributing risk factors [9,10].

Recovery after limb-threatening arterial disease is similarly multidimensional. Functional recovery – regaining walking ability – improves after both endovascular and surgical revascularization in the majority of patients [11], while longitudinal diabetic-foot cohorts show that ulcer healing, recurrence, further amputation and mortality are interlinked outcomes best understood together rather than in isolation [12]. Yet once major amputation becomes unavoidable, survival falls far short of general-population expectations: a recent analysis found a median observed survival of only 457 days after major amputation, against an age-and-sex-matched expected survival of nearly 4700 days [13]. Delays in recognizing and treating CLTI and diabetic foot ulceration remain common and are themselves associated with worse outcomes, while multidisciplinary diabetic-foot teams have been shown to reduce major amputation rates [14,15].

Most of this evidence derives from large administrative claims databases in the United States and the United Kingdom, or from population-wide registries; single-center, granular clinical data from Eastern Europe remain scarce, even though amputation and revascularization rates in this region are closely tied to comorbidity burden and access to specialized vascular care [16]. Furthermore, because most such analyses treat each amputation as an isolated index event, few can directly observe, within the same dataset, the transition of an individual patient from an index revascularization to a subsequent amputation. A hospital registry that captures repeat admissions by the same patient over several years offers an opportunity to do exactly this, even at the more limited scale of a single department.

We therefore analysed four and a half years of consecutive admissions to a tertiary vascular surgery department to quantify amputation rates and identify their independent predictors among patients with occlusive arterial disease, characterize the impact of amputation on recovery-related in-hospital outcomes, namely length of stay, intensive care use and discharge status and exploit same-patient readmission linkage within the registry to directly document, for the first time in this dataset, the interval and clinical profile of patients who progress from an index admission without amputation to a later admission requiring one.

2. Materials and Methods

The methodological framework of the present study was designed to characterize the study population, define the relevant clinical and procedural variables, reconstruct longitudinal patient trajectories, and identify factors associated with amputation risk.

2.1. Study design, setting and data source

We performed a retrospective, single-center cohort study using the administrative discharge registry of the Vascular Surgery Clinic, „Sf. Spiridon” Emergency

County Clinical Hospital, Iași, Romania, a university-affiliated tertiary referral center. All consecutive admissions recorded between 4 January 2022 and 29 July 2026 were extracted, yielding 646 admissions. Each record included patient sex, age, area of residence, date of birth, admission and discharge dates and type, discharge status, principal and secondary ICD-10 diagnoses, a free-text discharge summary, coded procedures, the date of the main procedure, and intensive care unit (ICU) time-stamps where applicable. Patient identifiers in the source file were already restricted to initials; for this analysis, admissions belonging to the same individual were linked using the combination of initials and date of birth, which is unique within the dataset.

This registry has also, separately, been analysed by our group to characterise outcomes of hybrid (combined open and endovascular) revascularization procedures performed in the same department (manuscript in preparation). The present study addresses a distinct, non-overlapping question — predictors of amputation across the entire occlusive arterial disease population, its impact on recovery-related outcomes, and longitudinal progression to amputation using readmission linkage — and reports different outcome measures from that earlier analysis.

2.2. Study population

Admissions with a principal or secondary diagnosis of aortic or iliac aneurysm (ICD-10 I71/I72; $n=52$) were excluded from the primary analysis: aneurysmal disease has a distinct pathophysiology from occlusive PAD, none of these admissions involved an amputation, and their inclusion would have diluted the occlusive-disease risk estimates. The analytic cohort therefore comprised 594 admissions in 541 patients with occlusive arterial disease (dominated by arterial stenosis/embolism-thrombosis, ICD-10 I74 and I77).

2.3. Variable definitions

Comorbidities were ascertained from principal and secondary ICD-10 codes: diabetes mellitus (E10/E11), hypertension (I10-I13/I15), ischemic heart disease (I20-I25), atrial fibrillation (I48), chronic kidney disease (N18 or an explicit free-text mention), dyslipidemia (E78), current smoking (T65.2/F17 or an explicit free-text mention), and a documented history of a prior amputation (Z89 or an explicit free-text mention). Fontaine clinical stage (II-IV) was extracted, where explicitly documented, from the free-text diagnosis and discharge-summary fields; a stage was recoverable for 309/594 admissions (52.0%).

Procedures were extracted from the coded national inpatient procedure list attached to each admission and classified, in a fixed priority order, into: major amputation (above-knee, below-knee or ankle-disarticulation codes), minor amputation (toe, transmetatarsal or midtarsal codes), isolated stump re-amputation, endovascular aneurysm repair, hybrid (combined endovascular and open bypass/endarterectomy) procedures, open bypass, endarterectomy, endovascular angioplasty with or without stenting, thrombectomy/embolectomy, fasciotomy, or conservative wound care only. "Any amputation" comprised the major, minor and re-amputation categories combined. Length of stay (LOS) was calculated as the interval between admission and discharge timestamps. ICU utilization was derived from recorded ICU time-stamps. Discharge status was collapsed into healed (surgically or otherwise), improved, stationary, or died.

2.4. Longitudinal linkage

Admissions were sorted chronologically within each linked patient identifier to build a per-patient admission sequence. For patients with two or more admissions in the analytic cohort, we identified those whose first recorded admission did not involve an amputation, and determined whether any subsequent admission in the sequence

did; where it did, the interval in days between the two admissions was calculated. This design cannot capture amputations performed outside this department, and is explicitly limited to what could be observed within the registry.

2.5. Statistical analysis

Continuous variables are reported as mean (standard deviation) or median (interquartile range, IQR) according to distribution, and were compared with the Mann-Whitney U test. Categorical variables are reported as n (%) and were compared with the chi-square or Fisher's exact test as appropriate. Independent predictors of amputation were identified using multivariable logistic regression including age, sex, area of residence, diabetes, hypertension, ischemic heart disease, chronic kidney disease, smoking, prior amputation history and emergency admission; results are reported as odds ratios (OR) with 95% Wald confidence intervals (CI). A two-sided $p < 0.05$ was considered statistically significant. Analyses were performed in Python 3.11 (pandas, scipy and scikit-learn).

3. Results

3.1. Cohort characteristics

Of 646 admissions screened, 52 (8.0%) were excluded for an aneurysm diagnosis, leaving an analytic cohort of 594 admissions in 541 patients with occlusive PAD (54 patients contributed two or more admissions, accounting for 107 of the 594 admissions). Mean age was 68.8 (SD 9.4) years (range 27-97); 434 (73.1%) were male and 260 (43.8%) resided in a rural area. Diabetes was present in 312 admissions (52.5%), hypertension in 488 (82.2%), ischemic heart disease in 158 (26.6%), atrial fibrillation in 113 (19.0%), chronic kidney disease in 64 (10.8%), dyslipidemia in 230 (38.7%), current smoking in 116 (19.5%), and a documented prior amputation in 63 (10.6%). Most admissions were elective referrals (548, 92.3%); 23 (3.9%) were emergencies and 23 (3.9%) were planned readmissions.

The treatment performed was endovascular angioplasty with or without stenting (including four endovascular aneurysm-type repairs without a coded aneurysm diagnosis) in 496 admissions (83.5%), a hybrid open-plus-endovascular procedure in 16 (2.7%), conservative wound care only in 1 (0.2%), and an amputation in 81 (13.6%) — 10 major (1.7%: 7 below-knee, 2 above-knee, 1 ankle disarticulation), 66 minor (11.1%: toe, transmetatarsal or midtarsal), and 5 isolated stump re-amputations (0.8%).

3.2. Predictors of amputation

Table 1 compares baseline characteristics between admissions with and without amputation. Diabetes was markedly more frequent among amputations (76.5% vs 48.7%, $p < 0.001$), as was a documented history of a prior amputation (23.5% vs 8.6%, $p < 0.001$). Age, sex, area of residence, hypertension, ischemic heart disease, atrial fibrillation, chronic kidney disease, dyslipidemia and smoking did not differ significantly between groups. Among the 309 admissions with a documented Fontaine stage, amputation occurred in 49/196 (25.0%) of stage IV (tissue loss) admissions, versus 1/81 (1.2%) of stage II and 0/32 (0%) of stage III admissions (stage IV vs II-III combined: OR=37.3, $p < 0.001$; Figure 1B). Amputation rate was likewise far higher in diabetic than non-diabetic admissions (19.9% vs 6.7%; Figure 1A).

Table 1. Baseline characteristics of the occlusive-PAD cohort by amputation status (n=594)

Characteristic	Amputation (n=81)	No amputation (n=513)	p
Age, years, mean (SD)	68.0 (7.6)	68.9 (9.6)	0.315
Male sex, n (%)	62 (76.5)	372 (72.5)	0.502
Rural residence, n (%)	42 (51.9)	218 (42.5)	0.119
Diabetes mellitus, n (%)	62 (76.5)	250 (48.7)	<0.001
Hypertension, n (%)	66 (81.5)	422 (82.3)	0.876
Ischemic heart disease, n (%)	19 (23.5)	139 (27.1)	0.589
Atrial fibrillation, n (%)	18 (22.2)	95 (18.5)	0.447
Chronic kidney disease, n (%)	10 (12.3)	54 (10.5)	0.568
Dyslipidemia, n (%)	24 (29.6)	206 (40.2)	0.085
Current smoking, n (%)	12 (14.8)	104 (20.3)	0.293
Prior amputation history, n (%)	19 (23.5)	44 (8.6)	<0.001
ICU admission, n (%)	24 (29.6)	70 (13.6)	<0.001
Length of stay, days, median (IQR)	19.1 (14.2-33.0)	7.1 (4.2-10.1)	<0.001
In-hospital death, n (%)	1 (1.2)	3 (0.6)	n/a*

*SD = standard deviation; IQR = interquartile range; ICU = intensive care unit. *Not formally tested owing to the small number of deaths (n=4 overall).*

3.3. Multivariable predictors of amputation

On multivariable logistic regression (Table 2), diabetes and a prior amputation history remained independent predictors of amputation after adjustment for age, sex, residence, hypertension, ischemic heart disease, chronic kidney disease, smoking and emergency admission (McFadden pseudo- $R^2=0.080$; n=594, 81 events). No other covariate reached statistical significance.

Table 2. Multivariable logistic regression for predictors of amputation (n=594)

Variable	OR	95% CI	p
Age, per 10-year increase	0.93	0.70-1.23	0.599
Male sex	1.27	0.71-2.28	0.425
Rural residence	1.55	0.94-2.53	0.084
Diabetes mellitus	3.39	1.92-5.98	<0.001
Hypertension	0.86	0.45-1.64	0.646
Ischemic heart disease	0.79	0.44-1.42	0.430
Chronic kidney disease	1.07	0.49-2.30	0.871
Current smoking	0.80	0.40-1.61	0.539
Prior amputation history	2.51	1.35-4.69	0.004
Emergency admission	0.99	0.31-3.12	0.982

OR = odds ratio; CI = confidence interval. Reference categories: female sex, urban residence, absence of the listed comorbidity/history, non-emergency admission.

3.4. Recovery-related in-hospital outcomes

Overall median LOS was 8.0 days (IQR 4.2-13.0). Amputation was associated with a nearly three-fold longer stay than admissions without amputation (median 19.1 vs 7.1 days, $p < 0.001$); LOS did not differ significantly between major and minor amputation (median 22.1 vs 18.6 days, $p = 0.337$). ICU admission was more than twice as frequent after amputation (29.6% vs 13.6%, $p < 0.001$). In-hospital mortality was low throughout the cohort (4/594, 0.7%: 1 after amputation, 3 without), too infrequent for formal comparison. Discharge status was favourable in both groups: 508/594 admissions (85.5%) were discharged healed (surgically or otherwise) and a further 65 (10.9%) improved; among amputations specifically, 72/81 (88.9%) were discharged healed.

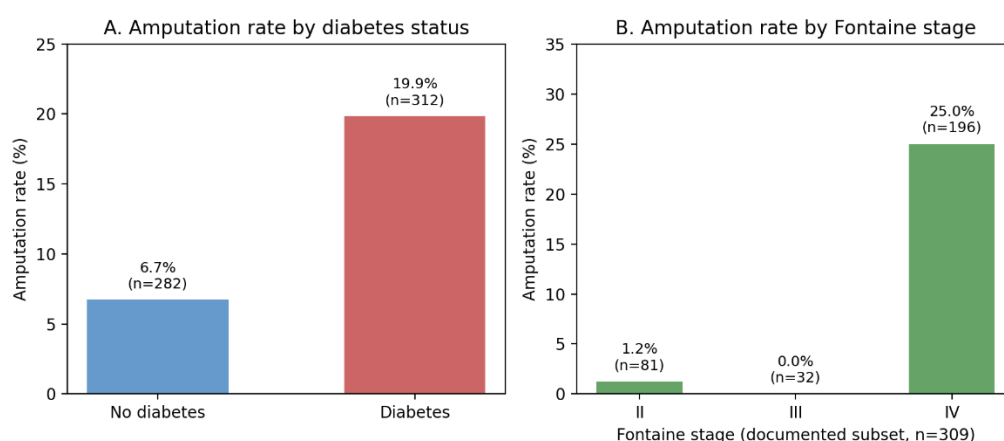


Figure 1. Amputation rate by (A) diabetes status and (B) documented Fontaine clinical stage (known-stage subset, $n = 309$).

3.5. Longitudinal progression to amputation among readmitted patients

Fifty-four patients contributed two or more admissions to the analytic cohort (107 admissions in total). Of these, 45 patients' first recorded admission did not involve an amputation; among this readmission-eligible group, 5 patients (11.1%) required an amputation at a subsequent admission, at a median of 70.0 days after the index admission (range 27.7-646.1 days). All five had received endovascular angioplasty with or without stenting at their index admission, and all five were diabetic. Among readmitted patients whose index admission did not involve amputation, progression to a later amputation occurred in 5/24 diabetic patients (20.8%) versus 0/21 non-diabetic patients (0%; Fisher's exact $p = 0.051$). Table 3 details each of these five patients.

Patient	Diabetes	Index admission treatment	Days to amputation admission	Amputation performed
1	Yes	Endovascular angioplasty/stenting	646	Toe/transmetatarsal (minor)
2	Yes	Endovascular angioplasty/stenting	28	Above/below-knee (major)
3	Yes	Endovascular angioplasty/stenting	164	Toe/transmetatarsal (minor)
4	Yes	Endovascular angioplasty/stenting	70	Toe/transmetatarsal (minor)
5	Yes	Endovascular angioplasty/stenting	70	Toe/transmetatarsal (minor)

Patients are anonymized and ordered by time-to-amputation-admission. Days are counted from the index (first recorded, non-amputation) admission to the admission at which amputation was performed.

4. Discussion

The present findings are discussed in relation to the main predictors of amputation, longitudinal progression following revascularization, associated in-hospital outcomes, and their implications for subsequent patient management.

4.1. Clinical predictors and longitudinal progression of limb loss

In this single-center cohort of consecutive admissions for occlusive arterial disease, amputation occurred in 13.6% of admissions, and its risk was driven overwhelmingly by two factors: diabetes mellitus and a prior history of amputation, each independently associated with roughly a two- to three-and-a-half-fold increase in odds, after accounting for age, sex, residence and classical cardiovascular comorbidity. This pattern mirrors, and is biologically consistent with, the well-established observation that diabetic arterial disease is more distal and heavily calcified, and carries a several-fold higher amputation risk than non-diabetic disease of comparable severity [5,6]. It is also consistent with recent Medicare-based work showing that the specific phenotype of tissue loss — not simply the presence of diabetes — meaningfully stratifies subsequent amputation risk [17]. In our cohort, the strongest single correlate of amputation was not a comorbidity at all but disease severity itself: admissions with a documented Fontaine stage IV (tissue loss) had an amputation rate of 25.0%, against 1.2% or less for stage II-III disease (OR=37.3). This finding, although expected on pathophysiological grounds, underlines that by the time tissue loss is present, revascularization alone frequently arrives too late to prevent some degree of amputation, reinforcing calls for earlier referral and treatment of claudication and rest pain before ulceration supervenes.

The second independent predictor — a prior history of amputation — is where this cohort adds most directly to the existing literature. Large administrative analyses have shown that a first, minor amputation is frequently a harbinger of further limb loss: approximately one in four Medicare beneficiaries with diabetes, PAD and a prior minor amputation require a major amputation within five years, a six-fold increase in risk [7], while a population-based English cohort documented an 10.7% one-year ipsilateral progression rate to major amputation after a minor procedure [8], and population-based Canadian and American cohorts report a roughly 2.4-fold increase in contralateral major amputation and elevated mortality after an initial amputation, with frailty, gangrene, emergency admission and prior revascularization identified as risk factors [9,10]. Our data reproduce this signal at the single-center level and, through readmission linkage, allow it to be observed directly rather than inferred: of 45 readmitted patients whose first recorded admission did not involve amputation, 5 (11.1%) required one at a later admission, at a median of only 70 days. Strikingly, all five were diabetic and all had been treated at their index admission with endovascular angioplasty/stenting alone — while none of the 21 readmitted non-diabetic patients progressed to amputation. Although this subgroup is small and the comparison did not reach conventional statistical significance ($p=0.051$), the consistency of direction with far larger administrative cohorts [7-9] argues that this is a real, clinically important signal rather than a chance finding, and identifies a specific, identifiable subgroup — diabetic patients managed endovascularly — for whom closer structured follow-up after revascularization may be warranted.

Amputation also carried a substantial recovery-related cost within this admission: length of stay was nearly three times longer (median 19.1 vs 7.1 days) and ICU utilization more than double (29.6% vs 13.6%) than for admissions without amputation. Whether ICU care itself contributes to, rather than merely reflects, this burden is debated: a recent systematic review of ICU use after vascular surgery found higher adjusted mortality and complication rates associated with ICU admission without clear evidence of benefit beyond emergency and aortic cases, attributing this to residual con-

foundings by severity rather than a causal effect of ICU care [18]. Our data cannot distinguish between these explanations, but they do confirm that amputation, rather than any single comorbidity, is the strongest driver of resource utilization in this population — a point relevant to bed-planning and to counselling patients and families about the expected course of an amputation-associated admission. Chronic kidney disease, although previously linked to amputation and mortality risk in peripheral arterial disease at a population level [19], was not an independent predictor in our multivariable model, plausibly reflecting both the modest prevalence of CKD in our cohort (10.8%) and the limited statistical power to detect smaller effect sizes.

Despite this in-hospital burden, most patients in our cohort — including 88.9% of those who underwent amputation — were discharged in a healed state, and functional recovery after revascularization is generally favourable: in the large VOYAGER PAD trial cohort, walking impairment improved in the majority of patients after both surgical and endovascular revascularization [11]. This apparent good short-term recovery sits in tension with the much bleaker medium-term picture reported after major amputation elsewhere: one recent analysis found a median observed survival of only 457 days after major amputation, against an expected survival of nearly 4700 days for an age- and sex-matched general population (13), and a large population-based cohort of minor amputations reported a 17.2% one-year mortality [8]. Our own in-hospital mortality was low (0.7% overall), which is unsurprising: an administrative registry limited to a single admission captures only deaths that occur during that hospitalization, while most amputation-associated mortality reported in the literature accrues over the following months to years, well beyond hospital discharge. This discrepancy is itself an argument for pairing favourable in-hospital outcome data of the kind reported here with dedicated post-discharge follow-up, rather than treating a good discharge status as evidence of a good overall outcome.

The randomized BEST-CLI trial found similar amputation-free survival with an initial endovascular-first or surgery-first strategy in patients suitable for either approach, including in its pre-specified diabetes substudy, where the relative benefit of revascularization did not differ significantly by diabetic status [20,21]. This supports an inclusive, anatomy-driven approach to revascularization strategy selection rather than withholding aggressive treatment from diabetic patients; it does not, however, address the post-revascularization surveillance question raised by our longitudinal findings, since BEST-CLI compared treatment strategies rather than tracking progression after an initial, successful procedure. Individualizing the choice and site of intervention according to angiosome- or woundosome-based principles has been proposed as one way to improve durability of endovascular treatment in exactly this diabetic, distally-diseased population [22], and our findings — a cluster of diabetic patients progressing to amputation within weeks to months of an isolated angioplasty — are consistent with a rationale for such targeted technique selection alongside closer clinical and imaging follow-up. More broadly, delays in recognizing and treating chronic limb-threatening ischemia and diabetic foot ulceration remain common and are associated with worse outcomes, while structured multidisciplinary diabetic-foot teams have been shown to reduce major amputation rates [14,15], our data support directing such multidisciplinary surveillance specifically at diabetic patients in the weeks and months following an endovascular procedure, a period during which our cohort suggests the risk of progression to amputation is concentrated.

4.2. Rehabilitation implications and perioperative functional management

Beyond the vascular and surgical management of patients at risk of limb loss, the present findings also highlight the importance of integrating rehabilitation into the perioperative pathway. When amputation is foreseeable and the clinical condition allows sufficient preparation time, preoperative functional assessment may help establish baseline mobility, joint range of motion, muscle strength, balance, transfer ability,

and the potential for subsequent prosthetic rehabilitation. Current vascular and rehabilitation guidelines support a multidisciplinary approach involving vascular surgeons, rehabilitation specialists, physiotherapists, occupational therapists, and prosthetic specialists when major amputation is considered.

Following amputation, rehabilitation should begin as early as clinically feasible and should focus initially on preserving joint mobility, preventing contractures, maintaining muscle strength, and restoring functional independence. Particular attention should be directed toward residual-limb management, including appropriate positioning, oedema control, progressive shaping, skin and scar care, and preparation for prosthetic fitting. Therapeutic exercise should also address the proximal musculature, the contralateral lower limb, trunk control, balance, transfers, and progressive mobility with assistive devices. An individualized rehabilitation programme incorporating exercise and gait training is recommended to improve functional status, walking ability, and quality of life after lower-limb amputation.

These considerations may be particularly important in patients with diabetes and PAD. In the present cohort, diabetes independently increased the odds of amputation, while all five patients who progressed from an initial non-amputation admission to a subsequent amputation were diabetic. Rehabilitation in this population should therefore extend beyond the residual limb and include preservation of the contralateral limb, patient education, maintenance of mobility, and close surveillance for new skin lesions, wounds, or functional decline. Such an approach may complement vascular surveillance and multidisciplinary diabetic-foot care by addressing functional recovery while simultaneously reducing the risk of secondary disability.

4.3. Limitations

Several limitations should be considered. First, this is a retrospective, single-center study relying on administrative coding for comorbidities and procedures, which is subject to misclassification and to the completeness of clinical documentation; a Fontaine stage could only be recovered for 52.0% of admissions from free text, introducing potential ascertainment bias into the stage-stratified analysis.

Second, our registry captures only admissions to this department: patients who underwent a subsequent amputation elsewhere — at another hospital, or on a general surgery service — would be misclassified as non-progressors, so the true rate of progression to amputation among readmitted patients is likely underestimated.

Third, the longitudinal progression analysis, while clinically compelling and directionally consistent with much larger administrative cohorts, is based on only 45 re-admission-eligible patients and 5 amputation events, limiting statistical power and precluding multivariable adjustment within this subgroup. Fourth, in-hospital mortality could not be related to longer-term, post-discharge survival, which the available data do not capture.

Finally, this registry has separately been used to study hybrid revascularization outcomes in the same department; although the present analysis addresses a distinct question with non-overlapping outcome measures, both studies draw on overlapping admissions, which should be considered when interpreting the two bodies of work together.

5. Conclusions

In this cohort of admissions for occlusive peripheral arterial disease, diabetes mellitus and a prior history of amputation — rather than age or classical cardiovascular comorbidity — were the dominant, independent predictors of amputation, and advanced tissue loss (Fontaine stage IV) conferred a markedly elevated risk. Amputation nearly tripled hospital length of stay and more than doubled ICU utilization, identifying it as the principal driver of resource use in this population, even though most patients, including most amputees, were discharged in a healed state.

Using same-patient readmission linkage, we directly observed a diabetic subgroup progressing from an index endovascular revascularization to amputation within weeks to months, a signal consistent with much larger administrative cohorts describing minor amputation as a harbinger of further limb loss. These findings support structured, diabetes-targeted post-revascularization surveillance and multidisciplinary diabetic-foot care pathways as a means of intercepting this trajectory before further amputation occurs, and argue for prospective, longer-follow-up studies to confirm and extend the progression signal identified here.

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Abbreviations

AF – atrial fibrillation;
 CI – confidence interval;
 CKD – chronic kidney disease;
 CLTI – chronic limb-threatening ischemia;
 ICD-10 – International Classification of Diseases, 10th revision;
 ICU – intensive care unit; IHD – ischemic heart disease;
 IQR – interquartile range; LOS – length of stay; OR – odds ratio;
 PAD – peripheral arterial disease;
 TASC – TransAtlantic Inter-Society Consensus;
 WIfI – Wound, Ischemia, and foot Infection classification

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