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Patient activation levels are low in patients undergoing revascularisation for lower limb arterial disease but do not correlate with 30-day clinical outcomes

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Patient activation levels are low in patients undergoing revascularisation for lower limb arterial disease but do not correlate with 30-day clinical outcomes

The PAMiLLA Study: The ***P***atient ***A***ctivation ***M***easure ***i***n ***L***ower ***L***imb ***A***rterial Disease Study

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Article Highlights:

Type of research: Single-centre prospective cohort study

Key findings: Patient activation was measured using the Patient Activation Measure (PAM) in 80 patients undergoing lower limb revascularisation procedures. The median PAM score was 53/100. 60% of patients demonstrated lower levels of activation (levels 1 and 2 out of 4), whereas only 11% had the highest level of activation (level 4). There was no correlation between PAM score and 30-day clinical outcomes.

Take home message: Patient activation in patients undergoing lower limb revascularisation procedures for peripheral arterial disease is low. PAM scores did not correlate with 30-day clinical outcomes.

Table of Contents Summary:

In this study of 80 patients undergoing lower limb revascularisation procedures for peripheral arterial disease, patient activation was low in most patients. Patient activation was lower in patients who smoke and patients with type 2 diabetes mellitus. Patient activation did not correlate with 30-day clinical outcomes.

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Abstract

Background: Patient activation refers to the ability of individuals to engage in their healthcare. Studies have shown a positive association between patient activation and improved clinical outcomes in some patient groups.

Objective: This study aims to characterise the level of activation in patients with peripheral arterial disease (PAD) undergoing revascularisation procedures and to determine if patient activation is associated with 30-day clinical outcomes.

Methods: This is a single-centre, prospective, observational study (ethics reference: 23/NS/0078). Patients undergoing planned lower limb revascularisation within a 5-month period were invited to participate and to complete the Patient Activation Measure (PAM) survey prior to their surgery. Responses were scored on a Likert scale and an overall PAM score produced between 1 and 100 (lowest to highest activation). The relationship between baseline characteristics and PAM score was evaluated using linear regression. Spearman's rank-order correlation and logistic regression was conducted to examine the relationship between PAM scores and 30-day clinical outcomes.

Results: Eighty patients were included in this study. The median age was 71 years (IQR 3 years) and 70% were male. The median PAM score was 53 (IQR 16). Current smokers and patients with type 2 diabetes had significantly lower PAM scores than non-smokers ($p<0.05$) and non-diabetics ($p<0.001$). Multivariate regression revealed age and type 2 diabetes were significant predictors of PAM score. There was no association between PAM score and any 30-day clinical outcomes.

Conclusions: Patient activation is low in our sample of PAD patients undergoing revascularisation procedures. This suggests more work is needed to educate and engage patients in self-management of this long-term condition. Patient activation was not correlated

with 30-day clinical outcomes, but further research is warranted to determine whether it is related to medium or long-term clinical outcomes.

Key Words: peripheral arterial disease, patient activation, self-management, chronic conditions.

Conflict of interest: The authors of this work have no conflicts of interest to report.

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Manuscript Body

Introduction

In the United Kingdom (UK), 70% of National Health Service (NHS) spending relates to the care of patients with long-term conditions such as peripheral arterial disease (PAD) (1). PAD is a chronic disease characterised by atherosclerosis of the lower limb arteries, resulting in reduced blood flow to the peripheries. Since 1990, the global prevalence of PAD has increased by over 70%, and continues to increase (2). PAD is associated with cardiovascular and cerebrovascular events, amputations, impaired quality of life, and mortality (3). In its most severe form, patients can experience rest pain, gangrene, and limb loss (4).

UK National Institute for Health and Care Excellence (NICE) guidelines suggest all patients with PAD should be offered secondary prevention strategies, as well as healthy lifestyle counselling including smoking cessation, diet, and exercise (5). Patient compliance to these treatments and lifestyle modifications is vital to prevent disease progression and subsequent complications, however this largely relies on patient self-management and motivation. Due to increasing demands on health systems, patient self-management of long-term conditions is becoming increasingly important. It is now a fundamental component of the NHS Universal Personalised Care and the NHS Long-Term Plan (6). For chronic conditions such as PAD, patient engagement with their care and motivation for healthy lifestyle behaviours has been reported to significantly impact health outcomes (7,8).

Patient activation is defined as ‘an individual’s knowledge, skill, and confidence for managing their health and health care’. The Patient Activation Measure (PAM), first published in 2004,

is a validated and reliable 13-item Likert scale survey used to assess an individual's level of patient activation (9). The survey scores patients on a scale from 0 to 100, which corresponds to 1 of 4 PAM levels. Level 1 indicates those with the lowest activation, and Level 4 the highest.

The PAM has a recognised relationship with preventative behaviours and patient health outcomes. Those with higher levels of activation are more likely to attend preventative health check-ups, screening appointments, immunisations, and maintain healthy lifestyle behaviours like exercise and maintaining a healthy diet (7). Furthermore, higher PAM scores are associated with reduced emergency department attendances, reduced hospitalisations (10), reduced likelihood of readmission to hospital within 30 days of discharge (11,12), increased medication adherence (11), lower healthcare costs (7), and a better patient experience (7,8).

Use of the PAM within vascular surgery is broadly lacking. Humphries *et al.* measured patient activation in a cohort of 257 patients with different types of vascular diseases, of which 32% had PAD (13). The authors showed that age, education level, household income and type of vascular disease correlated with the PAM score, but symptom duration, race, and sex did not. The study demonstrated no difference in the levels of activation reported by patients with critical limb-threatening ischemia (CLTI) compared to patients with non-limb threatening PAD (13). Additionally, in a study of more than 1,200 patients with cardiovascular disease and/or diabetes, baseline activation level predicted how much patients' participation in and experience of shared decision-making (SDM) (14). However, it is unknown whether this holds true for PAD patients, though there is an overlap between these patient groups. A qualitative study by Rodriguez *et al.* demonstrated that patients with CLTI had become passive in their care with limited coping mechanisms (15), translating to the lowest level (level 1) of activation (15).

Moreover, in a study of PAD patients with high low-density lipoprotein cholesterol (LDL-C) levels, a risk factor for PAD, when assessing patient understanding of optimal LDL-C levels and the importance of LDL-C lowering medications, 66% of patients did not know the optimal LDL-C level, and only 47% were confident in the knowledge that their own behaviours could reduce their LDL-C levels (16). Notably, less than 15% of patients knew how to further prevent issues associated with their health condition, highlighting the need for interventions to educate PAD patients about SDM and self-management of their condition.

To our knowledge, there is currently no research investigating the association between patient activation and clinical outcomes after revascularisation. If a relationship exists, this could encourage service delivery to be tailored to an individual's activation level to optimise their post-procedural health outcomes, particularly by identifying those patients that require extra support before and after hospitalisation. It may also explain some of the discrepancies in post-operative outcomes between patients presenting with the same disease. Therefore, the aim of this study was to evaluate patient activation among patients with PAD and to determine whether this is associated with 30-day post-procedural outcomes. We hypothesise that patients with higher levels of patient activation have more favourable clinical outcomes than those with lower levels of activation.

Methods

Study Setting

The ***P***atient ***A***ctivation ***M***easure ***i***n ***L***ower ***L***imb ***A***rterial Disease (PAMiLLA) study is a single-centre, prospective, observational study conducted over a 6-month period (1st October 2023 –

1st April 2024). Ethics approval was granted on 14th July 2023 by the North of Scotland Research Ethics Committee (23/NS/0078).

Inclusion and Exclusion Criteria

Patients aged 18 years and over who had a planned endovascular or open revascularisation procedure for lower limb arterial disease between 1st October 2023 and 1st March 2024 were invited to participate. All participants had advanced PAD whereby revascularisation was indicated. Diagnosis was made using a compilation of duplex ultrasound, CT/MR angiography and invasive angiography. Patients who could not read or write in English were excluded as only the license for the English-language version of the PAM survey was available. Patients who were not willing or able to consent to participate were also excluded.

Sample Size

Research by the providers of the 13-item Patient Activation Measure (PAM)®, Insignia Health ©, reports a study must have at least 75 unique participants to allow for general evaluation of PAM score change, but lacks measurement power for evaluation by each of the four PAM activation levels. A sample of 200+ is recommended for PAM level evaluation in cross-sectional and longitudinal research. This study is a pragmatic vascular first with a limited timeframe, so will attempt to recruit 75 participants as a minimum target. This sample should allow for meaningful analysis relating to the research aims.

Recruitment

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Participants were identified from routine clinical encounters including outpatient clinics, multi-disciplinary team meetings, and operating theatre and endovascular procedure lists. Inpatients were approached on the vascular surgery ward whilst outpatients were contacted over the phone. All patients were informed about the study, provided with a participant information sheet, and given sufficient time to consider the information before consenting to participate.

All patients in our vascular unit undergo formal and informal education programmes prior to intervention. Formal educational programmes are delivered by vascular clinical nurse specialists and physiotherapists focusing on supervised exercise therapy, smoking cessation, and risk factor optimisation. This is supported by informal education in outpatient clinic appointments with vascular surgeons.

Patient Activation Measure Survey

The PAM survey was conducted by being read out prior to the revascularisation procedure, either over the phone (for outpatients) or in person (for inpatients). The primary outcome of this study is patient activation, measured using the 13-item PAM survey (Insignia Health ©) (17). The PAM survey is established as a general measure of activation. It includes 13 statements assessing a patients self-reported knowledge, skills, and confidence for self-management of their health (9,18). Patients are asked to rate their level of agreement to the statements using a Likert scale ranging from ‘disagree strongly’ to ‘agree strongly’ (Appendix A). Using the raw scores, the PAM is scored on a numerical scale from 0 to 100. The PAM score correlates to one of four levels of activation based on pre-set validated cut-off points: level 1 (≤47.0 points), level 2 (47.1–55.1 points), level 3 (55.2–67 points), and level 4 (≥67.1 points). Level 1 includes patients with the lowest activation scores, considered to be passive and lack confidence in managing their health. Level 2 indicates those with some knowledge;

however, they continue to believe that their healthcare is largely out of their control. Level 3 includes patients with the key facts, who are goal-oriented and building their self-management skills. Finally, level 4 indicates patients whose key focus is maintaining a healthy lifestyle and have adopted new behaviours. All surveys were conducted by a single researcher (GH).

Patient Characteristics

Demographic and clinical data was also collected from the patient at the time of completing the survey. Patients were asked about their age, gender, ethnicity, postcode, height, weight, current smoking and alcohol status, and comorbidities. This was cross-checked on the electronic medical record (EMR) system used by the NHS Trust. Patients' index of multiple deprivation (IMD) decile was determined from the postcodes using the 2019 English Index of Multiple Deprivation income domain, the official measure of relative deprivation in small areas in England (19). Indication for revascularisation and procedure was recorded from the EMR.

Clinical Outcomes

Clinical outcomes within 30 days of the revascularisation procedure were collected from the electronic medical record system. Clinical outcomes included (where relevant): bypass graft failure, reintervention, complications, major limb amputation, minor limb amputation, duration of hospital stay, hospital readmission, reattendance to the Accident & Emergency department, and mortality. Complications were defined as any deviation from the normal post-operative course and graded using the Clavien-Dindo classification. Duration of inpatient stay was classed as a continuous variable (number of days), whilst all other outcomes were coded as binary.

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Statistical Analysis

Categorical variables were described using frequencies and percentages. Continuous variables were described using mean and standard deviation (SD) or median and interquartile range (IQR). Normality tests were conducted for the PAM score. Differences in PAM score between patient characteristics groups were analysed using a Mann-Whitney-U test or Kruskal-Wallis test for non-parametric categorical variables. Univariate linear regression was used to identify which patient characteristics predicted PAM score. Variables with a P-value <0.1 were included in a multivariate linear regression model to examine which characteristics predicted PAM score.

For analysis of clinical outcomes, patients were stratified by procedure type (endovascular, or open and hybrid procedures). This was done to account for differences in the invasiveness and risk of complications of the procedure. The relationship between PAM score and clinical outcomes were analysed using a Spearman's rank-order correlation for continuous outcomes and summarised descriptively using median and IQR for categorical outcomes. Logistic regression analysis was used to evaluate whether PAM score could predict 30-day clinical outcomes. All statistical analyses were performed using IBM SPSS Statistics 28.0.

Results

Eighty patients were included in this study. Most patients were male (70%) and of white ethnicity (82%). The median age was 71 years (IQR 13 years) (Table 1). Patients were comorbid, with common co-morbidities including hypertension (74%), chronic kidney disease

(61%), hypercholesterolemia (60%), ischemic heart disease (40%), and type 2 diabetes (36%). The smoking rate amongst patients (30%) was higher than the national average (20) and the median body mass index (BMI) was 24.7 kg/m^2 (IQR 6.8). The study sample covered neighbourhoods from deciles 1 (high deprivation) to 10 (low deprivation); the median IMD was 4 (IQR 3). The most common indications for revascularisation were CLTI with tissue loss and short-distance claudication, at 28% each (Table 2). The most common procedure was native vessel angioplasty (52%), followed by graft angioplasty (12%).

In this patient group, the median PAM score was 53.2/100 (IQR 16.1). The PAM score was significantly lower for patients with type 2 diabetes versus those without (mean rank 29.4 versus 46.8, respectively, $p<0.001$), and for current smokers versus non-smokers (mean rank 37.0 versus 48.2, respectively, $p<0.05$). The majority (60%) of patients were classified as having low levels of activation (Level 1 or 2), whilst 23 patients (29%) fell into level 3, and 9 (11%) into level 4 (the highest level of activation). Further analysis evaluating the PAM levels was not performed as the study was not adequately powered to allow this. There was no difference in the median PAM score between patients who completed the survey over the phone compared to in person (53.2 for both groups). There was no difference in median PAM when stratified by indication for revascularisation: median PAM score was 52.1 for patients with at-risk grafts, 51.0 for patients with CLTI (with or without tissue loss), and 51.0 for patients with short-distance claudication (H-statistic 0.21, $p=0.899$). Additionally, there was no difference in median PAM score between patients undergoing endovascular, open, or hybrid procedures (H-statistic 0.65, $p=0.722$).

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Normality tests demonstrated PAM score was not normally distributed ($p<0.001$). A logarithmic transformation was performed to normalise the distribution of the PAM scores before analysis. Univariate linear regression was used to identify patient characteristics that predicted PAM score: type 2 diabetes, number of co-morbidities, age, current alcohol status of >14 units per week, and current smoking status (Table 3). These variables were then included in a multivariate regression model. The regression model statistically significantly predicted PAM score, $F(5, 72) =4.374$, $p=0.002$, $R^2=0.233$. Both age (95% CI: -0.01, 0.00, $p=0.05$) and type 2 diabetes (95% CI: -0.21, 0.00, $p=0.05$) added significantly to the prediction.

Analysis of 30-day clinical outcomes was split for endovascular procedures (n=47), or open and hybrid procedures (n=20) (Appendix B). A Spearman's rank-order correlation was run to determine the relationship between PAM score and duration of inpatient stay. There was no correlation between PAM score and duration of inpatient stay for either endovascular (95% CI: -0.38, 0.2, $p>0.05$), or open and hybrid procedures (95% CI: -0.49, 0.41, $p>0.05$).

PAM scores were descriptively analysed by 30-day clinical outcomes (Table 4). For most outcomes, the median PAM score did not differ by more than 4 points for patients who experienced the outcome and those who did not. While statistical tests were not performed, we noted the median PAM score was 17 points lower in patients who required re-intervention on the ipsilateral arterial tree within 30 days of a revascularisation procedure compared to those who did not (42 versus 59, respectively). Median PAM score was 7 points lower for those with bypass grafts that failed within 30 days versus those whose grafts remained patent (46 versus 53, respectively).

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Simple logistic regression was performed to determine the relationship between PAM score and 30-day clinical outcomes (Table 5). For both endovascular and open/hybrid procedures, PAM score did not significantly predict the likelihood of any of the clinical outcomes. Notably, for patients who underwent an open or hybrid procedure, for a one unit change in PAM score, the odds of amputation-free survival increased by 1.9, although this was not statistically significant ($p>0.05$).

Discussion

Improving patient education and clinical outcomes for patients with PAD was identified as a top priority in the James Lind Alliance Priority Setting process (21). Our study is therefore timely and relevant, as patient education and activation are connected. Despite this, measurement of patient activation is underused in the NHS despite the movement encouraging self-management of long-term chronic conditions. This is significant as PAD is a long-term largely lifestyle-related condition that requires patient engagement and commitment to lifestyle modifications to improve clinical outcomes. In our study, we found that most patients with PAD undergoing revascularisation procedures had low levels of activation, and only just over 1 in 10 patients had the highest level of activation. We found that activation was lower in current smokers and patients with type 2 diabetes. In our multivariate analysis, age and type 2 diabetes were significant predictors to the model. Lastly, we did not find a relationship between activation level and 30-day clinical outcomes after lower limb revascularisation procedures.

There are notable differences between our results and those of Humphries *et al.*, who evaluated patient activation in 257 patients with all types of vascular disease (PAD, venous, aortic, carotid, other). In their cohort, only 33.2% of patients reported level 1 or 2 activation, compared

to 60% in our study. Additionally, the median PAM score in their cohort was 64.3 compared to 53.2 in our cohort. They found no difference in patient activation between patients with different types of vascular disease, so the differences between our groups may be due to differences in healthcare delivery and patient education programmes in the United States and the UK, cultural differences, or other unmeasured factors.

Patient activation is known to be associated with better health behaviours, lower levels of healthcare utilisation, and greater quality of life in patients with chronic diseases (24), however its association with clinical outcomes is less studied. Longitudinal analyses investigating how the PAM predicts diabetes-related outcomes in more than 10,000 patients with diabetes or pre-diabetes has shown PAM level predicts cholesterol and blood pressure control in these patients. Furthermore, a higher PAM level was associated with lower odds of developing pre-diabetes (25). Given that type 2 diabetes is prevalent in patients with PAD, we had hypothesised that PAM would correlate with post-procedural outcomes in PAD patients undergoing revascularisation. Our study did not find this association for 30-day outcomes; however, we believe a longer follow-up period is needed and a difference may be found at 3-, 6-, or 12-months post-revascularisation.

Our descriptive analysis of PAM scores in patients experiencing different clinical outcomes showed that, following an open or hybrid procedure, patients who went on to have reintervention or whose bypass graft failed had lower PAM scores than those who did not experience these negative outcomes. Furthermore, logistic regression indicated higher PAM scores to be associated with a greater likelihood of amputation-free survival, but caution is required when interpreting these results since statistical significance was not reached and our

sample numbers were small. Nonetheless, small differences in PAM score are still likely to be clinically relevant. Research has shown that a difference of 4 points on the PAM scale to be meaningful; 4 points is often the difference between the average PAM score between those engaged in several healthy behaviours and those who are not (26–28). Furthermore, small shifts in healthcare utilisation can be highly impactful in terms of cost. For example, a US study investigating changes in activation scores following tailored coaching support report that a decline of 0.02 average hospital admissions translates into a saving of $145 per person per month, and a 0.02 emergency department visit reduction translates to an average of $11 saved per person per month (29). Thus, despite the lack of statistical significance in PAM scores between patients experiencing negative clinical outcomes and those who did not, the small differences observed may still have meaningful impact in terms of healthcare utilisation and cost.

Understanding and use of the PAM may also help to reduce health inequalities. Previous work has shown that health literacy, or an individual's ability to access and understand health information, is lower in areas of greater social deprivation (30). This is relevant considering patient understanding of health information is linked to their level of activation (31). Furthermore, there is direct evidence to show unequal distribution of patient activation across society. A US study of more than 4,000 individuals with at least one chronic condition showed that baseline patient activation levels were higher for white individuals, university graduates, those above the poverty threshold, and those with private medical insurance (32). A longitudinal study assessing use of an integrated care model for patients with diabetes and chronic kidney disease showed that patients from culturally and linguistically diverse (CALD) backgrounds had lower baseline activation scores than patients from non-CALD backgrounds. Over 12-months, there was a significant increase in patient activation levels in patients from

CALD-backgrounds, whereas the activation levels of those from non-CALD backgrounds did not change significantly (33), suggesting gains are to be made on tackling ethnic health inequalities. Considering 82% of our study population were white, it is not unreasonable to assume that the baseline activation scores we report are higher than for patients of other ethnic groups, limiting the translatability of our findings. Important work is needed to produce translatable PAM scores.

Despite formal and informal educational programmes provided in our vascular unit, patient activation in our study group was generally low. To address low rates of risk factor optimisation and lifestyle support for patients, a group in Leicester, UK developed and piloted a complex intervention in the form of a care bundle called the LEGS intervention. Part of the intervention included a patient and carer education leaflet which was co-developed with patients. Le Boutillier *et al*. conducted a multi-pronged qualitative research study to evaluate the factors influencing the feasibility and implementation of the intervention (34). In this study, patients highlighted the importance of timing of when they receive lifestyle advice – that is, interventions would be better received earlier in the disease process rather than when patients have late-stage disease and perceive it is "too late". Additionally, patients preferred information delivered face-to-face and stressed the value of the patient-provider relationship. These findings should be incorporated into educational and other interventions that aim to improve patient activation in patients with PAD.

Our study is the first study to our knowledge investigating patient activation in vascular surgery patients in the United Kingdom, thereby providing novel data and suggesting areas for further research. One strength of our study is that we only included a specific subset of vascular

patients, those with PAD. However, we did not capture the severity of the patient's disease or the length of time the patient had been living with the condition, both of which may contribute to a patient's activation level. Our study has several other limitations. A main weakness of this study is our small sample size which lacked power calculation, as we were unable to estimate a meaningful effect size from the literature. This prevented analysis of our data stratifying by PAM activation levels. This is important since sometimes there can be a continuous relationship between PAM score and outcomes, whilst in other circumstances there may be a threshold effect. Also, it is likely that the PAM levels (as opposed to the continuous scores) are more clinically useful when it comes to tailoring health service delivery to patients. Furthermore, a far greater percentage of participants underwent endovascular procedures versus open or hybrid procedures, likely due to bias in our recruitment strategy. Patients undergoing day-case endovascular procedures are typically healthier and engage more readily with clinicians. Unfortunately, we did not collect information on why some patients declined participation. Finally, we did not collect information on the patient's level of education or household income, both known to be associated with PAM scores (13).

Conclusion

This study shows that patient activation is generally low among PAD patients undergoing lower limb revascularisation. In our analysis, there was no statistically significant relationship between PAM score and 30-day clinical outcomes, but median PAM scores were lower in patients whose bypass grafts failed and those who required reintervention within 30-days. We would recommend further study with a larger sample size and a longer follow-up period, as differences in clinical outcomes may appear in the medium or long-term. If patient activation is associated with clinical outcomes, tailoring support by activation level with the aim of

increasing self-management of this long-term condition could improve health outcomes and reduce healthcare spending.

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Table 1. Baseline patient characteristics

Patient Characteristic	**N = 80**
	Median (IQR)
Age (years)	71 (3)
Body mass index (kg/m^2)	24.7 (6.8)
IMD[1]	4 (3)
Median PAM score	53 (16)
PAM level	**n (%)**
1	21 (26%)
2	27 (34%)
3	23 (29%)
4	9 (11%)
Gender	
Male	56 (70%)
Female	24 (30%)
Ethnicity	
White	66 (82%)
Asian or Asian British	7 (9%)
Black, Black British, African, or Caribbean	3 (4%)
Mixed or multiple ethnic groups	3 (4%)
Other	1 (1%)
Smoking status	
Never smoked	23 (29%)
Current smoker	24 (30%)
Ex-smoker	33 (41%)
Alcohol consumption	
None	28 (35%)
≤14 units per week	36 (45%)
>14 units per week	16 (20%)
Comorbidities	
Type 1 diabetes	7 (9%)
Type 2 diabetes	29 (36%)
Hypertension	59 (74%)
Hypercholesterolemia	47 (60%)
Ischaemic heart disease	32 (40%)
Heart failure	12 (15%)
Atrial fibrillation	19 (24%)
Chronic obstructive pulmonary disease	18 (22%)
Cerebrovascular disease (previous stroke or transient ischemic attack)	17 (21%)
Chronic kidney disease[2]	49 (61%)
End-stage renal failure	5 (6%)
Previous lower limb revascularisation	39 (50%)
Previous minor lower limb amputation	10 (13%)
Previous major lower limb amputation	4 (5%)

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Number of comorbidities	
0	3 (4%)
1-3	41 (51%)
4-6	34 (43%)
6+	2 (2%)
Method of survey completion	
PAM survey conducted face-to-face	27 (34%)
PAM survey conducted over the phone	53 (66%)

[1] Determined from patient's postcode using the 2019 English Index of Multiple Deprivation (IMD) income domain, on a scale from 1 – 10 (1=most deprived, 10=least deprived).

[2]Determined from most recent eGFR blood result.

Table 2. Indications for revascularisation and procedures performed

Indication for Revascularisation	**N = 67**
	N (%)
CLTI with tissue loss	19 (28%)
Short-distance claudication	19 (28%)
CLTI	15 (22%)
At risk graft on surveillance duplex scan	10 (15%)
Non-healing wound	2 (3%)
Claudication with significant quality of life impairment	1 (2%)
Claudication – optimisation prior to major orthopaedic surgery	1 (2%)
Procedures	**N = 67**
	N (%)
Native vessel angioplasty	35 (52%)
Graft angioplasty	8 (12%)
Combined procedures otherwise unable to categorise	7 (11%)
Endarterectomy	6 (9%)
Aortouni/bifemoral bypass or ileofemoral bypass	5 (8%)
Iliac stenting	3 (4%)
Fem-distal bypass	3 (4%)

Table 3. Linear regression analysis of numerical PAM score based on patient characteristics

Patient characteristic	**R-squared**	**P-value**
Type 2 diabetes	**0.14**	**<0.001**
Number of co-morbidities	**0.11**	**<0.01**
Age	**0.08**	**<0.01**

Significant alcohol consumption (>14 units/week)	**0.05**	**0.04**
Current smoker	**0.05**	**0.06**
Ethnicity	0.01	0.49
BMI	0.00	0.65
Sex	0.02	0.29
IMD	0.00	0.89
Multivariable model including the highlighted variables (p<0.1)	0.23	<0.01

Table 4. Numerical summary of PAM scores for binary clinical outcomes

Clinical outcome	Endovascular (n=47)		Open/hybrid (n=20)	
	Median PAM score (IQR)			
Reintervention on ipsilateral arterial tree[1]	Yes (n=5) 53 (6)	No (n=7) 45 (23)	Yes (n=7) 42 (13)	No (n=2) 59[4]
Complications	Yes (n=11) 51 (10)	No (n=36) 53 (15)	Yes (n=11) 51 (23)	No (n=9) 53 (10)
Major amputation	Yes (n=2) 51[4]	No (n=45) 53 (12)	Yes (n=1) -[4]	No (n=19) 53 (21)
Minor amputation	Yes (n=5) 53 (23)	No (n=42) 51 (12)	Yes (n=0) -[4]	No (n=20) 52 (20)
Readmission[2]	Yes (n=4) 51 (3)	No (n=41) 53 (14)	Yes (n=15) 53 (5)	No (n=3) 51 (21)
Emergency department attendance[2]	Yes (n=7) 53 (7)	No (n=38) 51 (16)	Yes (n=3) 53[4]	No (n=14) 52 (22)
Death	Yes (n=1) -[4]	No (n=46) 52 (12)	Yes (n=0) -[4]	No (n=20) 52 (20)
Amputation free survival	Yes (n=43) 53 (13)	No (n=4) 51 (2)	Yes (n=19) 53 (21)	No (n=1) -[4]
Bypass graft failure (n=22[3])	-		Yes (n=2) 46[4]	No (n=20) 53 (20)

[1]Of patients who had a reintervention

[2]Not including patients who were not discharged from hospital within 30 days

[3]Of patients who had bypass grafts

[4] n ≤3 so median and/or IQR not calculable

Table 5. Results from the logistic regression models showing the effect of PAM score on categorical clinical outcomes

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NB: There are no results for open and hybrid procedures for the outcomes minor amputation or death because n=0.

Clinical outcome	B (Odds Ratio)	P-value	95% CI (lower)	95% CI (upper)	Nagelkerke R^2 value
Endovascular procedures					
Reintervention on ipsilateral arterial tree[1] (n=5)	1.00	0.96	0.89	1.12	0.00
Complications[1] (n=11)	0.94	0.16	0.86	1.03	0.08
Major amputation (n=2)	0.97	0.69	0.83	1.14	0.01
Minor amputation (n=5)	1.03	0.48	0.96	1.10	0.02
Readmission[2] (n=4)	0.97	0.57	0.87	1.08	0.02
Emergency department attendance[2] (n=7)	0.99	0.83	0.92	1.07	0.00
Death (n=1)	0.96	0.78	0.77	1.21	0.01
Amputation free survival (n=43)	1.03	0.63	0.92	1.15	0.01
Open and hybrid procedures					
Reintervention on ipsilateral arterial tree[1] (n=7)	0.94	0.18	0.85	1.03	0.13
Complications (n=11)	1.01	0.90	0.93	1.09	0.00
Major amputation (n=1)	0.53	0.46	0.10	2.86	0.40
Readmission[2] (n=3)	0.99	0.99	0.89	1.12	0.00
Emergency department attendance[2] (n=3)	0.99	0.97	0.89	1.11	0.00
Amputation free survival (n=19)	1.89	0.46	0.35	1.19	0.39

[1]Complications were defined as any deviation from the expected post-operative course and graded using the Clavien-Dindo classification.

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