Quality of provided care in vascular surgery : outcome assessment & improvement strategies

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Part 3

Quality of life

Chapter 8

Revascularization in Peripheral Arterial Disease:

Lack of Social Support is Associated with Prolonged in-Hospital Length of Stay

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ABSTRACT

Objectives: Patient-centered variables such as social support are increasingly being recognized as important for outcomes in patients with intermittent claudication (IC). Whether patient-centered indicators are associated with in-hospital length of stay (LOS) and the type of invasive treatment IC patients receive is unknown.

Materials and methods: IC patients receiving invasive treatment were enrolled from the Elisabeth Hospital, the Netherlands. Patients received a diagnostic work-up and chart abstraction was performed at baseline. Perceived social support was assessed with the perceived social support (PSS) by PSS-scale at baseline. Primary endpoints were LOS and type of lower extremity arterial revascularization (LEAR).

Results: A total of 116 patients (63% male, mean age=63±9.8 years) were revascularized for IC. Low familial PSS (=lowest tertile) was present in 27.6% of the patients. LOS was prolonged in the low family PSS group as compared with the high PSS group (M=5.0±5.3 days vs. M=3.5±2.6 days, *P*=0.03). In the multivariable linear regression analysis (adjusting for age, sex, risk score, lowest ABI, history of revascularization, and type of treatment [PTA vs. surgery], higher PSS scores were associated with shorter LOS (B=-.074, CI95% -.145;-.003). In this analysis, undergoing a PTA was also associated with a shorter LOS (B=-5.925, CI95% -7.293; 4.558).

Conclusion: Lack of familial PSS was independently associated with prolonged LOS in IC. Furthermore, low PSS was more often associated with open vascular surgical treatment in stead of minimal invasive procedures. Further research is needed to study the nature of these associations and to study PSS in relation to long term outcomes in IC.

INTRODUCTION

Intermittent claudication (IC) severely impacts health status and quality of life (QOL) [1, 2] . Patients with IC are limited not only in their walking capacity and physical activity, but also demonstrate substantial impairment in other QOL domains including social functioning, emotional, and mental health [1, 3, 4].

IC can usually be managed conservatively with only 5-10% of patients requiring intervention within five years of presentation [5]. The most important outcome measure for the IC patient is relief of symptoms, whereas graft patency and operative mortality represent the traditional outcome measures for assessment of lower extremity arterial revascularization (LEAR) because of IC. More recently, however, the focus is shifting from lesion- and graft-oriented results to more patient-based outcomes evaluating the effect of LEAR on functional outcome and QOL. More rarely, efforts are being made to evaluate the impact of these patient-based differences, which often have their origin in the psychosocial context of the patient, on disease outcomes and patency rates in patients [6] with peripheral arterial obstructive disease (PAOD).

In other cardiovascular diseases, the influence of psychological variables, such as perceived social support (PSS), on health outcomes is more extensively documented [7-10]. The quality of one's PSS system is reflected in having perceived access to both practical help and emotional support from the patient's personal environment. In line with these findings, low PSS is known to be associated with adverse health outcomes, and excess mortality in myocardial infarction patients [9]. PSS of patients with a chronic disease is needed to have a sense of embededdness which can help them to master difficulties inherent to their disease and treatment. PSS influences the extent to which patients engage in unhealthy behaviors such as smoking, fatty diet intake, and excessive alcohol consumption [10].

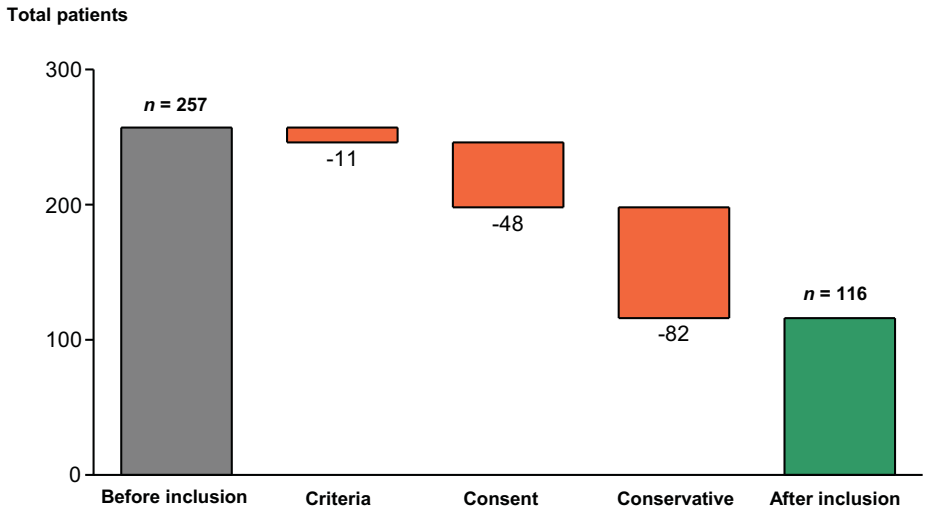
There is some evidence that IC patients with inadequate PSS may fail to seek appropriate treatment [11], but evidence that relates patients' PSS system to prognosis and disease outcomes in IC is lacking. The present study focuses on short-term outcomes after LEAR in patients with IC and aims to (1) evaluate the role of PSS on in-hospital length of stay (LOS) and (2) examine whether differences with regard to type of LEAR are related to the level of PSS.

MATERIALS AND METHODS

Patients

A total of 116 patients with newly diagnosed IC were consecutively enrolled at the vascular outpatient clinic of the department of vascular surgery of the St. Elisabeth Hospital in Tilburg, the Netherlands (Figure 1); they were evaluated during the 30-day post-LEAR period. The criterion for inclusion in the study population was intermittent claudication (IC). IC was defined as extremity pain, discomfort, or weakness that is consistently produced by the same amount of walking or equivalent muscular activity in a given patient and that is promptly relieved by cessation of that activity with a pain free walking distance (PFWD) < 100 meters and an AP after exercise < 50 mmHG (Fontaine stage IIb). This corresponds with category 3 of the Society of Vascular Surgery / North American Chapter of the International Society for Cardiovascular surgery (SVS/ISCVS) standards [12] and according to the Trans-Atlantic Inter-Society Consensus Document on Management of Peripheral Arterial Disease (TASC) guidelines [5, 13]. The included femoral popliteal lesions were according to the TASC-classification type A, B or C for plaque morphology. All patients in this study were treated with a lower extremity arterial revascularization (LEAR) procedure. Resting ankle-brachial index (ABI), ABI after exercise, maximum (MWD), and pain-free walking distance (PFWD) were determined in all patients at base-

Figure 1. Flowchart of patients that were included in this study (*n*=116).



Data are presented as *n*, unless otherwise specified.
IC=intermittent claudication. Excluded patients=Six patients were excluded from the study due to cognitive impairment (two patients), recent myocardial infarction, visual problems, illness (flu), and participation in another study.

line. The study was designed according to the Helsinki Declaration and was approved by the local ethics committee. All 116 patients signed an informed consent paper and completed a measure of social support at baseline. The total length of stay (LOS) was defined as the number of days from date of admission to date of discharge.

Risk factors and comorbidity

Risk factors and comorbidity were registered prospectively of all patients during their admission intake. Smoking, hypertension, cardiac disease, hyperlipidaemia, diabetes mellitus, renal disease, pulmonary disease, carotid disease and age were classified according to the SVS/ISCVS standards and according to the TASC. The risk factor and comorbidity management, according to TASC and the AHA/ACC [14, 15] were either conducted by a vascular specialist or cardiologist preoperatively in the out patient clinic or during admission before operation when urgent intervention was indicated.

Medication

Medication use according to the TASC- and AHA/ACC guidelines was listed by the patients at baseline; all reported medications were reviewed and classified according to the following categories: psychotropic medication, ACE-inhibitors and calcium channel blockers: blood pressure lowering agents (BPLA), anti-platelet agents (APA), β-blockers: heart rate lowering agents (HRLA) and lipid lowering agents (LLA).

Social support

PSS adequacy was assessed with the Multidimensional Scale of Perceived Social Support (MSPSS) and was administered and determined before the diagnosis IC was made; it is a validated tool to objectify this attribute. It consists of 12 items that are rated on a 7-point rating scale ranging from "*very strongly disagree*" to *"very strongly agree"* [16]. Three sources of PSS are addressed, i.e., family, friends, or significant other. The MSPSS has good internal and test-retest reliability, and moderate construct validity; Cronbach's alphas for the scale as a whole and for the subscales range from .85 to .91. The scale and its subscales are inversely related to both depression and anxiety. The MSPSS is validated across a number of healthy and somatic populations [17, 18].

Revascularization

The vascular treatment (LEAR) consisted of percutaneous transluminal angioplasties (PTAs) endaterectomies (EAs) and bypass graft procedures (BGP). The PTAs were carried

out by conventional balloon dilatation of the lesion with or without stent placement and were performed under regional anaesthesia. EAs and BGPs were performed according to standard vascular techniques. For the BGPs, we preferably used reversed vein for femoral popliteal (supra - and infragenual) and crural BGPs. The decision to intervene and the type of intervention were driven by the SVS/ISCVS - and TASC reporting standards.

Adverse events

In the Netherlands, the Association of Surgeons of the Netherlands (ASN) has agreed on one common definition of AEs [19, 20]. This definition differs from that used in other studies because it has been chosen with the explicit aim of excluding subjective judgment on cause and effect, and right and wrong. The definition of an AE is: "an unintended and unwanted event or state occurring during or following medical care, that is so harmful to a patient's health that (adjustment of) treatment is required or that permanent damage results. The AE may be noted during hospitalization, until 30 days after discharge or transferee to another department. The intended result of treatment, the likelihood of the adverse outcome occurring, and the presence or absence of a medical error causing it, is irrelevant in identifying an adverse outcome". This definition did not change during the study period. An AE is identified by one of the physicians in the surgical team who documents the AE in an electronic medical file real time. This file is operational throughout the hospital and the outpatient clinic, which makes recording easy. In-hospital and at the outpatient clinic, documented AEs are automatically presented at the daily surgical conference and discussed. As listed in Appendix 1, the AEs were subdivided into four groups: minor, surgical, failed revascularization and systemic.

Statistical analyses

To detect differences in LOS as a function of perceived social support, Student's t-tests were performed for the three social support subscales and for the total social support scale. Prior to these analyses, the scales were dichotomized, with the lowest tertile indicating the low social support group. Others have also advocated dichotomization of patient-based measures to facilitate interpretability for clinical practice [21]. Chi-square tests were used to detect differences in type of LEAR (PTA, EA and BGP) as a function of perceived social support scales. Chi-square tests and Student's t-tests were used to examine baseline differences between patient groups with regard to social support.

The independent association between low PSS and LOS was evaluated in a multivariable linear regression analysis using LOS as dependent variable, adjusting for age, sex, risk score, type of LEAR, and the occurrence of an AE, ABI, and history of LEAR. Next, to evaluate the independent association between low PSS and type of LEAR (surgery

vs. endovascular; endovascular was used as the reference category), a multivariable logistic regression analysis was performed using type of LEAR as dependent variable. All analyses were conducted with SPSS Version 16.0 (SPSS, Inc, Chicago, IL) using a *P*-value <0.05 as the criterion for statistical significance.

RESULTS

Patients' characteristics

Comorbidity

Baseline characteristics for the total sample and stratified by social support from patients' family are presented in Table 1. There were no statistically significant differences between the low vs. high familial PSS group. However, non-significant trends were observed for the low PSS group towards a lower ABI (*P*=0.11), more cardiac disease (*P*=0.15), and more psychotropic medication use (*P*=0.10).

Peripheral arterial occlusive disease

Concerning the TASC type of femoral popliteal lesion, no difference was seen between both groups (TASC A: total *n*=51, 44%; low PSS: *n*=9, 28% vs. high PSS: *n*=42, 50% and TASC B: total *n=49*, 42%; low PSS: *n*=18, 56% vs. high PSS: *n*=31, 37% and 16 patients (14%) with TASC C lesions: low PSS: *n*=5, 16% vs. high PSS: *n*=11, 13%, *P*=0.09). A summary of patients' TASC - classification for femoral popliteal lesion is listed in Table 1.

Revascularization

No significant differences were found regarding the type of LEAR stratified by PSS, except for PSS from patients' family. Patients with inadequate PSS from their family tended to undergo more frequently an EA (χ^2=4.8, *P*=0.03). A non-statistically significant trend was also observed regarding PTA; patients with low PSS from their family tended to receive less frequently a PTA (χ^2=2.4, *P*=0.12) (Table 2).

Adverse events

PSS was not associated with postoperative AEs (*P*=0.78) including the registered AE groups minor other AEs, surgical AEs and failed revascularization stratified by PSS as listed in Table 2.

Table 1. Baseline characteristics of the total sample (*n*=116) and stratified by low and high social support.

Characteristics	**total** *n*=116	**Low PSS** *n*=32	**High PSS** *n*=84	*P*-value
Gender				**0.55**
Male	73 (63)	20 (62)	69 (63)	
Female	43 (37)	12 (38)	31 (37)	
Patients				
Mean age (SD), yrs	63.0 (9.8)	61.3 (9.0)	63.6 (10.0)	0.27
Education level	83 (72)	23 (72)	60 (71)	0.48
Having no partner	34 (29)	8 (25)	26 (31)	0.34
Clinical manifestation				
Mean ABI (SD)	61.3 (16.3)	59.9 (16.8)	65.5 (14.3)	0.11
Mean PFWD (SD), m	107.4 (321.5)	99.3 (122.6)	110.1 (163.9)	0.74
Mean MWD (SD), m	321.5 (297.4)	304.1 (268.2)	327.5 (308.1)	0.71
Comorbidity				
Cardiac disease	37 (32)	13 (41)	24 (29)	0.15
Pulmonary disease	7 (6)	3 (9)	4 (5)	0.29
Carotid disease	13 (11)	4 (13)	9 (11)	0.50
Diabetes mellitus	21 (18)	7 (22)	14 (17)	0.34
Hypertension	47 (41)	13 (41)	34 (40)	0.57
Renal disease	6 (5)	1 (3)	5 (6)	0.47
Tobacco use	70 (60)	18 (56)	52 (62)	0.36
Hyperlipidaemia	64 (55)	19 (59)	45 (54)	0.36
Medication				
Psychotropic	13 (11)	6 (19)	7 (8)	0.10
HRLA	23 (20)	6 (19)	17 (20)	0.54
BPLA	23 (10)	8 (25)	15 (18)	0.40
LLA	37 (32)	12 (38)	25 (30)	0.35
APA	26 (22)	8 (25)	18 (21)	0.80
TASC-classification				
Femoral popliteal lesions				0.09
Type A lesion	51 (44)	9 (28)	42 (50)	
Type B lesion	49 (42)	18 (56)	31 (37)	
Type C lesion	16 (14)	5 (16)	11 (13)	

Data are presented as *n* and (%), unless otherwise specified.
PSS=perceived social support; *SD*=standard deviation; *yrs*=years; *ABI*=ankle brachial index; *PFWD*=pain free walking distance; *m*=meters; *MWD*=maximum walking distance; *ACE*=angiotensin-converting enzyme; *BPLA*=blood pressure lowering agent (ACE inhibitor & calcium channel blocker); *APA*=anti-platelet agent; *HRLA*=heart rate lowering agent (ß-blocker); *LLA*=lipid lowering agent (HMG-CoA-reductase inhibitor); *TASC*=Trans-Atlantic Inter-Society Consensus Document on Management of Peripheral Arterial Disease.

Table 2. Summary of primary revascularization and perioperative AEs (<30 days) stratified by low and high PSS.

Subject	**total** *n*=116	**Low PSS** *n*=32	**High PSS** *n*=84	*P*-value
LEAR				
Endovascular	94 (81)	23 (72)	71 (85)	0.10
Surgical	22 (19)	9 (28)	23 (15)	
EA	6 (5)	4 (13)	2 (2)	0.04
BGP	16 (14)	5 (16)	11 (13)	0.72
ADVERSE EVENTS				
Patients with	12 (10)	5 (16)	7 (8)	0.78
Surgical	7 (41)	2 (40)	5 (42)	0.42
Failed revascularization	10 (59)	3 (60)	7 (58)	0.91
PTA	8 (80)	2 (66)	6 (86)	0.87
BGP	2 (20)	1 (34)	1 (14)	0.47

Data are presented as *n* and (%), unless otherwise specified.
AE=adverse event; *PSS*=perceived social support; *PTA*=percutaneous transluminal angioplasty; EA=endarterectomy; *BGP*=bypass graft procedure.

Length of stay

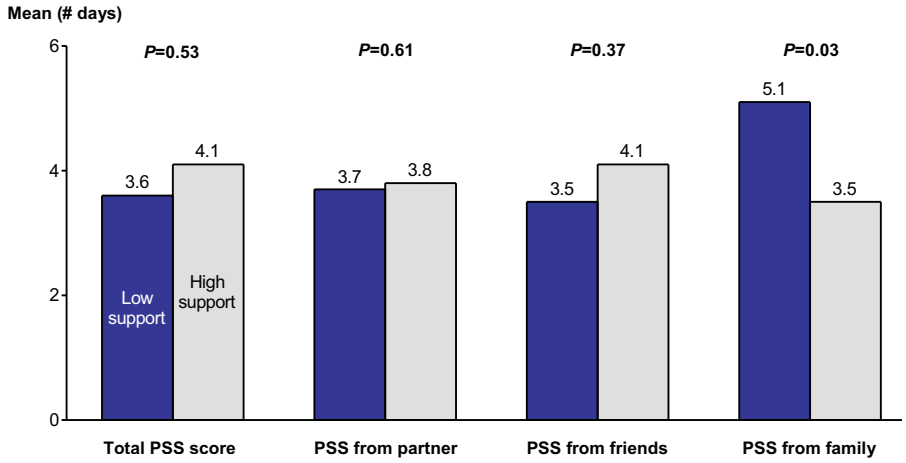
LOS did not differ for groups based on the total PSS score (mean low support=3.6 days vs. high support=4.1 days, *P*=0.53) and the PSS from partner (mean low support=3.7 days vs. high support=3.8 days, *P*=0.61) and friends (mean low support=3.5 days vs. high support=4.1 days, *P*=0.37) scales. In contrast, there was a significant difference for the PSS groups based on family support (mean low support=5.1 days vs. high support=3.5 days, *P*=0.03) (Figure 1).

Multivariate analyses

In the multivariable linear regression analysis (adjusting for age, sex, risk score, lowest ABI, history of revascularization, and type of treatment [PTA vs. surgery], higher PSS scores were associated with shorter LOS (B=-.074, CI95% -.145;-.003). In this analysis, undergoing a PTA was also associated with a shorter LOS (B=-5.925, CI95% -7.293; 4.558). Subsequently, a multivariable logistic regression analysis (adjusting for age, sex, risk score, lowest ABI, and history of revascularization) was performed using type of LEAR (surgery vs. endovascular; endovascular was used as the reference category) as dependent variable; patients that reported low PSS more often received surgery (OR=3.3, CI 95% 1.028-10.620, *P*=0.05). Female patients (OR=0.3, CI 95% 0.087-1.017,

P=0.05) and patients with a higher ABI, were less likely to undergo surgery (OR=0.9, CI 95% 0.913-0.984, *P*<0.01).

Figure 2. Number of hospitalization days, stratified by level of perceived social support.



Data are presented as *n*, unless otherwise specified.
PSS=perceived social support.

DISCUSSION

In the present study, we demonstrated that lack of PSS from the patients' family prolonged LOS in IC patients after LEAR, adjusting for demographics, ABI, type of LEAR, and risk factors. Furthermore, low PSS was more often associated with receiving surgical treatment rather than an endovascular procedure.

PAOD is clinically manifested by IC and is associated with higher mortality rates and a major adverse impact on quality of life. It is also associated with long-term cardiovascular events because of underlying generalized atherosclerotic processes [22, 23]. PAOD patients typically have multiple cardiovascular risk factors, such as smoking, diabetes mellitus, hypertension, and chronic renal insufficiency, which put them at high risk for fatal cardiovascular events [5]. Aggressive primary and secondary risk factor management is needed to influence the development or course of the PAOD [5]. Besides the focus on these traditional risk factors, more and more efforts are being made to study the psychosocial factors in relation to patient-based outcomes and prognosis in PAOD [3, 10, 24, 25]. Moreover in coronary artery disease (CAD), extensive literature has established that psychosocial factors, such as PSS, contribute to the pathogenesis of CAD [7, 9, 25-31].

Social isolation has been associated with mortality and morbidity in individuals with established CAD, those who are relatively socially isolated being at the highest risk [8, 30,

[32-41]. Lack of social support also portends a poor prognosis in patients after myocardial infarction [28, 29]. The underlying mechanisms remain to be identified. A variety of explanations have been offered to account for the association between social isolation and mortality. One hypothesis is that isolated patients are more ill and may delay seeking medical care. Alternatively, individuals who are more ill may become more isolated [37]. Social isolation may indirectly affect survival through its relation with psychological distress, disease severity, demographic factors, or some other unknown confounding factor [37]. While the relationship between social support and cardiovascular outcomes is strong and consistent, relatively few studies have investigated the impact of patient-based differences, with regard to their social support in particular, on disease outcomes in PAOD. To the best of our knowledge, there has been no previous study evaluating the relationship of PSS of IC patients on short-term outcomes after LEAR. To understand the overall effects of LEAR in IC patients, the procedures and hospital stay were not only evaluated in terms of traditional clinical factors, but also in terms of patient-based measures, such as PSS. Gaining insight into the role of patient-based measures associated with outcomes in PAOD is important to identify patients being at increased risk for adverse outcomes.

The results of the current study indicate that no differences exist between the low vs. high PSS group concerning baseline patient characteristics. Therefore, the significant difference in LOS in this study cannot be attributed to a difference in patient demographics or clinical risk factors.

Various aspects of PSS were examined, i.e. social support received from family, friends, or significant others, as potential risk factors for adverse outcomes among IC patients receiving LEAR. LOS was different for patients that perceived low social support from their family. LOS did not differ for groups based on the total PSS scale and the PSS from partner or friends. Likewise, Cassel [42] and Cobb [43] observed that patients who were more socially connected appeared to have better prognosis in recovering from illness or in maintaining their health. Their conceptualization of social support emphasized feelings of belongingness.

There was an independent relationship between LOS and PSS from patients' family, at the disadvantage of the low PSS group, resulting in an increased LOS compared to the high PSS group. Besides the fact that a prolonged LOS results in an increase of financial costs, it might also result in an increased chance of having postoperative AEs resulting in more morbidity for the individual patient and therefore decrease the patient's quality of life. Because levels of family PSS are associated with LOS after surgery, and it is likely that social support from closer persons (i.e., friends and particularly the family) is predictive of health [44], evaluation of the efficacy of the PSS is warranted. Clinicians should be aware of the potential consequences of low levels of family PSS and include a few simple questions like those used in our research to find out about the patient's views of the

availability and adequacy of their social support system. Important to stress is that there were no problems in organized caring in daily activities for patients who underwent vascular surgery with trained nursing personnel at home after admission. The present findings add to and advance our knowledge and understanding of this area.

Patients with inadequate PSS from their family tended to undergo more frequently an EA. Even when adjusted for ABI and clinical risk factors, lack of PSS was associated with an increased risk of undergoing surgery in stead of a minimal invasive procedure. Putative effects of social factors may be mediated through effects on the coagulation system [45, 46]. The effects on the atherosclerotic process, however, have been studied and associations between different aspects of PSS and presence or extent of coronary artery disease have been found in angiographic studies [47, 48].

There was no relation between high or low PSS and perioperative AEs. More important, no difference was found between both groups in the primary goal of treatment of these IC patients; successful LEAR by PTA or a BGP. This could be explained by the fact that there were no differences in baseline patient characteristics, the patients were treated according to the same pre - and postoperative guidelines and vascular surgeons during the study period.

Limitations of the study

There are several limitations of the present findings. The PSS assessments were based on self-report measures and clinical ratings may have yielded different results. However, a short self-report questionnaire is easy to adopt in clinical practice and patient burden is brought to a minimum. The sample was composed exclusively of patients with IC, and our results may not generalize to other patient samples. Therefore, future studies are warranted to replicate our findings across PAOD patients. Sample size was limited in this study. Nevertheless, the effect of low social support was discerned in our small sample and even after controlling for important clinical risk factors. This study also has several strengths, such as the longitudinal design of the study; social support was assessed prior to the LEAR and short-term outcomes were subsequently recorded. Furthermore, it was the first of its kind evaluating the role of PSS on in-hospital LOS and examining whether differences with regard to type of LEAR are related to the level of PSS in PAOD patients.

CONCLUSION

This study identifies IC patients who lack social support that have worse short term outcomes after LEAR. PSS from the patients' family independently predicted prolonged LOS in IC patients. Furthermore, low PSS was more often associated with surgical treatment

in stead of minimal invasive procedures. These results are in line with the vast literature regarding social support and prognosis in CAD and underscore the importance of future studies that examine the nature of these associations and its relation with long term outcomes in IC.

REFERENCES

1. Breek JC, de Vries J, van Heck GL, van Berge Henegouwen DP, Hamming JF. Assessment of disease impact in patients with intermittent claudication: Discrepancy between health status and quality of life. J Vasc Surg 2005; 41(3): 443-50.
2. Vogt MT, Wolfson SK, Kuller LH. Lower extremity arterial disease and the aging process: A review. J Clin Epidemiol 1992; 45(5): 529-42.
3. Aquarius AE, Denollet J, Hamming JF, Breek JC, De Vries J. Impaired health status and invasive treatment in peripheral arterial disease: A prospective 1-year follow-up study. J Vasc Surg 2005; 41(3): 436-42.
4. Pell JP. Impact of intermittent claudication on quality of life. The scottish vascular audit group. Eur J Vasc Endovasc Surg 1995; 9(4): 469-72.
5. Norgren L, Hiatt WR, Dormandy JA, Nehler MR, Harris KA, Fowkes FG, Bell K, Caporusso J, Durand-Zaleski I, Komori K, Lammer J, Liapis C, Novo S, Razavi M, Robbs J, Schaper N, Shigematsu H, Sapoval M, White C, White J, Clement D, Creager M, Jaff M, Mohler E, 3rd, Rutherford RB, Sheehan P, Sillesen H, Rosenfield K. Inter-society consensus for the management of peripheral arterial disease (tasc ii). Eur J Vasc Endovasc Surg 2007; 33 Suppl 1: S1-75.
6. Cherr GS, Wang J, Zimmerman PM, Dosluoglu HH. Depression is associated with worse patency and recurrent leg symptoms after lower extremity revascularization. J Vasc Surg 2007; 45(4): 744-50.
7. Rosengren A, Wilhelmsen L, Orth-Gomer K. Coronary disease in relation to social support and social class in swedish men. A 15 year follow-up in the study of men born in 1933. Eur Heart J 2004; 25(1): 56-63.
8. Burg MM, Barefoot J, Berkman L, Catellier DJ, Czajkowski S, Saab P, Huber M, DeLillo V, Mitchell P, Skala J, Taylor CB. Low perceived social support and post-myocardial infarction prognosis in the enhancing recovery in coronary heart disease clinical trial: The effects of treatment. Psychosom Med 2005; 67(6): 879-88.
9. Lett HS, Blumenthal JA, Babyak MA, Strauman TJ, Robins C, Sherwood A. Social support and coronary heart disease: Epidemiologic evidence and implications for treatment. Psychosom Med 2005; 67(6): 869-78.
10. Rozanski A, Blumenthal JA, Kaplan J. Impact of psychological factors on the pathogenesis of cardiovascular disease and implications for therapy. Circulation 1999; 99(16): 2192-217.
11. Aquarius AE, Denollet J, Hamming JF, De Vries J. Age-related differences in invasive treatment of peripheral arterial disease: Disease severity versus social support as determinants. J Psychosom Res 2006; 61(6): 739-45.
12. Rutherford RB, Baker JD, Ernst C, Johnston KW, Porter JM, Ahn S, Jones DN. Recommended standards for reports dealing with lower extremity ischemia: Revised version. J Vasc Surg 1997; 26(3): 517-38.

13. Dormandy JA, Rutherford RB. Management of peripheral arterial disease (pad). Tasc working group. Transatlantic inter-society consensus (tasc). J Vasc Surg 2000; 31(1 Pt 2): S1-S296.
14. Hirsch AT, Haskal ZJ, Hertzer NR, Bakal CW, Creager MA, Halperin JL, Hiratzka LF, Murphy WR, Olin JW, Puschett JB, Rosenfield KA, Sacks D, Stanley JC, Taylor LM, Jr., White CJ, White J, White RA, Antman EM, Smith SC, Jr., Adams CD, Anderson JL, Faxon DP, Fuster V, Gibbons RJ, Hunt SA, Jacobs AK, Nishimura R, Ornato JP, Page RL, Riegel B. Acc/aha guidelines for the management of patients with peripheral arterial disease (lower extremity, renal, mesenteric, and abdominal aortic): A collaborative report from the american associations for vascular surgery/society for vascular surgery, society for cardiovascular angiography and interventions, society for vascular medicine and biology, society of interventional radiology, and the acc/aha task force on practice guidelines (writing committee to develop guidelines for the management of patients with peripheral arterial disease)--summary of recommendations. J Vasc Interv Radiol 2006; 17(9): 1383-97; quiz 1398.
15. Hunt SA, Abraham WT, Chin MH, Feldman AM, Francis GS, Ganiats TG, Jessup M, Konstam MA, Mancini DM, Michl K, Oates JA, Rahko PS, Silver MA, Stevenson LW, Yancy CW, Antman EM, Smith SC, Jr., Adams CD, Anderson JL, Faxon DP, Fuster V, Halperin JL, Hiratzka LF, Jacobs AK, Nishimura R, Ornato JP, Page RL, Riegel B. Acc/aha 2005 guideline update for the diagnosis and management of chronic heart failure in the adult: A report of the american college of cardiology/american heart association task force on practice guidelines (writing committee to update the 2001 guidelines for the evaluation and management of heart failure): Developed in collaboration with the american college of chest physicians and the international society for heart and lung transplantation: Endorsed by the heart rhythm society. Circulation 2005; 112(12): e154-235.
16. Zimet GD DN, Zimet SG, Farley GK. The multidimensional scale of perceived social support. J Pers Assesst. 1988; 52: 30-41.
17. Eker D, Arkar H. Perceived social support: Psychometric properties of the mspss in normal and pathological groups in a developing country. Soc Psychiatry Psychiatr Epidemiol 1995; 30(3): 121-6.
18. Cecil H, Stanley MA, Carrion PG, Swann A. Psychometric properties of the mspss and nos in psychiatric outpatients. J Clin Psychol 1995; 51(5): 593-602.
19. Marang-van de Mheen PJ, van Hanegem N, Kievit J. Effectiveness of routine reporting to identify minor and serious adverse outcomes in surgical patients. Qual Saf Health Care 2005; 14(5): 378-82.
20. Veen EJ, Janssen-Heijnen ML, Leenen LP, Roukema JA. The registration of complications in surgery: A learning curve. World J Surg 2005; 29(3): 402-9.
21. Rumsfeld JS, Magid DJ, Plomondon ME, Sales AE, Grunwald GK, Every NR, Spertus JA. History of depression, angina, and quality of life after acute coronary syndromes. Am Heart J 2003; 145(3): 493-9.
22. Meijer WT, Grobbee DE, Hunink MG, Hofman A, Hoes AW. Determinants of peripheral arterial disease in the elderly: The rotterdam study. Arch Intern Med 2000; 160(19): 2934-8.
23. Schouten O, Hoeks SE, Bax JJ, Poldermans D. Cardiac risk reduction in patients with intermittent claudication. Eur J Vasc Endovasc Surg 2007; 33(6): 715-6.
24. Aquarius AE, Denollet J, Hamming JF, De Vries J. Role of disease status and type d personality in outcomes in patients with peripheral arterial disease. Am J Cardiol 2005; 96(7): 996-1001.
25. Bosworth HB, Siegler IC, Olsen MK, Brummett BH, Barefoot JC, Williams RB, Clapp-Channing NE, Mark DB. Social support and quality of life in patients with coronary artery disease. Qual Life Res 2000; 9(7): 829-39.

26. Kaplan GA, Keil JE. Socioeconomic factors and cardiovascular disease: A review of the literature. Circulation 1993; 88(4 Pt 1): 1973-98.
27. Marmot MG, Smith GD, Stansfeld S, Patel C, North F, Head J, White I, Brunner E, Feeney A. Health inequalities among british civil servants: The whitehall ii study. Lancet 1991; 337(8754): 1387-93.
28. Berkman LF, Leo-Summers L, Horwitz RI. Emotional support and survival after myocardial infarction. A prospective, population-based study of the elderly. Ann Intern Med 1992; 117(12): 1003-9.
29. Case RB, Moss AJ, Case N, McDermott M, Eberly S. Living alone after myocardial infarction. Impact on prognosis. Jama 1992; 267(4): 515-9.
30. Williams RB, Barefoot JC, Califf RM, Haney TL, Saunders WB, Pryor DB, Hlatky MA, Siegler IC, Mark DB. Prognostic importance of social and economic resources among medically treated patients with angiographically documented coronary artery disease. Jama 1992; 267(4): 520-4.
31. Kawachi I, Colditz GA, Ascherio A, Rimm EB, Giovannucci E, Stampfer MJ, Willett WC. A prospective study of social networks in relation to total mortality and cardiovascular disease in men in the USA. J Epidemiol Community Health 1996; 50(3): 245-51.
32. Berkman LF. The role of social relations in health promotion. Psychosom Med 1995; 57(3): 245-54.
33. King KB. Psychologic and social aspects of cardiovascular disease. Ann Behav Med 1997; 19(3): 264-70.
34. Jenkinson CM, Madeley RJ, Mitchell JR, Turner ID. The influence of psychosocial factors on survival after myocardial infarction. Public Health 1993; 107(5): 305-17.
35. Ruberman W, Weinblatt E, Goldberg JD, Chaudhary BS. Psychosocial influences on mortality after myocardial infarction. N Engl J Med 1984; 311(9): 552-9.
36. Farmer IP, Meyer PS, Ramsey DJ, Goff DC, Wear ML, Labarthe DR, Nichaman MZ. Higher levels of social support predict greater survival following acute myocardial infarction: The corpus christi heart project. Behav Med 1996; 22(2): 59-66.
37. Brummett BH, Barefoot JC, Siegler IC, Clapp-Channing NE, Lytle BL, Bosworth HB, Williams RB, Jr., Mark DB. Characteristics of socially isolated patients with coronary artery disease who are at elevated risk for mortality. Psychosom Med 2001; 63(2): 267-72.
38. Oxman TE, Freeman DH, Jr., Manheimer ED. Lack of social participation or religious strength and comfort as risk factors for death after cardiac surgery in the elderly. Psychosom Med 1995; 57(1): 5-15.
39. Orth-Gomer K, Unden AL, Edwards ME. Social isolation and mortality in ischemic heart disease. A 10-year follow-up study of 150 middle-aged men. Acta Med Scand 1988; 224(3): 205-15.
40. Welin C, Lappas G, Wilhelmsen L. Independent importance of psychosocial factors for prognosis after myocardial infarction. J Intern Med 2000; 247(6): 629-39.
41. Brummett BH, Mark DB, Siegler IC, Williams RB, Babyak MA, Clapp-Channing NE, Barefoot JC. Perceived social support as a predictor of mortality in coronary patients: Effects of smoking, sedentary behavior, and depressive symptoms. Psychosom Med 2005; 67(1): 40-5.
42. Cassel J. The contribution of the social environment to host resistance: The fourth wade hampton frost lecture. Am J Epidemiol 1976; 104(2): 107-23.
43. Cobb S. Presidential address-1976. Social support as a moderator of life stress. Psychosom Med 1976; 38(5): 300-14.
44. Ulchino B. The relationship between social support and physiological processes: A review with emphasis on underlying mechanisms and implications for health. PsychoLogical Bulletin 1996; 119: 488-531.

45. Brunner EJ, Marmot MG, White IR, O'Brien JR, Etherington MD, Slavin BM, Kearney EM, Smith GD. Gender and employment grade differences in blood cholesterol, apolipoproteins and haemostatic factors in the whitehall ii study. Atherosclerosis 1993; 102(2): 195-207.
46. Helminen A, Rankinen T, Vaisanen S, Rauramaa R. Social network in relation to plasma fibrinogen. J Biosoc Sci 1997; 29(2): 129-39.
47. Cooper CL, Faragher EB, Bray CL, Ramsdale DR. The significance of psychosocial factors in predicting coronary disease in patients with valvular heart disease. Soc Sci Med 1985; 20(4): 315-8.
48. Seeman TE, Syme SL. Social networks and coronary artery disease: A comparison of the structure and function of social relations as predictors of disease. Psychosom Med 1987; 49(4): 341-54.