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Rebecka Striberger

Secondary prevention in patients with intermittent claudication and evaluation of e-health support

SECONDARY PREVENTION IN PATIENTS WITH INTERMITTENT CLAUDICATION AND EVALUATION OF E-HEALTH SUPPORT

Secondary prevention in patients with intermittent claudication and evaluation of e-health support

Thesis for Doctoral Degree (Ph.D.)

By Rebecka Striberger

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REBECKA STRIBERGER

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ABSTRACT

Introduction: Intermittent claudication is the most common symptom of peripheral arterial disease, with impaired walking ability due to pain in the legs and with negative effects on quality of life as well as a high risk for cardiovascular events. The first line of treatment is secondary prevention, including smoking cessation, walking exercise and best medical therapy with the purpose of reducing claudication symptoms, of slowing down the progression of the atherosclerotic process and of preventing cardiovascular events. However, there is a deficiency in evidence-based systematic care regarding secondary prevention for these patients. Accordingly, new ways to support patients with intermittent claudication to adhere to treatment is needed. Further, knowledge about patients' requisite resources for managing their disease are important to be able to improve the care of patients with intermittent claudication. Therefore, the overall aim of this thesis is to explore illness perception and associated factors for adherence to secondary prevention treatment for patients with IC. A further aim is to test and evaluate a web-based application as support for secondary prevention in patients with IC.

Methods: Study I was a systematic review of current research in illness perception. The data were analysed deductively using the common-sense model, as well as inductively with conventional content analysis. In study II, health literacy was evaluated in patients with intermittent claudication regarding clinical characteristics, demographics, self-efficacy and quality of life. The method was a cross-sectional multicentre questionnaire study. In total, 158 patients were included. Study III aimed to compare illness perceptions, health literacy, self-efficacy, adherence to treatment, and quality of life in patients with intermittent claudication. It was a longitudinal cohort multicentre questionnaire study where the participants from study II (n=158) were followed up after 6 (n=133) and 12

months (n=128). Descriptive and inferential statistics were used in studies II-IV. Study IV was a randomised controlled pilot trial which aimed to evaluate the usability of a web-based application and its effect on secondary prevention outcomes. Patients' experiences of using the application were collected through focus group interviews and analysed with thematic analysis. In total, 34 patients were included. For three months, the intervention group (n=18) reported information in the application about physical activity, smoking, medication therapy, blood pressure, pain after activity, and quality of life.

Results: In study I, the findings showed a lack of understanding of the symptoms, the cause and the chronic nature of the disease. The beliefs about control and cures varied from awareness of the positive effects of physical activity to the belief that walking would not have any effect, but instead make patients' situations worse. There was fear that the disease would progress, leading to increased dependency and a lack of control. The experienced consequences showed that living with the disease meant a process of adaptation to patients' new situations. According to study II, 52.5 % of the participants had insufficient levels of health literacy. Insufficient levels were more frequent among patients living alone compared to co-habitants. Patients with a university degree reported a significantly higher ability to access and understand health-related information. Further, patients with sufficient health literacy reported significantly higher self-efficacy and quality of life, and were more physically active than patients with insufficient health literacy. According to study III, women reported higher illness coherence and higher emotional representations compared to men. The believed cause for one's disease reported most often was smoking, followed by age, genetics and "no idea". Patients with sufficient health literacy reported less consequences and lower emotional representations of the disease. They also reported higher self-efficacy and higher quality of life than patients with insufficient health literacy. Quality of life increased between baseline and 12 months, but there were no differences in self-efficacy. In study IV, the results showed a non-significant trend towards increased walking distance and an improved mean change in ankle-brachial index in the intervention group compared to the control group. Patients in the intervention group also had an improved quality of life between baseline and follow-up, and reported higher levels than in the control group, in which no improvement was found. The focus group interviews identified three major themes, focussed on describing a process whereby the *usability factors* of the application led to the feeling of having *a helping hand* which further worked as a *promoter of self-care and control*.

Conclusion: Illness perception, health literacy and self-efficacy are factors influencing self-management in patients with IC and should be addressed to be able to improve adherence to secondary prevention. The positive results from the pilot study indicate that the web-based application might be beneficial for patients with IC in giving support to adherence to secondary prevention treatment and that a further study at a larger scale could be valuable.

LIST OF PUBLICATIONS

The thesis is based on results from the following papers referred to in the text by Roman numerals. The published papers have been reprinted with permission from the publishers.

I. Striberger, R, Axelsson, M, Zarrouk, M, Kumlien, C. Illness perceptions in patients with peripheral arterial disease: A systematic review of qualitative studies. *International Journal of Nursing Studies.* 2021;116: 103723.

II. Striberger, R, Axelsson, M, Kumlien, C, Zarrouk, M. Health literacy in patients with intermittent claudication in relation to clinical characteristics, demographics, self-efficacy and quality of life – A cross-sectional study. *Journal of Vascular Nursing.* 2022;40(3): 121–127.

III. Striberger, R, Zarrouk, M, Kumlien, C, Axelsson, M. Illness perception, health literacy, self-efficacy, adherence and quality of life in patients with intermittent claudication – A longitudinal cohort study. *BMC Nursing.*, 2023;22(1): 167.

IV. Striberger, R, Zarrouk, M, Axelsson, M, Kumlien, C. Web-based lifestyle application as support for secondary prevention in patient with intermittent claudication – A randomised controlled pilot trial and patient experience. *(Submitted)*

ABBREVIATIONS

ABI	Ankle-brachial index
BMT	Best medical therapy
CAD	Coronary artery disease
CLTI	Chronic limb-threatening ischaemia
CSM	Common sense model
CVD	Cardiovascular disease
DM	Diabetes mellitus
E-health	Electronic health
Hei-Q	Health education impact questionnaire
HLS-EU	European Health Literacy Survey Questionnaire
HLS-EU-Q16-SE	European Health Literacy Survey Questionnaire 16 Swedish
HRQoL	Health-related quality of life
IC	Intermittent claudication
IPQ-R	The Revised Illness Perception Questionnaire
IQR	Inter-quartile range
MARS-5	Medication Adherence Report Scale - 5
PAD	Peripheral arterial disease
QoL	Quality of life

S-GSE	General Self-Efficacy Scale
SET	Supervised exercise therapy
VascuQoL-6	Vascular Quality of Life Questionnaire-6
WHO	World Health Organization

INTRODUCTION

Peripheral arterial disease (PAD) is a chronic disease demanding life-long treatment with secondary prevention. The severity of PAD ranges from asymptomatic intermittent claudication (IC) to IC with pain in lower extremities after exercise, to chronic limb-threatening ischaemia (CLTI) that causes rest pain, ulcers and/or gangrene (1). This thesis will mainly focus on patients with IC who are treated with secondary prevention, including medical treatment and lifestyle recommendations. Living with IC means walking impairment, losing independence and a decreased quality of life (QoL) (2). Studies show that IC is unrecognised and under-treated compared to other cardiovascular diseases (CVD), and that there is a lack of public awareness (3-5) as well as lack of patient awareness of IC as a systemic manifestation of atherosclerosis and its associated morbidity and mortality (6). Secondary prevention, including smoking cessation, walking exercise and medical treatment, is crucial for patients with IC to prevent cardiovascular events (coronary death, myocardial infarction, stroke) (1). However, there is a recurring lack of adherence to secondary preventive strategies in patients with PAD (7), and there are also deficiencies in offering structured nonpharmacological treatment for these patients (8). During my years of working as a specialist nurse in a vascular outpatient clinic and meeting these patients, I have seen how there is a lack of a structured secondary preventive care for this group of patients. The questions I have posed myself pertain to how the patients manage their chronic illness and how compliant they are to the treatment and advice given at the vascular outpatient clinic. To be able to improve the care for patients with IC, knowledge about factors that influence their self-management is important. Further, these patients require support to increase the adherence to their treatment with secondary prevention, and it is necessary that the health care system finds new ways to meet these patients' needs.

BACKGROUND

Peripheral arterial disease

Peripheral arterial disease is a slowly developing chronic disease, which results from narrowing of blood vessels in the lower limbs, mostly secondary to atherosclerotic vascular disease. The atherosclerotic occlusions can develop in locations from the aorta to the pedal arteries (1). The different stages of PAD are classified by Fontaine's stages (9) and Rutherford's categories (10) (Table 1).

Table 1. Fontaine's stages and Rutherford's categories. Classification systems of PAD.

FONTAINE		RUTHERFORD	
Stage	**Clinical presentation**	**Category**	**Clinical presentation**
I	Asymptomatic	0	Asymptomatic
IIa	Mild claudication	1	Mild claudication
IIb	Moderate-severe claudication	2	Moderate claudication
		3	Severe claudication
III	Ischaemic rest pain	4	Ischaemic rest pain
		5	Minor tissue loss
IV	Ulceration or gangrene	6	Major tissue loss

In recent years, the prevalence for PAD has increased worldwide, especially in low- and middle-income countries. Globally, approximately 236 million people are living with PAD (11), of whom 10-20 % have IC (12). In the age group 60-90 years, the estimated prevalence of PAD in Sweden is ≈18 %, whereof 11 % asymptomatic, 6.8 % IC and 1.2 % CLTI (13). Earlier studies have shown a higher prevalence of PAD among men compared to women among individuals 70-75 years of age (14, 15). However, a recent review reported an equalisation between prevalence in men and women with increasing age (11). Further,

symptom presentation between men and women differs. Women with PAD present more often with rest pain, while their prevalence of IC is lower compared to men. They also tend to present more often with atypical leg symptoms (16). A majority of patients with PAD are asymptomatic, which makes it challenging to detect the disease (1). Also, persons with PAD may not walk far or fast enough to induce muscle ischaemic symptoms because of comorbidities, or they do not recognise the symptoms as PAD (17).

Patients with PAD often present additional comorbidities, such as diabetes mellitus (DM) or atherosclerosis in other vascular locations (18). Atherosclerosis is a systemic disease and patients with PAD are at high risk for cardiovascular morbidity and mortality. According to a population-based study in Sweden, patients with PAD have a higher all-cause mortality over 10 years with 56% for asymptomatic PAD, 63% for IC, and 75% for CLTI, compared to 27% for the reference population (19).

Intermittent claudication

Intermittent claudication is the most common symptomatic form of PAD and is due to reduced circulation, which results in tissue hypoxia, causing fatigue, cramp or pain in the lower extremities. It is typically manifested in the calf muscles but may also occur in the buttocks, hips, thighs or feet, depending on the affected arteries (20). The risk factors for developing IC are the same as for other atherosclerotic diseases and includes smoking, DM, dyslipidaemia, hypertension, obesity, older age, heredity and chronic kidney disease (21, 22).

Influence on quality of life

Living with IC has a major impact on the patients' daily lives, entailing loss of independence and having to adapt to a more restricted way of living (2). Reduced walking capacity causes not only physical limitations (23) but also has an effect on social functions, emotional well-being and mental health (24, 25), specifically when symptoms worsen (26). Even though different instruments have been used for measuring QoL, several studies have showed that IC is a condition that is highly associated with decreased quality of life (2). Interventions for patients with IC aim to slow down the atherosclerotic process to prevent cardiovascular events. Interventions also typically aim to increase QoL and is therefore an important outcome measure for patients with IC (27).

Diagnosis

Diagnosing IC is based on vascular history, physical examination, exercise treadmill testing and measuring the ankle-brachial index (ABI). The ABI is an objective non-invasive method for the assessment of vascular status and is a strong marker of atherosclerosis (20). The validity of the ABI is high, with 98 % specificity for detecting ≥50% stenosis in the leg arteries (28). ABI is calculated by measuring the ratio of the highest ankle systolic blood pressure divided by highest systolic blood pressure in the upper arm (left or right). A normal resting ABI is 0.9-1.3 mm Hg. An ABI of <0.8 mm Hg indicates mild to moderate IC and an ABI of <0.7 indicates severe PAD (29). An ABI of <0.9 is associated with increased risk for all-cause mortality, cardiovascular mortality and cardiovascular events (20).

For older patients or patients with DM or chronic kidney disease, ankle arteries can be non-compressible due to media sclerosis, resulting in a false high ABI. The pedal arteries are not as affected by calcification as the ankle arteries and in these cases, measurement of the toe brachial index can be used (30). If surgery is needed, the diagnosis can be further expanded with imaging such as ultrasound, computed tomography angiography (CTA), magnetic resonance angiography (MRA) or digital subtraction angiography (DSA) (20).

Secondary prevention

The treatment of IC can be divided into non-invasive and invasive procedures. Non-invasive procedures pertain to secondary prevention, including lifestyle modifications and medical treatment. Invasive procedures include open or endovascular surgery. According to the current European guidelines on the management of IC (20), secondary prevention is the first line of treatment for patients with IC, and includes smoking cessation, exercise therapy and best medical therapy (BMT) (Table 2). The purpose of the treatment is to reduce claudication symptoms and slow down the progression of the atherosclerotic process, as well as to prevent cardiovascular events (20). For patients with IC, surgery should only be considered after 6 months of treatment with secondary prevention and with no improvement in the patient's QoL (31).

Table 2. Risk factors associated with intermittent claudication with recommendation targets for secondary prevention according to the European guidelines (20) (32)

RISK FACTOR	RECOMMENDED TARGETS
Smoking	Total smoking cessation
Inactivity	Exercise ≥150 min/week
Diabetes	Hb_{A1c}≤7.0 %
Hyperlipidemia	LDL cholesterol <1.4 mmol/L or a reduction ≥50 % if 1.4-3.5 mmol/L at baseline
Platelet and coagulation activity	Antiplatelets for all patients with symptomatic IC
Hypertension	Blood pressure: 65-79 years: <140/80 mm Hg or <130/80 mm if tolerated. ≥ 80 years: 140 to 150 mmHg range or 130 to 139 mmHg if tolerated and with caution, if DBP is already below 70 mmHg
Obesity	Body mass index≤25 kg/m^2

Haemoglobin A1c (Hb_{A1c}), Low-density lipoprotein (LDL), Diastolic blood pressure (DBP)

Smoking cessation

Smoking is the leading modifiable risk factor for developing IC (20). Smoking accelerates the atherosclerotic process and increases the risk of developing PAD by two- to six-fold (33). A systematic review showed that smoking is the cause of PAD in half of the cases (34). According to Black (35), the severity of PAD tends to increase with pack-years. Furthermore, continuing to smoke is associated with a higher risk of disease progression, graft failure, amputation, restenosis after endovascular revascularisation, myocardial infarction and death (36-38).

Therefore, smoking cessation is recommended in all patients with IC and reduces the risk for cardiovascular events- and mortality over a few years (35, 37, 39). Smoking cessation in combination with regular exercise has the potential to improve walking distances (1). A study on Swedish snuff use found no increased risk for developing PAD (40). However, studies have shown that patients using smokeless tobacco have an increased risk for cardiovascular events and should receive advice of cessation (41, 42). Patients need to be motivated to succeed with smoking cessation, and cessation counseling should be offered to all patients with IC (20).

Exercise therapy

A systematic review shows that exercise sessions at least twice a week can improve walking distances with 50-200% for patients with IC (43). Cochrane reviews have showed that supervised exercise therapy (SET) is the most effective activity for improving pain-free and maximum walking distance compared to no

exercise (44), home-based exercise therapy and walking advice (45). According to regnant guidelines (20), patients with IC are recommended SET for 30-60 minutes at least three times per week for 12 weeks. When SET is not feasible or available, a structured home-based exercise training programme is recommended. Patients with IC should also strive to achieve the general physical activity recommendations for CVD prevention, including at least 150-300 minutes a week of moderate-intensity aerobic physical activity or 75 -150 minutes a week of vigorous-intensity aerobic activity (20).

Despite the documented effects of SET, availability is generally low (46). Further, the patients' adherence to the SET programmes are low due to lack of motivation, claudication pain, and also economic and geographic reasons (46, 47). A meta-analysis concluded that QoL increases with increased walking distance among patients with IC (48). However, several barriers for walking as exercise exist, including literacy, comorbidities and lack of understanding regarding the benefit of walking exercises (23). Even though there is strong evidence for SET, most vascular clinics in Sweden lack the possibility to offer this kind of treatment. Therefore, new ways to support patients with IC in adhering to walking exercise regimes is needed.

To further reduce cardiovascular risks, a BMI of < 25 kg/m^2 is desirable. The are no specific dietary recommendations for patients with IC. Systematic reviews indicate that a Mediterranean diet (olive oil, high amount of vegetables, fruits, whole grain products, nuts) might be beneficial for these groups of patients – however, the evidence is not yet clear (49, 50).

Best medical therapy

Treatment with BMT should include antiplatelet drugs, lipid-lowering drugs, antihypertensive drugs (for patients with hypertension) and glycemic control (for patients with DM) (20) (Table 2). Antiplatelet agents slow down the progression of the disease and can in some cases improve symptoms (51), and is recommended for all patients with symptomatic PAD after bleeding risk assessment (20). Further, LDL plays a major role in the development of atherosclerotic plaque, and lipid-lowering drugs are therefore recommended (20), both to reduce the risk of cardiovascular events and for the positive effect on walking distance (52). Hypertension is associated with progression of the atherosclerotic process, and patients with IC should be treated to reach the target levels of <140/80 mm Hg or <130/80 mm if tolerated in patients 65-79 years of

age, and the ranges of 140 to 150 mmHg or 130 to 139 mmHg if tolerated and with caution if DBP is already below 70 mmHg in patients ≥ 80 years (32). DM is a risk factor for patients with PAD as regards increased perioperative complications, the amputation rate and the mortality rate (53). Blood glucose is therefore recommended to be reduced to near normal Hb_{A1c} values ≤ 7% (≤ 53 mmol/mol) for these patients (20).

Other pharmacological treatment includes vasodilators, with the purpose of improving walking distances. The recommendation for the use of this treatment has recently been added to the European clinical practice guidelines and should only be considered in patients with high adherence to BMT. If no improvement is seen after three to six months, the treatment should be stopped (20).

Adherence to treatment

All medical and behavioural treatments require some degree of behavioural change. When treatment demands substantial behavioural adjustments, there is an increased risk that the patients do not consistently follow their prescribed treatment regime (54). Positive associations between adherence and QoL has been shown in patients with chronic conditions (55-57). Nevertheless, in general, chronic diseases are associated with lower adherence to treatment (58).

To be able to make lifestyle changes and adhere to BMT, patients need to gain knowledge about their disease. Since IC is a chronic and progressive disease that worsens over time, it is important to give patients evidence-based information and education on how to decrease the progression of general atherosclerotic disease to prevent cardiovascular events and improve daily living (2). It is a challenge for patients to make lifestyle changes and maintain adherence to their treatment. To promote adherence over the long term, a variety of strategies can be used. For instance, these can include tailored recommendations based on the patient's situation, self-monitoring (so that patients can follow their own adherence) and long-term contact with health care (59).

One way to support patients' adherence to their treatment is by nurse-led clinics. There are several studies evaluating the effects of secondary prevention in nurse-led support, with positive results in reducing the risk for progression of atherosclerosis (60-62). However, a RCT examining the effect of a nurse-led follow-up programme found no effect between the intervention group and the group receiving standard care (63), which illuminates the challenges in creating

sustainable support for these patients. For patients with IC, the lifestyle modifications required can be quite extensive, and a need for more support in these patients' self-management has been reported (64). Therefore, it is necessary to find new ways to support these patients.

E-health (Electronic health)

Digital health is the use of information and communication technologies for health. It includes the concept of e-health, defined by the World Health Organization (WHO) (65) as "the use of information and communications technology in support of health and health-related fields". Digital health is an increasingly important concept and according to WHO (65), digital health constitutes a way to enhance patients' independence and participation in their health care and also is a way to increase QoL practices.

A review of RCTs showed improved self-management and clinical health outcomes in patients with chronic diseases using mobile technologies (66). Another review by Brørs et al. (67) yielded evidence for using e-health innovations in secondary prevention for patients with coronary artery disease (CAD). Since e-health is a way for individuals to be involved in their own health care, using this technology for patients with IC could be a way of increasing adherence to treatment. Different e-health solutions have increased rapidly in availability over the last years. A review summarising applications related to telemedicine found several studies on home-based exercise programmes in patients with PAD (68). However, there is a lack of studies using e-health encompassing all parts of secondary prevention treatment for this specific group of patients.

E-health tools that are developed for patients need to have high usability. Research has shown a gap between the developers and the users, i.e. the patients (69). To not be able to understand given information increases the risk for low adherence to treatment (54, 70). However, both written and digital information materials directed to patients are often presented in a way that may make them difficult to understand for patients (71-73). Accordingly, when developing information materials, usability and levels of health literacy should be considered (74).

Factors influencing adherence

Health literacy

There is a variation of definitions of health literacy in the literature. A comprehensive definition based on reviewing 17 different definitions were formulated by Sörensen et al. (75) and will be used in this thesis. The definition is as follows: *Health literacy is linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise, and apply health information in order to make judgments and take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve QoL during the life course*.

There is an association between limited health literacy and low socio-economic status, lower education and older age (76-78). The level of health literacy is not fixed but can temporarily be reduced when affected by stress or illness, or when facing a new diagnosis (79, 80). Health literacy can also be improved by educational interventions (81, 82). In general, insufficient health literacy is associated with more hospital readmission, higher mortality (83, 84) and lower adherence to treatment (83, 85, 86). Further, insufficient health literacy is associated with unhealthy behaviours, such as smoking (87-89) and inactivity (88, 90, 91). Moreover, studies in other chronic conditions show that insufficient health literacy is associated with lower QoL (84, 92-94). This means that to be able to provide optimal support to patients with IC, knowledge of health literacy is crucial. However, currently there is a lack of studies that have measured health literacy and what other possible factors that influence the outcomes of secondary prevention treatment in this group of patients.

Illness perception

Individuals dealing with long-term illness develop their own comprehension of their condition as a means to cope with the illness, its related symptoms and the treatment involved. The Common-Sense Model of Self-Regulation ("the Common-Sense Model", CSM) is a framework for describing individual processes in managing a health threat. These illness perceptions, constituting cognitive and emotional representations and reflecting individuals' beliefs, are usually organised with respect to five concepts; identity, timeline, causal, control/cure and consequences, outlined below according to Leventhal et al. (95) (Table 3).

Table 3. Illness perceptions in the Common-Sense Model (CSM)

CONCEPTS IN THE CSM	ILLNESS PERCEPTIONS
Beliefs about identity of illness	Beliefs about the symptoms that are caused by the illness. These beliefs do not always correspond with medical knowledge.
Timeline beliefs	Often range the situation from the acute to the chronic. This can influence adherence to medical treatment where it is usually higher for patients who believe they are in an acute condition than for patients who believe they are in a chronic condition.
Causal beliefs	Ideas of the cause for the illness. These beliefs can affect the adherence to lifestyle modifications.
Beliefs about control or cure	Beliefs in whether the illness is responsive to treatment. Higher levels of perceived control are generally associated with shorter timeline perceptions.
Beliefs about consequences	Beliefs in what impact the illness will have on the patient's life. The belief does not always correlate with the severity of the disease.

When a new situation emerges, the patient will construct their own interpretations which will influence behaviour and management in that specific situation. This includes expectations and beliefs about different behavioural choices and includes adherence to treatment. Patients' illness perceptions are subjective and individual, and differ even between patients with the same disease (95).

Studies shows that level of health literacy is related to the patients' perception of their illness, which has an impact on their self-management (96-98). Furthermore, illness perceptions relate to patients' QoL (55, 93, 99-101). According to Petrie and Weinman (102), illness perception has an influence on adherence to both treatment advice and medical treatment. Patients' illness perception have been found to be associated with self-care management and health outcomes in other chronic conditions (103-105) and specifically to adherence to secondary prevention in patients with CAD (106, 107). Further, a study by Galea et al. (108) showed that illness perceptions have an effect on walking distance in patients with PAD. This indicates that illness perception may be another important factor to consider when planning for secondary prevention for patients with IC.

Self-efficacy

Self-efficacy is the ability to perform necessary behaviour to achieve a specific goal. It also affects the amount of effort and persistence typically devoted to

achieve this specific goal. Self-efficacy theory contributes a link between self-perceptions and actions where individual beliefs about personal capabilities predict later behaviour (109). Self-efficacy is a predictor for health- related behaviour change (110) where the patients' confidence and perception of their ability to accomplish a certain level of performance directly correlate with their success (111). Patients with high self-efficacy have a perceived ability to manage challenges related to their diseases, which leads to a sense of control over their situation (109). Studies show that positive illness perceptions are positively associated with self-efficacy in patients with both CAD (112) and DM (113). Moreover, positive associations have also been shown between self-efficacy and QoL (114-116) in patients with chronic conditions.

A review on self-efficacy found that health literacy seems to be a barrier for effective self-management of chronic diseases (117). The association between health literacy and self-efficacy has also been showed for patients with DM, affecting the self-management of their disease (118). Further, both health literacy and self-efficacy have been shown to be associated with adherence to secondary prevention in patients with CAD (119). There are also several studies demonstrating the relationship between self-efficacy and medication adherence in patients with chronic diseases (113, 120, 121). In addition, low perceived self-efficacy has been shown to be associated with nonadherence to health recommendations (120, 122), indicating that patients with high self-efficacy have higher adherence to lifestyle changes as well. Research has shown that patients' self-efficacy can be enhanced by nurse-led self-management programmes (6, 123). Further, mobile applications can work as promoters for self-efficacy in patients with chronic conditions (117).

A study of patients with both PAD and DM found that self-efficacy is significantly associated with walking ability (124). Another study on determinants that influence the long-term adherence to SET for patients with IC showed that patients with high self-efficacy remained significantly more active after participating in SET compared to patients with low self-efficacy (125). However, studies describing self-efficacy in relation to other aspects of secondary prevention for patients with IC are needed.

Theoretical framework

As has been pointed out earlier, several prior studies have described the associations between factors that have impact on patients' self-management of a disease and its effect on QoL. To further visualise how health literacy, illness perceptions and self-efficacy relate to patients' management of their disease, the middle-range theory of self-care can be used. The theory addresses "the process of maintaining health with health promoting practices within the context of the management required of a chronic illness" (126). Further, the middle-range theory of self-care is a theoretical framework developed for patients with chronic conditions. It has been applied to patients with CVD, including PAD (127).

Self-care is defined as "a naturalistic decision-making process addressing both the prevention and management of chronic illness". The middle-range theory of self-care includes the concepts of self-care maintenance, self-care monitoring and self-care management. The goal of self-care maintenance is to maintain health and prevent progression of a given disease. It refers to adherence to self-care behaviours such as smoking cessation, regular exercise and taking medication as prescribed. The goal of self-care monitoring is recognition of change through a process of observing oneself for changes in signs and symptom. The goal of self-care management is effective treatment of symptoms by interpretation and response to signs and symptoms when they occur (126). According to the theory, these concepts are closely interrelated, and are all important factors contributing to sufficient self-care. However, due to different barriers, such as lack of skill in self-care, lack of motivation or lack of confidence, patients with chronic diseases do not always apply all the strategies referred to by these concepts, leading to insufficient self-care (128).

As described earlier, health literacy, illness perceptions and self-efficacy influence self-management and adherence to treatment in other chronic conditions. Therefore, using the middle-range theory of self-care could further clarify the role of health literacy, illness perceptions and self-efficacy as factors influencing adherence to the secondary prevention treatment of patients with IC (Table 4).

Table 4. Health literacy, illness perception and self-efficacy in patient with intermittent claudication using the concepts of the middle-range theory of self-care

CONCEPTS OF THE MIDDLE-RANGE THEORY OF SELF-CARE	HEALTH LITERACY	ILLNESS PERCEPTION	SELF-EFFICACY
Self-care maintenance			
Continued cardiovascular health behaviours	✓	✓	✓
Gaining knowledge			
Seek information about the condition	✓		
Determine where to get more information	✓		
Understand self-care requirements	✓		
Adherence to condition-specific treatments			
Take medications as prescribed		✓	
Know normal and side effects of treatments			
Understand why treatment is prescribed	✓	✓	
Keep scheduled appointments and contact providers as needed			
Self-care monitoring			
Know common signs and symptoms		✓	
Know signs and symptoms of worsening disease		✓	
Know signs and symptoms of complications		✓	
Establish routine for monitoring signs and symptoms			
Self-care management			
Distinguish among cardiovascular symptoms and non–life-threatening conditions		✓	
Have a plan for what to do when signs and/or symptoms occur			✓
Evaluate the effectiveness of treatment		✓	
Know when and which provider to call when signs and/or symptoms occur	✓		

Rationale

It is well known that secondary prevention is essential for patients with IC to decrease the progression of atherosclerosis and to improve functional capacity and QoL. Despite this, a deficiency in evidence-based systematic care regarding secondary prevention exists for these patients. Knowledge about patients' requisite resources for managing their disease are important to be able to improve the care of patients with IC.

How patients perceive the illness has an effect on the adherence to secondary preventive treatment. To summarise the current research on illness perceptions in patients with PAD would provide insights into their understanding and

management of the illness. To understand patients' beliefs about their illness could be an important contribution in the management of patients with PAD.

The level of health literacy and self-efficacy has an impact on how patients manage their disease. Evaluating health literacy in relation to clinical characteristics, demographics, self-efficacy and QoL in patients with IC would lead to understanding which patients need support with health information and, further, to understanding how health literacy is related to patients' ability to manage their illness and its outcomes in terms of QoL.

To further compare illness perceptions, health literacy, self-efficacy, adherence and QoL would generate knowledge about how these factors are interrelated. As IC is a chronic and progressive disease, the ability to handle the disease might change over time. It is therefore important to study self-efficacy and QoL in a longitudinal perspective for IC.

To enhance patients' adherence to their treatment, new ways of furthering adherence need to be tested. Studies using e-health as support has proven that e-health tools are effective for patients with other diseases, but are lacking for patients with IC. Therefore, to test a web-based application as support for secondary prevention in a pilot study, prior to interventions at a larger scale, would be of importance. Further, since involving patients in the research process enhances the probability of an application suitable for the patients' needs, knowledge of the patients' experiences of using e-health would provide valuable information.

Altogether, studies on these topics would generate knowledge for a theoretical foundation to develop current deficient secondary prevention care for IC into an effort that better enhances self-care.

AIM

The overall aim of this thesis was to explore illness perceptions and associated factors for adherence to secondary prevention treatment for patients with IC. Further, to test and evaluate a web-based application as support for secondary prevention in patients with IC.

Specific aims

To systematically review and synthesise the literature on illness perceptions in patients with PAD (I).

To evaluate health literacy in patients with IC regarding clinical characteristics, demographics, self-efficacy and QoL (II).

To compare illness perception, health literacy, self-efficacy, adherence to treatment and QoL in patients with IC (III).

To evaluate the usability of a web-based application and its effect on secondary prevention outcomes for patients with IC. Further, to describe the patients' experiences of using a web-based application (IV).

METHODS

Design

This thesis consists of four studies with different designs: one qualitative study, two quantitative studies and one study employing both qualitative and quantitative methods. A summary of the study designs and methods is presented in Table 5.

Table 5. Overview of study design and methods

	Study I	**Study II**	**Study III**	**Study IV**
Design	Systematic review of qualitative studies	Cross-sectional multi-centre study	Longitudinal multi-centre cohort study	Randomised controlled pilot trial and qualitative interviews
Data collection	Systematic literature search	Questionnaires; Medical records	Questionnaires	Questionnaires; Clinical tests; Focus group interviews
Participants	316 (in 14 studies) (191 men, 125 women)	158 (78 men, 80 women)	133 (66 men, 67 women)	34 (16 men, 18 women)
Data analysis	Framework analysis with "best-fit approach"; Content analysis	Descriptive and inferential statistics	Descriptive and inferential statistics	Descriptive and inferential statistics; Thematic analysis

Participants and setting

In study I, the participants consisted of the informants included in the 14 reviewed studies. The inclusion criteria were studies with populations of adult patients (≥18 years) diagnosed with PAD, and that the studies should have a qualitative design with a focus on describing illness perceptions.

Studies II/III were carried out at the vascular outpatient clinic at Skåne University Hospital in Malmö, Helsingborg County Hospital and Kristianstad Central Hospital. Patients with a referral to one of the participating vascular clinics were recruited at the end of their visit to the outpatient clinic after the diagnosis of IC was established. The inclusion criteria were that the patients had been diagnosed with IC (defined by clinical findings and [ABI]< 0.9) (Rutherford classification 1-3) and that they had the ability to read and understand Swedish. The exclusion criteria were if it was planned that the patient would undergo vascular surgery, or if the patient had earlier received surgical treatment for IC. Patients fulfilling the inclusion criteria were informed of the study both orally and in writing, and were asked to participate by registered nurses specialised in vascular diseases.

Study IV was conducted at the vascular outpatient clinic at Skåne University Hospital in Malmö. The inclusion criteria were; patients diagnosed with IC (defined by clinical findings and [ABI] < 0.9) (Rutherford classification 1-3); ability to read and understand Swedish; ability of patient to perform a walking capacity test at their own pace; access to a smartphone, tablet or computer; and access to the verification service BankID (129). The exclusion criteria were if it was planned that the patient would undergo vascular surgery, or if the patient had earlier received surgical treatment for IC. Patients meeting the inclusion criteria were informed of the purpose of the study by registered nurses specialised in vascular diseases and were asked for permission to be contacted for further information. The patients who accepted were contacted by phone and received thorough information from the dissertation author about the study. Those interested in participating were scheduled for allocation at the vascular outpatient clinic in Malmö.

Data collection

Study I

For the literature search in the systematic review, the databases PubMed, CINAHL and PsycINFO were used, since they cover the relevant research fields (care science, health science, medical science and psychology). For transparency, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (130) was followed. The main search was conducted 12.12.17 and an update was done 31.07.19, with no new studies found. No limitations on publication dates or language restriction within the search were made. The PEO

model, including population, exposure and outcome (131), were used to structure the search. Three paging blocks were formed by a combination of keywords where all terms related to PAD (population and exposure), illness perceptions (outcome) and qualitative studies were used, including both MeSH terms (medical subject headings) and free keywords. To ensure that the paging blocks were complete, a librarian at Malmö University was consulted. The Boolean search operators were used for combining the three paging blocks with operators AND between the blocks and OR within each block, as described by Ely and Scott (132).

For the relevance appraisal of the studies, the search results were merged into the web application Rayyan, to structure the results and to blind the assessment (133). After duplicates were removed, 722 articles were identified. The titles and abstracts were screened for relevance against the inclusion criteria independently by the dissertation author and one of the research team members, resulting in exclusion of 704 articles. After reading the remaining 18 full-text articles, a further three articles were excluded, resulting in 15 articles meeting the inclusion criteria. The reference lists from the included studies were then searched manually for additional relevant studies. Three studies were added to the relevance appraisal but were excluded after full-text assessment.

The quality of the 15 included articles was critically appraised using a checklist for qualitative research that was created from a combination of modifications of tools from the Critical Appraisal Skills Programme (CASP) (134), and the Swedish Agency for Health Technology Assessment and the Assessment of Social Services (SBU) (135). The study design, sample and setting, data collection, outcome and analysis methods were assessed, and quality was appraised as high, moderate or low based on the overarching criteria from SBU (135). To achieve high quality, an article needed to be assessed as high in each section of the criteria, and for moderate quality, an article needed to be assessed as moderate on a majority of the criteria. Both the relevance and quality appraisal were conducted independently by the dissertation author and one of the research team members. To avoid conflicts of interest, three studies were quality-appraised by the dissertation authors and another of the team members. Discrepancies were discussed until agreement. The appraisal resulted in a classification of articles as high-quality (n=6), moderate quality (n=8) and low quality (n=1). Due to the limited number of results in relation to the study aim, the article with low quality was excluded, leaving 14 articles for analysis.

Studies II and III

The data for studies II and III were collected between 2018 and 2020. During the patients referral visit, baseline questionnaires (background data, health literacy, self-efficacy and QoL) (Table 4) and informed consent forms were handed out to the patients interested in participating (n=215) by a registered nurse specialised in vascular diseases. Together with the advice to fill in the forms at home, the participants received prepaid envelopes for sending in the questionnaires, thus giving them time to consider the decision to participate. Background data regarding e.g. demographics, co-morbidities, clinical characteristics and lifestyle factors were collected through a self-reported questionnaire developed only for this study. The lifestyle factors of physical activity and smoking were included based on the guidelines of secondary prevention for patients with IC (1). Physical activity was self-defined and self-reported, and the two questions were phrased as follows: "Are you physically active?" (*yes/no*) and "How many times per week are you physically active?" (*1–2*, *3–4*, *> 4*). Medical records were reviewed at baseline for ABI, blood pressure, cholesterol level, and blood glucose. One reminder was sent out to non-responders – ultimately, a total of 158 patients decided to participate and answer the questionnaires. After six months a new set of questionnaires were sent out by mail (on illness perception, self-efficacy, adherence to medication and QoL), and 133 patients then continued their participation. The last set of questionnaires were sent out after 12 months (self-efficacy and QoL) and 128 patients responded at this stage (Table 6). Prepaid envelopes were sent out at both times together with the questionnaires. For non-responders at 6-and 12 months, two reminders were sent out.

Table 6. Data collection, studies II/III

DATA COLLECTION	STUDY II/III	STUDY III	
	Visit (n=158)	6 months (n=133)	12 months (n=128)
Background data	✓		
Health literacy (HSL-EU-Q16-SE)	✓		
Illness perception (IPQ-R)		✓	
Adherence to medication (MARS-5)		✓	
Self-efficacy (S-GSE)	✓	✓	✓
Quality of life (Vascuqol-6)	✓	✓	✓
Medical records: Ankle brachial index, blood pressure, blood glucose, cholesterol level	✓		

HLS-EU-Q16-SE: The European Health Literacy Survey Questionnaire 16, IPQ-R:The Revised Illness Perception Questionnaire, MARS-5: The Medication Adherence Report Scale, S-GSE: General Self-Efficacy Scale, Vascuqol-6: Vascular Quality of Life Questionnaire-6

Health literacy (studies II/III)

The European Health Literacy Survey Questionnaire 16 (HLS-EU- Q16-SE) is a short version of the European Health Literacy Survey Questionnaire (HLS-EU-Q47) (75, 136), validated and available in Swedish. It consists of 16 items divided on four dimensions: *Access/obtain* (ability to seek, find and obtain health information), *understand* (ability to comprehend the health information that is accessed), *process/appraise* (ability to judge and evaluate the accessed health information) and *apply/use* (ability to use the health information to maintain and improve health). The item responses are graded on a four-point Likert scale: *very easy*, *easy*, *difficult*, *very difficult.* The responses were combined into two categories; *very easy and easy* (scored with one) and the responses *difficult* and *very difficult* (scored with zero). For respondents answering at least 14 questions (137), a total score was calculated and divided into the three levels as follows: inadequate (0–8 points), problematic (9–12 points) and sufficient (13–16 points). The three levels were then dichotomised into "insufficient" ("inadequate" and "problematic"*)* and "sufficient" health literacy (75). Cronbach's alpha was 0.91.

Illness perceptions (study III)

The Revised Illness Perception Questionnaire (IPQ-R) was used for a quantitative assessment of patients' illness perceptions. It is based on the Common-Sense Model of self-regulation (95) and is revised so as to focus on the following concepts (with interpretation of high scores): timeline acute/chronic (belief that

the illness is enduring), timeline cyclical (belief that the illness is cyclical), consequences (negative consequences for the patient's life), personal control (high level of control over the illness), treatment control (belief that the treatment is effective for the illness), illness coherence (greater understanding of the illness), and emotional representations (greater emotional impact associated with the illness) (138). The instrument is translated to Swedish and has been validated. It contains 38 items regarding perceptions of the illness and 18 items about causes of the illness, with response options on a five-point Likert scale from *strongly disagree* to *strongly agree.* The last item has an open-ended response where respondents are to rank the three most important factors believed to be the cause of their illness (139). Regarding concepts with four and five items, one missing item was allowed for, and for concepts with 6 items, a maximum of 2 missing items was allowed for. Cronbach's alphas for the concepts in study III were $\alpha = 0.82$ for timeline acute/chronic, $\alpha = 0.79$ for timeline cyclical, $\alpha = 0.71$ for consequences, $\alpha = 0.65$ for personal control, $\alpha = 0.79$ for treatment control, $\alpha = 0.92$ for illness coherence and $\alpha = 0.86$ for emotional representations.

Self-efficacy (studies II/III)

General Self-Efficacy Scale (S-GSE) is an instrument measuring the strength of an individual's belief in their own ability to deal with challenging situations (140). The instrument is available in Swedish (141) and has been validated in a Swedish context (142). It consists of 10 items rated on a four-point Likert scale (*not at all true* to *exactly true*). The answers are summed to a complete score (10–40), where a high score represents high self-efficacy (140). For a respondent to be included in the analysis, all the questions needed to be answered. Cronbach's alpha was 0.92 in these studies.

Health-related quality of life (studies II-IV)

Vascular Quality of Life Questionnaire-6 (VascuQol-6) is a disease-specific instrument for measuring HRQoL in patients with PAD, and is a short version of the Vascular Quality of Life Questionnaire (VascuQoL) (143). The instrument is translated into Swedish and has been shown to have good psychometric properties (144, 145). It contains six items divided into five subscales: activity (2 items), emotional factors, pain, social factors, and symptoms. The item responses are graded on a four-point scale and the answers are summed to a total score (6-24), where a high score indicates high HRQoL (146). For a respondent to be

included in the analysis, all the questions needed to be answered. The internal consistency was (α= .85) (studies II, III).

Adherence to treatment (study III)

The Medication Adherence Report Scale (MARS-5) is an instrument used to determine patients' self-reported adherence to medication treatment in general. It consists of five items, and item responses are graded on a five-point Likert scale ranging from *always* to *never.* The scores are summed (5-25), with a higher score indicating higher self-reported adherence (147). The instrument is valid and available in Swedish (148). For respondents to be included in the analysis, all questions needed to be answered. Cronbach's alpha was 0.57 in study III, which is below the recommended value (α = 0.70) (149).

Study IV

Quantitative data collection

The intervention was conducted between September 2021 and February 2022. In total, 50 patients were asked to participate, of whom 16 patients were excluded due to not meeting the inclusion criteria (n=4), declining participation (n=7), or being unreachable (n=5). This resulted in 34 patients being included in the study. Data was collected at baseline and after three months. At the baseline visit, the participants received both verbal and written information, whereafter the informed consent form was signed. At the end of the first visit, the participants were randomised into an intervention group (n=18) or a control group (n=16) using sealed envelopes.

The primary outcome was walking capacity, measured by the 6-minute walk test (6MWT). The test was conducted at the vascular clinic and was supervised and standardised by two physiotherapists. Secondary outcomes included health education and QoL (collected through questionnaires) as well as ABI, blood pressure and information about lifestyle factors (Table 7).

For estimating the cardiovascular risk (study IV), the Systematic Coronary Risk Estimation 2 (SCORE2) and the Systematic Coronary Risk Estimation 2 older persons (SCORE2-OP) (for patients > 70 years of age) were calculated at baseline. The parameters in SCORE2 include gender, age, smoking, systolic blood pressure and non-HDL cholesterol level. For SCORE-OP, the parameters also include occurrence of DM (150, 151). The parameters used in SCORE2 were

self-reported, except for blood pressure (measured during the clinic visits) and cholesterol levels (transcribed from medical records). This risk assessment model estimates the 10-year risk of CVD (150, 151), and the result divides the participants into four risk groups: low risk (<1%), moderate risk (1-4%), high risk (5-9%) or very high risk (≤10%) (152).

After the first visit, three participants discontinued due to not managing to register in the verification service BankID (n=2) or to not reporting in the application (n=1). In the control group, 5 participants discontinued due to family reasons (n=2) or were unable to attend at the outpatient clinic, thus not completing the clinical tests but completing the questionnaires (n=3).

Table 7. Timeline instruments and tests for all participants in study IV

	Baseline	**Follow-up (3 months)**
Tests		
6-minute walk test	✓	✓
Ankle-brachial index	✓	✓
Blood pressure	✓	✓
Body mass index	✓	✓
Questionnaires		
Quality of life (Vascuqol-6)	✓	✓
Health education (Hei-Q)	✓	✓
Lifestyle factors		
Smoking	✓	✓
Physical activity	✓	✓
Coronary risk estimation		
Score2/Score2-OP	✓	

Ankle-brachial index

For the assessment of vascular status, the ABI was measured. According to regnant guidelines, the participants should be in a supine position during measurement (20). However, since this position is not possible for all due to other physical limitations, a leg-out sitting position was chosen in this study. The participants rested for 20 minutes, and ABI was measured for both the arteria

dorsalis pedis and the arteria tibial posterior. Systolic blood pressure was measured for both arms and ABI was calculated by dividing the highest ankle pressure by the highest systolic blood pressure in the arm according to guidelines (20).

6-minute walk test

The 6MWT was used to measure the patients' functional capacity. It measures the total distance which the patients are able to walk in six minutes (153) and evaluates the severity of PAD (154). It is a self-paced exercise test, and the patients are allowed to stop and rest if necessary and resume walking when they can (155). The participants rested before starting the test, according to guidelines, and since a warm-up could affect the result, they were transported in wheelchairs to the test location. The test was conducted in a 30m corridor, and the participants were instructed to "walk as far as you can during 6 minutes". During the test, the respondents received communications in standardised phrases, such as information about time remaining. The heart rate and oxygen saturation were measured before, during and after the test, and levels of dyspnoea and fatigue levels were rated by the participants using the Borg scale as explicated in Kammin et al. (155).

Health education impact

The Health Education Impact Questionnaire (hei-Q) is a questionnaire specifically designed to measure the impact of health education on self-management skills in patients with chronic diseases (156). The Swedish version of hei-Q is validated (157) and consists of 40 items across eight scales: *positive and active engagement in life,* (i.e., engaged and motivated to improve their situation), *health-directed behaviour* (healthful behaviours including prevention, diet, and exercise), *skill and technique acquisition* (skills in symptom relief and techniques to manage the health problem), *constructive attitudes and approaches,* (attempts to minimise the effects of the illness and determination not to allow the illness to control their life), *self-monitoring and insight* (an individual's ability to monitor and manage their condition and insight into living with the illness), *health service navigation* (an individual's belief in their ability to communicate with and find access to health care), *social integration and support* (high level of social interaction, sense of support from others and limited social isolation), and *emotional well-being* (overall negative affective responses to illness, including

anxiety, stress, anger and depression). The questionnaire items use a four-point Likert scale ranging from *strongly disagree* to *strongly agree* and the answers are summed to a complete score in each scale (157).

Intervention

A web-based application for secondary prevention in patient with IC was tested. During the visit at the vascular outpatient clinic, the participants in both the intervention and the control group received standard care, meaning information about lifestyle modifications (smoking cessation and walking exercise) and BMT. The participants in the intervention group received access to the Lifepod® support system software, which is a web-based application designed to support adherence to lifestyle recommendations and medication. Prior to the study, the Lifepod® application was modified to enable support in secondary prevention treatment for patients with IC. The included variables were selected based on treatment guidelines and were adjusted to recommended targets for these patients (1).

The application was built as a two-sided system. One side was the patients' interface, accessible through a smartphone, tablet or computer, where participants logged information about the amount of physical activity, numbers of cigarettes smoked, adherence to pharmacological treatment, blood pressure, pain after physical activity and QoL. The other side of the system was the medical interface, where all the reported information were accessed by the dissertation author and one other member of the research team. The system ranked the patients, thus giving high-priority alerts to patients with the greatest needs. The application has a built-in functionality for reminders, rewards and features to motivate and encourage patients. The participants reported in the application for three months and were able to review all their data in relation to recommended targets. During the study, the participants received feedback, recommendations about healthy behaviours in relation to their results, as well as notifications in the form of short messages depending on their individual health status. The application provided a chat function where the participants could contact the research team if needed. They also had access to technical support from the company providing the application.

Qualitative data collection

After the intervention was completed, the participants in the intervention group (n=15) were invited to take part in a focus group interview regarding their experience of using a web-based application for secondary prevention. The patients interested in participating (n=13) were divided by three occasions, meaning 4-5 participants in each focus group. The interviews took place in spring 2022 at the vascular clinic, Skåne University Hospital. Oral and written information was given, and the participants signed informed consent forms prior to interview start. The focus group interviews were conducted by the dissertation author (moderator) leading the interview and another member of the research team (assistant moderator), taking care of practicalities and providing supplementary questions when needed. An interview guide with categories of questions (opening, introductory, transition, key and ending) were used as explicated by Krueger and Casey (158). The interview guide contained questions regarding usability, management of the application, its perceived effects on secondary prevention outcomes, its content, and potential further development of the application. All interviews were audio-recorded and lasted for 50, 57 and 74 minutes respectively.

Data analysis

Both quantitative and qualitative analysis has been used. A summary of the difference analysis is presented in Table 8.

Table 8. Overview of methods for analysis in studies I-IV

	STUDY I	STUDY II	STUDY III	STUDY IV
Quantitative analysis				
Shapiro-Wilk test		✓	✓	✓
Pearson's Chi-square test		✓	✓	✓
T-test		✓	✓	✓
Paired t-test			✓	✓
Mann-Whitney U-test		✓	✓	✓
Spearman's rank correlation			✓	
Multiple logistic regression		✓		
Linear multiple regression			✓	
Wilcoxon signed-rank test			✓	
Bonferroni correction			✓	
Cronbach's alpha		✓	✓	
Qualitative analysis				
Deductive – "best-fit approach"	✓			
Inductive – content analysis	✓			
Thematic analysis				✓

Statistical analysis (studies II-IV)

The data were analysed using IBM SPSS Statistics for Windows, version 26-28 (IBM Corp., Armonk, N.Y., USA). A p-value of <0.05 was considered significant (studies II-IV). For categorical variables, frequencies and percentages were used to describe the data, and the Chi-square test was used for analysing differences in proportions. Normal distribution was assessed using histograms and the Shapiro-Wilk test. Normally distributed ordinal variables were presented with means and standard deviations (SD), and an independent samples T-test was used to compare groups. Non-normally distributed ordinal variables were presented with medians as well as first and third interquartile ranges (IQR), and differences between groups were tested by the Mann-Whitney U-test (studies II-IV).

To analyse differences in variables with repeated measures, paired T-tests (studies III-IV) and the Wilcoxon signed-rank test (study III) was used. The significant levels were adjusted with a manual Bonferroni correction (study III).

Missing data were handled according to pairwise deletion (159). In study II, a multiple logistic regression model was used to determine factors associated with levels of health literacy, adjusted for potentially confounding variables. To explore associations between variables in study III, Spearman's rank correlation (r_s) analysis was conducted between illness perception, self-efficacy, adherence to medication treatment, and QoL. The significant variables from the correlation analysis were then used in a linear multiple regression to identify predictors of QoL. For testing the internal consistency of the questionnaires in study II and III, Cronbach's alpha coefficients were calculated.

Qualitative analysis

Study I

In the systematic review, the data from the included studies were analysed with a "best-fit" approach to framework analysis. Framework synthesis is a structured approach for organising and analysing data (160). A "best-fit" approach to framework analysis is an approach that is suitable when the framework does not completely match the data (161). A deductive analysis was conducted using the concepts of illness perception in the CSM. The data were extracted from the findings sections of the studies and were sorted against the concepts from the framework (timeline, identity, cause, control/cure and consequences). After extracting all data representing illness perceptions in the framework, a new concept, i.e., the experienced consequences, was created for the data representing the participants' perceptions of illness from a retrospective perspective. This data was analysed separately using inductive conventional content analysis according to Hsieh and Shannon (162). The extracted data were read repeatedly to obtain a sense of the whole. The texts describing illness perceptions were highlighted and keywords were written in the margins using the appellations from the studies. These keywords were then developed into codes, and the text was sorted into categories. All text within each code was examined, and some codes were combined during this process. The analysis was conducted by the dissertation author and discussed throughout the process by the research team.

Study IV

The data from the focus group interviews were analysed using a thematic analysis described by Braun and Clarke (163). This method aims to find repeated patterns and meanings. The data were analysed with an inductive approach on a semantic

level, finding explicit meanings in the data (163). Phases One and Two of the analysis were conducted by the dissertation author and one additional member from the research team. In Phase one, to become familiarised with the data, the interviews were read independently multiple times and initial ideas for coding were written down. In Phase Two, the data were organised into meaningful groups using the initial codes formed by reoccurring elements. Phases Three to Five of the analysis were conducted by the dissertation author and discussed throughout the process by the research team. During Phase three, the initial codes were sorted into potential themes and all relevant data were gathered into each theme. For Phase four, the potential themes were reviewed and refined so as to form a thematic map. In Phase Five, the essence of each theme was defined.

ETHICAL CONSIDERATIONS

The four studies included in this thesis have been carried out in accordance with the principles outlined in the Declaration of Helsinki (164), and followed the four basic ethical principles: respect for autonomy, beneficence, nonmaleficence and justice (165).

The principle of respect for autonomy involves three conditions; intentionality (actions are performed according to one's plan), understanding (sufficient knowledge of the situation) and voluntariness (ability to act without controlling influences) (165). To fulfill these conditions, the participants in studies II-IV received oral and written information about the aims of the studies, the procedures, potential risk and benefits. They were also informed that participation was voluntary and could be cancelled whenever they wished without affecting care received or giving any reasons. All participants in studies II-IV signed an informed consent form after receiving information and before any data collection started. In study IV, two informed consent forms were signed, first for the quantitative part of the data collection and second for the focus group interviews. In studies II and III, one reminder was sent to the patients that were interested in participating, but did not return the questionnaires or the informed consent at baseline. Two reminders were sent out to the non-responders at the 6- and 12-month follow-up. If questionnaires were not returned after reminders, this was considered as a withdrawal from the study.

The principles of beneficence (doing good) and nonmaleficence (doing no harm) were followed (165, 166). The beneficence of participation pertained to the possibility to add to scientific knowledge that hopefully other patients may benefit from in the future (studies II-IV). Furthermore, participation in study IV

meant receiving more information of the importance of adherence to their treatment, which could lead to a reduced risk for cardiovascular events.

All personal data were handled according to the Data Protection Act (167). To ensure that personal data is processed in a lawful and proper manner, a Personal Data Processing Agreement was established together with the personal data representative at Malmö University (study IV). Confidentiality was secured by removing personal data from the surveys using code keys which only the research group had access to (studies II-IV). Further, all electronic data were password-protected. Confidentiality in study IV was secured by using an electronic identification solution to get access to the data in the web-based application. To secure the participants' integrity, the results of the studies were presented only on a general level.

Participation in the studies included blood pressure measurements, undergoing ABI measurement, taking a walking test, answering questionnaires in writing, and participating in a focus group interview. These tests were considered as posing negligible risks for the participants. In case of any medical complications, competence to handle such situation existed within the research group. Furthermore, if there was a need for a counselor, the research group could arrange such contact.

The principle of justice involves the right to be treated with equal respect (165). All patients meeting the inclusion criteria were asked to participate with the equal right to accept or decline. However, equality could not be ensured, though the exclusion criteria pertained to e.g. non-Swedish-speaking persons (studies II-IV), persons without technical equipment (smartphone, computer) or persons without BankID (study IV).

An application was sent to an Ethical Review Board according to The Act concerning the Ethical Review of Research Involving Humans (168). The studies were approved by the Regional Ethical Review Board in Lund, Sweden (Dnr 2017/609).

RESULTS

A summary of the results is provided below. A more comprehensive description of the results from each study can be found in papers I-IV. The result in study I is based on 14 prior studies including 316 participants (191 men and 125 women). The participants' ages ranged from 44 to 92 years. The demographics and clinical characteristics in studies II-IV are presented in Table 9.

Table 9. Baseline demographics and clinical characteristics of participants in studies II-IV

	STUDY II/III Total (n=158)	**STUDY IV Intervention group (n=18)**	**STUDY IV Control group (n=16)**
Gender w (%)	80 (50.6)	7 (38.9)	11 (68.8)
Age *mean (SD)*	74.1 (7.3)	71.5 (6.2)	74.4 (8.6)
Body mass index (kg/m^2) *mean (SD)*	25.8 (4.1)	26.7 (5.0)	26.8 (4.3)
Ankle brachial index *mean (SD)*	0.65 (0.19)	0.65 (0.17)	0.62 (0.12)
Systolic blood pressure (mmHg) *mean (SD)*	148.2 (21.2)	154.5 (21.3)	150.3(33.3)
Diastolic blood pressure (mmHg) *mean (SD)*	76.6 (10.5)	73.0 (8.2)	75.6 (12.3)
***Civil status n* (%)**			
Living alone	53 (33.5)	6 (33.3)	9 (56.3)
Cohabitation	89 (56.3)	12 (66.7)	7 (43.8)
Living apart	5 (3.2)	-	-
Education level n (%)			
Elementary school	44 (27.8)	4 (22.2)	2 (12.5)
Upper secondary school	45 (28.5)	5 (27.8)	3 (18.8)
University	42 (26.6)	8 (44.4)	5 (31.3)
Other	26 (16.5)	1 (5.6)	6 (37.5)
Lifestyle factors n (%)			
Current smoking	33 (20.9)	4 (22.2)	4 (25.0)
Former smoking	108 (68.4)	11 (61.1)	11 (68.8)
Never smoking	16 (10.1)	3 (16.7)	1 (6.3)
Physical activity	125 (79.1)	14 (77.8)	13 (81.3)

Study I

The participants in the included prior studies had PAD of varying severity, but a preponderance of IC. The studies were conducted in Europe or North America. Data were collected through individual interviews (n = 10), focus group interviews (n = 3) or both (n = 1). The results from study I are presented according to the concepts in the CSM, which pertain to illness perceptions from a prospective perspective. After the inductive analysis, a new concept was added, pertaining to consequences of the disease in a retrospective perspective.

Beliefs about identity of the illness

The beliefs about the cause for the leg symptoms were not unanimous. There were beliefs that the symptoms were a result of PAD, but also beliefs that other medical conditions were the reasons for the symptoms. Other factors were also described, such as the ageing process or generalised cramps. There were also several participants that had no idea.

Beliefs about the timeline of the illness

The results differed regarding beliefs of the duration of the disease. Some believed PAD to be a permanent condition that could not be cured. Others believed that the disease was a temporary condition that did not require self-management, but that surgical treatment could cure or reduce symptoms.

Beliefs about the cause of the illness

Some participants believed that lifestyle factors were the cause of the illness. There were also participants who did not acknowledge lifestyle factors as a cause of the disease. Smoking was recognised as a risk factor in several studies, but recognition was inconsistent regarding the role of other lifestyle factors. Other beliefs about the cause pertained to ageing, comorbidity or coincidence.

Beliefs about the control or cure of the illness

Beliefs about the control or cure of the illness included views of the patients' control of the illness and the effectiveness of the treatment. The participants had beliefs that walking was important for improving their situation, but lacked awareness of how much exercise of that kind which was necessary. Reasons for not doing physical activity were fear of pain, lack of guidance regarding duration and intensity of walking, and beliefs that walking would not have any effect.

Importance of smoking cessation and increased exercise were acknowledged, but the ability to change one's behaviour was sometimes described as deficient. High beliefs about what surgical treatment could accomplish were expressed, with expectations to be cured.

Beliefs about the consequences of the illness

The participants' beliefs about what impact the illness would have on their lives showed that the participants expected several negative consequences. They described a fear of worsening of symptoms but also a fear of future amputation. They were worried that the illness would cause increased dependency and worried over how they would manage if their partner also would become sick. The future felt uncertain, generating feelings of lack of control.

Experienced consequences of living with PAD

The additional perceptions reported pertained to the experienced consequences of living with PAD. Participants expressed that living with PAD generated feelings such as anger, humiliation and powerlessness, but most of all, a feeling of frustration. The physical limitations were seen as leading to involuntary isolation and a feeling of being left out when participants were forced to abstain from physical or social activities. Living with PAD meant losing independence. Participants felt that they were a burden for others, which created a feeling of powerlessness. To be forced to give up activities that had been important to them affected their self-image.

Participants described their situation in terms of a process of adaptation. Activities needed to be planned in advance and participants needed to be prepared for the fact that everything takes more time. The adaptation process was described in terms of lowering expectations and being realistic. Some accepted their new situations, finding new hobbies and others value in life. Others for whom physical activity had been an important factor in the past had more difficulty accepting and adapting to their new situation.

Study II

In study II, 52,5 % of the participants reported an insufficient level of health literacy. When evaluating their level of health literacy in relation to sex and to clinical characteristics, no differences were found. Regarding demographics,

differences were seen in civil status and educational level. Insufficient health literacy was more frequent among participants living alone compared to participants who were co-habitants. Participants with a university degree reported higher ability in the dimension to "understand" *(p= 0.007)* and "access" *(p=0.008)* information relevant to health compared to those with another educational level. When evaluating the level of health literacy in relation to lifestyle factors, the results showed that current smokers had a higher ability to "access" *(p=0.001*) and "understand" *(p=0.021)* information relevant for health compared to former smokers and those who were never smokers. Further, a higher proportion of participants reported that they were physically active among those with sufficient health literacy, compared to those with insufficient levels of health literacy *(p=0.029)*. The participants that reported themselves to be physically active had a higher ability to "understand" information relevant to health *(p=0.020)*. The association between physical activity and health literacy was confirmed in the logistic regressions. The odds of having sufficient health literacy were highest among physically active participants *(OR 2.77; 95% CI 1.05-7.27; p=0.039)*. Moreover, participants with sufficient health literacy reported higher self-efficacy *(p=0.001)* and QoL *(p=0.001)* than did participants with insufficient health literacy.

Study III

In study III, differences between health literacy levels could be seen in relation to the concepts of illness perception, in that participants with sufficient health literacy reported lower emotional representations *(p=0.001)* and less consequences *(p=0.003)* of IC than participants with insufficient health literacy. Further, illness perceptions differed by sex, in that women reported higher emotional representations *(p=0.047)* and higher illness coherence *(p=0.028)* compared to men. As a part of illness perception, the participants' reported beliefs of what caused their illness fell largely into the categories smoking (42.7%), age (21.8%), genetics (9.1%), and no idea (7.3%).

Several associations were found between illness perceptions and adherence to medication treatment. Illness coherence *(r_s=0.21; p=0.028)* and treatment control *(r_s=0.22; p=0.016)* correlated positively with adherence, indicating that the participants with higher scores on these concepts had higher adherence. The concepts of timeline *(r_s=−0.24; p=0.009)*, timeline cyclic *(r_s =− 0.19; p =0.042)*,

personal control *(r_s =− 0.19; p= 0.044)* and emotional representations *(r_s =− 0.58; p<0.001)* correlated negatively with adherence, indicating that the participants with higher scores on these concepts had lower adherence.

Moreover, positive associations were found between personal control in illness perception and QoL *(r_s =0.35; p< 0.001)* and between self-efficacy and QoL *(r_s=0.22; p=0.014)*, indicating that higher scores were positively associated with higher QoL. Further, the participants with sufficient health literacy reported higher self-efficacy *(p=0.049)* and QoL *(p=0.005)* than participants with insufficient health literacy, which was essentially the same result as in study II. A negative association was found between the perception of consequences of the illness and QoL *(r_s=−0.57; p<0.001)* and between adherence to medication treatment and QoL *(r_s =−0.22; p=0.013)*, indicating that higher scores were associated with lower QoL. A multiple regression model (F 23.03; p < 0.001) explained 46.5% of the variance in QoL (adjusted R square=0.465). Both perceived consequences *(B=−0.569, β=−0.576, p<0.001)* and adherence to medication treatment *(B=−0.556, β=−204, p<0.001)* were negative predictors of QoL meaning that higher scores in these variables predicted poorer QoL.

Finally, the QoL medians with (IQR) were 13.0 (11.0–17.0) at baseline, 15.0 (11.0–17.0) at 6 months, and 16.0 (12.0–18.8) at 12 months. When comparing changes over time, a significant increase in QoL was seen between baseline and 6 months *(p= 0.033)*, baseline and 12 months *(p<0.001)*, and 6 months and 12 months *(p= 0.031)*. After a correction for multiple comparisons (Bonferroni), the significant increase in QoL remained between baseline and 12 months *(p=0.003)*. No significant changes over time were seen in self-efficacy.

Study IV

The participants' adherence to daily reporting in the application in study IV were at high levels during the entire time period of the study (86-93 %). The median reporting times for participants were 14 seconds per variable, and the median reviewing time for the research team were 12 seconds per participant and day. The result of the primary and secondary outcomes is presented in Table 10.

Table 10. Primary and secondary outcomes after the use of web-based application during three months in patients with IC

	OUTCOMES	RESULTS
Primary outcome	Walking distance	A non-significant trend for increased walking distance in the intervention group (28.5 m) compared to the control group (8.3 m) *(p=0.389)*.
Secondary outcomes	Ankle brachial index	Significant improvement in mean change in ABI in intervention group *(0.06 (0.11)) compared to the control group * (-0.05 (0.08)) *(p=0.015)*.
	Quality of life	Significant improvement in QoL in the intervention group between baseline (16.0 (12.0-17.0) and follow-up 18.0 (14.0-19.0) *(p=0.049)*.
	Health education	Significant increase in *self-monitoring and insight* in both the intervention group: 18.0 (16.0-19.0) to 19.0 (18.0-20.0) *(p=0.016*) and the control group: 18.0 (16.0-20.0) to 19.0 (17.5-20.5) *(p=0.014*), meaning higher insight into living with a health problem. Significant increase of *skill and technique acquisition* between baseline 12.0 (8.0-13.0) and follow-up 12.5 (11.0-15.0) in the control group *(p=0.024)*, meaning that respondents had developed skills in symptom relief and techniques to manage their own health.
	Lifestyle factors	A non-significant trend in physical activity. More participants in the intervention group were physically active after three months (from 73.3 % at baseline to 86.7 % at follow-up) compared to the control group, in which less participants were physically active (from 78.6 % at baseline to 64.3-% at follow-up) *(p=0.135)*. No differences in smoking in either of the groups after three months.

Values are medians (IQR) or *mean (SD)

Experience of using a web-based application

Three major themes were identified from the focus group interviews. These themes pertained to a process where the *usability factors* of the application led to the feeling of having *a helping hand,* which further worked as a *promoter of self-care and control*.

In relation to the theme of *usability factors*, the participants described the application as *being user-friendly*, *being rewarding* and *giving the possibility to interact* with health care. The advantages with the application reported most often were that it was easy to navigate in and to register for. The access to all of the registered data was important, giving the possibility to follow one's own progression. Further, being rewarded after completing the set-up goals were

valuable, as well as the possibility to interact with the health care professionals (here the research team). Future desirable improvements according to the participants pertained not least to the rating scale, which was difficult to land at the intended position. Participants also critiqued the requirement of identification with BankID each time for log-in, which was considered unnecessary. Finally, several users wanted to have the possibility of interacting with other users through the application.

Further, the application was described *as a helping hand* that worked as a motivator. The participants described how the application became a "friend" and a tool that increased their motivation for walking exercise and increased their discipline in following recommendations.

Finally, the participants described the application as *a promoter of self-care and control*. Having to report daily, the participants became aware of how much physical activity they performed and exactly how many cigarettes they smoked. The application worked as a promoter for lifestyle recommendations and of more extensive self-care. The application also helped to create a structure for reports, and the routines of daily reporting made it easier to follow recommendations. However, according to the participants, the use of the application did not have any impact on their adherence to the lifestyle recommendations after the intervention was completed. To be able to follow their own progression helped to *create control* over their situation. However, the inability to interpret the measurements they reported in the application could also create worry, and more knowledge was desired about what values to expect.

METHODOLOGICAL CONSIDERATIONS

This thesis is based on four studies using both quantitative (studies II-IV) and qualitative methods (studies I, IV). Using a combination of methods is considered a strength, in that the different types of knowledge which then are generated leads to a more comprehensive picture of the research area (169). The methodological choices made here will be discussed with respect to aspects of trustworthiness (truth value, applicability, consistency, neutrality), as described by Lincoln and Guba (170). The conventional formulations for quality criteria in quantitative studies (internal validity, external validity, reliability, objectivity) will be used in combination with four quality criteria for qualitative studies (credibility, transferability, dependability, confirmability) (171).

Truth value

For evaluating the truth value of findings reported, *internal validity* is used in quantitative research, and refers to the extent to which the observed results represent the truth and are not due to methodological errors. *Credibility* is correspondingly used in qualitative research, and refers to the participants' views and the researchers' interpretation and representation of the findings.

Internal validity

Internal validity could be threatened by information bias, referring to systematic errors which occur if variables are collected incorrectly or falsely measured (172). To minimise the risk of information bias, all questionnaires used in this thesis have been validated in a Swedish context. However, the background questionnaire was developed specifically for studies II and III, and could be considered to yield limitations due to lack of validation. Physical activity and

smoking habits measurements were obtained as self-reported outcomes (studies II-IV), which could result in inaccurate estimation due to social desirability bias or failure to recollect adherence behaviour (173). To reduce this risk, a digital tool for measuring physical activity would have been preferable (study IV). An update in SCORE2, suitable for patients with DM has recently been published (174). This update would have been preferable to use in cases where DM was present. The use of SCORE2 may have led to an underestimation of the risk of developing CVD in patients with DM and should be considered when interpreting the result.

Many of the participants in study III reported maximum scores in the medication adherence questionnaire, indicating a ceiling effect. Similar results have been reported in previous studies (175-177). As described earlier, BMT is an important part of the secondary prevention in patients with IC, and exploring medication adherence is necessary. It has been shown that refill-of-prescriptions records from pharmacies, in combination with self-reported data, measure different aspects of adherence (178), and could be a better way for measuring medication adherence in future research.

Another systematic error that could threaten internal validity is selection bias. which occurs when the research sample is not representative of the target population, leading to spurious variations in research outcomes. The recruitment process is a challenge since people with specific characteristics are more likely to participate than others. To reduce the risk of selection bias, randomised recruitment can be used (179). However, in order to recruit as many participants as possible, consecutive sampling was used in studies II/III. A limitation in these studies might be that no power calculation was performed. The period of the data collection proceeded for two years and was planned to continue to reach the estimated sample size of 200 participants, as in previous studies using the IPQ-R (180-182). However, due to the Covid-19 pandemic, the recruitment had to stop earlier since patients with IC were not a prioritised group for care during this time, meaning that they were generally not called in to visit outpatient clinics. Despite somewhat small sample sizes in studies II and III, significant differences were found. However, there is a risk that the study failed to reject the null hypothesis – that is, that differences may have existed which were not detected (type II-error) (183).

The longitudinal design of the study was used to be able to determine patterns over time. However, a limitation with this method is the risk for attrition, since continued participation requires commitment from the participants during a longer time (184). In study III, the participants needed to fill in questionnaires on three occasions over one year. During this time, some of the participants decided to withdraw from further participation. However, the dropout rate during follow-up was acceptable, and patients ceasing to participate may be considered as unavoidable attrition.

Another threat to internal validity is constituted by the confounding factors which affect the variables being studied, something which might lead to a result not reflecting the real relationships between the included variables. One way of dealing with confounders is by employing multivariate analysis (185). This method was used for establishing the associations between physical activity and health literacy in study II, adjusting for age, gender, level of education and civil status.

Further ways to enhance internal validity could have included using double-blinding in an RCT (186). However, this was not possible in study IV due to the nature of the intervention. To standardise the conditions of the intervention, a study protocol was strictly followed to ensure that the procedure was the same for all participations.

Credibility

To ensure credibility in study I, the quality of the included studies was critically appraised using a combination of established assessment tools. CASP is a generic tool provided for the assessment of trustworthiness, and was modified by adding questions from SBU (135) to further ensure appraisal rigor.

The quality of the data in the focus group interviews is dependent on the interviewers' technique (158). To decrease the risk for information bias in study IV, an interview guide was used, to ensure that the questions were phrased the same way each time. To further increase credibility, the interviews were conducted by both a moderator leading the interview and an assistant moderator providing supplementary questions when needed. In the analysis process, credibility was further enhanced by moving forth and back between the themes and maintaining closeness to the original text until consensus was achieved in the research team.

Applicability

External validity (*generalisability)* in quantitative research, or *transferability* in qualitative research, refer to how well the findings are applicable to other groups and settings.

External validity

To increase the generalisability of results to a broader Swedish context in study II and III, participants from three different vascular clinics in the south of Sweden were included. A limitation in studies II-IV was mastery of the Swedish language as a participant inclusion criterion. Language barriers can affect how patients perceive and manage their own health (187). Therefore, when excluding non-Swedish speaking patients, the generalisability of the outcomes is affected. However, providing questionnaires in other languages was not possible for this thesis. Further, only a Swedish testing context was available for the web-based application. This needs to be considered when interpreting the results, since non-Swedish speaking patients are not represented in study II-IV.

The main purpose of a pilot study is not to test a hypothesis, but to assess the different aspects of the study. By performing a pilot study, the probability of success in a full-scale study is enhanced (188). The inclusion criteria that the participants required a smartphone, computer or tablet could exclude patients interested in participation. Smartphone usage is increasing also in the elderly population (189). However, to avoid the risk of exclusion of participants without the requisite technical equipment, this could be provided by the research team. Unfortunately, this was not possible for this thesis.

Transferability

In study I, all the included studies were conducted in Europe or North America, with attendant limitations for transferring the results to a global context. Further, due to the lack of studies on illness perceptions specific to patients with IC, studies on PAD (regardless of disease severity) were also included. The result can thereby be transferred to patients with PAD from the geographical areas where the included studies were conducted, but not specifically to patients with IC. Another way to further enhance transferability is by providing sufficient information on the participants and the research context (190). Descriptive data to this effect was presented in study IV, but was not possible to provide in study I due to limited data on the informants in the included studies.

Consistency

To evaluate consistency, *reliability* is used in quantitative research and refers to the extent to which the results can be reproduced when the research is repeated under the same conditions (191). *Dependability* is the corresponding quality criterion used in qualitative research, and refers to the constancy of the data over similar conditions (170).

Reliability

To objectively estimate reliability, internal consistency can be calculated using the Cronbach's alpha (149). In studies II and III, Cronbach's alpha was found appropriate for all the questionnaires used, except from the questionnaire measuring adherence to medication. In this latter questionnaire, Cronbach's alpha was estimated at 0.57, which is below the recommended level at 0.7 according to Tavakol (149). This could be interpreted to mean that the questionnaire might not be suitable for patients with IC.

Dependability

To enhance dependability in study I, the search strategy was published. This enables a possibility to reproduce the results. Dependability can also be achieved when another researcher is part of each stage of the research process (192). In studies I and IV, the dissertation author conducted the studies, but all members of the research team were involved in the different steps in the research process.

Neutrality

Neutrality refers to the degree to which the results are based on the participants' responses and not biased by the researchers' own perspectives. *Objectivity* means that research should be unbiased and devoid of personal interpretations, a quality criterion used in quantitative research. *Confirmability* is to which extent the findings are shaped by the respondents and not biased by researchers' preferences or interests, and is the corresponding quality criterion used in qualitative research.

Objectivity

A threat to objectivity could arise if there are economic interests, such as those of sponsors, actively implicated in a research study (190). The company providing

the web-based application in study IV did not fund the research. Consequently, there were no such conflicts of interest here.

Confirmability

Three of the members in the research team had extensive experience of working with patients with intermittent claudication, and one team member had no such experience. Prior understanding can be an advantage in qualitative research – for example, with formulating research questions. However, there is a risk that the researchers' pre-understanding of the research area might affect the findings (193). To minimise this risk, the different steps in the method were discussed in the research group throughout the process (163). The focus group interview as a method can enhance confirmability since verification of the findings occurs during the interviews (158). Further, each interview ended with the moderator summarising the discussed experiences, giving the participants a chance to confirm or reject the findings. To enhance confirmability in the analysis process, the dissertation author and one other member of the research team did the initial ideas for coding independently and followed up through comparison and discussion to reach consensus. Enhancing confirmability can also be done by demonstrating how interpretations were established – for example, by showing how the findings derived from the data (194). This was achieved in study IV by using quotes. Finally, to reduce the risk for researcher bias, all members of the research team were part of the analysis process.

DISCUSSION

The results from the four studies in this thesis present new knowledge about patients with IC when it comes to their illness perceptions and factors associated with their adherence to secondary preventive treatment. The thesis also contributes to the comprehension of e-health as support for increasing adherence to treatment.

In study I, a systematic review was conducted to comprehensively summarise all available qualitative evidence regarding illness perceptions in patients with PAD. The study found that patients' beliefs about their illness are heterogeneous regarding what is held to cause their symptoms, as well as regarding timelines (whether the disease is held to be acute or chronic). Further, causal beliefs also differed in ways which were confirmed in study III, where illness perceptions were quantitatively assessed. Some of the participants acknowledged the role of lifestyle factors, while others focussed on age or comorbidity, or professed not to know. This is in line with previous research showing gaps in disease knowledge in patients with PAD (64, 195). Lack of knowledge of what has caused the disease, together with unawareness of the chronic nature of the disease, may decrease the chance of adherence to recommended treatment. The participants also expressed a need for more information regarding walking exercises. They averred uncertainty on how much they should exercise, and fears that they could make their situation worse by walking. This unawareness might affect self-management, and concretises the need for structural support. A study on patients with coronary heart disease found that illness perceptions were improved in patients who had attended cardiac rehabilitation (93). Tailored educational interventions focussing on the concepts of illness perception could be a way to enhance knowledge of the disease and thereby improve self-management.

For the analysis, the CSM framework was used, which was suitable as a deductive structure in the analysis. However, an additional concept were added so as to visualise both beliefs about consequences and the experienced consequences of the disease. The experienced consequences entailed a process of adaptation to living with a chronic disease, a process which may also be addressed when supporting the patients with their self-management. Also, further studies with the objective of exploring illness perceptions in relation to the different stages of the disease in patients with PAD are warranted. As described earlier, knowledge of how patients with PAD/IC perceive their illness is crucial for providing optimal support to secondary prevention treatment. However, to be able to tailor this information, knowledge regarding patients' level of health literacy is important, something which was evaluated in study II.

The results in study II showed that a majority of the participants had insufficient levels of health literacy. This is in line with a previous study on health literacy in patients with PAD (196), emphasising the importance of taking the level of health literacy into account when planning for secondary prevention support for these patients. Since health literacy temporarily can be reduced when facing a new diagnosis (79), one could argue that patients with IC could benefit from repeated information at a later time after the diagnosis is established.

The result in study II also showed that patients with sufficient health literacy were more physically active and had higher self-efficacy and quality of life compared to the patients with insufficient health literacy. This accords with previous research on patients with CVD which shows that health literacy has a direct effect on QoL (84, 94, 197), but also an indirect effect via self-efficacy (197). This illuminates the importance of enhancing the health literacy of these patients.

A review of health literacy interventions showed that health literacy interventions can improve behavioural outcomes such as smoking cessation and increased physical activity in patients with CVD (82). This indicates that improved health literacy could lead to increased adherence to secondary prevention treatment for patients with IC. The improvement in health literacy could be achieved through educational interventions such as one-on-one education, group workshops, smartphone apps or Teach-back classes (82).

The result from study III showed that patients with sufficient health literacy experienced less consequences and lower emotional representations than patients with insufficient health literacy. This corroborates the results from a study on patients with CVD where participants with insufficient health literacy perceived

the condition to have fewer negative impacts on daily life, and also experienced stronger negative emotions, than those with sufficient health literacy (198). This further underscores the advantages of strengthening health literacy in these patients.

The fact that QoL increased between baseline and 12 months, even though no systematic secondary prevention support was offered, was a positive and interesting result. However, the results from study I showed that patients with PAD undergo a process of adaptation whereby they adapt to their new situation and find new ways of doing things that do not require physical activity at the same levels as before, which further contributes to declines in functional capacity. Even though QoL was improved, the cardiovascular risks remain, and are often even higher since the patients are less likely to perform walking exercises due to their physical limitations.

As discussed earlier, the majority of the participants in study III had maximum scores in the questionnaire for adherence. This is in line with the results from a previous study comparing self-reported adherence with registry-based adherence in patients with IC, showing that self-reporting adherence was overestimated (199). However, the result contrasts with the results from a study on medication beliefs in patients with PAD, where patients expressed weak beliefs regarding necessity of medication, indicating that patient concerns about the treatment are stronger (200). These results correspond to the results from study I regarding participants' unawareness of the chronic nature of their disease and the requirement of long-term medication to prevent progression of the disease, so as to decrease risk for cardiovascular events and improve QoL. Altogether, the results from the questionnaire measuring adherence should thereby be interpreted with caution.

Further, no change in self-efficacy was found between baseline and the follow-up at 12 months. To improve self-efficacy, some sort of support is most likely needed. Research has shown that patients' self-efficacy can be enhanced by nurse-led self-management programmes (6, 123). Since self-efficacy could be a mediator between health literacy and QoL (197), improving self-efficacy would be beneficial for improving the patients' self-management. According to the middle-range theory of self-care, the concepts of self-maintenance, self-monitoring and self-management are closely interrelated, and are all important factors contributing to sufficient self-care (126). Since health literacy, illness perceptions and self-efficacy are factors influencing adherence to treatment, the

results from studies II and III suggest that by strengthening these factors, the chances of pursuing sufficient self-care would increase.

In study IV, adherence to the web-based application's routines was high during the three-month study period. The focus group interviews revealed that the application was seen as user-friendly. Nevertheless, one supposition here is that patients with sufficient health literacy might benefit more from a web-based application as support than do patients with insufficient health literacy. To ensure that all patients, regardless of health literacy levels, can be strengthened in their self-management health literacy is an important goal, and further studies with full-scale RCTs would be one way to find out more about how to achieve this goal.

Several positive effects of using a web-based application as support for patients with IC were seen in study IV. The result showed a non-significant trend towards increased walking distance for both the intervention group (28.5 m) and the control group (8.3 m). According to McDermott et al. (201), a small minimal clinically important difference in health outcomes is achieved at 8 metres, and a large minimal clinically important difference in health outcomes is achieved at 22 metres. This indicates that both groups had a trend towards clinical improvement in their walking distances, even though the increase was statistically non-significant. However, according to Sandberg et al. (202), an improvement of walking distance at 46 metres is the minimal detectable change after an intervention for patients with IC. Consequently, the present results should be interpreted with caution.

The participants in the intervention group had an increased mean change in ABI compared to the control group, for whom ABI decreased. According to a previous review, a reduction of >0.15 in ABI is associated with progression of symptoms and a twofold increase in mortality. Further, the average increase of ABI after surgical interventions is 0.10-0.15 (203). Even though the changes observed in the present studies were quite small, and did not reach the levels described by Poredos et al. (203), the results indicate that the web-based application might be a motivator to walking exercise. However, the patients' health status is not entirely explained by ABI, but also needs to be evaluated through patients' own assessments (204).

The participants in the intervention group reported significant improvement in QoL between baseline and follow-up. Even though the increase did not reach the level of substantial clinical benefits, which is 3.5 scale steps in vascuqol-6 for

patients with IC, the result reached the level of a minimal important difference at 1.7-2.2 scale steps (205). Altogether, the results from study IV discussed above suggest that patients with IC might benefit from using a web-based application as support and that there is a value in further research on this issue at a larger scale.

To realise further improvements for patients, the application should be modified together with the patients. According to De Maeijer et al. (206), the need for innovation is determined by the end user, showing the importance of involving participants in the different steps of the research process. If the digital tools are co-produced, this increases the chance of avoiding intersubjectivity and instead creating a product that offers the users the support they need and actually want to use. The result from the focus group interviews included ideas offered for improvement of the application. With an even more tailored application suitable for patients with IC, the chances of adherence to the secondary preventive treatment could increase.

The results from the focus groups showed that the participants valued the possibility to interact with health care professionals through the application. According to the middle range theory of self-care, the goal of self-care management is effective treatment of symptoms by interpretation and response to signs and symptoms when they occur (126). The possibility to get feedback from health care offers more immediate support, which might enhance patients' ability to manage their disease.

Users also expressed a wish for a possibility to interact with other users. This result corresponds with the result from a previous study on how patients with IC experience participating in a community-based cardiovascular rehabilitation programme. The social support from other patients encouraged study participants to be physically active. Additionally, the pedometers used to measure the walking distances attained further increased participants' motivation to exercise (207). The possibility to objectively measure walking distance was something that was expressed during the focus group interview in study IV as a way to improve the application.

The participants also appreciated that they had access to all reported data, which created the possibility to follow their own progression. This suggests that the application might provide support to the patients' self-monitoring of their disease, which according to previous work on self-care processes (126) is something which can further improve patients' self-care. Further, study participants

described the application as a promoter for self-care and control. According to the participants, their discipline to adhere to their treatment increased during the study period, and the application made it easier to follow treatment recommendations. However, participants also revealed that the adherence discipline to lifestyle recommendations decreased after the intervention was completed when they did not have access to the application anymore. This indicates the importance of sustainable support for these patients and that web applications might improve the patients' self-maintenance, where the goal is to maintain health and prevent progression of the disease, according to the middle-range theory of self-care (126).

Also, as described earlier, patient's self-efficacy is an important factor to be able to pursue adherence to a treatment (208). However, self-efficacy was not measured in the pilot study – this factor could be a valuable addition to a full-scale RCT. These considerations could affect adherence to secondary preventive treatment, and should be viewed together with the fact that the participants in the focus group interviews expressed how important it was that their reported data were assessed daily by a health care professional. These results also correspond on a broader level with the e-health literacy framework. For the patients to benefit from e-health, support should be designed which is suitable for the patients' needs. Also, personal contact with health care professionals needs to be available (209). The results of study IV showed that the tested application seemed to reinforce all three factors included in the middle-range theory of self-care, indicating that e-health could be beneficial in supporting patients with IC to handle their disease better. A further study at a larger scale can therefore be valuable.

CONCLUSION

Patients with PAD perceive their disease in different ways, and are often unaware of the chronic nature of the disease and of the reasons why secondary preventive treatment is being pursued. These beliefs may influence patients' self-care maintenance, self-care monitoring and self-care management regarding their disease, which in turn influences adherence to treatment and should therefore be addressed (study I).

Among patients with IC, insufficient health literacy is common, particularly among those living alone. A university degree appears to be beneficial when "accessing" and "understanding" information relevant to health. Further, patients with sufficient health literacy have higher self-efficacy and QoL, and are more physically active than patients with insufficient health literacy (study II).

Sufficient health literacy seems to be a protector against consequences and emotional representations of the disease in illness perceptions, but also seems to strengthen self-efficacy and QoL. QoL increases over time, but self-efficacy does not change over time (study III).

The web-based application appears to have positive effects on secondary prevention outcomes, indicating that e-health might offer support to patients with IC in their self-care. This suggests that a larger-scale follow-up study could be valuable (study IV).

CLINICAL IMPLICATIONS

Several of the findings from this thesis can be used in clinical settings. The knowledge that patients have different beliefs regarding their illness can be applied in daily clinical work. Additionally, knowledge of patients' health literacy can further help to improve the communication between health care professionals and the patients. However, the findings on patients' beliefs about their disease challenge health care professionals to improve how information is conveyed.

If health care can address health literacy and illness perceptions in patients with IC, and use this knowledge to tailor information offered based on the patients' prerequisites to use it, adherence to treatment might be enhanced.

The positive results from the pilot study indicates that e-health might be an important part of health care for these patients. Clinical settings need to be adjusted so as to be able to provide suitable e-health support in the near future. In addition, the positive results for the control group regarding increasing insight into how to live with their disease indicates that even smaller efforts by health care professionals can have an impact on the adherence to secondary prevention treatment, leading to improved QoL for patients with IC.

POPULÄRVETENSKAPLIG SAMMANFATTNING

Benartärsjukdom är en kronisk sjukdom som innebär nedsatt cirkulation framför allt orsakat av åderförkalkning i benens artärer. Claudicatio intermittens eller fönstertittasjuka som den också kallas är det vanligaste symtomet på benartärsjukdom där den nedsatt cirkulationen leder till smärta i benen vid fysisk ansträngning som först försvinner efter en stunds vila. Att leva med sjukdomen innebär för många en minskad självständighet, ofrivillig isolering och en sänkt livskvalitet. Riskfaktorer är bland annat rökning, ålder, högt blodtryck, höga blodfetter och diabetes. Då åderförkalkning inte bara drabbar benens kärl utan även andra blodkärl i kroppen löper patienter med benartärsjukdom en ökad risk för hjärtinfarkt och stroke. I första hand behandlas patienterna med sekundärprevention vilket innebär rökstopp, gångträning och kärlskyddande läkemedel. Denna behandling är livslång och ska fortsätta även i de fall där kirurgisk behandling är aktuell. Då den kan vara krävande att genomföra livsstilsförändringar kan det vara svårt att vara följsam till sin behandling. För att kunna förbättra vården för dessa patienter behövs därför kunskap om vilka faktorer som påverkar patienternas förmåga till egenvård. Vidare så behöver nya sätt hur stöd kan utformas att testas. E-hälsoverktyg har visat vara framgångsrikt i andra patientgrupper, men har inte ännu testas på patienter med claudicatio intermittens. Det övergripande syftet med avhandlingen var därför att undersöka sjukdomsuppfattning och faktorer som kan påverka följsamheten till sekundärprevention hos patienter med claudicatio intermittens. Vidare att testa och utvärdera en webbaserad applikation som stöd till behandlingen hos dessa patienter.

I studie I var syftet att systematiskt sammanställa resultatet från forskningsstudier gjorda på sjukdomsuppfattningen hos patienter med benartärsjukdom. Metoden var en systematisk litteraturöversikt där totalt 14 artiklar inkluderades. Resultatet visade en saknad i förståelse i sjukdomens symtom, orsak och att tillståndet är kroniskt. Uppfattningen om behandlingen varierade från kännedom om de positiva effekterna av fysisk aktivitet till en uppfattning att det inte skulle ha någon effekt alls, utan i stället göra situationen värre. Det fanns en rädsla att sjukdomen skulle försämras och att det skulle leda till att de blev mer beroende av hjälp från andra och att de skulle förlora kontrollen. De upplevda konsekvenserna av att leva med sjukdomen innebar en process av anpassning till den nya situationen.

I studie II var syftet att utvärdera hälsolitteracitet hos patienter med claudicatio intermittens med avseende av klinisk karaktäristika, demografi, tilltro till egen förmåga och livskvalitet. Metoden som användes var en tvärsnittsstudie där data samlades in via frågeformulär. Totalt 158 patienter inkluderades. Resultatet visade att 52.5 % av deltagarna hade otillräcklig hälsolitteracitet. Otillräcklig nivå var mer vanligt hos de som levde ensamma jämfört med sammanboende. De som hade en universitetsutbildning rapporterade en högre förmåga att få tillgång till och att förstå hälsorelaterad information. Vidare visade resultatet att patienter med tillräcklig hälsolitteracitet rapporterade högre tilltro till sin förmåga och även högre livskvalitet. De var också mer fysisk aktiva än patienter med otillräcklig hälsolitteracitet.

I studie III var syftet var att jämföra sjukdomsuppfattning, hälsolitteracitet, tilltro till egen förmåga, följsamhet till behandling och livskvalitet hos patienter med claudicatio intermittens. Studie III var en uppföljning på studie II där de deltagarna följdes upp efter 6- och 12 månader. Datainsamlingen var även här frågeformulär. Resultatet visade att kvinnor rapporterade högre förståelse för sin sjukdom och hade samtidigt högre emotionell påverkan jämfört med män. Uppfattningen avseende orsaken till sjukdomen var rökning, ålder, ärftlighet eller ”ingen aning”. Patienter med tillräcklig hälsolitteracitet rapporterade mindre konsekvenser och lägre emotionell påverkan. De visade också på högre tilltro till sin förmåga och högre livskvalitet jämfört med de som hade otillräcklig hälsolitteracitet. Mellan studiestarten och uppföljningen efter 12 månader hade livskvaliteten ökat, men ingen skillnad fanns i tilltron till sin förmåga.

I studie IV som var en pilotstudie så var syftet att utvärdera användbarheten av en webbaserad applikation och dess effekt på sekundärpreventiva utfallsmått hos patienter med claudicatio intermittens. Vidare syfte var att beskriva patienters erfarenheter av att använda en webbaserad applikation. Data samlades in via fokusgruppintervjuer. Totalt inkluderas 34 patienter som lottades att ingå i interventionsgrupp eller kontrollgrupp. Interventionsgruppen fick tillgång till en applikation där de rapporterade in information avseende fysisk aktivitet, rökning, läkemedelsbehandling, blodtryck, smärta efter aktivitet och livskvalitet. Denna information granskades av forskningsgruppen och individuella råd kunde ges via applikationen.

Resultatet visade att interventionsgruppen förbättrade ankelindex och att de hade en trend mot förbättrad gångsträcka jämfört med kontrollgruppen. De förbättrade även sin livskvalitet från studiens start till uppföljningen efter 3 månader. Via fokusgruppintervjuerna identifierades tre teman där applikationen beskrevs som användarvänlig vilket ledde till en känsla av att ha en hjälpande hand som vidare fungerade som en promotor till egenvård och kontroll.

Sammanfattningsvis så visade avhandlingen att sjukdomsuppfattning, hälsolitteracitet och tilltro till egen förmåga är faktorer som påverkar hur patienter med claudicatio intermittens hanterar sin sjukdom.
Det positiva resultatet i pilotstudien visade att en webbaserad applikation skulle kunna vara fungera som stöd hos dessa patienter i deras följsamhet till sin sekundärpreventiva behandling, men behöver testas i en större studie.

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REFERENCES

1. Aboyans V, Ricco JB, Bartelink MEL, Björck M, Brodmann M, Cohnert T, et al. 2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS): Document covering atherosclerotic disease of extracranial carotid and vertebral, mesenteric, renal, upper and lower extremity arteriesEndorsed by: the European Stroke Organization (ESO)The Task Force for the Diagnosis and Treatment of Peripheral Arterial Diseases of the European Society of Cardiology (ESC) and of the European Society for Vascular Surgery (ESVS). Eur Heart J. 2018;39(9):763-816.
2. Abaraogu UO, Ezenwankwo EF, Dall PM, Seenan CA. Living a burdensome and demanding life: A qualitative systematic review of the patients experiences of peripheral arterial disease. PLoS One. 2018;13(11):e0207456.
3. Cronin CT, McCartan DP, McMonagle M, Cross KS, Dowdall JF. Peripheral artery disease: a marked lack of awareness in Ireland. Eur J Vasc Endovasc Surg. 2015;49(5):556-62.
4. Lovell M, Harris K, Forbes T, Twillman G, Abramson B, Criqui MH, et al. Peripheral arterial disease: lack of awareness in Canada. Can J Cardiol. 2009;25(1):39-45.
5. Tóth-Vajna Z, Tóth-Vajna G, Gombos Z, Szilágyi B, Járai Z, Berczeli M, et al. Screening of peripheral arterial disease in primary health care. Vasc Health Risk Manag. 2019;15:355-63.
6. Sol BG, van der Bijl JJ, Banga JD, Visseren FL. Vascular risk management through nurse-led self-management programs. J Vasc Nurs. 2005;23(1):20-4.
7. Patel KK, Jones PG, Ellerbeck EF, Buchanan DM, Chan PS, Pacheco CM, et al. Underutilization of Evidence-Based Smoking Cessation Support Strategies Despite High Smoking Addiction Burden in Peripheral Artery Disease Specialty Care: Insights from the International PORTRAIT Registry. J Am Heart Assoc. 2018;7(20):e010076.

8. Saxon JT, Safley DM, Mena-Hurtado C, Heyligers J, Fitridge R, Shishehbor M, et al. Adherence to Guideline-Recommended Therapy-Including Supervised Exercise Therapy Referral-Across Peripheral Artery Disease Specialty Clinics: Insights From the International PORTRAIT Registry. J Am Heart Assoc. 2020;9(3):e012541.
9. Rose GA. The diagnosis of ischaemic heart pain and intermittent claudication in field surveys. Bull World Health Organ. 1962;27(6):645-58.
10. Rutherford RB, Baker JD, Ernst C, Johnston KW, Porter JM, Ahn S, et al. Recommended standards for reports dealing with lower extremity ischemia: revised version. J Vasc Surg. 1997;26(3):517-38.
11. Song P, Rudan D, Zhu Y, Fowkes FJI, Rahimi K, Fowkes FGR, et al. Global, regional, and national prevalence and risk factors for peripheral artery disease in 2015: an updated systematic review and analysis. Lancet Glob Health. 2019;7(8):e1020-e30.
12. Fowkes FG, Rudan D, Rudan I, Aboyans V, Denenberg JO, McDermott MM, et al. Comparison of global estimates of prevalence and risk factors for peripheral artery disease in 2000 and 2010: a systematic review and analysis. Lancet. 2013;382(9901):1329-40.
13. Sigvant B, Wiberg-Hedman K, Bergqvist D, Rolandsson O, Andersson B, Persson E, et al. A population-based study of peripheral arterial disease prevalence with special focus on critical limb ischemia and sex differences. J Vasc Surg. 2007;45(6):1185-91.
14. Criqui MH. Peripheral arterial disease--epidemiological aspects. Vasc Med. 2001;6(3 Suppl):3-7.
15. Kröger K, Stang A, Kondratieva J, Moebus S, Beck E, Schmermund A, et al. Prevalence of peripheral arterial disease - results of the Heinz Nixdorf recall study. Eur J Epidemiol. 2006;21(4):279-85.
16. Porras CP, Bots ML, Teraa M, van Doorn S, Vernooij RWM. Differences in Symptom Presentation in Women and Men with Confirmed Lower Limb Peripheral Artery Disease: A Systematic Review and Meta-Analysis. Eur J Vasc Endovasc Surg. 2022;63(4):602-12.
17. Aronow WS. Peripheral arterial disease in the elderly. Clin Interv Aging. 2007;2(4):645-54.
18. Diehm C, Schuster A, Allenberg JR, Darius H, Haberl R, Lange S, et al. High prevalence of peripheral arterial disease and co-morbidity in 6880 primary care patients: cross-sectional study. Atherosclerosis. 2004;172(1):95-105.
19. Sartipy F, Sigvant B, Lundin F, Wahlberg E. Ten Year Mortality in Different Peripheral Arterial Disease Stages: A Population Based Observational Study on Outcome. Eur J Vasc Endovasc Surg. 2018;55(4):529-36.

20. Nordanstig J, Behrendt CA, Baumgartner I, Belch J, Bäck M, Fitridge R, et al. Editor's Choice -- European Society for Vascular Surgery (ESVS) 2024 Clinical Practice Guidelines on the Management of Asymptomatic Lower Limb Peripheral Arterial Disease and Intermittent Claudication. Eur J Vasc Endovasc Surg. 2024;67(1):9-96.
21. Criqui MH, Aboyans V. Epidemiology of peripheral artery disease. Circ Res. 2015;116(9):1509-26.
22. Golledge J. Update on the pathophysiology and medical treatment of peripheral artery disease. Nat Rev Cardiol. 2022;19(7):456-74.
23. Abaraogu U, Ezenwankwo E, Dall P, Tew G, Stuart W, Brittenden J, et al. Barriers and enablers to walking in individuals with intermittent claudication: A systematic review to conceptualize a relevant and patient-centered program. PLoS One. 2018;13(7):e0201095.
24. Pell JP. Impact of intermittent claudication on quality of life. European Journal of Vascular and Endovascular Surgery. 1995;9(4):469-72.
25. Rezvani F, Pelt M, Härter M, Dirmaier J. Effects of walking impairment on mental health burden, health risk behavior and quality of life in patients with intermittent claudication: A cross-sectional path analysis. PLoS One. 2022;17(9):e0273747.
26. Thomas M, Patel KK, Gosch K, Labrosciano C, Mena-Hurtado C, Fitridge R, et al. Mental health concerns in patients with symptomatic peripheral artery disease: Insights from the PORTRAIT registry. Journal of Psychosomatic Research. 2020;131:109963.
27. Mehta T, Venkata Subramaniam A, Chetter I, McCollum P. Disease-specific quality of life assessment in intermittent claudication: review. Eur J Vasc Endovasc Surg. 2003;25(3):202-8.
28. Xu D, Li J, Zou L, Xu Y, Hu D, Pagoto SL, et al. Sensitivity and specificity of the ankle—brachial index to diagnose peripheral artery disease: a structured review. Vascular Medicine. 2010;15(5):361-9.
29. Crawford F, Welch K, Andras A, Chappell FM. Ankle brachial index for the diagnosis of lower limb peripheral arterial disease. Cochrane Database Syst Rev. 2016;9(9):Cd010680.
30. Tehan PE, Barwick AL, Sebastian M, Chuter VH. Diagnostic accuracy of resting systolic toe pressure for diagnosis of peripheral arterial disease in people with and without diabetes: a cross-sectional retrospective case-control study. J Foot Ankle Res. 2017;10:58.
31. Nordanstig J, Behrendt CA, Bradbury AW, de Borst GJ, Fowkes FGR, Golledge J, et al. Peripheral arterial disease (PAD) – A challenging manifestation of atherosclerosis. Preventive Medicine. 2023;171:107489.
32. Mancia G, Kreutz R, Brunström M, Burnier M, Grassi G, Januszewicz A, et al. 2023 ESH Guidelines for the management of arterial hypertension The Task Force for the management of arterial hypertension of the European Society of Hypertension: Endorsed by the International Society of Hypertension (ISH) and the European Renal Association (ERA). J Hypertens. 2023;41(12):1874-2071.

33. Fowkes FG, Housley E, Riemersma RA, Macintyre CC, Cawood EH, Prescott RJ, et al. Smoking, lipids, glucose intolerance, and blood pressure as risk factors for peripheral atherosclerosis compared with ischemic heart disease in the Edinburgh Artery Study. Am J Epidemiol. 1992;135(4):331-40.
34. Morley RL, Sharma A, Horsch AD, Hinchliffe RJ. Peripheral artery disease. BMJ. 2018;360:j5842.
35. Black JH, 3rd. Evidence base and strategies for successful smoking cessation. J Vasc Surg. 2010;51(6):1529-37.
36. Willigendael EM, Teijink JA, Bartelink ML, Peters RJ, Büller HR, Prins MH. Smoking and the patency of lower extremity bypass grafts: a meta-analysis. J Vasc Surg. 2005;42(1):67-74.
37. Armstrong EJ, Wu J, Singh GD, Dawson DL, Pevec WC, Amsterdam EA, et al. Smoking cessation is associated with decreased mortality and improved amputation-free survival among patients with symptomatic peripheral artery disease. J Vasc Surg. 2014;60(6):1565-71.
38. Behrooz L, Abumoawad A, Rizvi SHM, Hamburg NM. A modern day perspective on smoking in peripheral artery disease. Front Cardiovasc Med. 2023;10:1154708.
39. Duncan MS, Freiberg MS, Greevy RA, Jr., Kundu S, Vasan RS, Tindle HA. Association of Smoking Cessation With Subsequent Risk of Cardiovascular Disease. Jama. 2019;322(7):642-50.
40. Yuan S, Titova OE, Damrauer SM, Åkesson A, Larsson SC. Swedish snuff (snus) dipping, cigarette smoking, and risk of peripheral artery disease: a prospective cohort study. Sci Rep. 2022;12(1):12139.
41. Yatsuya H, Folsom AR. Risk of incident cardiovascular disease among users of smokeless tobacco in the Atherosclerosis Risk in Communities (ARIC) study. Am J Epidemiol. 2010;172(5):600-5.
42. Van't Hof JR, Wang W, Matsushita K, Heiss G, Folsom AR, Widome R, et al. Association of Smokeless Tobacco Use With Incident Peripheral Artery Disease: Results From the Atherosclerotic Risk in Communities Study. Am J Prev Med. 2023;64(5):728-33.
43. Watson L, Ellis B, Leng GC. Exercise for intermittent claudication. Cochrane Database of Systematic Reviews. 2008(4).
44. Lane R, Harwood A, Watson L, Leng GC. Exercise for intermittent claudication. Cochrane Database of Systematic Reviews. 2017(12).
45. Hageman D, Fokkenrood HJ, Gommans LN, van den Houten MM, Teijink JA. Supervised exercise therapy versus home-based exercise therapy versus walking advice for intermittent claudication. Cochrane Database Syst Rev. 2018;4(4):Cd005263.
46. Abaraogu UO, Abaraogu OD, Dall PM, Tew G, Stuart W, Brittenden J, et al. Exercise therapy in routine management of peripheral arterial disease and intermittent claudication: a scoping review. Ther Adv Cardiovasc Dis. 2020;14:1753944720924270.

47. Cetlin MD, Polonsky T, Ho K, Zhang D, Tian L, Zhao L, et al. Barriers to participation in supervised exercise therapy reported by people with peripheral artery disease. J Vasc Surg. 2023;77(2):506-14.
48. Kruidenier LM, Viechtbauer W, Nicolaï SP, Büller H, Prins MH, Teijink JAW. Treatment for intermittent claudication and the effects on walking distance and quality of life. Vascular. 2012;20(1):20-35.
49. Adegbola A, Behrendt C-A, Zyriax B-C, Windler E, Kreutzburg T. The impact of nutrition on the development and progression of peripheral artery disease: A systematic review. Clinical Nutrition. 2022;41(1):49-70.
50. Wan D, Li V, Banfield L, Azab S, de Souza RJ, Anand SS. Diet and Nutrition in Peripheral Artery Disease: A Systematic Review. Canadian Journal of Cardiology. 2022;38(5):672-80.
51. Tsigkou V, Siasos G, Rovos K, Tripyla N, Tousoulis D. Peripheral artery disease and antiplatelet treatment. Curr Opin Pharmacol. 2018;39:43-52.
52. Jansen-Chaparro S, López-Carmona MD, Cobos-Palacios L, Sanz-Cánovas J, Bernal-López MR, Gómez-Huelgas R. Statins and Peripheral Arterial Disease: A Narrative Review. Front Cardiovasc Med. 2021;8:777016.
53. Stoberock K, Kaschwich M, Nicolay SS, Mahmoud N, Heidemann F, Rieß HC, et al. The interrelationship between diabetes mellitus and peripheral arterial disease. Vasa. 2021;50(5):323-30.
54. O'Donohue W, Levensky E. Promoting Treatment Adherence: A Practical Handbook for Health Care Providers. Thousand Oaks, California2006. Available from: https://sk.sagepub.com/books/promoting-treatment-adherence.
55. Kosse RC, Koster ES, Kaptein AA, de Vries TW, Bouvy ML. Asthma control and quality of life in adolescents: The role of illness perceptions, medication beliefs, and adherence. J Asthma. 2020;57(10):1145-54.
56. Krack G, Holle R, Kirchberger I, Kuch B, Amann U, Seidl H. Determinants of adherence and effects on health-related quality of life after myocardial infarction: a prospective cohort study. BMC Geriatr. 2018;18(1):136.
57. Park NH, Song MS, Shin SY, Jeong J-h, Lee HY. The effects of medication adherence and health literacy on health-related quality of life in older people with hypertension. International Journal of Older People Nursing. 2018;13(3):e12196.
58. Burkhart PV, Sabaté E. Adherence to long-term therapies: evidence for action. J Nurs Scholarsh. 2003;35(3):207.
59. Middleton KR, Anton SD, Perri MG. Long-Term Adherence to Health Behavior Change. Am J Lifestyle Med. 2013;7(6):395-404.
60. Galvin K, Webb C, Hillier V. Assessing the impact of a nurse-led health education intervention for people with peripheral vascular disease who smoke: the use of physiological markers, nicotine dependence and withdrawal. Int J Nurs Stud. 2001;38(1):91-105.

61. Hatfield J, Gulati S, Abdul Rahman MN, Coughlin PA, Chetter IC. Nurse-led risk assessment/management clinics reduce predicted cardiac morbidity and mortality in claudicants. J Vasc Nurs. 2008;26(4):118-22.

62. Sillesen H, Madelung S, Eldrup N, Roed M. Organising a Nurse-driven PAD Rehabilitation Clinic Within the Vascular Surgical Department: What is Required and are Treatment Goals Reached – A Prospective Study? European Journal of Vascular and Endovascular Surgery. 2007;33(1):26-32.

63. Haile ST, Johansson UB, Lööf H, Linné A, Joelsson-Alm E. Patient Related Outcomes After Receiving a Person Centred Nurse Led Follow Up Programme Among Patients Undergoing Revascularisation for Intermittent Claudication: A Secondary Analysis of a Randomised Clinical Trial. Eur J Vasc Endovasc Surg. 2023;66(3):371-9.

64. Byskosh N, Pamulapati V, Xu S, Vavra AK, Hoel AW, Tian L, et al. Identifying gaps in disease knowledge among patients with peripheral artery disease. J Vasc Surg. 2022;75(4):1358-68.e5.

65. WHO Guidelines Approved by the Guidelines Review Committee. WHO guideline Recommendations on Digital Interventions for Health System Strengthening. Geneva: World Health Organization

© World Health Organization 2019.; 2019.

66. Han M, Lee E. Effectiveness of Mobile Health Application Use to Improve Health Behavior Changes: A Systematic Review of Randomized Controlled Trials. Healthc Inform Res. 2018;24(3):207-26.

67. Brørs G, Pettersen TR, Hansen TB, Fridlund B, Hølvold LB, Lund H, et al. Modes of e-Health delivery in secondary prevention programmes for patients with coronary artery disease: a systematic review. BMC Health Services Research. 2019;19(1):364.

68. Lareyre F, Chaptoukaev H, Kiang SC, Chaudhuri A, Behrendt CA, Zuluaga MA, et al. Telemedicine and Digital Health Applications in Vascular Surgery. J Clin Med. 2022;11(20).

69. Madanian S, Nakarada-Kordic I, Reay S, Chetty T. Patients' perspectives on digital health tools. PEC Innov. 2023;2:100171.

70. Horne R, Cooper V, Wileman V, Chan A. Supporting Adherence to Medicines for Long-Term
Conditions. European Psychologist. 2019;24(1):82-96.

71. Eltorai AE, N PT, Yang H, Daniels AH, Born CT. Readability of Trauma-Related Patient Education Materials From the American Academy of Orthopaedic Surgeons. Trauma Mon. 2016;21(1):e20141.

72. McEnteggart GE, Naeem M, Skierkowski D, Baird GL, Ahn SH, Soares G. Readability of Online Patient Education Materials Related to IR. J Vasc Interv Radiol. 2015;26(8):1164-8.

73. Roberts H, Zhang D, Dyer GS. The Readability of AAOS Patient Education Materials: Evaluating the Progress Since 2008. J Bone Joint Surg Am. 2016;98(17):e70.

74. McInnes N, Haglund BJ. Readability of online health information: implications for health literacy. Inform Health Soc Care. 2011;36(4):173-89.

75. Sørensen K, Van den Broucke S, Pelikan JM, Fullam J, Doyle G, Slonska Z, et al. Measuring health literacy in populations: illuminating the design and development process of the European Health Literacy Survey Questionnaire (HLS-EU-Q). BMC Public Health. 2013;13:948.

76. Friis K, Lasgaard M, Rowlands G, Osborne RH, Maindal HT. Health Literacy Mediates the Relationship Between Educational Attainment and Health Behavior: A Danish Population-Based Study. J Health Commun. 2016;21(sup2):54-60.

77. Stormacq C, Van den Broucke S, Wosinski J. Does health literacy mediate the relationship between socioeconomic status and health disparities? Integrative review. Health Promot Int. 2019;34(5):e1-e17.

78. Sørensen K, Pelikan JM, Röthlin F, Ganahl K, Slonska Z, Doyle G, et al. Health literacy in Europe: comparative results of the European health literacy survey (HLS-EU). Eur J Public Health. 2015;25(6):1053-8.

79. DeWalt DA, Broucksou KA, Hawk V, Brach C, Hink A, Rudd R, et al. Developing and testing the health literacy universal precautions toolkit. Nurs Outlook. 2011;59(2):85-94.

80. Nutbeam D, Lloyd JE. Understanding and Responding to Health Literacy as a Social Determinant of Health. Annu Rev Public Health. 2021;42:159-73.

81. Nutbeam D. Defining, measuring and improving health literacy. Health Evaluation and Promotion. 2015;42(4):450-6.

82. Walters R, Leslie SJ, Polson R, Cusack T, Gorely T. Establishing the efficacy of interventions to improve health literacy and health behaviours: a systematic review. BMC Public Health. 2020;20(1):1040.

83. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. Ann Intern Med. 2011;155(2):97-107.

84. Kanejima Y, Shimogai T, Kitamura M, Ishihara K, Izawa KP. Impact of health literacy in patients with cardiovascular diseases: A systematic review and meta-analysis. Patient Educ Couns. 2022;105(7):1793-800.

85. Miller TA. Health literacy and adherence to medical treatment in chronic and acute illness: A meta-analysis. Patient Educ Couns. 2016;99(7):1079-86.

86. Institute of Medicine Committee on Health L. In: Nielsen-Bohlman L, Panzer AM, Kindig DA, editors. Health Literacy: A Prescription to End Confusion. Washington (DC): National Academies Press (US)

Copyright 2004 by the National Academy of Sciences. All rights reserved.; 2004.

87. Fawns-Ritchie C, Starr JM, Deary IJ. Health literacy, cognitive ability and smoking: a cross-sectional analysis of the English Longitudinal Study of Ageing. BMJ Open. 2018;8(10):e023929.

88. Jayasinghe UW, Harris MF, Parker SM, Litt J, van Driel M, Mazza D, et al. The impact of health literacy and life style risk factors on health-related quality of life of Australian patients. Health Qual Life Outcomes. 2016;14:68.

89. Li M, Sonoda N, Koh C, Yasumoto R, Morimoto A. Association between health literacy and current smoking among middle-aged Japanese ever smokers. Public Health and Toxicology. 2022.

90. Aaby A, Friis K, Christensen B, Rowlands G, Maindal HT. Health literacy is associated with health behaviour and self-reported health: A large population-based study in individuals with cardiovascular disease. Eur J Prev Cardiol. 2017;24(17):1880-8.

91. Buja A, Rabensteiner A, Sperotto M, Grotto G, Bertoncello C, Cocchio S, et al. Health Literacy and Physical Activity: A Systematic Review. Journal of Physical Activity and Health. 2020;17(12):1259.

92. BA AL, Alhalal EA. Effects of health literacy on type 2 diabetic patients' glycemic control, self-management, and quality of life. Saudi Med J. 2022;43(5):465-72.

93. Jennings CS, Astin F, Prescott E, Hansen T, Gale Chris P, De Bacquer D. Illness perceptions and health literacy are strongly associated with health-related quality of life, anxiety, and depression in patients with coronary heart disease: results from the EUROASPIRE V cross-sectional survey. Eur J Cardiovasc Nurs. 2023;22(7):719-29.

94. Wieczorek M, Meier C, Vilpert S, Reinecke R, Borrat-Besson C, Maurer J, et al. Association between multiple chronic conditions and insufficient health literacy: cross-sectional evidence from a population-based sample of older adults living in Switzerland. BMC Public Health. 2023;23(1):253.

95. Leventhal H, Phillips LA, Burns E. The Common-Sense Model of Self-Regulation (CSM): a dynamic framework for understanding illness self-management. J Behav Med. 2016;39(6):935-46.

96. Kale MS, Federman AD, Krauskopf K, Wolf M, O'Conor R, Martynenko M, et al. The Association of Health Literacy with Illness and Medication Beliefs among Patients with Chronic Obstructive Pulmonary Disease. PLoS One. 2015;10(4):e0123937.

97. Perez A. Acculturation, Health Literacy, and Illness Perceptions of Hypertension among Hispanic Adults. Journal of Transcultural Nursing. 2015;26(4):386-94.

98. Walters R, Leslie SJ, Sixsmith J, Gorely T. Health Literacy for Cardiac Rehabilitation: An Examination of Associated Illness Perceptions, Self-Efficacy, Motivation and Physical Activity. Int J Environ Res Public Health. 2020;17(22).

99. Bonsaksen T, Haukeland-Parker S, Lerdal A, Fagermoen MS. A 1-year follow-up study exploring the associations between perception of illness and health-related quality of life in persons with chronic obstructive pulmonary disease. International Journal of Chronic Obstructive Pulmonary Disease. 2014;9(null):41-50.

100. Foxwell R, Morley C, Frizelle D. Illness perceptions, mood and quality of life: a systematic review of coronary heart disease patients. J Psychosom Res. 2013;75(3):211-22.

101. Holmlund L, Hörnsten C, Valham F, Olsson K, Hörnsten Å, Ängerud KH. Illness Perceptions and Health-Related Quality of Life in Women and Men With Atrial Fibrillation. Journal of Cardiovascular Nursing. 2024;39(1).
102. Petrie KJ, Weinman J. Why illness perceptions matter. Clin Med (Lond). 2006;6(6):536-9.
103. Kaptein AA, Klok T, Moss-Morris R, Brand PL. Illness perceptions: impact on self-management and control in asthma. Curr Opin Allergy Clin Immunol. 2010;10(3):194-9.
104. Kugbey N, Oppong Asante K, Adulai K. Illness perception, diabetes knowledge and self-care practices among type-2 diabetes patients: a cross-sectional study. BMC Res Notes. 2017;10(1):381.
105. Sawyer AT, Harris SL, Koenig HG. Illness perception and high readmission health outcomes. Health Psychology Open. 2019;6(1):2055102919844504.
106. Mosleh SM, Almalik MM. Illness perception and adherence to healthy behaviour in Jordanian coronary heart disease patients. Eur J Cardiovasc Nurs. 2016;15(4):223-30.
107. Thagizadeh A, Ghahramanian A, Zamanzadeh V, Aslanabadi N, Onyeka TC, Ramazanzadeh N. Illness perception and cardiovascular risk factors in patients with myocardial infarction undergoing percutaneous coronary intervention in Iran. BMC Cardiovasc Disord. 2022;22(1):245.
108. Galea Holmes MN, Weinman JA, Bearne LM. Are Walking Treatment Beliefs and Illness Perceptions Associated With Walking Intention and 6-Min Walk Distance in People With Intermittent Claudication? A Cross-Sectional Study. J Aging Phys Act. 2019;27(4):473-81.
109. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. Psychol Rev. 1977;84(2):191-215.
110. Shortridge-Baggett LM. Self-efficacy: measurement and intervention in nursing. Sch Inq Nurs Pract. 2001;15(3):183-8.
111. Bandura A. Self-efficacy : the exercise of control: W. H. Freeman; 1997.
112. Mobini S, Allahbakhshian A, Shabanloei R, Sarbakhsh P. Illness Perception, Self-Efficacy, and Medication Adherence in Patients With Coronary Artery Disease: A Path Analysis of Conceptual Model. SAGE Open Nurs. 2023;9:23779608231171772.
113. Kim H, Sereika SM, Lingler JH, Albert SM, Bender CM. Illness Perceptions, Self-efficacy, and Self-reported Medication Adherence in Persons Aged 50 and Older With Type 2 Diabetes. J Cardiovasc Nurs. 2021;36(4):312-28.
114. Cudris-Torres L, Alpi SV, Barrios-Núñez Á, Gaviria Arrieta N, Mejía Gutiérrez J, Alvis Barranco L, et al. Quality of life in the older adults: The protective role of self-efficacy in adequate coping in patients with chronic diseases. Front Psychol. 2023;14:1106563.

115. Peters M, Potter CM, Kelly L, Fitzpatrick R. Self-efficacy and health-related quality of life: a cross-sectional study of primary care patients with multi-morbidity. Health Qual Life Outcomes. 2019;17(1):37.

116. Thomet C, Moons P, Schwerzmann M, Apers S, Luyckx K, Oechslin EN, et al. Self-efficacy as a predictor of patient-reported outcomes in adults with congenital heart disease. Eur J Cardiovasc Nurs. 2018;17(7):619-26.

117. Farley H. Promoting self-efficacy in patients with chronic disease beyond traditional education: A literature review. Nurs Open. 2020;7(1):30-41.

118. Ong-Artborirak P, Seangpraw K, Boonyathee S, Auttama N, Winaiprasert P. Health literacy, self-efficacy, self-care behaviors, and glycemic control among older adults with type 2 diabetes mellitus: a cross-sectional study in Thai communities. BMC Geriatrics. 2023;23(1):297.

119. Lu M, Xia H, Ma J, Lin Y, Zhang X, Shen Y, et al. Relationship between adherence to secondary prevention and health literacy, self-efficacy and disease knowledge among patients with coronary artery disease in China. Eur J Cardiovasc Nurs. 2020;19(3):230-7.

120. Martos-Méndez MJ. Self-efficacy and adherence to treatment: the mediating effects of social support. Journal of Behavior, Health & Social Issues. 2015;7(2):19-29.

121. Náfrádi L, Nakamoto K, Schulz PJ. Is patient empowerment the key to promote adherence? A systematic review of the relationship between self-efficacy, health locus of control and medication adherence. PLOS ONE. 2017;12(10):e0186458.

122. Geremew G, Ambaw F, Bogale EK, Yigzaw ZA. Adherence to Lifestyle Modification Practices and Its Associated Factors Among Hypertensive Patients in Bahir Dar City Hospitals, North West Ethiopia. Integr Blood Press Control. 2023;16:111-22.

123. Huang Z, Liu T, Chair SY. Effectiveness of nurse-led self-care interventions on self-care behaviors, self-efficacy, depression and illness perceptions in people with heart failure: A systematic review and meta-analysis. Int J Nurs Stud. 2022;132:104255.

124. Collins TC, Lunos S, Ahluwalia JS. Self-efficacy is associated with walking ability in persons with diabetes mellitus and peripheral arterial disease. Vasc Med. 2010;15(3):189-95.

125. Bolt LJJ, Jacobs M, Sigterman TA, Krasznai AG, Sikkink C, Schurink GWH, et al. Assessment of behavioral determinants influencing success of supervised exercise therapy in patients with intermittent claudication: A cross sectional survey. Physiol Behav. 2020;215:112732.

126. Riegel B, Jaarsma T, Strömberg A. A middle-range theory of self-care of chronic illness. ANS Adv Nurs Sci. 2012;35(3):194-204.

127. Riegel B, Moser DK, Buck HG, Dickson VV, Dunbar SB, Lee CS, et al. Self-Care for the Prevention and Management of Cardiovascular Disease and Stroke: A Scientific Statement for Healthcare Professionals From the American Heart Association. J Am Heart Assoc. 2017;6(9).

128. Riegel B, Jaarsma T, Lee CS, Strömberg A. Integrating Symptoms Into the Middle-Range Theory of Self-Care of Chronic Illness. ANS Adv Nurs Sci. 2019;42(3):206-15.
129. Finansiell. ID-Teknik BID AB; 2024 [cited 2024 1104]. Available from: https://www.bankid.com/en.
130. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med. 2009;6(7):e1000097.
131. Bettany- Saltikov J, McSherry R. How To Do a Sytematic Literature Review in Nursing: A Step-By-Step Guide2016.
132. Ely C, Scott I. Essential study skills for nursing: Elsevier Health Sciences; 2007.
133. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. Systematic Reviews. 2016;5(1):210.
134. Skills CA. Programme CASP (Systematic review) Checklist. [online] Available at: URL. ; 2018 [
135. Assessment SAfHT, Services AoS. Evaluation and synthesis of studies using qualitative methods of analysis. SBU Stockholm; 2016.
136. Wångdahl J, Lytsy P, Mårtensson L, Westerling R. Health literacy among refugees in Sweden - a cross-sectional study. BMC Public Health. 2014;14:1030.
137. JM P, K G, S VdB, K S, Okan O. Measuring healthliteracy in Europe: introducing the european health literacy Survey Question-naire (HLS-EU-Q). In: editors. International Handbook of health literacy research practice andpolicy across the lifespan. . Okan O BU, Levin-Zamir D, Pinheiro P, Sørensen K,, editor: Bristol: Policy Press; 2019.
138. Moss-Morris R, Weinman J, Petrie K, Horne R, Cameron L, Buick D. The Revised Illness Perception Questionnaire (IPQ-R). Psychology & Health. 2002;17(1):1-16.
139. Brink E, Alsén P, Cliffordson C. Validation of the Revised Illness Perception Questionnaire (IPQ-R) in a sample of persons recovering from myocardial infarction--the Swedish version. Scand J Psychol. 2011;52(6):573-9.
140. Schwarzer R, & Jerusalem, M. (1995). Generalized Self-Efficacy scale. In J. Weinman, S. Wright, & M. Johnston, Measures in health psychology: A user's portfolio. Causal and control beliefs (pp. 35-37). Windsor, UK: NFER-NELSON. Generalized Self-Efficacy scale. . J Weinman, S Wright, & M Johnston, Measures in health psychology: A user's portfolio Causal and control beliefs (pp 35-37) 1995.
141. Koskinen-Hagman M SR, Jerusalem M. Swedish version of the General Self-Efficacy Scale. 1999.
142. Löve J, Moore CD, Hensing G. Validation of the Swedish translation of the General Self-Efficacy scale. Qual Life Res. 2012;21(7):1249-53.
143. Morgan MB, Crayford T, Murrin B, Fraser SC. Developing the Vascular Quality of Life Questionnaire: a new disease-specific quality of life measure for use in lower limb ischemia. J Vasc Surg. 2001;33(4):679-87.

144. Kumlien C, Nordanstig J, Lundström M, Pettersson M. Validity and test retest reliability of the vascular quality of life Questionnaire-6: a short form of a disease-specific health-related quality of life instrument for patients with peripheral arterial disease. Health Qual Life Outcomes. 2017;15(1):187.

145. Nordanstig J, Karlsson J, Pettersson M, Wann-Hansson C. Psychometric properties of the disease-specific health-related quality of life instrument VascuQoL in a Swedish setting. Health Qual Life Outcomes. 2012;10:45.

146. Nordanstig J, Wann-Hansson C, Karlsson J, Lundström M, Pettersson M, Morgan MB. Vascular Quality of Life Questionnaire-6 facilitates health-related quality of life assessment in peripheral arterial disease. J Vasc Surg. 2014;59(3):700-7.

147. Horne R, Weinman J. Self-regulation and Self-management in Asthma: Exploring The Role of Illness Perceptions and Treatment Beliefs in Explaining Non-adherence to Preventer Medication. Psychology & Health - PSYCHOL HEALTH. 2002;17:17-32.

148. Bäck A, Sundell KA, Horne R, Landén M, Mårdby A-CM. The Medication Adherence Report Scale (MARS-5) in a Swedish sample with bipolar disorder - a pilot study. the International Journal of Person-Centered Medicine. 2012;2:263-70.

149. Tavakol M, Dennick R. Making sense of Cronbach's alpha. Int J Med Educ. 2011;2:53-5.

150. SCORE2 risk prediction algorithms: new models to estimate 10-year risk of cardiovascular disease in Europe. Eur Heart J. 2021;42(25):2439-54.

151. SCORE2-OP risk prediction algorithms: estimating incident cardiovascular event risk in older persons in four geographical risk regions. Eur Heart J. 2021;42(25):2455-67.

152. Östgren CJ, Söderberg S, Festin K, Angerås O, Bergström G, Blomberg A, et al. Systematic Coronary Risk Evaluation estimated risk and prevalent subclinical atherosclerosis in coronary and carotid arteries: A population-based cohort analysis from the Swedish Cardiopulmonary Bioimage Study. Eur J Prev Cardiol. 2021;28(3):250-9.

153. Balke B. A SIMPLE FIELD TEST FOR THE ASSESSMENT OF PHYSICAL FITNESS. REP 63-6. Rep Civ Aeromed Res Inst US. 1963:1-8.

154. Montgomery PS, Gardner AW. The clinical utility of a six-minute walk test in peripheral arterial occlusive disease patients. J Am Geriatr Soc. 1998;46(6):706-11.

155. Kammin EJ. The 6-Minute Walk Test: Indications and Guidelines for Use in Outpatient Practices. J Nurse Pract. 2022;18(6):608-10.

156. Osborne RH, Elsworth GR, Whitfield K. The Health Education Impact Questionnaire (heiQ): an outcomes and evaluation measure for patient education and self-management interventions for people with chronic conditions. Patient Educ Couns. 2007;66(2):192-201.

157. Kumlien C, Miller M, Fagerstrom C, Hagell P. Evaluation of Self-management Program Outcomes: Adaptation and Testing of a Swedish Version of the Health Education Impact Questionnaire (heiQ). J Appl Meas. 2018;19(3):303-19.
158. Krueger RA. Focus groups: A practical guide for applied research: Sage publications; 2014.
159. Kang H. The prevention and handling of the missing data. Korean J Anesthesiol. 2013;64(5):402-6.
160. Barnett-Page E, Thomas J. Methods for the synthesis of qualitative research: a critical review. BMC Med Res Methodol. 2009;9:59.
161. Carroll C, Booth A, Cooper K. A worked example of "best fit" framework synthesis: a systematic review of views concerning the taking of some potential chemopreventive agents. BMC Med Res Methodol. 2011;11:29.
162. Hsieh H-F, Shannon SE. Three Approaches to Qualitative Content Analysis. Qualitative Health Research. 2005;15(9):1277-88.
163. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative Research in Psychology. 2006;3(2):77-101.
164. Human Experimentation: Code of Ethics of the World Medical Association (Declaration of Helsinki). Can Med Assoc J. 1964;91(11):619.
165. Beauchamp T, Childress J. Principles of Biomedical Ethics: Marking Its Fortieth Anniversary. Am J Bioeth. 2019;19(11):9-12.
166. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. Jama. 2013;310(20):2191-4.
167. Swedish Code of Statutes. the Data Protection Act (2018:218) [Available from: https://www.riksdagen.se/sv/dokument-och-lagar/dokument/svensk-forfattningssamling/lag-2018218-med-kompletterande-bestammelser_sfs-2018-218/.
168. Swedish Code of Statutes. The Act concerning the Ethical Review of Research Involving Humans (2003:460). [Available from: https://www.riksdagen.se/sv/dokument-och-lagar/dokument/svensk-forfattningssamling/lag-2003460-om-etikprovning-av-forskning-som_sfs-2003-460/.
169. Foss C, Ellefsen B. The value of combining qualitative and quantitative approaches in nursing research by means of method triangulation. J Adv Nurs. 2002;40(2):242-8.
170. Lincoln YSaG, E.G. Naturalistic Inquiry. Thousand Oaks: SAGE; 1985.
171. Guba EG. Criteria for assessing the trustworthiness of naturalistic inquiries. ECTJ. 1981;29(2):75-91.
172. Althubaiti A. Information bias in health research: definition, pitfalls, and adjustment methods. J Multidiscip Healthc. 2016;9:211-7.
173. Stirratt MJ, Dunbar-Jacob J, Crane HM, Simoni JM, Czajkowski S, Hilliard ME, et al. Self-report measures of medication adherence behavior: recommendations on optimal use. Transl Behav Med. 2015;5(4):470-82.

174. Group S-DW, Collaboration tECR. SCORE2-Diabetes: 10-year cardiovascular risk estimation in type 2 diabetes in Europe. European Heart Journal. 2023;44(28):2544-56.

175. Pon Ed, Azzati SE, Dooren Av, Kleefstra N, Heerdink E, Dulmen Sv. Effects of a Proactive Interdisciplinary Self-Management (PRISMA) program on medication adherence in patients with type 2 diabetes in primary care: a randomized controlled trial. Patient Preference and Adherence. 2020:749b+.

176. Huiskes VJB, Vriezekolk JE, van den Ende CHM, van Dijk L, van den Bemt BJF. Impact of physician' and pharmacy staff supporting activities in usual care on patients' statin adherence. PLoS One. 2022;17(2):e0264555.

177. Lindblom S, Ytterberg C, Flink M, Carlsson AC, Stenberg U, Tistad M, et al. The Use of Teach Back at Hospital Discharge to Support Self-Management of Prescribed Medication for Secondary Prevention after Stroke—Findings from A Feasibility Study. Healthcare. 2023;11(3):391.

178. Norberg H, Sjölander M, Glader EL, Gustafsson M. Self-reported medication adherence and pharmacy refill adherence among persons with ischemic stroke: a cross-sectional study. Eur J Clin Pharmacol. 2022;78(5):869-77.

179. Hegedus EJ, Moody J. Clinimetrics corner: the many faces of selection bias. J Man Manip Ther. 2010;18(2):69-73.

180. Alsén P, Brink E, Persson LO, Brändström Y, Karlson BW. Illness perceptions after myocardial infarction: relations to fatigue, emotional distress, and health-related quality of life. J Cardiovasc Nurs. 2010;25(2):E1-e10.

181. Braido F, Baiardini I, Menoni S, Gani F, Senna GE, Ridolo E, et al. Patients with asthma and comorbid allergic rhinitis: is optimal quality of life achievable in real life? PLoS One. 2012;7(2):e31178.

182. Muscat P, Weinman J, Farrugia E, Callus R, Chilcot J. Illness perceptions predict distress in patients with chronic kidney disease. BMC Psychology. 2021;9(1):75.

183. Banerjee A, Chitnis UB, Jadhav SL, Bhawalkar JS, Chaudhury S. Hypothesis testing, type I and type II errors. Ind Psychiatry J. 2009;18(2):127-31.

184. Murphy SW. Longitudinal Studies 1: Determinants of Risk. In: Parfrey PS, Barrett BJ, editors. Clinical Epidemiology: Practice and Methods. New York, NY: Springer US; 2021. p. 83-101.

185. Skelly AC, Dettori JR, Brodt ED. Assessing bias: the importance of considering confounding. Evid Based Spine Care J. 2012;3(1):9-12.

186. Berger VW, Bour LJ, Carter K, Chipman JJ, Everett CC, Heussen N, et al. A roadmap to using randomization in clinical trials. BMC Med Res Methodol. 2021;21(1):168.

187. Ward M, Kristiansen M, Sørensen K. Migrant health literacy in the European Union: A systematic literature review. Health Education Journal. 2019;78(1):81-95.

188. Thabane L, Ma J, Chu R, Cheng J, Ismaila A, Rios LP, et al. A tutorial on pilot studies: the what, why and how. BMC Med Res Methodol. 2010;10:1.

189. Beneito-Montagut R, Rosales A, Fernández-Ardèvol M. Emerging Digital Inequalities: A Comparative Study of Older Adults' Smartphone Use. Social Media + Society. 2022;8(4):20563051221138756.

190. Miyata H, Kai I. Reconsidering Evaluation Criteria for Scientific Adequacy in Health Care Research: An Integrative Framework of Quantitative and Qualitative Criteria. International Journal of Qualitative Methods. 2009;8(1):64-75.

191. Heale R, Twycross A. Validity and reliability in quantitative studies. Evid Based Nurs. 2015;18(3):66-7.

192. Cope DG. Methods and meanings: credibility and trustworthiness of qualitative research. Oncol Nurs Forum. 2014;41(1):89-91.

193. Creswell JW, Creswell JD. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches: SAGE Publications; 2022.

194. Eldh AC, Årestedt L, Berterö C. Quotations in Qualitative Studies: Reflections on Constituents, Custom, and Purpose. International Journal of Qualitative Methods. 2020;19:1609406920969268.

195. Smolderen KG, Romain G, Gosch K, Arham A, Provance JB, Spertus JA, et al. Patient knowledge and preferences for peripheral artery disease treatment. Vasc Med. 2023;28(5):397-403.

196. Strijbos RM, Hinnen JW, van den Haak RFF, Verhoeven BAN, Koning OHJ. Inadequate Health Literacy in Patients with Arterial Vascular Disease. Eur J Vasc Endovasc Surg. 2018;56(2):239-45.

197. Du S, Feng Z, Wang W, Tian L, Wang Y. A structural equation model linking health literacy, self efficacy and quality of life in adults with coronary heart disease. BMC Cardiovascular Disorders. 2022;22(1):285.

198. Muscat DM, Cvejic E, Bell K, Smith J, Morris GM, Jansen J, et al. The impact of health literacy on psychosocial and behavioural outcomes among people at low risk of cardiovascular disease. Preventive Medicine. 2022;156:106980.

199. Haile ST, Joelsson-Alm E, Johansson UB, Lööf H, Palmer-Kazen U, Gillgren P, et al. Effects of a person-centred, nurse-led follow-up programme on adherence to prescribed medication among patients surgically treated for intermittent claudication: randomized clinical trial. Br J Surg. 2022;109(9):846-56.

200. Eyholzer S, Perrenoud B, Dwyer AA. Patient perceptions of peripheral artery disease: A cross-sectional study of hospitalized adults. J Vasc Nurs. 2019;37(3):188-93.

201. McDermott MM, Tian L, Criqui MH, Ferrucci L, Conte MS, Zhao L, et al. Meaningful change in 6-minute walk in people with peripheral artery disease. J Vasc Surg. 2021;73(1):267-76.e1.

202. Sandberg A, Cider Å, Jivegård L, Nordanstig J, Wittboldt S, Bäck M. Test-retest reliability, agreement, and minimal detectable change in the 6-minute walk test in patients with intermittent claudication. J Vasc Surg. 2020;71(1):197-203.

203. Poredos P, Stanek A, Catalano M, Boc V. Ankle-Brachial Index: Diagnostic Tool of Peripheral Arterial Disease and Predictor of Cardiovascular Risk—An Update of Current Knowledge. Angiology.0(0):00033197241226512.

204. Johnston AL, Vemulapalli S, Gosch KL, Aronow HD, Abbott JD, Patel MR, et al. Ankle-brachial index in patients with intermittent claudication is a poor indicator of patient-centered and clinician-based evaluations of functional status. Journal of Vascular Surgery. 2019;69(3):906-12.

205. Nordanstig J, Pettersson M, Morgan M, Falkenberg M, Kumlien C. Assessment of Minimum Important Difference and Substantial Clinical Benefit with the Vascular Quality of Life Questionnaire-6 when Evaluating Revascularisation Procedures in Peripheral Arterial Disease. Eur J Vasc Endovasc Surg. 2017;54(3):340-7.

206. De Maeijer E, Hout T, Weggeman M, Post G. Studying Open Innovation collaboration between the high-tech industry and science with linguistic ethnography - battling over the status of knowledge in a setting of distrust. Journal of Innovation Management. 2017;4:8.

207. Siercke M, Berg SK, Missel M. Spurred by pedometers, unity and fun exercise: A qualitative study of participation in rehabilitation for patients with intermittent claudication (The CIPIC Rehab study). J Vasc Nurs. 2021;39(3):59-66.

208. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. Psychological review. 1977;84(2):191.

209. Norgaard O, Furstrand D, Klokker L, Karnoe Knudsen A, Batterham R, Kayser L, et al. The e-health literacy framework: A conceptual framework for characterizing e-health users and their interaction with e-health systems. Knowledge Management and E-Learning. 2015;7:522–40.

ORIGINAL PAPERS I-IV

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Illness perceptions in patients with peripheral arterial disease: A systematic review of qualitative studies

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ABSTRACT

Background: Patients with chronic diseases create their own subjective beliefs about their conditions based on their illness perceptions. In the common-sense model, illness perceptions constitute personal beliefs about illness with regard to five components: identity, timeline, cause, control/cure, and consequences. Patients' illness perceptions affect both their management of their disease and their adherence to treatment. Since patients with peripheral arterial disease need life-long treatment for secondary prevention, generating knowledge about illness perceptions in patients with peripheral arterial disease is essential.
Objectives: To systematically review and synthesise the literature on illness perceptions in patients with peripheral arterial disease.
Design: A systematic review
Data sources: PubMed, CINAHL, and PsycINFO.
Review methods: A systematic search strategy was conducted in December 2017, with an update in July 2019. Two team members independently screened all titles and abstracts. A relevance and quality appraisal of the studies was performed. The references from the included studies were evaluated for additional studies. The data from 14 studies were extracted and synthesised using a "best-fit" approach to framework analysis. A deductive analysis was conducted using the common-sense model. The data not suitable for the framework were analysed separately using inductive conventional content analysis, yielding an additional component representing the retrospective consequences of peripheral arterial disease.
Findings: The findings showed diversity in illness perceptions in each of the five components of the framework as well as in the additional component. The findings showed participants' lack of understanding of the chronic nature of the disease, i.e., about the timeline, the identity of the symptoms and the cause of the disease. The patients' beliefs about control and cures varied from having high motivation to engage in physical activity to thinking that walking could make their situations worse. There was fear about the future, as patients perceived disease progression and decreasing control to be consequences of their illness. Living with the disease, the emphasis in the additional component, was a process for regaining control and adapting to their situations.
Conclusions: Patients with peripheral arterial disease shape their own understandings of their conditions. These beliefs may influence their management of their disease and adherence to treatment. Therefore, the current study suggests that illness perceptions should be addressed when planning secondary prevention for patients with peripheral arterial disease.

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What is already known about this topic?

- Peripheral arterial disease is a chronic condition with high risk for cardiovascular morbidity and mortality that requires life-long secondary prevention treatment.

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- Illness perceptions are patients' responses to their disease, which influence their coping behaviour, including adherence to treatment.

What this paper adds

- Knowledge that patients´with peripheral arterial disease have different beliefs about their illness, sometimes in contrast to each other.
- Knowledge of the importance of illness perceptions for planning secondary prevention and better understanding of the prerequisites for patient with peripheral arterial disease to adhere to secondary prevention treatment.

1. Introduction

Peripheral arterial disease (PAD) is a chronic atherosclerotic disease that requires life-long treatment for secondary prevention. However, PAD is under-recognised and under-treated compared to other cardiovascular diseases (Hirsch et al., 2007; Cronin et al., 2015). The severity of PAD ranges from intermittent claudication (IC) with pain in the lower extremities after exercise to critical limb ischaemia (CLI), which causes rest pain, ulcers and gangrene (Aboyans et al., 2018). The prevalence of PAD is approximately 10% in people over 70 years of age and increases with age (Fowkes et al. 1992). Although atherosclerosis is a systemic disease and patients with PAD have a higher 5-year cumulative cardiovascular mortality than persons with no PAD, 13% versus 5% (Sigvant et al., 2016). A review by Abaraogu et al. (2018) with focus on the experiences of living with PAD showed that individuals with PAD seem to be unaware of the chronic nature of the disease despite the associated consequences in everyday life. Patients' illness perceptions are their responses to their disease, which influence their management behaviour, including adherence to treatment (Petrie and Weinman, 2006). Understanding patients' beliefs about their illness could be important to increase adherence to secondary prevention treatment.

Individuals suffering from long-term illness shape their own understandings of their conditions to manage their illness, associated symptoms and treatment. The common-sense model (CSM) by Leventhal et al. (1980) is a theoretical framework describing the process for managing a health threat and influencing adherence to treatments and lifestyle changes to manage illness. In the CSM, illness perceptions constituting cognitive and emotional representations reflect individuals' beliefs with regard to identity, timeline, cause, control and cure, and consequences. Previous research has shown that illness perceptions play a role in how individuals cope with chronic disease, for instance, how patients with myocardial infarction manage their condition (Alsén et al., 2008). Additionally, illness perceptions seem to influence rehabilitation in terms of physical exercise in patients with cardiac disease (Flora et al., 2015; French et al., 2006). Illness perceptions also have an impact on treatment control (Kunschitz et al., 2017) and are associated with levels of health-related quality of life (HRQoL) in patients with cardiac disease. (Stafford et al., 2008). Patients with PAD have an impaired HRQoL due to limitations in physical functioning (Dumville et al., 2004). Further, a systematic review of qualitative studies with focus on HRQoL in patients with PAD (Aber et al., 2018) demonstrates that available measures of HRQoL do not cover all aspects of importance in patients with PAD. However, knowledge about how illness perceptions affect disease management and adherence to treatment in individuals with PAD needs to be clarified. As illness perceptions are important in cardiovascular conditions, we believe that illness perceptions are also important for individuals with PAD. Secondary prevention is essential for managing PAD, and illness perceptions have an effect on adherence to both treatment advice and medical treatment. Understanding patients' beliefs about their illness can provide important knowledge in the management of patients with PAD. The objective of this study was therefore to systematically review and synthesise illness perceptions in patients with PAD.

2. Method

The study design was a systematic review, and the data were analysed using the CSM as a framework. The inclusion criteria were studies with populations of adult patients (≥ 18 years) diagnosed with PAD. The studies should have a qualitative design describing illness perceptions in the participants´own words.

2.1. Search strategy

The main search was conducted 12.12.17, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher et al., 2009). An update was conducted 31.07.19, with no new studies found. The databases PubMed, CINAHL and PsycINFO were used, as they cover the relevant research fields; care science, health science, medical- and psychology science. Three paging blocks were formed by a combination of keywords and used according to the population, exposure, outcome (PEO) model (Bettany-Saltikov, 2012). The paging blocks were formed using all terms related to PAD (population and exposure), illness perceptions (outcome) and qualitative studies and contained both MESH terms and free keywords (Additional file 1). A librarian at Malmö University was consulted to ensure that the paging blocks were complete. The paging blocks were then combined using Boolean search operators OR within each block AND between the blocks (Ely and Scott, 2007). No limitations on publication dates or language restriction within the search were made.

2.2. Relevance appraisal

The search results from the different databases were uploaded to the reference management software EndNote (X8) and then merged into Rayyan (Ouzzani et al., 2016), a web application, making it possible to structure the results and to blind the assessment. The systematic literature search identified 722 articles after duplicates were removed. The titles and abstracts from the search were screened for relevance against the inclusion criteria independently by the first and last author. In the first relevance appraisal, 704 articles were excluded due to wrong diagnosis (647), irrelevant focus (56) or language (Chinese) (1). After reading the 18 full-text articles, two were excluded based on diagnoses and one based on the method. In total, 15 articles met the inclusion criteria. The reference lists from the included studies were searched manually for additional relevant studies, resulting in three studies being added to the relevance appraisal and thereafter excluded (Fig. 1).

2.3. Quality appraisal

The quality of the included studies was critically appraised using a checklist for qualitative research that was created from a combination of modifications of tools from the Critical Appraisal Skills Programme (CASP, 2018) and the Swedish agency for health technology assessment and the assessment of social services (SBU, 2016). The quality was evaluated based on the study design, sample and setting, data collection, outcome and analysis methods. The quality was appraised high, moderate or low based on the overarching criteria from SBU (2016), which divides the sections according to the thoroughness in the studies methodological description. For high quality, each section of the criteria needed to be assessed as high and a majority assessed as moderate for moderate quality. Both the study relevance and study quality were critically appraised independently by the first and last authors, and to

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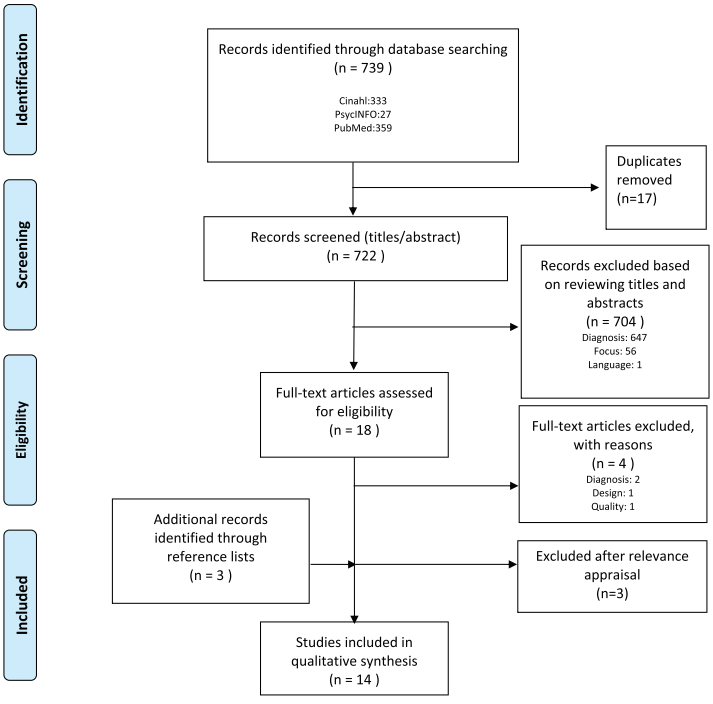

Fig. 1. PRISMA flow diagram for illness perception in patients with peripheral arterial disease.

avoid conflict of interest, three studies were quality appraised by the first and second authors. Any discrepancies were discussed until agreement. A third author was available for potential disagreement between the reviewers but did not need to interfere. The appraisal identified six articles as high quality and eight articles as moderate quality. One article was appraised as low quality due to the limited number of results in relation to the study aim and was therefore excluded, leaving 14 articles for analysis.

2.4. Data analysis

The data were synthesised using a "best-fit" approach to framework analysis, which is an approach that is suitable when the framework does not completely match the data (Carroll et al., 2011). The CSM model was chosen since it is a well-known framework describing illness perception in its general sense. Therefore, a deductive analysis was conducted based on the pre-existing components (timeline, identity, cause, control/cure, and consequences) from the CSM. The data were extracted from the findings sections of the studies and were sorted against the components from the framework. After extracting all the data from the studies representing illness perceptions in the framework, a new component, i.e., the experienced consequences, was created for the data representing the participants' perceptions of illness from a retrospective perspective. The data that were not suitable within the framework were analysed separately using inductive conventional content analysis according to Hsieh and Shannon, 2005. The analysis was conducted by the first author and validated throughout the entire process by all authors. The extracted data were read repeatedly to make sense of the whole, thereafter highlighting the text that appeared to describe illness perceptions. Keywords were written in the margins using the appellations from the studies. These keywords were developed into codes, and the text was sorted. All text within each code was examined, and some codes were combined during this process.

3. Findings

The studies included were conducted between 1997 and 2017 with 316 participants (191 men, 125 women) aged between 44 and 92 years. The participants had various degrees of PAD, with a preponderance of IC (Table 1). The studies were conducted in North America or Europe. The methods used in the studies were individual interviews ($n = 10$), focus group interviews ($n = 3$) or both ($n = 1$) (Table 2). More detailed descriptions of the studies included are presented in Table 3. The findings are presented using the five components (timeline, identity, cause, control/cure, consequences) of the CSM describing illness perceptions from a prospective perspective, in addition to the one component added to the framework that emerged from the inductive content analysis describing illness perceptions from a retro perspective. The included studies are represented in two or more components of the framework (Table 3).

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Table 1
Characteristics of the participants.

Author(s)	Age(mean/ range)	Gender (m/w)	Degree of PAD	Database(s)
Collins et al. (2006)	65.4-	19/16	Average ABI# 0.73±0.25	CINAHLPubMed
Cunningham et al. (2014)	70.9-	11/9	IC#	CINAHLPubMed
Egberg et al. (2012)	7364–81	7/8	IC#	CINAHL
Galea et al. (2008)	76.954–89	7/8	ABI# ≤0.9Lowest ABI#: 0.67	CINAHLPsycINFOPubMed
Galea Holmes et al. (2017)	6644–79	13/6	Duration of symptoms:< 2 years: 9≥ 2 years: 10	CINAHLPsycINFO
Gibson & Kendrick (1998)	-62–75	6/3	Not specified	CINAHL
Gorely et al. (2015)	71-	17/7	ABI# <0.9,CLI excluded	CINAHLPubMed
Harwood et al. (2017)	7144–79	14/11	ABI# <0.9CLI# excluded	PubMed
Lokin et al. (2015)	60.851–72	10/9	ABI# <0.9, manage 2 min on treadmill	CINAHLPubMed
Schorr et al. (2015)	67.5849–83	33/5	ABI# <0.9	CINAHL
Treat-Jacobson et al. (2002)	6544–83	24/14	IC#, CLI#, ulcers, all represented, numbers not specified	CINAHL
Wann-Hansson et al. (2005)	7760–92	12/12	IC#:4, rest pain: 2, ulcers: 18	CINAHLPsycINFO
Wann-Hansson et al. (2008)	7561–85	9/5	IC#:5, ulcers: 5, altered sensations from the legs: 4	CINAHLPsycINFO
Wann-Hansson & Wennick (2016)	7050–81	9/12	IC#:15Rest pain or ulcers: 6	CINAHL

ABI= ankle-brachial index.
CLI=chronic limb ischaemia.
IC= intermittent claudication#PAD= peripheral arterial disease.

3.1. Beliefs about the timeline of the illness

This component describes the beliefs regarding the duration of the illness, i.e., PAD. The beliefs about the duration of the disease consisted of different apprehensions, with some participants perceiving PAD as a permanent condition that could not be cured (Gorely et al., 2015; Wann-Hansson and Wennick, 2016). Other participants believed that the condition was temporary and did not require self-management but that surgical treatment could cure or reduce symptoms (Egberg et al., 2012; Cunningham et al., 2014; Wann-Hansson and Wennick, 2016).

3.2. Beliefs about the identity of the illness

This component includes the beliefs about the symptoms that are caused by the illness. The beliefs about the identity of illness were divided into disease-related factors and other factors associated with ageing. The participants believed that leg symptoms, e.g., pain, fatigue, and weakness, were a result of PAD (Cunningham et al. 2014, Gorely et al., 2015; Schorr et al., 2015), but they also had ideas about the effects of other medical conditions, such as neuropathy or emphysema (Collins et al., 2006; Schorr et al., 2015). However, other participants had no ideas about what caused their symptoms (Collins et al., 2006, Cunningham et al. 2014, Egberg et al., 2012, Gibson and Kendrick 1998, Gorely et al., 2015, Lokin et al., 2015), while others described beliefs that the symptoms could be explained by cramp or a sign of ageing (Egberg et al., 2012; Gorely et al., 2015; Harwood et al., 2017). These beliefs could result in delayed seeking of medical care (Gibson and Kendrick 1998; Gorely et al., 2015; Harwood et al., 2017).

3.3. Beliefs about the cause of the illness

This component refers to individuals' perceptions of the cause of the illness.

Some participants believed that the cause of the illness was lifestyle factors such as smoking or insufficient exercise. In the majority of the studies, the participants acknowledged smoking as a risk factor, whereas the results differed regarding other lifestyle factors (Gibson and Kendrick 1998; Gorely et al., 2015; Lokin et al., 2015; Schorr et al., 2015; Treat-Jacobson et al., 2002; Wann-Hansson and Wennick, 2016).

There were also participants who did not acknowledge lifestyle factors as a cause of the disease (Lokin et al., 2015; Treat-Jacobson et al., 2002). Beliefs about the cause of PAD also included that the disease was caused by comorbidity, chance or just the ageing process (Gibson and Kendrick 1998; Gorely et al., 2015; Lokin et al., 2015; Wann-Hansson and Wennick 2016).

3.4. Beliefs about the control or cure of the illness

This component concerns the participants' beliefs about whether the illness could be cured or kept under control and to what extent the individuals could affect the outcome.

Beliefs that the condition could be controlled or cured were divided into beliefs about lifestyle changes and beliefs that the solution was in the hands of others, i.e., with surgical treatment. The participants showed awareness of the positive effects of physical activity but reported that they lacked guidance regarding the extent to which they should be exercising (Cunningham et al. 2014, Galea Holmes et al. 2017, Gorely et al., 2015). They lacked specific information about the recommended duration and intensity of walking and expressed fears about making their situations worse due to excessive walking (Galea Holmes et al. 2017, Gorely et al., 2015, Wann-Hansson et al., 2008). Motivations to walk included an increasing ability to participate in certain activities or walking being good for the participants' general health rather than disease-specific benefits. The participants also had beliefs that walking was necessary for improving their situation and slowing the progression of the disease (Cunningham et al., 2014; Galea et al., 2008, Galea Holmes et al. 2017). The participants expressed the importance of lifestyle changes in the forms of smoking cessation and increased exercise but did not always have the ability to change their behaviour (Schorr et al., 2015, Treat-Jacobson et al. 2002). The most common reason for not walking was the fear of pain. Another reason was uncertainty about the appropriate duration and intensity of walking. Another reason to not participate in physical activity was the participants' beliefs that walking would not have any effect on their situation (Cunningham et al. 2014, Lokin et al., 2015). This belief was accompanied by high expectations for surgical treatment. Participants in several studies expressed unquestioning beliefs about what surgical treatment could accomplish, and many participants expected to be cured (Cunningham et al., 2014; Gibson and Kendrick 1998; Harwood et al., 2017; Lokin et al., 2015). A feeling of relief was expressed when participants were scheduled for surgery (Egberg et al., 2012; Wann-Hansson et al., 2005).

3.5. Beliefs about the consequences of the illness

The beliefs about consequences describe participants' beliefs about the impact that the illness will have on their lives in

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Table 2
Overview of the included qualitative studies.

Author, Year, Country	Data collection	Method of analysis	Study aims and objectives	Sample	Relevant findings for present study	Study quality
Collins et al. (2006) USA	Focus group and individual interviews	Constant comparative method according to grounded theory	To explore patients' perceptions of the role of exercise in the treatment of peripheral arterial disease.	Consecutive sample of 35 participants from primary care.	Lack of awareness about what caused the symptoms. Worries about the future.	Moderate
Cunningham et al. (2014) Scotland	Semi-structured individual interviews	Thematic analysis	To explore the beliefs and physical activity behaviour of patients with PAD who have received vascular intervention.	Consecutive sample of 20 participants who had received a vascular intervention for IC 6 months and 2 years previously.	Some participants had knowledge about the benefits of walking. Others did not believe in these benefits but had high expectations for surgical treatment.	High
Egberg et al. (2012) Sweden	Individual semi-structured interviews	Thematic analysis	To describe individuals' experiences of living with IC due to PAD from an insider's perspective.	Purposive sample of 15 participants with IC at a visit or revisit at the vascular department.	The illness gave a feeling of being dependant on others Fear of worsening of symptoms.	High
Galea et al. (2008) Canada	Focus group interviews	Content analysis	To identify barriers and facilitators associated with walking for exercise amongst people who experience IC.	Sample of 15 participants recruited from a medical facility specializing in PAD.	Individuals believed that walking is good for PAD; however, uncertainty to the benefits or harm caused by pain during walking.	Moderate
Galea Holmes et al. (2017) United Kingdom	Semi-structured individual interviews	Framework analysis	To explore people's experiences of and beliefs about their illness and walking with IC.	Semi-purposive sample of 19 participants from vascular outpatient clinics.	Beliefs that walking was necessary to slow the progression of the disease that there was a lack of guidelines for walking with IC.	High
Gibson & Kendrick (1998) England	Individual interviews	Constant comparative method according to grounded theory	To explore the lived experience of PAD.	Convenience sample of nine participants recruited from vascular outpatient clinic.	Lack of awareness of what caused the symptoms, resulting in delay in seeking medical care. High expectations for surgical treatment.	Moderate
Gorely et al. (2015) United Kingdom	Focus group interviews	Thematic analysis	To explore the experiences of individuals living with IC due to PAD, their knowledge about the condition, and their thoughts about being asked to walk more and an intervention to promote walking.	Sample of 24 participants recruited via vascular clinic.	Uncertainty amongst participants about whether they could do enough physical activity to make a difference. Lack of guidelines about walking with IC.	Moderate

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Table 2 (*Continued*).

Author, Year, Country	Data collection	Method of analysis	Study aims and objectives	Sample	Relevant findings for present study	Study quality
Harwood et al. (2017) United Kingdom	Semi-structured individual interviews	Thematic analysis	To examine the barriers and facilitators to exercise programmes in patients with IC.	Sample of 25 participants who had completed, declined or withdrawn from supervised exercise programme.	Identification of symptoms as part of the ageing process. Avoidance of physical activities due to feelings of being a burden.	Moderate
Lokin et al. (2015) The Netherlands	Semi-structured interviews	Thematic analysis	To investigate the understanding of patients with IC regarding the aetiology and atherosclerotic nature of their disease.	Convenience sample of 19 participants from a previous study.	Lack of awareness that IC is a symptom of systemic atherosclerosis. High expectations for surgical treatment.	Moderate
Schorr et al. (2015) USA	Semi-structured individual interviews and questionnaire	Content analysis	To describe the symptoms experienced by individuals diagnosed with PAD.	Purposive sample of 38 participants.	Beliefs amongst participants that having PAD negatively affected their self-esteem and their outlook on life.	High
Treat-Jacobson et al. (2002) USA	Qualitative interviews, open-ended questions	Constant comparative method according to grounded theory	To evaluate the effects of PAD on HRQoL from the patient's perspective to establish a foundation for systematic PAD-specific HRQoL assessment in this population.	Purposive sample of 38 participants from two medical centres.	A lack of knowledge of the causes of PAD and the need for lifestyle changes Physical limitations caused by PAD resulted in isolation.	Moderate
Wann-Hanson et al. (2005) Sweden	Individual semi-structured interviews	Manifest and latent content analysis	To investigate patients' experiences of living with PAD and its influence on activities in daily life while awaiting intervention.	Purposive sample of 24 participants admitted for planned active treatment.	Uncertainty and fear about the future. Emotional experiences such as changes in mood and temper. Limitations in social life and feelings of involuntary isolation.	High
Wann-Hanson et al. (2008) Sweden	Individual semi-structured interviews	Manifest and latent content analysis	To illuminate the long-term experiences of living with PAD and the recovery following revascularization.	Sample recruited from previous study of 14 participants.	Gradual awareness of having a chronic disease. Adaptation to the situation by lowering expectations and being realistic in setting goals made it possible to feel satisfaction in life despite everything.	High
Wann-Hanson & Wennick (2016) Sweden	Focus group interviews	Manifest and latent content analysis	To elucidate how patients with PAD communicate their knowledge about their illness and treatments.	Purposive sample of 21 participants who had undergone a vascular intervention in the preceding six months.	Some participants explained PAD as a chronic condition, while others explained it as a temporary to be cured. Age was seen as the main cause to the disease. Insufficient knowledge of the aetiology, consequences, risk factors and preventive options.	Moderate

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Table 3
Studies representation in the common-sense model.

	Beliefs about identity of illness	Timeline beliefs	Causal beliefs	Beliefs about control or cure	Beliefs about consequences	Consequences of living with PAD
Collins et al. (2006)	✓				✓	✓
Cunningham et al. (2014)	✓	✓		✓		✓
Egberg et al. (2012)	✓	✓		✓	✓	✓
Galea et al. (2008)				✓		✓
Galea Holmes et al. (2017)				✓	✓	✓
Gibson & Kendrick (1998)	✓		✓	✓		✓
Gorely et al. (2015)	✓	✓	✓	✓		✓
Harwood et al. (2017)	✓			✓		✓
Lokin et al. (2015)	✓	✓	✓	✓		✓
Schorr et al. (2015)	✓		✓			✓
Treat-Jacobson et al. (2002)			✓		✓	✓
Wann-Hanson et al. (2005)				✓	✓	✓
Wann-Hanson et al. (2008)				✓	✓	✓
Wann-Hanson & Wennick (2016)		✓	✓		✓	✓

a prospective perspective. The participants described both emotional and practical reactions as a consequence of PAD. The emotional consequences were worries and fears about the future. The fear could be about the worsening of symptoms or amputation (Collins et al., 2006, Egberg et al. 2012, Galea Holmes et al. 2017, Treat-Jacobson et al., 2002, Wann-Hansson et al., 2005). Another belief was a fear that PAD would lead to increased dependency. Since participants were dependant on others, there was also a fear of what would happen to them if their spouses were to become sick. Not knowing what the future would bring created a feeling of lack of control (Egberg et al. 2012, Galea Holmes et al. 2017, Treat-Jacobson et al., 2002, Wann-Hansson et al., 2005, Wann-Hansson et al., 2008, Wann-Hansson and Wennick 2016).

3.6. Experienced consequences of living with pad

In addition to the components within the illness perception framework, another category emerged that complemented the CSM. The participants described not only their beliefs about what consequences the illness would have on their lives but also the experienced consequences in a retrospective perspective that affected their illness perceptions. Their illness perceptions were influenced by emotional as well as social consequences. They experienced having lost their independence due to their disease, which affected their self-image. Living with PAD meant adapting to a new way of life.

3.6.1. Emotional consequences

The participants described feelings of embarrassment when forced to stop due to pain in their legs. They felt ashamed and did not wanted others to notice (Egberg et al., 2012; Galea et al., 2008; Treat-Jacobson et al., 2002). Apart from the experience of embarrassment, dealing with PAD generated a number of negative feelings such as anger, humiliation and powerlessness, but most of all, a feeling of frustration (Egberg et al. 2012, Galea Holmes et al. 2017, Gibson and Kendrick 1998, Harwood et al., 2017, Wann-Hansson et al., 2005). These negative feelings caused a negative mood and irritation, which had an impact on their relationships with family and friends (Egberg et al. 2012, Wann-Hansson et al., 2005).

3.6.2. Social consequences

The consequences of living with IC also caused practical and social consequences.

Several studies have reported involuntary isolation due to physical limitations.

The participants described a feeling of being left out when forced to abstain from physical or social activities. They felt limitations to being spontaneous and that all sorts of activity needed to be planned. They also expressed a feeling of being a burden to others and therefore avoiding social situations (Egberg et al. 2012, Gorely et al., 2015, Harwood et al., 2017, Treat-Jacobson et al., 2002, Wann-Hansson et al., 2005).

3.6.3. Dependence

Living with PAD led to increased dependence. The participants saw it as necessary to ask for help but preferred to avoid certain activities rather than accepting support. They expressed feelings of helplessness and inadequacy when family members needed to take over specific tasks in the household. Being dependant on others gave them a feeling of powerlessness, and they searched for strategies to gain control over their situations (Egberg et al. 2012, Cunningham et al., 2014, Treat-Jacobson et al., 2002, Wann-Hansson et al., 2005).

3.6.4. Changing self-image

Being forced to change their ways of life also changed the participants' self-image. Physical limitations caused dependence on others and changed their senses of self. They felt forced to give up activities that had been important to them, which affected how they saw themselves. (Egberg et al. 2012, Gibson and Kendrick et al. 1998, Schorr et al., 2015, Treat-Jacobson et al., 2002, Wann-Hansson et al., 2005).

3.6.5. Adaptation

The participants described a process of adaptation to living with PAD, both practical and emotional. They described a need to plan activities in advance. They needed more time for transport and had to take into account that everything takes more time. Impulsive and spontaneous activities were replaced with thorough planning around known places for rest. Activities causing discomfort were avoided in favour of new hobbies that did not require walking. In some studies, the participants coped with their new situations by connecting them to the process of ageing (Harwood et al., 2017; Wann-Hansson et al., 2005; Wann-Hansson et al., 2008). The participants described the emotional part of the adaptation process as lowering expectations and being realistic. They were forced to accept their limitations and find a way to live with them (Egberg et al. 2012, Gibson and Kendrick et al. 1998, Wann-Hansson et al., 2008). The process of adaptation differed between participants. Some accepted their new situations, finding new hobbies, meeting friends in their own homes instead of going out and, in that sense, finding other value in life. Others who had been physically active in the past and thought that activity was an important factor had more difficulty accepting and adapting to their new situations (Cunningham et al., 2014; Egberg et al., 2012; Wann-Hansson et al., 2005; Wann-Hansson et al., 2008).

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4. Discussion

This review synthesises illness perceptions in patients with PAD using the CSM. The findings showed diversity in illness perceptions in each of the five components of the framework as well as in the additional component.

There was a belief about PAD as a temporary condition to be cured. The findings also revealed uncertainty about the identity of the symptoms and the cause of the disease. The findings showed different beliefs about how to control and cure PAD. These beliefs varied from having a high motivation for physical activity to thinking that walking could make one's situation worse. For the final component of the CSM, the finding revealed a fear of the future, as patients perceived disease progression and decreasing control to be consequences of their illness. As a consequence of living with the disease, the emphasis in the additional component was the participants' processes for regaining control and adapting to their new situations, which affected their illness perceptions.

Beliefs about how to control and cure PAD differed, from regarding physical activity as beneficial for the prognosis of the disease to not believing in the value of exercise as a treatment but instead having high expectations for surgical treatment.

These findings correspond to beliefs amongst individuals with myocardial infarction who reasoned that their conditions could be improved on their own or that it was uncontrollable and instead put trust in others (Alsen et al. 2008). Importantly, our findings showed that the participants requested more information with regard to how often and to what extent they should exercise, which may indicate a need for individual-based information. According to Atreja et al. (2005), when lifestyle modification is required, patients' beliefs must be addressed to tailor the information and, in that way, enhance adherence to treatment. Illuminating illness perceptions of PAD highlights beliefs that physical activity could cause harm and may provide a possibility for increasing adherence to physical activity in this group.

Beliefs about the consequences of PAD reflected worries about the future and fears of losing control and independence. This finding is in line with previous research in patients with chronic heart failure, showing experiences of fears about the future as a central aspect (Jeon et al., 2010) and the presence of fears of not being able continue working due to the limitations caused by the disease (Europe and Tyni-Lenné 2004). However, from the reviewed studies, it became clear that beliefs about the consequences of PAD also need to be illuminated from patients' own view of lived consequences.

In the additional component of the framework, the findings showed the occurrence of involuntary isolation due to the physical limitations caused by the disease. Other studies have shown that the higher feeling of loneliness, the more negatively affected illness perceptions will be in patients with chronic illness (Tuncay et al., 2018) and that negative illness perceptions can lead to increasing anxiety and decreasing quality of life in patients with cardiac disease (Foxwell et al., 2013). These observations suggests that by addressing beliefs about both the expected outcomes of the disease and the consequences of living with the PAD, other factors affecting patients' daily lives could be elucidated.

Moreover, the findings showed a lack of understanding of the chronic nature of the disease and of the aetiology of PAD. This finding is in line with previous studies that have shown a lack of patient awareness of PAD as a systemic manifestation of atherosclerosis and its associated morbidity and mortality (Sol et al., 2005; Abaraogu et al., 2018). The fact that patients with PAD view their disease as temporary or caused by older age and believe that it is out of their own control does not support the prerequisites for adherence to their treatment. Because beliefs about the timeline of the disease could have an effect on compliance with treatment (Leventhal et al., 2016), early identification of patients' perceptions of their illness offers the opportunity to increase adherence to behaviour changes and improve illness outcomes (Petrie and Weinman, 2006). Illuminating illness perceptions in patients with PAD may enhance opportunities to increase adherence to secondary prevention treatment, decreasing the risk for cardiovascular events and improving quality of life.

4.1. Methodological considerations

All the included studies were conducted in Europe or North America, creating a limitation from a global perspective. The participants in the included studies had various degrees of PAD and had been living with the disease for a different amount of time, which could have had an impact on the perception of their illness.

Using the "best-fit" approach made it possible to capture the relevant data, but the data were not limited by it since it was possible to conduct to inductive analysis outside of the framework. (Carroll et al. 2011). The finding suggested that the CSM was a suitable framework to describe illness perceptions amongst patients with PAD with the addition of one supplementary component. This component illuminates how illness perceptions are influenced by the experienced consequences of living with PAD. The consequences of the disease component in the CSM offers a prospective view that reveals the expected outcome (Leventhal et al., 2003). In this review, the participants also reflected on their lived experience of the consequences of the disease. This perspective was represented in all of the included studies and could influence their beliefs about their disease since illness perceptions can change over time, often toward more realistic beliefs (Leventhal et al., 1998). Studies measuring this dynamic process over time needs to be further studied as well as the impact of illness perception for adherence to treatment. Also, further studies with the objective of exploring illness perceptions in relation to the different stages of the disease in patients with PAD are warranted.

4.2. Clinical implications

The knowledge about illness perceptions in patients with PAD can be of value in both clinical work as in research. This knowledge can be applied in the daily practice when communicating with patients about medical treatment and nursing care. Furthermore, this understanding can be used to tailor information and guide patients in their illness management but also in the development of interventions directed to individualized secondary prevention measures. Hopefully, this may lead to better adherence to secondary prevention amongst patients with PAD.

4.3. Conclusions

Patients with PAD shape their own understandings of their conditions. These different beliefs may influence their management of their disease and their adherence to treatment. Therefore, the current study suggests that illness perceptions are addressed when planning secondary prevention for patients with PAD.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ijnurstu.2020.103723.

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References

Abaraogu, U.O., Ezenwankwo, E.F., Dall, P.M., Seenan, C.A., 2018. Living a burdensome and demanding life: a qualitative systematic review of the patients experiences of peripheral arterial disease. PLoS ONE 13 (11). doi:10.1371/journal.pone.0207456.

Aber, A., Lumley, E., Phillips, P., Buckley Woods, H., Jones, G., Michaels, J., 2018. Themes that Determine Quality of Life in Patients with Peripheral Arterial Disease: a Systematic Review. The Patient – Patient-Centered Outcomes Research 11 (5), 489–502. doi:10.1007/s40271-018-0307-7.

Aboyans, V., Ricco, J.B., Bartelink, M.L.E.L., Björck, M., Brodmann, M., Cohnert, T., Collet, J.P., Czerny, M., De Carlo, M., Debus, S., Espinola-Klein, C., Kahan, T., Kownator, S., Mazzolai, L., Naylor, A.R., Roffi, M., Röther, J., Sprynger, M., Tendera, M., Tepe, G., Venermo, M., Vlachopoulos, C., Desormais, I.ESC Scientific Document Group, 2018. ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS): document covering atherosclerotic disease of extracranial carotid and vertebral, mesenteric, renal, upper and lower extremity arteries. Eur. Heart J. 9 (39), 763–816. doi:10.1093/eurheartj/ehx095.

Alsén, P., Brink, E., Persson, L.O., 2008. Patients illness perception four months after a myocardial infarction. J Clin Nurs 17 (5a), 25–33. doi:10.1111/j.1365-2702.2007.02136.x.

Atreja, A., Bellam, N., Levy, S.R., 2005. Strategies to Enhance Patient Adherence: making it Simple. Medscape General Medicine 7 (1), 4.

Bettany-Saltikov, J., 2012. How to Do a Systematic Literature Review in nursing: a Step-By-Step Guide. McGraw-Hill/Open University Press, Maidenhead.

Carroll, C., Booth, A., Cooper, K., 2011. A worked example of "best fit" framework synthesis: a systematic review of views concerning the taking of some potential chemopreventive agents. BMC Med Res Methodol 29 (11). doi:10.1186/1471-2288-11-29.

Collins, T.C., Kroll, T.L., Krueger, P.N., Willson, P., Ashton, C.M., Sharf, B.F., 2006. A Qualitative Approach to Developing a Patient-Derived Intervention to Increase Exercise in Peripheral Arterial Disease. J Cardiopulm Rehabil 26 (2), 92–100.

Critical Appraisal Skills Programme (2018) CASP Qualitative Checklist. [online] Available at: URL. Accessed:190709. https://casp-uk.net/wp-content/uploads/2018/03/CASP-Qualitative-Checklist-2018_fillable_form.pdf.

Cronin, C.T., McCartan, D.P., McMonagle, M., Cross, K.S., Dowdall, J.F., 2015. Peripheral artery disease: a marked lack of awareness in Ireland. European Journal of Vascular and Endovascular Surgery 49 (5), 556–562. doi:10.1016/j.ejvs.2014.12.017.

Cunningham, M.A., Swanson, V., Pappas, E., O'Carroll, R.E., Holdsworth, R.J., 2014. Illness Beliefs and Walking Behavior After Revascularization for Intermittent Claudication – A qualitative study. J Cardiopulm Rehabil Prev 34 (3), 195–201. doi:10.1097/hcr.0000000000000046.

Dumville, J.C., Lee, A.J., Smith, F.B., Fowkes, F.G., 2004. The health-related quality of life of people with peripheral arterial disease in the community: the Edinburgh Artery Study. British Journal of General Practice. Nov1 54 (508), 826–831.

Egberg, L., Andreassen, S., Mattiasson, A.C., 2012. Experiences of living with intermittent claudication. Journal of Vascular Nursing 30 (1), 5–10. doi:10.1016/j.jvn.2011.11.001.

Ely, C., Scott, I., 2007. Essential Study Skills For Nursing. Elsevier, Edinburgh.

Europe, E., Tyni-Lenné, R., 2004. Qualitative analysis of the male experience of heart failure. Heart & Lung. The Journal of Cardiopulmonary and Acute Care 33 (4), 227–234. doi:10.1016/j.hrtlng.2004.03.003.

Flora, P.K., Anderson, T.J., Brawley, L.R., 2015. Illness perceptions and adherence to exercise therapy in cardiac rehabilitation participants. Rehabil Psychol 60 (2), 179–186. doi:10.1037/a0039123.

Fowkes, F.G., Housley, E., Riemersma, R.A., Macintyre, C.C., Cawood, E.H., Prescott, R.J., Ruckley, C.V., 1992. Smoking, lipids, glucose intolerance, and blood pressure as risk factors for peripheral atherosclerosis compared with ischemic heart disease in the Edinburgh Artery Study. Am. J. Epidemiol. 135 (4), 331–340. doi:10.1093/oxfordjournals.aje.a116294.

Foxwell, R., Morley, C., Frizelle, D., 2013. Illness perceptions, mood and quality of life: a systematic review of coronary heart disease patients. J Psychosom Res 75 (3), 211–222. doi:10.1016/j.jpsychores.2013.05.003.

French, D.P., Cooper, A., Weinman, J., 2006. Illness perceptions predict attendance at cardiac rehabilitation following acute myocardial infarction: a systematic review with meta-analysis. J Psychosom Res 61 (6), 757–767. doi:10.1016/j.jpsychores.2006.07.029.

Galea, M.N., Bray, S.R., Ginis, K.A., 2008. Barriers and Facilitators for Walking in Individuals With Intermittent Claudication. J Aging Phys Act 16 (1), 69–84. doi:10.1123/japa.16.1.69.

Galea Holmes, M.N., Weinman, J.A., Bearne, L.M., 2017. 'You can't walk with cramp!' A qualitative exploration of individuals' beliefs and experiences of walking as treatment for intermittent claudication. J Health Psychol 22 (2), 255–265. doi:10.1177/1359105315600238.

Gibson, J.M., Kendrick, M., 1998. Pain and powerlessness: the experience of living with peripheral arterial disease. J Adv Nurs 27 (4), 737–745. doi:10.1046/j.1365-2648.1998.00599.x.

Gorely, T., Crank, H., Humphreys, L., Nawaz, S., Tew, G.A., 2015. "Standing still in the street": experiences, knowledge and beliefs of patients with intermittent claudication - A qualitative study. Journal of Vascular Nursing 33 (1), 4–9. doi:10.1016/j.jvn.2014.12.001.

Harwood, A.E., Broadbent, E., Totty, J.P., Smith, G.E., Chetter, I.C., 2017. "Intermittent claudication a real pain in the calf" - Patient experience of diagnosis and treatment with a supervised exercise program. Journal of Vascular Nursing 35 (3), 131–135. doi:10.1016/j.jvn.2017.03.001.

Hirsch, A.T., Murphy, T.P., Lovell, M.B., Twillman, G., Treat-Jacobson, D., Harwood, E.M., Mohler, E.R., Creager, M.A., Hobson, R.W., Robertson, R.M., Howard, W.J., Scroeder, P., Criqui, M.H., 2007. Gaps in public knowledge of peripheral arterial disease: the first national PAD public awareness survey. Circulation 116 (18), 2086–2094. doi:10.1161/CIRCULATIONAHA.107.725101.

Hsieh, H.F., Shannon, S.E., 2005. Three approaches to qualitative content analysis. Quality Health Research 15 (9), 1277–1288. doi:10.1177/1049732305276687.

Jeon, Y.H., Kraus, S.G., Jowsey, T., Glasgow, N.J., 2010. The experience of living with chronic heart failure: a narrative review of qualitative studies. BMC Health Serv Res 10 (77). doi:10.1186/1472-6963-10-77.

Kunschitz, E., Friedrich, O., Schöppl, C., Maitz, J., Sipötz, J., 2017. Illness perception patterns in patients with Coronary Artery Disease. Psychol Health Med 22 (8), 940–946. doi:10.1080/13548506.2016.1271439.

Leventhal, H., Brissette, I., Leventhal, E.A., 2003. In: Cameron, LD, Leventhal, H (Eds.). Routledge, London, pp. 42–65.

Leventhal, H., Leventhal, E.A., Contrada, R.J., 1998. Self-regulation, health and behavior: a perceptual-cognitive approach. Psychology and Health 13 (4), 717–733. doi:10.1080/08870449808407425.

Leventhal, H., Meyer, D., Nerenz, D., 1980. The common-sense model of illness danger. In: Rachman, S. (Ed.). In: Medical Psychology, 2. Pergamon Press, New York, pp. 7–30 Edited by.

Leventhal, H., Phillips, L.A., Burns, E., 2016. The Common-Sense Model of Self-Regulation (CSM): a dynamic framework for understanding illness self-management. J Behav Med 39 (6), 935–946. doi:10.1007/s10865-016-9782-2.

Lokin, J.L., Hengeveld, P.J., Conijn, A.P., Nieuwkerk, P.T., Koelemay, M.J., 2015. Disease understanding in patients with intermittent claudication: a qualitative study. Journal of Vascular Nursing 33 (3), 112–118. doi:10.1016/j.jvn.2015.02.002.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G.The PRISMA Group, 2009. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: the PRISMA Statement. PLoS Med 6 (7), e1000097. doi:10.1371/journal.pmed1000097.

Ouzzani, M., Hammady, H., Fedorowicz, Z., Elmagarmid, A., 2016. Rayyan – a web and mobile app for systematic reviews. Syst Rev 5, 210. doi:10.1186/s13643-016-0384-4.

Petrie, K.J., Weinman, J., 2006. Why illness perception matter. Clinical Medicine 6 (6), 536–539.

SBU, 2016. Evaluation and Synthesis of Studies Using Qualitative Methods of Analysis. Swedish Agency for Health Technology Assessment and Assessment of Social Services, Stockholm.

Schorr, E., Peden-McAlpine, C., Treat-Jacobson, D., Lindquist, R., 2015. Characterization of the peripheral artery disease symptom experience. Geriatr Nurs (Minneap) 36 (4), 293–300. doi:10.1016/j.gerinurse.2015.03.004.

Sigvant, B., Lundin, F., Wahlberg, E., 2016. The Risk of Disease Progression in Peripheral Arterial Disease is Higher than Expected: a Meta-Analysis of Mortality and Disease Progression in Peripheral Arterial Disease. European Journal of Vascular and Endovascular Surgery 51 (3), 395–403. doi:10.1016/j.ejvs.2015.10.022.

Sol, B.G., van der Bijl, J.J., Banga, J.D., Visseren, F.L., 2005. Vascular risk management through nurse-led self-management programs. Journal of Vascular Nursing 23 (1), 20–24. doi:10.1016/j.jvn.2004.12.003.

Stafford, L., Berk, M., Jackson, H.J., 2008. Are illness perceptions about coronary artery disease predictive of depression and quality of life outcomes. J Psychosom Res 66 (3), 211–220. doi:10.1016/j.jpsychores.2008.09.005.

Treat-Jacobson, D., Halverson, S.L., Ratchford, A., Regensteiner, J.G., Lindquist, R., Hirsch, A.T., 2002. A Patient-derived Perspective of Health-related Quality of Life With Peripheral Arterial Disease. Journal of Nursing Scholarship 34 (1), 55–60. doi:10.1111/j.1547-5069.2002.00055.x.

Tuncay, F.Ö., Fertelli, T., Mollaoglu, M., 2018. Effects of loneliness on illness perception in persons with a chronic disease. J Clin Nurs 27 (7–8), e1494–e1500. doi:10.1111/jocn.14273.

Wann-Hansson, C., Hallberg, I.R., Klevsgård, R., Andersson, E., 2005. Patientsexperiences of living with peripheral arterial disease awaiting intervention – a qualitative study. Int J Nurs Stud 42 (8), 851–862. doi:10.1016/j.ijnurstu.2004.11.009.

Wann-Hansson, C., Hallberg, I.R., Klevsgård, R., Andersson, E., 2008. The long-term experience of living with peripheral arterial disease and the recovery following revascularisation: a qualitative study. Int J Nurs Stud 45 (4), 552–561. doi:10.1016/j.ijnurstu.2006.11.006.

Wann-Hansson, C., Wennick, A., 2016. How do patients with peripheral arterial disease communicate their knowledge about their illness and treatments? A qualitative descriptive study. BMC Nurs 15 (29). doi:10.1186/s12912-016-0151-9.

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Health literacy in patients with intermittent claudication in relation to clinical characteristics, demographics, self-efficacy and quality of life – A cross-sectional study

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Background: Intermittent claudication requires treatment with secondary prevention to reduce disease progression and the risk of cardiovascular events and to improve quality of life. Health literacy and self-efficacy are important preconditions for the health behaviour changes necessary for adhering to secondary prevention.
Aim: Evaluate health literacy in patients with intermittent claudication regarding clinical characteristics, demographics, self-efficacy and quality of life.
Methods: A cross-sectional study evaluating health literacy, self-efficacy and quality of life using questionnaires. Patients with intermittent claudication from vascular units in the south of Sweden were included.
Results: In total, 158 patients were included, of which, 52.5% reported "inadequate" (0-8 points) or "problematic" (9-12 points) health literacy with no differences between men and women. A significant higher proportion of patients living alone reported "inadequate" or "problematic" health literacy than "sufficient" (13-16 points) health literacy. Patients with "sufficient" health literacy reported significantly higher self-efficacy and quality of life and were more physically active than patients with "inadequate" or "problematic" health literacy. Also, patients with a university degree reported a significantly higher ability to "access" (seek, find and obtain) and "understand" (comprehend the accessed) information relevant to health.
Conclusion: The majority of patients with intermittent claudication have "inadequate" or "problematic" health literacy. Also, an "inadequate" or "problematic" health literacy level is more common among patients living alone, and education level appears to be more important when "accessing" and "understanding" information relevant to health. This illuminates the importance of not only the patients' health literacy but also demographics when planning for secondary prevention.
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Introduction

Intermittent claudication (IC) is a chronic condition secondary to atherosclerosis. Patients with IC require lifelong treatment with secondary preventive measures including tobacco cessation, physical activity, dietary changes, and the best medical treatment.[1] However, the overall medical and social setting to support patients with IC with this treatment is suboptimal.[2,3] Moreover, important preconditions for health behaviour changes may need to be considered for adhering to secondary prevention. Health literacy and self-efficacy have been shown to be significantly associated with adherence to secondary prevention in patients with coronary artery disease.[4] Therefore, additional knowledge about health literacy and self-efficacy may be important when planning the secondary prevention for patients with IC.

Approximately 236 million people live with peripheral artery disease (PAD),[5] in which IC is the most common condition, representing 10–20%.[6] It is characterized by ischemic muscle pain during walking, which is relieved when at rest.[1] Patients with IC suffer from walking impairment, loss of independence, and decreased

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quality of life (QOL).[7] Patients with PAD suffer a 2.6-fold increased risk for cardiovascular mortality compared to those with normal ankle brachial index (ABI) and no symptoms of IC.[8] The risk factors for development of PAD and other forms of atherosclerosis are similar (smoking, hypertension, dyslipidaemia and diabetes). To halt the progression of the atherosclerotic process in order to reduce the risk of cardiovascular events and increase quality of life (QOL), secondary prevention measures are crucial.[1] Importantly, one review found that patients with PAD showed diverse perceptions concerning the illness, with different etiological beliefs regarding the disease and treatment with secondary prevention. The reasons for non-adherence to treatment were insufficient knowledge or the inability to change behaviour patterns.[9]

The association between improved health behaviour and improved health literacy has been shown in other cardiovascular diseases (CVD).[10] However, such important associations have not been studied in patients with IC. The concept of health literacy is defined by the World Health Organization and can briefly be described as the degree in which individuals have the ability to find, understand, and use information in order to make health-related decisions.[11] A review by Berkman et al.[12] showed that low health literacy is associated with more hospitalizations, non-adherence to treatment, lower ability to interpret health-related information, lower health status, and higher mortality rates. Importantly, health literacy has been shown to be improved by education, and as a result, improved overall health outcomes.[13]

Associations between health literacy and self-efficacy have been demonstrated in a review by Farley,[14] where low health literacy seems to be a barrier for the self-management of chronic diseases. Self-efficacy is defined as a person's own judgement of capabilities to perform a certain activity in order to achieve a certain outcome.[15] The confidence and perception of a person's ability to accomplish a certain level of performance directly correlates to their success rate. The subject's beliefs concerning his or her capabilities can therefore predict future behaviour.[16] Also, self-efficacy can be changed over time. A study by Sol et al.[17] showed improved self-efficacy to be associated with improved adherence to guidelines for physical activity in patients with CVD. Similar results have also been reported in patients with PAD, showing that self-efficacy is significantly associated with walking ability and adherence to exercise in patients with PAD.[18] However, there is an important scientific gap evaluating self-efficacy in relation to health literacy in patients with IC. The aim of this study was therefore to explore health literacy in patients with IC in relation to clinical characteristics, demographics, self-efficacy, and QOL.

Method

The study was conducted with a cross-sectional design.

Participants

Patients from three vascular surgical departments in the south of Sweden were invited to take part in the study. The patients were recruited at the first visit to the outpatient clinic at the time they were diagnosed with IC. The inclusion criteria were patients diagnosed with IC (defined by clinical findings and [ABI] <0.9) and the ability to read and understand Swedish. Since PAD ranges from asymptomatic to critical ischemia, the patients´situation could differ in terms of comorbidities, disease burden, treatment strategies, and disease exposure based on the severity of the disease. Therefore, only patients with IC were included and patients with critical ischemia (rest pain, ulceration, and gangrene) were excluded, along with patients who previously received surgical treatment for IC.

Data collection

The data were collected between 2018 and 2020. Patients fulfilling the inclusion criteria were asked for participation by registered nurses specialized in vascular diseases at the Departments for Vascular diseases in Malmö, Helsingborg and Kristianstad. Patients who opted in received both oral and written information, and a questionnaire along with the informed consent form. The patients were advised to fill in the questionnaire and the informed consent form at home, thus giving them time to consider the decision to participate. The patients interesting in participation sent back the questionnaires and the informed consent to the research team using a prepaid envelope. One reminder was sent to non-responders. Medical records were reviewed for ABI, blood pressure, cholesterol levels and blood glucose.

Questionnaire

The self-reported questionnaires used included instruments regarding health literacy, self-efficacy, and QOL. Permission to use the instruments was granted from the originators. Background data were collected through a self-reported questionnaire developed only for this study, which included questions regarding demographics, co-morbidities, clinical characteristics, and lifestyle factors such as physical activity and smoking. The lifestyle factors were included based on the importance of secondary prevention for patients with PAD.[1,8] Physical activity were self-reported, and the two questions were phrased as: *"Are you being physically active?" (yes/no)* and *"How many times per week are you being physically active?" (1-2, 3-4, >4).*

Health literacy

European Health Literacy Survey Questionnaire 16 (HLS-EU-Q16-SE) is a short version of European Health Literacy Survey Questionnaire (HLS-EU). The instrument is available in Swedish and has been validated in a Swedish context.[19] In the current study the internal consistency was (α =.91). It consists of 16 items in four different dimensions of health literacy: "Access/obtain" refers to the ability to seek, find and obtain health information. "Understand" refers to the ability to comprehend the health information that is accessed. "Process/appraise" refers to the ability to judge and evaluate the accessed health information and "apply/use" refers to the ability to use the health information to maintain and improve health.[20] It uses a four-point response scale: "very easy", "easy", "difficult", "very difficult", and one option for "I don't know". The responses "very easy" and "easy" are combined into one category and receive the value of one point. The responses "very difficult" and "difficult" are combined into another category and receive zero points, and the response "I don't know" is treated as missing data. A sum score is calculated and divided into three categories: 0–8 inadequate, 9–12 problematic and 13–16 sufficient.[19] The health literacy index was divided into two categories: not sufficient health literacy (inadequate and problematic) and sufficient health literacy according to Sørensen et al.[21]

Self-efficacy

The General Self-Efficacy Scale (S-GSE) consists of 10 items rated on a four-point Likert scale ("not all true" to "exactly true").[22] The Swedish version was used[23] which have good psychometric properties.[24] A good internal consistency was showed in the current study (α = .92). The answers are summed to a complete score (10–40), where a high score represent high self-efficacy.[22]

QOL

Vascular Quality of Life Questionnaire-6 (VQ6) is a disease-specific instrument for measuring QOL of patients with PAD. The

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Swedish version of VQ6 has shown good psychometric properties.[25] In the current study the internal consistency was (α =.85). The instrument contains six items divided into five subscales: activity (two items), emotional, pain, social, and symptoms. A four-point response scale was used, and a sum score was calculated (6–24), where a high score indicates a high quality of life.[26]

Statistics

Descriptive statistics (i.e., frequencies, percentages, means and medians) were used to describe the study sample. Normal distributed variables are presented as mean with standard deviation and non-normally distributed variables as median, with first and third interquartile ranges (IQR) in parenthesis. Normal distribution was assessed using histograms and Shapiro-Wilks test. The characteristics between groups were compared using χ^2 test for categorical variables, independent samples t-tests for normal distributed data, and Mann-Whitney U-test for ordinal variables not normally distributed. Multiple logistic regression model was used to determine factors associated with level of health literacy and adjusted for confounding variables. A p-value of 0.05 was used to determine the significance. The internal consistency was measured using Cronbachś alpha that ranges between 0 and 1, with higher values indicating more reliability.[27] For analyzing the data, IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp were used.

Ethical consideration

The study has been carried out in accordance with the principles outlined in the Declaration of Helsinki.[28] The study has been approved by the Regional Ethical Review Board in Lund (Dnr 2017/609).

Results

A total of 215 patients fulfilled the inclusion criteria and were invited to participate in the study. Initially, 142 patients answered the questionnaires. After the reminding letter was sent to non-responders, another 16 patients were included, resulting in 158 patients in total who completed the questionnaires, with a 73.5% response rate.

Demographics and clinical characteristics

The total population consisted of 80 women (50.6%) and 78 men (49.4%), with a mean age of 74 years (range 47–92). The most common comorbidities in the total population were hypertension (66.5%) and hyperlipidaemia (50%). The men had higher diastolic blood pressure ($p = 0.006$) and body mass index (BMI) ($p = 0.001$) compared to the women. Also, the men had a higher prevalence of CVD ($p = 0.028$) and DM ($p = 0.004$) compared to the women, whereas asthma and chronic obstructive pulmonary disease were more prevalent in the women ($p = 0.007$). The overall mean ABI was 0.65 (*SD*=0.19), with no differences between men and women (Table 1). In the total population, 89.3% were current or former smokers, and 33.5% were living alone (Table 2). Additional demographics and clinical characteristics are presented in Table 1.

Clinical characteristics, demographics and lifestyle factors in relation to health literacy level

In the total population, 52.5% reported "inadequate or problematic" health literacy, with no differences between men and women ($p = 0.173$). Patients with "sufficient" health literacy reported both higher self-efficacy ($p = 0.001$) and QOL ($p = 0.001$) than patients with "inadequate and problematic" health literacy.

"Inadequate or problematic" health literacy was more frequent among patients living alone compared to patients who were cohabitants. There were no differences in comorbidities or ABI between different levels of health literacy. However, there was a higher proportion of physically active patients among those with "sufficient" health literacy than among patients with "inadequate or problematic" health literacy ($p = 0.029$) (Table 2).

Moreover, when exploring the dimensions in health literacy, no differences was found in the dimensions of "appraise-" or "apply" information relevant to health.

Importantly, current smokers had a higher ability to "access-" ($p = 0.001$) and "understand" ($p = 0.021$) information relevant for health compared to former smokers and those who were never smokers. Further, the patients that reported to be physically active had a higher ability to "understand" information relevant to health ($p = 0.020$). This also applied for patients with a university degree ($p = 0.007$) who also reported a higher ability to "access" information relevant to health ($p = 0.008$) (Table 3).

The association between physical activity and health literacy was confirmed in the logistic regression. The odds of having "sufficient" health literacy were highest among patients who are physi-

Table 1
Demographics and clinical characteristics in patients with intermittent claudication.

	Total (n = 158)	Men (n = 78)	Women (n = 80)	p-value
Age (years)	74.1 (7.3) *	73.3 (7.3) *	75.0 (6.6) *	0.160
Ankle brachial index	0.65 (0.19) *	0.67 (0.19) *	0.62 (0.19) *	0.114
Body mass index (kg/m^2)	24.9 (25.1-26.4) **	26.1 (23.6-29.4) **	24.3 (21.6-27.9) **	**0.001**
Diastolic blood pressure	76.0 (74.5-78.6) **	79.6 (11.3) *	73.9 (9.1) *	**0.006**
Systolic blood pressure	148.2 (135.0-160.0) **	144 (129.5-160.0) **	150.7 (21.3) *	0.089
Cholesterol (mmol/l)	4.5 (3.8-5.8)**	5.1 (4.1-5.9)**	4.1 (3.5-5.3)**	**0.010**
Blood glucose (mmol/l)	6.2 (5.6-7.5)**	6.1 (5.6-7.2) **	6.4 (5.8-8.3)**	0.811
Comorbidities n (%)				
Angina pectoris	23 (14.6)	12 (15.4)	11 (13.8)	0.527
Asthma/COPD	32 (20.2)	9 (11.5)	23 (28.7)	**0.007**
Cerebrovascular disease	19 (12.0)	14 (17.9)	5 (6.3)	**0.028**
Diabetes mellitus	46 (29.1)	31 (39.7)	15 (18.8)	**0.004**
Hyperlipidemia	79 (50.0)	41 (52.6)	38 (47.5)	0.692
Hypertension	105 (66.5)	49 (62.8)	56 (70.0)	0.186
Myocardial infarction	20 (12.7)	10 (12.8)	10 (12.5)	0.119

*mean (SD): standard deviation
**median (IQR): Inter quartile range

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Table 2
Clinical characteristics, demographics and lifestyle factors in relation to health literacy level in patients with intermittent claudication.

	Total (n = 158)	Inadequate health literacy	Problematic health literacy	Columns compared for p-values		
				Not sufficient health literacy joint variable	Sufficient health literacy	p-value #
Health literacy n (%)	155	15 (9.5)	68 (43.0)	83 (52.5)	72 (45.6)	
Clinical characteristics						
Ankle brachial index *	0.65 (0.19)	0.66 (0.19)	0.64 (0.18)	0.65 (0.18)	0.64 (0.20)	0.247
Demographics						
Age (years) *	74.0 (7.28)	74.0 (8.7)	74.3 (7.4)	74.2 (7.6)	73.8 (6.9)	0.712
Body mass index (kg/m^2) *	25.8 (4.1)	28.0 (4.8)	25.9 (4.3)	26.2 (4.5)	25.4 (3.6)	0.204
Gender, n (% men)	77 (49.7)	8 (53.3)	29 (42.6)	37 (48.1)	40 (55.6)	0.173
Civil status n (%)						
Living alone	53 (33.5)	5 (33.3)	30 (44.1)	35 (42.2)	17 (23.6)	**0.024**
Cohabitation	89 (56.3)	8 (53.3)	34 (50.0)	42 (50.6)	45 (62.5)	**0.050**
Live-apart	5 (3.2)	2 (13.3)	0 (0.0)	2 (2.4)	3 (4.2)	0.497
Education level n (%)						
Elementary school	44 (28.0)	6 (40.0)	18 (26.9)	24 (28.9)	18 (25.0)	0.553
Upper-secondary school	45 (28.7)	6 (40.0)	22 (32.8)	28 (33.7)	17 (23.6)	0.151
Vocational school	26 (16.6)	1 (6.7)	10 (14.9)	11 (13.3)	14 (19.4)	0.311
University	42 (26.8)	2 (13.3)	17 (25.0)	19 (22.9)	23 (31.9)	0.223
Lifestyle factors n (%)						
Physical activity	124 (79.0)	10 (66.7)	52 (76.5)	62 (74.7)	62 (86.1)	**0.029**
Never smoker	16 (10.1)	1 (6.7)	7 (10.3)	8 (9.8)	7 (9.7)	0.994
Former smoker	108 (68.4)	12 (80.0)	49 (72.1)	61 (73.5)	46 (63.9)	0.158
Current smoker	33 (20.9)	2 (13.3)	11 (16.2)	13 (15.7)	19 (26.4)	0.108
Questionnaires**						
General self-efficacy scale	30 (27-34)	30 (24-31)	30 (26-33)	30 (27.7-30.1)	32 (30-36)	**0.001**
Vascular quality of life-6	13.0 (11.0-17.0)	10.0 (9.0-16.0)	12.0 (11.0-15.0)	12.0 (10.0-15-0)	15.0 (12.8-18.0)	**0.001**

*mean (SD): standard deviation
**median (IQR): Inter quartile range
#Health literacy analyzed in two groups (not sufficient [problematic and inadequate] and sufficient). Inadequate and problematic health literacy were collapsed into a joint variable to enable analyses – this is due to low proportions of inadequate health literacy

Table 3
Demographics and lifestyle factors in relation to dimensions in health literacy.

	Access/obtain information relevant to health	Understand information relevant to health	Appraise/judge/evaluate information relevant to health	Apply/use information relevant to health
Gender *				
men	12 (10–13)	19 (18–21)	8 (7–9)	9 (8–10)
women	11 (10–14)	10 (18–22)	8 (7–9)	9 (8–10)
p-value	0.716	0.072	0.547	0.633
Civil status *				
Cohabitation	12 (10-13)	19 (18-22)	8 (7-9)	9 (8-10)
Living alone	11 (9-13)	19 (18-21)	8 (7-9)	9 (8-10.25)
p-value	0.308	0.948	0.427	0.978
Education level *				
University	12 (11–14)	21 (18–23)	9 (7–10)	9 (8–11)
Other education	11 (9.5–13)	19 (17.75–21)	8 (7–9)	9 (8–10)
p-value	**0.008**	**0.007**	0.088	0.068
Physical activity *				
Yes	12 (10–13)	20 (18–22)	8 (7–9)	9 (8–10)
No	11 (8.5–12.5)	18 (17–19.25)	8 (7–8)	8 (7–9.25)
p-value	0.071	**0.020**	0.176	0.066
Tobacco *				
Current smoker	13 (11–15)	21 (18–23)	8 (7–10.25)	9 (7–11)
Former /never smoker	11 (10–12.5)	19 (18–21)	8 (7–9)	9 (8–10)
p-value	**0.001**	**0.021**	0.312	0.489

*median (IQR):Inter quartile range.

cally active, after adjusting for age, gender, level of education and civil status (OR 2.77; 95% CI 1.05-7.27; p = 0.039) (Table 4).

Discussion

The aim of this study was to explore health literacy in patients with IC in relation to clinical characteristics, demographics, self-efficacy and quality of life. The results of the study show that more than half of the patients with IC have "inadequate or problematic" health literacy with no differences between men and women. There was a difference in civil status in relation to health literacy, showing that a higher proportion of patients with "inadequate or problematic" health literacy live alone. Importantly, patients with "sufficient" health literacy reported higher proportion of physical activity as well as significantly higher self-efficacy and QOL than participants with "inadequate and problematic" health literacy.

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Table 4
Demographics and lifestyle variables in relation to sufficient health literacy analyzed by multiple logistic regression and expressed as odds ratio (OR) with 95% confidence intervals (CI).

Independent variables Variables	Categories	Dependent variable Sufficient health literacy	*p*-value
Age	Age	1.00 (0.95-1.05)	0.980
Civil status	Cohabitant	1.94 (0.90-4.16)	0.091
	Living alone	Reference	
Education level	University	1.36 (0.62-2.96)	0.445
	Other education	Reference	
Gender	Male	1.51 (0.73-3.10)	0.267
	Female	Reference	
Physical activity	Active	2.77 (1.05-7.27)	**0.039**
	Not active	Reference	

It was more frequent with "inadequate or problematic" health literacy among the patients who live alone. This result contrasts with study by Geboers et al.,[29] who found no significant association between health literacy and civil status among older adults. However, the finding corresponds with a study by Bo et al.,[30] who examined health literacy in a Danish population-based study showing the association between individuals living alone and a lower level of health literacy. This may indicate that lower health literacy could be more common in people living alone in general, regardless of diagnosis, which could be an important factor to consider when planning for secondary prevention for patients with IC. It may be that patients with IC living alone to a greater extent have lower health literacy and therefore are less capable of changing their health behaviour and adhering to secondary prevention. According to Kim et al.,[31] individuals with a rich social life have a stronger intention to seek information. However, due to physical limitations, patients with IC avoid social situations, leading to involuntary isolation.[9] Consequently, it is essential that healthcare professionals are aware of the health literacy in the patients, in particular those suffering from IC in order to be able to provide extra support to succeed with secondary prevention. Such tailored interventions are most likely beneficial to improve QOL and perhaps also healthcare costs, due to the reduced risk of cardiovascular events.

A higher proportion of physically active patients is found among those with "sufficient" health literacy, which is in line with a review by Buja et al.,[32] showing that higher health literacy is associated with higher levels of physical activity. Further, the results in the health literacy dimension engaging "understanding" information relevant to health were significantly higher in those reported to be physically active. Also, education level was important in the health literacy dimensions of "accessing-" and "understanding" information relevant to health, where participants with a university degree had a significantly higher ability in these two dimensions. This could mean that patients that reported to have a low level of physical activity may also have a lower health literacy and thus more difficulties in assimilating the walking exercise advice. In line with Cawthon et al.,[33] perhaps the healthcare system should implement a routine assessment to evaluate health literacy. This result could be that the patients' level of health literacy can guide healthcare professionals to a more structured approach to tailor information in order to further increase patients' adherence to secondary preventive measures.

Current smokers had a higher ability to "access-" and "understand" information relevant for health compared to former/never smokers. This is an interesting and surprising result, as smoking cessation is a crucial part of the treatment. However, patients with chronic pain may be less responsive to standard smoking cessation interventions due to the burden associated with co-morbidities,[34] and patients with IC could therefore need tailored support to be able to adhere to the smoking cessation advice. Individuals with high self-efficacy are more likely to seek preventive care and succeed with smoking cessation.[15] Therefore, by strengthen patients' self-efficacy towards health behaviour change, the adherence to secondary prevention could be improved.

The results demonstrate that patients with "sufficient" health literacy reported both significantly higher self-efficacy and QOL than patients with "inadequate and problematic" health literacy. These findings are in line with previous research by Wang et al. (2017)[35] showing that higher health literacy and self-efficacy generates better health-related quality of life in patients with hypertension. However, in this study, 52.5 % of patients with IC reported "inadequate or problematic" health literacy indicating that the majority of patients with IC may need extra support to be able to adhere to treatment with secondary prevention. This support could be offered by healthcare professionals conducting structured care and being observant of whether the patients have understood the information. This could be achieved through, for instance, an extra phone call as a follow-up, or if there are prerequisites, to use a digital solution in the form of home-based monitoring where the patients can achieve support more frequently. Improving the patients' health literacy with tailored information and follow-up teaching may contribute to better self-efficacy, which, in turn, could lead to better QOL and reduced risk of disease progression.

Strengths and limitations

A strength of this study is that the participants were recruited from three different vascular units in the south of Sweden. However, the cross-sectional design of the study is a limitation because the causality of the factors associated with health literacy cannot be determined.[36] The number of participants was somewhat small but would not have affected the significant differences found; however, differences that were not detected may exist. The use of well-known and validated instruments is a strength, increasing the elimination of measurement bias (ibid.). The background questionnaire was developed specific for this study and could be considered a limitation due to lack of validation. Another limitation is Swedish language as an inclusion criterion; however, the non-responders were Swedish speaking but declined participation for unknown reasons. Since there is a high proportion of immigrants (35%) in our region,[37] we know that the proportion of immigrants together with other socioeconomic factors contribute to non-compliance in different screening programs in our region.[38,39] even when the invitations are available in a variety of different languages.[39] The response-rate was acceptable; unfortunately, no drop-out analysis could be done since the non-responders had not signed the informed consent and were therefore not participating in the study. The non-responders had a mean age of 72 years, which did not differ particularly from the patients of the study. Among the non-responders, 63% were male compared to 49% among the responders, which is in line with previous research showing women to be more likely to participate in research studies.[40] Physical activity and smoking habits were obtained as self-reported outcomes, which could result in inaccurate estimation due to social desirability bias.[41,42] However, considering the study design, self-report was the most suitable method of assessing factors related to the treatment with secondary prevention.

Conclusion

The majority of patients with IC have "inadequate or problematic" health literacy, with no differences between men and women.

Patients with IC with sufficient health literacy are most likely to be capable of managing their disease, as they reported higher self-efficacy and QOL. They also engage in physical activity more often compared to patients with "inadequate or problematic" health literacy. Importantly, "inadequate or problematic" health literacy is more common among patients who live alone, and level of education also seems to be an important predictor concerning the ability to access and comprehend information regarding health. This emphasizes the value of not only knowing the patients' health literacy but also demographics when planning for secondary preventive measures.

Efforts to improve health literacy may lead to both better self-efficacy and QOL, which are two aspects that will most likely affect the patients' health behaviour and adherence to secondary prevention.

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Declaration of Competing Interest

The authors declare that there is no conflict of interest.

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References

1. Aboyans V, Ricco JB, Bartelink MEL, et al. 2017 ESC guidelines on the diagnosis and treatment of peripheral arterial diseases, in collaboration with the European Society for vascular surgery (ESVS): Document covering atherosclerotic disease of extracranial carotid and vertebral, mesenteric, renal, upper and lower extremity arteriesEndorsed by: the European stroke organization (ESO)the task force for the diagnosis and treatment of peripheral arterial diseases of the European society of cardiology (ESC) and of the European society for vascular surgery (ESVS). Eur Heart J. *Mar*. 2018;39(9):763–816 1. doi:10.1093/eurheartj/ehx095.
2. Harwood AE, Pymer S, Ibeggazene S, Ingle L, Caldow E, Birkett ST. Provision of exercise services in patients with peripheral artery disease in the United Kingdom. *Vascular*. 2021:17085381211035259 Aug 4. doi:10.1177/17085381211035259.
3. Patel KK, Jones PG, Ellerbeck EF, et al. Underutilization of evidence-based smoking cessation support strategies despite high smoking addiction burden in peripheral artery disease specialty care: insights from the international PORTRAIT registry. *J Am Heart Assoc*. 2018;7(20):e010076 Oct 16. doi:10.1161/jaha.118.010076.
4. Lu M, Xia H, Ma J, et al. Relationship between adherence to secondary prevention and health literacy, self-efficacy and disease knowledge among patients with coronary artery disease in China. *Eur J Cardiovasc Nurs*. 2020;19(3):230–237 Mar. doi:10.1177/1474515119880059.
5. Song P, Rudan D, Zhu Y, et al. Global, regional, and national prevalence and risk factors for peripheral artery disease in 2015: an updated systematic review and analysis. *Lancet Glob Health*. 2019;7(8):e1020–e1030 Aug. doi:10.1016/s2214-109x(19)30255-4.
6. Fowkes FG, Rudan D, Rudan I, et al. Comparison of global estimates of prevalence and risk factors for peripheral artery disease in 2000 and 2010: a systematic review and analysis. *Lancet*. 2013;382(9901):1329–1340 Oct 19. doi:10.1016/s0140-6736(13)61249-0.
7. Abaraogu UO, Ezenwankwo EF, Dall PM, Seenan CA. Living a burdensome and demanding life: a qualitative systematic review of the patients experiences of peripheral arterial disease. *PLoS One*. 2018;13(11):e0207456. doi:10.1371/journal.pone.0207456.
8. Sartipy F, Sigvant B, Lundin F, Wahlberg E. Ten year mortality in different peripheral arterial disease stages: a population based observational study on outcome. *Eur J Vasc Endovasc Surg*. 2018;55(4):529–536 Apr. doi:10.1016/j.ejvs.2018.01.019.
9. Striberger R, Axelsson M, Zarrouk M, Kumlien C. Illness perceptions in patients with peripheral arterial disease: a systematic review of qualitative studies. *Int J Nurs Stud*. 2021;116:103723 Apr. doi:10.1016/j.ijnurstu.2020.103723.
10. Aaby A, Friis K, Christensen B, Rowlands G, Maindal HT. Health literacy is associated with health behaviour and self-reported health: a large population-based study in individuals with cardiovascular disease. *Eur J Prev Cardiol*. 2017;24(17):1880–1888 Nov. doi:10.1177/2047487317729538.
11. Kickbusch I, Pelikan J, Apfel F, Tsouros A. *Health literacy: the solid facts*. World Health Organization. Regional Office for Europe; 2013 *https://apps.who.int/iris/handle/10665/326432*.
12. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. *Ann Intern Med*. 2011;155(2):97–107 Jul 19. doi:10.7326/0003-4819-155-2-201107190-00005.
13. Nutbeam D. Defining, measuring and improving health literacy. *Health Eval Promot*. 2015;42(4):450–456. doi:10.7143/jhep.42.450.
14. Farley H. Promoting self-efficacy in patients with chronic disease beyond traditional education: a literature review. *Nurs Open*. 2020;7(1):30–41 Jan. doi:10.1002/nop2.382.
15. Bandura A. *Self-Efficacy : the Exercise of Control*. W. H. Freeman; 1997.
16. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev*. 1977;84(2):191–215 Mar. doi:10.1037//0033-295x.84.2.191.
17. Sol BG, van der Graaf Y, van Petersen R, Visseren FL. The effect of self-efficacy on cardiovascular lifestyle. *Eur J Cardiovasc Nurs*. 2011;10(3):180–186 Sep. doi:10.1016/j.ejcnurse.2010.06.005.
18. Bolt LJJ, Jacobs M, Sigterman TA, et al. Assessment of behavioral determinants influencing success of supervised exercise therapy in patients with intermittent claudication: a cross sectional survey. *Physiol Behav*.. 2020;215:112732 Mar 1. doi:10.1016/j.physbeh.2019.112732.
19. Wängdahl J, Lytsy P, Mårtensson L, Westerling R. Health literacy among refugees in Sweden - a cross-sectional study. *BMC Public Health*. 2014;14:1030 Oct 3. doi:10.1186/1471-2458-14-1030.
20. Magasi S, Durkin E, Wolf MS, Deutsch A. Rehabilitation consumers' use and understanding of quality information: a health literacy perspective. *Arch Phys Med Rehabil*. 2009;90(2):206–212 Feb. doi:10.1016/j.apmr.2008.07.023.
21. Sørensen K, Pelikan JM, Röthlin F, et al. Health literacy in Europe: comparative results of the European health literacy survey (HLS-EU). *Eur J Public Health*. 2015;25(6):1053–1058 Dec. doi:10.1093/eurpub/ckv043.
22. Schwarzer R, Jerusalem M, Weinman J, Wright S, Johnston M. *Measures in Health Psychology: A User's Portfolio. Causal and Control Beliefs (pp. 35-37)*. Generalized Self-Efficacy scale. Windsor, UK: NFER-NELSON; 1995.
23. Koskinen-Hagman M., Schwarzer R., Jerusalem M. Swedish version of the general self-efficacy scale. 1999. Accessed September 27, http://userpage.fu-berlin.de/~health/swedish.htm.
24. Löve J, Moore CD, Hensing G. Validation of the Swedish translation of the general self-efficacy scale. *Qual Life Res*. 2012;21(7):1249–1253 Sep. doi:10.1007/s11136-011-0030-5.
25. Kumlien C, Nordanstig J, Lundström M, Pettersson M. Validity and test retest reliability of the vascular quality of life Questionnaire-6: a short form of a disease-specific health-related quality of life instrument for patients with peripheral arterial disease. *Health Qual Life Outcomes*. 2017;15(1):187 Sep 29. doi:10.1186/s12955-017-0762-1.
26. Nordanstig J, Wann-Hansson C, Karlsson J, Lundström M, Pettersson M, Morgan MB. Vascular quality of life questionnaire-6 facilitates health-related quality of life assessment in peripheral arterial disease. *J Vasc Surg*. 2014;59(3):700–707 Mar. doi:10.1016/j.jvs.2013.08.099.
27. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Educ*. 2011;2:53–55 Jun 27. doi:10.5116/ijme.4dfb.8dfd.
28. Human experimentation: code of ethics of the world medical association (Declaration of Helsinki). *Can Med Assoc J*. 1964;91(11):619 Sep 12.
29. Geboers B, Reijneveld SA, Jansen CJ, de Winter AF. Health literacy is associated with health behaviors and social factors among older adults: results from the lifelines cohort study. *J Health Commun*. 2016;21(sup2):45–53. doi:10.1080/10810730.2016.1201174.
30. Bo A, Friis K, Osborne RH, Maindal HT. National indicators of health literacy: ability to understand health information and to engage actively with healthcare providers - a population-based survey among Danish adults. *BMC Public Health*. 2014;14:1095 Oct 22. doi:10.1186/1471-2458-14-1095.
31. Kim YC, Lim JY, Park K. Effects of health literacy and social capital on health information behavior. *J Health Commun*. 2015;20(9):1084–1094. doi:10.1080/10810730.2015.1018636.
32. Buja A, Rabensteiner A, Sperotto M, et al. Health literacy and physical activity: a systematic review. *J Phys Act Health*. 2020;17(12):1259 01 Dec2020. doi:10.1123/jpah.2020-0161.
33. Cawthon C, Mion LC, Willens DE, Roumie CL, Kripalani S. Implementing routine health literacy assessment in hospital and primary care patients. *Jt Comm J Qual Patient Saf*. 2014;40(2):68–76. doi:10.1016/s1553-7250(14)40008-4.
34. Unrod M, Gironda RJ, Clark ME, et al. Smoking behavior and motivation to quit among chronic pain patients initiating multidisciplinary pain treatment: a prospective study. *Pain Med*. 2014;15(8):1294–1303. doi:10.1111/pme.12364.
35. Wang C, Lang J, Xuan L, Li X, Zhang L. The effect of health literacy and self-management efficacy on the health-related quality of life of hypertensive patients in a western rural area of China: a cross-sectional study. *Int J Equity Health*. 2017;16(1):58 Jul 1. doi:10.1186/s12939-017-0551-9.
36. Benestad HB, Laake P, Laake P, Benestad HB, Olsen BR. Chapter 4 - research strategies, planning, and analysis. *Research in Medical and Biological Sciences (Second Edition)* Academic Press; 2015:89–124.

37. Statistics Sweden. Statistical database. Accessed September 9, 2022, https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__BE__BE0101__BE0101Q/UtlSvBakgFin/?rxid=d03e8188-c63f-4512-932f-953b218ce304.
38. Zackrisson S, Andersson I, Manjer J, Janzon L. Non-attendance in breast cancer screening is associated with unfavourable socio-economic circumstances and advanced carcinoma. *Int J Cancer*. 2004;108(5):754–760 Feb 20. doi:10.1002/ijc.11622.
39. Zarrouk M, Holst J, Malina M, et al. The importance of socioeconomic factors for compliance and outcome at screening for abdominal aortic aneurysm in 65-year-old men. *J Vasc Surg*. 2013;58(1):50–55 Jul. doi:10.1016/j.jvs.2012.12.080.
40. Galea S, Tracy M. Participation rates in epidemiologic studies. *Ann Epidemiol*. 2007;17(9):643–653 /09/01/2007. doi:10.1016/j.annepidem.2007.03.013.
41. Adams SA, Matthews CE, Ebbeling CB, et al. The effect of social desirability and social approval on self-reports of physical activity. *Am J Epidemiol*. 2005;161(4):389–398 Feb 15. doi:10.1093/aje/kwi054.
42. Connor Gorber S, Schofield-Hurwitz S, Hardt J, Levasseur G, Tremblay M. The accuracy of self-reported smoking: a systematic review of the relationship between self-reported and cotinine-assessed smoking status. *Nicotine Tob Res*. 2009;11(1):12–24 Jan. doi:10.1093/ntr/ntn010.

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Illness perception, health literacy, self-efficacy, adherence and quality of life in patients with intermittent claudication – a longitudinal cohort study

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Abstract

Background Patients with intermittent claudication need lifelong treatment with secondary prevention to prevent cardiovascular events and progression of atherosclerotic disease. Illness perception, health literacy, self-efficacy, adherence to medication treatment, and quality of life are factors influencing patients' self-management. Knowledge of these factors could be important when planning for secondary prevention in patients with intermittent claudication.

Aim to compare illness perception, health literacy, self-efficacy, adherence to treatment, and quality of life in in patients with intermittent claudication.

Methods A longitudinal cohort study was conducted with 128 participants recruited from vascular units in southern Sweden. Data were collected through medical records and questionnaires regarding illness perception, health literacy, self-efficacy, adherence to treatment, and quality of life.

Results In the subscales in illness perception, patients with sufficient health literacy reported less consequences and lower emotional representations of the intermittent claudication. They also reported higher self-efficacy and higher quality of life than patients with insufficient health literacy. In comparison between men and women in illness perception, women reported higher illness coherence and emotional representations associated with intermittent claudication compared to men. A multiple regression showed that both consequences and adherence were negative predictors of quality of life. When examining changes over time, a significant increase in quality of life was seen between baseline and 12 months, but there were no significant differences in self-efficacy..

Conclusion Illness perception differs in relation to level of health literacy and between men and women. Further, the level of health literacy seems to be of importance for patients' self-efficacy and quality of life. This illuminates the need for new strategies for improving health literacy, illness perception, and self-efficacy over time. For example, more tailored information regarding secondary prevention could be provided to strengthen self-management to further improve quality of life in patients with intermittent claudication.

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Keywords Illness perception, Self-efficacy, Health literacy, Adherence to treatment, Quality of life, Intermittent claudication, Secondary prevention

Background

Patients with intermittent claudication (IC) need lifelong treatment with secondary prevention to prevent cardiovascular events and progression of the atherosclerotic disease [1]. IC is further associated with decreased quality of life (QoL) due to presence of pain and loss of walking ability, which means that living with IC involves managing symptoms to maintain QoL [2]. Importantly, many of these patients do not get secondary prevention support according to the recommendations in current guidelines [1, 3, 4]. Studies have shown that IC is largely unrecognized and under-treated compared to other cardiovascular diseases and that there is a lack of public and patient awareness [5, 6]. The way patients perceive illness is one relevant aspect that determines their health-management behaviour, [7] and it can be improved by patient education [8–10]. Therefore, factors that influence illness perception and QoL could provide important knowledge about how to improve secondary prevention treatment in patients with IC.

Approximately 236 million people globally live with peripheral arterial disease (PAD), [11] where IC is the mildest form, affecting10–20% [12]. IC is characterized by ischemic muscle pain during activity, [1] causing physical limitations and decreased QoL [2]. Since IC mainly derives from atherosclerosis, patients with IC are at significant risk of cardiovascular morbidity [13]. The risk factors consist of smoking, hypertension, hyperlipidaemia, and diabetes mellitus; accordingly, secondary prevention with smoking cessation, physical activity, dietary changes, and best medical therapy (BMT, i.e., cholesterol reduction, antithrombotic drugs, and blood pressure control) are necessary for patients with IC to prevent progression of the atherosclerosis process and to prevent further cardiovascular morbidities [1]. Research has shown that there are differences between men and women with PAD. A systematic review showed in a meta-analysis that women tend to present more often with atypical leg symptoms compared to men and the review recommend that data on men and women should be reported separately [14]. This illuminates the importance of studying differences between men and women with IC in other variables as well.

Research has shown the importance of patients' adherence to treatment in relation to QoL. Positive associations between adherence and QoL have been shown in other conditions, such as myocardial infarction, [15] diabetes mellitus, [16] and hypertension [17]. Besides the association between adherence to treatment and QoL, research in patients with coronary heart disease has reported positive associations between illness perceptions and QoL, where patients experiencing lower personal- and treatment control, lower illness coherence, or a cyclic timeline belief reported lower QoL [18]. However, research about associations between adherence to treatment, QoL, and illness perception in patients with IC is lacking.

Patients with PAD shape their own understandings of their conditions, which may influence their management of their disease and adherence to treatment [19]. The common-sense model (CSM) is a theoretical framework describing illness perception as a process for managing a health threat. The CSM includes perception, interpretation, and response to a health threat and consists of both cognitive and emotional representations in five subscales (identity, timeline, cause, control and cure, and consequences) [20]. Studies have shown associations between illness perception and adherence to secondary prevention in patients with coronary heart disease [21, 22].

Adherence to secondary prevention medication is vital to reduce the risk of morbidity and mortality [23, 24]. However, low adherence to medical treatment has been reported in patients with IC, where only two thirds are taking antiplatelets and statins five years after diagnosis [25, 26]. Adherence to long-term treatment has been associated with several influencing factors, including those related to the patients (such as illness perception and self-efficacy) [27]. Additionally, beliefs regarding both medicines and illness together with self-efficacy need to be addressed to better understand adherence to medication treatment [28]. Another important factor for adherence is health literacy, which is described as the ability to "access", "understand", "appraise", and "apply" health-related information. Health literacy influences self-management behaviours and individual outcomes in chronic diseases. Patients with IC having inadequate or problematic health literacy reported both lower self-efficacy and worse QoL [29]. Self-efficacy is described as an individual's belief in their own capacity to execute behaviours necessary to face challenges and to complete a specific task [30]. For instance, among patients with PAD, better self-efficacy was associated with better walking ability [31]. Importantly, individuals with limited self-efficacy tend to avoid setting goals and experience low confidence in their ability to succeed in the task ahead, [30] leading to lower QoL [32], but nurse-led self-management programmes can enhance patients' self-efficacy [33].

There is evidence that illness perception, health literacy, self-efficacy, adherence to treatment and QoL influence

the self-management in chronic diseases. Therefore, the contribution of the current study is to generate knowledge of these factors in patients with IC during the natural course of the disease the first year after diagnosis. This knowledge could further be used to improve strategies regarding secondary prevention care for patients with IC to increase their QoL. Accordingly, this study aimed to compare illness perception, health literacy, self-efficacy, adherence to treatment, and QoL in patients with intermittent claudication.

The analysis was based on the following research questions:

What do patients with IC believe cause their illness?

What differences are there in illness perception between men and women and between patients with sufficient and insufficient health literacy?

What associations are there between illness perception, adherence, self-efficacy and quality of life?

What are the predictors of quality of life?

What changes are there in self-efficacy and quality of life during the first year after diagnosis?

Method

Design

This was a longitudinal cohort study in which the participants filled in the questionnaires at three different occasions (baseline, 6 months, and 12 months), and data from medical records were extracted at baseline (Fig. 1). A consecutive sample method was used to select participants. This means that all patients visiting three outpatient clinics for vascular diseases located in southern Sweden meeting the inclusion criteria were invited to participate during the time of the study.

Participants

Patients with a referral to one of the participating vascular clinics were recruited at their first visit to the outpatient clinic. At this visit, they were diagnosed with IC. All patients visiting these clinics received BMT, including medicine prescription and information of the importance of walking exercise and smoking cessation. The patients fulfilling the inclusion criteria were asked for participation by registered nurses specialized in vascular diseases. The inclusion criteria were patients diagnosed with IC (defined by clinical findings and ankle brachial index [ABI] < 0.9) and the ability to read and understand Swedish. Since the aim was to investigate the natural course of IC, patients with more severe PAD (rest pain, ulceration, and gangrene) or previously received surgical treatment for IC were excluded since their experience of the disease might differ from the patients newly diagnosed. The sampling procedure is accounted for in Fig. 1.

Data collection

The data were collected between 2018 and 2020. Patients interested in participation received oral and written information during the referral visit. The information was given by registered nurses specialized in vascular diseases at the three clinics included in the study. Baseline questionnaires (background data, health literacy, self-efficacy and QoL) and informed consent forms were handed out during the referral visit with the advice to fill in the forms at home, thus giving the patients time to consider the decision to participate. One reminder was sent to non-responders. The questionnaires were sent back to the research team using prepaid envelopes. For the follow-up, the patients received new sets of questionnaires by mail after 6 months (illness perception, self-efficacy, adherence and QoL) and after 12 months (self-efficacy and QoL) together with prepaid envelopes. Two reminders were sent to non-responders. Background data – such as demographics, co-morbidities, clinical characteristics, and lifestyle factors – were collected through a self-reported questionnaire developed only for this study. The lifestyle factors physical activity and smoking were included based on the importance of secondary prevention for patients with PAD [1, 13]. Physical activity was self-reported, and the two questions were phrased as follows: "Are you being physically active?" (*yes/no*) and "How many times per week are you being physically active?" (*1–2, 3–4, > 4*). ABI, blood pressure, cholesterol level, and blood glucose were collected from medical records at baseline. The data collection process is presented in Fig. 1.

Questionnaires

Data on illness perception, health literacy, self-efficacy, adherence to medication treatment, and QoL were collected through self-administered questionnaires described below.

Illness perception

The Revised Illness Perception Questionnaire (IPQ-R) was based on the Common Sense Model of self-regulation [34] and revised with the following subscales: timeline acute/chronic, timeline cyclical, consequences, personal control, treatment control, illness coherence, and emotional representations, [35] which are accounted for in Table 1. The Swedish version of the instrument was validated and contains 38 items regarding perceptions of the illness and 18 items about causes of the illness. It uses a five-point Likert scale from *strongly disagree* to *strongly agree.* The last item has an open-ended response where the patient should list the three most important causal factors of the disease [36]. On subscales with 6 items a maximum of 2 missing items were allowed. Cronbach's alphas for the subscales in the current study were $\alpha = 0.82$

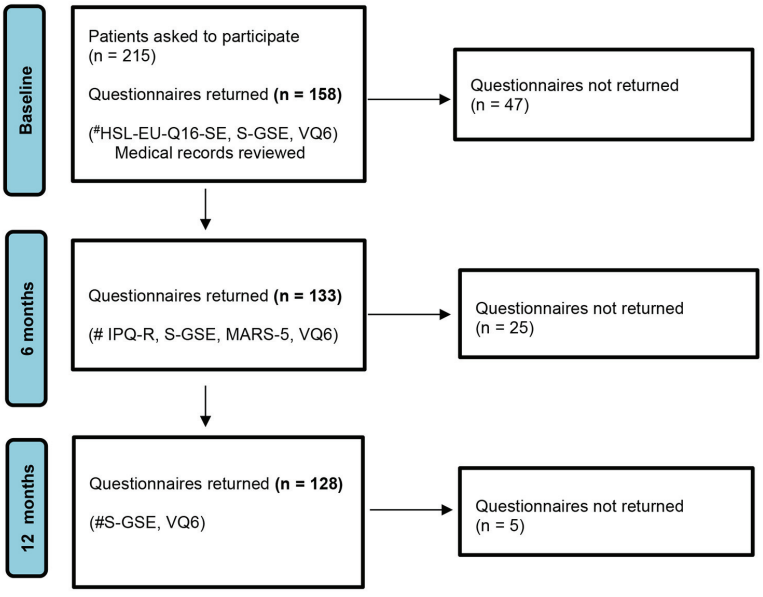

Fig. 1 Flow chart of data collection.
#Abbreviations for questionnaires:
HSL-EU-Q16-SE: Health literacy
S-GSE: Self-efficacy
VQ6: Quality of life
IPQ-R: Illness perception
MARS-5: Adherence to treatment.

Table 1 Interpretation of IPQ-R subscales (Moss-Morris et al., 2002)

IPQ-R subscale	Score range	Definition	Interpretation of high scores
Timeline	6–30	Evaluates duration of illness	The patient believes the illness is enduring
Timeline cyclical	4–20	Evaluates views on cyclical nature of illness	The patient believes the illness is cyclical
Consequences	6–30	Evaluates views on negative consequences for patient	The illness has negative consequences on the patient's life
Personal control	6–30	Evaluates views on the effect of personal control by the patient on the illness	The patient has high level of control over the illness
Treatment control	5–25	Evaluates views on the effectiveness of treatments available	The treatment is effective for the illness
Illness coherence	5–25	Evaluates the understanding of the illness	The patient has greater understanding of the illness
Emotional representations	6–30	Evaluates how the illness affects the patient emotionally	There is a greater emotional impact associated with the illness

for timeline acute/chronic, α=0.79 for timeline cyclical, α=0.71 for consequences, α=0.65 for personal control, α=0.79 for treatment control, α=0.92 for illness coherence, and α=0.86 for emotional representations.

Health literacy

European Health Literacy Survey Questionnaire 16 (HLS-EU-Q16-SE) was validated and translated to Swedish and is a short version of the European Health Literacy Survey Questionnaire (HLS-EU). It consists of 16 items in four different dimensions: "access/obtain", "understand", "process/appraise", and "apply/use" health related information. It uses a four-point Likert scale: *very easy*, *easy*, *difficult*, *very difficult.* The responses *very easy* and *easy* were combined into one category (scored with one) and the responses *very difficult* and *difficult* were combined into another category (scored with zero). A sum score was calculated for respondents answering at least

14 questions [37] and divided into the three categories inadequate (0–8), problematic (9–12), and sufficient (13–16) [38]. The three health literacy levels were dichotomized into two levels: "insufficient" ("inadequate" and "problematic") and "sufficient" health literacy [39]. Cronbach's alpha was 0.91 in the current study.

Self-efficacy

The General Self-Efficacy Scale (S-GSE) is an instrument measuring the strength of an individual's belief in their own ability to deal with difficult situations and setbacks [40]. The Swedish version of the instrument was validated [41, 42]. It consists of 10 items rated on a four-point Likert scale (*not all true* to *exactly true*). A total score was calculated where a high score indicates a high self-efficacy [40]. All the questions needed to be answered in order to be included in the analysis. Cronbach's alpha was 0.92 in the current study.

Adherence to treatment

The Medication Adherence Report Scale (MARS-5) is the instrument used to determine patients' self-reported adherence to medication treatment in general. In the current study, the patients were advised to report adherence specifically to the medication treatment for IC. The MARS consists of five items and uses a five-point Likert scale ranging from *always* to *never.* All questions needed to be answered in order to be included in the analysis. The instrument is valid and available in Swedish [43]. A total score was calculated where a higher score indicates a higher level for medication adherence [44]. Cronbach's alpha was 0.57 in the current study, which is below the recommended value ($\alpha = 0.70$) [45].

Quality of life

The Vascular Quality of Life Questionnaire-6 (VQ6) is a disease-specific instrument for the assessment of QoL in patients with PAD and is a short version of the Vascular Quality of Life Questionnaire (VascuQoL) [46]. The instrument was translated into Swedish and showed good psychometric properties [47, 48]. It consists of six items divided into five subscales: activity (two items), emotional, pain, social, and symptoms. The items are rated on a four-point Likert scale. The answers were summed to a total score (6–24), where a high score indicates a high quality of life [49]. All the questions needed to be answered in order to be included in the analysis. In the current study, Cronbach's alpha was 0.88.

Statistics

For analysing the data, IBM SPSS Statistics for Windows (Version 26.0. Armonk, NY: IBM Corp) was used. A p-value of 0.05 was set to determine the significance. For categorical variables, frequencies and percentages were calculated to describe the data, and the chi-square test was used for analysing differences in proportions. Normally distributed ordinal variables were presented as mean with standard deviation, and an independent samples t-test was used to compare groups. Non-normally distributed ordinal variables were presented as median with first and third interquartile ranges, and a Mann-Whitney U-test was used to analyse differences between groups. Normal distribution was assessed using histograms and the Shapiro-Wilk test. Spearman's correlation analysis was conducted between the subscales of illness perception, self-efficacy, adherence to medication treatment, and quality of life. A linear multiple regression was conducted with the significant variables from the Spearman's correlation analysis and with QoL as a dependent variable. For variables with repeated measures, the Wilcoxon signed-rank test was used to analyse differences, and the significant levels were adjusted with a manual Bonferroni correction. Missing data were handled according to pairwise deletion[50]. The questionnaires' internal consistency was tested using Cronbach's alpha coefficient.

Results

A total of 158 patients were included in the study, of which 133 patients continued participation at 6 months and 128 continued at 12 months, resulting in a response rate of 73.5% at baseline, 61.9% at 6 months, and 59.5% at 12 months (Fig. 1). The study population at 6 months consisted of 66 men and 67 women, with a mean age of 75 years (age range 47–92). In the comparison between men and women, a difference was shown in civil status, where living alone was more common among women ($p < 0.001$). No differences appeared in age, ABI, education level, or lifestyle factors between men and women. The background characteristics of the study sample at baseline are presented in Table 2.

Illness perceptions

The participants reported what they believed caused their illness, namely, IC. Of the 110 participants that answered the question regarding the causal factors, smoking was the most reported (42.7%), followed by age (21.8%), genetics (9.1%), and no idea (7.3%).

Comparison between men and women

In an illness perception comparison between men and women, women reported higher illness coherence, indicating greater understanding of IC than men ($p = 0.028$). Women also reported higher emotional representations associated with IC ($p = 0.047$) compared to men (Table 3).

Table 2 Clinical characteristics, demographics, and lifestyle factors at baseline in subjects with intermittent claudication

	Total (n = 158)	Women (n = 80)	Men (n = 78)	p-value
Age (years)	74.1 (7.3)	75.0 (6.6)	73.3 (7.3)	0.160
Ankle brachial index	0.65 (0.19)	0.62 (0.19)	0.67 (0.19)	0.114
Body mass index (kg/m^2)	25.8 (4.1)	24.8 (4.4)	26.8 (3.6)	**0.003**
Diastolic blood pressure (mmHg)	76.6 (10.5)	73.9 (9.1)	79.6 (11.3)	**0.006**
Systolic blood pressure (mmHg)	148.2 (21.2)	150.7 (21.3)	145.7 (20.9)	0.155
Cholesterol (mmol/l)	4.7 (1.3)	5.1 (1.3)	4.4 (1.3)	**0.012**
Blood glucose (mmol/l) *	6.2 (5.6–7.5)	6.1 (5.6–7.2)	6.4 (5.8–8.3)	0.811
Civil status n (%)				
Living alone	53 (33.5)	38 (47.5)	15 (19.2)	**0.001**
Cohabitation	89 (56.3)	37 (46.3)	52 (66.7)	**0.001**
Live-apart	5 (3.2)	3 (3.8)	2 (2.6)	0.752
Education level n (%)				
Elementary school	44 (27.8)	21 (26.3)	23 (29.5)	0.614
Upper-secondary school	45 (28.5)	25 (31.3)	20 (25.6)	0.465
Vocational school	26 (16.5)	10 (12.5)	16 (20.5)	0.163
University	42 (26.6)	24 (30.0)	18 (23.1)	0.349
Lifestyle factors n (%)				
Physical activity	125 (79.1)	65 (82.3)	60 (76.9)	0.495
Never smoker	16 (10.1)	9 (11.3)	7 (9.0)	0.655
Former smoker	108 (68.4)	50 (62.5)	58 (75.3)	0.083
Current smoker	33 (20.9)	21 (26.3)	12 (15.4)	0.101

Values are means (standard deviation) or number (percentage) of participants in each group.

*Median (Inter quartile range).

Comparison between sufficient and insufficient health literacy

Patients with sufficient health literacy reported less consequences (p=0.003) and lower emotional representations (p=0.001) of the IC than patients with insufficient health literacy. They also reported higher self-efficacy (p=0.049) and higher QoL (p=0.005) than patients with insufficient health literacy (Table 3).

Correlation

The subscales timeline (r_s=−0.24; p=0.009), timeline cyclic (r_s=−0.19; p=0.042), personal control (r_s=−0.19; p=0.044), and emotional representations (r_s=−0.58; p<0.001) correlated negatively with adherence to medication treatment, indicating that higher scores on these subscales were associated with lower adherence. The subscales treatment control (r_s = 0.22; p=0.016) and illness coherence (r_s = 0.21; p=0.028) correlated positively with adherence to medication treatment, indicating that higher scores on these subscales were associated with higher adherence (Table 4).

Quality of life

Positive associations were found between personal control and QoL (p<0.001) and between self-efficacy and QoL (p=0.014), indicating that higher scores were positively associated with higher QoL. A negative association was found between the consequences of the illness and QoL (p<0.001) as well as between adherence to medication treatment and QoL (p=0.013), indicating that experiences of higher consequences of IC and higher adherence to medication treatment were associated with lower QoL (Table 4).

Factors related to QoL

A multiple regression model explained 46.5% of the variance in QoL (adjusted R square=0.465; p<0.001) and showed that both consequences and adherence to medication treatment were negative predictors of QoL, meaning that one unit increase in these variables decreased QoL (Table 5).

Changes over time

The QoL medians with inter quartile range (IQR) were 13 at baseline (11–17), 15 at 6 months (11–17), and 16 at 12 months (12–18.8). A significant increase in QoL was seen between baseline and 6 months (p=0.033), baseline and 12 months (p<0.001), and 6 months and 12 months (p=0.031). After a correction for multiple comparisons (Bonferroni), the significant increase in QoL remained between baseline and 12 months (p=0.003). No significant changes over time were seen in self-efficacy.

Table 3 Differences between men and women and health literacy regarding illness perception, self-efficacy, adherence to medication treatment, and quality of life at six months in subjects with intermittent claudication

Variables*	Total (n = 133)	Women (n = 67)	Men (n = 66)	Insufficient health literacy (n = 70)	Sufficient health literacy (n = 61)	p-value (w/m)*	p-value (insuff /suff)*
Illness perception subscales							
Timeline missing (n = 11)	24.0 (20.3–26.6)	24.0 (20.0–26.4)	24.0 (21.0–27.0)	23.5 (19.8–26.1)	24.0 (20.9–27.0)	0.752	0.309
Timeline cyclical missing (n = 11)	10.0 (8.0–13.0)	10.0 (8.0–13.0)	11.0 (8.0–13.0)	10.0 (8.0–12.8)	10.9 (8.0–14.0)	0.785	0.392
Consequences missing (n = 7)	17.5 (14.0–21.0)	18.0 (14.0–19.8)	17.0 (15.0–21.0)	19.0 (15.8–21.0)	16.5 (14.0–18.0)	0.432	**0.003**
Personal control missing (n = 7)	19.0 (17.0–22.0)	18.5 (17.0–22.0)	19.0 (17.3–21.8)	19.0 (17.0–21.0)	19.0 (17.8–22.0)	0.840	0.325
Treatment control missing (n = 15)	16.0 (13.8–18.0)	16.0 (14.0–18.0)	16.0 (13.0–18.0)	15.0 (13.4–18.0)	16.1 (14.0–18.0)	0.856	0.376
Illness coherence missing (n = 13)	19.0 (15.0–21.0)	20.0 (15.3–24.0)	17.0 (13.5–20.0)	18.0 (15.0–21.0)	19.0 (15.0–23.5)	**0.028**	0.194
Emotional representations missing (n = 5)	17.0 (13.0–20.8)	18.0 (13.0–22.0)	16.0 (13.0–18.0)	18.0 (14.0–22.3)	15.0 (12.3–18.0)	**0.047**	**0.001**
Self-efficacy *missing (n = 12)*	30.0 (26.5–33.5)	30.0 (26.0–34.0)	30.0 (27.0–32.0)	30.0 (26.0–32.0)	31.0 (28.0–35.0)	0.740	**0.049**
Adherence to treatment *missing (n = 6)*	25.0 (24.0–25.0)	25.0 (24.0–25.0)	25.0 (24.0–25.0)	25.0 (24.0–25.0)	25.0 (24.0–25.0)	0.496	0.223
Quality of life *missing (n = 5)*	15.0 (11.0–17.0)	15.0 (11.0–17.0)	16.0 (11.5–17.0)	13.0 (10.0–17.3)	16.0 (14.0–17.0)	0.152	**0.005**

*Median (IQR)

w: women, m: men, insuff: insufficient health literacy, suff: sufficient health literacy

Discussion

The present study showed that illness perception differed in patients with IC in relation to sex and health literacy level. Patients' self-reported beliefs on the causes of IC were smoking, age, and genetics. However, even if smoking was the most commonly reported causal beliefs for the disease (42%), the majority of the participants (89%) were current or former smokers. This is in line with a previous review on illness perception in patients with PAD, which showed that the patients had different beliefs regarding smoking as a causing factor for the disease; only some acknowledged smoking as a causing factor [19]. This has also been seen in patients with COPD, who expressed uncertainty about the connection between smoking and the disease [51]. The fact that 7.3% had no idea what caused their disease emphasizes a need to improve the patients' awareness of the aetiology of the disease. As illness perception clearly influences patients' beliefs about the causes of IC, an educational intervention addressing their perceptions could be one option to increase their awareness and, in turn, also their QoL. For example, previous research has shown that an illness perception correction-based educational programme provided via phone calls by a nurse improved QoL in patients with heart failure [52].

In a comparison between men and women concerning illness perception, women reported higher illness coherence and higher emotional representations, indicating they have greater understanding and greater emotional impact associated with IC compared to men. The difference in illness coherence contrasts with Al-Smadi et al.'s [53] review of illness perception in patients with coronary heart disease, where four studies [36, 54–56] reported no differences between men and women and two studies [57, 58] reported higher illness coherence in men than in women. The difference in emotional representation is in line with a review on sex differences in patients with chronic disease, where women experienced more negative stress about their condition compared to men [59]. Differences between men and women with PAD have also been studied earlier. A review showed that men and women differ in the presentation of PAD symptoms, where women more often present atypical symptoms and rest pain and, less often, IC symptoms [14]. Since differences between men and women with IC occur both in illness perception and symptom presentation, sex differences in IC patients should be further studied. Health care professionals' awareness of potential sex differences could create preconditions for more individualized information, which could further improve the patients' self-management of secondary prevention.

Table 4 Spearman's correlation analysis between illness perception, self-efficacy, adherence to medication treatment and quality of life in subjects with intermittent claudication

Variables	Timeline	Timeline cyclic	Consequences	Personal control	Treatment control	Illness coherence	Emotional representations	Self- efficacy	Adherence to treatment
Timeline cyclic	−0.262 p-value **(0.004)**								
Consequences	0.190 p-value **(0.037)**	−0.116 p-value (0.204)							
Personal control	−0.171 p-value (0.062)	0.144 p-value (0.116)	−0.170 p-value (0.058)						
Treatment control	−0.283 p-value **(0.002)**	0.006 p-value (0.945)	−0.103 p-value (0.267)	0.469 p-value **(< 0.001)**					
Illness coherence	0.127 p-value (0.176)	−0.146 p-value (0.113)	−0.025 p-value (0.783)	0.322 p-value **(< 0.001)**	0.372 p-value				
Emotional representations	0.005 p-value (0.953)	0.103 p-value (0.260)	0.488 p-value **(< 0.001)**	−0.079 p-value (0.379)	−0.043 p-value (0.643)	−0.170 p-value (0.063)			
Self- efficacy	0.067 p-value (0.484)	0.085 p-value (0.368)	−0137 p-value (0.142)	0.074 p-value (0.432)	−0.081 p-value (0.394)	−0.130 p-value (0.165)	0.072 p-value (0.427)		
Adherence to treatment	−0.239 p-value **(0.009)**	−0.188 p-value **(0.042)**	−0.084 p-value (0.356)	−0.183 p-value **(0.044)**	0.224 p-value **(0.016)**	0.205 p-value **(0.028)**	−0.577 p-value **(< 0.001)**	−0.057 p-value (0.540)	
Quality of life	−0.175 p-value (0.057)	0.076 p-value (0.415)	−0.568 p-value **(< 0.001)**	0.348 p-value **(< 0.001)**	0.114 p-value (0.238)	−0.010 p-value (0.917)	−0.108 p-value (0.243)	0.224 **p-value (0.014)**	−0.224 **p-value (0.013)**

Table 5 Multiple linear regression at six months with quality of life as dependent variable

Independent variables	B	Standard error	β	p-value
Consequences in illness perception	−0.569	0.074	−0.576	**< 0.001**
Personal control in illness perception	0.167	0.087	0.143	0.057
Self-efficacy	0.096	0.056	0.123	0.088
Adherence to treatment	−0.556	0.196	−0.204	**0.050**

R square: 0.445

Adjusted R-square: 0.465

Sign: < 0.001

Patients with sufficient health literacy reported less consequences and lower emotional representations of the IC than patients with insufficient health literacy. This concurred with previous studies on patients with COPD and cardiovascular disease, which showed that those with insufficient health literacy also experienced more emotional representations [60, 61]. The current study also showed higher self-efficacy and higher QoL among patients with sufficient health literacy compared to those with insufficient health literacy, which is in line with previous research [62, 63]. These findings suggest that improving patients' health literacy may improve their self-efficacy, which in turn may positively influence their QoL. Since health literacy can be improved by information and structured education, [64] patients with IC may benefit from a more active support from the health care system. Different methods – such as motivational interviewing, individual or group support, and in-person or web- or telephone-based support – have been beneficial for improving health literacy in patients with chronic diseases [65]. Further research is needed to assess these methods for improving health literacy in patients with IC. As previously suggested, digital formats may be more accessible for patients and perhaps more cost-effective, but they need both testing and evaluation among patients with IC.

Consequences and adherence to medication treatment were negative predictors of QoL in patients with IC. That the perceived consequences of the disease have an impact on daily life has earlier been confirmed in a review on patients with PAD; the patients experienced involuntary isolation and loss of independence due to their disease, which affected their self-image [19]. In this study, the association between increased adherence to medication treatment and decreased QoL is a surprising result in need of consideration. A possible explanation

might be that pain and loss of independence have a negative impact on QoL in patients with IC [2]. Since BMT aims to prevent cardiovascular events and decrease the atherosclerotic progression rather than relieve IC symptoms, [1] high adherence to medications does not directly affect QoL. This negative association between adherence to treatment and QoL has also been reported earlier in a review on patients with COPD. According to Agh et al., [66] the treatment with inhaler therapy in COPD may affect the patient's daily life due to perceived stigma when using inhalers in public, which could explain increased QoL with low adherence. However, this reason is not applicable to patients with IC since the treatment with BMT would not affect the patients' daily life. Since adherence to taking antiplatelets and statins decreases after five years, [25, 26] future research with a longer perspective and, importantly, a combination of different methods to measure adherence would further illuminate associations between adherence and QoL in patient with IC. Another important aspect is that health care professionals should always remember to ask patients about their adherence behaviour since it is necessary information to enable evaluations of initiated treatment.

When examining changes over time, this study found a significant increase in QoL between baseline and 12 months despite no systematic secondary prevention support. This is an interesting finding that could be explained in a review on illness perception in patients with PAD: the patients experienced a process of adaptation, where they accepted their new situation and found other values in life [19]. This corresponds to the description of QoL as the discrepancy between an individual's hopes and expectations and present experiences [67].

Even if the improvement in QoL was rather small, having knowledge of the reason for this increase despite no interactive care or support would be valuable in the process of creating a sustainable care for patients with IC. However, this was not possible with the current study design, so further research is needed, preferably with a qualitative approach that can describe the individual experiences. The fact that self-efficacy did not change over time was an expected result since managing chronic disease processes can be demanding and motivation can decrease over time [68]. Moreover, improvements in self-efficacy most likely require support to achieve, which Sol et al [33] have shown in patients with cardiovascular conditions. Even though QoL improved one year after visiting the outpatient clinic for vascular diseases, improving patients' health literacy, self-efficacy, and illness perception is necessary to further improve the self-management of the disease. Most likely, patients with IC could benefit from better support to create more control and understanding in their process of managing the disease in order to maintain or increase their QoL. This could in turn be beneficial for secondary prevention, which is the first line of treatment. However, to be able to achieve this in clinical practice new strategies are needed. Positive experiences of nurse-led units in terms of increased awareness of their disease and increased motivation for initiating lifestyle changes has been shown among patients with IC [69]. This could be one option to improve patients' self-management. Another way could be through self-management programmes, gaming, mobile applications, or social media [32]. However, future research is needed to evaluate these methods in relation to patients with IC.

Strengths and limitations

A strength of this study is that only validated instruments were used, thereby minimizing measurement bias. Another strength is that data extracted from medical records were used to describe medical status. However, a potential weakness is that all data from the questionnaires were self- reported, which can be inaccurate due to social desirability or failure to recollect adherence behaviour [70]. A validated instrument for evaluating physical activity would be preferable in future research. Since many of the patients scored maximum points in the adherence questionnaire, the potential ceiling effect needs to be considered. This makes it impossible to distinguish differences in adherence behaviour. Similar skewness in adherence reports has been found in previous studies [71–73]. Studies have shown self-reported questionnaire to overestimate patients' adherence in other chronic conditions [74, 75]. Nevertheless, despite the limitation, self-reported medication adherence measures can provide valuable and useful information [70]. Further research on adherence in patients with IC is recommended, preferably using different research methods, such as refill-of-prescriptions records from pharmacies in combination with self-reported data.

The longitudinal design of the study enabled us to determine patterns over time. However, this study required the participants to fill in questionnaires on three occasions over one year. During this time, some of the participants decided to withdraw further participation. A further limitation might be that no power calculation was performed. The period of the data collection proceeded for two years in order to recruit as many participants as possible and was planned to continue. However, due to the pandemic, the recruitment had to stop earlier since patients with IC were not a prioritized group for care during this time, meaning that they were not called to visit the open clinic. Significant differences were found despite a somewhat small sample size; however, differences that were not detected may exist [76]. The internal consistency of the scales, which was measured through Cronbach's alpha or psychometric tests, was appropriate (apart from MARS and in line with previous research [45,

54, 66]), which is to be considered a strength. The drop-out rate during follow-up was acceptable, and patients ceasing to participate may be considered as an unavoidable attrition [77].

Conclusion

Illness perception differs in some aspects in relation to the level of health literacy as well as between men and women. Further, the level of health literacy seems to be of importance for patients' self-efficacy and QoL. The current result suggest a need for new strategies to improve health literacy, illness perception, and self-efficacy over time – for example, by providing more tailored information regarding secondary prevention, preferably by using e-health tools, in order to strengthen self-management to further improve QoL in patients with IC.

Abbreviations

ABI	Ankle brachial index
BMT	Best medical therapy
CSM	Common Sense Model
HLS-EU	European Health Literacy Survey Questionnaire
HLS-EU-Q16-SE	European Health Literacy Survey Questionnaire 16 Swedish
IC	Intermittent claudication
IPQ-R	The Revised Illness Perception Questionnaire
IQR	Inter quartile range
MARS-5	Medication Adherence Report Scale
PAD	Peripheral arterial disease
QoL	Quality of life
S-GSE	General Self-Efficacy Scale
VascuQoL	Vascular Quality of Life Questionnaire
VQ6	Vascular Quality of Life Questionnaire-6

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Authors' contributions

All the authors (RS, MZ, CK, and MA) have participated in the design, planning, and development of the study. RS was responsible for the data collection. The analysis was conducted by RS and MA, and all authors took part in the interpretation of the results. RS drafted the manuscript, and CK, MZ, and MA reviewed and contributed with important intellectual content. The authors read and approved the final manuscript.

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Data availability

The dataset is available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the Regional Ethical Review Board in Lund, Sweden (Dnr 2017/609). All participants received oral and written information about the study, including information that it was voluntary to participate and that they could withdraw their participation at any time with no further explanation. They also received information that this study did not include any compensation for participation. Informed consent was obtained from all participants. The questionnaires were coded and the keycode was only available for the research team ensuring confidentiality. All methods conducted adhered to the relevant guidelines and regulations in accordance with the Declaration of Helsinki [78].

Consent for publication

Not applicable.

Competing interests

The authors have no conflicts of interest to declare.

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References

1. Aboyans V, Ricco JB, Bartelink MEL et al. 2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS): Document covering atherosclerotic disease of extracranial carotid and vertebral, mesenteric, renal, upper and lower extremity arteriesEndorsed by: the European Stroke Organization (ESO)The Task Force for the Diagnosis and Treatment of Peripheral Arterial Diseases of the European Society of Cardiology (ESC) and of the European Society for Vascular Surgery (ESVS). *Eur Heart J*. Mar 1 2018;39(9):763–816. doi:https://doi.org/10.1093/eurheartj/ehx095.
2. Abaraogu UO, Ezenwankwo EF, Dall PM, Seenan CA. Living a burdensome and demanding life: a qualitative systematic review of the patients experiences of peripheral arterial disease. PLoS ONE. 2018;13(11):e0207456. https://doi.org/10.1371/journal.pone.0207456.
3. Patel KK, Jones PG, Ellerbeck EF, et al. Underutilization of evidence-based Smoking Cessation support strategies despite high smoking addiction Burden in Peripheral Artery Disease Specialty Care: insights from the International PORTRAIT Registry. J Am Heart Assoc. Oct 2018;16(20):e010076. https://doi.org/10.1161/jaha.118.010076.
4. Harwood AE, Pymer S, Ibeggazene S, Ingle L, Caldow E, Birkett ST. Provision of exercise services in patients with peripheral artery disease in the United Kingdom. Vascular Aug. 2021;4:17085381211035259. https://doi.org/10.1177/17085381211035259.
5. Cronin CT, McCartan DP, McMonagle M, Cross KS, Dowdall JF. Peripheral artery disease: a marked lack of awareness in Ireland. Eur J Vasc Endovasc Surg May. 2015;49(5):556–62. https://doi.org/10.1016/j.ejvs.2014.12.017.
6. Lovell M, Harris K, Forbes T, et al. Peripheral arterial disease: lack of awareness in Canada. Can J Cardiol Jan. 2009;25(1):39–45. https://doi.org/10.1016/s0828-282x(09)70021-2.
7. Petrie KJ, Weinman J. Why illness perceptions matter. *Clin Med (Lond)*. Nov-Dec. 2006;6(6):536–9. https://doi.org/10.7861/clinmedicine.6-6-536.
8. Ashour A, Al-Smadi A, Shajrawi A, Al-Rawashdeh S, Alshraifeen A, Abed M. Changes in illness perception among patients' undergoing percutaneous coronary intervention. Heart Lung Nov-Dec. 2020;49(6):836–41. https://doi.org/10.1016/j.hrtlng.2020.08.026.
9. Petrie KJ, Cameron LD, Ellis CJ, Buick D, Weinman J. Changing illness perceptions after myocardial infarction: an early intervention randomized controlled trial. Psychosom Med Jul-Aug. 2002;64(4):580–6. https://doi.org/10.1097/00006842-200207000-00007.
10. Rakhshan M, Rahimi M, Zarshenas L. The Effect of an Education Program based on illness perception on the lifestyle of patients with metabolic syndrome: a Randomized Controlled Clinical Trial. Int J Community Based Nurs Midwifery Oct. 2019;7(4):279–87. https://doi.org/10.30476/ijcbnm.2019.81658.0.
11. Song P, Rudan D, Zhu Y, et al. Global, regional, and national prevalence and risk factors for peripheral artery disease in 2015: an updated systematic review and analysis. Lancet Glob Health Aug. 2019;7(8):e1020–30. https://doi.org/10.1016/s2214-109x(19)30255-4.
12. Fowkes FG, Rudan D, Rudan I, et al. Comparison of global estimates of prevalence and risk factors for peripheral artery disease in 2000 and 2010: a

systematic review and analysis. Lancet Oct. 2013;19(9901):1329–40. https://doi.org/10.1016/s0140-6736(13)61249-0.
13. Sartipy F, Sigvant B, Lundin F, Wahlberg E. Ten year mortality in different peripheral arterial Disease Stages: a Population based Observational Study on Outcome. Eur J Vasc Endovasc Surg Apr. 2018;55(4):529–36. https://doi.org/10.1016/j.ejvs.2018.01.019.
14. Porras CP, Bots ML, Teraa M, van Doorn S, Vernooij RWM. Differences in Symptom Presentation in Women and Men with confirmed Lower Limb Peripheral Artery Disease: a systematic review and Meta-analysis. Eur J Vasc Endovasc Surg Apr. 2022;63(4):602–12. https://doi.org/10.1016/j.ejvs.2021.12.039.
15. Krack G, Holle R, Kirchberger I, Kuch B, Amann U, Seidl H. Determinants of adherence and effects on health-related quality of life after myocardial infarction: a prospective cohort study. BMC Geriatr Jun. 2018;7(1):136. https://doi.org/10.1186/s12877-018-0827-y.
16. Majeed A, Rehman M, Hussain I, et al. The impact of treatment adherence on quality of life among type 2 diabetes Mellitus Patients - Findings from a cross-sectional study. Patient Prefer Adherence. 2021;15:475–81. https://doi.org/10.2147/ppa.S295012.
17. Uchmanowicz B, Chudiak A, Mazur G. The influence of quality of life on the level of adherence to therapeutic recommendations among elderly hypertensive patients. Patient Prefer Adherence. 2018;12:2593–603. https://doi.org/10.2147/ppa.S182172.
18. Foxwell R, Morley C, Frizelle D. Illness perceptions, mood and quality of life: a systematic review of coronary heart disease patients. J Psychosom Res Sep. 2013;75(3):211–22. https://doi.org/10.1016/j.jpsychores.2013.05.003.
19. Striberger R, Axelsson M, Zarrouk M, Kumlien C. Illness perceptions in patients with peripheral arterial disease: a systematic review of qualitative studies. Int J Nurs Stud Apr. 2021;116:103723. https://doi.org/10.1016/j.ijnurstu.2020.103723.
20. Leventhal H, Meyer D, Nerenz D. The common sense representation of illness danger. The Common Sense Representation of Illness Danger. 1980;01/01:17–30.
21. Mosleh SM, Almalik MM. Illness perception and adherence to healthy behaviour in jordanian coronary heart disease patients. Eur J Cardiovasc Nurs Jun. 2016;15(4):223–30. https://doi.org/10.1177/1474515114563885.
22. Thagizadeh A, Ghahramanian A, Zamanzadeh V, Aslanabadi N, Onyeka TC, Ramazanzadeh N. Illness perception and cardiovascular risk factors in patients with myocardial infarction undergoing percutaneous coronary intervention in Iran. BMC Cardiovasc Disord Jun. 2022;2(1):245. https://doi.org/10.1186/s12872-022-02684-9.
23. Dopheide JF, Veit J, Ramadani H, et al. Adherence to statin therapy favours survival of patients with symptomatic peripheral artery disease. Eur Heart J Cardiovasc Pharmacother Jul. 2021;23(4):263–70. https://doi.org/10.1093/ehjcvp/pvz081.
24. Kumbhani DJ, Steg PG, Cannon CP, et al. Adherence to secondary prevention medications and four-year outcomes in outpatients with atherosclerosis. Am J Med. Aug 2013;126(8):693–700e1. https://doi.org/10.1016/j.amjmed.2013.01.033.
25. Wawruch M, Wimmer G Jr, Murin J, et al. Patient-Associated characteristics influencing the risk for Non-Persistence with Statins in older patients with peripheral arterial disease. Drugs Aging Sep. 2019;36(9):863–73. https://doi.org/10.1007/s40266-019-00689-2.
26. Wawruch M, Murin J, Tesar T, et al. Non-Persistence with Antiplatelet Medications among older patients with peripheral arterial disease. Front Pharmacol. 2021;12:687549. https://doi.org/10.3389/fphar.2021.687549.
27. Burkhart PV, Sabaté E. Adherence to long-term therapies: evidence for action. J Nurs Scholarsh. 2003;35(3):207.
28. Unni E, Bae S. Exploring a New Theoretical Model to explain the behavior of Medication Adherence. *Pharmacy (Basel)*. Apr. 2022;1(2). https://doi.org/10.3390/pharmacy10020043.
29. Striberger R, Axelsson M, Kumlien C, Zarrouk M. Health literacy in patients with intermittent claudication in relation to clinical characteristics, demographics, self-efficacy and quality of life - A cross-sectional study. J Vasc Nurs Sep. 2022;40(3):121–7. https://doi.org/10.1016/j.jvn.2022.09.001.
30. *Self-efficacy in changing societies*. Self-efficacy in changing societies. Cambridge University Press; 1995:xv, 334-xv, 334.
31. Collins TC, Lunos S, Ahluwalia JS. Self-efficacy is associated with walking ability in persons with diabetes mellitus and peripheral arterial disease. Vasc Med Jun. 2010;15(3):189–95. https://doi.org/10.1177/1358863x10362604.
32. Farley H. Promoting self-efficacy in patients with chronic disease beyond traditional education: a literature review. Nurs Open Jan. 2020;7(1):30–41. https://doi.org/10.1002/nop2.382.
33. Sol BGM, van der Graaf Y, van Petersen R, Visseren FLJ. The Effect of Self-Efficacy on Cardiovascular Lifestyle. Eur J Cardiovasc Nurs. 2011;10(3):180–6. https://doi.org/10.1016/j.ejcnurse.2010.06.005.
34. Byrne M, Walsh J, Murphy AW. Secondary prevention of coronary heart disease: patient beliefs and health-related behaviour. J Psychosom Res May. 2005;58(5):403–15. https://doi.org/10.1016/j.jpsychores.2004.11.010.
35. Moss-Morris R, Weinman J, Petrie K, Horne R, Cameron L, Buick D. The Revised Illness Perception Questionnaire (IPQ-R). *Psychology & Health*. 2002/01/01 2002;17(1):1–16. doi:https://doi.org/10.1080/08870440290001494.
36. Brink E, Alsén P, Cliffordson C. Validation of the revised illness perception questionnaire (IPQ-R) in a sample of persons recovering from myocardial infarction–the swedish version. Scand J Psychol Dec. 2011;52(6):573–9. https://doi.org/10.1111/j.1467-9450.2011.00901.x.
37. JM P, VdB KGS, Okan KS. O. *Measuring healthliteracy in Europe: introducing the european health literacy Survey Question-naire (HLS-EU-Q). In: editors. International Handbook of health literacy research practice andpolicy across the lifespan*. vol 2019.69 Bristol: Policy Press; 2019.
38. Wångdahl J, Lytsy P, Mårtensson L, Westerling R. Health literacy among refugees in Sweden - a cross-sectional study. BMC Public Health Oct. 2014;3:14:1030. https://doi.org/10.1186/1471-2458-14-1030.
39. Sørensen K, Pelikan JM, Röthlin F, et al. Health literacy in Europe: comparative results of the european health literacy survey (HLS-EU). Eur J Public Health Dec. 2015;25(6):1053–8. https://doi.org/10.1093/eurpub/ckv043.
40. Schwarzer R, Jerusalem M. (1995). Generalized Self-Efficacy scale. In J. Weinman, S. Wright, & M. Johnston, Measures in health psychology: A user's portfolio. Causal and control beliefs (pp. 35–37). Windsor, UK: NFER-NELSON. Generalized Self-Efficacy scale. *J Weinman, S Wright, & M Johnston, Measures in health psychology: A user's portfolio Causal and control beliefs (pp 35–37)* 1995;Windsor, UK: NFER-NELSON.
41. Koskinen-Hagman MSR, Jerusalem M. Swedish version of the General Self-Efficacy Scale. 1999.
42. Löve J, Moore CD, Hensing G. Validation of the swedish translation of the General Self-Efficacy scale. Qual Life Res Sep. 2012;21(7):1249–53. https://doi.org/10.1007/s11136-011-0030-5.
43. Bäck A, Sundell KA, Horne R, Landén M, Mårdby A-CM. The Medication Adherence Report Scale (MARS-5) in a swedish sample with bipolar disorder - a pilot study. Int J Person-Centered Med. 2012;2:263–70.
44. Horne R, Weinman J. Self-regulation and Self-management in Asthma: Exploring The Role of Illness Perceptions and Treatment Beliefs in Explaining Non-adherence to Preventer Medication. Psychology & Health - PSYCHOL HEALTH. 02/01 2002;17:17–32. doi:https://doi.org/10.1080/08870440290001502.
45. Tavakol M, Dennick R. Making sense of Cronbach's alpha. Int J Med Educ Jun. 2011;27:2:53–5. https://doi.org/10.5116/ijme.4dfb.8dfd.
46. Morgan MB, Crayford T, Murrin B, Fraser SC. Developing the vascular quality of Life Questionnaire: a new disease-specific quality of life measure for use in lower limb ischemia. J Vasc Surg Apr. 2001;33(4):679–87. https://doi.org/10.1067/mva.2001.112326.
47. Nordanstig J, Karlsson J, Pettersson M, Wann-Hansson C. Psychometric properties of the disease-specific health-related quality of life instrument VascuQoL in a swedish setting. Health Qual Life Outcomes Apr. 2012;30:10:45. https://doi.org/10.1186/1477-7525-10-45.
48. Kumlien C, Nordanstig J, Lundström M, Pettersson M. Validity and test retest reliability of the vascular quality of life Questionnaire-6: a short form of a disease-specific health-related quality of life instrument for patients with peripheral arterial disease. Health Qual Life Outcomes Sep. 2017;29(1):187. https://doi.org/10.1186/s12955-017-0762-1.
49. Nordanstig J, Wann-Hansson C, Karlsson J, Lundström M, Pettersson M, Morgan MB. Vascular quality of Life Questionnaire-6 facilitates health-related quality of life assessment in peripheral arterial disease. J Vasc Surg Mar. 2014;59(3):700–7. https://doi.org/10.1016/j.jvs.2013.08.099.
50. Kang H. The prevention and handling of the missing data. Korean J Anesthesiol May. 2013;64(5):402–6. https://doi.org/10.4097/kjae.2013.64.5.402.
51. van Eerd EA, Risør MB, van Rossem CR, van Schayck OC, Kotz D. Experiences of tobacco smoking and quitting in smokers with and without chronic obstructive pulmonary disease-a qualitative analysis. BMC Fam Pract Nov. 2015;4:16:164. https://doi.org/10.1186/s12875-015-0382-y.
52. Sadeghi Akbari A, Cheraghi MA, Kazemnejad A, Nomali M, Zakerimoghadam M. Effect of illness perception correction - based Educational Program on Quality of Life and Self- Care in patients with heart failure: a Randomized Controlled Trial. J Caring Sci Jun. 2019;8(2):89–93. https://doi.org/10.15171/jcs.2019.013.

53. Al-Smadi AM, Ashour A, Hweidi I, Gharaibeh B, Fitzsimons D. Illness perception in patients with coronary artery disease: a systematic review. Int J Nurs Pract Dec. 2016;22(6):633–48. https://doi.org/10.1111/ijn.12494.
54. Alsén P, Brink E, Persson LO, Brändström Y, Karlson BW. Illness perceptions after myocardial infarction: relations to fatigue, emotional distress, and health-related quality of life. J Cardiovasc Nurs Mar-Apr. 2010;25(2):E1–e10. https://doi.org/10.1097/JCN.0b013e3181c6dcfd.
55. Grace SL, Krepostman S, Brooks D, et al. Illness perceptions among cardiac patients: relation to depressive symptomatology and sex. J Psychosom Res Sep. 2005;59(3):153–60. https://doi.org/10.1016/j.jpsychores.2005.05.005.
56. Yan J, You LM, He JG, et al. Illness perception among chinese patients with acute myocardial infarction. Patient Educ Couns Dec. 2011;85(3):398–405. https://doi.org/10.1016/j.pec.2010.11.010.
57. Bergman E, Malm D, Karlsson JE, Berterö C. Longitudinal study of patients after myocardial infarction: sense of coherence, quality of life, and symptoms. Heart Lung Mar-Apr. 2009;38(2):129–40. https://doi.org/10.1016/j.hrtlng.2008.05.007.
58. Bergman E, Malm D, Berterö C, Karlsson JE. Does one's sense of coherence change after an acute myocardial infarction? A two-year longitudinal study in Sweden. Nurs Health Sci Jun. 2011;13(2):156–63. https://doi.org/10.1111/j.1442-2018.2011.00592.x.
59. Vlassoff C. Gender differences in determinants and consequences of health and illness. J Health Popul Nutr Mar. 2007;25(1):47–61.
60. Kale MS, Federman AD, Krauskopf K, et al. The Association of Health literacy with illness and medication beliefs among patients with chronic obstructive Pulmonary Disease. PLoS ONE. 2015;10(4):e0123937. https://doi.org/10.1371/journal.pone.0123937.
61. Walters R, Leslie SJ, Sixsmith J, Gorely T. Health literacy for Cardiac Rehabilitation: an examination of Associated illness perceptions, Self-Efficacy, motivation and physical activity. Int J Environ Res Public Health Nov. 2020;20(22). https://doi.org/10.3390/ijerph17228641.
62. Xu XY, Leung AYM, Chau PH, Health Literacy. Self-Efficacy, and Associated factors among patients with diabetes. Health Lit Res Pract Apr. 2018;2(2):e67–e77. https://doi.org/10.3928/24748307-20180313-01.
63. Panagioti M, Skevington SM, Hann M, et al. Effect of health literacy on the quality of life of older patients with long-term conditions: a large cohort study in UK general practice. Qual Life Res May. 2018;27(5):1257–68. https://doi.org/10.1007/s11136-017-1775-2.
64. Nutbeam D, McGill B, Premkumar P. Improving health literacy in community populations: a review of progress. Health Promot Int. Oct 1 2018;33(5):901–911. doi:https://doi.org/10.1093/heapro/dax015.
65. Taggart J, Williams A, Dennis S, et al. A systematic review of interventions in primary care to improve health literacy for chronic disease behavioral risk factors. BMC Fam Pract Jun 1. 2012;13:49. https://doi.org/10.1186/1471-2296-13-49.
66. Ágh T, Dömötör P, Bártfai Z, Inotai A, Fujsz E, Mészáros Á. Relationship between Medication Adherence and Health-Related quality of life in subjects with COPD: a systematic review. Respir Care Feb. 2015;60(2):297–303. https://doi.org/10.4187/respcare.03123.
67. Calman KC. Quality of life in cancer patients–an hypothesis. J Med Ethics Sep. 1984;10(3):124–7. https://doi.org/10.1136/jme.10.3.124.
68. Devan H, Hale L, Hempel D, Saipe B, Perry MA. What Works and Does Not Work in a Self-Management Intervention for People With Chronic Pain? Qualitative Systematic Review and Meta-Synthesis. Phys Ther. May 1 2018;98(5):381–397. doi:https://doi.org/10.1093/ptj/pzy029.
69. Haile S, Lööf H, Johansson UB, Linné A, Joelsson-Alm E. Increasing patients' awareness of their own health: experiences of participating in follow-up programs after surgical treatment for intermittent claudication. J Vasc Nurs Mar. 2022;40(1):47–53. https://doi.org/10.1016/j.jvn.2021.11.004.
70. Stirratt MJ, Dunbar-Jacob J, Crane HM, et al. Self-report measures of medication adherence behavior: recommendations on optimal use. Transl Behav Med Dec. 2015;5(4):470–82. https://doi.org/10.1007/s13142-015-0315-2.
71. George J, Kong DC, Thoman R, Stewart K. Factors associated with medication nonadherence in patients with COPD. Chest Nov. 2005;128(5):3198–204. https://doi.org/10.1378/chest.128.5.3198.
72. Menckeberg TT, Bouvy ML, Bracke M, et al. Beliefs about medicines predict refill adherence to inhaled corticosteroids. J Psychosom Res Jan. 2008;64(1):47–54. https://doi.org/10.1016/j.jpsychores.2007.07.016.
73. Axelsson M, Brink E, Lundgren J, Lötvall J. The influence of personality traits on reported adherence to medication in individuals with chronic disease: an epidemiological study in West Sweden. PLoS One Mar. 2011;28(3):e18241. https://doi.org/10.1371/journal.pone.0018241.
74. Brown MT, Bussell J, Dutta S, Davis K, Strong S, Mathew S. Medication adherence: Truth and Consequences. Am J Med Sci Apr. 2016;351(4):387–99. https://doi.org/10.1016/j.amjms.2016.01.010.
75. Tommelein E, Mehuys E, Van Tongelen I, Brusselle G, Boussery K. Accuracy of the Medication Adherence Report Scale (MARS-5) as a quantitative measure of adherence to inhalation medication in patients with COPD. Ann Pharmacother May. 2014;48(5):589–95. https://doi.org/10.1177/1060028014522982.
76. Mascha EJ, Vetter TR, Significance. Errors, Power, and sample size: the blocking and tackling of Statistics. Anesth Analg Feb. 2018;126(2):691–8. https://doi.org/10.1213/ane.0000000000002741.
77. Caruana EJ, Roman M, Hernández-Sánchez J, Solli P. Longitudinal studies. J Thorac Dis Nov. 2015;7(11):E537–40. https://doi.org/10.3978/j.issn.2072-1439.2015.10.63.
78. Human Experimentation. Code of Ethics of the World Medical Association (Declaration of Helsinki). Can Med Assoc J Sep. 1964;12(11):619.

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