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ORIGINAL ARTICLE

Presentation and medical management of peripheral arterial disease in general practice: rationale, aims, design and baseline results of the PACE-PAD Study

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Abstract
Background Peripheral arterial disease (PAD) is highly prevalent among individuals of higher age or those with one or more cardiovascular risk factors. Screening for PAD is recommended, since it is often linked to atherothrombotic manifestations in the coronary or carotid circulation and associated with a substantial increase in all-cause and cardiovascular mortality. We aimed to assess patients with newly diagnosed, suspected and confirmed PAD in the primary care setting with regards to clinical characteristics, diagnostic and therapeutic management (including referral to specialists), and medium-term outcomes.
Methods This was a multicentre, prospective, observational cohort study with a cross-sectional and a longitudinal part. A total of 2,781 general practitioners across Germany were cluster randomised to document five consecutive patients each in one of the strata: (1) patients with intermittent claudication (IC) or other typical PAD-related complaints (group A) or (2) patients >55 years of age with one or more risk factors (group B) for PAD (current smoking, diabetes, previous myocardial infection and/or previous stroke). Patients with confirmed PAD will be followed up for diagnostic procedures, therapy and vascular events over 18 months.
Results In group A, a total of 2,131 patients with suspected PAD (80.1% confirmed, 75.9% with referral to specialists) and in group B 9,921 patients were included (44.6% confirmed, 54.6% referral). The ankle-brachial index was calculated in 41.3% and 33.5% only. Mean age was 66.6 years (group A) and 68.4 years (group B), respectively. Vascular risk factors were prevalent in both groups, in particular smoking (group A 44.6%, group B 44.4%), hypertension (73.2 and 78.1%), hypercholesterolaemia (64.6 and 70.6%) and diabetes mellitus (41.7 and 60.6%). Concomitant atherothrombotic morbidities were frequent in both groups. In patients with the respective diseases, antihypertensive, antidiabetic, lipid-lowering and antithrombotic therapies were prescribed in group A in 96.6, 96.0, 91.1 and 89.7% and in group B in 98.3, 97.4, 94.1 and 91.2%.
Conclusion The cross-sectional part of the study indicates a substantial burden of disease in PAD patients in primary

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care. Treatment rates appear to have improved compared to earlier surveys. In the follow-up period, outcomes of these patients and their association with disease stages, guideline-oriented treatment or patient compliance and disease-coping strategies, among other factors, will be determined.

Keywords Peripheral arterial disease · Management · Vascular risk factors · Observational study · Health care research

Background

Atherosclerotic cardiovascular disease remains the most common single cause of death in Germany and other Western countries (Statistisches Bundesamt 2006). Its three main manifestations comprise coronary heart disease (CDH), cerebrovascular disease (CVD) and peripheral arterial disease (PAD). The latter condition has been found to be highly prevalent in the general population and in primary care, respectively. For example, the getABI study in 6,880 patients aged 65 years and above found asymptomatic PAD as evidenced by a low ankle-brachial index (ABI) in 12.1%, and symptomatic PAD in 8.7% of patients (Diehm et al. 2004). Thus, only half of patients who present with objective evidence of PAD have clinically significant limb symptoms, such as walking impairment, intermittent claudication, ischaemic rest pain or non-healing wounds (Hirsch et al. 2006). The main medical problem of the PAD patient is not losing the lower extremity due to amputation, but rather to suffer a myocardial infarction or stroke (Heald et al. 2006). In view of the high disease burden of PAD with its associated risk of poor ischaemic outcomes, appropriate screening and intervention measures—including aggressive treatment of the common atherosclerotic risk factors—have been suggested repeatedly (Belch et al. 2003; Hirsch et al. 2006; Norgren et al. 2007).

While the necessity of such measures is widely undisputed, the situation and management of PAD patients in primary care has been less well investigated. It may well differ between primary care setting across health care systems and countries (Hirsch et al. 2001b; Khan et al. 2007), and therefore extrapolation may not be possible. The primary care setting is of particular interest from a public health perspective, because the general physician serves as gatekeeper (Grumbach et al. 1999) with an important role in the case finding for PAD, referral to specialists to confirm or reject the suspected diagnosis and in the long-term management of these risk patients.

Against this background, the Patient Care Evaluation-Peripheral Arterial Disease (PACE-PAD) Study was initiated. The present article describes the rationale, aims and methods of the study and the key findings of the cross-sectional part.

Methods

Aims and study hypotheses

The primary aim of the study is the description of the management (diagnostics and therapy) of patients with newly diagnosed, suspected or confirmed PAD, with particular focus on the interaction between general physician and specialist care, depending on patient-related factors such as compliance with therapy and activity (coping with disease).

Secondary study aims are the investigation of the outcomes of guideline-oriented therapy on the incidence of cardiovascular, cerebrovascular or peripheral vascular events in patients with newly diagnosed PAD, depending on patient-related factors such as compliance and activity.

The following hypotheses will be tested: The cumulative incidence of cardiac, cerebrovascular and peripheral vascular events during the follow-up period is lower:

1. In PAD patients with guideline-oriented management compared to PAD patients without such management
2. In PAD patients with high compliance compared with those with low compliance
3. In PAD patients who are actively coping with their disease compared with patients who do not

Design and study flow

PACE-PAD is a multicentre, observational, non-interventional prospective study with pretest and pilot study periods, and in the main study, a cross-sectional part (all patients) and a longitudinal part with three visits over 18 months (for confirmed PAD patients in Fontaine stage I-IV only, see Fig. 1). Patients were assigned to two strata (symptomatic patients and patients with risk factors, both with suspected PAD).

A representative sample of ca. 43,500 physicians were contacted (general physicians or internists in primary care) throughout Germany. The "total design method" (Dillman 1991) for mail surveys was used with elements to ensure high acceptance rates. Basic elements include: minimisation of the burden on the respondent by designing questionnaires that are attractive in appearance and easy to complete, printing mail questionnaires in booklet format, placing personal questions at the end, creating a vertical flow of questions and creating sections of questions based on their content; constructing a persuasive letter and using personalised communication; essential follow-up contacts of non-respondents (Dillman 1991). The questionnaire was pretested in terms of comprehensibility and feasibility with 12 randomly chosen physicians applying think aloud and probing techniques.

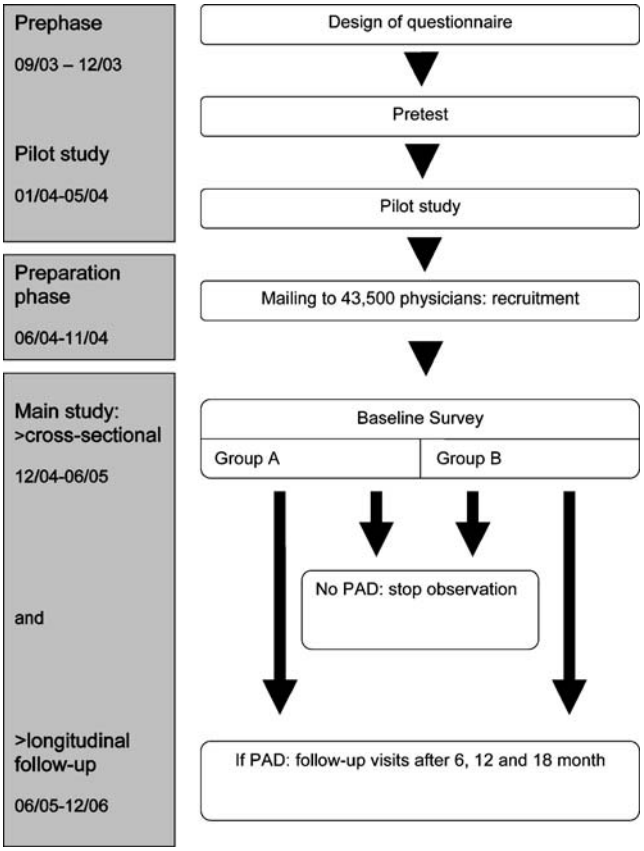

Fig. 1 Study design

Physicians were assigned to one of two patient strata by means of cluster randomisation using a computer-generated randomisation list. They were requested to include consecutively up to five eligible patients in the assigned stratum.

The study was conducted according to the principles of "good epidemiological practice" (Arbeitsgruppe Epidemiologische Methoden der Deutschen Arbeitsgemeinschaft Epidemiologie, DAE). Protection of patient and centre data was ensured. According to a statement of the legal department of the University Duisburg-Essen, for this non-interventional study a formal approval was not necessary.

Eligibility criteria

Patients were eligible for inclusion in group A if they had *newly occurring* intermittent claudication (IC) or claudication-like complaints with suspected PAD.

Patients with suspected PAD were eligible for inclusion in group B if they were aged 55 years or above *and* had (1) previous myocardial infarction and/or (2) previous ischaemic stroke and/or (3) manifest type 1 or type 2 diabetes mellitus and/or (4) current smoking (for more than 10 years).

Patients were not eligible if they had PAD which had been diagnosed earlier.

Cross-sectional part

At inclusion the initials, birth date and gender of the patients were recorded. Further, type of insurance (private or general) and participation at a disease management program (diabetes mellitus type 1 or 2, coronary heart disease or other) were noted. Besides weight, height, systolic and diastolic blood pressure (method according to physician discretion), presence of complaints possibly associated with PAD (gluteal or leg pain when walking, reduced walk distance, ulceration or problems with leg wound healing), presence of risk factors for PAD (smoking, type 1 or 2 diabetes, arterial hypertension, hypercholesterolaemia and previously diagnosed carotid stenosis) were recorded, as were previous ischaemic manifestations [transient ischaemic attack (TIA) or prolonged reversible ischaemic neurological deficit (PRIND), stable or unstable angina pectoris, including myocardial infarction] or interventions [percutaneous transluminal coronary angioplasty (PTCA) with or without stenting, coronary artery bypass surgery (CABG), carotid revascularisation or stenting].

The general health state of the patient was rated by the physician on a 10-point numerical scale (1=extremely poor, 10=excellent). Similarly, compliance with therapy (1= extremely poor, 10=excellent) as well as coping with disease (1=passive, 10=active) were assessed.

The following *diagnostic* procedures for PAD were recorded (by extremity, if applicable): leg pulse status at arteria (a.) femoralis, a. tibialis posterior, a. dorsalis pedis (normal, pathological, not assessed), auscultation of arteries, Ratschow test, measurement of walking distance, tiptoe exercise testing, Doppler-based measurement of the ABI, PAD stage according to Fontaine stage (if confirmed: I: asymptomatic, IIa: mild claudication, IIb: moderate-severe claudication, III: ischaemic rest pain, IV: ulceration or gangrene), alternatively differential diagnosis of PAD or exclusion of PAD diagnosis in the office. Referrals were recorded, too (angiology, vascular surgery, neurology, orthopaedics, phlebology, radiology, other). In the case of referral to a vascular specialist, his/her diagnoses (PAD yes/no, Fontaine stage, ABI and therapy) were recorded, too.

The following *therapeutic* measures were recorded: specific exercise, drug therapy [prostaglandins, rheologic agents (pentoxifylline, naftidrofuryl) or other] and planned vascular surgery (revascularisation, peripheral bypass surgery). Further detailed assessment of risk factor management was performed: smoking cessation, antithrombotic therapy (aspirin, ticlopidine, clopidogrel, other), anticoagulation (unfractionated heparins, low molecular weight heparins, heparinoids, vitamin K antagonists, other), lipid-lowering measures (diet, statins, fibrates, other), antihypertensive treatment (salt restriction, diuretics, calcium channel blockers, beta blockers, $alpha_1$ blockers, AT1 receptor

antagonists, other), antidiabetic therapy (diet, insulin, oral antidiabetic drugs) or other and unspecified measures used for risk reduction.

Longitudinal study: endpoints at follow-up visits

The following endpoints will be recorded: myocardial infarction, stroke or minor/major amputation due to PAD.

Statistics

The sample size was calculated based on the assumption that the cumulative incidence of vascular events after 18 months is 6.8% in PAD patients with guideline-oriented therapy vs 9.8% in other PAD patients. Guideline-oriented therapy was defined by quality indicators that were determined by a standardised questionnaire. A sample of 3,483 symptomatic patients (of whom at least 85% were assumed to have diagnosed PAD) and of 20,485 patients with risk factors (of whom at least 10% were assumed to have diagnosed PAD) is required to obtain a power of 80% at a significance level of 5%.

Using cross tables, frequency distributions and descriptive statistics, the distributions of variables between the two patient strata were compared. Additionally, a subgroup analysis of patients aged ≥55 years was performed. Throughout all analyses, a two-sided or the chi-square p value <0.05 (to evaluate differences between proportions for two or more than two groups) was considered to denote statistical significance. All analyses were performed with SPSS version 13 for Windows (SPSS Inc, Chicago, IL, USA).

Findings of the cross-sectional study

Characteristics Table 1 provides an overview of demographic and clinical patient characteristics at inclusion. Mean patient age was somewhat lower in group A compared to group B (66.6 vs 68.4 years), as per definition in the latter group only patients aged 55 years and above were eligible. Male patients constituted about two thirds of the cohorts. While smoking was recorded in both groups with equal frequency, the other index risk factors current smoking, diabetes, hypertension and hypercholesterolaemia were more prevalent in group B, mostly with a long disease history. Previous ischaemic events (myocardial infarctions, stroke etc.), related interventions and current atherothrombotic manifestations (angina pectoris) were noted substantially more frequently in group B, but were also prevalent in group A.

Table 2 subdivides the patients in group A into those aged below 55 years and those aged 55 years and above, in order to enable direct comparison with the age-matched group B. Compared to those patients aged ≥ 55 years, the younger patients in group A were less frequently current smokers, but included higher proportions of diabetic and hypercholesterolaemic individuals.

Diagnostics In group A, 80.1% of all included patients were finally assigned a PAD diagnosis and in group B 44.6% (Table 3). While the great majority of physicians reported that they applied basic diagnostic measures such as inspection, auscultation and leg pulse status (usually at three levels and on both sides), walking distance (57.3% in group A), tiptoe exercise testing (55.9% in group A) and Ratschow test (33.7% in group A) were done less frequently. The ABI was determined in 41.3 (group A) and 33.5% (group B) only.

Referrals While in group A three quarters were also seen by one or more specialists for further diagnostics or therapy, the proportion was much lower (only 54.6%) in group B (Table 4). If referred, patients in both groups were seen mostly by angiologists or vascular specialists.

Health status, coping, compliance The majority of patients were reported to be at an intermediate level of health status (ca. 60% in level 4–7 on the 10-point scale; Table 5). About a quarter of patients (27.8% in group A and 23.5% in group B) were reported to be passive. Compliance with diagnostics and therapy was predominantly intermediate or high.

Management Table 6 shows the patient management for diabetes, hypertension, hypercholesterolaemia and smoking in both strata. General advice about smoking cessation in current smokers and dietary advice in patients with elevated blood cholesterol level was frequent in both groups. Treatment rates with blood pressure-lowering therapy in hypertensive patients were 96.6% in group A and 98.3% in group B. Likewise, treatment rates were also similar in both groups for diabetic patients (antidiabetic therapy in 96.0% in group A and 97.4% in group B), as well as for lipid-lowering therapy in hyperlipidaemic patients (91.1% in group A and 94.1% in group B).

PAD The great majority of the PAD patients in both groups received antithrombotics or anticoagulants (89.7% of group A and 91.2% of group B; Table 7). Pain medication was prescribed in a quarter of group A and group B patients. While there was a substantially lower proportion of training advice in group A (66.1 vs 71.4% in group B), in this group more prescriptions of rheologic agents (35.0 vs 31.1% in group B) and more planned vascular surgery interventions (23.3 vs 20.6% of group B) were reported. Both groups showed similar prescription prevalences of prostaglandins,

Table 1 Patient characteristics in the two strata at inclusion

Parameter	Group A (n=2,131)	Group B (n=9,921)	p value
Age (years), mean SD	66.6±11.1	68.4±8.0	<0.05
<55	15.1 (323)	0 (0)	<0.05
55–64	24.2 (515)	34.9 (3,464)	<0.05
65–74	35.5 (756)	41.5 (4,113)	<0.05
75–84	21.8 (465)	21.4 (2,123)	0.66
85+	3.4 (72)	2.2 (221)	<0.05
Males:females, %	63.9:36.1	67.5:32.5	<0.05
Body mass index	27.7±4.5	28.5±6.9	<0.05
Systolic and diastolic BP	140.4/82.6	139.1/81.2	<0.05
Complaints: yes	98.7 (2,103)	51.7 (4,576)	<0.05
Vascular risk factors			
None/1/2/3/4[a]	4.2/19.1/34.4/32.8/9.5	0.9/11.4/33.6/41.0/13.1	<0.05
Current smoking	44.6 (951)	44.4 (4,408)	0.89
>10 years	41.9 (892)	43.5 (4,318)	<0.05
Diabetes mellitus	41.7 (889)	60.6 (6,010)	<0.05
>10 years	20.0 (427)	50.4 (5,000)	<0.05
Arterial hypertension	73.2 (1,560)	78.1 (7,751)	<0.05
>10 years	46.7 (995)	57.2 (5,676)	<0.05
Hypercholesterolaemia	64.6 (1,377)	70.6 (7,007)	<0.05
>10 years	33.6 (715)	43.8 (4,346)	<0.05
Carotid stenosis	8.4 (179)	8.7 (860)	0.73
Earlier ischaemic events			
None/1/2/3/4/5/missing	61.2/21.5/11.5/4.5/0.9/0.2/0.2	38.5/23.4/25.6/10.1/2.0/0.4/0.0	<0.05
Cerebrovascular: any	13.7 (293)	24,0 (2,377)	<0.05
TIA/PRIND	10.7 (228)	14.4 (1,433)	<0.05
Ischaemic stroke	6.0 (127)	19.3 (1,913)	<0.05
Coronary: any	31.3 (667)	47.4 (4,705)	<0.05
Stable AP	26.4 (562)	34.9 (3,465)	<0.05
Instable AP	6.7 (142)	12.2 (1,207)	<0.05
Myocardial infarction	12.5 (267)	34.7 (3,445)	<0.05
Coronary interventions			
None	80.3 (1,711)	69.7 (6,917)	<0.05
Percutaneous transluminal coronary angioplasty (PTCA)	11.4 (243)	19.1 (1,897)	<0.05
Coronary artery bypass surgery (CABG)	6.9 (146)	12.5 (1,243)	<0.05
Carotid surgery	2.9 (62)	2.9 (289)	0.99
Other	2.4 (52)	1.7 (165)	<0.05

Values indicate % (n)
[a] Carotid stenosis excluded

Table 2 Vascular risk factors (age ≥ or <55 years)

Vascular risk factors	Group A (age ≥55) (n=1,808)	Group B (age ≥55) (n=9,921)	p value	Group A (age <55) (n=323)
None/1/2/3/4[a]	4.0/17.6/35.7/33.4/9.3	0.9/11.4/33.6/41.0/13.1	<0.05	5.3/27.2/26.9/29.7/10.8
Current smoking	39.4 (713)	44.4 (4,408)	<0.05	73.7 (238)
>10 years	37.0 (669)	43.5 (4,318)	<0.05	69.0 (223)
Diabetes mellitus	44.2 (800)	60.6 (6,010)	<0.05	27.6 (89)
>10 years	22.1 (400)	50.4 (5,000)	<0.05	8.4 (27)
Arterial hypertension	76.3 (1,379)	78.1 (7,751)	0.08	56.0 (181)
>10 years	51.4 (929)	57.2 (5,676)	<0.05	20.4 (66)
Hypercholesterolaemia	66.1 (1,195)	70.6 (7,007)	<0.05	56.3 (182)
>10 years	36.0 (651)	43.8 (4,346)	<0.05	19.8 (64)
Carotid stenosis	9.2 (166)	8.7 (860)	0.47	4.0 (13)

Values indicate % (n)
[a] Carotid stenosis excluded

Table 3 Diagnostics to confirm or reject the PAD diagnosis in the two strata

Frequency of diagnostics	Group A (n=2,131)	Group B (n=9,921)	p value
Inspection	87.4 (1,863)	89.9 (8,921)	<0.05
Pathological	32.7 (696)	17.6 (1,745)	<0.05
Ambilateral pulse status at 3 levels[a]	86.0 (1,833)	83.7 (8,304)	<0.05
Any level pathological	81.7 (1,740)	48.8 (4,843)	<0.05
Auscultation	61.6 (1,313)	64.0 (6,349)	<0.05
Pathological	26.5 (564)	16.1 (1,602)	<0.05
Ratschow test	33.7 (719)	31.6 (3,136)	0.06
Pathological	21.7 (462)	12.6 (1,250)	<0.05
Walking distance	57.3 (1,221)	44.2 (4,390)	<0.05
Pathological	48.9 (1,041)	25.1 (2,487)	<0.05
Tiptoe posture	55.9 (1,191)	51.1 (5,068)	<0.05
Pathological	27.1 (577)	14.2 (1,410)	<0.05
ABI measurement	41.3 (880)	33.5 (3,321)	<0.05
≤0.9	29.0 (618)	17.0 (1,690)	<0.05
Other	5.2 (111)	4.5 (444)	0.15
PAD diagnosed[b]	80.1 (1,706)	44.6 (4,423)	<0.05

Values indicate % (n)
[a] A. femoralis, a. tibialis posterior, a. dorsalis pedis, both legs each
[b] With specialist preference if applicable

recommended bed rest, recommended posture of legs, wound treatment and antibiotics.

Fontaine stages In group B, there were significantly more asymptomatic PAD patients than in group A, while there were significantly more PAD patients in group A in higher stages (Table 8).

Table 4 Referrals to specialists

Specialisation	Group A (n=2,131)	Group B (n=9,921)	p value
Number: none /1/2/3/4/5/6/7	24.1/45.7/ 18.6/7.2/3.0/ 0.7/0.4/0.3	45.4/32.3/ 12.6/5.9/ 2.2/1.2/0.3/0.1	<0.05
Angiology	41.2 (877)	28.2 (2,795)	<0.05
Vascular surgery	33.0 (703)	20.9 (2,069)	<0.05
Neurology	10.0 (213)	10.2 (1,012)	0.81
Orthopaedics	11.5 (245)	9.4 (933)	<0.05
Phlebology	6.0 (128)	5.6 (560)	0.51
Radiology	14.3 (305)	10.0 (997)	<0.05
Other	8.4 (180)	8.2 (816)	0.73

Values indicate % (n)

Table 5 Health status, compliance and coping in the two strata

Parameter	Group A (n=2,131)	Group B (n=9,921)	p value
General health status			
1–3	12.5 (267)	11.2 (1,112)	0.08
4–7	60.7 (1,294)	60.4 (5,997)	0.83
8–10	26.3 (560)	28.1 (2,783)	0.10
Missing	0.5 (10)	0.3 (29)	0.21
Compliance			
1–3	14.7 (314)	11.9 (1,182)	<0.05
4–7	39.7 (845)	39.7 (3,936)	1.00
8–10	45.4 (968)	48.2 (4,780)	<0.05
Missing	0.2 (4)	0.2 (23)	1.00
Coping			
1–3	27.8 (592)	23.6 (2,336)	<0.05
4–7	44.1 (939)	45.8 (4,544)	0.15
8–10	27.8 (593)	30.3 (3,009)	<0.05
Missing	0.3 (7)	0.3 (32)	1.00

Values indicate % (n); 10-point scales with 0=worst and 10=best value

Table 6 Prescription prevalences for diabetes, hypertension, hypercholesterolaemia and smoking

Parameter	Group A (n=2,131)	Group B (n=9,921)	p value
Diabetes	n=889	n=6,010	
Recommended diabetic diet	87.4 (777)	91.1 (5,478)	<0.05
Insulin	32.8 (292)	37.4 (2,250)	<0.05
Oral antidiabetic drugs	55.9 (497)	60.2 (3,619)	<0.05
Other	5.2 (46)	4.5 (270)	0.35
Antidiabetics: any	96.0 (853)	97.4 (5,854)	<0.05
Hypertension	n=1,560	n=7,751	
Recommended sodium restriction	49.0 (765)	57.2 (4,431)	<0.05
Diuretics	46.9 (731)	53.5 (4,147)	<0.05
Calcium channel blockers	32.4 (506)	32.4 (2,515)	1.00
Beta blockers	40.3 (628)	50.1 (3,881)	<0.05
$Alpha_1$ blockers	5.6 (87)	5.4 (416)	0.71
AT1 blockers	20.3 (317)	21.5 (1,667)	0.31
ACE inhibitor	54.7 (853)	60.2 (4,666)	<0.05
Other	9.0 (141)	10.5 (813)	0.09
Antihypertensives: any	96.6 (1,507)	98.3 (7,616)	<0.05
Hypercholesterolaemia	n=1,377	n=7,007	
Recommended low-fat diet	77.7 (1,070)	84.1 (5,894)	<0.05
Statins	72.3 (996)	75.9 (5,320)	<0.05
Fibrates	4.6 (63)	4.9 (344)	0.63
Other	3.4 (47)	4.5 (314)	0.08
Lipid-lowering therapy: any	91.1 (1,255)	94.1 (6,597)	<0.05
Smoking	n=951	n=4,408	
Smoking stop recommended	93.3 (887)	92.7 (4,088)	0.63

Values indicate % (n)
ACE angiotensin-converting enzyme

Table 7 Prescription prevalences for PAD

Parameter	Group A (n=1,706)	Group B (n=4,423)	p value
Antithrombotics: any	84.0 (1,433)	84.9 (3,755)	0.39
Anticoagulants: any	10.1 (172)	10.6 (469)	0.58
Antithrombotics or anticoagulants	89.8 (1,532)	91.0 (4,023)	0.17
Prostaglandins	4.5 (76)	4.8 (214)	0.55
Rheologic agents	31.5 (537)	28.7 (1,271)	<0.05
Planned vascular surgery (revascularisation, peripheral bypass surgery)	23.3 (398)	20.6 (910)	<0.05
Pain medication	23.7 (404)	23.1 (1,020)	0.61
Training	66.1 (1,127)	71.4 (3,157)	<0.05
Recommended bed rest	4.9 (83)	5.6 (246)	0.31
Recommended posture of legs	13.1 (224)	13.3 (589)	0.87
Wound treatment	11.5 (197)	11.6 (513)	1.00
Antibiotics	4.1 (70)	3.6 (160)	0.37

Values indicate % (n)

Discussion

The present cross-sectional study provides detailed insights into the characteristics, diagnostic procedures and therapeutic management of patients with suspected PAD on the basis of symptoms (group A) or one or more cardiovascular risk factors that are often associated with PAD (group B).

The study is open and non-controlled, which may lead to bias. In contrast to randomised controlled trials, the present study was performed in health service research. In this context, a blinded design was not practical.

The suspicion of PAD on the basis of IC was verified with further diagnostic procedures by the treating physician in 80.1% of patients and in about half of the patients (44.6%) with risk factors. This confirms that patients at high risk can be easily identified on the basis of clinical symptoms or by the presence of one or more of four easily identifiable risk factors. A substantial proportion of patients in both groups was referred to specialists for differential diagnosis as indicated in the guidelines (e.g. exclusion of spinal claudication, venous claudication, nerve root compression or symptomatic Bakers's cyst (Hirsch et al. 2006)). Patients with previous CHD, CVD events or PAD had, across vascular beds, remarkably consistent risk factors. This finding is in line with the "Reduction of Atherothrombosis for Continued Health (REACH)" registry (Bhatt et al. 2006) or the global observation of survivors of myocardial infarction in the INTERHEART study (Yusuf et al. 2004).

Table 8 Fontaine stages

Fontaine stages	Group A (n=1,706)	Group B (n=4,423)	p value
Missing/multiple stages	0.9 (16)	1.3 (58)	0.36
I (asymptomatic)	17.8 (304)	23.9 (1,055)	<0.05
IIa (mild claudication)	35.5 (605)	34.2 (1,515)	<0.05
IIb (moderate-severe claudication)	33.1 (564)	29.7 (1,312)	<0.05
III (ischaemic rest pain)	9.2 (157)	7.6 (336)	<0.05
IV (ulceration or gangrene)	3.5 (60)	3.3 (147)	<0.05

Values indicate % (n)

Both groups in PACE-PAD showed high rates of vascular risk factors and atherothrombotic manifestations; the respective proportions were even higher in group B owing to the inclusion criteria. It was interesting to note that physicians in order to confirm the suspected PAD diagnosis regularly applied the recommended elements of physical examination (inspection, auscultation, pulse palpitation at different levels) and did additional non-invasive tests. However, the ABI, which is the most suitable non-invasive screening test for PAD, was infrequently used to confirm the diagnosis. Compared to angiography, an ABI less than 0.9 is 90% sensitive and 98% specific for a stenosis of 50% or more in leg arteries (Criqui et al. 1996; Yao et al. 1969) and, among well-trained operators, the test-retest reliability is excellent (Holland-Letz et al. 2007; Kaiser et al. 1999). A large series of studies has confirmed the prognostic value of a low ABI to predict future cardiovascular and cerebrovascular events (Heald et al. 2006; Holland-Letz et al. 2007). While this diagnostic tool is recommended in the major international and national PAD guidelines, including those of the USA or Germany (Diehm et al. 2001; Hirsch et al. 2006; Norgren et al. 2007), it is still underused as PACE-PAD confirms. However, as this study relies on self-reporting of the physicians, reporting bias may have occurred.

Regarding management, the data in our study suggest that treatment intensity in IC patients as well as in patients with risk factors has improved. The current PAD guidelines univocally agree that asymptomatic and symptomatic PAD patients should be treated with the same intensity as other manifestations of atherosclerosis, particularly coronary heart disease. Besides the advice to stop smoking as the central PAD risk factor, concomitant diabetes mellitus, arterial hypertension and dyslipidaemia must be aggressively treated (Hirsch and Gotto 2002; Hirsch et al. 2006; Norgren et al. 2007). The benefit of antiplatelet therapy [acetylic salicylic acid and clopidogrel; (1996)] has been shown in many randomised controlled studies and a meta-analysis of the Antithrombotic Trialists' Collaboration (Antithrombotic Trialists' Collaboration 2002). Statins have been shown to reduce coronary death in PAD patients irrespective of their initial cholesterol value (Heart Protection

Study Collaborative Group 2003), and similarly, the ACE inhibitor ramipril (Yusuf et al. 2000) has been shown to prevent coronary death in PAD patients with subclinical or clinical disease (Ostergren et al. 2004). Applying these drug treatments systematically to PAD patients would lead to a 25–30% mortality reduction (Feringa et al. 2006). The large majority of patients in our study received recommendations on how to improve lifestyle (smoking cessation, diet, exercise), and compared to previous screening studies on PAD, for example getABI in Germany (Pittrow et al. 2003), or PARTNERS in the USA (Hirsch et al. 2001a), treatment rates seem to have improved. The large contemporary REACH registry reported in patients with manifest PAD and the respective concomitant disease or condition drug treatment rates of 92% for hypertension, 86% for diabetes, 70% for hyperlipidaemia and 82% for antiplatelet use (Bhatt et al. 2006). While at first glance these rates appear satisfactory, in that registry only a minority of patients were at target goals for blood pressure, glucose, cholesterol, body weight and non-use of tobacco (Bhatt et al. 2006).

The clinical health status of the majority of IC (Liles et al. 2006) and of vascular risk patients is reduced, which is also confirmed by our findings. Further, various disease-coping strategies [such as "approach or avoidance" in patients with CHD (van Elderen et al. 1999)] have been described. The present study will provide an opportunity to assess the association between these factors and PAD outcomes.

Conclusions

A substantial number of PAD patients in general practice are identified on the basis of IC symptoms or typical risk factors. Increased use of the ABI would help to make the diagnostic process more efficient. PAD patients carry a substantial burden of disease (complaints, comorbidities). Their outcomes will be followed prospectively in the longitudinal part of this study.

AN, JW, FH and RD participated in study conception and design, acquisition of data, analysis and interpretation of data, funding acquisition, and drafting and critical revision of the paper for important intellectual content. HP, ED, OO and CD advised on the study design and focussed especially on patients' compliance and coping with disease. US did the sample size calculations and GL the baseline statistical calculations. All authors accept responsibility for the scientific content of the paper.

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Conflict of interest The authors confirm that there are no relevant associations that might pose a conflict of interest.

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