International Journal of Cardiology 167 (2013) 2149–2155

Contents lists available at ScienceDirect

International Journal of Cardiology

journal homepage: www.elsevier.com/locate/ijcard

Angina and intermittent claudication in 7403 participants of the 2003 Scottish Health Survey: Impact on general and mental health, quality of life and five-year mortality

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ARTICLE INFO

Article history:
Received 1 February 2012
Received in revised form 18 May 2012
Accepted 27 May 2012
Available online 15 June 2012

Keywords:
Angina
Claudication
Morbidity
Mortality
Quality of life

ABSTRACT

Background: Angina and intermittent claudication impair function and mobility and reduce health-related quality of life. Both symptoms have similar etiology, yet the physical and psychological impacts of these symptoms are rarely studied in community-based cohorts or in individuals with isolated symptoms.
Methods: The 2003 Scottish Health Survey was a cross-sectional survey which enrolled a random sample of individuals aged 16–95 years living in Scotland. The Rose Angina Questionnaire, the Edinburgh Claudication Questionnaire, the Short Form-12 (SF-12) and the General Health Questionnaire were completed. Self-assessed general health was reported. Survey results were linked to national death records and mortality at five years was calculated. Subjects with isolated angina or intermittent claudication and neither symptom were compared (22 participants with both symptoms were excluded); 7403 participants (aged ≥16 years) were included.
Results: Participants with angina (n = 205; 60 ± 15 years; 45% male) rated their general health worse and were more likely to have a potential mental-health problem than those with intermittent claudication (n = 173; 61 ± 15 years; 41% male). Mean (standard deviation) physical and mental component scores on the SF-12 were higher for participants with intermittent claudication relative to those with angina (physical component score: 42.3 (10.6) vs. 35.0 (11.7), $p<0.001$; mental component score: 52.3 (8.5) vs. 46.5 (11.7), $p=0.001$). There was an observed absolute difference in five-year mortality of 4.8% (angina 12.3%, 95% CI 8.5–17.6; intermittent claudication 7.5%, 95% CI 4.4–12.6) although not statistically significant ($p=0.16$).
Conclusions: Both intermittent claudication and angina adversely impact general and mental health and survival, even in a relatively young, community-based cohort.

1. Introduction

Understanding the impact of symptom burden is important in managing chronic cardiovascular disease. Intermittent claudication and angina are common symptoms of atherosclerotic disease and each considerably impair function and reduce health-related quality of life [1–5].

Intermittent claudication is a symptom of atherosclerotic narrowing of lower limb arteries, known as peripheral artery disease (PAD) and causes significant pain when mobilizing due to an imbalance of oxygen supply and demand to the skeletal leg muscle. Angina, a symptom of coronary artery disease (CAD) is the result of the same mismatch between oxygen supply and demand in the myocardium caused by atherosclerotic narrowing of the coronary arteries.

Intermittent claudication and angina have a similar etiology, both impair mobility and function yet the physical and psychological impacts of these symptoms are rarely studied in community-based cohorts [6] or compared with each other or to individuals without each symptom [2,6]. Our aim was to examine the impact of these two common symptoms of chronic atherosclerotic cardiovascular disease on self-assessed general health, likelihood of mental health problems, health-related quality of life and long-term mortality in participants with angina, intermittent claudication or neither symptom from the 2003 Scottish Health Survey [7]. Understanding the

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0167-5273
doi:10.1016/j.ijcard.2012.05.099

impact of symptom burden is important in health services planning and tailoring and targeting health care interventions.

2. Methods

2.1. 2003 Scottish Health Survey

The 2003 Scottish Health Survey was a cross-sectional survey of a random sample (n = 8148 adults, 44% male) of the Scottish population [7,8] which focused on cardiovascular disease and risk factors and screened for angina and intermittent claudication using validated questionnaires [9,10]. Detailed information was collected on demographics, anthropometrics, somatic and psychological health, medications, physical activity, diet, self-assessed general health and health-related quality of life [7,8]. Data was collected in the participant's home in two stages; the first stage was an interviewer visit (this included completing the Rose Angina Questionnaire [9] and the Edinburgh Claudication Questionnaire [10]), and the second, a visit at home by a specially trained nurse (clinical measures such as blood pressure, blood and saliva samples) [11]. Computer-assisted interviewing was used for both the interviewer and nurse interviews [11]. A multi-stage stratified probability sampling design was used; at the first stage, postcode sectors or groups of postcode sectors were selected, and at the second stage, addresses were selected [11]. The population surveyed included people living in private households in Scotland with a registered residential address (>99% of households), but excluded those living in institutions, including nursing homes [11]. The survey included all geographical areas of Scotland where it was feasible to undertake the survey [11]. The sampling frame included postcode sectors for several islands, but excluded inhabited islands with very small populations [11]. All adults living in the household at the selected address were included in the survey sample. In total, 8148 adults were interviewed (stage 1), and of these 5444 saw a nurse (stage 2). For consenting participants, the survey has been linked to hospitalization and mortality records (adults n = 7425; 16 to 95 years of age; 44% male) [8]. These linked [11] data allow morbidity and mortality follow-up to 31 December 2008. Ethical approval for the 2003 Scottish Health Survey was obtained from the Multi-Centre Research Ethics Committee for Scotland [11].

2.2. Questionnaires and measurements

Participants completed the Rose Angina Questionnaire [9], the Edinburgh Claudication Questionnaire [10], the General Health Questionnaire (GHQ) [12], and the Short Form-12 (SF-12) [13] and rated their self-assessed general health as either 'very bad', 'bad', 'fair', 'good' or 'very good'.

Both the Rose Angina Questionnaire and the Edinburgh Claudication Questionnaire are derived from a single cardiovascular questionnaire developed by Geoffrey Rose in 1962 [14]. The Rose Angina Questionnaire [9] is a validated and reliable angina screening tool which has been used in several population-based studies of angina prevalence [15]. Evidence suggests that the questionnaire compares favorably with documented diagnosis in primary care (positive predictive value 100% for men and 78% for women) [16], but may be less favorable with cardiologist opinion (sensitivity 44%, specificity 86%, positive predicative value 56%) [17]. Nonetheless, the Rose Angina Questionnaire is a useful tool for detecting likely cases of current, but undiagnosed angina and for detecting symptomatic angina [15]. The Edinburgh Claudication Questionnaire [10], is based on the original Rose cardiovascular survey [14], but was further developed to address concerns regarding the sensitivity of the original questionnaire. The Edinburgh Claudication Questionnaire [10] has a sensitivity of 91.3% and a specificity of 99.3% when compared to physician diagnosis of intermittent claudication [10]. Both the Rose Angina Questionnaire and the Edinburgh Claudication Questionnaire grade the severity of symptoms, as either grade 1 or grade 2, with grade 2 indicating more severe symptoms (grade 2 angina: chest pain or discomfort when walking at an ordinary pace on level ground; grade 2 intermittent claudication: leg pain or discomfort when walking at an ordinary pace on the level) [9,10]. For some of our analyses both grades were combined for each symptom (intermittent claudication = grade 1 or 2; angina = grade 1 or 2). The GHQ [12] is a screening tool for identifying the presence of psychological distress and assessing mental well-being. The GHQ-12 includes 12 questions relating to participants' general level of happiness, depression, anxiety and sleep disturbance over the past four weeks. A score between 0 and 12 is generated and a score ≥4 was used in the 2003 Scottish Health Survey [7] and this study to indicate the presence of a possible psychiatric disorder [12]. Reliability coefficients of the GHQ are reported to range from 0.78 to 0.95 [18].

The SF-12 [13] is a health-related quality of life tool which assesses both physical and mental constructs of health-related quality of life. The SF-12 has been demonstrated to be reliable and valid [19]. SF-12 data were available for participants aged ≥20 years only (excludes n = 325 participants aged 16–19 years). Lower physical or mental component score means indicate worse health-related quality of life. Socioeconomic deprivation was measured using 2001 Carstairs–Morris index of deprivation [20], an area-based index measured in quintiles. The Carstairs–Morris index of deprivation is a composite index of the indicators relating to car ownership, overcrowding, unemployment and low social class (based on the National Statistics-socioeconomic Classification) from the 2001 Scottish Census [21].

2.3. Statistical analysis

Survey and mortality data were compared for participants aged ≥16 years with intermittent claudication, or angina or without either symptom. Each category of the GHQ (0, 1–3, ≥4) and self-assessed general health outcomes were compared across symptom groups using both unadjusted and adjusted ordered logistic regression. Means for the physical and mental component-scores of the SF-12 were compared across symptom groups using both unadjusted and adjusted linear regression. All-cause mortality was examined using Kaplan–Meier analysis and compared across symptom groups using unadjusted and adjusted Cox-proportional hazards models. All adjusted analyses were adjusted for the following: age, sex, marital status, socioeconomic status, education and self-reported comorbidities (hypertension, myocardial infarction, stroke, diabetes or a respiratory condition). All analyses were completed using STATA version 10.1, p-values<0.05 were considered statistically significant.

The authors of this manuscript have certified that they comply with the Principles of Ethical Publishing in the International Journal of Cardiology [22].

3. Results

3.1. Prevalence of intermittent claudication and angina

Of the 7425 adult participants, 205 (2.8%) had angina, 173 (2.3%) had intermittent claudication and 22 (0.3%) participants had both symptoms. Due to the small number of participants with both angina and intermittent claudication we excluded these from our analysis. Of the 205 participants with angina, 137 had grade 1 angina and 68 had grade 2 angina. Of the 173 participants with intermittent claudication, 99 had grade 1 intermittent claudication and 74 had grade 2 intermittent claudication.

3.2. Demographics

All baseline variables examined were significantly different ($p<0.05$) between participants with angina or intermittent claudication and participants without either of these symptoms, with the exception of the proportion of males and socioeconomic status ($p>0.05$).

There was no difference in the demographics of participants with intermittent claudication compared to those with angina with the exception of three of the five examined comorbidities which were more common in participants with angina (hypertension, $p=0.03$; previous myocardial infarction, $p=0.002$ and respiratory conditions, $p=0.001$) (Table 1). Age at which the participants completed full-time education also differed significantly between participants with intermittent claudication and angina, with a greater proportion of participants with intermittent claudication completing full-time education at an older age.

3.3. Self-assessed general health

Over seventy percent of participants without either symptom rated their general health as 'good' or 'very good' (Table 2). In contrast, 46% of participants with intermittent claudication rated their health as 'good' or 'very good' and 13% rated their health as 'bad' or 'very bad'. Only 25% of participants with angina rated their health as 'very good' or 'good' and 32% rated their health as 'bad' or 'very bad'. Participants with intermittent claudication typically rated their general health better than participants with angina, with the exception of grade 2 intermittent claudication compared to grade 1 angina.

3.4. Mental health (General Health Questionnaire)

More than one third of the participants with angina were likely to have a mental health problem (GHQ score ≥4) and these individuals were more than twice as likely to have a mental health problem relative to participants without either symptom (Table 3).

Table 1
Demographics according to the presence of intermittent claudication, angina or neither symptom.

	Neither angina nor intermittent claudication	Angina	Intermittent claudication	Angina vs. intermittent claudication
	n = 7025	n = 205	n = 173	p
Age, mean (SD)	49.0 (17.8)	60.0 (14.6)	60.5 (15.4)	**0.75**
Male sex, n (%)	3109 (44.3)	93 (45.4)	70 (40.5)	**0.34**
Carstairs–Morris 2001 quintiles, n (%)[a]				
I (least deprived)	1342 (19.2)	17 (8.4)	24 (14.0)	**0.30**
II	1705 (24.4)	34 (16.7)	34 (19.8)	
III	1513 (21.6)	47 (23.2)	40 (23.3)	
IV	1258 (18.0)	47 (23.2)	30 (17.4)	
V (most deprived)	1181 (16.9)	58 (28.6)	44 (25.6)	
Marital status, n (%)[b]				
Single, never married	1667 (23.7)	31 (15.1)	23 (13.3)	**0.33**
Married	3934 (56.0)	104 (50.7)	102 (59.0)	
Separated	261 (3.7)	5 (2.4)	7 (4.1)	
Divorced	535 (7.6)	19 (9.3)	10 (5.8)	
Widowed	625 (8.9)	46 (22.4)	31 (17.9)	
Comorbidities, n (%)				
Hypertension[c]	1879 (26.9)	117 (57.4)	80 (46.2)	**0.03**
Myocardial infarction[d]	225 (3.2)	43 (21.1)	16 (9.3)	**0.002**
Stroke[e]	162 (2.3)	14 (6.9)	13 (7.5)	**0.81**
Diabetes[f]	272 (3.9)	35 (17.1)	26 (15.0)	**0.59**
Respiratory condition	546 (7.8)	53 (25.9)	22 (12.7)	**0.001**
Age finished fulltime education, n (%)[g]				
Not yet finished at time of survey	478 (6.8)	8 (3.9)	8 (4.6)	**0.04**
Never went to school	30 (0.4)	1 (0.5)	2 (1.2)	
14 or under	636 (9.1)	35 (17.1)	35 (20.2)	
15	1702 (24.2)	100 (48.8)	58 (33.5)	
16	1700 (24.2)	40 (19.5)	39 (22.5)	
17	761 (10.8)	8 (3.9)	8 (4.6)	
18	430 (6.1)	6 (2.9)	4 (2.3)	
19 or over	1286 (18.3)	7 (3.4)	19 (11.0)	

SD, standard deviation. The Carstairs–Morris index of deprivation is a composite index of the indicators relating to car ownership, overcrowding, unemployment and low social class (based on the National Statistics-socioeconomic Classification) from the 2001 Scottish Census [21].
These significance values are for the comparison of means and proportions for participants with angina compared to those with intermittent claudication.
[a] Missing data n = 29.
[b] Missing data n = 3.
[c] Missing data n = 36.
[d] Missing data n = 6.
[e] Missing data n = 3.
[f] Missing data n = 1.
[g] Missing data n = 3 (denominator for calculated percentages is number with available data).

3.5. Health-related quality of life (Short Form-12)

Participants without either symptom had the highest mean physical component-score on the SF-12. The mean physical component-score on the SF-12 was higher for participants with intermittent claudication relative to those with angina. Participants with grade 1 intermittent claudication had higher mean physical component-scores compared to participants with grade 2 intermittent claudication or grade 1 or 2 angina. Across almost all comparisons, participants with angina had the lowest mean mental component-score on the SF-12, with the exception of the adjusted analyses for grade 2 angina compared to grade 2 intermittent claudication (Table 4).

Table 2
Self-assessed general health according to the presence of intermittent claudication, angina or neither symptom.

	Neither angina nor intermittent claudication	Angina			Intermittent claudication		
		Grade 1	Grade 2	Grade 1 or grade 2	Grade 1	Grade 2	Grade 1 or grade 2
	n = 7025	n = 137	n = 68	n = 205	n = 99	n = 74	n = 173
Very good, n (%)	2440 (34.7)	6 (4.4)	1 (1.5)	7 (3.4)	15 (15.2)	6 (8.1)	21 (12.1)
Good, n (%)	2753 (39.2)	37 (27.0)	7 (10.3)	44 (21.5)	35 (35.4)	24 (32.4)	59 (34.1)
Fair, n (%)	1306 (18.6)	62 (45.3)	26 (38.2)	88 (42.9)	40 (40.4)	31 (41.9)	71 (41.0)
Bad, n (%)	420 (6.0)	26 (19.0)	28 (41.2)	54 (26.3)	8 (8.1)	12 (16.2)	20 (11.6)
Very bad, n (%)	106 (1.5)	6 (4.4)	6 (8.8)	12 (5.9)	1 (1.0)	1 (1.4)	2 (1.2)

	Unadjusted p	Adjusted p
Neither angina nor intermittent claudication vs. angina	p<0.001	p<0.001
Neither angina nor intermittent claudication vs. intermittent claudication	p<0.001	p<0.001
Angina vs. intermittent claudication	p<0.001	p = 0.004
Grade 1 angina vs. grade 1 intermittent claudication	p<0.001	p = 0.001
Grade 1 angina vs. grade 2 intermittent claudication	p = 0.12	p = 0.69
Grade 2 angina vs. grade 1 intermittent claudication	p<0.001	p<0.001
Grade 2 angina vs. grade 2 intermittent claudication	p<0.001	p = 0.004
Grade 1 angina vs. grade 2 angina	p<0.001	p = 0.001
Grade 1 intermittent claudication vs. grade 2 intermittent claudication	p = 0.07	p = 0.009

Count reflects total number of participants with available data.

Table 3
General Health Questionnaire (GHQ-12) according to the presence of intermittent claudication, angina or neither symptom.

	Neither angina nor intermittent claudication	Angina			Intermittent claudication		
		Grade 1	Grade 2	Grade 1 or grade 2	Grade 1	Grade 2	Grade 1 or grade 2
	n = 6740	n = 132	n = 62	n = 194	n = 93	n = 67	n = 160
0, n (%)	4371 (64.9)	56 (42.4)	20 (32.3)	76 (39.2)	59 (63.4)	35 (52.2)	94 (58.8)
1–3, n (%)	1400 (20.8)	35 (26.5)	17 (27.4)	52 (26.8)	15 (16.1)	17 (25.4)	32 (20.0)
≥4, n (%)	969 (14.4)	41 (31.1)	25 (40.3)	66 (34.0)	19 (20.4)	15 (22.4)	34 (21.3)

	Unadjusted p	Adjusted p
Neither angina nor intermittent claudication vs. angina	p<0.001	p<0.001
Neither angina nor intermittent claudication vs. intermittent claudication	p = 0.048	p = 0.35
Angina vs. intermittent claudication	p<0.001	p = 0.007
Grade 1 angina vs. grade 1 intermittent claudication	p = 0.004	p = 0.01
Grade 1 angina vs. grade 2 intermittent claudication	p = 0.15	p = 0.83
Grade 2 angina vs. grade 1 intermittent claudication	p<0.001	p = 0.03
Grade 2 angina vs. grade 2 intermittent claudication	p = 0.01	p = 0.17
Grade 1 angina vs. grade 2 angina	p = 0.14	p = 0.21
Grade 1 intermittent claudication vs. grade 2 intermittent claudication	p = 0.24	p = 0.04

Count reflects total number of participants with available data.

3.6. Multivariable linear regression of component-scores of the Short Form-12

In the multivariable analysis, having angina or intermittent claudication significantly decreased the physical component-score and angina was a significant predictor of a decrease in the mental component-score (Table 5). Several demographic variables significantly predicted a lower physical component-score: increasing age, female sex, greater socioeconomic deprivation, hypertension, myocardial infarction, stroke, diabetes or a respiratory condition. Variables which significantly predicted a higher physical component-score included being married, separated or widowed and completing education when aged ≥19 years. In addition to angina, variables which predicted a lower mental component-score included female sex, greater socioeconomic deprivation, being separated or divorced, finishing school at a young age and having any of the aforementioned comorbidities, with the exception of diabetes. In comparison, the only variable which predicted a higher mental component-score on the SF-12 was older age.

3.7. All-cause mortality at five years

According to the grade of symptoms, all-cause mortality at five years was highest in participants with grade 2 angina (Table 6). All-cause mortality is also shown in Fig. 1.

4. Discussion

The prevalence of angina (2.8%) and intermittent claudication (2.3%) in the 2003 Scottish Health Survey [7] is consistent with the prevalence rates from other studies in this population. In a cross-sectional survey undertaken between 1 April 2001 and 31 March 2002 of primary care data from 362,155 residents of Scotland, the prevalence of 'ever angina' for men was 2.8% and 2.5% for women [23]. The prevalence of intermittent claudication was 4.5% in the Edinburgh Artery Study [24]. The Edinburgh Artery Study was a cross-sectional survey of a random sample of 1592 male and female general practice patients aged 55–74 years from across socioeconomic groups and geographical areas in Edinburgh from 1988 onwards [24]. Similar to the 2003 Scottish

Table 4
SF-12 component-scores according to the presence of intermittent claudication, angina or neither symptom.

	Neither angina nor intermittent claudication	Angina			Intermittent claudication		
		Grade 1	Grade 2	Grade 1 or grade 2	Grade 1	Grade 2	Grade 1 or grade 2
	n = 5979	n = 115	n = 48	n = 163	n = 89	n = 55	n = 144
Physical component Score[a], mean (SD)	49.0 (10.4)	37.5 (11.8)	28.9 (9.0)	35.0 (11.7)	44.0 (10.0)	39.4 (11.0)	42.3 (10.6)
Mental component Score[a], mean (SD)	51.9 (8.7)	46.7 (11.8)	46.1 (11.7)	46.5 (11.7)	52.0 (8.3)	52.8 (8.9)	52.3 (8.5)

	Physical component score		Mental component score	
	Unadjusted p	Adjusted p	Unadjusted p	Adjusted p
Neither angina nor intermittent claudication vs. angina	p<0.001	p<0.001	p<0.001	p<0.001
Neither angina nor intermittent claudication vs. intermittent claudication	p<0.001	p = 0.001	p = 0.69	p = 0.51
Angina vs. intermittent claudication	p<0.001	p<0.001	p<0.001	p<0.001
Grade 1 angina vs. grade 1 intermittent claudication	p<0.001	p = 0.002	p<0.001	p = 0.001
Grade 1 angina vs. grade 2 intermittent claudication	p = 0.32	p = 0.91	p = 0.001	p = 0.04
Grade 2 angina vs. grade 1 intermittent claudication	p<0.001	p<0.001	p = 0.001	p = 0.01
Grade 2 angina vs. grade 2 intermittent claudication	p<0.001	p<0.001	p = 0.002	p = 0.06
Grade 1 angina vs. grade 2 angina	p<0.001	p = 0.002	p = 0.78	p = 0.93
Grade 1 intermittent claudication vs. grade 2 intermittent claudication	p = 0.01	p = 0.02	p = 0.63	p = 0.35

SD, standard deviation; count reflects total number of participants with available data.
[a] Means calculated using available data, and only in those aged ≥20 years (excludes n = 325 participants aged 16–19 years).

Table 5
Linear regression model for the relationship between intermittent claudication and angina and component-scores of the SF-12.

	Physical component score n = 6286 $R^2 = 0.27$			Mental component score n = 6286 $R^2 = 0.07$		
	β	95% CI	p	β	95% CI	p
Angina[a]	−7.10	−8.52, −5.69	<0.001	−3.98	−5.30, −2.67	<0.001
Intermittent claudication[a]	−2.31	−3.76, −0.86	0.002	0.82	−0.53, 2.17	0.23
Female (reference: male)	−0.49	−0.96, −0.02	0.04	−1.15	−1.59, −0.72	<0.001
Age (per additional year)	−0.16	−0.18, −0.14	<0.001	0.10	0.78, 0.11	<0.001
Carstairs–Morris quintiles (reference: I — least deprived)						
II	−0.71	−1.40, −0.02	0.044	−0.09	−0.74, 0.56	0.79
III	−1.95	−2.67, −1.22	<0.001	−0.25	−0.93, 0.42	0.46
IV	−1.73	−2.48, −0.97	<0.001	−1.02	−1.73, −0.32	0.004
V (most deprived)	−3.13	−3.92, −2.34	<0.001	−1.95	−2.68, −1.21	<0.001
Marital status (reference: single, never married)						
Married	1.39	0.74, 2.03	<0.001	0.59	−0.01, −1.19	0.06
Separated	1.70	0.41, 3.0	0.01	−3.82	−5.03, −2.62	<0.001
Divorced	−0.55	−1.53, 0.43	0.28	−1.79	−2.71, −0.88	<0.001
Widowed	1.38	0.28, 2.49	0.01	−0.57	−1.60, 0.46	0.28
Age finished full time education (reference: not yet finished at time of survey)						
Never went to school	−0.93	−4.65, 2.79	0.62	−2.82	−6.28, 0.64	0.11
14 or under	−1.47	−2.96, 0.02	0.05	−1.62	−3.00, −0.23	0.02
15	−0.32	−1.58, 0.95	0.62	−1.11	−2.28, 0.07	0.07
16	0.99	−0.26, 2.23	0.12	−0.47	−1.63, 0.69	0.43
17	0.58	−0.76, 1.92	0.40	0.46	−0.78, 1.71	0.47
18	1.11	−0.37, 2.58	0.14	0.75	−0.62, 2.12	0.28
19 or over	2.18	0.92, 3.44	0.001	−0.92	−1.27, 1.08	0.88
Comorbidities[b]						
Hypertension	−2.43	−2.97, −1.89	<0.001	−1.27	−1.77, −0.77	<0.001
Myocardial infarction	−6.51	−7.79, −5.23	<0.001	−1.21	−2.40, −0.02	0.047
Stroke	−7.13	−8.71, −5.55	<0.001	−3.76	−5.24, −2.29	<0.001
Diabetes	−3.02	−4.18, −1.85	<0.001	−0.35	−1.44, 0.74	0.53
Respiratory condition	−5.84	−6.68, −5.00	<0.001	−2.31	−3.09, −1.53	<0.001

95% CI, 95% confidence interval.
[a] Reference is without the symptom.
[b] Reference is without the condition.

Health Survey, the Edinburgh Artery Study examined the current intermittent claudication, but unlike the 2003 Scottish Health Survey, was limited to people aged 55–74 years.

In the 2003 Scottish Health Survey [7], both angina and intermittent claudication were associated with significantly worse self-assessed general health and health-related quality of life when compared to participants without either of these symptoms. Although the adjusted analyses of five year mortality did not suggest a difference in this outcome for participants with either angina or intermittent claudication compared to survey participants without either symptom this may be due to small numbers. Nor was there any difference in the likelihood of mental health problems between participants with intermittent claudication and those without this symptom or angina when we adjusted for age, sex, marital status, education and comorbidity.

Relative to participants with intermittent claudication, individuals with angina fared worse for self-assessed general health, mental health and health-related quality of life, and although with the exception of grade 2 angina when compared to grade 1 intermittent claudication, five-year mortality was similar for participants with either symptom, this may be due to small numbers.

Only one other community-based study [6] has, to our knowledge compared the quality of life of individuals with intermittent claudication, or angina or without either symptom. Health related quality of life in people with angina or intermittent claudication was also examined in the 12 year follow-up of the Edinburgh Artery Study [6]. Of the

Table 6
All-cause mortality at five years according to the presence of intermittent claudication, angina or neither symptom.

	Neither angina nor intermittent claudication	Angina			Intermittent claudication		
		Grade 1	Grade 2	Grade 1 or grade 2	Grade 1	Grade 2	Grade 1 or grade 2
	n = 7025	n = 137	n = 68	n = 205	n = 99	n = 74	n = 173
All-cause mortality at 5 years, % [95% CI]	4.1 [3.7, 4.6]	9.5 [5.6, 15.8]	18.0 [10.6, 29.5]	12.3 [8.5, 17.6]	7.1 [3.4, 14.3]	8.1 [3.7, 17.2]	7.5 [4.4, 12.6]

	Unadjusted p	Adjusted p
Neither angina nor intermittent claudication vs. angina	p<0.001	p = 0.10
Neither angina nor intermittent claudication vs. intermittent claudication	p = 0.03	p = 0.65
Angina vs. intermittent claudication	p = 0.14	p = 0.16
Grade 1 angina vs. grade 1 intermittent claudication	p = 0.52	p = 0.19
Grade 1 angina vs. grade 2 intermittent claudication	p = 0.74	p = 0.29
Grade 2 angina vs. grade 1 intermittent claudication	p = 0.04	p = 0.02
Grade 2 angina vs. grade 2 intermittent claudication	p = 0.10	p = 0.10
Grade 1 angina vs. grade 2 angina	p = 0.09	p = 0.27
Grade 1 intermittent claudication vs. grade 2 intermittent claudication	p = 0.80	p = 0.84

95% CI, 95% confidence interval.

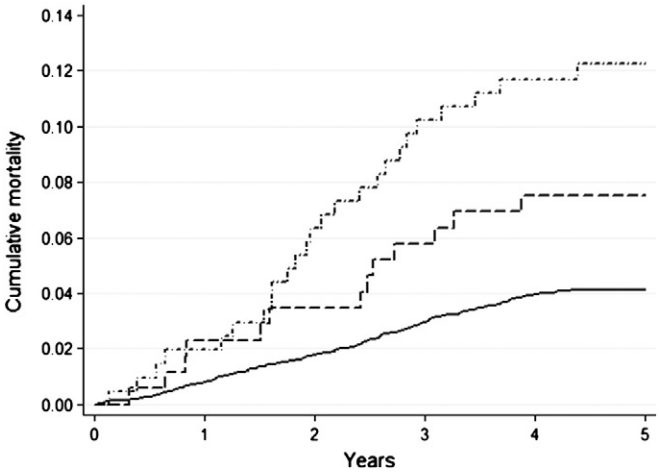

Fig. 1. All-cause mortality at five years according to the presence of intermittent claudication, angina or neither symptom. Solid line is neither intermittent claudication nor angina, dashed line is intermittent claudication, and dotted line is angina.

1107 survey participants alive after 12 years, 925 participated in the long-term follow-up [6]. Participants completed the World Health Organization (WHO) angina and intermittent claudication questionnaires and health-related quality of life was examined using the Short Form-36 (SF-36). Thirty one participants had intermittent claudication without angina and 99 participants had angina without intermittent claudication [6]. No significant difference in the physical or mental component-scores of the SF-36 was found between these two groups [6].

In a study of 89 patients with coronary artery disease and 89 patients with PAD, patients with PAD had worse health-related quality of life as measured by the SF-36 than patients with coronary artery disease [2], however, there was an overlap of symptoms between the two groups and it could be argued that patients with PAD had more severe disease than those with coronary artery disease in this cohort. Patients with PAD had chronic severe PAD described as "presence of pain at rest, ulcerations or gangrene, and an ankle/brachial index (ABI) <90% or incompressible arteries" and 41% were at Fontaine stage 3 (rest pain) and 59% were at Fontaine stage 4 (gangrene). Patients with coronary artery disease were graded Canadian Cardiovascular Class 1 (2%), Class 2 (12%) or Class 3 (58%) or Braunwald classification 1 (27%) [2].

The Peripheral Arterial Disease Awareness, Risk, and Treatment: New Resources for Survival (PARTNERS) Program compared health-related quality of life of individuals with PAD (ABI <0.90 or prior history of PAD) to that of people without clinical or hemodynamic evidence of PAD or other cardiovascular disease and people with a clinical history of cardiac or cerebrovascular disease (and without PAD) [25]. Participants with PAD had similar physical and mental component scores on the SF-36, which were worse than those of the reference group without clinical or hemodynamic evidence of PAD or other cardiovascular disease [25].

This current analysis adds to the literature on the impact of common symptoms of cardiovascular disease on the health and wellbeing of those affected. Many previous studies examining the impact of angina or intermittent claudication on these measures involved patient cohorts or assessed the impact of a disease-specific intervention. This analysis is unique in that the participants are a random cross-sectional sample of the general population and the number of participants in each group is much larger than in previous studies [6]. Moreover, we were able to compare health-related quality of life measures in a large number of controls from the sample population without either angina or intermittent claudication.

The etiologies of angina and intermittent claudication are similar; both are typically precipitated by physical exertion and impair mobility and activity endurance. Yet participants with angina fared worse in terms of physical and mental quality of life than those with intermittent claudication, along with worse self-rated health and a higher likelihood of mental health problems. The impact of peripheral arterial disease on quality of life may be less because patients don't consider lower limb symptoms as threatening to their long-term health as chest pain. Indeed, they may be less likely to present to health services and be diagnosed (and there is evidence that peripheral arterial disease is under diagnosed [26]). Physicians may also underestimate the prognostic significance of peripheral arterial disease compared with angina.

Although we have performed adjusted analyses which have controlled for several important factors such as age, sex, marital status, socioeconomic status, education and comorbidities (hypertension, myocardial infarction, stroke, diabetes or a respiratory condition) there may be other factors contributing to the between-group differences observed across the outcomes examined. The findings from the multivariable linear regression of the physical and mental component-scores of the SF-12 provide some clue that there are other unconsidered factors which may affect these outcomes. For example, 27% of the variation in the physical component-score was accounted for with the baseline variables considered in the model. In comparison, the same model accounted for only 7% of the variation in the mental component-scores. Other factors not considered which may account for some of the differences in the outcomes examined between these two symptom groups may include the length of illness, management and treatment and other comorbidities, including previous and current mental health problems.

Although participants with angina in the 2003 Scottish Health Survey [7] typically had a greater likelihood of mental health problems, lower physical and mental health component-scores than participants with intermittent claudication, the impact of intermittent claudication on physical and psychological morbidity and mortality is consistently reported [2,3,6,27,28] and should not be underestimated or ignored. Our findings, when compared to those without either symptom in this survey serve to highlight the importance of addressing these outcomes for individuals with intermittent claudication as well as for those with angina.

The small, but statistically non-significant difference in five-year mortality rates for those with angina and intermittent claudication may be due to small numbers. Other studies have examined the influence of concurrent symptomatic PAD and CAD on prognosis [5], but to our knowledge few studies consider long-term prognosis in community-based individuals with isolated symptomatic PAD and CAD.

There may be additive or negative synergistic consequences on health-related quality of life, self-assessed general health, mental health as well as prognosis for people with both angina and intermittent claudication which we have not examined due to small numbers. A recent study highlights the impact of concurrent angina and symptomatic peripheral artery disease on health-related quality of life and symptom burden [5]. Participants with coexisting chronic stable angina and symptomatic peripheral arterial disease in the Coronary Artery Disease in General Practice (CADENCE) study had a longer history of heart disease, were more likely to experience angina on a weekly basis and had poorer health-related quality of life compared to participants with chronic stable angina without symptomatic PAD [5].

The screening tools used to identify intermittent claudication and angina are widely used and validated, however, they do not take into account asymptomatic cases. Asymptomatic PAD has been shown to have a negative impact on quality of life and is therefore an important consideration [29], and some participants with angina or without angina or intermittent claudication may have asymptomatic disease. As both questionnaires focus on symptoms, cases where these symptoms are well managed may not have been captured. There may be

some cases in our analysis where angina or intermittent claudication has not been identified due to issues affecting mobility or health which would impair an individual from exercising to a level which would elicit the presentation of angina or intermittent claudication which typically occur with physical exertion. This sample will have included individuals who may be house-bound as all survey screening was conducted in the participant's home. The SF-12 is a generic tool used to measure health-related quality of life; a disease-specific tool may be more sensitive to health-related quality of life for individuals with angina [30] or intermittent claudication [31]. We have not explored what type of mental health problems these individuals are likely to have and this warrants further research.

In this cohort, the long-term prognosis of these two symptom groups was similar (albeit that this may be the result of small numbers); however the impact of angina on general health, mental health and health-related quality of life was greater than that of intermittent claudication. Both angina and intermittent claudication impair physical and mental health and health-related quality of life, even when each symptom occurs in isolation. Understanding the impact of these two common symptoms is important in health services planning and tailoring and targeting healthcare interventions for people with angina and those with intermittent claudication.

Acknowledgments

The authors wish to acknowledge the staff at the Information Services Division (ISD), National Health Service Scotland for the data used in this analysis and the following members of the Peripheral Artery Disease Project Advisory Group: Mr Dominique Byrne — Department of Vascular Surgery, Gartnavel General Hospital, Glasgow, United Kingdom (provided clinical interpretation of findings); Dr James Chalmers — Information Services Division, National Health Service Scotland, Edinburgh, United Kingdom (provided support for interpretation of data) and Mr Adam Redpath — Information Services Division, National Health Service Scotland, Edinburgh, United Kingdom (provided support in the interpretation of data).

Dr Sally C Inglis is supported by an Overseas Public Health Post-Doctoral Fellowship from the National Health and Medical Research Council (NHMRC) of Australia and the Heart Foundation of Australia (NHMRC Grant ID 472 699). Dr Inglis is a member of the National Health and Medical Research Council funded National Centre of Research Excellence for Peripheral Arterial Disease (NCRE-PAD).

Professor Simon Stewart is supported in the form of a Senior Research Fellowship from the National Health and Medical Research Council of Australia (NHMRC Grant ID 472658).

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