Prevalence and clinical characteristics of left ventricular dysfunction among elderly patients in general practice setting: cross sectional survey

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Abstract

Objective To assess the prevalence and clinical characteristics of left ventricular dysfunction among elderly patients in the general practice setting by echocardiographic assessment of ventricular function.
Design Cross sectional survey.
Setting Four centre general practice in Poole, Dorset.
Subjects 817 elderly patients aged 70-84 years.
Main outcomes Echocardiographic assessment of left ventricular systolic function including measurement of ejection fraction by biplane summation method where possible, clinical symptoms, and signs of left ventricular dysfunction.
Results The overall prevalence of left ventricular systolic dysfunction was 7.5% (95% confidence interval 5.8% to 9.5%); mild dysfunction (5.0%) was considerably more prevalent than moderate (1.6%) or severe dysfunction (0.7%). Measurement of ejection fraction was possible in 82% of patients (n = 667): in patients categorised as having mild, moderate, or severe dysfunction, the mean ejection fraction was 48% (SD 12.0), 38% (8.1), and 26% (7.9) respectively. At all ages the prevalence was much higher in men than in women (odds ratio 5.1, 95% confidence interval 2.6 to 10.1). No clinical symptom or sign was both sensitive and specific. In around half the patients with ventricular dysfunction (52%, 32/61) heart failure had not been previously diagnosed.
Conclusions Unrecognised left ventricular dysfunction is a common problem in elderly patients in the general practice setting. Appropriate treatment with angiotensin converting enzyme inhibitors has the potential to reduce hospitalisation and mortality in these patients, but diagnosis should not be based on clinical history and examination alone. Screening is feasible in general practice, but it should not be implemented until the optimum method of identifying left ventricular dysfunction is clarified, and the cost effectiveness of screening has been shown.

Introduction

Heart failure is a common cause of hospitalisation and death across the industrialised world. In contrast to coronary artery disease and stroke, the number of hospital admissions and deaths attributed to heart failure is increasing, and this rise is predicted to continue.[1–4] Improving the diagnosis and care of patients with heart failure is therefore likely to have a major impact on morbidity, mortality, and healthcare costs, which in the United Kingdom are estimated to be £360 million a year.[5]

Systolic left ventricular dysfunction, which can be observed by echocardiography, is the commonest cause of the clinical syndrome of heart failure. Clinical trials have shown that treatment, particularly with angiotensin converting enzyme inhibitors, can increase survival and improve quality of life for patients with severe, moderate, and mild systolic left ventricular dysfunction.[6–9] The substantial protective effect of treatment on mortality and hospitalisation has been shown in a meta analysis (odds ratio 0.65, 95% confidence interval 0.57 to 0.74).[10] Progression to overt clinical heart failure can also be delayed by treatment of asymptomatic left ventricular dysfunction.[11]

The ability to develop a coherent strategy to apply the evidence in a community setting is limited by a lack of knowledge about the extent, severity, and age distribution of left ventricular systolic dysfunction in the general population.[12] The prevalence of clinical heart failure has been reported from Framingham[13] and elsewhere,[14] but knowledge of the prevalence of left ventricular systolic dysfunction, as determined by echocardiography, in the United Kingdom is limited to one cross sectional survey in Glasgow of patients aged 25-74 years.[15] This survey was restricted to responders to the 1992 monitoring trends and determinants in cardiovascular disease risk factor survey and included few patients from elderly age groups, who contribute most to the overall burden of heart failure. Our study aimed to determine the prevalence of left ventricular systolic dysfunction, as detected by echocardiography, in patients from an unselected general practice population aged over 70 years.

Subjects and methods

Sample

We selected a random sample of 1200 individuals aged 70-84 years from the age-sex register of a large four centre group general practice in Poole, Dorset. Of these patients, we excluded 144 (12.0%) as they had died or were no longer registered with the practice.

The remaining 1056 patients were invited to attend for clinical and echocardiographic examination. Housebound patients were offered a home assessment. In total, 817 (77.4%) patients received an echocardiographic assessment. The mean age of those assessed was 76.1 years (SD 3.9 years), and 442 (54.1%) of them were women. Patients who declined assessment were slightly older (mean 77.0 years, SD 4.2, P = 0.004) and more likely to be women (62.0%, P = 0.03).

The study was approved by the local research ethics committee.

Clinical assessment

We collected data on 12 clinical symptoms and signs that are commonly considered by clinicians in primary care in the diagnosis of heart failure. The symptoms were breathlessness at rest, when walking, when trying to sleep, and at any time in the previous two weeks. The signs were tachycardia (>90 beats/min), third heart sound, gallop rhythm, raised jugular venous pressure (>5 cm), hepatomegaly, hepatojugular reflux, basal crepitations, and bilateral ankle oedema. Patients who attended the surgery were seen in sequence by the study doctor, echocardiography technician, and nurse. Patients unable to attend were offered the same assessment at home. The blood pressure recorded was the mean of two readings taken with the patient rested and sitting, using an automatic sphygmomanometer (UA-751, A and D Medical, Tokyo).

Echocardiography

A detailed echocardiographic examination was performed by an experienced senior cardiac technician without reference to the clinical findings of the doctor, using a Sonos 100 CF (Hewlett Packard, MS, USA) cardiovascular imaging system providing two dimensional echocardiography, spectral Doppler and colour Doppler flow mapping information using a 2.5 or 3.5 MHz duplex transducer and a 1.9 MHz sound only continuous wave Doppler transducer. Standard views were obtained with the patient in the left lateral position. Images were stored on videotape. Two dimensional, M mode, colour flow, and Doppler studies were performed on all patients. Left ventricular function was assessed qualitatively as normal, mild, moderate, or severe dysfunction. Where possible, we calculated the ejection fraction by the biplane disc summation method (Simpson's rule).[16]

The final decision on grading of ventricular dysfunction was made by a senior cardiologist (IS). The assessment was achieved by reanalysis of videotape recordings of patients who were found by the technician to have any degree of left ventricular dysfunction, with the first results concealed. Normal left ventricular function was reported if there was no more than one dysfunctional echocardiographic segment of the left ventricular myocardium. Mild global left ventricular hypokinesis was regarded as normal in the presence of β blockers or other negatively inotropic agents. In three patients the videotape recording was inadequate, and in a further eight patients a videotape was not available because they had been assessed at home. In these cases, classification was based on the judgment of the technician who had conducted the initial examination.

We maintained continuous quality assurance by asking a sample of around 5% of patients (weighted by abnormality) to attend for rescreening at the local hospital. Results were given continually to the practice based technician. As a further quality control measure, we interspersed videotaped recordings of a random sample of 23 patients who had normal ventricular function with the abnormal tapes reanalysed by the cardiologist, without any means of distinguishing them. All patients were confirmed as normal.

Review of medical records

We reviewed the computerised and paper records, including hospital correspondence, for all patients with echocardiographic evidence of left ventricular dysfunction. Any record of a previous diagnosis of ventricular dysfunction or heart failure by a general practitioner or hospital cardiologist, an echocardiogram report of heart failure or left ventricular dysfunction, or a chest *x* ray report of heart failure or increased cardiothoracic ratio were accepted as evidence of a previous diagnosis of heart failure.

Statistical analysis

We carried out statistical analysis using Stata.[17] We used the χ^2 test to compare categorical variables, and two sample *t* tests for quantitative variables. We calculated 95% confidence intervals using the binomial exact method for binary variables, and we estimated odds ratios using the Mantel Haenzsel method and logistic regression. We developed a multivariate model using forward selection with an entry criterion of P≤0.05 using a likelihood ratio test (see table 4). We developed the model presented in table 5 using factors from the clinical history and examination detected in five or more patients. These were included initially in a backward stepwise logistic regression model using a significance level of <0.1 for entry and >0.2 for removal. These criteria enabled more of the clinical factors to be included and their predictive power presented. The inclusion of age and sex in this model altered the odds ratio for the clinical variables only slightly, and the odds ratios presented in table 5 are not adjusted for these variables.

Results

Table 1 shows the prevalence of left ventricular systolic dysfunction in men and women. Prevalence was significantly higher in men than in women (12.8% versus 2.9%; P < 0.001). Mild dysfunction was considerably more prevalent (5.0%) than moderate dysfunction (1.6%) or severe dysfunction (0.7%). It was possible to make a measurement of ejection fraction in 667 patients (82%). The mean ejection fraction for normal, mild, moderate, and severe categories was 66.3% (SD 13.5), 47.7% (12.0), 38.3% (8.1), and 26.0% (7.9) based on measurement in 624, 29, 9, and 5 patients respectively.

Table 2 shows the prevalence of any grade of dysfunction by age and sex. The overall prevalence of all grades of dysfunction was 7.5% (95% confidence interval 5.8% to 9.5%). Prevalence was more than twice as high at age ≥80 than at ages 70-74, but the relative difference between men and women was preserved (20.5% versus 5.4%; P < 0.05).

Table 1 Prevalence of echocardiographically graded left ventricular function by sex

	Men (n=375)		Women (n=442)	
Left ventricular function	**No**	**Prevalence (%) (95% CI)**	**No**	**Prevalence (%) (95% CI)**
Normal	327	87.2 (83.3 to 90.4)	429	97.1 (95.0 to 98.4)
Mild dysfunction	31	8.3 (5.7 to 11.5)	10	2.3 (1.1 to 4.1)
Moderate dysfunction	11	2.9 (1.5 to 5.2)	3	0.7 (0.1 to 2.0)
Severe dysfunction	6	1.6 (0.6 to 3.4)	0	0 (0 to 0.8)*

*One sided 97.5% confidence interval.

Table 2 Age specific prevalence of abnormal left ventricular function*

Age group (years)	Men		Women		Men and women combined	
	No	**Prevalence (%) (95% CI)**	**No**	**Prevalence (%) (95% CI)**	**No**	**Prevalence (%) (95% CI)**
All ages	48/375	12.8 (9.6 to 16.6)	13/442	2.9 (1.8 to 5.0)	61/817	7.5 (5.8 to 9.5)
70-74	17/180	9.4 (5.5 to 14.7)	4/184	2.2 (0.6 to 5.5)	21/364	5.8 (3.6 to 8.7)
75-79	16/122	13.1 (7.7 to 20.4)	4/166	2.4 (0.7 to 6.1)	20/288	6.94 (4.3 to 10.5)
80-84	15/73	20.5 (12.0 to 31.6)	5/92	5.4 (1.8 to 12.2)	20/165	12.1 (7.6 to 18.1)

*Abnormal includes mild, moderate, and severe dysfunction.

Tables 3 and 4 show the characteristics that predict left ventricular dysfunction and that might therefore be used as criteria for selective screening in general practice. Reassuringly, the strongest predictor in the multivariate model presented in table 4 was a previous diagnosis of heart failure (adjusted odds ratio 5.8, 95% confidence interval 2.9 to 11.5) followed by male sex (5.1, 2.6 to 10.1). A previous diagnosis of vascular disease (stroke, myocardial infarction, or angina) was also associated with around a twofold increase in risk of left ventricular dysfunction. The overall increase in risk with age was around 10% per year. Smoking history showed no significant association with echocardiographic findings. About half (48%, 29/61) of all patients with left ventricular dysfunction had previous heart failure documented in their medical records: 83% (5/6) in patients with severe dysfunction compared with 34% (14/41) in patients with mild dysfunction.

Table 5 shows the clinical variables, including medical history, that independently predicted left ventricular dysfunction. The strongest predictors were history of myocardial infarction (odds ratio 3.8; positive likelihood ratio 4.3) and angina (2.6; 3.3). The most specific physical sign was a raised jugular venous pressure >5 cm (specificity 97%, 95% confidence interval 95% to 98%). The most sensitive physical sign was basal crepitations (sensitivity 44%, 32% to 56%). Hepatomegaly (n=3), hepatojugular reflux (n=3), and gallop rhythm (n=2) did not show significant univariate association with left ventricular dysfunction. A third heart sound was detected in only one patient; this patient did have left ventricular dysfunction. If those patients with left ventricular dysfunction who had previously been diagnosed with heart failure were excluded from the analysis, then none of the clinical examination variables contributed to the model of independent predictors of left ventricular dysfunction. Of the patients who on examination had one of the factors included in the multivariate model, only between one seventh and one quarter of them had abnormal left ventricular function on echocardiographic examination.

The proportion of those patients with left ventricular dysfunction who had been prescribed treatment with diuretics was 36% (22/61), with angiotensin converting enzyme inhibitors was 33% (20/61), and with digoxin was 16% (10/61).

Table 3 Risk factors for any grade of left ventricular dysfunction by univariate analysis with Mantel Haenzsel odds ratios adjusted for age and sex (n=817)

	% (No) of patients			
Risk factor	**With left ventricular dysfunction (n=61)**	**With no left ventricular dysfunction (n=756)**	**Odds ratio (95% CI)**	**P value**
Male	79 (48)	43 (327)	5.0* (2.6 to 9.6)	<0.001
Never smoked	21 (13)	35 (268)	1 (baseline)	—
Former smoker	72 (44)	55 (418)	1.3 (0.7 to 2.4)	0.430
Current smoker	7 (4)	9 (70)	0.8 (0.2 to 2.3)	0.620
Age group (years)				
70-74	34 (21)	45 (343)	1 (baseline)	—
75-79	33 (20)	35 (268)	1.4† (0.7 to 2.6)	0.339
80-84	33 (20)	19 (145)	2.5† (1.3 to 4.9)	0.005
Self reported history				
Any heart disease	80 (49)	50 (377)	4.1 (2.1 to 8.0)	<0.001
Hypertension‡	41 (25)	35 (263)	1.4 (0.8 to 2.5)	0.207
Angina	48 (29)	16 (119)	4.3 (2.5 to 7.6)	<0.001
Myocardial infarction	39 (24)	9 (70)	4.9 (2.7 to 9.0)	<0.001
Heart failure	34 (21)	6 (45)	7.3 (3.8 to 14)	<0.001
Stroke	15 (9)	4 (33)	3.1 (1.3 to 7.5)	0.006
Diabetes	10 (6)	6 (43)	1.7 (0.7 to 4.5)	0.258

*Age adjusted only.
†Sex adjusted only.
‡Including clinical measurement of blood pressure (systolic ≥160 mmHg or diastolic ≥90 mmHg) reduced odds ratio to 1.0 (95% confidence interval 0.6 to 1.8).

Table 4 Odds ratio of having any grade of echocardiographically abnormal left ventricular function from multivariate logistic regression model (n=816)

Variable	Odds ratio (95% CI)	P value
Male	5.1 (2.6 to 10.1)	<0.001
Age (per year)	1.1 (1.0 to 1.2)	0.028
Heart failure*	5.8 (2.9 to 11.5)	<0.001
Myocardial infarction*	2.6 (1.3 to 5.2)	0.007
Stroke*	2.6 (1.1 to 6.4)	0.034
Angina*	2.1 (1.1 to 4.2)	0.031

*History reported by subject of these conditions at any age.

Discussion

Left ventricular systolic dysfunction is common in elderly patients in general practice. About 1 in 20 patients aged 70-74 and 1 in 10 patients aged 75-84 have left ventricular dysfunction. There are no comparable data for patients aged over 75 years, but for patients aged 65-74 years our estimate is consistent with the

estimated prevalence of ventricular dysfunction of 5.6% reported from a Glasgow study (Glasgow has a substantially higher standardised mortality ratio for cardiovascular disease, but the sample assessed was limited to a selected population of responders to a questionnaire).[15] The prevalence of ventricular dysfunction in a smaller sample from Rotterdam, aged ≥70 years, was considerably lower at 4.2%.[18] Patient selection and a lower response rate could account for the low prevalence in this Dutch population, which was described as relatively healthy.

A key finding of our study is the higher prevalence of disease in men than in women. This is consistent with gender differences in the prevalence of ischaemic heart disease, but runs contrary to the general practice stereotype of an elderly breathless woman with swollen legs. Interestingly, previous prevalence estimates in the United Kingdom, which have relied on review of general practice records based on assessment of clinical features, electrocardiograms, and chest *x* rays,[19 20] have shown no apparent gender difference in prevalence in elderly age groups. This may reflect the difficulty of making a reliable diagnosis of heart failure without echocardiography, particularly in patients who may have peripheral oedema and breathlessness for a variety of non-cardiac causes.[21]

At the design stage of our study we agreed that prevalence should be reported on the basis of categorical grading of global left ventricular systolic function rather than quantitative measurement of ejection fraction. This decision was made partly in the knowledge of the difficulty of making reliable measurements of ejection fraction in this age group (especially in subjects most likely to have abnormal left ventricular function), and partly because we anticipated that global assessment was likely to be the best predictor of outcome and benefit from treatment in elderly patients. Without longer follow up we lack data to justify the assertion that global assessment is likely to be the best predictor of outcome and benefit from treatment in elderly patients, but the clear separation and gradient of mean ejection fraction for each category indicates that qualitative categorisation and quantitative assessment of ejection fraction are broadly consistent with each other.[22] The number of abnormal echocardiograms not reviewed by the cardiologist was small, and thus even if all were false positive diagnoses these would only have inflated the prevalence by 1.3%.

The high response rate, the use of home assessment, and the similar demographic characteristics of responders and non-responders encourages us to believe that our prevalence estimates are robust. It seems unlikely that the lower assessment rate among women can account for more than a small part of the observed gender difference. Our study was, however, set in a desirable retirement area, which is likely to have had inward migration of more affluent and possibly fitter elderly people. Thus our prevalence estimate may be lower than in less privileged areas and may underestimate the prevalence of left ventricular dysfunction in the United Kingdom.

Only half of our patients with left ventricular dysfunction had a previous record of heart failure in their medical records. This was confirmed by the observed levels of prescribing of diuretics and angiotensin converting enzyme inhibitors. There are a substantial number of elderly individuals who have asymptomatic or misdiagnosed left ventricular dysfunction, which is likely to be due to the very limited sensitivity and specificity of clinical history taking and examination in general practice. Only 11% of patients with left ventricular dysfunction will have a raised jugular venous pressure. Bilateral ankle oedema has the unfortunate characteristic of relatively high prevalence in the general population and relatively low specificity. Although these clinical findings are useful in acute severe heart failure at the time of hospitalisation, they have only a small role in detecting left ventricular dysfunction in the community.[23 24] Our study extends and explains the findings of Remes, that the clinical diagnosis of left ventricular dysfunction in primary care is not accurate or easy.[21] Clinical diagnosis based on raised jugular venous pressure, bilateral ankle oedema, or basal crepitations will very often be misleading.

On the evidence of our study, targeting individuals for more detailed assessment on the basis of gender, age, and a history of ischaemic heart disease would detect a substantial proportion of the currently unrecognised left ventricular dysfunction. However, it would be unwise to embark on a screening programme in elderly people (whether or not selected by age, sex, or medical history) until we have better evidence of its cost effectiveness in this elderly patient group.

Table 5 Clinical factors that independently predict left ventricular dysfunction, and their sensitivity, specificity, and positive likelihood ratio

Variable	Odds ratio* (95% CI)	Sensitivity (%)	Specificity (%)	Positive likelihood ratio
History				
Breathlessness when walking	2.3 (0.9 to 6.4)	15 (9/60)	97 (730/751)	5.4
Examination				
Jugular venous pressure >5 cm	2.4 (0.8 to 6.8)	11 (7/61)	97 (721/745)	3.6
Basal crepitations	2.4 (1.3 to 4.3)	44 (6/61)	82 (727/751)	2.4
Bilateral peripheral oedema	1.9 (0.9 to 4.1)	18 (11/61)	91 (684/751)	2.0
Past history				
Myocardial infarction	3.8 (1.9 to 7.4)	39 (24/61)	91 (686/756)	4.3
Angina	2.6 (1.4 to 5.0)	48 (29/61)	84 (637/756)	3.3

*Adjusted for other factors by multivariate analysis (see text).

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Key messages

- Left ventricular dysfunction detected by echocardiography is common in elderly people
- Men are much more likely to be affected than women
- The accuracy of clinical diagnosis is very limited in this age group
- Many patients who would benefit from treatment remain undetected

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Patients' perceptions of medical explanations for somatisation disorders: qualitative analysis

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Abstract

Objectives To describe, from the perspective of patients, distinguishing features of doctors' attempts to explain the symptoms of somatisation disorders.
Design Qualitative analysis of verbatim records of interviews in which patients recounted doctors' explanations of their symptoms.
Setting Patients with persistent somatising symptoms referred from general practices in Liverpool and St Helens and Knowsley were interviewed before entry into a treatment programme.
Subjects 228 of 324 patients referred were interviewed. Initial interviews were used to develop the process and technique, and the final analysis was based on a subsample of 68 records, randomly chosen from the transcripts of 188 subjects who were interviewed subsequently.
Results Doctors' explanations were often at odds with the patients' own thinking. Analysis showed that medical explanations could be grouped into one of three categories, defined by the patients' perceptions. Most explanations were experienced as rejecting the reality of the symptoms. An intermediate category comprised explanations that were viewed as colluding, in which the doctor acquiesced with the patients' own biomedical theories. However, a few explanations were perceived by patients as tangible, exculpating, and involving. These explanations were experienced by patients as satisfying and empowering.
Conclusions Patients with somatisation disorders feel satisfied and empowered by medical explanations that are tangible, exculpating, and involving. Empowering explanations could improve these patients' wellbeing and help to reduce the high demands they make on health services.

Introduction

The nomenclature of disease has been developed to facilitate communication between doctors and other healthcare professionals. It is not designed to provide explanations for patients, and may occasionally be used to obscure their understanding.[1] Recent emphasis on doctors' communication skills reflects not only mounting pressure from patients who want information so that they can participate in their own care[2] but also the profession's wish to uphold its traditional responsibility of translating its language and thinking into terms that can be understood by lay people.[3 4]

Lay beliefs about illness form a parallel but much less well recognised explanatory system reflecting cultural, social, and political influences—for example, from the media or the activities of pressure groups.[5 6]