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The influence of general health status and social support on symptomatic outcome following coronary artery bypass grafting

G M Lindsay, L N Smith, P Hanlon, D J Wheatley

Abstract

Objectives—To assess health status, level of social support, and presence of coronary artery disease risk factors before and after coronary artery bypass grafting (CABG); to assess symptomatic relief approximately 12 months postoperatively; and to examine the association between preoperative health status and recurrence of symptoms.

Design—Observational study.


Subjects and methods—Patients awaiting elective CABG were recruited one month before the expected date of operation. Preoperative assessment included severity of symptoms, coronary artery disease risk factors, short form 36 (SF-36) questionnaire, and social activities questionnaire. The presence and severity of angina and breathlessness were reported postoperatively (mean 16.4 months). Multiple regression analysis was used to identify factors associated with improved outcome following CABG.

Main outcome measure—Patient reported presence and severity of angina and breathlessness.

Results—183 patients were followed for a mean of 16.4 months after CABG. Angina and breathlessness were completely relieved in 55% and 36% of patients, respectively. In patients with residual symptoms, the severity was significantly reduced (angina p < 0.001; breathlessness, p = 0.02). Patients with low SF-36 scores and low social network scores preoperatively were less likely to be relieved of symptoms (p < 0.001). Health status and social support levels preoperatively were lower than in other reported coronary artery disease patients groups. Preoperatively, coronary artery disease risk factors were higher than recommended in current guidelines: 67.4% had raised plasma cholesterol, 39.0% were hypertensive, 80% were moderately obese, and 22.9% were smokers.

Conclusions—Recurrence of symptoms exceeded other published studies. Patients’ perception of general health, symptoms, and social support influences outcome.

Keywords: health status indicator; coronary artery bypass; social support; risk factors

Coronary artery bypass graft (CABG) surgery has been an accepted treatment for angina pectoris for more than 25 years. Models have been developed that use preoperative information (for example, severity of coronary artery disease; previous CABG; degree of comorbidity) to stratify surgical risk and predict the prognosis following CABG. Models differ with respect to the range of data included and their source (for example, medical records, angiogram results, computerised patient information systems). Although increasing interest in the influence of patient health and wellbeing on outcome following healthcare interventions has been reported, patients’ perspective of their health status has not been a component of models designed to predict prognosis. General health status as perceived by the patient may influence outcome following CABG surgery.

A range of health measurement tools has been developed over the last decade for the purpose of quantifying and differentiating between different health states. One validated health status measure that has been used extensively is the short form 36 (SF-36). This is a general health status measure that has been used to evaluate health status in general population surveys and in the presence of coronary artery disease, and to determine the effectiveness of medical treatments in patients with angina.

Social support is increasingly recognised as an important aspect of life that relates to positive health. In a systematic review of studies investigating aspects of social support, a positive relation between increased social support and a lower incidence of coronary artery disease was found. In that study, social support was considered to be a function of an increased number of social contacts and the quality of those relations, including emotional and confiding support. In the present study, using the SF-36 instrument, we related the patients’ perceived health status preoperatively, their levels of social support, demographic indices, and the presence of preoperative coronary artery disease risk factors to the recurrence and severity of symptoms following CABG.

Methods

Patients
A consecutive sample of patients (n = 214) was recruited over a six month period from the...
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of interpersonal relationships.

including number and type of social contacts

oped as a measure of social wellbeing,

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health assessment questionnaire

been reported as valid and reliable in nor-

mal populations as well as in coronary artery
disease patient groups. It has been found

to be an acceptable health status measure for

use within the NHS. The SF-36 form is a 36

item scale that generates scores for eight
dimensions of health. These are: physical func-
tioning, mental health, bodily pain, general

health, vitality (energy/fatigue), social func-
tioning, role limitations because of physical

problems, and role limitations because of men-
tal health problems (psychological distress and

psychological wellbeing). The scores for each
domain are based on the same scale of 0 to 100;

0 is the worst possible health status and 100 the

best.

The social activities questionnaire was devel-

oped as a measure of social wellbeing,

including number and type of social contacts
together with perceived satisfaction and value

of interpersonal relationships. It consists of

11 questions covering the number of friends
and family the patient has, how much they feel
at ease and "get along" with those contacts,
and how often they meet. In addition, member-
ship and level of activity in clubs, groups, or

voluntary organisations were explored. Scores
are calculated from the responses, with higher
scores being associated with a greater level of
social support. The possible scores range from
a minimum of 8 to a maximum of 50.

The visual analogue scale consists of a

horizontal continuous line ranging from 0 to 7,

where 0 represents "no effect on overall

wellbeing and health" and 7 represents "com-

plete disability, discomfort and restriction to

life". Respondents were asked to indicate the

severity of their symptoms at the time of data

collection by placing a mark on the scale. A

similar scale design has been used in postop-

erative pain assessment.

surgical waiting list for CABG at one cardiac

surgical centre, according to the following

inclusion criteria:

- isolated CABG procedure;

- elective operation;

- residence within approximately 50 miles of

the hospital;

- expected date for operation estimated to be

approximately four weeks after preoperative

assessment for the study.

All patients invited to participate in the study
agreed to take part, and written informed con-

sent was provided. The sample size was set at

214 in order to allow sufficient statistical power
to detect a 10% change in the SF-36 scores

with a confidence level of 90% and a probabil-

ity value of p = 0.05. Ethical approval was

obtained from the research ethics committee of

Glasgow Royal Infirmary. University NHS

(National Health Service) Trust.

ASSessment instruments

Three instruments—the SF-36, 1 the social net-

works assessment, 7 and a visual analogue scale
to assess severity of angina and

breathlessness—were completed by the pa-

tients.

The SF-36 health assessment questionnaire

has been reported as valid and reliable in nor-

mal populations as well as in coronary artery
disease patient groups. 7 8 10. It has been found
to be an acceptable health status measure for

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item scale that generates scores for eight
dimensions of health. These are: physical func-
tioning, mental health, bodily pain, general

health, vitality (energy/fatigue), social func-
tioning, role limitations because of physical

problems, and role limitations because of men-
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plete disability, discomfort and restriction to

life". Respondents were asked to indicate the

severity of their symptoms at the time of data

collection by placing a mark on the scale. A

similar scale design has been used in postop-

erative pain assessment.

Data collection process

Patients were assessed twice: first before their

operation (approximately four weeks before) in

the outpatient department, and second at

approximately 16 months after their operation

in their home. The self completion instruments

were posted to participants before both assess-

ment appointments. All data were collected by

the same researcher.

Preoperative clinical assessment

Demographic details (age, sex, postcode) were

used to estimate socioeconomic status, using

an updated version of the Carstairs and Morris

depression scores. Tobacco smoking habit

was recorded. Blood pressure was measured in

accordance with the British Hypertension

Society guidelines. Plasma cholesterol was

measured from a venous blood sample at the

Institute of Biochemistry, Glasgow Royal In-

fmary NHS Trust, using standardised protocols

and internationally agreed quality assurance

procedures. The patients were weighed in light
clothes without shoes to the nearest 0.1 kg and

height was measured in cm to the nearest

0.5 cm. Body mass index (kg/m2) was derived

from these measurements. Waist measurement

with a flexible tape was taken as the smallest

circumference between the rib cage and the

iliac crest and recorded to the nearest 0.1 cm.

Postoperative assessment

The number of grafts inserted at operation was

noted from the patients’ medical records.

Patients were asked to document whether

angina or breathlessness or both were experi-

enced. When present, the severity was reported

as previously described for the preoperative

assessment.

Statistical methods

Summary statistics were calculated for the

variables recorded in both preoperative and

postoperative assessments. The Mann–

Whitney test and Student’s t test were used to

compare the presurgery variables and the

number of grafts inserted at operation in patients

who were relieved of angina and

breathlessness and in those who continued to

experience symptoms. In addition, a compari-

son was made between demographic character-

istics of our study patients and all patients in

the local health board area undergoing CABG

over the same time period (J Womersley,

Greater Glasgow Health Board, personal com-

munication, 1997), and from the UK cardiac

surgical register. The influence of coronary

artery disease risk factors, socioeconomic

status, health status (SF-36), severity of angina

and breathlessness, and social networks on

presence of symptoms postoperatively was

assessed using multiple linear regression analy-

sis.

Results

Demographics

Table 1 shows the patient demographics,

including age, sex ratio, and distribution

according to socioeconomic deprivation cat-

categories, as measured by the Carstairs classifi-
domains, showing median, interquartile range, and total range of scores.

Figure 2 Box and whisker plot of SF-36 health survey scores for the eight health domains, showing median, interquartile range, and total range of scores.

Table 2 Mean values of major coronary artery disease risk factors, with target levels at preoperative assessment

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Mean (SD)</th>
<th>Per cent exceeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic blood pressure (&gt;140 mm Hg)</td>
<td>134.7 (10.1)</td>
<td>39.0</td>
</tr>
<tr>
<td>Diastolic blood pressure (&gt;90 mm Hg)</td>
<td>81.0 (12.3)</td>
<td>30.0</td>
</tr>
<tr>
<td>Total cholesterol (&gt;5.2 mmol/l)</td>
<td>5.8 (1.2)</td>
<td>67.4</td>
</tr>
<tr>
<td>Body mass index (&gt;25 kg/m²)</td>
<td>28.0 (3.4)</td>
<td>80.8</td>
</tr>
<tr>
<td>Body mass index (&gt;30 kg/m²)</td>
<td>28.0 (3.4)</td>
<td>22.9</td>
</tr>
<tr>
<td>Waist, male (&lt;94 cm)</td>
<td>96.9 (8.1)</td>
<td>36.9</td>
</tr>
<tr>
<td>Waist, female (&lt;80 cm)</td>
<td>91.0 (9.2)</td>
<td>69.2</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>12.6</td>
<td></td>
</tr>
<tr>
<td>Current smoking</td>
<td>22.9</td>
<td></td>
</tr>
</tbody>
</table>

SF-36 HEALTH STATUS
Scores were calculated for the eight domains of health. The median, interquartile range, and total range of scores are presented in fig 2. The mean scores and their standard deviations are presented in table 3 and indicate that physical role limitation was the lowest scored health domain, while mental health was the highest scored or least affected health domain. Comparison with results obtained in other published surveys is also presented in table 3. The patients in this study had lower scores across all domains of health, indicating poorer health status. Because the “role limitation: physical” and “role limitation: emotional” domains were not normally distributed (fig 2), comparison with mean values from the other series presented was not possible.

SOCIAL NETWORK SCORES
The social network scores were calculated from the questionnaire responses returned by the majority of the study group (86.1%; n = 179). The mean (SD) of scores was 24 (7.0) (range 8 to 38). The mean scores were lower than reported in a large survey of the general population (n = 4351) in the USA, where the mean (SD) was 25.8 (7.9). It was not possible with the data available to check whether this observed difference was significant.

ATTRITION AND SURVIVAL RATE
The number of original study patients (n = 214) who underwent the CABG operation was 209 (97.7%). Five patients (2.4%) did not have an operation for various reasons, namely: improvement in clinical status (n = 1), surgical risk subsequently considered too high (n = 1), patient refused operation (n = 2), patient not contacted with date for operation because of misplaced medical records (n = 1). Thirty day postoperative mortality was 4.8% (n = 10).

From a total of 199 patients who survived beyond the 30 day perioperative period, 13 patients refused follow up assessment and three died (two male, one female) during the first year after operation. Thereafter 183 patients, representing 85.5% of the original cohort (n = 214), were followed up completely. Overall one year survival for those who were operated on (n = 209) was 93.08%. Postoperative assessment was undertaken after a mean interval of 16.4 months.

ANGINA AND BREATHLESSNESS
Almost all of the patients reported angina (94.2%) and breathlessness (92.8%) at preoperative assessment. At postoperative assess-
Table 3  SF-36 domain scores for study patients, general population sample, and two groups of patients with coronary artery disease

<table>
<thead>
<tr>
<th>SF-36 domain scores (0–100%)</th>
<th>Study patients</th>
<th>General population: female 55–64 years</th>
<th>General population: male 55–64 years</th>
<th>Recent myocardial infarction*</th>
<th>Recent angina*</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>214</td>
<td>684 (77)</td>
<td>681 (72)</td>
<td>107</td>
<td>256</td>
</tr>
<tr>
<td>Bodily pain</td>
<td>44.1 (25.9)</td>
<td>75.0 (25.1)</td>
<td>78.8 (23.6)</td>
<td>72.8 (25.3)</td>
<td>61.6 (24.5)</td>
</tr>
<tr>
<td>Energy</td>
<td>35.6 (21.4)</td>
<td>59.0 (21.4)</td>
<td>62.0 (22.7)</td>
<td>57.7 (19.0)</td>
<td>48.5 (20.8)</td>
</tr>
<tr>
<td>General health</td>
<td>36.9 (17.1)</td>
<td>68.0 (22.0)</td>
<td>68.1 (22.9)</td>
<td>59.2 (19.3)</td>
<td>52.0 (18.9)</td>
</tr>
<tr>
<td>Mental health</td>
<td>61.1 (18.7)</td>
<td>74.4 (18.5)</td>
<td>78.0 (17.3)</td>
<td>75.8 (15.7)</td>
<td>73.0 (18.7)</td>
</tr>
<tr>
<td>Physical function</td>
<td>34.8 (24.1)</td>
<td>74.8 (23.5)</td>
<td>80.0 (22.1)</td>
<td>69.7 (26.1)</td>
<td>63.2 (26.7)</td>
</tr>
<tr>
<td>Role: emotional‡</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role: physical‡</td>
<td></td>
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</tr>
<tr>
<td>Social function</td>
<td>47.8 (28.3)</td>
<td>85.9 (22.6)</td>
<td>86.9 (22.6)</td>
<td>84.6 (21.2)</td>
<td>80.3 (23.0)</td>
</tr>
</tbody>
</table>

Values are mean (SD) unless otherwise stated.
*See SF-36: health survey manual and interpretation guide.†
‡See Jenkinson et al.‡
§See text and fig 2.

Differences in preoperative variables for patients with and without angina or breathlessness are presented in table 4. Patients who reported angina were more likely to be younger (<p = 0.008) and to have lower health status, as measured by the physical function (p = 0.029), energy and vitality (p = 0.002), bodily pain (p = 0.001), mental health (p = 0.001), and social function scales (p = 0.009) of the SF-36 questionnaire. Patients who reported breathlessness were also more likely to be younger (<p = 0.023), to be current smokers (<p = 0.043), to have lower social network scores (<p = 0.003), to have increased waist circumference (<p = 0.027), and to have suffered lower levels of health preoperatively on the SF-36 scales for physical function (p = 0.067), energy and vitality (p = 0.027), mental health (p = 0.003), and role limitation because of physical factors (p = 0.020).

The contribution of preoperative variables to the presence of angina and breathlessness postoperatively was examined using a multiple linear regression model. Increased age and lower score in bodily pain (SF-36) (that is, more preoperative general pain) were associated with recurrence of angina (R^2 adjusted = 12.5%). Postoperative breathlessness was associated with a lower social networks score, diabetes mellitus, and a lower score in mental health (SF-36) (R^2 adjusted = 12.1%).

Table 4 Differences in preoperative variables between patients with and without angina and breathlessness more than one year after surgery

<table>
<thead>
<tr>
<th>Preoperative variables</th>
<th>Angina postoperation</th>
<th></th>
<th></th>
<th></th>
<th>Breathlessness postoperation</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Present</td>
<td>Absent</td>
<td>p Value</td>
<td>Present</td>
<td>Absent</td>
<td>p Value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>57.1 (8.4)</td>
<td>59.1 (8.6)</td>
<td>0.008</td>
<td>59.9 (6.5)</td>
<td>57.2 (7.9)</td>
<td>0.023</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preoperative angina rating</td>
<td>4.18 (1.77)</td>
<td>4.28 (1.74)</td>
<td>0.704</td>
<td>4.29 (1.71)</td>
<td>4.13 (1.82)</td>
<td>0.554</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preoperative breathlessness rating</td>
<td>3.79 (2.03)</td>
<td>3.97 (1.80)</td>
<td>0.516</td>
<td>4.03 (1.96)</td>
<td>3.65 (1.79)</td>
<td>0.200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex (male/female)</td>
<td>43.6 (57.5)</td>
<td>56.4 (48.5)</td>
<td>0.411</td>
<td>61.1 (75.8)</td>
<td>38.9 (24.2)</td>
<td>0.113</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deprivation category</td>
<td>4.68 (1.78)</td>
<td>4.71 (1.63)</td>
<td>0.915</td>
<td>4.78 (1.67)</td>
<td>4.53 (1.77)</td>
<td>0.336</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social network score</td>
<td>23.3 (7.4)</td>
<td>24.8 (6.3)</td>
<td>0.167</td>
<td>23.0 (7.0)</td>
<td>26.2 (6.1)</td>
<td>0.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current smoker (not current smoker) (%)</td>
<td>48.8 (43.9)</td>
<td>51.2 (56.1)</td>
<td>0.570</td>
<td>0.26 (0.44)</td>
<td>0.22 (0.44)</td>
<td>0.043</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension, systolic (yes/no) (%)</td>
<td>37.5 (47.3)</td>
<td>62.5 (52.7)</td>
<td>0.243</td>
<td>56.3 (66.4)</td>
<td>43.3 (33.6)</td>
<td>0.212</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension, diastolic (yes/no) (%)</td>
<td>55.9 (42.1)</td>
<td>44.1 (57.9)</td>
<td>0.146</td>
<td>64.7 (63.4)</td>
<td>35.3 (36.6)</td>
<td>0.891</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyperlipidaemia (yes/no) (%)</td>
<td>35.8 (56.6)</td>
<td>64.2 (43.4)</td>
<td>0.013</td>
<td>61.3 (64.2)</td>
<td>38.7 (35.8)</td>
<td>0.729</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity (BMI &gt;30) (%)</td>
<td>47.6 (44.3)</td>
<td>52.4 (55.7)</td>
<td>0.704</td>
<td>66.7 (62.9)</td>
<td>33.3 (37.1)</td>
<td>0.653</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased waist circumference</td>
<td>52.4 (41.2)</td>
<td>47.6 (58.8)</td>
<td>0.149</td>
<td>74.6 (58.0)</td>
<td>52.4 (42.0)</td>
<td>0.027</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus (yes/no) (%)</td>
<td>47.8 (44.7)</td>
<td>52.2 (53.3)</td>
<td>0.776</td>
<td>65.2 (63.5)</td>
<td>34.8 (36.5)</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-36 physical function</td>
<td>31.8 (23.7)</td>
<td>39.8 (23.6)</td>
<td>0.029</td>
<td>33.6 (22.6)</td>
<td>40.6 (25.7)</td>
<td>0.007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-36 general health</td>
<td>36.8 (17.4)</td>
<td>37.1 (16.8)</td>
<td>0.907</td>
<td>35.8 (17.0)</td>
<td>38.9 (17.4)</td>
<td>0.252</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-36 energy/vitality</td>
<td>31.6 (20.7)</td>
<td>41.4 (19.4)</td>
<td>0.002</td>
<td>34.3 (20.0)</td>
<td>41.5 (20.9)</td>
<td>0.027</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-36 bodily pain</td>
<td>38.1 (23.4)</td>
<td>50.7 (26.2)</td>
<td>0.001</td>
<td>43.5 (26.1)</td>
<td>47.6 (25.0)</td>
<td>0.315</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-36 mental health</td>
<td>56.5 (19.0)</td>
<td>65.5 (17.3)</td>
<td>0.001</td>
<td>56.5 (18.2)</td>
<td>67.0 (18.1)</td>
<td>0.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-36 social function</td>
<td>44.1 (28.0)</td>
<td>55.1 (26.4)</td>
<td>0.009</td>
<td>49.2 (28.5)</td>
<td>51.5 (26.1)</td>
<td>0.598</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-36 role limitation physical</td>
<td>13.8 (50.9)</td>
<td>16.5 (32.3)</td>
<td>0.577</td>
<td>14.0 (26.7)</td>
<td>22.6 (37.8)</td>
<td>0.020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-36 role limitation emotional</td>
<td>34.6 (44.4)</td>
<td>42.4 (43.8)</td>
<td>0.252</td>
<td>34.7 (42.8)</td>
<td>46.0 (45.8)</td>
<td>0.105</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Values are mean (SD) unless otherwise stated. Significant p values are highlighted in bold font (Mann-Whitney U test).
in the published scores for patients with recent myocardial infarction or angina and the general population group, our patients’ scores are therefore similarly lower than the published data for coronary heart disease groups. This is not unexpected, given that these patients had been referred for operation. In addition, there are many other variables that are not matched in the groups—for example, age, sex ratio, and socioeconomic deprivation category could not be controlled. Because the data are not standardised, interpretation of results must be undertaken with caution. We do, however, consider that they provide a broad context in which the results from our study may be interpreted. Examination of other published series provided a general view of the variation in scores that can be obtained using this instrument. This is the first time that these indices have been used in a predictive model for postoperative symptoms.

SOCIAL SUPPORT NETWORKS
Social support networks were less strong than in other population groups, a factor that has been related to increased incidence of coronary artery disease morbidity and mortality and may reflect the adverse family history. The influence of the level of social support on the symptomatic outcome following CABG indicated that patients were more likely to have breathlessness after operation if levels of social support were low before operation (table 4). Improvements in the perception of general health and wellbeing following CABG have been reported in patients where self esteem has been enhanced through social contacts. This may be an area where interventions to promote and foster supportive social contacts could be beneficial to patients’ health generally and to their postoperative outcomes. This view is supported by a study in which improved social support to patients following myocardial infarction was associated with a decrease in cardiac death or reinfarction. Cardiac rehabilitation provides a social context through which coronary prevention interventions are delivered, and it may be worthwhile to ensure that patients awaiting CABG are included in such programmes.

CORONARY ARTERY DISEASE RISK FACTORS
Raised plasma cholesterol, hypertension, and obesity were common (table 2), although this was not shown to have any influence postoperatively on the occurrence of angina and breathlessness or on their severity. The influence of these factors on native or graft vessel atherogenesis takes longer than the study period. Also reduction in further coronary artery disease events, including death, over a 10 year period can be improved through achievement of levels of coronary artery disease risk factors below those measured in the participants in the present study. The influence of continued smoking upon recurrence of angina was not assessed in this study, although analysis was tied to preoperative smoking habit. Socioeconomic deprivation category was not related to the presence of either angina or breathlessness postoperatively. This may be because the patient group was not drawn evenly from all groups to allow sufficient numbers for comparison. The patients were drawn largely from the east end of Glasgow and were from areas of worse socioeconomic deprivation than all patients undergoing CABG surgery from the local health board area. In addition, they appeared to be significantly younger. Coronary event rates in individuals with coronary artery disease from areas of high socioeconomic deprivation are increased significantly compared with those in individuals from less deprived areas. Therefore the patients in this study had an age profile and socioeconomic deprivation status that confer a higher risk of adverse outcome. The extent to which the results from this study can be generalised should take into account the age and socioeconomic profile of the patients.

ANGINA AND BREATHLESSNESS
There was a trend for patients with high scores in the SF-36 domains of bodily pain, energy and vitality, mental health, and social function to have their angina relieved as a result of CABG surgery, as indicated in table 4. Elimination of angina was enhanced further if their baseline physical function score was also high, but interestingly no other factors appeared to have a significant impact on the elimination or amelioration of angina symptoms at the postoperative assessment. This contrasts with the work of Pocock and colleagues, who showed that high levels of angina before operation were related to return of angina postoperatively. Low physical function scores on the SF-36 have been shown to be independently associated with mortality following CABG.

Fewer patients reported relief of angina than in other studies. However, we found that, despite residual symptoms, there was a significant improvement across all eight domains of the postoperative SF-36 scores (p < 0.001). Pocock and colleagues detected chest pain at one year in 10% of patients, and CABRI trial (coronary angioplasty v bypass revascularisation investigation) participants had 10.9% recurrence of angina. At two years 42% of patients may have recurrent angina. In the latter study patients with chest pain during exercise testing were investigated, but pain did not correlate with signs of myocardial ischaemia. Because there may be several causes of chest pain, further investigation of the exact nature of the pain would be required to confirm its relation to myocardial ischaemia. Exercise testing was not carried out in the present study; therefore assessment of symptoms was solely based on the patients’ reports. Patients with higher preoperative SF-36 scores in the domains of energy/vitality, mental health, and physical role limitation (that is, people who reported better levels of health) were more likely to have their breathlessness eliminated after CABG (table 4). By contrast, current smokers, younger patients, and those with lower levels of social support networks were significantly more likely to have postoperative breathlessness. This may be helpful
information in terms of selection of patients for operation, as poorer outcomes in terms of cardiac events have been reported in smokers, individuals with diabetes mellitus, and in those with lower levels of social support networks. If breathlessness was present after CABG, then patients with high scores in bodily pain, energy and vitality, and social function at baseline assessment were likely to experience the greatest relief of breathlessness. Better health (as measured by five domains of the SF-36 questionnaire), older patients, not smoking, absence of diabetes mellitus, and higher levels of social support before operation were all associated with a better outcome in terms of relief of breathlessness.

The results of the multiple linear regression analysis indicated that the presence of postoperative angina was reduced in older patients and in those with higher preoperative bodily pain. Breathlessness was generally worse in patients with diabetes mellitus, but was improved for patients with high preoperative social network and mental health scores. The remaining variation in the scores is attributable to unidentified factors and to the random nature of the variables measured. The magnitude of the contribution of the preoperative variables observed in this study can be considered as significant in the context of the large range of possible influential factors in a clinical situation of such complexity.

LIMITATIONS

Breathlessness may originate from other pathologies such as chronic obstructive airways disease, and additional investigations would be required to establish that symptoms were directly related to myocardial ischaemia. This is also the case for patient reports of angina. The patients in this study were younger than in local and national datasets, so the extent to which the finding can be generalised to all patients undergoing CABG may be questioned. A limitation of the study was the absence of any objective assessment of the origin of the symptoms reported by the patient, such as exercise tolerance testing or radioisotope imaging studies. This would be important to confirm that the symptoms experienced were a result of myocardial ischaemia. However, patient accounts of the severity of coronary artery disease symptoms are an important measure of severity of disease in terms of clinical management, and represent a critical factor in the use of health services and in care decision making. In addition, no account was taken of the details of the CAGB surgical procedure undertaken other than number of grafts, or of angiographic documentation of disease severity and ventricular function. These factors may vary considerably within the patient group and have a significant effect on outcome.

CONCLUSIONS

The patients in our study reported more angina and breathlessness over one year following CABG surgery than in other previously published studies dealing with symptomatic outcome. Patient’s perceptions of their health status and levels of social support preoperatively were useful indicators of health status postoperatively. The baseline history of patients may help to explain the variability in patient outcome in addition to the known clinical variables. Insight into the particular dimensions of health that were influential was also provided. These indices may be helpful in addition to other clinical factors in identifying high risk patients. Furthermore, interventions to improve levels of health and social support before surgery may improve symptomatic outcome.

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