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A controlled trial of cognitive behavioural therapy for non-cardiac chest pain

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ABSTRACT

Background. The majority of patients presenting to cardiac clinics with chest pain who are reassured they do not have heart disease or other serious physical disorder continue to experience symptoms, worry about heart disease and restrict their activities. This randomized trial investigated the effectiveness of psychological treatment within routine cardiac care.

Methods. Consecutive patients presenting with chest pain and reassured by a cardiologist they do not have heart disease were reassessed 6 weeks later. Those with persistent limiting symptoms were offered the opportunity to participate in a trial of cognitive behavioural therapy.

Results. Thirty-seven subjects agreed to take part. A number of subjects were unenthusiastic about psychological intervention or, following explanation of the study, regarded further treatment as not being necessary. At 3 months there were significant differences between the treatment group and the control group on key outcome measures of symptoms, mood and activity. At 6 months there were fewer differences but significant advantages of treatment in terms of limitation of activities and worry about physical symptoms.

Conclusion. We conclude that there is a need for 'stepped' further care following reassurance in the cardiac clinic and that cognitive behavioural treatment is effective with those with persistent disabling symptoms.

INTRODUCTION

About half of new referrals to cardiac clinics with the presenting complaint of chest pain are found not to have heart disease or other serious physical disorder. Despite a normal expectation of life and physical prognosis, between 50 and 70% continue to experience symptoms, worry about heart disease, restrict their activities and seek medical help (Bass & Wade, 1984; Mayou *et al.* 1994; Bass & Mayou, 1995). Various cardiac and non-cardiac explanations have been proposed, including micro-vascular coronary artery disease, coronary spasm, chest wall pain, oesophageal dysmotility or reflux, hyperventilation, panic disorder and general anxiety. However, in routine clinical practice many patients are given a non-specific diagnosis.

We have proposed a multi-factorial model of aetiology whereby minor physical problems are interpreted as evidence of serious medical problems, usually heart disease. This leads to anxiety and further symptoms, so maintaining the problem in a vicious circle. The reasons why minor physical symptoms are misinterpreted include: previous psychological problems, experience of heart disease in others leading to increased awareness of heart disease, panic attacks and severe symptoms of anxiety, and ambiguous, inconsistent or incorrect medical information.

Treatment of patients with non-cardiac chest pain is regarded as difficult in primary care and hospital out-patient clinics. Negative physical investigation and reassurance are only effective

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for a small proportion of patients. However, we have shown that psychological intervention is effective in reducing symptoms and disability in patients with persistent symptoms despite negative cardiological investigation who were referred from general practice (Klimes *et al*. 1990).

These results are encouraging, especially when compared with the lack of effectiveness of other treatment, but we need to know whether conclusions on selected subjects who were willing to be referred for a research trial of psychological treatment are more widely applicable. Is psychological treatment acceptable, feasible and effective within routine care for those who do not improve following negative investigations and routine advice and information by the cardiologist? A programme of Oxford research is evaluating these issues. The present study was designed to answer this question within a cardiac clinic in which we have previously described the characteristics of consecutive attenders with the presenting symptom of chest pain (Mayou *et al*. 1994). A second study, reported in an accompanying paper (Sanders *et al*. 1997), has evaluated a brief intervention following negative coronary angiography and a third, current, trial is evaluating the role of a cardiac nurse working in close collaboration with the cardiologists in the assessment and management of newly presenting patients with palpitations which are not thought to be due to significant heart disease. We expect that, taken together, these trials will demonstrate cost effective ways of providing improved routine care and selective extra psychological treatment for the large numbers of patients who present to cardiac clinics.

METHOD

Design

A controlled trial was carried out to compare a psychological treatment, cognitive behavioural treatment, with standard clinical managment and advice.

Patients

Patients aged 18–65 were recruited from a population of consecutive new referrals to a general hospital cardiac out-patient clinic who had presented with chest pain, had had negative investigations and had been reassured there was no cardiac or other significant medical cause for the symptoms. There were two subgroups: one had out-patient investigation only, the other was admitted for coronary angiography, which showed normal coronary arteries.

Following discharge subjects received a letter from their cardiologist saying that they would be asked to attend a research clinic at the same hospital in a few weeks' time and 6 weeks later they were sent an appointment.

Selection criteria

The main criterion for inclusion was the presence of persisting non-cardiac chest pain occurring at least once a week in the month before the assessment. Criteria for exclusion included subsequent cardiac diagnosis, current major depression, living outside the country and being unable to speak English.

The general nature of the trial treatment was explained to all suitable subjects before randomization and questions were answered. Patients who agreed to take part in the research were randomly allocated to cognitive behavioural treatment (CBT) or assessment only control (AOC) using a system of sealed envelopes prepared by random number generation. They were all given a diary in which to record episodes of chest pain during the following week and were asked to return for two further assessements 3 and 6 months later. The assessment procedure did involve general discussion of the importance of interaction of physical and psychological factors and of the principles of the treatment. A number of patients commented that they found assessment only to be useful and informative.

Assessment

Subjects were assessed separately by a psychiatrist (R.M.) and a research sociologist (B.B.) using semi-structured interviews covering medical and psychiatric history and current symptoms, what they had been told by general practitioners and hospitals, their beliefs about causation, and their social functioning in the domains of leisure, work, social and family life. They also completed self-report questionnaires measuring symptoms, mental state and health beliefs. These measures were repeated at 3 and 6-month follow-up.

Demographic and medical information

Demographic information and information

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about previous physical problems and treatment, medication, consultation with general practitioners and hospitals was recorded.

Chest pain

Frequency and severity of symptoms, the distress caused by the symptoms, degree of limitation caused by the symptoms and satisfaction with medical care was noted. Subjects completed a chest pain diary for the week following the research interview.

Limitation of activities

The research assessment included detailed questions about limitation and avoidance of specified activities and each activity was scored on a 0–3 scale of difficulty. Subjects were given interviewer ratings on a 0–3 scale of limitation and of impairment in leisure, work, family and overall social impairment. This method has been found to be reliable in previous studies and to be sensitive to changes over time (Mayou *et al*. 1994).

Mood, mental state and beliefs

The Structured Clinical Interview for DSM-III-R (Spitzer *et al*. 1986), for anxiety and depression and somatoform disorders, and semistructured questions about beliefs about causes of symptoms were used. Self-report questionnaires included the Brief Symptom Inventory (Derogatis & Melisaratos, 1983) and the Whitely Index (Pilowsky, 1967).

Treatment

The cognitive behavioural treatment was based on principles described in the previous trial by Klimes *et al*. (1990). Treatment consisted of up to 12 sessions of individual therapy with a research counselling psychologist (D.S.) trained and supervised by a clinical psychologist (I.K.). The therapy emphasized that while the patient's symptoms were 'real' and not just 'psychological', the symptoms were not necessarily caused by serious organic or medical factors. The treatment aimed to: (1) offer an alternative, non-cardiac explanation of symptoms by formulating the problem in terms of a combination of physical, cognitive and behavioural factors, and to challenge any catastrophic interpretations of symptoms; (2) teach patients how to cope with symptoms using behavioural techniques such as relaxation and controlled breathing, and graded increase in activities; and, (3) examine the problems that may be maintaining the symptoms, including stress or anxiety caused by work, relationships or family difficulties.

Patients were asked to practice skills for coping with the symptoms between sessions and carry out behavioural experiments during and between sessions to test out alternative explanations of the symptoms.

Stage 1. Assessment and psychological formulation of the problem

This involved a detailed assessment of the symptoms, degree of limitation, current coping style, beliefs about causation, and formulation of the problems in terms of a combination of physical, cognitive, emotional and behavioural factors. The initial stage involved an explanation of why the patient was being offered psychological treatment. The key task at this stage was to engage patients in psychological therapy.

Stage 2. Role of breathing and hyperventilation in causing or maintaining symptoms

The hyperventilation provocation test was used to demonstrate how minor physical changes caused by overbreathing may lead to unpleasant symptoms, including chest pain in a proportion of patients, which may be interpreted as dangerous symptoms. Patients learned slow controlled breathing to cope with symptoms.

Stage 3. Role of muscular tension in causing and maintaining symptoms

This involved relaxation training using progressive muscular relaxation and applied relaxation to reduce and cope with symptoms. It was followed by a re-appraisal of beliefs based on the role of tension.

Stage 4. Role of catastrophic thoughts in maintaining symptoms

This was a review of thoughts associated with symptoms, with cognitive techniques to modify thoughts: distraction and negative thoughts.

Stage 5. Dealing with avoidance

Once patients had some control over symptoms, they drew up a hierarchy of activities that were

previously avoided because of symptoms, and were gradually asked to increase the level of activities.

Stage 6. Dealing with maintaining factors

A problem-solving approach was used to identify and deal with lifestyle and personality factors that may maintain symptoms such as a highly stressful lifestyle, lack of assertiveness in social situations or on-going life problems. Unhelpful assumptions were identified and challenged using cognitive approaches.

Data analysis

Baseline differences in background variables were examined using *t* tests, χ^2 and Fisher's exact test. The main outcome measures used were reported frequency, severity and distress of chest pain in the last month, the number of pain-free days in the last week recorded in the diary, the degree of limitation of activities and leisure, and scores on the mood and health belief questionnaires.

Repeated measures analysis of co-variance, using the baseline score as the co-variate, was used to test the differences between the treatment and control groups on each outcome measure. Because of the high attrition rate the analyses were done in two ways: (*a*) an 'intention to treat' analysis on all randomized subjects, substituting the last score obtained for missing scores; and (*b*) an analysis confined to those who remained in the study throughout (and completed treatment). The treatment of missing data is always problematical and both methods make assumptions about outcome. The main results are presented for the 'intention to treat' analysis. However, this method, which assumes no change, could underestimate spontaneous improvement in the control group which had a higher attrition rate. Differences between the two methods are noted where appropriate.

RESULTS

The subjects

Of 133 consecutive out-patient or NCA referrals, 43 were not assessed for the research for the reasons shown in Table 1. Ninety subjects were assessed in the research clinic of whom 56 met the inclusion criteria and 37 (two-thirds of those eligible) agreed to take part and were randomized to the study; 20 to the treatment group and 17 to the control group. Characteristics of the randomized subjects are shown in Tables 2, 3 and 4.

The 19 eligible subjects who did not wish to take part in the study were similar to randomized subjects in demographic characteristics and in their previous history of chest pain and its medical management, although they were more satisfied with the care they had received. Reported frequency of chest pain was similar in the two groups, but those who declined rated their symptoms as less severe and distressing and all but one said their activities were not limited at all or were only slightly limited. They were also less likely to have a current psychiatric diagnosis and scored significantly lower on the somatization scale of the Brief Symptom Inventory (BSI).

Patients in the treatment group rated their chest pain as more severe, but apart from this there were no significant differences between the treatment and control groups on demographic attributes, previous medical history and management of chest pain symptoms. Over 80% had had one or more experiences of being treated as 'a heart patient' before being referred to the cardiac clinic: diagnosis of angina, treatment with anti-anginal medication, prescribed glyceryl trinitrate (GTN) sprays or tablets to use when the pain came on, admitted as emergencies. There was also considerable psychiatric morbidity and a third of subjects described current panic attacks.

Non-completers

CBT group

Fifteen of the 20 CBT subjects (75%) completed treatment; there were complete follow-up data on 12 (60%) subjects and partial data on the other three. (One woman could not be assessed at 3 months because she was abroad, and two men did not complete psychological questionnaires.)

Four subjects (20%) in the CBT group, three women and one man, dropped out of the study before the first treatment session. All were working full-time in manual occupations, and two women were also attending a menopause clinic; three rated their symptoms as severe or very severe and one as mild. Their symptoms

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Table 1. *Subject selection:* 133 *consecutive out-patient or NCA referrals*

	N	%
Not assessed in research clinic		
No or mild chest pain: did not want assessment	20	15
Did not keep appointment	10	8
Refused an assessment appointment	6	4
Excluded for medical reasons	7	5
Total not assessed	43	32
Assessed in research clinic		
Excluded		
No symptoms at time of assessment	17	13
Symptoms less than once per week	12	9
Cardiac or other physical reasons	1	1
Psychiatric illness	4	3
Suitable but declined		
Mild symptoms	8	6
Other reason	11	8
Randomized to trial	37	28
Total assessed	90	68
Total of assessed and non-assessed	133	100

were unimproved (or, in one case, worse) at 3 and 6 months, although the woman with mild symptoms at baseline rated herself as a bit better overall and was doing more (she had been treated for anaemia during the follow-up period, and felt less tired).

One further subject withdrew after one treatment session because of difficulty in getting time off work; he wrote to say that he felt 'eighty per cent better' and was coping well using the therapy tapes.

AOC group

Ten of the AOC subjects (59%) remained in the study until the final assessment, for these subjects there was complete data on all but one who did not complete psychological questionnaires. Seven subjects in the control group, two men and five women, dropped out, three very soon after recruitment and four when they were contacted for the 3-month assessment. Their reasons were not always clear, but in at least four instances antipathy to what was seen as psychological explanations for symptoms was evident. Death or illness in the family played a part in two cases, and travel may have been an added disincentive as five patients had long journeys to the hospital. Losing time at work did not feature, as only one person was working full-time.

Follow-up information was available on five of the seven. Three rated their symptoms as less severe and frequent (two had had no chest pain in the previous month), and described themselves as 'a bit' or 'much' better, but also said they had not been very bad before, and their activities had not increased. One said 'I think I've learnt to cope with it; I take deep breaths, try to relax.' The other two, who were very restricted at baseline, rated their symptoms and limitations

Table 2. *Demographic characteristics of randomized subjects*

Demographic	CBT ($N = 20$) *N* (%)	AOC ($N = 17$) *N* (%)	Total ($N = 37$) *N* (%)	Suitable/ refused ($N = 19$) *N* (%)
Gender				
Female	11 (55)	11 (65)	22 (60)	12 (63)
Male	9 (45)	6 (35)	15 (40)	7 (37)
Marital status				
Married	18 (90)	15 (88)	33 (89)	13 (68)
Not married	2 (10)	2 (12)	4 (11)	6 (32)
Social class				
I, II, III NM	9 (45)	7 (41)	16 (43)	11 (58)
III M, IV, V	11 (55)	10 (60)	21 (57)	8 (42)
In paid employment?				
Yes	15 (75)	10 (58)	25 (68)	12 (63)
No	5 (25)	7 (42)	12 (32)	7 (37)
Mean age (S.D.)	47·45 (9·75)	51·76 (9·66)	49·40 (9·82)	46·84 (12·87)
Range	31–64	33–63	31–63	

Test of significance χ^2 = no significant differences for CBT *v.* AOC or suitable/refused *v.* total.

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Table 3. *Medical and psychiatric characteristics of randomized subjects*

	CBT ($N = 20$) *N* (%)	AOC ($N = 17$) *N* (%)	Total ($N = 37$) *N* (%)	Suitable/ refused* ($N = 19$) *N* (%)
Patient status				
NCA	14 (70)	12 (71)	26 (70)	8 (42)
OP	6 (30)	5 (29)	11 (30)	11 (57)
History of chest pain				
Less than 6 months	5 (25)	6 (35)	11 (36)	5 (28)
6–23 months	7 (35)	5 (29)	12 (32)	10 (56)
2 years or more	8 (40)	6 (35)	11 (38)	3 (17)
Emergency admission for chest pain				
No	14 (70)	12 (71)	26 (70)	17 (90) < 0·1
Yes	6 (30)	5 (29)	11 (30)	2 (10)
Anti-anginal medication in past				
No	11 (55)	9 (53)	20 (54)	12 (63)
Yes	9 (45)	8 (47)	17 (46)	7 (37)
Used GTN tablet/spray				
No	12 (60)	5 (56)	21 (58)	16 (84)
Yes	8 (40)	7 (44)	15 (42)	3 (16)
Not known		1		
GP mentioned angina as cause (Pt's report)				
No	11 (55)	10 (59)	21 (58)	11 (58)
Yes	9 (45)	7 (41)	16 (42)	8 (42)
Current SCID psychiatric diagnosis				
No	3 (15)	7 (38)	10 (22)	17 (90) < 0·01
Depression	1 (5)	0 (0)	2 (4)	2 (10)
General anxiety	6 (36)	3 (20)	11 (20)	
Panic	10 (50)	6 (38)	19 (35)	
Somatoform	0 (0)	1 (6)	1 (2)	

[1] Test of significance $\chi^2 = P$ values for suitable/refused *v.* total.
No significant differences for CBT *v.* AOC.

as basically unchanged and remained convinced that their symptoms were due to heart disease.

Outcome

Mean values for the main outcome measures in the intention to treat analysis are shown in Table 5, together with the results for the repeated measures analysis of co-variance. Angiography was not related to outcome and the angiography and out-patients groups were, therefore, combined.

Overall, the results at the end of treatment showed that cognitive behaviour therapy was highly successful in reducing the frequency, severity and associated distress of symptoms, improving mental state, changing cognitions about the causes of symptoms, and in increasing social activities and quality of life. These improvements were largely maintained at 6 months. The patients in the control group, by contrast, had not improved at the 3-month point. At 6 months they showed improvement in the frequency and distress of symptoms, and in mental state. However, severity of symptoms had not improved and they were still limiting their activities.

Symptom measures

Over time there was a significant improvment in both groups in frequency and distress of symptoms, but the Group by Time interactions showed that in the CBT group this improvement ocurred early on in treatment, whereas the AOC group had not changed at the 3-month point but subsequently improved as evident at 6 months. The simple group effect for severity of symptoms indicated greater improvement in the CBT group immediately post-treatment, which was maintained at 6 months. Further analyses of covariance to test for differences between the two groups at the 6-month follow-up showed that severity of symptoms at 6 months was significantly lower in the CBT group than the AOC group ($F(1,34) = 4{\cdot}82$, $P < 0.05$), but there were no significant 6-month group effects for frequency, distress or number of pain-free days.

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Table 4. *Symptoms at baseline*

	CBT ($N = 20$) *N* (%)	AOC ($N = 17$) *N* (%)	Total ($N = 37$) *N* (%)		Suitable/ refused ($N = 19$) *N* (%)	
Symptoms (Subjective ratings)						
Frequency						
Daily or more	7 (35)	8 (47)	15 (40)		6 (32)	
At least weekly	13 (65)	9 (53)	23 (60)		13 (68)	
Severity						
Severe/v. severe	15 (75)	7 (41)	22 (59)	< 0·01*	5 (26)	< 0·01†
Mod/mild	5 (25)	10 (59)	15 (41)		14 (74)	
Distress						
Mod/very	17 (85)	12 (71)	29 (78)		7 (37)	< 0·01†
Slight/none	3 (15)	5 (29)	8 (22)		12 (63)	
Breathlessness						
Yes	13 (65)	6 (38)	19 (53)	0·1*	10(53)	
No	7 (35)	10 (63)	17 (47)		9 (47)	
Due to stress (Pt's view)						
No	13 (65)	13 (76)	26 (70)		15 (79)	
Yes	7 (35)	4 (24)	11 (30)		4 (21)	
Limitation						
None/slight	5 (25)	6 (35)	11 (30)		18 (95)	< 0·001†
Mod/very	15 (75)	11 (65)	26 (70)		1 (5)	
Somatization score						
Mean	1·03	1·09	1·06	0·60 < 0·01‡		
S.D.	0·58	0·61	0·58	0·54		

* χ^2 *P* value for CBT *v.* AOC.
† χ^2 *P* value for suitable/refused *v.* total.
‡ *t* test *P* value for suitable/refused *v.* total.

Social activity measures

Group effects were found for all activity measures indicating greater improvement in the CBT group. There were no interaction effects. The CBT group showed a similar pattern of change as in the symptom measures, with most improvement occurring by the end of treatment and being maintained or improving further during the 3-month post-treatment follow-up. By contrast, the AOC group hardly changed at all over the 6 months, restricting their activities almost as much at the end of the study as at the beginning. Further ANCOVAs showed that patients in the CBT group showed significantly greater improvement at the 6-month point than AOC patients in limitation ($F(1,34) = 5{\cdot}19$, $P < 0.05$), overall social impairment ($F(1,34) = 4{\cdot}87$, $P < 0.05$) and social difficulty score ($F(1,34) = 5{\cdot}56$, $P < 0.05$).

Mental state measures

DSM-III-R psychiatric disorder

Treated subjects were less likely than controls to be rated as suffering from DSM-III-R psychiatric disorder at 3 months but there were no differences at 6 months.

The Brief Symptom Inventory

This measures self-reported psychological symptoms and it was analysed using the Global Severity Index (total score/no. completed questions) and one of the nine subscores, Somatization. The latter was of particular interest in the present study because it 'reflects distress arising from perceptions of bodily dysfunction'. The GSI showed a Group × Time effect. The somatization score showed time and interaction effects.

The Whitely Index

This measures health beliefs and was analysed using the total score and one of the three possible subscores, Disease Conviction, which was felt to be particularly relevant as the questions cover beliefs of bodily dysfunction and the desire for its recognition by others. The total score showed a Group × Time interaction, while the Disease Conviction score showed a simple Group effect.

The pattern of change on psychological variables was similar to the symptom measures,

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Table 5. *Means and standard deviations of outcome measures at baseline, 3 months and 6 months by CBC or AOC*

Outcome measure	Mean (S.D.) Baseline	3 months	6 months	ANCOVA using baseline score as covariate	*P* values for group diffs. at 6 months
Symptoms (subjective rating)					
Frequency (last month)					
CBT	3·45 (0·86)	2·55 (1·53)	2·75 (1·59)	T: $F(1,35) = 4{\cdot}18$, $P < 0{\cdot}05$	NS
AOC	3·53 (0·80)	3·71 (0·99)	2·71 (1·80)	GxT: $F(1,35) = 9{\cdot}41$, $P = 0{\cdot}01$	
Severity (last month)					
CBT	3·00 (0·97)	1·75 (1·07)	1·95 (1·32)	G: $F(1,34) = 10{\cdot}37$, $P < 0{\cdot}01$	$P < 0{\cdot}05$
AOC	2·58 (1·18)	2·65 (1·06)	2·35 (1·54)		
Distress (last month)					
CBT	3·15 (0·67)	1·90 (1·21)	2·05 (1·19)	T: $F(1,35) = 4{\cdot}10$, $P < 0{\cdot}05$	NS
AOC	2·76 (1·03)	2·65 (0·93)	1·88 (1·32)	GxT: $F(1,35) = 9{\cdot}09$, $P < 0{\cdot}01$	
Pain-free days (last week)*					
CBT	2·20 (1·91)	3·85 (2·62)	3·50 (2·78)	GxT: $F(1,35) = 5{\cdot}95$, $P = 0{\cdot}02$	NS
AOC	2·18 (1·78)	2·18 (2·38)	3·47 (2·58)		
Activities (interviewer rating)					
Limitation					
CBT	2·90 (0·91)	2·25 (1·07)	2·25 (1·12)	G: $F(1,34) = 7{\cdot}69$, $P < 0{\cdot}01$	$P < 0{\cdot}05$
AOC	2·71 (1·05)	2·71 (1·05)	2·59 (1·18)		
Effects on leisure					
CBT	2·20 (0·83)	1·50 (1·19)	1·45 (1·28)	G: $F(1,34) = 4{\cdot}93$, $P < 0{\cdot}05$	$P < 0{\cdot}1$
AOC	2·12 (0·99)	2·00 (1·17)	1·88 (1·22)		
Social Difficulty Score					
CBT	13·96 (6·73)	9·05 (7·87)	9·00 (8·15)	G: $F(1,34) = 7{\cdot}97$, $P < 0{\cdot}01$	$P < 0{\cdot}05$
AOC	13·11 (7·34)	12·58 (8·18)	12·02 (8·34)		
Overall social impairment					
CBT	2·20 (0·83)	1·55 (0·95)	1·45 (1·10)	G: $F(1,34) = 5{\cdot}78$, $P < 0{\cdot}05$	$P < 0{\cdot}05$
AOC	2·00 (1·10)	1·88 (1·11)	1·88 (1·11)		
Mental state					
BSI Global Severity Index†					
CBT	0·45 (0·32)	0·35 (0·37)	0·37 (0·33)		
AOC	0·44 (0·32)	0·47 (0·31)	0·29 (0·22)	GxT: $F(1,35) = 5{\cdot}41$, $P = 0{\cdot}02$	NS
BSI Somatization Score					
CBT	1·03 (0·58)	0·67 (0·53)	0·69 (0·51)	G: $F(1,34) = 8{\cdot}11$, $P < 0{\cdot}001$	NS
AOC	1·09 (0·61)	1·27 (0·59)	0·79 (0·62)	GxT: $F(1,35) = 7{\cdot}46$, $P < 0{\cdot}02$	
				T: $F(1,35) = 6{\cdot}63$, $P < 0{\cdot}05$	
Whitely Index					
CBT	4·00 (3·01)	2·80 (2·33)	3·50 (3·04)	GxT: $F(1,35) = 9{\cdot}81$, $P < 0{\cdot}01$	NS
AOC	3·71 (3·46)	4·06 (3·82)	2·59 (2·96)		
Disease Conviction Score (Whiteley)					
CBT	0·50 (0·83)	0·30 (0·57)	0·25 (0·55)	G: $F(1,34) = 3{\cdot}02$, $P < 0{\cdot}05$	NS
AOC	0·59 (0·94)	0·71 (0·99)	0·47 (0·94)		
Hyperventilation score†					
CBT	14·36 (6·88)	9·58 (6·17)	11·16 (7·70)	G: $F(1,33) = 5{\cdot}12$, $P < 0{\cdot}05$	NS
AOC	15·29 (6·29)	16·00 (6·76)	12·24 (9·20)		

* Includes 6 cases (3 in each group) where data from the interview was substituted for missing diary.
† Excludes one outlier in CBT group; *P* values not affected.

with significant improvement for the CBT group and some deterioration in the AOC group during the first 3 months and a convergence at the 6-month point. At 6 months the two groups did not differ significantly on these measures.

The separate analysis excluding those who dropped out of the study showed similar overall results, but there was a significant difference between the CBT and AOC groups at 6 months on Disease Conviction Scores ($F(1,18) = 5{\cdot}35$, $P < 0.05$). This suggests that cognitive behavioural treatment was successful in changing beliefs about illness for those in the treatment group who actually received the treatment.

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Patterns of outcome

Of the 16 patients who completed treatment (or in one case withdrew after a single session), seven (43%) reported clinically significant improvements in the sense of major reductions in frequency and/or severity of symptoms, much less concern about the symptoms and a return to normal activities. Five of the seven were symptom-free or were getting only very infrequent mild symptoms. The remaining two were still getting symptoms at least once a week but they no longer felt distressed or limited by them. They reported finding the treatment useful, particulary the opportunity to discuss the causes of the symptoms and to learn controlled breathing, relaxation and distraction to cope with the symptoms. A further two treated subjects (13%) were doing well in that they described a worthwhile improvement in everyday activity to normal or near-normal functioning, even though the frequency, severity and distress of symptoms had not improved from moderate baseline levels.

Of the remaining seven treated subjects, five (31%) reported only modest reductions in severity, frequency and distress of symptoms and in limitation of activities and two (13%) showed no improvement. This subgroup contained most of those in the CBT group who, at baseline, reported very severe, distressing symptoms several times a day and major limitation and avoidance of activities; six were assessed as suffering from SCID psychiatric disorder at recruitment.

The greatest symptomatic improvement occurred in subjects who did not have on-going life difficulties. However, those with ongoing problems in the treatment group, even though they tended to experience continuing symptoms, were more able to relate their symptoms to stress and became less concerned about them.

One of the two subjects not helped by the treatment had chronic personal difficulties and a history of abuse from childhood; the second patient had severe hypochondriasis with grossly abnormal illness beliefs. The former patient continued psychological treatment after the end of the trial.

Improvements in the control group (including those for whom full and partial information was available) were slower and less striking, with modest improvements in symptoms and associated distress, and less change in everyday activity and beliefs.

DISCUSSION

Six weeks after negative investigation and reassurance by cardiologists, a substantial proportion of patients with non-cardiac chest pain continued to experience distress and disability. The characteristics of the two subgroups, those investigated in the out-patient clinic only and those investigated with angiography, were very similar to our previously published descriptions.

Subjects recruited for the trial of psychological treatment were those with continuing and usually limiting symptoms who could be expected to have a poor long-term outcome. Our main finding is that a psychological intervention previously shown to be effective in a more selected and motivated group of referrals from general practice (Klimes *et al*. 1990), is also effective for routine out-patients. There was substantial and significant improvement in the frequency and severity of symptoms, limitation of activities, concern about heart disease and in other associated symptoms. For most patients this meant a change from unpleasant and worrying symptoms and limitation of valued activities to a normal or nearly normal everyday life.

At 3 months there were significant differences between the treatment group and control groups on all the key outcome measures; but at 6 months the lack of further change in the treatment group and the slow improvement in the untreated controls, meant that there were fewer differences. However, the continuing major benefits for the treated subjects of reduced limitation of everyday activities and perceptions of the severity and significance of any chest pain suggest they were functioning substantially better and were close to their pre-morbid status.

Clinical observations suggest that important ingredients of treatment include offering a feasible alternative explanation of the symptoms in terms of an acceptable psychological model, helping patients to learn to cope with the symptoms and change their attitudes towards the symptoms. Increasing physical activities was important in helping patients to reduce impairment caused by the symptoms and altering beliefs about the symptoms: 'It doesn't do me

any harm to be active therefore the symptoms can't be serious', for example.

Those treated patients who did not improve had more severe symptoms and limitation to start with and were more likely to describe other chronic difficulties in their lives. One subject had a history of major abuse in childhood and of considerable difficulties throughout adult life. For these people longer, more varied, psychological treatment would be more appropriate.

It is important to point out two methodological caveats: (1) there were some differences at baseline between the two groups, indicating that the treatment group were slightly more depressed and anxious than the control group and rated their symptoms as more severe; and (2) a number of subjects dropped out before beginning treatment and it was not possible to obtain full outcome data on all randomized subjects.

The replication of our earlier evaluation of cognitive behavioural treatment within a routine out-patient setting is encouraging. However, the study did raise a number of important issues about delivery and acceptability for clinical practice. There were considerable practical difficulties in recruitment and assessment. These were partly those of any randomized clinical trial but they also reflected the particular problems of introducing a psychological treatment to patients who had been referred to cardiologists with presumptive cardiac diagnoses.

(1) A number of patients assessed as suitable were not interested in taking part in a research trial. This was often because they did not see the symptoms as having had a severe enough effect on their lives to justify the time and trouble of the treatment programme, and partly because the assessment itself was found to be useful. A few subjects found the idea that symptoms might in any way be psychological unacceptable. After considerable experience of being 'treated patients', for example receiving anti-anginal medication, being admitted as emergencies to intensive care units and having coronary angiography, it is hardly suprising that they found it difficult to accept what they saw as an abrupt change of clinical direction, despite our considerable efforts to present our treatment as part of a routine continuing clinical process. The assessments were conducted in the Department of Psychological Medicine in the general hospital and were seen to be separate from routine care in the cardiology clinic: greater integration with cardiac care with more obvious backing from the cardiologists would have been valuable.

(2) We also experienced a high level of drop outs in the trial, often related to the treatment being seen as 'too psychological' and, therefore, unacceptable. This was despite the assessments and treatments being conducted in the general hospital , which would be expected to improve the acceptability (Guthrie, 1995).

(3) There were also patients who said that they had found a one-off assessment useful and that they did not think further treatment would be necessary as they were now reassured and knew how to proceed.

There are implications for the way in which care is coordinated and organized and the ways in which patients are given information, explanation and the opportunity for discussion; a more stepped approach to treatment might be appropriate. We suggest that patients should be given more opportunity to discuss the implications of negative test results at their consultation. They could also be given written information. Advice should emphasize that chest pains are a common problem deserving investigation and that the findings are encouraging and enable clear medical plans for symptomatic treatment and return to full activities.

Patients could be offered a follow-up appointment. This could be with a cardiac nurse or it might be with a properly briefed general practitioner. This would provide an opportunity to review non-cardiac explanations and further treatment. Patients with continuing worries about heart disease or with major distress and disability might then be considered for more specialist treatment. For some a small number of sessions is sufficient, focusing on understanding the possible causes and maintenance of the symptoms and learning how to cope with symptoms; for others, particularly those with psychological disorders and chronic on-going difficulties, longer and more detailed psychological treatment is appropriate.

While this study has been concerned with management of patients attending specialist cardiology clinics, it is important to be aware that investigation, diagnosis and treatment before referral and whilst waiting for an ap-

pointment can have substantial effects on patients' beliefs, their concern about symptoms and their disability. Planning of coordinated physical and other care should begin as early as possible with the maximum continuity between primary and specialist care.

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