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Cost-effectiveness of cognitive behavioural therapy, graded exercise and usual care for patients with chronic fatigue in primary care

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ABSTRACT

Background. Chronic fatigue is a common condition, frequently presenting in primary care. The aim of this study was to compare the cost-effectiveness of cognitive behavioural therapy (CBT) and graded exercise therapy (GET), and to compare therapy with usual care plus a self-help booklet (BUC).

Method. Patients drawn from general practices in South East England were randomized to CBT or GET. The therapy groups were then compared to a group receiving BUC recruited after the randomized phase. The main outcome measure was clinically significant improvements in fatigue. Cost-effectiveness was assessed using the net-benefit approach and cost-effectiveness acceptability curves.

Results. Costs were available for 132 patients, and cost-effectiveness results for 130. Costs were dominated by informal care. There were no significant outcome or cost differences between the therapy groups. The combined therapy group had significantly better outcomes than the standard care group, and costs that were on average £149 higher (a non-significant difference). Therapy would have an 81·9% chance of being cost-effective if society were willing to attach a value of around £500 to each four-point improvement in fatigue.

Conclusion. The cost-effectiveness of cognitive behavioural therapy and graded exercise were similar unless higher values were placed on outcomes, in which case CBT showed improved cost-effectiveness. The cost of providing therapy is higher than usual GP care plus a self-help booklet, but the outcome is better. The strength of this evidence is limited by the use of a non-randomized comparison. The cost-effectiveness of therapy depends on how much society values reductions in fatigue.

INTRODUCTION

Most people will suffer occasional fatigue. However, sometimes fatigue is chronic and results in professional help, particularly from general practitioners. For a minority of such patients a diagnosis of chronic fatigue syndrome (CFS), or myalgic encephalopathy (ME), is given. There is much debate as to the cause of CFS/ME and what constitutes an effective treatment, with a seeming polarization into 'psychological' and 'physical' camps. This was illustrated by a recent UK government report and responses to it (CFS/ME Working Group, 2002). What does appear to be agreed though is that many people do seek treatment for

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persisting fatigue (and not necessarily CFS/ME) and that there are important economic consequences for health services, patients and their families, and society as a whole (Lloyd & Pender, 1992; Bombardier & Buchwald, 1996; McCrone *et al*. 2003). However, economic evaluations of specific interventions, such as cognitive behavioural therapy (CBT) and graded exercise therapy (GET), are rare (Chisholm *et al*. 2001). This paper addresses two questions. First, how do CBT and GET compare in terms of cost effectiveness? Second, how do therapy (CBT or GET) and usual GP care plus a self-help booklet (BUC) compare in terms of cost-effectiveness?

METHOD

Sample, setting and interventions

Details of the study design have already been reported (Ridsdale *et al*. 2004). Patients with unexplained fatigue that had lasted for more than 3 months were recruited from 22 general practices in London and the South East of England between January 1999 and June 2001. Consenting patients were randomized to six sessions of CBT or GET. Sessions each lasted 45 min. CBT was delivered by trained cognitive behavioural therapists and included an initial assessment, activity planning, homework and establishing a sleep routine. The aim of the CBT was to enable patients to address negative beliefs regarding symptoms, self-expectations and self-esteem. GET was tailored to each patient's physical capacity and aimed for a gradual increase in aerobic activities, especially walking, and was delivered by physiotherapists. A further sample of patients, also with chronic fatigue, were subsequently recruited from the general practices, were given a booklet on self-management of fatigue (Chalder, 1997), and received usual treatment from their GP. As with many studies, the sample size was determined on the basis of power calculations to show significant differences in clinical outcome measures rather than differences in cost-effectiveness.

Outcome measures

Assessments were made at baseline and at 3- and 8-month follow-up. The primary outcome was change in fatigue between baseline and 8-month follow-up. Fatigue was measured using a validated 11-item Likert instrument (Chalder *et al*. 1993), where the presence of fatigue problems are rated between 0 (less than usual) and 3 (much more than usual). Higher scores (up to a maximum of 33) therefore represent greater levels of fatigue. For the purposes of the economic evaluation we derived two variations of this outcome measure. First, we generated a variable that scored one if a clinically significant reduction in fatigue of at least four points was achieved (Ridsdale *et al*. 2004). Second, we produced a variable that was the total change in the fatigue score divided by four to measure the units of change with a one-unit change being equal to four points on the original scale.

Service use and costs

A broad perspective to the measurement of service use and costs was adopted, which is important because the economic implications of adopting new treatments may have far reaching effects that would not be identified if costs were confined just to the treatment or to health care services. The number of therapy sessions attended by each patient was recorded and additional service use was measured following an established methodology Knapp & Beecham (1990). The Client Service Receipt Inventory (CSRI) was used to retrospectively record service use for the 3 months prior to baseline and 8-month follow-up (Beecham & Knapp, 2001). Services included GPs, other clinicians, nurses, in-patient stays, physiotherapists (in addition to those providing GET), counsellors, nutritionists, social services and complementary therapy. Patients were also asked to record the number of hours per week that relatives and friends had helped them in specific areas (personal support, child care, help in/around the house, help outside the home, and other tasks) due to their fatigue.

Unit costs were combined with the service use data, with national figures (2000/01) used for statutory services where available (Netten *et al*. 2001). The cost of 1 h of CBT (£40) had been calculated previously (Chisholm *et al*. 2001), and was very similar to GET (£41) (Netten *et al*. 2001). The unit costs for privately provided services were assumed to be equal to payments by patients. In the absence of such data figures were taken from other sources (Simpson *et al*. 2000; Netten *et al*. 2001). Informal carers are not paid for their inputs but clearly there is still a cost involved if cost is defined as arising when other opportunities are foregone. It was assumed that the work that informal carers were providing would be similar to that of home care workers and, therefore, the unit cost of that service (£10.57) was used. A nominal figure of £5 per BUC patient was used to represent the cost of the booklet used to enhance usual care.

Lost employment costs have not been included in these analyses. There are different methods of attaching costs to lost employment and there is also debate as to whether they should be seen as an outcome rather than a resource input (Pritchard & Sculpher, 2000). We regard changes in lost employment costs as an outcome of therapy not a resource input. A list of unit costs used in the study is contained in the Appendix.

Analysis

Background characteristics of patients in the three treatment groups were compared using appropriate tests of significance (χ^2 tests for binary variables, analysis of variance for normally distributed continuous variables and Kruskal–Wallis tests for non-normally distributed continuous variables). The baseline measures of fatigue, symptoms, depression, anxiety and functioning were also compared between the treatment groups, using analysis of variance. The study aimed to compare the costs and cost-effectiveness of the different treatment options. Therefore, although service use data and data on individual cost items are reported we do not report tests of significance for group differences. Total costs were compared between the two intervention groups, and between the combined therapy and BUC groups, using multiple regression analysis with baseline and follow-up costs used as the dependent variable and the group identifier as an independent variable. In both models (CBT *v.* GET; therapy *v.* BUC) the following patient characteristics were adjusted for: gender, age, ethnicity, whether the patient lived alone, whether the patient had dependants, symptom level, level of depression, level of anxiety, level of social functioning, baseline fatigue score, percentage of time tired, number of months since chronic fatigue began and whether they had been classified as having CFS. In the analysis of follow-up costs, baseline costs were included as an independent variable.

Regression analysis using cost data frequently results in non-normally distributed residuals. Therefore, bootstrapping was used which involves resampling with replacement from the original sample a sufficiently large number of times in order to approximate the distribution of the population from which the original data were drawn (Mooney & Duval, 1993). In this case 5000 samples were generated. p values and 90% confidence intervals (CI) were calculated according to the bootstrap-t method described by Barber & Thompson (2000). An α value of 0·1 rather than 0·05 was chosen to define statistical significance for differences in the cost data, based on the assumption that there is less risk aversion involved in making inferences from cost data than there would be with clinical data.

Cost-effectiveness comparisons

The incremental cost-effectiveness (which was appropriate given the primary outcome measure) of one treatment over another was assessed using the net-benefit approach (Briggs, 2001). Net benefit (NB) was defined as:

$$NB = (\lambda \times E) - C,$$

where λ = the amount society values a one unit improvement in outcome, E = outcome and C = cost.

The resource costs (C) and outcomes (E) will be known for any individual patient in the study. There is a theoretical (though unknown) value (λ) that society would be willing to place on each of these units of outcome. If, for any individual patient, the product of λ and E exceeds the cost incurred for that patient then a net benefit to society has been achieved (NB > 0). However, if costs exceed the product of λ and E then there is a net loss to society (NB < 0).

Net benefits were calculated for each patient in the sample using a range of different values for λ. It was assumed that λ would not be negative, but could be zero (i.e. society would not place any value on an improvement in fatigue). Alternative values used were increments of £500 up to £10 000. This range was not defined beforehand, but was rather chosen to indicate the values at which the cost-effectiveness

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Table 1. *Sample characteristics*

	GET (n=50) n (%)	CBT (n=52) n (%)	BUC (n=30) n (%)	p^1	p^2
Female	33 (66)	37 (71)	23 (77)	0·593	0·396
White ethnicity	44 (88)	45 (87)	30 (100)	0·116	0·039
Living alone	11 (22)	8 (15)	5 (17)	0·667	0·807
Has dependants	17 (34)	27 (52)	11 (37)	0·152	0·527
Tired 50–75% of time	21 (42)	22 (42)	16 (53)	0·556	0·279
Tired 75–100% of time	16 (32)	12 (23)	8 (27)	0·597	0·932
Classified as having CFS	18 (36)	13 (25)	6 (20)	0·250	0·265
	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)		
Age	40·0 (10·7)	40·0 (12·8)	36·9 (10·7)	0·436	0·197
Fatigue score	24·8 (5·4)	25·4 (4·8)	22·9 (5·2)	0·113	0·043
Symptom score	16·8 (5·8)	17·2 (5·9)	14·5 (6·7)	0·145	0·052
Depression score	8·2 (3·9)	8·2 (3·2)	6·9 (2·6)	0·178	0·063
Anxiety score	10·2 (4·9)	10·7 (4·5)	9·4 (4·0)	0·455	0·267
Social functioning score	18·1 (8·6)	20·2 (7·3)	18·2 (7·2)	0·350	0·553
	Median (IQR)	Median (IQR)	Median (IQR)		
Duration of condition	23 (7–60)	28 (10–53)	31 (11–70)	0·411	0·264

BUC, usual care plus booklet; GET, graded exercise therapy; CBT, cognitive behavioural therapy; IQR, inter-quartile range; p^1, significance of difference between BUC, GET and CBT; p^2, significance of difference between BUC and GET/CBT.

acceptability curve (see below) reached certain levels and 'flattened' out. Differences in net benefits between CBT and GET and between therapy and BUC were then compared using bootstrapped multiple regression models (one model for each value of λ) controlling for baseline costs and the aforementioned patient characteristics. This procedure used 5000 repetitions, which meant that for each model 5000 values of the incremental net benefit were generated. The proportion of incremental net benefits that exceeded zero indicated the probability that cost-effectiveness would be achieved at that particular value of λ. Cost-effectiveness acceptability curves were generated which showed the relationship between λ and this probability. The net benefit analysis was conducted twice – once with the outcome variable indicating whether a clinically significant improvement had occurred, and the second indicating the magnitude of clinically significant change in fatigue.

Sensitivity analyses

Informal care is a major cost associated with chronic fatigue (Chisholm *et al.* 2001; McCrone *et al.* 2003), but there is not a clear consensus as to how this cost should be calculated. We therefore calculated alternative total costs by assuming that the unit cost of informal care was (1) equal to the national minimum wage (£4.10 per hour) and (2) equal to zero. There is also some uncertainty regarding the cost that should be attached to the therapy itself. In addition to the base case scenario, we calculated service costs using a therapy cost that was (1) one-third higher and (2) one-third lower. Higher therapy costs might result from more qualified staff providing the intervention. Lower grade staff would result in decreased costs, as would the provision of fewer therapy sessions. This latter possibility would be relevant if the planned six sessions were more than were needed for a therapeutic response. The values of λ at which the probability of therapy being cost-effectiveness exceeded 0·8 in the base case were used to calculate net benefits using the service costs incorporating these alternative costs.

RESULTS

Of 144 patients referred to the randomized component of the study 123 were actually randomized to treatment. Forty-seven patients were referred for entry to the BUC group and 40 agreed to participate. Of the 168 patients who entered the study, service use and costs data were available at both time points for 132 (79%), and cost-effectiveness data for 130 (77%). The three treatment groups did not differ significantly (at conventional levels) in terms of patient characteristics and baseline values of outcome measures (Table 1). However, when the two therapy groups were combined and compared to the usual care group there were

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Table 2. *Service use and costs (2000/01 £s) in 3 months prior to baseline and follow-up assessments (GET v. CBT)*

	Grade exercise ($n=50$)						Cognitive behavioural therapy ($n=52$)					
	Baseline			Follow-up			Baseline			Follow-up		
	Service use		Cost	Service use		Cost	Service use		Cost	Service use		Cost
	n (%)	Mean (S.D.)[1]	Mean (S.D.)	*n* (%)	Mean (S.D.)[1]	Mean (S.D.)	*n* (%)	Mean (S.D.)[1]	Mean (S.D.)	*n* (%)	Mean (S.D.)[1]	Mean (S.D.)
Intervention	0 (0)	0·0 (0·0)	0 (0)	44 (88)	4·4 (2·4)	136 (72)	0 (0)	0·0 (0·0)	0 (0)	52 (100)	5·4 (1·5)	178 (51)
GP	49 (98)	3·1 (2·3)	52 (39)	42 (84)	2·1 (1·9)	36 (32)	46 (89)	2·5 (1·6)	42 (26)	42 (81)	2·0 (2·0)	34 (33)
Other doctor	24 (48)	0·8 (1·1)	64 (92)	18 (36)	0·7 (1·3)	66 (126)	17 (33)	0·8 (1·8)	85 (296)	16 (31)	0·7 (1·5)	62 (167)
Nurse	12 (24)	0·5 (1·0)	5 (20)	13 (26)	0·5 (1·1)	4 (9)	6 (12)	0·2 (0·5)	1 (4)	9 (17)	0·3 (0·6)	1 (3)
In-patient	1 (2)	0·06 (0·42)	15 (103)	2 (4)	0·06 (0·31)	22 (125)	1 (2)	0·02 (0·14)	5 (34)	2 (4)	0·08 (0·44)	21 (110)
Physioth.	4 (8)	0·3 (1·2)	12 (48)	5 (10)	0·3 (1·0)	22 (127)	2 (4)	0·1 (0·6)	1 (7)	2 (4)	0·2 (0·9)	2 (12)
Counsellor	4 (8)	0·3 (1·2)	12 (47)	3 (6)	0·2 (0·9)	3 (13)	2 (4)	0·04 (0·2)	1 (3)	4 (8)	0·5 (1·9)	9 (39)
Nutritionist	3 (6)	0·2 (0·9)	13 (53)	2 (4)	0·1 (0·7)	4 (25)	0 (0)	0·0 (0·0)	0 (0)	1 (2)	0·1 (0·4)	3 (23)
Social services	1 (2)	0·04 (0·28)	3 (23)	0 (0)	0·0 (0·0)	0 (0)	0 (0)	0·0 (0·0)	0 (0)	0 (0)	0·0 (0·0)	0 (0)
Compl. ther.	11 (22)	0·9 (2·4)	19 (53)	17 (34)	1·4 (2·4)	40 (76)	7 (14)	0·6 (2·0)	13 (47)	12 (23)	1·1 (2·8)	25 (60)
Informal care	24 (48)	113 (264)	1197 (2793)	24 (48)	128 (239)	1352 (2529)	28 (54)	197 (367)	2077 (3882)	31 (60)	155 (269)	1636 (2844)
Total cost	—	—	1392 (2827)	—	—	1684 (2584)	—	—	2225 (3920)	—	—	1970 (2895)

GET, graded exercise therapy; CBT, cognitive behavioural therapy; [1] number of contacts in past 3 months except for informal care (number of hours in past 3 months).

differences, with the therapy group including a significantly higher proportion of non-white patients and having significantly higher baseline fatigue, symptom and depression scores.

Service use and costs – GET *v*. CBT

Service use was similar between the GET and CBT groups during the three months preceding baseline and follow-up (Table 2). All patients in the CBT group received some therapy, whereas 12% of the GET group did not. The majority of patients received care from GPs, although this decreased slightly over time. There was a noticeable increase between baseline and 8-month follow-up in the number of patients using complementary healthcare services. Many patients at both points in time received help from informal carers and this dominated costs at baseline and follow-up (Table 3).

Table 2 shows that at baseline and follow-up the unadjusted mean total costs were highest for the patients who received CBT. With sample differences controlled for, the total mean 3-month cost at baseline was £519 (90% CI −£814 to £1904; $p=0{\cdot}522$) higher for the CBT group, whereas the mean cost at follow-up was £193 less for the CBT group (90% CI −£946 to £458; $p=0{\cdot}620$).

Service use and costs – therapy *v*. BUC

At baseline, almost all patients in the therapy and BUC groups were in contact with their GP and large proportions also had contacts with other clinicians, nurses and complementary therapists (Table 3). Overall, service utilisation was fairly similar in both groups. One major difference however was informal care, which was used by a much greater proportion of the therapy sample. By follow-up there were few notable changes in service use.

Most costs were relatively low and did not differ substantially between the two groups (Table 3). However, the costs of informal care were again extremely high. For the therapy group, the intervention itself accounted for only 9% of total costs.

After controlling for background characteristics, the baseline costs for the therapy group were £385 (90% CI −£811 to £1702; $p=0{\cdot}664$) greater than for the BUC group. At follow-up the therapy group was £149 more expensive (90% CI −£708 to £1011; $p=0{\cdot}791$).

Table 3. *Service use and costs (2000/01 £s) in 3 months prior to baseline and follow-up assessments (therapy v. booklet plus usual care)*

	Therapy (*n*=102)						Booklet plus usual care (*n*=30)					
	Baseline			Follow-up			Baseline			Follow-up		
	Service use		Cost	Service use		Cost	Service use		Cost	Service use		Cost
	n (%)	Mean (S.D.)[1]	Mean (S.D.)	*n* (%)	Mean (S.D.)[1]	Mean (S.D.)	*n* (%)	Mean (S.D.)[1]	Mean (S.D.)	*n* (%)	Mean (S.D.)[1]	Mean (S.D.)
Intervention	0 (0)	0·0 (0·0)	0 (0)	96 (94)	4·9 (2·0)	157 (66)	0 (0)	0·0 (0·0)	0 (0)	0 (0)	0·0 (0·0)	5 (0)
GP	95 (93)	2·8 (2·0)	47 (33)	84 (82)	2·1 (1·9)	35 (32)	30 (100)	2·6 (1·6)	44 (27)	26 (87)	2·2 (2·2)	38 (37)
Other doctor	41 (40)	0·8 (1·5)	75 (220)	34 (33)	0·7 (1·4)	64 (148)	7 (23)	1·2 (5·5)	76 (311)	9 (30)	0·8 (2·3)	80 (263)
Nurse	18 (18)	0·3 (0·8)	3 (14)	22 (22)	0·4 (0·9)	2 (6)	9 (30)	0·5 (0·8)	2 (4)	6 (20)	0·3 (0·6)	1 (4)
In-patient	2 (2)	0·04 (0·31)	9 (76)	4 (4)	0·07 (0·38)	21 (117)	0 (0)	0·0 (0·0)	0 (0)	1 (3)	0·03 (0·18)	8 (45)
Physioth.	6 (6)	0·2 (0·9)	7 (34)	7 (7)	0·2 (0·9)	12 (90)	1 (3)	0·3 (1·5)	7 (38)	1 (3)	0·1 (0·4)	2 (10)
Counsellor	6 (6)	0·2 (0·9)	6 (33)	7 (7)	0·3 (1·5)	6 (29)	2 (7)	0·6 (2·4)	16 (67)	4 (13)	0·8 (2·7)	28 (100)
Nutritionist	3 (3)	0·1 (0·6)	6 (37)	3 (3)	0·1 (0·6)	4 (24)	0 (0)	0·0 (0·0)	0 (0)	1 (3)	0·03 (0·18)	1 (3)
Social services	1 (1)	0·02 (0·20)	2 (16)	0 (0)	0·0 (0·0)	0 (0)	0 (0)	0·0 (0·0)	0 (0)	0 (0)	0·0 (0·0)	0 (0)
Compl. ther.	18 (18)	0·8 (2·2)	16 (50)	29 (28)	1·3 (2·6)	32 (68)	7 (23)	0·5 (1·1)	25 (67)	7 (23)	0·5 (1·1)	16 (37)
Informal care	52 (51)	156 (322)	1646 (3405)	55 (54)	142 (254)	1497 (2685)	7 (23)	99 (303)	1049 (3205)	12 (40)	123 (270)	1296 (2850)
Total cost	—	—	1817 (3437)	—	—	1830 (2737)	—	—	1220 (3219)	—	—	1475 (2916)

GET, graded exercise therapy; CBT, cognitive behavioural therapy; [1] number of contacts in past 3 months except for informal care (number of hours in past 3 months).

Cost-effectiveness analysis – GET *v.* CBT

Ridsdale *et al.* (2004) report that the mean decrease in the fatigue score for the GET group relative to the CBT group was 0·71 points, but this difference was not statistically significant. The data used in the cost-effectiveness analysis reveal that 35 (73%) of the GET group and 41 (79%) of the CBT group had a decrease in fatigue of at least four points. The mean unit-change (improvements or deteriorations divided by four) in the GET group was 2·4 (S.D. 2·2) and in the CBT group the figure was 2·7 (S.D. 2·1). From the cost-effectiveness acceptability curves (Fig. 1) it was estimated that if society placed a zero-value on a clinically significant decrease in fatigue then the probability that CBT would be more cost-effective compared to GET is 0·589. This probability increases to 0·766 if society values a clinically significant change at £5000. At all values considered CBT is more cost-effective. Turning to the magnitude of change, the second curve on Fig. 1 shows that with a zero value placed on a four-point change there is a probability of 0·663 that CBT is the most cost-effective option. This then gradually falls. However, it can be seen that the probability is largely insensitive to changes in the societal value placed on outcome and this is because the costs and the outcomes of the two options were very similar.

Cost-effectiveness analysis – therapy *v.* BUC

Outcomes were significantly better for therapy compared to BUC, with the mean difference being 4·38 points on the fatigue scale (Ridsdale *et al.* 2004). Eighteen (60%) of BUC had clinically significant improvements, whilst the figure was 76 (76%) for the therapy group. The mean (S.D.) number of four-unit changes was 1·2 (1·9) and 2·6 (2·2) in the two groups respectively. Therefore, therapy produced greater benefits but at an increased cost (£149), although the latter finding was not statistically significant. Fig. 2 shows the probability that the incremental net benefit is higher for therapy than BUC at different values of λ. With regard to the outcome measure which simply reveals whether a decrease in fatigue of at least four points has been achieved, with a zero valued placed on this the probability that therapy is more cost effective than BUC is 0·237. It is interesting to note

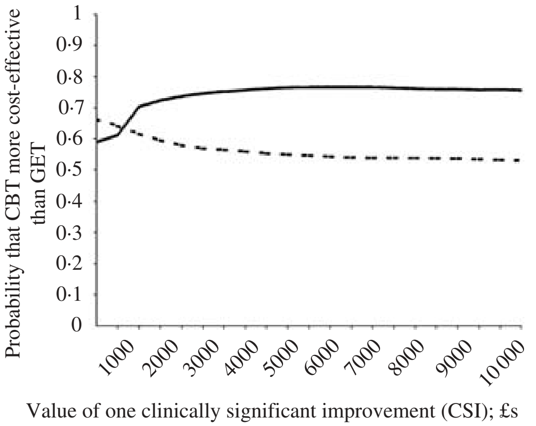

FIG. 1. Cost-effectiveness acceptability curve [cognitive behavioural therapy (CBT) compared to graded exercise therapy (GET)]. ——, Any CSI; - - -, number of CSIs.

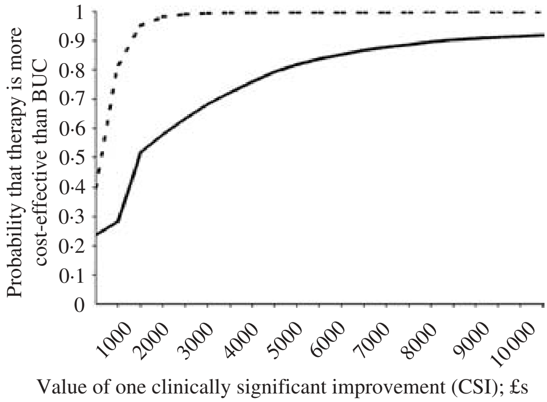

FIG. 2. Cost-effectiveness acceptability curve [therapy compared to usual care plus booklet (BUC)]. ——, Any CSI; - - -, number of CSIs.

that the probability of non-zero incremental net benefits increases with λ but at a decreasing rate. When λ is equal to £4500 the probability of therapy being the more cost-effective is 0·818. The other curve shows the probability of therapy being the most cost-effective option when the outcome measure is the fatigue score change divided by four. Here it can be seen that therapy is highly likely to be cost-effective for more moderate values placed on a unit of outcome. For example, if each four-point change is valued at £500 then the probability that therapy is more cost effective than BUC is 0·819. Therefore, although the actual level of λ is not known it can be seen that the probability of cost-effectiveness reaches very high levels towards the left of the scale on Fig. 1 and the sensitivity of this probability decreases with increases in λ.

Sensitivity analyses

If informal care is given a zero value, then with a λ of £4500 the probability of therapy being cost-effective when the outcome measure is a clinically significant improvement increases to 0·880. This rises to 0·894 if a unit cost of £4.10 is used. With regard to the number of clinically significant sized improvements, the probability of therapy being more cost effective when λ equals £500 than BUC is 0·989 with a zero value for informal care and 0·951 with a unit cost of £4.10.

If the cost of therapy increases by one-third, the probability that therapy is the most-cost-effective way of producing a clinically significant improvement falls to 0·797 with a λ of £4500. If the cost falls by one-third then the probability increases to 0·836. For the magnitude of change in fatigue, the probability of therapy being the most cost-effective is (by coincidence) 0·797 for higher therapy costs and 0·837 for lower costs when $\lambda = £500$. It can be seen, therefore, that the results of the analysis are not greatly affected by changes to these parameters.

DISCUSSION

This evaluation has shown that overall levels of service use and service costs are relatively low for patients with chronic fatigue and do not differ greatly by therapy group. The main exception is for informal care, which accounted for a substantial amount of cost before and after the interventions. Costs and outcomes were similar between GET and CBT. However, CBT appeared to be more cost-effective on the basis of the evidence provided by the cost-effectiveness acceptability curve analysis. It was of interest that whilst all patients in the CBT arm received therapy, only 88% of the patients in the GET arm did so. Had the remaining 12% actually received therapy then – potentially – the difference between CBT and GET outcomes would have been less. However, this is entirely speculative. Treatments need to be acceptable to patients and the fact that 12% of the GET group decided not to receive therapy is of interest in itself.

It is arguable that informal care, which accounted for a substantial amount of cost, should not be considered in cost-effectiveness analyses in the health care arena. Whilst health care costs will be most relevant for decision makers, it can also be the case that informal care is a valuable therapeutic input and it may also substitute for statutory services. For such reasons we considered it an important element to include.

Outcomes for therapy *per se* were better than for usual care enhanced by the use of a self-help booklet but total 3-month costs were on average £149 more. (This though was not statistically significant.) The use of the cost-effectiveness acceptability curve showed that if a decrease in fatigue of four points is valued at around £500 then the probability that therapy is cost-effective is 0·819 if the magnitude of change is considered. A much higher value is required to show that therapy is the most cost-effective option if we are only concerned with whether or not a clinically significant change has taken place (regardless of the magnitude). This is because both therapy and BUC tended to result in an improvement in excess of four points. Whether or not society would place such values on positive outcomes is unclear. What is revealed though by the curves is that values above these figures have a diminishing limited effect on the probability that therapy is cost-effective.

Limitations

There are a number of limitations to the study. Firstly, although the comparison of CBT and GET was based on random allocation, the comparison between therapy and BUC was not randomized and there were some significant baseline differences. It is appropriate in such circumstances to control for baseline differences using multivariate analysis, but it is important to recognize that adjustment can only be made for variables that have been measured. It is possible that unmeasured variables may affect the results and, therefore, the evidence produced by this study is not as strong as if it had been produced under randomized conditions.

Secondly, the collection of data under 'experimental' conditions may also be different from data collected under 'routine' conditions. However, we feel that such a bias is minimal here given that patients were drawn from the same practices and the same instruments were used for assessments.

Thirdly, reliance on patient self-report might result in some inaccuracies in service use measures. The method has though been employed in numerous other studies, and given that the recall period was short (3 months) we do not expect that this would have presented a major problem. Any inaccuracies are possibly offset by the gains in the breadth of services measured that only self-report would allow.

Fourthly, there is not a consensus as to how the main cost component, informal care, should be measured. We did conduct sensitivity analyses around the cost of informal care, and these revealed that the results were fairly robust. Sensitivity analyses also revealed that the results were robust to changes in the cost of therapy itself.

Finally, interpretation of a unit change on the fatigue scale is difficult to interpret. This is addressed to some extent by also using a four-point change to represent clinical significance. However, this is in itself somewhat arbitrary and still presents a challenge for interpretation by those not closely involved in care for this patient group.

This study has shown that good outcomes can be achieved for those with chronic fatigue but at a cost. Whether this cost is worth paying is clearly a value judgement and depends on how much society values improvements in this condition. We feel that multivariate methods employed to make comparisons between the groups was valid, but clearly the evidence would be strengthened were patients also randomized to the BUC group. Future work needs to be conducted to ascertain how much society does value improvements in health care status for patients with fatigue and other disorders.

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APPENDIX

Unit costs (2000/2001 £s) per hour unless otherwise stated

Service	Cost (£)
GP (attendance)	17
Nurse	31
In-patient (day)	242
Out-patient (attendance)	
Generic	74
General surgery	62
Dermatology	57
Gastroenterology	76
Neurology	109
Cardiology	75
Psychiatric	128
Oncology	107
Infectious diseases	248
Nephrology	91
Haematology	64
Accident and emergency	61
Other medical physician	148
Osteopath/chiropractor	20/18*
Physiotherapist	41
Counsellor	28
Acupuncturist	32/24*
Nutritionist	32
Reflexologist	20/19*
Dowser	N.A.†
Social worker	82
Informal care	11
CBT	40
Self-help booklet	5

* The initial figure refers to the average price of an initial contact and the second figure refers to subsequent contacts.

† A unit cost for a dowser was not required as the only patients who used this service paid a direct charge for it.

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