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Cost-Effectiveness and Health Care Utilization in a Multidisciplinary Pain Center: Comparison of Three Treatment Groups

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Recent literature supports the efficacy of multidisciplinary pain management in treating persons suffering from chronic pain. However, the components of multidisciplinary pain management need to be evaluated in terms of effects on patients' quality of life as well as saving of future health care dollars. Therefore, cost-effectiveness of three treatment groups was compared by examining treatment outcome, posttreatment health care costs, and posttreatment health care visits. Results revealed that patients receiving both medical and psychological treatment (multidisciplinary pain management) exhibited the largest improvements in functional capacity, while being the least costly after their treatment program had ended. In contrast, patients who received only medical treatment exhibited significant deterioration in outcome after their treatment ended, and consumed substantially more posttreatment health care dollars.

KEY WORDS: chronic pain; cognitive–behavioral; cost-effectiveness.

INTRODUCTION

As the efficacy of multidisciplinary pain centers (MPCs) in treating persons with chronic pain has become apparent, there has been a trend toward research on the cost-effectiveness of MPC programs (Okifuji, Turk, & Kalauokalani, 1998; Turk, 1996). The cost-effectiveness of a treatment is dependent upon both successful treatment outcome *and* monetary savings in treatment costs, posttreatment health care expenditures, or both. The demand for cost-effectiveness research is accentuated by the fact that chronic pain is reported by 80 million Americans (Bonica, 1987), and 60% of all social security disability claims involve the allegation of pain (Simmons, Avant, Demski, & Parisher, 1988). Pain is the second most common reason for a visit to the physician, accounting for more than 70 million office visits every year (National Center for Health Statistics, 1986). The number of MPCs in the United States increased sharply in the 1980s as health professionals sought to treat various chronic pain syndromes in a more timely and cost-effective fashion. As medical and psychological treatments for chronic pain become increasingly refined, the question of which treatments are medically, psychologically, and *financially* effective has become important to health care providers, insurance companies, and consumers of health care services. Reviewed here after are studies that were designed to address some of these issues.

A metaanalysis of studies examining the efficacy of MPCs revealed multidisciplinary pain management to be an efficacious treatment modality as well as a cost-effective one (Flor, Fydrich, & Turk, 1992). Sixty-five studies published between 1960 and 1990 were aggregated into this meta-analysis. These studies were included if the design involved a multidisciplinary approach to pain management as well as reports of empirical findings. The treatments typically included a combination of psychological, medical, and physical/occupational therapy. Dependent variables were coded into three categories: psychophysiological,

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behavioral, and verbal/subjective. Results revealed the MPC to be efficacious as compared to no-treatment control groups. At long-term follow-up, 75% of patients were found to be functioning better than their untreated counterparts. The largest effect sizes were found for self-report measures of pain. In terms of behavioral outcome, patients treated at MPCs were more likely to return to work and decrease their use of health care than untreated patients. The latter finding suggests that MPCs can be significantly cost-effective and could result in as much as a 43% saving in disability payments alone (Flor et al., 1992). Moreover, savings in medical and surgical expenditures were estimated to lead to a total saving of over $184 million.

The efficacy of multidisciplinary pain management in reducing posttreatment medical visits was also explored by Caudill, Schnable, Zuttermeister, Benson, and Friedman (1991). Results indicated that patients had significantly fewer medical visits after undergoing treatment than before treatment, and this finding appeared to be stable for up to 2 years after treatment termination. A similar study compared pre- and posttreatment medical utilization among patients with chronic low-back pain undergoing a 2-week multidisciplinary pain management program (Simmons et al., 1989). Results indicated that medical costs following the program were reduced by an average of 59%.

A study that compared treatment outcome and cost-effectiveness among five different groups was conducted by Cassisi, Sypert, Salamon, and Kapel (1989). One group received multidisciplinary pain management, and the other groups included those patients not approved by insurance, those who declined participation, patients from other programs, and dropouts. At a 22-month follow-up, the group that completed treatment had significantly fewer surgeries and hospitalizations, and significantly more employed patients as compared to the nonparticipant groups. This study remains the one study to date that has incorporated more than one comparison group in evaluating the cost-effectiveness of multidisciplinary pain management.

The cost-effectiveness of two pain management strategies was examined by Jensen et al. (1995). Multidisciplinary pain management by clinic staff (physicians, physical therapists, nurses) who were trained in the cognitive–behavioral approach was compared to multidisciplinary pain management by clinic staff including a cognitive–behavioral clinical psychologist. The cost-effectiveness ratio of the two treatment options was computed as follows: Total cost and incremental cost were calculated using average salary of psychologist time, plus administrative overheads, social insurance, and cost of space. Cost-effectiveness was calculated as the ratio between the sum of those costs and the score of each dependent measure. Results indicated that both treatments yielded equally effective post treatment outcomes such as pain intensity, disability, anxiety, helplessness, and marital satisfaction. However, the treatment that did not involve the psychologist cost significantly less. Thus, the treatment that did not include "formal" cognitive–behavioral therapy was deemed most cost-effective.

Many questions are left unanswered in the MPC cost-effectiveness literature. With the exception of the Cassisi et al. study, there is a lack of no-treatment comparison groups when examining cost-effectiveness (Cassisi et al., 1989). In addition, most multidisciplinary treatment, by definition, is heterogeneous. Marketed as a single treatment package, the MPC treatment obscures variations in cost-effectiveness with different treatment components. This is compounded by a situation in which different MPC patients often receive different treatments dictated not only by medical needs but also by insurance coverage. Consequently, not all of the patients in an MPC can be assumed to be receiving cognitive–behavioral treatment (CBT) even though it is a mainstay of pain management.

A recent meta-analysis of cognitive–behavioral therapy revealed CBT to be an effective treatment modality beyond pharmacotherapy and other traditional interventions (Morley, Eccleston, & Williams, 1999). Although cognitive–behavioral treatment has been demonstrated by Morley et al. (1999) and others as effective in improving MPC patients' *treatment outcomes* (improvements in functional capacity, less pain, less depression), it is not known whether the cognitive–behavioral component of MPCs is *cost-effective* (Flor et al., 1992). Thus, the incremental utility/effectiveness of CBT has not yet been confirmed.

With the exception of Jensen et al. (1995), no studies have examined cost-effectiveness of the cognitive–behavioral treatment component. In particular, no studies have attempted to distinguish the psychological versus pharmacotherapeutic contributions to cost-effectiveness. The purpose of this study was to compare posttreatment health care costs and post treatment health care usage in chronic pain patients receiving either (i) psychological (cognitive–behavioral) treatment

plus pharmacotherapy (CBT + PCT), (ii) pharmacotherapy alone (PCT), or (iii) no-treatment from a pain center; standard care (NT). Pharmacotherapy, in this study, was defined as the detoxification of addictive analgesic medications, medication-monitoring, and analgesic prescription by attending anesthesiologists and medical staff. Pharmacotherapy also included pain-relieving injections administered only if the attending anesthesiologist determined it was suitable treatment for the patient.

The present study advances previous research by comparing different pain treatment groups on such cost-related variables. It was expected that the cognitive–behavioral component of pain management would be responsible for a significant drop in posttreatment health care costs. That is, patients receiving the CBT + PCT would be least costly (monetarily) after treatment completion, and those receiving no pain center treatment would be most costly, with the PCT group being intermediate in posttreatment utilization.

METHOD

Participants

Study participation was solicited from chronic pain sufferers who had been referred to an MPC in Dallas, Texas, for evaluation by a team of health care professionals, including an anesthesiologist, a physiatrist, and a licensed psychologist. All patients had been previously diagnosed with some sort of chronic pain syndrome of which medical etiologies had been identified. This clinic was a tertiary MPC, meaning that the patients in this sample had experienced recurrent intractable pain for more than 6 months, had limited success with traditional medical approaches, and were referred to this pain management center for multidisciplinary evaluation and (potentially) treatment. Patients reported experiencing pain most commonly in the low-back, followed by mid-back, head, shoulder, and neck. Admission criteria at the pain clinic required that those with neuropsychological disorders or terminal illness be excluded.

The operations of the pain clinic were such that random assignment of patients to the three treatment conditions was not possible. This was largely due to third party reimbursement policies, as faced by most previous research in this area. Thus, patients in the PCT group were those whose insurance adjusters had authorized payment for pharmacotherapy only. Those who had received authorization for pharmacotherapy plus cognitive–behavioral therapy became the CBT + PCT group. Those who did not receive authorization for any treatment went into the NT group. The authorization decisions were driven mainly by the insurance adjusters' perceptions of medical necessity. Thus, to control for any pre-treatment differences between the three groups, pre-treatment levels of physical functioning, age, ethnicity, and marital status were evaluated by ANOVA.

It should also be noted that even though the NT group was labeled as receiving no (multidisciplinary) treatment, it was to be expected that some patients in this group would seek medical consultation or minimal treatment for pain during the course of this study. On examining the follow-up questionnaires, the most common source of help for patients not receiving care from the pain clinic was physical therapy, chiropractic, and massage. This "minimalist treatment" remained sufficiently different from the other two treatment conditions to justify the comparisons made in this study. Logistical constraints made it virtually impossible to recruit patients willing to eliminate all pain treatments over the duration of the study. There were also ethical considerations that militated against the creation of such a zero-treatment control condition.

Measures

Follow-up Questionnaires

These questionnaires included items concerning type of treatment the patients were currently receiving, the cost of treatments, employment status, disability status, pain severity, and depression levels. All groups completed five questionnaires over a period of 10 months.

Health Status Questionnaire (HSQ)

The HSQ (Health Outcomes Institute, 1993) is a 39-item instrument that assesses several domains of a person's health and functioning: Bodily pain, energy, health perception, mental health, physical functioning, risk for double depression, risk for dysthymia, risk for major depression, emotional roles, physical roles, and social functioning. Only the items in the "physical functioning" domain were used for this study, to evaluate possible differences in pretreatment physical limitations. Examples of items include "Does your health limit you in these activities? Vigorous activities, such

Table I. Treatment and Questionnaire Schedule for Treatment Groups

Month	CBT + PCT group	PCT group	NT group
0	Evaluation	Evaluation	Evaluation
1	Pain center treatment	Pain center treatment	Treatment other than pain center
2	Pain center treatment	Pain center treatment	Treatment other than pain center
3	Pain center treatment	Pain center treatment	Treatment other than pain center
4			
5	Follow-up assessment 1	Follow-up assessment 1	Follow-up assessment 1
6			
7	Follow-up assessment 2	Follow-up assessment 2	Follow-up assessment 2
8			
9	Follow-up assessment 3	Follow-up assessment 3	Follow-up assessment 3
10			
11	Follow-up assessment 4	Follow-up assessment 4	Follow-up assessment 4
12			
13	Follow-up assessment 5	Follow-up assessment 5	Follow-up assessment 5

as running, lifting heavy objects, participating in strenuous sports; Climbing several flights of stairs; Bending, kneeling or stooping." Responses are answered on a 3-point response scale, ranging from "Yes, limited a lot" to "No, not limited at all." The items that assessed physical functioning were scored and examined among the three groups (see Data Analysis later).

Multidimensional Pain Inventory (MPI)

The MPI (Kerns, Turk, & Rudy, 1985) is a comprehensive instrument that is composed of three sections with a total of 13 empirically derived scales (Kerns et al., 1985). The present study focuses on only one of the scales, namely, Interference. This scale assesses the patient's perception of how much and in what ways the patient perceives his/her pain to affect daily functioning, and thus will be used to represent patients' functional impairment in a broad range of daily activities. The MPI is a reliable and valid instrument (Jamison, Rudy, Penzien, & Mosley, 1994). An improvement score was generated for each patient by subtracting the pretreatment Interference score from the posttreatment Interference score. Thus, negative scores are indicative of improvement in functional capacity from pre- to posttreatment.[5]

[5]Residualized improvement scores were also generated for the MPI Pre-Post Interference scores, using a regression equation with the "Pre" score as the predictor and the "Post" score as the response variable. These residuals were analyzed, and those ANOVA results were identical to that of the ANOVAs incorporating the improvement "difference" scores.

Procedure

Upon admission to the pain center, the PCT + CBT and PCT groups received treatment throughout a 3-month duration. For the PCT + CBT group, treatment consisted of cognitive–behavioral therapy incorporating biofeedback and relaxation training, plus pharmacotherapy. Cognitive–behavioral therapy was provided by licensed psychologists. The PCT group received pharmacotherapy only. Pharmacotherapy was provided on a monthly basis by attending anesthesiologists. After the 3-month treatment period, the participants were mailed five follow-up questionnaires over a period of 10 months (Table I). These questionnaires required participants to indicate the number of pain-related visits they had made to any health care professional during the 2 months preceding each follow-up, and to estimate the costs of those visits. The number of health care contacts obtained from patient self-report has been found to be a valid index of health care usage, as measured by daily diaries and through direct comparisons with medical records (Gil, Abrams, Phillips, & Williams, 1992). Participants' estimated costs of visits were confirmed by comparing self-report to their actual medical records. See Table I below for the treatment and questionnaire schedule for the three treatment groups.

Posttreatment health care costs for all groups were defined as the total pain-related health care costs from 3 months postevaluation to 13 months postevaluation. For the CBT + PCT and PCT groups, health care usage was defined as the total number of

Table II. Descriptive Statistics for Pretreatment Physical Functioning by Treatment Group

	N	*M*	*SD*
PCT + CBT	16	45.21	14.25
NT	9	47.51	23.25
PCT	6	32.59	32.75

pain-related visits patients made to a physician after their MPC treatment was completed, for 10 months posttreatment (same as 13 months postevaluation). For the NT group, health care usage was defined as the total number of visits patients made to a physician, from 3 months postevaluation to 13 months postevaluation.

RESULTS

Participants

The final sample consisted of 16 participants in the PCT + CBT group, 9 participants in the NT group, and 6 participants in the PCT group. The unequal sample sizes are because participants had to be excluded if they neglected to complete any of the cost or visit-related portion of the questionnaire. Thus, data from only those participants with complete records were subjected to analyses.

First, a one-way ANOVA was performed on pretreatment physical functioning (HSQ scale) across the three groups. As shown in Table II, the mean physical functioning scores were very similar for the PCT + CBT and the NT group, but lower for the PCT group that also had greater variability. These group differences did not reach statistical significance, $F(2, 30) = .98$, $p = .38$. Hence, pretreatment physical functioning was not expected to influence differences in posttreatment costs or visits. In addition, age was compared across groups to rule out significant age differences between the groups, as health care utilization tends to increase as people get older (Binstock, 1987). As shown in Table III, the mean ages were very similar for the PCT + CBT ($\overline{X} = 54.7$) and PCT groups ($\overline{X} = 55.3$), but lower for the NT group ($\overline{X} = 43.3$).

Table III. Descriptive Statistics for Age by Treatment Group

	N	*M*	*SD*
PCT + CBT	16	54.69	12.60
NT	9	43.34	11.62
PCT	6	55.34	17.39

Table IV. Descriptive Statistics for Posttreatment (10 months) Dollars by Treatment Group

	N	*M*	*SD*
PCT + CBT	16	$2695.12	$1991.78
NT	9	$2328.58	$984.33
PCT	6	$6281.18	$2544.94

However, analyses of variance revealed no significant differences in age across the groups, $F(2, 30) = 2.164$, $p = .14$. Finally, there were no differences among the groups in ethnicity or marital status ($\chi^2(2) = 1.18$, *ns*; $\chi^2(8) = 6.21$, *ns*, respectively).

Posttreatment Costs and Health Care Visits

MANOVA were subsequently performed on total posttreatment costs and pain-related health care visits across the three groups. As shown in Table IV, the PCT group consumed the highest amount of posttreatment health care dollars within a 10-month period, $F(2, 30) = 9.51$, $p < .001$. This difference is consistent even after differences in group variance were controlled using Levene's test of inequality ($p < .01$). The PCT + CBT and NT groups consumed roughly the same amount of post treatment dollars. Post hoc analyses revealed both the PCT + CBT and NT groups to be significantly lower in posttreatment costs than the PCT group, with no significant differences between the PCT + CBT and NT groups.

With regard to pain-related health care visits, the PCT group also made the highest amount of posttreatment visits within a 10-month period, $F(2, 30) = 3.53$, $p < .05$. There was a statistically significant difference among groups on this variable, as indicated in Table V. Post hoc analyses revealed the NT group to be significantly lower in number of posttreatment visits than the PCT group, with the difference between the PCT + CBT and PCT groups approaching significance ($p < .08$). No significant differences emerged between the PCT + CBT and NT groups in posttreatment visits.

Table V. Descriptive Statistics for Posttreatment (10 months) Health Care Visits by Treatment Group

	N	*M*	*SD*
PCT + CBT	16	23.9	19.93
NT	9	17.3	7.85
PCT	6	45.9	22.99

Table VI. Pre- and Posttreatment Functional Impairment by Treatment Group

	Group	*N*	*M*[a]	*SD*
Pretreatment	PCT + CBT	16	4.97	0.56
Posttreatment			3.75	1.16
Pretreatment	NT	8	4.35	1.58
Posttreatment			5.17	0.94
Pretreatment	PCT	6	1.96	1.97
Posttreatment			5.19	0.88

[a]MPI Interference Scale.

Table VII. Treatment Improvement by Treatment Group

	N	*M*[a]	*SD*
PCT + CBT	16	−1.22	1.25
NT	8	0.82	1.24
PCT	6	3.24	2.30

[a]Negative numbers indicate improvement.

Treatment Improvement

Finally, MPI Interference scores at pre- and posttreatment (e.g. 3 months postevaluation) were computed for the three groups. Improvement from pre- to posttreatment was computed by subtracting the pretreatment score from the posttreatment score (a negative number indicating improvement).[5] A one-way ANOVA was performed on this dependent variable by treatment group. As shown in Tables VI and VII, the PCT + CBT group ($\overline{X} = -1.22$) exhibited the greatest amount of improvement in functional capacity, $F(2, 30) = 19.66$, $p < .0001$, and exhibited significantly more improvement than the NT group ($\overline{X} = .82$, $p < .02$). To control for any pretreatment differences on the MPI Interference scores between the three groups, an ANCOVA was computed on the posttreatment scores, holding the pretreatment scores constant. Results again revealed that the PCT + CBT group exhibited the greatest improvement in functional capacity, $F(2, 29) = 6.29$, $p < .006$. The PCT group exhibited the least amount of improvement. In fact, every member of the PCT group deteriorated from pre- to posttreatment ($\overline{X} = 3.24$). Figure 1 graphically illustrates these differences in both treatment improvement and posttreatment health care costs among the three groups.

Results indicated that there was a relationship between treatment improvement and posttreatment health care costs (Table VIII). Thus, regression analysis was performed *across all treatment groups* on MPI Interference reduction predicting posttreatment health care costs. Results summarized in Table IX indicated that improvement was a significant predictor of posttreatment health care costs ($\beta = .51$, $p < .005$). The β coefficient in the regression equation can be interpreted as follows: for every one standard deviation change in the independent variable, the dependent variable changes beta times the standard deviation of the dependent variable (Cohen & Cohen, 1975). Thus,

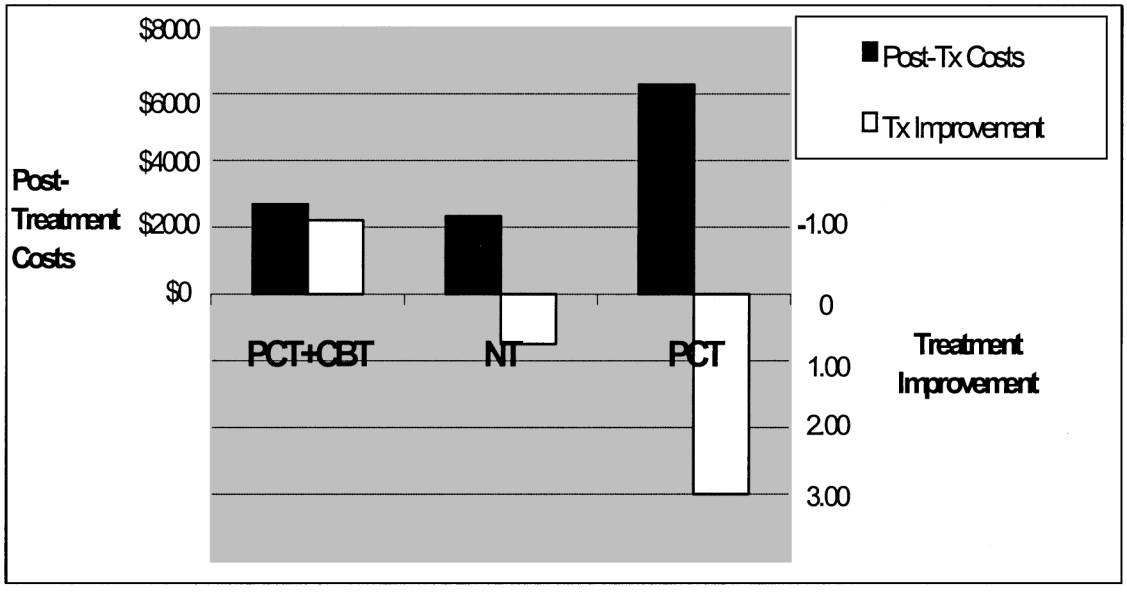

Fig. 1. Gauging treatment improvement with posttreatment health care costs.

Table VIII. MPI Improvement and Posttreatment Costs Across Groups

	M	*SD*
MPI improvement	0.14	2.15
10-month post-TX costs	$3,282.78	$2,361.53

for every one standard deviation improvement in the MPI Interference scale, there is a .51 standard deviation decrease in posttreatment health care costs—an average of $118.00 each month, or $1,116 per year.

DISCUSSION

Despite the relatively small sample sizes, significant main effects emerged for posttreatment health care consumption as well as for treatment outcome in this pain management center. It should be noted that the limited sample sizes in this study are not atypical of studies in this field that attempt to report cost data ($N = 16$: Simmons et al., 1987; $N = 3$: Gutkin, Holborn, Walker, & Anderson, 1994; $N = 14$, Cassisi et al., 1989). Results suggest that PCT patients receiving pharmacotherapy without any psychological care may be the most costly to the health care system after their multidisciplinary pain treatment comes to an end. Moreover, these patients also exhibited deterioration in functional capacity from pre- to posttreatment. Thus, as a result of getting worse in functional capacity, the pharmacotherapy patients appear to be incurring more pain-related health care costs—substantially more than patients in the other groups. It should be noted that patients in the pharmacotherapy group were equal in levels of physical functioning at pretreatment evaluation as compared to the other two groups. Moreover, according to PCT patients' self-report, their high posttreatment costs accounted for by the PCT group were, by and large, because of various invasive surgical procedures by anesthesiologists or orthopedic specialists, whereas the other groups reported substantially fewer treatments of this kind.

The difference in cost consumption between the PCT + CBT and PCT group could be considered striking, given that the only difference between these groups is the fact that the PCT + CBT group received cognitive–behavioral treatment. It appears that patients receiving pharmacotherapy whose cognitive and behavioral dysfunctions are not addressed are at risk for deterioration in functional capacity and for consuming far more health care dollars.

Table IX. Regression Analysis of Improvement on Posttreatment Health Care Costs

	B	*SE*	β	*t*	Significance
Constant	3126.87	383.43		8.16	.0001
MPI improvement	532.53	168.99	.51	3.15	.004

As mentioned previously, the NT group was a no multidisciplinary-treatment group, *not* a no-treatment group. Treatments received after their initial evaluation included those from their primary care physician, physical therapist, chiropractor, massage therapist, or all of these. Thus, it appears that these patients were far better-off pursuing their own ancillary treatment options for pain as opposed to being in an MPC and receiving only pharmacotherapy.

The PCT + CBT and NT groups consumed roughly equal posttreatment health care dollars and visits. Thus, the crucial delineating factor between these two groups appears to be the finding that the PCT + CBT group exhibited significantly more treatment improvement than the NT group. In fact, on average, the NT group exhibited *more* functional impairment from evaluation to 3 months postevaluation. Consequently, the PCT + CBT group, while consuming the same amount of health care dollars posttreatment, exhibited far greater improvements in functional capacity. It appears that the combination of pharmacotherapy and cognitive behavioral therapy is the best choice of treatment in terms of cost-effectiveness, thus supporting and adding to the findings of Cassisi et al. (1989), Caudill et al. (1991), and Simmons et al. (1989). Patients in this group achieved significantly higher levels of functional capacity while consuming no more dollars than those in the other treatment groups.

Moreover, improvement in functional capacity from pre- to posttreatment was significantly predictive of posttreatment health care costs. Findings indicate that for every 36% improvement in the MPI Interference scale, patients saved an average of $118 per month on posttreatment health care costs. Treatment improvements appear to go hand in hand with savings.

CONCLUSIONS

The findings from this study contribute to the current literature that occasionally questions the

financial practicality of cognitive–behavioral therapy in the chronic pain treatment setting. Results indicate that cognitive–behavioral interventions do make a significant contribution to patients' functional capacity as well as posttreatment health care consumption. Pharmacotherapy plus cognitive–behavioral therapy was the most cost-effective treatment. Patients in this group improved the most while consuming no more health care dollars posttreatment. The importance of the psychologist's role in treating chronic pain patients was also demonstrated in this study. When patients received no cognitive–behavioral interventions, their health care expenditures were three times as great during the 10 months following their treatment. Moreover, the patients who received cognitive–behavioral treatment were the only ones who, on average, exhibited improvement in functional capacity (24%) from pre- to posttreatment. Thus, it appears that psychologists can help chronic pain patients substantially improve their quality of life, and in doing so, reduce their health care consumption.

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