# Costs of an Intervention for Primary Care Patients With Medically Unexplained Symptoms: A Randomized Controlled Trial

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***Objective:*** **This study sought to determine whether an intervention for patients with medically unexplained symptoms in primary care reduced total costs, components of cost, and longer-term costs and whether it led to decreased service use outside the health maintenance organization (HMO).** ***Methods:*** **A randomized controlled trial involving 206 patients with medically unexplained symptoms was conducted in a staff-model HMO. The protocol emphasized the provider-patient relationship and included cognitive-behavioral therapy and pharmacological management. Cost data for medical treatments were derived from the HMO's electronic database. Patients were interviewed about work days lost and out-of-pocket expenses for medical care outside the HMO.** ***Results:*** **The difference in total costs ($1,071) for the 12-month intervention was not significant. The treatment group had significantly higher costs for antidepressants than the usual-care group ($192 higher) during the intervention, and a larger proportion received antidepressants. The intervention group used less medical care outside the HMO and missed one less work day per month on average (1.23 days), indicating a slight improvement in productivity, but the difference was not significant. The between-group difference in estimated total cost was smaller in the year after the intervention (difference of $341) but were not significant.** ***Conclusions:*** **The total costs for the intervention group were not significantly different, but the group had greater use of antidepressants. Coupled with findings of improved mental health outcomes for this group in a previous study, the results indicate that the intervention may be cost-effective. The longer-term impact needs to be further studied.** ***Psychiatric Services*** **58:1079–1086, 2007)**

For patients with medically unexplained symptoms, sometimes called somatization, there is little or no disease explanation for their numerous physical complaints (1,2). These patients become a problem in primary care when they embark on a quest to find an organic disease that they fear but do not have. Physicians may test for one or more organic causes—and even treat a nonexistent disease. Unnecessary laboratory testing and consultation results in increased costs and increased rates of iatrogenic complications, such as drug addiction from trial treatments of nonexistent conditions (3–9). Equally worrisome, physicians often ignore these patients' psychosocial distress (10–13). Rates of mental and physical dysfunction are high, disability and poor work records are common, relationships are poor, and personal distress prevails. Because of the high prevalence of unexplained symptoms among outpatients (14– 18), the health care system experiences excessive costs and utilization, and harmful effects on patients may result (12,13,19–25).

High-use patients with somatization may account for 5%–10% of all outpatients in primary care (12). Although most such data are based on the *DSM-IV* diagnosis of somatoform disorder, we recently found that more than 75% of distressed, high-use patients with medically unexplained symptoms did not have either a full or an abridged *DSM-IV* diagnosis of somatoform disorder (26).

In a key initial study by Smith and colleagues, a consultation letter to the patient's physician from the study's research team was shown to produce improvement in costs as well as in health outcomes among patients with somatization disorder, the most severe form of somatoform disorder (27,28). Using a more comprehensive treatment, in a recent randomized controlled trial we found evidence that an intensive primary care intervention could be suc-

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cessfully conducted by primary care clinicians over 12 months (29). A cognitive-behavioral and pharmacological treatment that has a strong emphasis on the provider-patient relationship was adapted for primary care and produced a clinically significant improvement in mental health function after the 12-month intervention. Depression and satisfaction with providers also improved, physical disability decreased, antidepressant use increased, and use of addicting agents decreased (29).

As part of the trial, we sought to compare differences in health care costs and components of costs for patients who received the intervention with those who received usual care and to determine whether the treatment led to decreased health care use outside the health maintenance organization (HMO) where the study was conducted. Distinguishing the differences in components of care and utilization—not just differences in total costs—has short- and long-term implications. An increase in prescription use and office visits in the short run may reduce costly hospitalizations in the longer term (30).

## Methods

### *Design*

Details of the randomized controlled trial have been published elsewhere (1,2,26,29,31,32). The study was approved by institutional review boards at Michigan State University and the HMO. Members of the staff-model HMO were recruited during May 2000 through January 2002 and gave informed consent. Criteria included membership in the HMO for the previous two years, age between 18 and 65 years, no more than one visit per month to a mental health professional in the year before study entry, and eight or more physician office visits per year for the past two years. Using explicit guidelines (1), chart raters who were clinicians identified patients with medically unexplained symptoms, which was defined as having no documented organic disease to explain symptoms of at least six months' duration. Only patients with the most severe comorbid organic diseases were excluded, which left 206 patients with medically unexplained symptoms as documented in their medical charts.

These patients were randomly assigned to treatment or usual care in the HMO. The treatment protocol was deployed by four nurse practitioners, who received 84 hours of training. The protocol emphasized the provider-patient relationship and included cognitive-behavioral therapy and pharmacological management.

Cognitive-behavioral treatment involved cognitive restructuring (including symptom diaries when indicated) and operant mechanisms tailored for busy primary care providers (for example, regularly scheduled visits and medications). To maximize other aspects of treatment (2), nurse practitioners used a behaviorally defined, five-step patient-centered method to establish a positive physician-patient relationship and a three-step patient-centered method to inform and motivate patients specifically about treatment (33,34). Although they did not use a training manual, nurse practitioners carefully followed the training they received. This was ensured by periodic taped reviews of their interactions as well as individual supervision and group meetings every one to three weeks. In the analysis that corrected for baseline severity of mental dysfunction, no difference in outcomes by individual nurse practitioner was found.

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The nurse practitioners also followed a collaborative stepped-care approach that has been useful in treating depression in primary care (35). They took full care of the patient, including management of frequent comorbid medical conditions. Rarely, for severe problems or hospital admissions, they consulted the patient's physician. Treatment focused on both mental and physical functioning and symptoms, but the primary endpoint was improved mental health functioning. Treatment included antidepressants, reduction or elimination of controlled-substance medications that were ineffective, exercise, relaxation training, physical therapy, and management of comorbid organic diseases. Most referrals were to mental health professionals, usually for improved patients who would benefit from counseling. Treatment entailed 12 scheduled patient visits with the nurse practitioner (20 minutes each) in weeks 1, 2, 3, 5, 8, 12, 16, 22, 28, 36, 44, and 52, but additional visits could occur. Telephone contact (from five to ten minutes) was scheduled between visits.

Patients in the control group received usual care from 21 HMO physicians and had their usual access to mental health professionals.

Outcomes were assessed by independent evaluators. For these patients, clinically significant improvement in the Mental Component Summary of the 36-item Short Form from the Medical Outcomes Study (SF-36) was found and reported elsewhere; in addition, depression, physical disability, and satisfaction with providers all improved, and there was an increase in use of antidepressants and a decrease in the use of addicting agents (narcotics, tranquilizers, and sleeping pills) (29).

### *Measurements of costs*

Much of the primary care for the study participants was provided by HMO staff at the HMO facilities. However, many services were also purchased by the HMO from outside providers—including, for example, all inpatient hospital care. We used data on costs from the HMO's electronic management information sys-

tem. For each participant, we used information on services delivered during the year that the individual was enrolled in the study. Costs are reported in current dollars from the time of the study.

In analyzing costs our intent was to measure the value of the resources used to deliver medical care to study participants. For services purchased by the HMO, such as outside referrals (which may have included psychiatric care), we documented the amount that the provider was paid, inclusive of patient copayments. We took this amount as our approximation of the resource costs of services. For services provided within the HMO, the management information system indicated the amount that an outside provider would have been paid for the same service. We used this information to approximate the costs of such in-house services. Because of a lack of data, we did not attempt to measure the costs of participants' time associated with receipt of services.

The intervention used nurse practitioners as primary care providers, but we calculated costs as though services were delivered by physicians. That is, the cost allocated to a particular type of visit at the HMO was treated as the same regardless of the provider type. Because nurse practitioner time has a lower cost than physician time, this approach may bias the comparison against the intervention. However, the intervention protocol requires regular meetings between nurse practitioners and physician supervisors (7) that were not separately accounted for in the cost analysis, and nurse practitioners' time spent on phone contacts with participants was also not included, because phone calls to patients were not recorded in the management information system. We believe the omission of meeting time and phone contact roughly offsets the failure to account for the lower cost of nurse practitioner time.

Although one of the criteria for inclusion in the study was that a participant expected to be a member of the HMO for at least one year after entering the study, participants who were not covered by the HMO during part of the 12-month period were included in the randomized controlled trial. However, because information on their use of services was incomplete or absent from the management information system, we excluded them (four in the treatment group and seven in usual care) from the cost analysis.

In addition to examining total costs of services, we looked at several components: costs associated with inpatient hospitalizations, all other costs (that is, other than for hospitalization), and costs for medications. We categorized medications by the National Drug Code into six groups: antidepressants, controlled-substance medications, musculoskeletal medications, pain medications, psychotropic medications (including antipsychotic, antianxiety, and alpha-agonist medications and stimulants), and others.

To capture health care utilization outside the HMO, at six- and 12-month follow-ups we asked the participants whether in the past three months they had any visits to other physicians for medical consultations, second opinions, or ongoing medical treatment; counseling of any type; visits to a chiropractor; visits to an urgent care facility; visits to an emergency room; diagnostic tests (such as blood tests and x-rays); acupuncture treatments; pain treatments; hypnosis; biofeedback sessions; or outpatient surgery or treatment that were not covered or authorized by the network. We then aggregated the corresponding out-of-pocket cost for these visits.

### *Statistical analysis*

In addition to the 11 patients excluded for lack of cost data, six participants (three in each group) did not complete the study and were excluded from the analysis, leaving a total sample of 189 patients. Baseline characteristics of patients were compared by using the t test for continuous variables and the chi square test for categorical variables. For costs we used the Wilcoxon rank-sum test.

As is very common with health care data, our cost distributions were skewed to the right. To mitigate the influence of skewness and outlying observations, we assumed a log-normal or log-logistic distribution to model total cost. In our sample, total cost was positive for all patients. There was one extreme outlier in the control group in the distribution of total costs (primarily attributable to hospital costs of $119,202). Covariates considered for inclusion in the model of costs were age at study entry, sex, marital status, education level (16 or more years of formal schooling compared with less than 16 years), eight subscales from the SF-36 (mental health, emotional role, social functioning, vitality, general health, bodily pain, physical role, and physical functioning), score on the Center for Epidemiological Studies–Depression scale (CES-D), the state anxiety scale of the Spielberger State Anxiety Inventory (STAI), the proportion of reported medically unexplained symptoms among all symptoms, and the score on the Psychosomatic Symptom Checklist. The mental component summary and physical component summary of the SF-36 were highly correlated with the eight SF-36 subscales and were not used in variable selections. Maximum likelihood estimation methods were used, and the choice of models was based on the Akaike information criterion.

Because promoting appropriate use of antidepressants was a key aim of the multifaceted intervention and there was no difference in use of other categories of medication (such as controlled substances or musculoskeletal or pain medication), we focused on the cost of antidepressant use in the study. A substantial proportion of patients were not prescribed antidepressants and incurred no cost for antidepressants. Application of the usual statistical regression methods, such as ordinary least squares, to the whole sample or log-normal models to nonzero part of the sample raises the possibility of bias.

Because our aim was to understand the actual expenditure from a budgetary standpoint, we used a two-part model to handle the clustering of zeros (36). In the first part of the two-part model we used logis-

*Table 1*

Baseline characteristics of the patients with medically unexplained symptoms in a health maintenance organization (HMO) who were randomly assigned to an intervention group or usual care

| Characteristics | Intervention group (N=94) | | Usual care (N=95) | | Test statistic[a] | df | p |
|---|---|---|---|---|---|---|---|
| | N | % | N | % | | | |
| Female gender | 76 | 81 | 73 | 77 | $\chi^2$=.46 | 1 | .50 |
| Married | 71 | 76 | 68 | 72 | $\chi^2$=.38 | 1 | .54 |
| <16 years of education | 76 | 81 | 68 | 72 | $\chi^2$=2.24 | 1 | .14 |
| Used health care outside the HMO in the 3 months before study entry | 26 | 28 | 31 | 33 | $\chi^2$=.56 | 1 | .46 |
| Age (M±SD) | 49.6±8.4 | | 47.5±8.7 | | t=–1.68 | 187 | .10 |
| SF-36 MCS (M±SD score)[b] | 45.9±12.0 | | 49.0±11.5 | | t=1.85 | 187 | .07 |
| SF-36 PCS (M±SD score)[c] | 37.3±10.3 | | 34.7±9.7 | | t=–1.81 | 187 | .07 |
| CES-D (M±SD score)[d] | 16.5±12.9 | | 15.2±11.8 | | t=–.72 | 187 | .47 |
| STAI (M±SD score)[e] | 40.7±20.6 | | 38.4±19.5 | | t=–.78 | 187 | .44 |
| Medically unexplained symptoms (M±SD)[f] | .61±.18 | | .59±.18 | | t=–.71 | 187 | .48 |
| PSC (M±SD score)[g] | 22.6±14.5 | | 24.1±16.4 | | t=.63 | 187 | .53 |

[a] A two-sample t test with equal variance for continuous variables and a chi square test for discrete variables were used. The equality of variances of the two groups was tested by the traditional F test and could not be rejected.

[b] Mental component summary of the 36-item Short Form from the Medical Outcomes Study (SF-36). Possible scores range from 0 to 100, with higher scores indicating better mental health functioning.

[c] Physical component summary of the SF-36. Possible scores range from 0 to 100, with higher scores indicating better physical functioning.

[d] Center for Epidemiological Studies–Depression scale. Possible scores range from 0 to 60, with higher scores indicating worse depressive symptoms.

[e] Spielberger State-Trait Anxiety Inventory (state anxiety scale). Possible scores range from 20 to 80, with higher scores indicating a greater level of anxiety.

[f] Measured as the proportion of medically unexplained symptoms of all reported symptoms

[g] Psychosomatic Symptom Checklist. Standardized to possible score range of 0 to 100, with higher scores indicating more frequent psychosomatic symptoms.

tic regression to estimate the probability of positive antidepressant cost. For the second part of the two-part model, we used linear, square-root or logarithm transformations for positive costs. The square-root transformation outperformed the other specifications. In this case, the estimated mean of antidepressant costs Y combined the two parts of the model; that is, a logit model for part 1: $P(Y>0|x_1)=\{1+\exp(-x_1'\beta_1)\}^{-1}$ and a linear predication for the transformed costs for part 2: $E(Y|Y>0,x_2)=(x_2'\beta_2)^2+\sigma^2$, where $\sigma^2$ is the conditional variance of √Y. We get $E(Y|x)=\{(x_2'\beta_2)^2+\sigma^2\}\{1+\exp(-x_1'\beta_1)\}^{-1}$. For each part of the two-part model we used stepwise selection methods to choose potential covariates from the list of covariates above. Only statistically significant covariates and the intervention dummy are reported in the final model.

## Results

As shown in Table 1, no statistically significant differences at baseline were found between participants in the treatment and control groups in gender, marital status, education level, use of outside health care, CES-D score, score on the state anxiety scale on the Spielberger STAI, proportion of medically unexplained symptoms of all reported symptoms, and the Psychosomatic Symptom Checklist score. (Data on race were not available.) The alpha was set at a more stringent level of .01 to reduce overall type I error. Age and mental and physical components of the SF-36 scores were slightly different between the two groups, but the differences were not statistically significant.

Table 2 shows that during the year of the intervention and the year afterward a larger proportion of patients used antidepressants in the treatment group than in the control group (76% in the treatment group compared with 57% in the control group in the first year, and 73% compared with 53% in the second year). There were no statistically significant differences in the proportions of other service use.

As shown in Table 3, the unadjusted total cost and components of cost did not differ between the two groups. However, the simple comparisons of means could be misleading because of outliers and skewness of the data. For example, the average total cost was $815 higher for the control group, a difference that was not significant. Removing one outlier in the control group reversed the direction of the mean difference, making it $554 higher for the treatment group than the control group; however, the difference was still insignificant.

### *Total cost*

Table 4 shows the log-logistic regression results for total cost among all participants. The log-logistic model was preferred because it had lower Akaike information criterion (AIC) values than the log-normal model in both year 1 (AIC=456.11 for log-normal and AIC=447.11 for loglogistic) and year 2 (AIC=559.97 for log-normal and AIC=554.30 for log-logistic). In year 2 one patient in the control group included in the year 1 analysis left the HMO and was therefore excluded.

Treatment was not statistically associated with total cost. Among all symptoms, the proportion of medically unexplained symptoms was negatively associated with total cost, perhaps because services for medically unexplained symptoms mostly

***Table 2***

Components of care received in the intervention year (year 1) and one year after (year 2) by patients with medically unexplained symptoms in a health maintenance organization (HMO) who were randomly assigned to an intervention group or usual care

| | Year 1 | | | | | Year 2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Intervention group (N=94) | | Usual care (N=95) | | | Intervention group (N=94) | | Usual care (N=95) | | |
| Component of care[a] | N | % | N | % | p[b] | N | % | N | % | p[b] |
| Inpatient hospitalization | 10 | 11 | 10 | 11 | .98 | 13 | 14 | 19 | 20 | .244 |
| Any medication | 92 | 98 | 93 | 98 | .99 | 92 | 98 | 91 | 97 | .650 |
| Antidepressants | 71 | 76 | 54 | 57 | .01 | 69 | 73 | 50 | 53 | .004 |
| Controlled-substance medication | 77 | 82 | 73 | 77 | .39 | 68 | 72 | 65 | 69 | .631 |
| Musculoskeletal medication | 9 | 10 | 8 | 8 | .78 | 12 | 13 | 9 | 10 | .487 |
| Pain medication | 72 | 77 | 65 | 68 | .21 | 68 | 72 | 62 | 66 | .343 |
| Psychotropic medication | 17 | 18 | 17 | 18 | .97 | 17 | 18 | 12 | 13 | .313 |
| Other medication | 92 | 98 | 93 | 98 | .99 | 92 | 98 | 88 | 94 | .148 |
| Used care outside the HMO by month 6 | 30 | 32 | 26 | 27 | .49 | na | na | na | na | na |
| Uses care outside the HMO by year end | 25 | 27 | 28 | 30 | .66 | na | na | na | na | na |

[a] Inpatient hospitalizations were identified by place of service and claim type. Medication categories were defined by National Drug Codes. Psychotropic medication included antipsychotic, antianxiety, and alpha-agonist medications and stimulants.

[b] Based on chi-square tests

involved laboratory or other diagnostic tests, which are less expensive than treatments for other causes, such as for organic diseases. The Psychosomatic Symptom Checklist score, on the other hand, was positively associated with total cost in the year of the study. More psychosomatic problems perhaps required more expensive care by specialists.

On the basis of the log-logistic distribution, the mean total cost was $E(Y|x)=\exp(x'\beta)\Gamma(1+\sigma)\Gamma(1-\sigma), 0<\sigma<1$, where $\Gamma$ is the gamma function and $\sigma$ is the shape parameter. At the average level of the proportion of medically unexplained symptoms and at the average level of the Psychosomatic Symptom Checklist score, the estimated mean total cost between the two groups differed by $1,071 (95% confidence interval [CI]=–606 to 2,749). The confidence interval was calculated by the delta method.

In year 2, however, the difference in total cost between the treatment and control groups was reduced to

***Table 3***

Unadjusted cost of services in the intervention year (year 1) and one year after (year 2) for patients with medically unexplained symptoms in a health maintenance organization (HMO) who were randomly assigned to an intervention group or usual care

| | Year 1 | | | | | Year 2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Intervention group (N=94) | | Usual care (N=95) | | | Intervention group (N=94) | | Usual care (N=94) | | |
| Component of care | M | SD | M | SD | p[a] | M | SD | M | SD | p[a] |
| Total cost | 7,944 | 7,178 | 8,760 | 14,823 | .46 | 6,659 | 6,229 | 7,928 | 13,339 | .74 |
| Inpatient hospitalization | 683 | 2,544 | 2,103 | 12,628 | .98 | 838 | 3,202 | 2,463 | 11,561 | .21 |
| Any medication | 2,871 | 2,510 | 2,648 | 2,973 | .05 | 2,485 | 2,680 | 2,310 | 2,488 | .42 |
| Antidepressant | 583 | 642 | 417 | 689 | <.01 | 420 | 479 | 313 | 513 | .01 |
| Medication to treat addiction | 141 | 406 | 225 | 645 | .20 | 109 | 333 | 202 | 508 | .61 |
| Musculoskeletal medication | 201 | 1,358 | 55 | 364 | .73 | 194 | 1,398 | 72 | 403 | .50 |
| Pain medication | 355 | 710 | 303 | 611 | .52 | 260 | 461 | 253 | 551 | .37 |
| Psychotropic medication | 58 | 280 | 179 | 898 | .99 | 45 | 252 | 95 | 557 | .38 |
| Other medication | 1,532 | 1,463 | 1,468 | 1,830 | .18 | 1,457 | 1,726 | 1,374 | 1,560 | .41 |
| Used care outside the HMO for 3 months by month 6 | 65 | 172 | 63 | 187 | .37 | na | na | na | na | na |
| Used care outside the HMO for 3 months by year end | 36 | 114 | 101 | 329 | .18 | na | na | na | na | na |

[a] From Wilcoxon rank-sum test using normal distribution approximation

***Table 4***

Adjusted total cost by log-logistic regression, in the intervention year (year 1) and one year after (year 2) for patients with medically unexplained symptoms who were randomly assigned to an intervention group or usual care[a]

| Variable | Year 1 (N=189) | | Year 2 (N=188) | |
|---|---|---|---|---|
| | β | SE | β | SE |
| Received the intervention | .14 | .11 | .04 | .15 |
| Medically unexplained symptoms[b] | –.73* | .30 | | |
| Psychosomatic Symptom Checklist | .02** | .00 | .01* | .01 |
| Center for Epidemiological Studies–Depression scale | | | .02 | .01 |
| Social functioning subscale[c] | | | .01 | .00 |
| Age | .02 | .01 | | |
| Constant | 8.58** | .08 | 8.41** | .11 |

[a] Continuous covariates are centered at the means; robust sandwich standard errors are presented.
[b] Proportion of medically unexplained symptoms of all reported symptoms;
[c] From the 36-item Short Form from the Medical Outcomes Study
*p<.05
**p<.01

$341 (CI=–2,113 to 2,794). This could be partly explained by the increased number of control group participants who received inpatient care in year 2. As seen in Table 2, in year 1 both treatment and control groups had an 11% hospitalization rate. In year, 2 however, the rates were 14% for the treatment group and 20% for the control group.

### *Medication cost*

Ideally, the intervention would lead to better management of patients with medically unexplained symptoms and to more appropriate use of all forms of health care, including hospitalizations. It appears, however, that such an effect, if it exists, cannot be estimated reliably in our experiment, because of limited sample size and other sources of variability in health care use. Therefore, we considered categories of medication use, over which the intervention might have a more direct effect.

Part 1 of the two-part model in Table 5 shows that more patients in the intervention group than in the control group were prescribed antidepressants in year 1 (odds ratio [OR]=2.43, CI=1.23–4.80) and in year 2 (OR=2.81, CI=1.42–5.58). Patients with higher scores on the Spielberger STAI were more likely to be on antidepressants, and they had spent more money on them. In year 1 patients who were female were more likely to use antidepressants, but patients with more education (more than 16 years of schooling) were less likely to do so. Among persons who used antidepressants, those with higher role-emotional scores incurred lower costs. Combining part 1 and part 2 of the two-part model, we derived the expected values of antidepressant cost. In year 1 the average antidepressant cost for the treatment group was $192 higher than for the control group (CI=41–342). This difference was statistically significant (p=.012). In year 2 the difference decreased to $123 (CI=–36 to 251) and was no longer statistically significant.

***Table 5***

Predicted mean antidepressant cost in two-part models in the intervention year (year 1) and one year after (year 2) for patients with medically unexplained symptoms who were randomly assigned to an intervention group or usual care[a]

| Variable | Year 1 (N=189) | | Year 2 (N=188) | |
|---|---|---|---|---|
| | Part 1 OR | Part 2 β | Part 1 OR | Part 2 β |
| Received the intervention | 2.43* | 2.02 | 2.81** | .08 |
| STAI[b] | 1.05** | .18** | 1.04** | .14** |
| Role-emotional subscale[c] | | –.06 | | |
| General health subscale[c] | | | .98* | |
| Female | 2.03 | | | |
| More than 16 years of education | .44* | | | |
| Constant | | 21.72** | | 20.45** |

[a] Continuous covariates are centered at the means.
[b] Spielberger State-Trait Anxiety Inventory (state anxiety scale)
[c] From the 36-item Short Form from the Medical Outcomes Study. The other SF-36 subscales were not statistically significant.
*p<.05
**p<.01

### *Health care costs outside the HMO*

At six and 12 months no difference was found between the treatment and control groups in the proportion of patients seeking health care outside of the HMO (at six months, 30 participants, or 32% in the treatment group, compared with 26 participants, or 27%, in the control group; and at 12 months, 25 participants, or 27%, in the treatment group compared with 28 participants, or 30%, in the control group). However, a reduction in the use of outside care was found for the treatment group from six months to 12 months after the intervention, whereas use increased for the control group. At 12-month follow-up, participants in the control group had spent a mean±SD of $65±$36 more out of pocket for medical services than the treatment group in the three months before the follow-up interview.

## Discussion

Overall, we did not find a significant difference in total costs between the treatment and control groups. The treatment group had higher medication use and costs but a lower hospitalization rate and less use of care outside of the HMO. In an update of the

Agency for Health Care Policy and Research practice guidelines for depression, Schulberg and colleagues (37) concluded that "the clinical and functional outcomes of depressed patients can be improved at a cost of $750 to $1,500 per enhanced treatment episode." Their conclusion was based on randomized controlled trials for treating major depression in primary care settings. Our study indicates similar findings for patients with medically unexplained symptoms, many of whom were depressed, in primary care practice. Our point estimate of the year 1 total cost differential was $1,071. About $200 of this differential was attributable to antidepressant use. In a previous study we found improved mental health outcomes and satisfaction for this sample of patients (29). Coupled with the finding of the smaller estimated cost differential in year 2 after the intervention, our findings indicate the potential for cost-effectiveness of the treatment strategy.

Few randomized controlled trials address the question of whether efficacious treatments reduce general health care costs or result in less loss of productivity from the societal perspective in the long term. However, our study showed less out-of-plan expense by 12 months. In addition, at six- and 12-month follow-ups, we asked each employed participant, "During the past four weeks, how many days of work did you miss due to illness?" The results indicated that the patients in the intervention group on average missed one less day at six months (1.23 days), although the difference, which was not significant (p=.08), disappeared by 12 months (.09 days, p=.90).

Some important limitations of our study should be noted. There has been doubt about the feasibility of performing economic evaluations alongside clinical trials (38). Power calculations for sample size have typically been based on clinical outcomes. Economic outcomes, and particularly those related to costs, typically exhibit more variation and other irregularities, such as missing data, skewness, or censoring. Our sample was not large enough to allow us to estimate with precision differences in total cost and components of cost attributable to treatment (39). We carried out a formal sample size analysis as follows. To test the equivalence of mean cost between the intervention and usual-care groups in a loglogistic model for cost with treatment indicator only, the null hypothesis is $H_0: \mu_T/\mu_C \leq \delta$ that the relative cost is not greater than a prespecified $\delta$. Analysis of costs in our randomized controlled trial suggested the shape parameter for the log-logistic distribution is $\sigma$=.456. To detect a 15% increase in total costs with 80% power at the level of significance of .05, the needed sample size is 546 per group. Nonetheless, we believe our results are consistent with other findings and can enrich future meta-analyses on the issue.

We are not able to estimate indirect costs from the patient's perspective: traveling costs, productivity lost due to illness, or time. However, we were able to measure the benefit of the treatment in terms of a reduction in number of lost work days and improvement in hours worked. Our findings suggest marginal benefit in reduction and improvement.

Finally, there was a one-time training cost for a nurse practitioner, involving the time of the nurse practitioner and a physician supervisor. We estimate this cost to be about $21,500 (including the cost of extra group meetings during a nurse practitioner's first year) if one nurse practitioner is trained (31) and less if more than one is trained. This cost should be divided over the number of patients the nurse practitioner sees. If a typical nurse practitioner provides care for 15 patients with medically unexplained symptoms each year for five years, the training cost amounts to less than $400 per patient per year.

## Conclusions

We studied the cost implications of a treatment protocol shown to be effective for patients with medically unexplained symptoms in primary care. We did not find a statistically significant difference in total cost for the intervention group, even though more frequent physician visits and greater use of antidepressant medication were observed. It is possible that the intervention may reduce costs in the longer term, but this issue requires further study with larger samples. Coupled with findings of improved mental health outcomes found in a previous study, our results indicate that the intervention may be cost-effective.


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The authors report no competing interests.


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