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ORIGINAL RESEARCH & CONTRIBUTIONS

Mindfulness-Based Stress Reduction in an Integrated Care Delivery System: One-Year Impacts on Patient-Centered Outcomes and Health Care Utilization

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Abstract

Background: Mindfulness-based stress reduction (MBSR) programs have demonstrated clinical effectiveness for both mental and physical health conditions. Less research exists on health services utilization, self-efficacy, or work productivity outcomes.

Objective: To assess one-year outcomes of MBSR in patients with chronic pain, chronic illness, or stress-related problems, measuring functional status, pain, self-efficacy, depression, anxiety, somatization, psychological distress, work productivity, and changes in health services utilization.

Methods: A prospective single cohort design evaluated an eight-week MBSR program for Kaiser Permanente Colorado members. Patient-reported measures were collected at baseline, eight weeks, and one year following MBSR. Differences in health services utilization were compared from six months before MBSR to six months following the one-year anniversary of MBSR.

Results: Most of the 38 participants were white (28; 74%), female (30; 79%), employed part-time (35; 92%), and average age 52.6 years, with multiple comorbidities (averaging 16.4 unique diagnoses), the most common being joint or back pain (28; 74%) and psychological disorder (20; 53%). Repeated measures analyses at 8 weeks (n = 26) and at 1 year (n = 24) showed significant improvements in self-reported mental and physical function, pain, psychological symptoms, and self-efficacy, but not work productivity. Significant decreases at 1 year were observed for visits in primary care (-50%, $p < 0.0001$), specialty care (-38%, $p = 0.0004$), and the Emergency Department (-50%, $p = 0.04$), and for hospital admissions (-80%, $p = 0.02$).

Conclusion: The MBSR program was associated with improvements in several patient-centered outcomes over 1 year and reductions in health services utilization up to 18 months.

Introduction

Chronic diseases are the leading causes of death and disability in the US. It is estimated that one of two adults in the US experiences at least one chronic illness and seven of ten deaths are attributable to chronic disease.[1] As many as one in three individuals report chronic pain[2]; nearly half of them experience poor control over their symptoms, highlighting the limitations of drug therapy as well as the complexity of the psychosocial and physical aspects of chronic pain.

Mindfulness-based therapies, which include mindfulness-based cognitive therapy and mindfulness-based stress reduction (MBSR), have emerged as effective treatments for a variety of conditions, including chronic pain, anxiety, depression, and psychological distress.[3-8] Such treatments aim to help patients develop an understanding of their vulnerabilities to illness and to build resilience through shifting cognitive, affective, and behavioral responses to both internal distress and external stressors. Through the practice of mindfulness, which has been described as paying attention, on purpose and without judgment in the present moment,[3] patients are taught to increase awareness and acceptance and to develop more skillful ways of responding to mental and physical experiences.

MBSR is typically delivered as a group intervention in eight class sessions with a separate six-hour retreat. In addition, one recent study has looked at the feasibility of an online mindfulness program for stress management.[8] Patients who benefit from this type of therapy include those experiencing stress-related illness such as irritable bowel syndrome, muscle tension, fibromyalgia, and chronic migraine,[9-12] as well as patients who have chronic diseases or chronic pain and are not coping well because of anxiety, depression, stress, or lack of family support.[13]

Since the publication of Kabat-Zinn's original study on mindfulness training in the medical setting,[14] a burgeoning literature has described the effectiveness of MBSR and similar mindfulness-based therapies on a variety of outcomes, including pain, function, quality of life, and psychological symptoms.[4-8,15] However, few have examined the effect of MBSR on health care utilization—a question of interest to health care systems that might support an MBSR program if it demonstrated reductions in the unnecessary use of health care services.[16,17] In addition, patient-centered outcomes such as self-efficacy and work productivity have not been studied extensively. If MBSR improves function, pain, and psychological symptoms, then it might also

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be expected to increase participants' self-efficacy—that is, their confidence in being able to manage their chronic pain and/or illness.[18-20] Similarly, improvements in general function and symptoms might also lead to improvements in work function, including less absence from work and increased productivity while at work. Such findings would be of considerable interest to employers when evaluating the benefit of MBSR for their workforce members. Moreover, most outcomes of MBSR are measured immediately following the eight-week class and at six months, though some studies have examined longer-term outcomes for selected patient populations.[21,22] Additional research on the persistence of the aforementioned outcomes would be of value.

We report here the results of an MBSR program provided through group classes in a large integrated care delivery system, beginning in 2005. The aims of this study were to assess the impact of MBSR on a broad range of patient-centered outcomes, including health and functional status, pain, work productivity impairment, self-efficacy, symptoms of depression, anxiety, somatization, and overall psychological distress, and to assess changes in health care utilization.

We hypothesized that MBSR would

1. increase participants' mental and physical functional status, work productivity, and self-efficacy
2. reduce symptoms of depression, anxiety, somatization, and psychological distress
3. decrease primary care, specialty care, mental health, Emergency Department visits, and hospital admissions.

Methods

Design and Procedures

This study was a prospective, single cohort design with patient-centered outcomes assessed at the beginning and end of the eight-week MBSR program and at one year after the baseline assessment. Changes in health care utilization were compared for the six-month period before the first MBSR class and the six-month period after the one-year anniversary of completion of the last class. The study protocol was approved by the Kaiser Permanente Colorado (KPCO) institutional review board on August 25, 2005.

Study Participants

Participants were all members of KPCO, a large, not-for-profit, integrated health care system that provides comprehensive, prepaid medical coverage to over 600,000 members in Colorado's Denver, Boulder, and Colorado Springs metropolitan areas. Data for the present study were obtained from 38 participants for whom 18 months of health services data were available. These participants were enrolled in 7 separate MBSR class cycles conducted from September 2005 through June 2009.

Study participants initially were referred by primary care physicians from two of KPCO's outpatient clinics following an informational meeting to describe the program and distribute program flyers. Flyers for patients describing the study were also posted in outpatient clinics where KPCO offered other complementary and alternative medicine services (eg, massage therapy, acupuncture, chiropractic therapy) to encourage self-referral.

Participation in the MBSR program was open to Health Plan members who were aged 18 years or older, with chronic pain, a chronic illness, or a stress-related problem. Individuals were excluded from participation if they had a poorly controlled psychiatric illness, severe antisocial behavior, or dementia; lacked English language skills; or were participating in a concurrent study. Additional inclusion criteria were applied during a 30-minute intake interview in which a clinical psychologist, who served as one of the MBSR instructors, took a brief medical and psychiatric history, determined final eligibility for participation, and obtained informed consent from participants. The additional inclusion criteria assessed at the intake interview were the following: has appropriate goals and expectations for the MBSR class, including understanding the difference between attempts to alleviate pain and attempts to alleviate suffering; agrees to participate fully in the program and make a commitment to the home practice of meditation and movement/exercise; understands his or her diagnosis and believes s/he has received appropriate medical evaluation and treatment and/or mental health services for medical conditions or psychiatric diagnoses; and understands MBSR as a complement to medical care.

After the intake interview, participants completed baseline questionnaires on health and functional status, psychological symptoms, self-efficacy, and work productivity.

Intervention

The eight-week MBSR program was offered through KPCO's Center for Complementary Medicine, which provided complementary medicine services at three outpatient clinics in the Denver and Boulder metropolitan areas. Classes were led by one of two instructors (a clinical psychologist and a family physician) trained to provide the Kabat-Zinn program of MBSR.[23]

Mindfulness-based stress reduction is an 8-week group intervention combining meditation techniques with psychoeducation to improve an individual's capacity to manage stress, reduce the impact of physical and psychological symptoms, and maximize the ability to thrive through all of life's circumstances. The intervention consisted of eight 2- to 2.5-hour classes conducted once a week and a 6-hour guided retreat held before the last class. Participants were also asked to complete 30 to 45 minutes of home practice and awareness exercises each day. Core practices include a guided body scan, mindfulness movement (yoga), and sitting and walking meditation. The core skills taught included:

- understanding of attitudes, perceptions, and unskillful thought patterns
- understanding and modulating one's reaction to stressors
- recognizing pleasant and unpleasant emotions, thoughts, and sensations
- using mindfulness in daily activities including interpersonal communication
- focusing attention on internal states and sensations (such as awareness of the breath) and maintaining an open, nonjudgmental, self-monitoring attitude.

Outcome Measures

Participants completed questionnaires on health and functional status, psychological symptoms, self-efficacy, and work productivity at baseline before the MBSR class, at the final session

of the MBSR class, and one year after the last MBSR session, when they were contacted by phone to complete the questionnaires. Data on visits to primary care, specialty care (eg, orthopedics, neurology, cardiology), the Emergency Department, and hospital admissions were collected from KPCO's electronic administrative and claims data for the period of six months before the class (baseline) and six months following the one-year anniversary of the last MBSR class (follow-up).

Patient self-report measures included the following:

- Medical Outcomes Study Short-Form 36 Health Survey.[24,25] Developed by Ware and colleagues,[26] the Medical Outcomes Study Short-Form 36 Health Survey is a validated self-report instrument that measures overall health ("How would you rate your health?" with responses on a Likert-type scale ranging from "poor" to "excellent") and 8 specific domains of function. The 8 scales can be combined into 2 summary scales,[27] which measure physical function (physical component summary [PCS]) and mental function (mental component summary [MCS]). We report here on results for the rating of overall health, PCS, MCS, and the pain subscale. A higher score on all of these measures indicates better health and function.
- Health and Work Performance Questionnaire. The Health and Work Performance Questionnaire, validated by Kessler and colleagues,[28] provides a global assessment of work absence and productivity impairment caused by health conditions. It is used to calculate, over the previous 2 weeks, the percentage of hours worked (number of hours one actually worked divided by the number of hours one was expected to work), as well as a rating of one's usual job performance on a 10-point scale, with higher values representing higher levels of productivity.
- Brief symptom inventory (BSI-18). The BSI-18 assesses self-reported symptoms of depression, anxiety, and somatization and provides a global severity index of overall psychological distress.[29] Lower scores on the BSI-18 indicate lower symptoms.
- Self-efficacy. Self-efficacy questions have been developed and widely used by Lorig and Holman[30] and others for assessing patients' confidence in managing a variety of health conditions, including arthritis and other chronic diseases.[31] Self-efficacy questions were used to assess MBSR participants' ratings of their confidence (0 = "not at all confident," 10 = "extremely confident") in undertaking several activities:
  - "Do all the things necessary to manage conditions on a regular basis"
  - "Do things other than just take medication to reduce how much your illness affects your everyday life"
  - "Control any other symptoms or health problems you have so that they don't interfere with the things you want to do."

Data Analyses

All analyses were conducted using SAS, version 9.1.3 (SAS Institute, Cary, NC). Analyses comparing one-year questionnaire completers with noncompleters were performed using Wilcoxon and χ^2 tests for continuous and categorical variables, respectively. The signed-rank test was used to assess change in utilization of health care services (ambulatory, primary, and specialty care visits, Emergency Department visits, and hospital admissions) from baseline to follow-up. Repeated measures analyses using SAS Proc Mixed, allowing for differing numbers of measurements and times of measurements, were employed to examine change over time in self-reported patient outcomes from baseline through eight weeks and one year following the MBSR program.

Table 1. Baseline characteristics of 38 mindfulness-based stress reduction class participants

Demographic characteristic	n (%)
Women	30 (79)
Men	8 (21)
White race[a]	28 (74)
Hispanic	26 (68)
Age, mean (SD), years	52.6 (10.2)
Employed part-time	35 (92)
Prevalent symptoms/diagnoses	
Joint and/or back pain	28 (74)
Psychological disorders	20 (53)
Chronic upper respiratory disorders	15 (39)
Female genitourinary symptoms	11/30 (37)
Number of unique diagnoses, mean (SD)	16.4 (10.2)

[a] Race and ethnicity data were obtained from health care visit data rather than self-report. Smaller denominators for these are the result of missing data.
SD = standard deviation.

Results

Initially, 45 participants were eligible for and attended the first MBSR class. However, 7 individuals ended their KPCO Health Plan membership before the 1-year follow-up period and thus were ineligible for study participation. Results are reported for the remaining 38 participants for whom 1-year health services utilization and self-report data were available. Table 1 provides descriptive statistics of these study participants.

Follow-up questionnaire data were obtained from 26 (68%) participants at 8 weeks and 24 (63%) at 1 year. To determine whether participants who did not complete follow-up questionnaires differed from those who did complete them, we analyzed differences between these 2 groups in demographic characteristics, baseline questionnaire scores, and health services utilization. No significant differences for any of these variables were found.

Repeated measures analyses of scores from the Medical Outcomes Study Short-Form 36 Health Survey, BSI-18, and Self-Efficacy measures (Table 2) showed significant changes from baseline to 8 weeks and 1 year. Improvements in mean MCS and bodily pain scores were seen at 8 weeks, averaging 7.5 ($p < 0.01$) and 4.5 ($p < 0.05$), respectively; and the magnitude of improvement was greater at 1 year, averaging 11.8 and 5.7, respectively ($p < 0.01$ for both scores). The PCS and general health scores also increased at 8 weeks by an average of 3.1 and 4.4, respectively ($p < 0.05$ for both), but remained unchanged from 8 weeks to 1 year.

The BSI-18 scores for anxiety, depression, and somatization and the global severity index all declined significantly from baseline to 8 weeks, with reductions ranging from 42% to 54% ($p < 0.01$ for all scores). These scores continued to decline at 1 year, with reductions from baseline ranging from 54% to 65% ,with the exception

of somatization, which remained unchanged from 8 weeks to 1 year ($p < 0.01$ for all scores at 1 year compared with baseline).

The 3 self-efficacy items showed increases in average scores from baseline to 8 weeks ranging from 0.5 to 1.4. Two of the 3 increases were significant: "confidence in managing conditions" ($p < 0.05$) and in "controlling symptoms so they don't interfere with activities" ($p < 0.01$). However, all 3 self-efficacy scores decreased between 0.4 and 1.8 points from baseline to 1 year, and these decreases were significant for 2 items: "confidence in managing conditions" and in "doing things other than taking medication to reduce effects of illness in everyday life" ($p < 0.05$ for both items).

Although the Health and Work Performance Questionnaire variables of percentage of expected hours worked and productivity ratings increased from the baseline to 8 weeks by 9% and 6%, respectively, these increases were not significant. At 1 year, the percentage of expected hours worked decreased slightly but remained above baseline by 4%, whereas productivity ratings decreased by 6% from baseline. Neither result was significant.

Health services utilization (Table 3) decreased significantly from baseline to follow-up in visits to primary care ($p < 0.0001$), specialty care ($p = 0.0004$), and the Emergency Department ($p = 0.04$), and in hospital admissions ($p = 0.02$).

Discussion

Completion of the MBSR program at KPCO was associated with statistically significant and clinically meaningful improvements at eight weeks in health and functional status, pain, symptoms of depression, anxiety, somatization, and overall psychological distress. These results are consistent with other studies reporting improvements in both psychological and physical outcomes following MBSR.[3-7]

Moreover, at the one-year follow-up, ratings for MCS and symptoms of anxiety and depression continued to improve, whereas the eight-week reductions in ratings for PCS, general health, pain, and somatization were sustained, suggesting that the magnitude of longer-term benefits of MBSR are greater for mental symptoms compared with physical symptoms and function. Other research on longer-term outcomes of MBSR also has shown positive results.[32]

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Our findings regarding self-efficacy were more equivocal. Although significant increases were seen at eight weeks for two of the three items ("confidence in managing conditions" and in "controlling symptoms so they don't interfere with activities"), there also were decreases in all three items at one year compared with baseline, two of which were significant ("confidence in managing conditions" and in "doing things other than taking medication to reduce effects of illness in everyday life"). Although these findings suggest that increases in self-efficacy resulting from MBSR may be more short-lived than other outcomes, this result may also reflect the small sample size. Still, they suggest that MBSR participants could benefit from additional interventions after eight weeks that support their ongoing confidence in their ability to manage their conditions more effectively.

The percentage of expected work hours completed and self-ratings of usual job performance showed small, nonsignificant increases following the MBSR classes, although these measures decreased at one year. Neither of the changes at one year was significant.

Table 2. Descriptive statistics and univariate tests of patient questionnaire scores at baseline, eight weeks, and one year

Outcome measured	Baseline, mean (SD) (n = 38)	8 weeks, mean (SD) (n = 26)	p value	1 year, mean (SD) (n = 24)	p value
SF-36 Health Survey					
Mental composite score	41.9 (12.7)	49.4 (9.0)	0.0003	53.7 (5.0)	< 0.0001
Physical composite score	46.9 (9.8)	50.0 (7.5)	0.0503	49.4 (8.6)	0.1461
Bodily pain	45 (10.3)	49.5 (9.2)	0.0363	50.7 (8.3)	0.0036
General health	46.9 (10.2)	51.3 (6.1)	0.0170	51.3 (8.1)	0.0289
Brief symptom inventory					
Anxiety	4.8 (4.1)	2.8 (2.4)	0.0009	1.7 (1.9)	< 0.0001
Depression	4.3 (4.7)	2.2 (2.8)	0.0049	1.6 (2.0)	0.0013
Somatization	2.8 (2.7)	1.3 (1.5)	0.0151	1.3 (2.5)	< 0.0001
Global severity index	11.9 (9.4)	6.3 (5.8)	0.0005	4.6 (4.8)	< 0.0001
Self-efficacy					
On a scale of 1 to 10, how confident are you that you can:					
Do all the things necessary to manage conditions on a regular basis?	7.4 (2.3)	8.6 (1.9)	0.0411	5.8 (3.6)	0.0222
Do things other than just take medication to reduce how much your illness affects your everyday life?	7.8 (2.4)	8.3 (2.4)	0.3248	6.0 (3.7)	0.0878
Control any other symptoms or health problems you have so that they don't interfere with the things you want to do?	7.1 (2.0)	8.5 (1.2)	0.0001	6.7 (2.8)	0.8549
Work Productivity Performance					
Percentage of expected work hours completed	84.5 (26.8)	92.3 (15.5)	0.1067	88.0 (12.3)	0.8486
Self-rating of usual job performance, 0-10	7.2 (2.6)	7.6 (2.9)	0.5923	7.1 (3.3)	0.9295

SD = standard deviation.

Table 3. Comparison of health services utilization before and after mindfulness-based stress reduction (MBSR) program[a]

	Mean (SD)		
Ambulatory visits	Baseline	Follow-up	p value[b]
Primary care	1.8 (1.5)	0.9 (1.1)	< 0.0001
Specialty care	7.8 (12.1)	4.8 (6.1)	0.0004
Emergency Department	0.2 (0.6)	0.1 (0.4)	0.04
Hospital admissions	0.1 (0.4)	0.02 (0.2)	0.02

[a] Comparison of use of services for 38 participants with at least 18 months of continuous Health Plan membership. Baseline measurements encompass the 6 months before the first MBSR class and the 1-year statistics represent the 6 months after 1 year of follow-up.
[b] p values using signed-rank tests.
SD = standard deviation.

Health services utilization decreases from baseline to follow-up were substantial across outpatient primary and specialty care visits, Emergency Department visits, and hospital admissions. These findings also point to potential reductions in costs associated with MBSR through reductions in health care utilization, even in a cohort where the mean age was older than age 50 years. We postulate that because patients are more confident in managing their conditions, they are less likely to visit their physician. Anxiety and somatization symptoms drive people to seek care, and by decreasing this aspect of an illness, utilization is also decreased. Although a formal cost analysis of the MBSR program linked to reductions in health care costs and improvements in patient-centered outcomes is beyond the scope of this paper, these results should be of interest to health care administrators considering a health plan benefit for MBSR.

Unlike Rosenzweig et al,[4] we did not investigate differential effects of MBSR on the basis of specific pain conditions owing to limited sample sizes for specific diagnostic categories and, equally important, because the high prevalence of medical and psychiatric comorbidities limited our ability to differentiate the participants into unique diagnostic categories. Likewise, we did not control for age.

This study contributes in several ways to the literature on the effectiveness of MBSR. First, we assessed the impact of MBSR on health services utilization, showing large and sustained decreases in this outcome over one year. Second, we studied MBSR in a multimorbid, heterogeneous patient population as seen in a community care delivery setting such as KPCO, increasing the generalizability of our results to real-world health care systems. Third, a broad set of patient-centered measures was used, including self-efficacy and work productivity in addition to the more typically evaluated outcomes of health and functional status and psychiatric symptoms. The finding of attenuations in participants' self-efficacy for managing their conditions provides useful information about the possible need for additional self-management support after completion of the class. In addition, we suggest that assessment of work productivity as a domain of function is important to both MBSR participants and employers, despite our nonsignificant results pertaining to this outcome. Changes in health care utilization and patient-centered outcomes were obtained during a one-year follow-up period, allowing us to ascertain longer trajectories of improvement or relapse beyond those most often measured at eight weeks following completion of the MBSR class. Finally, we believe that having electronic medical data on clinic visits, hospitalizations, and diagnosis codes available for analysis is a significant strength, facilitated by the KPCO model of care.

This study had several limitations. Our sample size for analysis was small in comparison with other published studies, limiting statistical power and possibly generalizability. Despite the small number of participants, our analyses yielded interesting and encouraging results across a broad set of patient-centered measures, as well as objective measures of health services utilization. However, our results may not be generalizable to other health care settings. Finally, this was a single cohort study with no comparison group. Study participants were already engaged in care by virtue of the enrollment strategy and could have experienced decreases in their physical and mental distress and improvements in their symptoms independent of the mindfulness practices, perhaps related to psychosocial support from the group or their usual care. However, given that these individuals were referred or self-referred to the program because of their chronic pain, chronic illness, or long-term stress-related disorders, and that they each had an average of more than 16 unique diagnoses, it is unlikely that their symptoms spontaneously improved. Moreover, a recent meta-analysis of the most rigorously designed, randomized controlled trials of MBSR demonstrated positive effects on depression, anxiety, and psychological distress in people with chronic disease, albeit smaller in magnitude than those reported in this study.[4]

Conclusion

Our results support the provision of MBSR as a standard intervention for patients with chronic pain, chronic illness, and stress-related disorders in clinical settings such as KPCO and suggest that participation in the MBSR program is associated with substantial clinical benefit for such patients, as well as significant reductions in health services utilization. Over time, the program at KPCO has grown in enrollment and popularity and is a valued resource for patients and health care professionals. ❖

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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Contentment

For some patients, though conscious that their condition is perilous, recover their health simply through their contentment with the goodness of the physician.

— *Precepts,* Hippocrates, c460 – c370BC, ancient Greek physician