Original Article

Effect of Mindfulness Meditation on Symptoms of Stress and Depression in Cancer outpatients of Sri Lanka. (MeSADISC study)

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ABSTRACT

Objectives

This intervention study aimed to evaluate mindfulness meditation as a method of treatment for cancer outpatients for stress reduction and control of symptoms of depression and to find out effects of socio demographic differences.

Method

Cancer outpatients were randomly selected on separate clinic dates at the National Cancer Institute of Sri Lanka and were enrolled as cases (n=44) and controls (n=30). Volunteers followed training sessions once weekly in addition to home based mindfulness meditation. All participants were asked to complete the "Beck's Depression" and "Symptoms of Stress" questionnaires prior to intervention and at each session. Controls were assessed based on the identical questionnaire at start and end of 9 weeks. Both groups were heterogeneous in age, socio-demographic characteristics and cancer types / stage.

Result

At the end of the intervention, patients in the intervention group had significantly lower scores of depressions and stress. Reduction in Beck's depression score was from 33.21 to 24.56 ($p<0.001$) in the treatment group, compared to 34.5 to 32.34 ($p>0.05$) in the control group. Reduction in Symptoms of Stress Inventory from 21.21 to 10.76 ($p<0.001$) was seen in the intervention group, compared to 22.50 to 25.5 increase in controls. Significant changes ($p<0.05$) were seen in all age categories, gender, education, income and levels of social interactions.

Conclusion

Mindfulness meditation programme was effective in decreasing levels of depression and stress in people with cancer, irrespective of socio-demographic backgrounds and cancer types or stages.

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Figures and Tables:

Keywords

Meditation; cancer; stress reduction; depression; socio demographic differences

INTRODUCTION

Various types of Cancer are on the rise all over the world. Although therapeutic interventions in Western medicine have vastly improved since of late, it is the common opinion among Oncologists and patients that they have more or less failed to meet the demands of disease as a whole. It has been found that 85% of patients and 71.4% of Oncologists possess the belief that psychological variables affect cancer progression[1] and since of late there has been an exponential growth of clinical treatment and wellness programmes based on mindfulness meditation and Yoga modelled after Mindful based stress reduction (MBSR) programme[2].

Various types of meditation can be classified into two broad groups: Transcendental and Mindfulness meditation. These techniques have been shown to be efficacious in chronic pain[1], anxiety disorders[3], fibromyalgia[4], epilepsy[5], psoriasis[6], hypertension[7,8], ischemic heart disease and cancer[9,10]. As such, considerable doubts exist that psycho-social interventions can affect cancer progression and mortality. Among cancer patients, there is a burgeoning interest in mind-body medicine and complementary-alternative therapies, alongside a strong desire

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to take proactive steps in their care[11].

When examining the psychological well-being of cancer patients, depression stands out as the most extensively researched aspect. Furthermore, it is the sole psychological factor that tends to be more prevalent among cancer patients compared to the general population[8]. Furthermore, a Canadian sample of women has attributed their Breast cancer due to Stress (42.2%). A ground breaking meta-analysis was published recently where an analysis of 25 odd independent studies was made. Satin, JR et al[9] concluded that there is reasonable evidence that depression predicts mortality but not to the same degree disease progression in cancer patients. In fact, Mustafa et al.[12] earlier published research saying there was a 25% higher mortality rate in depressed as compared to non-depressed cancer patients. The aforementioned meta-analysis showed a 26% increase of mortality rate among patients with depressive symptoms and 39% higher mortality rate among diagnosed with major depression.

It's reasonable to infer that by managing and reducing depression and anxiety, we can significantly enhance the essential quality of life and potentially reduce overall mortality rates. However, a substantial and unanswered inquiry revolves around the impact of meditation on cancer progression. Current models connect depression to cancer progression through both behavioural and biological pathways[9]. Chronic activation of hypothalamic-pituitary axis has been implicated in this regard[9]. Solberg et al[13] found that meditation may modify the suppressive influence of strenuous physical stress on immunity with regards to CD8+ and CD2+ cell proportions. Lewy et al[14] found that Natural Killer (NK) cell activity was a strong predictor of Cancer outcome.

It is also hypothesized that, 'Supportive social relationships may dilute the effects of cancer related stress on immunity and thereby facilitate immune recovery[15]. Additional studies on breast and prostate cancer patients revealed a consistent decline in cortisol levels during follow-up, alongside a continued decrease in Th1 cytokines. Recently, melatonin has gained attention as a valuable metric in assessing psychosocial interventions, demonstrating sensitivity to psychological factors in breast cancer patients[16],[17],[18],[19],[20].

METHOD:

This hospital based interventional study aimed to evaluate mindfulness meditation as a method of treatment in cancer outpatients, for Stress reduction and Symptoms of Depression and to find out effect of socio-demographic differences on Stress and Depression scores. The recruitment of participant in 'intervention' group and 'control' group was done prospectively through patients who are followed up at National cancer institute as outpatients. Patients who were in age range 2- 70 years of both genders and in whom the stages of cancer progression were in I, II, III were recruited following voluntary informed consent. Patients who were bed-ridden, or those with serious co-morbidities, previous psychiatric disease, and no responsible carers were excluded. Estimated sample size was 42. Sixty-two were enrolled to 'intervention' group whilst forty were recruited as controls.

Both groups were assessed at the start and end of the 2-month intervention while the intervention group was additionally assessed weekly using following scales and instruments; (1) Mood/ Depression score-Beck's inventory for depression, (2) Symptoms of stress-SOSI (Symptoms of stress inventory). This was also validated the same way as mentioned above for the Beck's inventory. Sinhalese version of the questionnaire was validated by a psychologist. Socio demographic details such as age, gender, race, ethnicity, monthly income, educational level, and relationship along with attitudes towards meditation were collected with a structured questionnaire.

After an awareness programme on mindfulness meditation for cancer outpatients at National Institute for Cancer, the investigators proposed volunteers to participate in the study. Out of a clinic attendance of around 650 on two days combined, 149 consented for participation. Twenty-five patients were excluded following not meeting inclusion criteria. Out of the remaining group, every other patient was selected adding up to a sample size of 62. Controls were selected on a separate clinic day. The control group comprised of 40 patients. Baseline assessment of the controls using the study instruments was performed on the same day of selection. Last assessment of controls was done after 9 weeks by sending a copy of the questionnaires. Assessment of the intervention group was done each week before the mindfulness meditation programme commenced.

Analysis of the intervention and control groups was done separately using the SPSS version 17.0. Ethical clearance was obtained from National Cancer

Institute and Faculty of Medicine, Colombo ethical review boards and international medical ethic codes of conduct were followed throughout the period of study.

RESULTS

In the interventional group, 44 (out of 62 who were selected initially) attended the first session and the mean age was 48 years (S.D±11). There were 11 Males (25%) and 33 Females (75%). Median Income category was LKR 10,000-25,000 per month. Median category for educational achievements was secondary school while family support median category was "Very Good" (Out of 3 categories named Distant, Average, Very good). In the control group, comparable results were seen as mean age - 45.1(S.D±12.6) years; sex distribution male: female - 10:20; median Income category LKR 10,000-25,000 per month; median education - secondary school; and median family support - "Average".

After 9 weeks of intervention period, the two scores: Beck's Depression inventory score for Depression and Symptoms of Stress Inventory score (SOSI) for Stress were compared in intervention and control groups. Pearson Chi-Square test revealed that the demographic variables in each group were not significant; age categories (P=0.47), sex (P=0.604), income (P=0.5), education (P=0.81). Independent two sample t-test was applied to the pre-intervention scores of depression

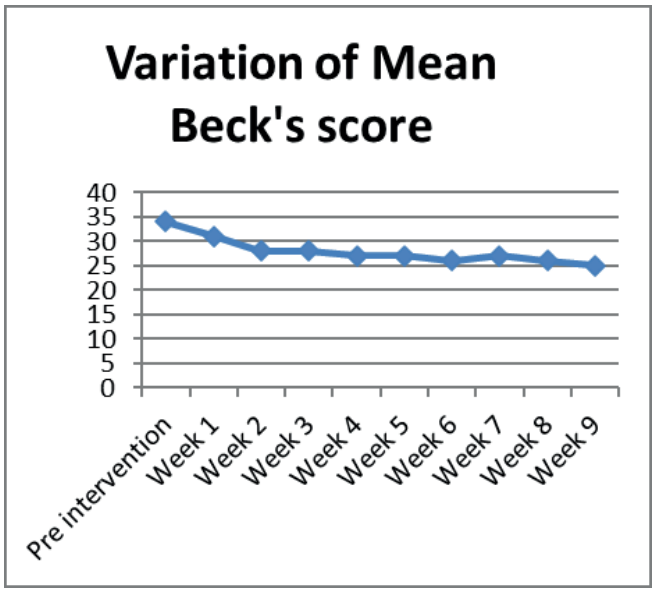

Figure 1- Variation of mean Beck's score in the intervention group

Table 1-Beck's score variation in the intervention and control groups

		Mean	Median	SD	Valid
Cases	Pre	33.2	33	4.77	44
	Week 1	30.25	29.5	3.60	36
	Week 2	28.52	29	3.77	27
	Week 3	28.09	28	3.14	32
	Week 4	27.8	28	2.85	30
	Week 5	26.79	27	2.60	28
	Week 6	26.57	26	2.96	35
	Week 7	25.84	25	2.49	34
	Week 8	25.74	24	2.56	31
	Week 9	24.56	24	2.30	31
Controls	Pre	34.5	33	5.43	40
	Week 9	32.4	31	4.01	40

Figure 1 shows the variation of Beck's depression scale scores over study period in the intervention group.

Beck's scale and the corresponding equal variance assumed two-tailed significance was 0.28 (P>0.05). Thus the 'intervention' and 'control' group did not differ significantly in terms of Beck's score at pre-intervention level. Independent two sample t-test applied to SOSI scores yielded a two tailed significance of 0.36 (P>0.05) and clearly showed that the two arms of the study were statistically indifferent. The variation of Beck's depression scale scores in intervention and control groups over the study period is shown in table 1.

The variation of Symptoms of Stress Inventory scores in intervention and control groups over the study period is shown in table 2.

Table 2 - SOSI score variation in the intervention and control groups

		Mean	Median	SD	Valid N
Cases	Pre	33.2	33	4.77	44
	Week 1	30.25	29.5	3.60	36
	Week 2	28.52	29	3.77	27
	Week 3	28.09	28	3.14	32
	Week 4	27.8	28	2.85	30
	Week 5	26.79	27	2.60	28
	Week 6	26.57	26	2.96	35
	Week 7	25.84	25	2.49	34
	Week 8	25.74	24	2.56	31
	Week 9	24.56	24	2.30	31
Controls	Pre	34.5	33	5.43	40
	Week 9	32.4	31	4.01	40

Figure 2 shows the variation of Symptoms of Stress Inventory scale scores over study period in the intervention group.

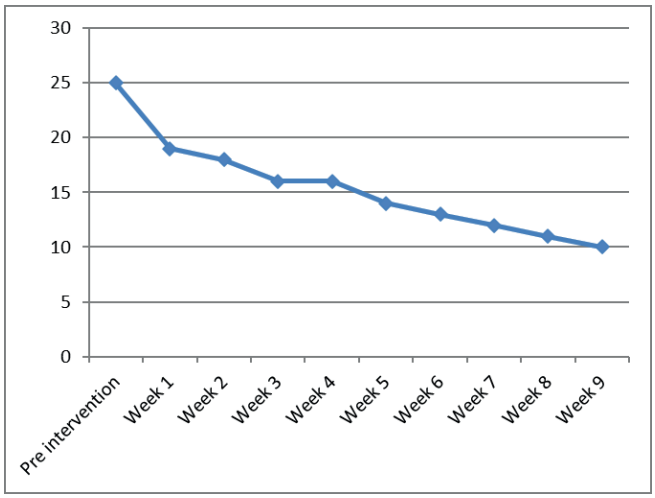

Figure 2- Variation in mean SOSI score in the intervention group

Amongst the participants in the intervention group, the mean Beck's score before meditation was 33.21 and the standard deviation was 4.77. Median was 33. The mean Beck's score after 9 weeks of meditation was 24.56(P<0.001) and the standard deviation was 2.30. Also the median Beck's value was 24. When these data were plotted there was visible reduction of the depression level. There was a steep reduction of depression level within first 2-3 weeks of meditation then that level maintained over the study period. With regards to the control group, the mean Beck's score before meditation was 34.50 and the standard deviation was 5.43. Also, the median Beck's score was 33. After 9 weeks mean Beck's score was 32.4 (P>0.05) and the standard deviation was 4.01. Median Beck's value was 31.

In the intervention group, mean SOSI score before meditation was 21.23 (SD - 5.97). Median SOSI score was 20. The mean SOSI score after 9 weeks of meditation was 10.88 (P<0.001) (SD - 2.74, median SOSI value – 10). Same assessment amongst the Controls at start yielded a mean of 22.5 (SD - 5.49, median – 21). At the next assessment at 9 weeks mean has increased to 25.5 (SD - 5.27, median – 25).

Beck's score values of both in intervention and control groups had reduced over time. Both changes are significant at P<0.05 but only participants in the intervention group show a significant change at 99% (P<0.001) level. Concerning SOSI there is a clear distinction between the two groups. Both groups showed a distinct change which was significant at P<0.001 level. But in controls, the significance is achieved by a negative change.

DISCUSSION

CAM (Complementary and Alternative medical therapy) is increasing practiced in many countries for patients with incurable or difficult to cure diseases. In some studies, prevalence of up to 64%[21], 38.8%[22], 52%[23] among adult populations have been found for practicing of CAM whilst in a systematic analysis overall prevalence was estimated to be 31.4%[20]. Most importantly only a minority of patients include CAM in their treatment plan with curative intent[24]. A meta-analysis indicated that reducing depression can yield considerable benefits for the overall mortality of cancer patients, although it did not significantly affect the suppression of disease progression[9].

Results of the current study indicate that mindfulness meditation has a significant effect in reducing the symptoms of stress and depression in cancer patients in

early disease stages (P<0.001 for depression scale and P<0.001 for symptoms of stress). This means a positive gain in overall mortality with good quality of life can be achieved through these brief mindfulness meditation programmes similar to observations made in other studies by different relaxation interventions[25].

SOSI score in the intervention group shows a reduction of mean from 22.2 to10.88 (P<0.001). SOSI reduction has been a gradual reduction over the weeks with almost a directly proportionate decrease of stress scores. This simply means that the SOSI score depicting symptoms of stress can be reduced further and further by repeated practicing of meditation. Relaxing after attaining a particular level of stress lower than the initial score is not preferable. In the control group observed difference is contrasting as it has increased substantially (22.5 to 25.5). Preliminary values before the commencement of mindfulness meditation in the intervention group were rather similar (21.2 and 22.50). Concerning the changes observed in scores of Beck's Inventory, it shows a mean reduction from 33.21to 24.56 (p<0.001) but more importantly most of the effect was observed within the first three weeks after which more or less a maintenance of that obtained level was observed. Control means changed from 34.50 to 32.4 and were not significant.

In one study, following an 8-week Mindfulness-Based Stress Reduction (MBSR), overall sleep disturbances and stress levels reduced significantly[16]. In another study on cancer patients, patients' scores decreased significantly from before to after the intervention on SOSI total scores and most subscales[19] and are comparable to findings of the current study. Female gender and higher education levels were associated with higher initial SOSI scores, and improvements on the SOSI were predicted by higher education levels and greater initial mood disturbances[19].

Deterioration of scores levels or non-improvement over time in the control group can be partially due to the negative feeling of being in the control group as opposed to the intervention group especially when huge improvements were apparent in intervention group. This was also reported in previous studies[9] however, participants of the control group in the current study didn't have any exposure to the meditation setup as the initial and final assessments were done outside the meditation institution and the last assessment was by post – mail-based communication.

It must be emphasized that there were no permanent drop outs out of the original 44 participants who were enrolled in mindfulness meditation programme. One reason for this observation is that the investigators did not enrol patients with advanced cancer stages and those who had serious co-morbidities limiting their ambulatory capacity. Drop-outs had been in other studies which recruited cancer patients who were at advanced stages[10,19].

In spite of the observed positive impact, there were absentees in most of the days after the first three weeks. It may be due to the belief that they had achieved and grasped what they needed and the thought that self-practice at home may suffice to maintain the desired level. But the investigators managed to bring the participants at least twice in the last three weeks (and six times overall). In other studies[10], repeated absenteeism over few weeks in sequence made the participant get higher depression and stress scores mainly because he/she got frustrated of seeing that others have grasped more through the training sessions he/she was unable to participate, so that social influence played a part in scores. Considering the sample size of similar previous studies[10], 480[26], 200[27] were enrolled compared to the 102 (cases=62, controls=40) patients in the current study.

Psychological factors influence the immune factors which control micro metastases[28] and meditation benefits through improved psychological functioning, reduction of stress symptoms, enhanced coping and well-being in cancer outpatients[29]. Additional physical and psychological health benefits of mindfulness meditation in care of cancer patients include improved pain relief [30] , cognitive functions[31], reduction of disease related weight loss[32], and improved sleep quality[33]. Further, mindfulness meditation has been recognised as a cost-effective intervention for patients with cancer[34],[35]. The current study brings to light the positive effects of mindfulness meditation on improving symptoms of depression and stress in patients with early stages of cancer. Further studies are needed in the studied

population to evaluate the impact of mindfulness meditation in improving overall quality of life.

CONCLUSION

Mindfulness meditation programme was effective in decreasing levels of depression and stress in patients with early stages of cancer, irrespective of socio-demographic backgrounds and cancer types.

DECLARATIONS

Source of funding: No external funding received

Conflict of Interest: None declared

Ethical clearance: Ethical approval for the study was granted by the Ethics Review Committee, Faculty of Medicine, University of Colombo

Authors' contribution: KD, DR, NDVG, CJ designed the study. CJ carried out the intervention. KD, DR, NDVG performed data collection and analysis and wrote manuscript. CJ supervised the study. All authors edited and approved the final manuscript.

REFERENCE

1. Kabat-Zinn J., An outpatient program in behavioural medicine for chronic pain patients based on the practice of mindfulness meditation: theoretical considerations and preliminary results. *Gen Hosp Psychiatry*, 1982. **4**(1): p. 33- 47.
2. Kabat-Zinn, J., Full catastrophe living: using the wisdom of your body and mind to face stress, pain, and illness. 1990.
3. Kabat-Zinn, J., et al., Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *Am J Psychiatry*, 1992. **149**(7): p. 936-43.
4. Kaplan, K.H., D.L. Goldenberg, and M. Galvin-Nadeau, The impact of a meditation-based stress reduction program on fibromyalgia. *Gen Hosp Psychiatry*, 1993. **15**(5): p. 284-9.
5. Deepak, K.K., S.K. Manchanda, and M.C. Maheshwari, Meditation improves clinic-electro encephalographic measures in drug-resistant epileptics. *Biofeedback Self Regul*, 1994. **19**(1): p. 25-40.
6. Kabat-Zinn, J., et al., Influence of a mindfulness meditation-based stress reduction intervention on rates of skin clearing in patients with moderate to severe psoriasis undergoing phototherapy (UVB) and photochemotherapy (PUVA). *Psychosom Med*, 1998. **60**(5): p. 625-32.
7. Schneider, R.H., et al., A randomised controlled trial of stress reduction for hypertension in older African Americans. *Hypertension*, 1995. **26**(5): p. 820-7.
8. Aung, S., Musa, R., A, J. R., M, A. S., & Abdullah, A. (2018). Relationship between Coping Mechanisms to Psychosocial Stress with Blood Pressure in Young Adults: A Pilot Study. *Bangladesh Journal of Medical Science*, **17**(3): 439–445. https://doi.org/10.3329/bjms.v17i3.37000
9. Satin, J.R., W. Linden, and M.J. Phillips, Depression as a predictor of disease progression and mortality in cancer patients: a meta-analysis. Cancer, 2009.
10. Speca, M., et al., A randomized, wait-list controlled clinical trial: the effect of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients. Psychosom Med, 2000. **62**(5): p. 613-22.
11. Cassileth, B.R. and C.C. Chapman, Alternative and complementary cancer therapies. *Cancer*, 1996. **77**(6): p. 1026-34.
12. Mustafa M., et al., Psychological interventions for women with metastatic breast cancer. Cochrane database of systematic reviews, 2013;**6**: doi: 10.1002/14651858.CD004253.pub4
13. Solberg, E.E., et al.,Meditation: a modulator of the immune response to physical stress? A brief report. *Br J Sports Med*, 1995. **29**(4): p. 255-7.
14. Levy, S.M., et al., Immunological and psychosocial predictors of disease recurrence in patients with early-stage breast cancer. *Behav Med*, 1991. **17**(2): p. 67-75.
15. Spiegel, D., et al., Effects of psychosocial treatment in prolonging cancer survival may be mediated by neuroimmune pathways. *Ann N Y Acad Sci*, 1998;**840**: p. 674-83.
16. Massion, A.O., et al.,Meditation, melatonin and breast/prostate cancer: hypothesis and preliminary data. *Med Hypotheses*, 1995; **44**(1): p. 39-46.
17. Carlson, L.E. and S.N. Garland, Impact of mindfulness-based stress reduction (MBSR) on sleep, mood, stress and fatigue symptoms in cancer outpatients. *Int J Behav Med*, 2005; **12**(4): p. 278-85.
18. Carlson, L.E., et al., One year pre-post intervention follow-up of psychological, immune, endocrine and blood pressure outcomes of mindfulness-based stress reduction (MBSR) in breast and prostate cancer outpatients. Brain Behav Immun, 2007. **21**(8): p. 1038-49.
19. Carlson, L.E., et al.,Mindfulness-based stress reduction

in relation to quality of life, mood, symptoms of stress, and immune parameters in breast and prostate cancer outpatients. *Psychosom Med*, 2003. **65**(4): p. 571-81.

20. Carlson, L.E., et al., The effects of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients: 6- month follow-up. Support Care *Cancer*, 2001. **9**(2): p. 112-23.
21. Ernst, E. and B.R. Cassileth, The prevalence of complementary/alternative medicine in cancer: a systematic review. *Cancer*, 1998. **83**(4): p. 777-82.
22. Munstedt, K., et al., Unconventional cancer therapy--survey of patients with gynaecological malignancy. *Arch Gynecol Obstet*, 1996; **258**(2): p. 81-8.
23. Miller, M., et al., The use of unproven methods of treatment by cancer patients. Frequency, expectations and cost. *Support Care Cancer*, 1998;**6**(4): p. 337-47.
24. Mansky PJ, Wallerstedt DB. Complementary medicine in palliative care and cancer symptom management. *Cancer J*, 2006;**12**(5): p. 425-31.
25. Puspitosari, W. A. ., Rohman, H. H. ., & Dewi, A. . (). Reducing the hemodialysis patient stress level through progressive relaxation. *Bangladesh Journal of Medical Science*, 2022;**21**(4): 842–847. https://doi.org/10.3329/bjms.v21i4.60283
26. Burstein HJ, Gelber S, Guadagnoli E, Weeks JC. Use of alternative medicine by women with early-stage breast cancer. *N Engl J Med*. 1999 Jun 3;**340**(22):1733-9. doi: 10.1056/NEJM199906033402206. PMID: 10352166.
27. Warrick PD, Irish JC, Morningstar M, Gilbert R, Brown D, Gullane P. Use of alternative medicine among patients with head and neck cancer. *Arch Otolaryngol Head Neck Surg*. 1999 May;**125**(5):573-9. doi: 10.1001/archotol.125.5.573. PMID: 10326817.
28. Magarey, C.J., Aspects of the psychological management of breast cancer. *Med J Aust*, 1988. **148**(5): p. 239-42.
29. Ott, M.J., R.L. Norris, and S.M. Bauer-Wu, Mindfulness meditation for oncology patients: a discussion and critical review. *Integr Cancer Ther*, 2006. **5**(2): p. 98- 108.
30. Efficacy of mindfulness-based cognitive therapy on late post-treatment pain in women treated for primary breast cancer: a randomized controlled trial. Johannsen M, O'Connor M, O'Toole MS, Jensen AB, Højris I, Zachariae R. *J Clin Oncol*. 2016;**34**:3390–3399.
31. Randomized controlled pilot trial of mindfulness-based stress reduction for breast and colorectal cancer survivors: effects on cancer-related cognitive impairment. Johns SA, Von Ah D, Brown LF, et al. *J Cancer Surviv*. 2016;10:437–448.
32. Focan C, Houbiers G, Gilles L, et al. Dietetic and psychological mindfulness workshops for the management of cachectic cancer patients. A randomized study. *Anticancer Res*. 2015;**35**:6311–6315.
33. The effects of mindfulness-based stress reduction on objective and subjective sleep parameters in women with breast cancer: a randomized controlled trial. Lengacher CA, Reich RR, Paterson CL, et al. *Psychooncology*. 2015;**24**:424–432.
34. Lengacher CA, Kip KE, Reich RR, et al. A cost-effective mindfulness stress reduction program: a randomized control trial for breast cancer survivors. Nurs Econ. 2015;**33**:210–218.
35. 35. Mehta R, Sharma K, Potters L, Wernicke AG, Parashar B. Evidence for the Role of Mindfulness in Cancer: Benefits and Techniques. *Cureus*. 2019;**11**(5):e4629. Published 2019 May 9. doi:10.7759/cureus.4629