

Coping Skills Practice and Symptom Change: A Secondary Analysis of a Pilot Telephone Symptom Management Intervention for Lung Cancer Patients and their Family Caregivers

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Abstract

Context. Little research has explored coping skills practice in relation to symptom outcomes in psychosocial interventions for cancer patients and their family caregivers.

Objectives. To examine associations of coping skills practice to symptom change in a telephone symptom management (TSM) intervention delivered concurrently to lung cancer patients and their caregivers.

Methods. This study was a secondary analysis of a randomized pilot trial. Data were examined from patient-caregiver dyads ($n=51$ dyads) that were randomized to the TSM intervention.

Guided by social cognitive theory, TSM involved four weekly sessions where dyads were taught coping skills including: a mindfulness exercise, guided imagery, pursed lips breathing, cognitive restructuring, problem solving, emotion-focused coping, and assertive communication.

Symptoms were assessed, including patient and caregiver psychological distress and patient pain interference, fatigue interference, and distress related to breathlessness. Multiple regression analyses examined associations of coping skills practice during the intervention to symptoms at 6 weeks post-intervention.

Results. For patients, greater practice of assertive communication was associated with less pain interference ($\beta=-0.45, p=0.02$) and psychological distress ($\beta=-0.36, p=0.047$); for caregivers, greater practice of guided imagery was associated with less psychological distress ($\beta=-0.30, p=0.01$). Unexpectedly, for patients, greater practice of a mindfulness exercise was associated with higher pain ($\beta=0.47, p=0.07$) and fatigue interference ($\beta=0.49, p=0.04$); greater practice of problem solving was associated with higher distress related to breathlessness ($\beta=0.56, p=0.01$) and psychological distress ($\beta=0.36, p=0.08$).

Conclusion. Findings suggest the effectiveness of TSM may have been reduced by competing effects of certain coping skills. Future interventions should consider focusing on assertive communication training for patients and guided imagery for caregivers.

Key Words: lung cancer; family caregivers; psychosocial interventions; symptom management; cognitive-behavioral; intervention components

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Introduction

Cancer is often conceptualized as a “dyadic disease” that can profoundly impact the patient and his or her family caregiver.^{1,2} Thus, numerous psychosocial interventions have focused on improving outcomes for cancer patient-caregiver dyads.^{3,4} Dyadic interventions have shown small to moderate effects on prevalent issues, including patient and caregiver psychological distress (i.e., depressive and anxiety symptoms)^{1,4} and patient pain,^{5,6} fatigue,⁷ and distress related to breathlessness.⁸ Unfortunately, little is known about the effective components of these complex interventions. Studies exploring intervention components in relation to outcomes have been limited in cancer⁹⁻¹¹ and non-cancer medical populations,¹² despite being an important step in developing efficacious interventions.^{13,14}

Some studies have explored associations between intervention components (e.g., participant coping skills practice) and outcomes in non-dyadic psychosocial interventions for cancer patients.⁹⁻¹¹ First, Andersen and colleagues⁹ analyzed an RCT testing a group-based intervention for breast cancer survivors. Greater practice of relaxation exercises was associated with less psychological distress and nurse-rated symptoms post-intervention. Reduction in symptoms was also predicted by use of assertive communication with medical providers. Similarly, Cohen and Fried¹¹ randomized breast cancer patients to either group-based cognitive-behavioral therapy or relaxation training. Greater practice of the skills taught in both conditions was related to post-intervention reductions in psychological distress, sleep difficulties, and fatigue. Lastly, Chan and colleagues¹⁰ examined an RCT testing a psychoeducation and progressive muscle relaxation program for patients with advanced lung cancer. Greater practice of progressive muscle relaxation was related to reduced breathlessness intensity and fatigue post-intervention. These studies provide preliminary evidence that coping skills practice is related to

reductions in certain symptoms. To our knowledge, however, no studies have explored these associations in a dyadic intervention for cancer patients and caregivers.

The objective of the present study was to examine associations between coping skills practice and symptom change in a telephone symptom management (TSM) intervention delivered concurrently to lung cancer patients and their caregivers.¹⁶ TSM focused on patient and caregiver well-being and the management of patient symptoms through a blend of cognitive-behavioral and emotion-focused strategies. Each session included social cognitive theory-based determinants of behavior change,^{21,22} such as enhancing knowledge of symptoms and coping skills, setting coping skills practice goals, assessing barriers to practice, modeling adaptive coping behavior, and enhancing social support.

In a pilot RCT, four sessions of TSM were compared to four sessions of an education/support condition, and no significant between-group differences were found for the main outcomes.¹⁶ However, this global analysis did not allow us to determine if certain coping skills were related to improved outcomes. We thus conducted a secondary analysis of this pilot trial. Based on social cognitive theory^{21,22} and previous research,⁹⁻¹¹ we hypothesized that greater practice of coping skills (i.e., noticing sounds and thoughts, guided imagery, pursed lips breathing, cognitive restructuring, problem solving, emotion-focused coping, and assertive communication) during the intervention would be related to fewer symptoms for patients (i.e., pain interference, fatigue interference, distress related to breathlessness, and psychological distress) and caregivers (i.e., psychological distress) at 6 weeks post-intervention.

Methods

Participants and Setting

Study procedures have been reported previously.¹⁶ All procedures were approved by the Indiana University Institutional Review Board (Clinicaltrials.gov number NCT01993550). Lung cancer patients and their family caregivers were recruited between March 2013 and April 2015 from three medical centers in Indianapolis, IN. Patient inclusion criteria included: 1) age \geq 18 years; 2) at least 3 weeks post-diagnosis of lung cancer; 3) at least moderate severity for one or more symptoms at recruitment, including: anxiety, depressive symptoms, pain, fatigue, or breathlessness; 4) a consenting family caregiver; and 5) adequate English fluency. Patient exclusion criteria included: 1) significant psychiatric or cognitive impairment; 2) previously providing feedback on the intervention;²³ 3) current participation in another psychosocial study; or 4) receiving hospice care. Caregiver inclusion criteria included: 1) age \geq 18 years; 2) living with the patient or visiting regularly; and 3) adequate English fluency. Caregiver exclusion criteria included: 1) current participation in another psychosocial study; 2) previously providing feedback on the intervention;²³ or 3) significant psychiatric or cognitive impairment.

Fifty-one dyads were randomized to TSM, and 75% completed three or four sessions. There was 31% attrition from allocation to 6 weeks post-intervention. Half of the attrition (8/51 dyads) was attributed to the patients' declining health or death, and the other half was attributed to lack of interest. Additional study flow information has been reported previously.¹⁶

Procedures

This study used a within-subjects design to analyze data from participants who were randomized to TSM in a pilot RCT.¹⁶ Assessments (i.e., baseline and 2 and 6 weeks post-intervention) were conducted by a research assistant who was blinded to the participants' study condition. The current analyses explore symptom changes from baseline to 6 weeks post-intervention, as we were interested in potential sustained effects of coping skills practice.

Telephone Symptom Management (TSM). Additional details about TSM are presented in the Supplemental Materials. Briefly, TSM was a manualized symptom management intervention, consisting of four weekly 45-minute sessions delivered by licensed clinical social workers. Patients and caregivers participated in the intervention concurrently by speakerphone. Each participant received a notebook with handouts and other study materials (e.g., a CD with guided relaxation exercises).

Each TSM session focused on different coping skills, and regular practice was emphasized. In session 1, three coping skills were described and practiced: noticing sounds and thoughts (a mindfulness exercise); guided imagery; and pursed lips breathing. Session 2 focused on coping with distressing thoughts based on the type of thought, including: 1) cognitive restructuring for unrealistic thoughts; 2) problem solving for realistic thoughts about a controllable situation; and 3) emotion-focused strategies (e.g., emotional processing) for realistic thoughts about uncontrollable situations. Session 3 focused on assertive communication. Session 4 focused on scheduling pleasant activities, pacing activities, and a plan for continued coping skills practice.

Measures

Sociodemographic and Medical Information. Participant demographics were self-reported at baseline and medical information was collected via medical record review.

Coping Skills Practice. During sessions 2 through 4, participants were asked to report the number of times they each practiced specific coping skills in the past week. The therapist reviewed any skills that participants did not recall. The present analysis only includes coping skills practice data from session 4 because this captured the majority of the skills taught in TSM. Practice of the following coping skills was assessed: noticing sounds and thoughts, guided

imagery, pursed lips breathing, cognitive restructuring, problem solving, emotion-focused coping, and assertive communication.

Outcome Measures. All outcome measures were well-validated for use with cancer patients and their caregivers. Patient symptoms were assessed using: 1) the pain interference subscale of the Brief Pain Inventory – Short Form;^{25,26} 2) the fatigue interference subscale of the Fatigue Symptom Inventory;²⁷ and 3) an item assessing distress related to breathlessness from the Memorial Symptom Assessment Scale.²⁸ Patient and caregiver psychological distress was assessed using the Patient Health Questionnaire (PHQ-8)^{29,30} and the Generalized Anxiety Disorders scale (GAD-7).^{30,31} The PHQ-8 and GAD-7 scores were highly correlated ($r = 0.65$ to 0.87) and were combined for an overall measure of psychological distress.

Statistical Analyses

Preliminary analyses were conducted to characterize the data. A Winsorization transformation was applied to reduce the influence of eleven outliers (i.e., scores $> 3 SD$) in the coping skills practice data.³³ No outliers were identified for the outcome measures. Missing data were imputed in LISREL 8.8³⁵ using the Markov Chain Monte Carlo (MCMC) method.³⁶ An MCMC imputation algorithm included all of the outcomes, coping skills, and two auxiliary variables denoting the reason for attrition. Ten datasets were imputed for patient variables and ten datasets were imputed for caregiver variables.

Analyses of associations between coping skills practice and symptom change were planned before data collection began. Multiple regression analyses were conducted in SPSS³⁷ to examine associations of coping skills practice to symptoms at 6 weeks post-intervention, while controlling for the baseline level of the respective symptom. Five regression models were tested. Patient and caregiver variables were examined in separate regressions due to the sample size,

which precluded the use of dyadic analyses.³⁸ The regressions were conducted on each imputed dataset; the results were then averaged using guidelines developed by Rubin.³⁹ Previous studies reported moderate associations between coping skills and outcomes, with β weights ≥ 0.30 .⁹⁻¹¹ Thus, we noted moderate associations regardless of the p -value, given that statistical significance can be heavily influenced by factors such as sample size.⁴⁰

Results

Descriptions of Participants, Coping Skills Practice, and Outcome Measures

Participant characteristics are presented in Tables 1 and 2. Descriptive statistics for coping skills practice and outcomes are presented in Tables 3 and 4.

Multiple Regression Results

Results from averaged multiple regression analyses are presented in Table 5. All of the regression models explained significant variability in symptoms at 6 weeks post-intervention, including 40% of patients' pain interference, 44% of patients' fatigue interference, 38% of patients' distress related to breathlessness, 49% of patients' psychological distress, and 64% of caregivers' psychological distress. Consistent with our hypotheses, greater practice of assertive communication demonstrated significant, moderate associations with less pain interference ($\beta=-0.45, p=0.02$) and less psychological distress ($\beta=-0.36, p=0.047$) for patients; greater practice of guided imagery demonstrated a significant, moderate association with less psychological distress ($\beta=-0.30, p=0.01$) for caregivers. Contrary to our hypotheses, greater practice of noticing sounds and thoughts demonstrated a significant, moderate association with higher fatigue interference ($\beta=0.49, p=0.04$) and a non-significant, moderate association with higher pain interference ($\beta=0.47, p=0.07$). Additionally, greater practice of problem solving demonstrated a significant, moderate association with higher distress related to breathlessness ($\beta=0.56, p=0.01$) and a non-

significant, moderate association with higher psychological distress ($\beta=0.36$, $p=0.08$) for patients. The remaining coping skills demonstrated small, non-significant associations with patient and caregiver outcomes.

Discussion

The purpose of this study was to identify effective coping skills in a telephone-delivered symptom management (TSM) intervention for symptomatic lung cancer patients and their family caregivers. Linking coping skills to symptom outcomes may inform the development of highly efficacious interventions.^{13,14} Our hypotheses were based on social cognitive theory^{21,22} and previous research⁹⁻¹¹ suggesting that greater practice of coping skills may reduce specific symptoms. We found that practice of certain coping skills during the intervention was associated with post-intervention improvement in some symptoms; however, practice of other skills demonstrated small, non-significant effects or moderate effects opposite of those hypothesized. These findings provide important information for symptom management interventions in this large, understudied population.

First, consistent with our hypotheses, greater practice of assertive communication during the intervention was associated with less pain interference and psychological distress for patients at 6 weeks post-intervention. Andersen and colleagues⁹ reported a similar effect in their component analysis of a psychosocial intervention for breast cancer patients. In TSM, dyads were taught to use assertive communication to obtain medical attention for symptoms as well as communicate thoughts and feelings and elicit social support. Prior studies have shown that eliciting social support can reduce multiple symptoms for cancer patients, including pain and psychological distress.^{8,41-43} Indeed, symptoms are often exacerbated when a patient does not receive sufficient practical assistance. Assertive communication training may improve symptom management in lung cancer patients.

Also consistent with our hypotheses, greater practice of guided imagery during the intervention was associated with less psychological distress for caregivers at 6 weeks post-intervention. Guided imagery is frequently taught in cognitive-behavioral interventions, which tend to produce short-term benefits for cancer caregivers.^{1,4,44} Few dyadic interventions have included caregivers of lung cancer patients;⁴⁵ however, the current findings suggest guided imagery may be beneficial for managing psychological distress in this population.

The practice of two coping skills (i.e., noticing sounds and thoughts, problem solving) was associated with increases in certain symptoms for patients. These results should be interpreted cautiously as they are inconsistent with other studies.⁹⁻¹¹ First, greater practice of noticing sounds and thoughts during the intervention was associated with higher pain and fatigue interference at 6 weeks post-intervention. This coping skill is derived from mindfulness-based therapies that encourage experiencing the present moment non-judgmentally and with acceptance.⁴⁶ Mindfulness-based interventions are often much longer than TSM and focus exclusively on this approach.⁴⁷⁻⁴⁹ In TSM this skill may have heightened patients' awareness of their symptoms, but may not have provided enough training for patients to experience less symptom interference. Second, greater practice of problem solving was associated with higher distress related to breathlessness and psychological distress for patients at 6 weeks post-intervention. Numerous dyadic interventions in cancer populations have included problem solving and demonstrated symptom reductions.^{1,4} However, these interventions rarely included lung cancer patients and taught a variety of coping skills. Without component analyses or dismantling studies it is impossible to disentangle individual coping skill effects. There are other explanations for the current findings, such as spurious associations. For example, breathlessness often increases concurrently with disease progression.⁵⁰ Patients with worsening disease may

increase their use of problem solving to address numerous concerns (e.g., treatment decisions), leading to a spurious association with breathlessness through deteriorating health. Further research is needed to determine whether aspects of mindfulness interventions and problem-solving approaches are beneficial for lung cancer patients.

Practice of other coping skills showed small, non-significant associations with patient and caregiver symptoms. TSM may have been too brief given the number of coping skills that were taught and the severity of participants' symptoms. A meta-analysis of interventions with caregivers of cancer patients found that a higher dose (i.e., number of sessions and hours) of coping skills based interventions produced better coping efforts.⁴ However, intervention dose was positively associated with caregiver depressive symptoms⁴ and, in a meta-analysis of dyadic interventions,¹ dose was unrelated to patient outcomes. Additionally, TSM was delivered via telephone which may have limited participants' ability to learn skills that could be demonstrated in-person.

There are numerous strengths of this study that are worth noting. To our knowledge, this was the first study to report associations between coping skills practice and outcomes in a dyadic intervention for cancer patients and their caregivers. It included a rigorous longitudinal design with blind assessments of outcomes, in-depth training of staff, and fidelity monitoring. Additionally, data imputation with auxiliary variables was utilized to increase the accuracy of parameter estimates.³⁴

Limitations of this study and future research directions should be noted. Associations between coping skills and outcomes are consistent with causality but may be attributed to spurious, reciprocal, or indirect effects.³² Only an RCT comparing individual coping skills can definitively support causal claims. Future studies should consider using a multiphase

optimization strategy (MOST) design to identify and test intervention components.⁵¹ There was also an increased potential for error given the multiple analyses. Moreover, the relatively small sample size likely reduced the accuracy of the parameter estimates. Larger studies would allow for dyadic analyses, inclusion of covariates, and exploration of symptom clusters. Exploring coping skills in relation to symptom clusters would take into account the co-occurrence of cancer-related symptoms.⁵² Lastly, whether these findings generalize to a more geographically and ethnically diverse sample requires further investigation.

Our findings demonstrate the utility of analyzing intervention components in relation to outcomes in psychosocial interventions: competing and small effects of certain coping skills likely reduced the effectiveness of TSM. Future interventions should consider focusing on assertive communication training for lung cancer patients and guided imagery for their caregivers, as practice of these skills was associated with improved outcomes. In recent years, there has been an increased focus on brief, theory-driven symptom management interventions for cancer populations. Effective components of these interventions must be identified and tested in order to advance this field of study and, ultimately, reduce the burden of cancer.

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Table 1. Patient and Caregiver Characteristics at Baseline

	Patients (<i>n</i> = 51)	Caregivers (<i>n</i> = 51)
Sex, <i>n</i> (%)		
Male	23 (45.10)	14 (27.45)
Female	28 (54.90)	37 (72.55)
Age		
Mean (<i>SD</i>)	63.47 (7.68)	56.33 (14.09)
Range	45 - 85	20 - 76
Race, <i>n</i> (%)		
Non-Hispanic White	45 (88.24)	44 (86.27)
Missing	0 (0.00)	1 (1.96)
Employment status, <i>n</i> (%)		
Employed full-time or part-time	9 (17.65)	23 (45.10)
Retired	25 (49.02)	16 (31.37)
Unemployed/other	17 (33.33)	11 (21.57)
Missing	0 (0.00)	1 (1.96)
Household income, <i>n</i> (%)		
\$0 – \$20,999	10 (19.61)	8 (15.69)
\$21,000 – \$50,999	12 (23.53)	11 (21.57)
\$51,000 – \$99,999	13 (25.49)	17 (33.33)
\$100,000 or more	7 (13.73)	9 (17.65)
Missing	9 (17.65)	6 (11.76)

Years of education		
Mean (<i>SD</i>)	12.92 (2.22)	13.94 (2.85)
Range	9 - 19	8 - 20
Married/living with partner, <i>n</i> (%)	35 (68.63)	41 (80.39)
Smoking status, <i>n</i> (%)		
Never smoked (or smoked < 100 cigarettes)	6 (11.76)	27 (52.94)
Formerly smoked	34 (66.67)	16 (31.37)
Currently smoke	11 (21.57)	8 (15.69)
Caregiver's relationship to the patient, <i>n</i> (%)		
Spouse/partner		32 (62.75)
Son/daughter		9 (17.65)
Other family member or friend		10 (19.61)
Caregiver lives with the patient, <i>n</i> (%)		37 (72.55)

SD = standard deviation.

Table 2. Patient Medical Information at Baseline ($n = 51$)

Study site, n (%)	
Indiana University Simon Cancer Center	39 (76.47)
Roudebush VA Medical Center	10 (19.61)
Eskenazi Health hospital in Indianapolis	2 (3.92)
Type of lung cancer, n (%)	
NSCLC	44 (86.27)
SCLC	7 (13.73)
Stage of cancer, n (%)	
Stage I-III NSCLC	25 (49.02)
Stage IV NSCLC	19 (37.25)
Limited-stage SCLC	3 (5.88)
Extensive-stage SCLC	4 (7.84)
Time since diagnosis in years	
Median (SD)	0.57 (2.12)
Range	0.07 - 11.99
Missing, n (%)	1 (1.96)
Treatments received, n (%)	
Chemotherapy	27 (52.94)
Radiation	13 (25.49)
Chemoradiation	12 (23.53)
Surgery	24 (47.06)
Patients' ECOG score	

Mean (<i>SD</i>)	1.43 (0.92)
Range	0 - 3

SD = standard deviation; NSCLC = non-small cell lung cancer; SCLC = small cell lung cancer;

ECOG = Eastern Cooperative Oncology Group.

Table 3. Descriptive Statistics for Patient and Caregiver Coping Skills Practice ($n = 38$ Dyads)

Coping skill	Patients	Caregivers
Noticing sounds and thoughts		
Mean (<i>SD</i>)	5.63 (5.60)	5.34 (6.42)
Range	0 - 23	0 - 24
Guided imagery		
Mean (<i>SD</i>)	4.61 (5.18)	3.95 (3.54)
Range	0 - 22	0 - 14
Pursed lips breathing		
Mean (<i>SD</i>)	10.47 (13.70)	5.95 (8.33)
Range	0 - 51	0 - 32
Cognitive restructuring		
Mean (<i>SD</i>)	6.75 (8.52)	6.41 (8.59)
Range	0 - 30	0 - 32
Problem solving ^a		
Mean (<i>SD</i>)	3.85 (4.38)	3.26 (4.66)
Range	0 - 16	0 - 17
Emotion-focused coping		
Mean (<i>SD</i>)	4.75 (4.77)	4.93 (4.87)
Range	0 - 17	0 - 19
Assertive communication		
Mean (<i>SD</i>)	4.83 (4.50)	4.29 (3.88)
Range	0 - 17	0 - 16

SD = standard deviation. Coping skills practice was assessed at the beginning of intervention session 4 and represents the amount of practice in the previous week. All statistics computed after outliers were transformed.

^aOne patient response was missing for this coping skill ($n = 37$).

Table 4. Descriptive Statistics for Patient and Caregiver Outcomes

Outcome	Baseline	6 Weeks Post-intervention
Patient pain interference		
<i>n</i>	51	34
α	0.96	0.95
Mean (<i>SD</i>)	2.27 (2.75)	2.66 (2.77)
Range	0 - 10	0 - 9
Patient fatigue interference		
<i>n</i>	50	35
α	0.94	0.94
Mean (<i>SD</i>)	22.43 (17.19)	20.11 (17.09)
Range	0 - 60	0 - 66
Patient distress related to breathlessness		
<i>n</i>	51	35
α^a	--	--
Mean (<i>SD</i>)	1.22 (1.12)	1.20 (1.23)
Range	0 - 4	0 - 4
Patient psychological distress		
<i>n</i>	50	35
α	0.89	0.91
Mean (<i>SD</i>)	12.43 (8.78)	10.77 (8.13)

Range	0 - 39	1 - 39
Caregiver psychological distress		
<i>n</i>	50	35
α	0.93	0.93
Mean (<i>SD</i>)	11.76 (10.26)	9.83 (9.35)
Range	0 - 41	0 - 36

α = alpha coefficient; *SD* = standard deviation. The variability in sample size is due to missing items.

^aAlpha coefficient was not computed for distress related to breathlessness because it was measured using one item.

Table 5. Multiple Regressions of Coping Skills Practice Predicting Lung Cancer Patients' Symptoms ($n = 51$) and their Family Caregivers' Psychological Distress ($n = 51$).

Outcome	Predictor	R^2	β	B	$SE B$	95% CI for B		F	t	p -
						Lower	Upper	(8,42)		Value
Patient pain interference										
		0.40						3.58		0.02 ^a
	Pain interference at baseline		0.41 ^b	0.43	0.38	0.15	0.70		3.23	0.02 ^a
	Noticing sounds and thoughts		0.47 ^b	0.26	0.37	< 0.01	0.51		2.06	0.07
	Guided imagery		-0.14	-0.09	0.37	-0.34	0.17		-0.66	0.49
	Pursed lips breathing		-0.22	-0.05	0.19	-0.11	0.01		-1.66	0.13
	Cognitive restructuring		0.04	0.01	0.24	-0.09	0.12		0.27	0.75
	Problem solving		0.05	0.04	0.37	-0.23	0.30		0.25	0.75
	Emotion focused coping		-0.04	-0.03	0.34	-0.24	0.17		-0.26	0.70
	Assertive communication		-0.45 ^b	-0.31	0.35	-0.54	-0.07		-2.67	0.02 ^a
Patient fatigue interference										
		0.44						4.28		< 0.01 ^a

Fatigue interference at baseline	0.50 ^b	0.48	0.35	0.24	0.72	4.06	< 0.01 ^a
Noticing sounds and thoughts	0.49 ^b	1.53	0.84	0.13	2.93	2.21	0.04 ^a
Guided imagery	-0.01	-0.04	0.84	-1.45	1.36	-0.05	0.67
Pursed lips breathing	-0.01	-0.02	0.42	-0.36	0.32	-0.10	0.63
Cognitive restructuring	-0.01	-0.02	0.53	-0.57	0.53	-0.06	0.68
Problem solving	0.18	0.74	0.85	-0.70	2.18	1.03	0.35
Emotion focused coping	-0.22	-0.82	0.76	-1.97	0.33	-1.46	0.24
Assertive communication	-0.28	-1.11	0.80	-2.39	0.18	-1.74	0.10
Patient distress related to breathlessness	0.38					3.28	0.01 ^a
Distress related to breathlessness at baseline	0.43 ^b	0.44	0.37	0.17	0.71	3.33	< 0.01 ^a
Noticing sounds and thoughts	< 0.01	< 0.01	0.24	-0.10	0.10	-0.02	0.76
Guided imagery	0.27	0.06	0.24	-0.04	0.17	1.27	0.24
Pursed lips breathing	-0.01	< 0.01	0.14	-0.03	0.02	-0.04	0.58
Cognitive restructuring	-0.11	-0.01	0.15	-0.05	0.03	-0.68	0.52

	Problem solving	0.56 ^b	0.16	0.25	0.05	0.26	3.02	0.01 ^a
	Emotion focused coping	-0.29	-0.07	0.21	-0.16	0.01	-1.80	0.10
	Assertive communication	-0.22	-0.06	0.22	-0.15	0.03	-1.29	0.21
Patient psychological distress		0.49					5.14	< 0.01 ^a
	Patient psychological distress at baseline	0.28	0.27	0.38	0.01	0.53	2.16	0.10
	Noticing sounds and thoughts	0.18	0.28	0.59	-0.40	0.96	0.82	0.46
	Guided imagery	0.02	0.03	0.60	-0.66	0.72	0.10	0.69
	Pursed lips breathing	0.12	0.07	0.30	-0.09	0.24	0.93	0.43
	Cognitive restructuring	0.28	0.27	0.38	-0.01	0.55	1.95	0.08
	Problem solving	0.36 ^b	0.74	0.60	0.04	1.44	2.16	0.08
	Emotion focused coping	-0.20	-0.37	0.54	-0.93	0.19	-1.37	0.28
	Assertive communication	-0.36 ^b	-0.70	0.57	-1.34	-0.06	-2.22	0.047 ^a
Caregiver psychological distress		0.64					9.72	< 0.01 ^a

Caregiver psychological							
distress at baseline	0.67 ^b	0.71	0.35	0.50	0.92	7.12	< 0.01 ^a
Noticing sounds and thoughts	0.02	0.04	0.57	-0.59	0.68	0.08	0.73
Guided imagery	-0.30 ^b	-1.01	0.60	-1.75	-0.28	-2.78	0.01 ^a
Pursed lips breathing	-0.01	-0.01	0.45	-0.41	0.40	-0.08	0.77
Cognitive restructuring	-0.28	-0.38	0.41	-0.68	-0.08	-2.44	0.10
Problem solving	0.23	0.59	0.59	-0.09	1.26	1.77	0.14
Emotion focused coping	-0.08	-0.22	0.64	-1.02	0.58	-0.46	0.55
Assertive communication	0.03	0.11	0.67	-0.79	1.00	0.19	0.63

Outcomes were assessed at 6 weeks post-intervention. Coping skills were assessed at the beginning of intervention session number 4.

Psychological distress refers to depressive and anxiety symptoms. Parameter estimates are averages of 10 imputed datasets, with *SE* adjusted to account for the variance between imputations. Due to averaging, some confidence intervals do not include zero despite having a *p*-value ≥ 0.05 .

^a*p*-value < 0.05.

^bModerate effect, defined as β weight $\geq \pm 0.30$.

Supplemental Materials

A randomized controlled pilot trial compared a telephone-delivered symptom management (TSM) intervention to an education/support condition for symptomatic lung cancer patients and their family caregivers. The results of this trial have been reported previously.¹ We conducted a secondary analysis of this trial to examine if greater practice of coping skills (i.e., noticing sounds and thoughts, guided imagery, pursed lips breathing, cognitive restructuring, problem solving, emotion-focused coping, and assertive communication) during the TSM intervention would be related to fewer symptoms for patients (i.e., pain interference, fatigue interference, distress related to breathlessness, and psychological distress) and caregivers (i.e., psychological distress) at 6 weeks post-intervention. The following sections provide additional study information, including the theoretical framework and research that guided TSM as well as detailed descriptions of session content. We also include specifics about the education/support condition. However, it is important to note that the current study used a repeated-measures design to analyze data from participants randomized to the TSM arm.

Training of Study Therapists and Fidelity Monitoring

TSM and the education/support condition were both delivered in four, 45 to 60 minute weekly phone sessions by licensed clinical social workers with experience working with medical populations. All social workers were trained by a PhD-level clinical psychologist through role-plays of sessions and didactic instructions. Social workers also received weekly, individual supervision by the psychologist. All sessions were audiorecorded, and 53% of the recordings were reviewed and rated using a study fidelity measure. Therapist adherence to the protocol was high, with an average fidelity rating of 97.5% across study conditions.

Telephone-delivered Symptom Management Intervention (TSM) Overview

TSM was a manualized protocol that involved a blend of cognitive-behavioral^{2,3} and emotion-focused⁴ strategies for managing symptoms in lung cancer patients and their family caregivers. TSM focused jointly on patient and caregiver well-being and the management of patient symptoms, including: 1) patient pain interference; 2) patient fatigue interference; 3) patient distress related to breathlessness; 4) patient psychological distress; and 5) caregiver psychological distress. These symptoms were targeted because they are highly prevalent in lung cancer patients and their caregivers⁵⁻⁷ and are amenable to non-pharmacological intervention.⁸⁻¹⁰

Each TSM session included social cognitive theory-based determinants of behavior change,^{11,12} such as enhancing knowledge of symptoms and coping skills, setting coping skills practice goals, assessing barriers to practice, modeling adaptive coping behavior, and enhancing social support through joint practice of the skills. The coping skills taught in TSM were hypothesized to improve patient and caregiver well-being and patient symptoms based on social cognitive theory^{11,12} and previous research in cancer and other medical populations.^{2,13,14} Specifically, improvement in outcomes was hypothesized to be mediated by mechanisms such as increased self-efficacy (i.e., confidence in one's ability to manage symptoms)^{11,12} and decreased physiological arousal.^{15,16}

TSM focused on training in coping skills that are often incorporated in cognitive-behavioral therapy (CBT)-based symptom management interventions.^{2,3} These CBT-based skills have been studied in various cancer populations,^{8,10,17} and included relaxation techniques, cognitive restructuring, problem solving, assertive communication, scheduling pleasurable activities, and activity pacing. TSM also included training in emotion-focused coping strategies⁴ to help patients and caregivers with realistic concerns about uncontrollable situations – which

cannot be appropriately addressed with cognitive restructuring or problem solving.¹⁴ Consistent with CBT-based approaches,^{2,13,18} the skills taught in TSM were designed to help patients and caregivers cope with or change thoughts, feelings, and behaviors that may be exacerbating their symptoms.

Prior to the first TSM session, each dyad member received a notebook that included an appointment reminder sheet, a calendar, session handouts, coping skills practice reminders and tracking sheets, and a CD with guided practices of skills from the first session. Patients and caregivers participated in the sessions concurrently via speakerphone. If the dyad did not have access to a speakerphone, they were sent one via mail. Each of the four sessions were held on a weekly basis for approximately 45 minutes.

TSM Session 1. The therapist began by building rapport with the dyad by asking general questions about their lives (e.g., employment, family) and the patient's cancer (e.g., date of diagnosis, treatment history). Following, the therapist provided a rationale for the intervention and an overview of the sessions. The cognitive-behavioral model of symptoms was presented, noting how lung cancer and its treatment can impact the dyad's thoughts, feelings, activities, and physiological responses.^{3,18} Each dyad member was asked to describe one key change in any of these areas since the lung cancer diagnosis. Relaxation was then introduced as an important skill for coping with physical symptoms as well as emotional distress.^{3,18}

The rationale for the relaxation exercises was then tailored to the dyad's symptoms. For example, if the patient was reporting distressing pain, relaxation was discussed as a means of reducing muscle tension and distracting from pain.¹⁶ Three coping skills were then described and practiced during the session, including noticing sounds and thoughts (a mindfulness

exercise), guided imagery, and pursed lips breathing. For between-session practice, the dyad was instructed to listen at least once per day to a CD with guided practices of these coping skills.

TSM Session 2. The therapist began by reviewing the between-session practice of the coping skills, including any barriers to practicing, and assessed the dyad's symptoms over the past week. Following, a rationale for examining distressing thoughts was presented based on Beck's cognitive theory.¹⁹ Specifically, the therapist explained that everyone has thoughts constantly going through their minds, known as automatic thoughts. Some automatic thoughts are helpful and true, whereas others can be unhelpful or not true. Identifying and examining automatic thoughts was described as a way to understand mood changes and cope more effectively with lung cancer and symptoms.

The therapist asked the patient to think of a recent challenging event related to his or her lung cancer. The patient was assisted in identifying thoughts and emotions related to the event. Using a handout, the therapist helped the patient determine whether the thoughts were realistic or unrealistic. If the thoughts were realistic, the patient decided whether they pertained to a controllable or uncontrollable situation. The therapist then directed the patient to different handouts depending on the nature of the thought (i.e., realistic or unrealistic) and situation (i.e., controllable or uncontrollable). One of three coping strategies was then presented, including cognitive restructuring for unrealistic thoughts, problem-solving for realistic thoughts about a controllable situation, or emotion-focused strategies for realistic thoughts about an uncontrollable situation.^{4,14}

First, if the patient reported unrealistic thoughts (e.g., "I can't do anything because of this pain"), cognitive restructuring was practiced.^{14,19} Specifically, the therapist helped the patient identify automatic thoughts about the event and then gather evidence for and against the

thoughts. The therapist then assisted the patient in developing a more adaptive thought; that is, a thought that considers all of the evidence and leads to less distress. Second, if the patient reported realistic thoughts about a controllable situation (e.g., “I am in a lot of pain”), problem-solving techniques were presented and a plan for addressing the situation was developed.^{13,17} Third, if the patient reported realistic thoughts about an uncontrollable situation (e.g., “My disease is progressing”), possible emotion-focused strategies were discussed and a written plan was developed. Emotion-focused strategies included engaging in self-soothing activities and disclosing emotions to others.⁴

After the patient completed the exercise, the therapist repeated these steps with the caregiver (i.e., examining recent thoughts related to the patient’s lung cancer and using one of the three coping strategies to address these thoughts). The therapist then used handouts to explain any of the three coping strategies that were not already discussed with the dyad. For between-session practice, the dyad was instructed to use the coping skills practice CD at least once per day. Additionally, they were asked to each write down a few thoughts when they had strong emotions during the week. Using a handout, they were asked to practice the appropriate coping strategy based on the type of thought and/or situation.¹⁴

TSM Session 3. The therapist began by reviewing the between-session practice of the coping skills from the prior sessions and assessed the dyad’s symptoms over the past week. An overview of assertive communication was provided, and each member of the dyad identified challenges in communicating with the other dyad member regarding lung cancer (e.g., discussion of patient symptoms or medical treatment decisions). While referring to handouts, the therapist provided specific instruction in communicating thoughts and feelings in a direct, honest, and respectful manner.^{20,21} Listening skills were also discussed. Each dyad member selected a topic

and practiced assertive communication with the other dyad member. The therapist provided feedback and asked each dyad member to provide feedback to each other. Each dyad member then noted a topic to discuss with the other dyad member during the coming week. The use of assertive communication with other individuals (e.g., the doctor, other family members) was also encouraged. For between-session practice, the dyad was instructed to do the following: 1) use the coping skills practice CD at least once per day, 2) write down a few thoughts when they experienced strong emotions and follow the handout describing the appropriate coping strategy for addressing these thoughts, and 3) practice assertive communication with each other on at least one occasion.

TSM Session 4. The therapist began by reviewing the between-session practice of the coping skills from the prior sessions and assessed the dyad's symptoms over the past week. Next, scheduling pleasurable activities was discussed. The therapist described how lung cancer and its treatment can impact the dyad's valued and enjoyable activities.⁷ Each dyad member wrote down three activities that he or she enjoyed and was able to do and selected one activity to do in the coming week. Activity pacing was then presented.³ Specifically, the therapist assisted each dyad member in identifying activities involving overexertion. The goal was to develop an activity-rest cycle that led to increased productivity and reduced pain and other symptoms.¹³ When discussing this cycle with patients who had fluctuating symptoms, a different activity-rest cycle was developed for periods with higher or lower symptom burden. Lastly, a plan for continued practice of each coping skill was developed. The dyad was encouraged to use the skills as often as necessary and to meet weekly with each other to review their use of the skills. Therapy termination was then discussed, and referrals for additional resources were provided if necessary.

Education/Support Condition Overview

The education/support condition was delivered using a manualized protocol that focused on providing dyads with education and resources related to relevant topics, such as quality of life concerns that are common in lung cancer. The duration and timing of the sessions was equivalent to the TSM condition (i.e., four, 45-minute sessions delivered weekly). Similar comparison groups have been used in prior psychosocial symptom management interventions with cancer patients and their caregivers.^{4,22} There was no overlap in content between the two study arms; training in symptom management approaches were not discussed in the education/support condition. Prior to the first session, dyads received notebooks with handouts that summarized the content of each session and provided additional information for the dyad to review between sessions. Patients and caregivers participated in the sessions concurrently via speakerphone.

Education/Support Session 1. The first session began with the therapist building rapport with the dyad by asking general questions about their lives and the patient's cancer. The dyad completed brief symptom assessments. The therapist then provided an overview of the sessions and presented an orientation to the patient's medical center, including information on parking, lodging, food, and transportation. Next, the therapist defined quality of life as encompassing the following domains of functioning: physical, social, roles/activities, and emotional.²³ Regarding the physical domain, the therapist asked about educational materials that the patient and caregiver may have received from their healthcare team. The dyad was encouraged to direct any questions about the patient's physical health to their treatment team. The patient's treatment team was then described, including healthcare professionals, mental health specialists, and

volunteers. For homework, the dyad was asked to review session-related handouts before the next session.

Education/Support Session 2. The second session began with a symptom assessment and the dyad was given an opportunity to ask questions related to the prior session's materials. The therapist then presented information on the social aspects of quality of life. The dyad was encouraged to think about who they can rely on for support, such as family members or friends. Employment was then discussed, if applicable, including a brief summary of the dyad's legal rights as employees. Handouts summarizing resources for each topic area were provided, including contact information for organizations that protect employees' legal rights. Lastly, the therapist described a program by the American Cancer Society focused on helping patients look their best (e.g., wigs, scarves, hats). Contact information for this program was provided. For homework, the dyad was asked to review session-related handouts before the next session.

Education/Support Session 3. The third session began with a symptom assessment and the dyad was asked if they had any questions from the previous sessions. Following, the therapist discussed roles/activities and emotional domains of functioning. Common changes in roles and activities after a cancer diagnosis were reviewed. General tips on managing the household were discussed, such as organizing items and using a wheeled cart to transport items. Next, the therapist described common emotional responses to cancer and cognitive changes that may occur after chemotherapy. The patient and caregiver were directed to handouts summarizing available mental health services at their medical center and tips for dealing with cognitive changes. For homework, the dyad was asked to review session-related handouts before the next session.

Education/Support Session 4. The fourth session began with a symptom assessment and the dyad was asked if they had any questions from the previous sessions. The therapist provided an overview of common financial concerns. This discussion included topics such as health insurance, Medicare and Medicaid, financial aspects of in-home care, disability benefits, social security, and financial planning. It was emphasized that the therapist was not an expert in these topics, and the dyad was directed to handouts describing resources related to each topic area, including websites and contact information for organizations. The therapist then described methods for evaluating health information available via the Internet and other modalities. Any remaining questions were answered, and the dyad was thanked for their contribution to the study.

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