Original Article

Massage Therapy for Hospitalized Patients Receiving Palliative Care: A Randomized Clinical Trial

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Abstract

Context. Massage therapy is increasingly used in palliative settings to improve quality of life (QoL) and symptom burden; however, the optimal massage "dosage" remains unclear.

Objectives. To compare three massage dosing strategies among inpatients receiving palliative care consultation.

Methods. At an urban academic hospital, we conducted a three-armed randomized trial examining three different doses of therapist-applied massage to test change in overall QoL and symptoms among hospitalized adult patients receiving palliative care consultation for any indication (Arm I: 10-min massage daily × 3 days; Arm II: 20-min massage daily × 3 days; Arm III: single 20-min massage). Primary outcome measure was single-item McGill QoL question. Secondary outcomes measured pain/symptoms, rating of peacefulness, and satisfaction with intervention. Data were collected at baseline, pre- and post-treatment, and one-day postlast treatment (follow-up). Repeated measure analysis of variance and paired t-test were used to determine significant differences.

Results. Total $n = 387$ patients were 55.7 (±15.49) years old, mostly women (61.2%) and African-American (65.6%). All three arms demonstrated within-group improvement at follow-up for McGill QoL (all $P < 0.05$). No significant between-group differences were found. Finally, repeated measure analyses demonstrated time to predict immediate improvement in distress ($P \leq 0.003$) and pain ($P \leq 0.02$) for all study arms; however, only improvement in distress sustained at follow-up measurement in arms with three consecutive daily massages of 10 or 20 minutes.

Conclusion. Massage therapy in complex patients with advanced illness was beneficial beyond dosage. Findings support session length (10 or 20 minutes) was predictive of short-term improvements while treatment frequency (once or three consecutive days) predicted sustained improvement at follow-up. J Pain Symptom Manage 2023;65:428–441.

Key Words

Palliative care, quality of life, massage, integrative medicine, pain, symptoms

Key Message

Among hospitalized patients with advanced illness receiving massage therapy to improve overall quality of life, a "dose" of 10 minutes daily for three days is as effective as 20 minutes daily for three days; both of these "doses" were superior to a single 20-minute massage.

Introduction

Palliative care provides expert symptom management and communication skills for hospitalized patients facing serious life-limiting illness. Many such patients experience lower quality of life (QoL) due to moderate-severe pain or other symptoms that require

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strong pharmacotherapies to alleviate associated distress. A major tenet of quality supportive care is the combination of therapeutic modalities, both pharmacologic and nonpharmacologic.[1–4] Patients with serious illnesses often rely on nonpharmacologic therapies to manage pain or other symptoms at home, and integrative therapies are increasingly recommended by palliative care clinicians and expert guidelines.[5–9] However, although slowly increasing, implementation of integrative therapies in the hospital setting can be challenging, variably supported by different medical specialties, and are thus, rarely available for hospitalized patients with serious illness.[10–12] Patients often seek nonpharmacologic options, but medications remain the mainstay of treating disease and treatment-related symptoms while hospitalized.

Therapeutic massage is one of the most common nonpharmacologic strategies offered to improve QoL, provide comfort, and decrease pain in hospice and palliative care settings outside the hospital.[13,14] Three systematic reviews found massage to be effective for treating cancer pain, surgical pain, and generalized pain versus active comparators.[15–17] Nevertheless, there remain limited data describing the impact of therapeutic massage in hospitalized patients receiving palliative care.[18–20]

Several setting-specific factors exist in the hospital which present logistical challenges to providing massage therapy. A massage session may be interrupted by care provided by other members of the team, personal visitors, or the activities of the patient's roommate in a semiprivate room.[21,22] Contracted massage therapists may not be available at times more convenient to or preferred by inpatients.[23] Additionally, funding mechanisms for massage remain limited, creating a barrier to access, particularly for under-resourced patient populations.[10,20] Despite these challenges, massage therapy deserves exploration as an important strategy to address symptom burden in patients with advanced illness, a nationwide opioid crisis in the setting of public concern for untreated pain, and documented patient demand for integrative therapies.[24] Unfortunately, little is known about optimal delivery of massage interventions in hospital settings, including dosing parameters such as time and frequency.[25–27] The purpose of this study was to examine the impact of different massage dosing strategies on QoL and meaningful chronic illness symptoms, including pain, in hospitalized patients receiving palliative care consultation.

Materials and Methods

Overall Original Design

We conducted a prospective randomized, three-arm comparative effectiveness trial to evaluate three massage dosing strategies for hospitalized patients receiving palliative care consultation. We hypothesized that massage administered daily for three consecutive days would lead to better outcomes than a single massage, and that massage time of 20 minutes would not lead to better outcomes than massage for 10 minutes.

Study Setting and Participants

MedStar Washington Hospital Center (MWHC) is a 912-bed tertiary referral academic medical center in Washington, D.C. The interdisciplinary palliative care service is widely integrated into inpatient care throughout MWHC, providing consultative services to over 2500 patients annually. Participants were hospitalized patients receiving palliative care consultation for any indication and anticipated to stay for at least four days. Patients were ineligible if younger than 18-years-old, unable to provide consent, unable to complete electronic surveys in English, on negative-pressure isolation, had an unstable spine or platelet count less than 10,000/μL, or received a massage within the last 30 days.

Study Intervention

Participants in all study arms received massages, per study randomization assignment, delivered by licensed, palliative-trained massage therapists contracted for this study. Each delivered massage was tailored to the needs of the patient in that moment with intention to bring comfort and improve QoL. For example, a participant with lower extremity pain might request that limb to be the focus of the massage, or alternatively might request that limb be avoided by the therapist − in each case, the therapist tailored the massage according to the preferences of the patient participant. Each therapist adapted and documented applied pressure using the Walton Pressure Scale.[28] Stroke style, tempo, and location of contact were adapted from established guidelines for hospital-based massage. The Appendix contains a sample of massage descriptions applied during the study and additional treatment and therapist details. Subjects in all study arms continued to receive standard medical care, including appropriate pharmacologic management for disease-related symptoms.

Study Measures

The study's primary outcome was the pre- versus post-intervention difference in the McGill QoL (MQoL) questionnaire single-item Likert question: "considering all parts of my life—physical, emotional, social, spiritual, and financial-over the past two days, the quality of my life has been. . ."[29] This question has been validated in hospitalized patients receiving palliative care consultation across different disease states.[30] Secondary outcomes included remaining MQoL subscales (physical symptoms, psychological symptoms,

outlook on life, and meaningful existence) and total MQoL score. Other secondary assessments were 1) the Edmonton Symptom Assessment Scale (ESAS), a validated, reliable instrument developed to measure nine common symptoms in palliative patients[31]; 2) the National Comprehensive Cancer Network Distress Thermometer, an 11-point Likert scale tool for general distress[32]; 3) a single-item peace questionnaire, adapted from a single question "are you at peace?" to a Likert scale for participant selfreport experience[33]; and 4) satisfaction with the assigned intervention. Of the primary or secondary measures, only the ESAS tool has an established minimal clinically important difference which is defined as a change of ≤ -1 decrease in scores (postintervention score subtracted from baseline score) for improvement and $\geq +1$ as deterioration.[34]

Recruitment, Consent, and Randomization

Eligible patients were identified by the MWHC inpatient palliative care consultation service at daily rounds or during routine clinical care and referred to the study coordinator. The study coordinator approached identified individuals to introduce the study, share relevant information, and completed consent, enrollment, and baseline collection processes. Following collection of baseline measures, participants were randomized by the study coordinator 1:1:1 using a computerized randomized scheme to receive either a 10-minute massage daily for three consecutive days (Arm I) or a 20-minute massage daily for three consecutive days (Arm II) or a single 20-minute massage (Arm III).[35] Fig. 1 depicts the study's design and timing specifics.

The nature of the study prevented subjects and study coordinator from being blinded to assigned interventions. Final analysis was completed using a deidentified data set by a statistician blinded to the participants. The subjects participated in the study over four consecutive days (Arm I, Arm II) or two consecutive days (Arm III).

Baseline study measures were collected from all participants prior to receiving the assigned intervention (s). Final study measures were collected from all participants one day after receiving the final assigned massage. Additionally, immediate pre- and postmassage measures were collected at each massage session. To blind the study coordinator to participant survey responses, selfreported study outcome measures were collected directly from participants via survey responses using the Tonic Health platform on electronic tablets. Tonic Health is a customizable, mobile survey application that is compliant with the Health Insurance Portability and Accountability Act and approved by MWHC and this study's institutional review board. Participants in all arms continued to receive standard pharmacologic pain management treatment which was not affected by participation in this study. Prior to participant recruitment, we received institutional review board approval from the MedStar Health Research Institute for this study (#2017−260). At the time of this study, our institution did not require pre-enrollment trial registration for a massage therapy study; this study was registered retroactively (ClinicalTrials.gov Identifier: NCT04916223). Patient demographics and clinical characteristics including mortality risk and illness severity were retrospectively extracted from the electronic medical records.

Statistical Analysis

Statistical analysis was performed using Stata 16.0 MP (StataCorp, 2019) and SPSS vs. 24.0 (IBM, 2016). Descriptive statistics and frequency distributions were used to report and compare demographic data and clinical patient characteristics. Categorical data were compared with chi-square test and analysis of variance (ANOVA) compared continuous variables across Arms for continuous confounders. Two analysis plans were applied based on data collection scheduling.

Analysis Plan 1. Primary analysis assessed QoL and other secondary measures collected at baseline and follow-up. Specifically, McGill, and ESAS scores and domains were assessed using paired t-tests to evaluate within-group changes before and after treatment for all participants and separately for each dosing strategy. One-way ANOVA was used to assess significant differences across all arms for QoL and other domains of McGill scale. Only participants with baseline and follow-up data were included in this analysis; using a complete case analysis approach.[36]

Analysis Plan 2. Additional analysis used repeated measures ANOVAs to assess secondary outcomes (i.e., distress, peace, and pain) collected before and after each massage. Two models were used to test secondary hypotheses: Model 1:3-time points (pretreatment 1, postlast treatment, follow up) as the within-subjects factor, and study arm (Arm I, Arm II, Arm III), set as between-subjects factor to compare different dosage of massage across groups and time. Model 2 only compared massage dosage (10 minutes vs. 20 minute) in Arm I and II with seven-time points: pretreatment 1 (time 1), post-treatment 1 (time 2), pretreatment 2 (time 3), post-treatment 2 (time 4), pretreatment 3 (time 5), post-treatment 3 (time 6), follow up (time 7). Study arm (Arm I & Arm II) was set as the between-subjects factor in Model 2. Baseline data was set as a covariate in both models and significance was set to $P < 0.05$ with two-tailed analyses.

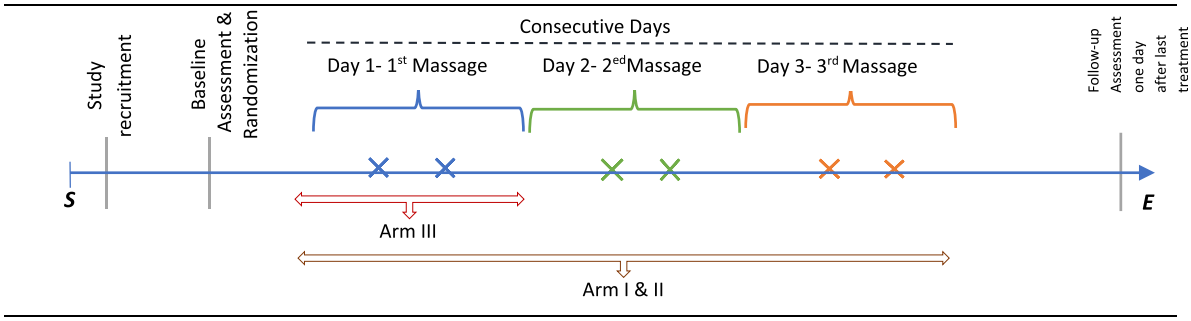

Fig. 1. Study protocol and data collection overview*

X = Data were collected immediately before and after massage

S: 2/23/2018 Start point of the study; ***E***: 3/29/2019 End of the study

* Participation occurred over two to four consecutive days depending on assigned study arm. Consent was collected at the same time as baseline. Randomization followed consent and baseline data collection using a computerized randomization 1:1:1 scheme.[35] Outcome assessments were electronically collected at baseline, before and after each massage, and one-day following the final massage (follow-up). The study's primary outcome was quality of life with other chronic illness symptoms (i.e., distress, peace, and pain) considered secondary outcomes.

Results

Descriptive Statistics

Fig. 2 depicts the study's flow diagram with n = 387 patients relatively evenly randomized across study arms. Most participants allocated to treatment received at least one massage and 73%−91% of participants received their full intervention. High proportions of randomized participants were included in the primary (60%−72%) and secondary (>90%) study analysis.

Table 1 displays demographic and clinical characteristics for all randomized participants and by study arm. Most participants (81%) were non-White only, with African Americans making up the largest proportion of participants (66%). Most participants were women (61%) and less than 65 years-old (mean = 55.6±15.1 years). Participants had a variety of primary advanced illnesses, with cancer (45%), heart failure (38%), and chronic kidney disease (29%) the most common. Most participants had high severity of illness scores (76% major or extreme severity) and calculated risk of mortality (59% major or extreme risk). There were no differences in demographics or clinical characteristics between study arms.

Analysis Plan 1—Primary Analysis

Two-hundred-fifty (n = 250) patients completed both McGill and ESAS assessments at baseline and post-intervention and were included in primary between and within-group analysis. Tables 2 and 3 display domain mean and standard deviation changes for McGill and ESAS assessments, respectively. All participant data were combined for the first column in each table to investigate massage impact beyond dosage as a secondary analysis approach.

The McGill global score and all domains scale showed sustained statistically significant improvement for all participants except for the support domain. Similar patterns of improvement occurred in each Arm separately; however, the existential domain was only significant for Arms II and III. No massage dosage was statistically superior when scores were compared between study arms. Results for distress and peace items indicated significant, sustained improvement for all participants. However, within-group analysis indicated significant changes only for distress among Arm II and for peace within Arms 1 and 3.

Baseline ESAS scores for drowsiness and tiredness were different and controlled for in postintervention analysis. The highest ESAS scores were recorded for symptoms of shortness of breath (6.9/10), tiredness (5.90/10), and pain (5.12/10) among all patients. Global ESAS score, pain, nausea, depression, anxiousness, and wellbeing had statistically significant improvement for all patients. However, within-group analysis per Arm indicated no significant improvement in symptoms compared to baseline among Arm I while pain, nausea, depression, and wellbeing were statistically improved in Arms 2 and 3. Results from between-group analysis indicated no Arm as superior in symptom improvements.

Many participants experienced clinically meaningful change in their symptoms following massage (Table 4) but no dosing approach was superior to any other. Pain had the highest proportion of participants to experience clinically meaningful improvement from massage (47%), followed by wellbeing (46.0%), tiredness (42.0%), and distress (40.4%). Drowsiness had the highest proportion of participants to indicate clinically meaningful deterioration among all patients (40%).

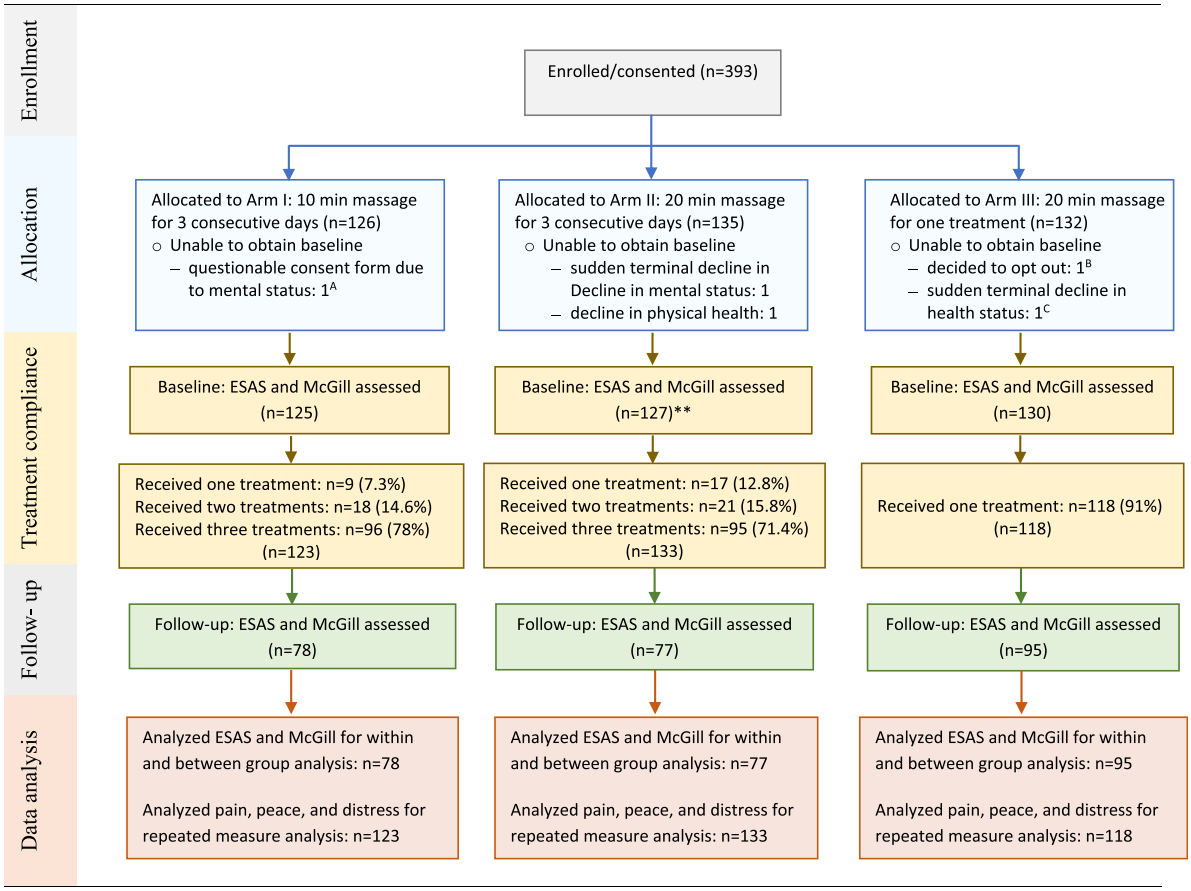

Fig. 2. Study flow diagram.

A: "Patient initialed on first page of consent but unable to do anything further, patient decided to withdraw from the study"

B: "Began presurvey with patient, but patient stated that he did not want to answer questions, patient decided to withdraw from study"

C: ". . .patient transferred to 2G and intubated. Patient deceased"

Notes: Patients who did not receive the assigned treatment either refused to receive massage due to unstable mental or physical health, or they were discharged before receiving massage treatment. ** Number discrepancy due to some participants not completing baseline survey but receiving massage treatments with pre and post assessment measures.

Table 5 displays Pearson correlation coefficients for McGill scale domains and ESAS symptoms. All symptoms were significantly correlated with McGill domains ($P < 0.001$) except for dyspnea. Peace and distress were highly correlated with the McGill domains and also with McGill total score.

Participants indicated their appreciation for massage at the end of the study with a high proportion reporting their interest to receive massage therapy in the future (data not shown; 95.7%, 89.2%, and 91.3% in Arms I-III, respectively; $P = 0.295$). When asked, "during the past day, how often was your pain well controlled?", a majority (68.4%) responded "often" or "very often". Moreover, 84.4% expressed satisfaction with hospital staff related to their pain control.

Analysis Plan 2—Repeated Measure Analysis

Repeated measures analysis utilized multiple imputation for missing data which is recognized as the ''gold standard'' for randomized control trials (Appendix B).[37–39]

Model I: 3-Timepoints by 3-Arms. Model I repeated measures analysis (Fig. 3) found time but not study Arm to predict decrease in distress ($\beta = -.15$, $P < 0.001$ and $\beta = 0.04$, $P = 0.404$, respectively), increase in peace ($\beta = 0.14$, $P = 0.001$ and $\beta = -0.04$, $P = 0.262$, respectively), and decrease in pain scores ($\beta = -0.13$, $P < 0.001$ and $\beta = 0.03$, $P = 0.515$, respectively). In addition, the group × time interaction was found to be significant for each variable: distress (F [8,

Table 1
Patients' Demographics and Clinical Characteristics

	All, *n* (%) 387 (100%)	Arm I, *n* (%) 126 (31.6%)	Arm II, *n* (%) 129 (35.4%)	Arm III, *n* (%) 132 (32.9%)	*P*-Value
DEMOGRAPHICS					
Age					
Mean (SD)	55.6 (15.1)	56.6 (15.3)	54.71 (15.01)	55.50 (15.14)	0.526
Range	19–96	19–89	19–96	22–96	
Age group					0.281
Less than 65	227 (71.6)	87 (69.0)	99 (76.7)	91 (68.9)	
65 y and more	110 (28.8)	39 (31.0)	30 (23.3)	41 (31.1)	
Sex					0.781
Male	150 (38.8)	50 (39.7)	52 (40.3)	48 (36.4)	
Female	237 (61.2)	76 (60.3)	77 (59.7)	84 (63.6)	
Race					
White	73 (18.9)	25 (19.8)	22 (17.1)	26 (19.7)	0.341
African/American	254 (65.6)	77 (61.1)	89 (69.0)	88 (66.7)	
Asian	5 (1.3)	2 (1.6)	2 (1.6)	1 (.8)	
Other	15 (3.9)	9 (7.1)	5 (3.9)	1 (.8)	
Multiracial	40 (10.3)	13 (10.3)	11 (8.5)	16 (12.1)	
Ethnicity					0.192
Hispanic	10 (2.6)	5 (4.0)	4 (3.1)	1 (.8)	
Non-Hispanic	362 (93.5)	115 (91.3)	118 (91.5)	129 (97.7)	
Unknown	15 (3.9)	6 (4.8)	7 (5.4)	2 (1.5)	
CLINICAL CHARACTERISTICS					
Cancer					0.668
Yes	174 (45.0)	60 (47.6)	41.1 (53)	61 (46.2)	
Heart failure					0.548
Yes	148 (38.2)	50 (39.7)	45 (34.9)	53 (40.2)	
CKD					0.677
Yes	111 (28.7)	38 (30.2)	36 (27.9)	37 (28.0)	
COPD					0.691
Yes	37 (9.6)	13 (10.3)	10 (7.8)	14 (10.6)	
HIV					0.804
Yes	16 (4.1)	4 (3.2)	6 (4.7)	6 (4.5)	
Deceased in hospital					0.859
Yes	18 (4.7)	6 (4.8)	5 (3.9)	7 (5.3)	
RRT					0.992
Yes	46 (11.9)	15 (11.9)	15 (11.6)	16 (12.1)	
Mechanical ventilation					0.243
Yes	96 (24.8)	34 (27.0)	36 (27.9)	26 (19.7)	
LVAD					0.358
Yes	64 (16.5)	25 (19.8)	17 (13.2)	22 (16.7)	
Risk of mortality					0.852
Minor	47 (12.1)	14 (11.1)	19 (14.7)	14 (10.6)	
Moderate	103 (26.6)	34 (27.0)	35 (27.1)	34 (25.8)	
Major	158 (40.8)	(50) 39.7	49 (38.0)	59 (44.7)	
Extreme	71 (18.3)	24 (19.0)	24 (18.6)	23 (17.4)	
Missing	8 (2.1)	4 (3.2)	2 (1.6)	2 (1.5)	
Severity of illness					0.926
Minor	13 (3.4)	5 (4.0)	4 (3.1)	4 (3.0)	
Moderate	70 (18.1)	27 (21.4)	24 (18.6)	19 (14.4)	
Major	186 (48.1)	55 (43.7)	63 (48.8)	68 (51.5)	
Extreme	110 (28.4)	35 (27.8)	36 (48.8)	39 (29.5)	
Missing	8 (2.1)	4 (3.2)	2 (1.6)	2 (1.5)	
Hospital LOS					0.584
Mean days (SD)	23.8 (23.7)	22.5 (25.0)	24.1 (21.4)	24.7 (24.7)	
Range	1.6–178.2	2.44 – 178.1	1.6 – 149.0	2.4 – 178.1	

Note: Chi-square and ANOVA tests were performed to analyze the baseline confounders for categorical and mean comparisons, respectively. No significant difference was observed among Arms for demographic and baseline clinical characteristics.

716] = 5.93, $P < 0.001$), peace (F [8, 681] = 3.14, $P = 0.002$), pain (F [8, 792] = 3.54, $P < 0.001$). Interaction probing revealed decreased distress for those in all Arms at Time 2 ($\beta = -0.50$, $P < 0.001$; $\beta = -0.40$, $P = 0.003$; and $\beta = -0.41$, $P = 0.001$, respectively) and only for Arms 1 and 2 at Time 3 ($\beta = -0.31$, $P = 0.024$ and $\beta = -0.30$, $P = 0.026$, respectively). Interactions were not as consistent for the peace variable with increases only demonstrated in Arm I at Time 3 ($\beta = 0.34$, $P = 0.017$) and in Arm II at Time 2 ($\beta = 0.37$, $P = 0.005$). Each arm also demonstrated decreased pain only at Time 2 ($\beta = -0.40$, $P = 0.003$; $\beta = -0.34$, $P = 0.015$; and $\beta = -0.37$, $P = 0.004$, respectively).

Table 2
Between and Within-Group Analysis for Massage Therapy Impact on Quality of Life (McGill Scale)

	All $n = 250$	Arm I $n = 78$	Arm II $n = 77$	Arm III $n = 95$	*P*-Value Between Group (ANOVA)
McGill Scale*					
Global McGill score Mean (SD)					
Baseline	6.06 (1.5)	6.07 (1.5)	6.26 (1.6)	5.88 (1.5)	0.283
Follow up	6.77 (1.7)	6.71 (1.7)	6.90 (1.8)	6.71 (1.6)	0.721
P-value/within group	0.000	0.000	0.000	0.000	
Paired t-test	t = 8.694	t = 4.022	t = 4.236	t = 6.883	
A. Quality of life					
Baseline	5.90 (2.8)	5.78(2.7)	5.95 (2.9)	5.95 (2.7)	0.911
Follow up	6.91 (2.3)	6.62 (2.4)	7.03 (2.4)	7.06 (2.0)	0.411
P-value/within group	0.000	0.018	0.001	0.000	
	t = 5.606	t = 2.412	t = 3.485	t = 3.824	
B. Physical symptom					
Baseline	4.56 (2.6)	4.66 (2.5)	4.89 (2.8)	4.22 (2.5)	0.241
Follow up	5.22 (3.0)	5.38 (3.1)	5.39 (3.0)	4.97 (3.0)	0.580
P-value/within group	0.000	0.024	0.140	0.022	
	t = 3.561	t = 2.306	t = 1.493	t = 2.335	
C. Physical wellbeing					
Baseline	5.62 (2.0)	5.58 (2.0)	5.62 (2.3)	5.66 (1.9)	0.964
Follow up	7.26 (1.8)	7.03 (1.9)	7.37 (2.1)	7.35 (1.6)	0.439
P-value/within group	0.000	0.000	0.000	0.000	
	t = 11.551	t = 5.300	t = 6.779	t = 7.976	
D. Psychological wellbeing					
Baseline	6.03 (2.9)	6.14 (3.1)	6.2(2.9)	5.76 (2.8)	0.531
Follow up	6.79 (2.8)	6. 85 (2.9)	7.0 (2.7)	6.53 (2.8)	0.484
P-value/within group	0.000	0.008	0.006	0.001	
	t = 5.264	t = 2.717	t = 2.823	t = 3.559	
E. Existential					
Baseline	6.25 (1.6)	6.25(1.5)	6.3 (1.7)	6.19 (1.6)	0.878
Follow up	6.6 (1.6)	6.5 (1.5)	6.7 (1.6)	6.6 (1.7)	0.731
P-value/within group	0.000	0.157	0.018	0.005	
	t = 3.876	t = 1.428	t = 2.412	t = 2.896	
F. Support					
Baseline	7.84 (2.1)	7.7 (2.1)	8.25 (2.0)	7.5 (2.1)	0.104
Follow up	7.98 (2.0)	7.8 (2.1)	8.04 (2.1)	8.09 (1.9)	0.622
P-value/within group	0.254	0.867	0.411	0.001	
	t = 1.143	t = 0.168	t = −0.827	t = 3.412	
Single Item Assessments					
Distress					
Baseline	5.59 (3.3)	5.22 (3.6)	5.76 (3.1)	5.75 (3.24)	0.500
Follow up	5.00 (3.4)	5.10 (3.5)	4.56 (3.2)	5.29 (3.5)	0.363
P-value/within group	0.005	0.777	0.000	0.137	
	t = −2.86	t = −0.284	t = −3.654	t = −1.499	
Peace					
Baseline	2.35 (1.2)	2.44 (1.1)	2.46 (1.29)	2.19 (1.1)	0.248
Follow up	2.69 (1.2)	2.78 (1.2)	2.79 (1.29)	2.53 (1.2)	0.275
P-value/within group	0.000	0.008	0.052	0.009	
	t = 4.194	t = 2.710	t = 1.970	t = 2.681	

Notes: McGill scale indicated the overall Cronbach alpha 0.83 for both baseline and postintervention measures.

Model II: 7-Timeponit by 2-Arms. Fig. 4 graphicly depicts the repeated measures results for distress, peace, and pain across seven time points for the two dosing strategies (10- and 20-minutes) delivered over three consecutive days: pre- and post-treatments 1, 2, and 3, and follow-up. Time but not study Arm predicted decrease in distress ($\beta = -0.04$, $P < 0.001$ and $\beta = 0.06$, $P = 0.224$, respectively) and decrease in pain scores ($\beta = -0.03$, $P = 0.01$ and $\beta = 0.06$, $P = 0.17$, respectively). Neither Time nor Arm predicted changes in peace. In addition, the group × time interaction was found to be significant for each variable: distress (F [13, 1182] = 5.66, $P < 0.001$), peace (F [13, 1009] = 5.14, $P < 0.001$), pain (F [13, 1195] = 3.71, $P < 0.001$). Interaction probing revealed unique patterns for each of the secondary outcomes. Specifically, distress decreased in Arm I across all seven time points ($P < 0.05$) while Arm II demonstrated decreased distress at Times 2 ($\beta = -0.59$, $P < 0.001$), 4 ($\beta = -0.50$, $P < 0.001$), 6 ($\beta = -0.42$, $P = 0.002$), and 7 ($\beta = -0.32$, $P = 0.016$). Peace increased for both Arms at Times 2, 4, and 6 ($P < 0.05$); but only for Arm I at Time 7 ($\beta = 0.36$,

Table 3
Symptom Mean Scores for Patients Edmonton Symptom Assessment Scale (ESAS)

	All $n = 250$	Arm I $n = 78$	Arm II $n = 77$	Arm III $n = 95$	*P*-Value Between Group (ANOVA)
Global ESAS mean (SD)					
Baseline	47.42 (19.09)	45.67 (18.8)	45.1 (19.9)	50.67 (18.3)	0.107
Follow up	43.1 (19.34)	45.15 (20.3)	39.01 (18.3)	44.89 (18.9)	0.076
P-value/within group	0.000	0.775	0.003	0.001	
Paired t-test	t = −4.043	t = −0.286	t = −3.111	t = −3.463	
Pain					
Baseline	5.12 (3.5)	4.83(3.4)	4.74 (3.7)	5.67 (3.3)	0.150
Follow up	4.08 (3.4)	4.07 (3.6)	3.83 (3.3)	4.28 (3.3)	0.682
P-value/within group	0.000	0.070	0.016	0.000	
	t = −5.145	t = −1.838	t = −2.47	t = −4.879	
Tiredness					
Baseline	5.90 (3.1)	5.86 (3.2)	5.16 (3.2)	6.54 (2.7)	0.014[a]
Follow up	5.50 (3.1)	5.85 (3.2)	4.69 (3.3)	5.88 (2.9)	0.143[b]
P-value/within group	0.078	0.990	0.286	0.051	
	t = −1.769	t = −0.013	t = −1.075	t = −1.975	
Nausea					
Baseline	1.93 (3.0)	1.77 (2.9)	1.86 (3.0)	2.13 (3.2)	0.724
Follow up	1.52 (2.7)	1.87 (3.1)	1.10 (2.3)	1.59 (2.7)	0.212
P-value/within group	0.023	0.748	0.039	0.046	
	t = −2.289	t = 0.322	t = −2.103	t = −2.019	
Depression					
Baseline	3.10 (3.4)	2.73 (3.3)	2.66 (3.2)	3.77 (3.5)	0.051
Follow up	2.44 (3.1)	2.62 (3.3)	1.81 (2.7)	2.80 (3.2)	0.099
P-value/within group	0.000	0.754	0.011	0.000	
	t = −3.744	t = −0.314	t = −2.615	t = −3.854	
Anxious					
Baseline	3.60 (3.4)	3.55 (3.5)	3.27 (3.3)	3.89 (3.4)	0.495
Follow up	2.95 (3.19)	3.25 (3.3)	2.57 (3.0)	3.03 (3.1)	0.402
P-value/within group	0.002	0.444	0.059	0.005	
	t = −3.172	t = −0.769	t = −1.917	t = −2.893	
Drowsy					
Baseline	4.12 (3.3)	4.12 (3.2)	3.25 (3.3)	4.82 (3.2)	0.009[a]
Follow up	4.23 (3.4)	4.47 (3.5)	3.69 (3.4)	4.47 (3.3)	0.251[b]
P-value/within group	0.583	0.347	0.264	0.274	
	t = 0.550	t = 0.947	t = 1.126	t = −1.101	
Appetite					
Baseline	4.34 (3.4)	4.26 (3.4)	4.05 (3.2)	4.6 (3.4)	0.498
Follow up	4.02 (3.3)	4.23 (3.2)	3.64 (3.0)	4.16 (3.6)	0.485
P-value/within group	0.147	0.951	0.262	0.176	
	t = −1.453	t = −.062	t = −1.131	t = −1.362	
Wellbeing					
Baseline	4.39 (3.0)	4.08 (2.9)	4.47 (3.1)	4.58 (3.1)	0.541
Follow up	3.57 (2.9)	3.59 (2.9)	3.15 (2.7)	3.90 (3.0)	0.244
P-value/within group	0.000	0.189	0.001	0.034	
	t = −4.010	t = −1.325	t = −3.461	t = −2.156	
Short of breath					
Baseline	6.69 (3.0)	6.82 (3.0)	7.15 (2.9)	6.68 (3.1)	0.179
Follow up	7.15 (3.25)	7.32 (3.3)	7.20 (3.1)	6.96 (3.3)	0.758
P-value/within group	.511	.280	0.481	0.490	
	t = 0.658	t = 1.088	t = −0.708	t = 0.693	

Notes: Overall Cronbach alpha for ESAS scale was 0.77 and 0.80 at baseline and postintervention, respectively.
[a]Arm II vs. Arm III.
[b]The baseline tiredness & drowsiness were controlled for comparing follow up tiredness score.

$P = 0.02$). Decreases in pain occurred for both Arms at Times 2, 4, and 6 ($P < 0.05$); however, only Arm I showed a decrease in pain at Time 7, ($\beta = -0.34$, $P = 0.03$).

Discussion

This is the first study to prospectively examine the impact of massage therapy "dosing" strategies on hospitalized patients receiving palliative care for any indication; it is also the largest massage dosing study for any patient population.[40–43] Results indicate that massage had an acute positive impact on selfreported QoL in addition to physical symptoms, physical wellbeing, and psychological wellbeing. Positive benefits were found across all three study arms demonstrating benefit independent of massage dosage differences. Repeated measure analysis for patient feelings of 'distress' indicated that frequency—specifically, one massage daily for three days vs. a one-time massage,

Table 4
Minimal Clinically Important Differences (MCID) for Each of the 10 ESAS Symptoms

	All *n* (%)	Arm I *n* = 78	Arm II *n* = 77	Arm III *n* = 95	*P*-Value
Pain					
Improvement	118 (47.2)	35 (44.9)	34 (44.2)	49 (51.6)	0.310
About the same	74 (29.6)	22 (28.2)	21 (27.3)	31 (32.6)	$\chi^2 = 4.786$
Deterioration	58 (23.2)	21 (26.9)	22 (28.6)	15 (15.8)	
Tiredness					
Improvement	105 (42.0)	29 (37.2)	31 (40.3)	45 (47.7)	0.693
About the same	65 (26.0)	21 (26.9)	22 (28.6)	22 (23.2)	$\chi^2 = 2.232$
Deterioration	80 (32.0)	28 (35.9)	24 (31.2)	28 (29.5)	
Nausea					
Improvement	65 (26.0)	18 (23.1)	19 (24.7)	28 (29.5)	0.751
About the same	138 (54.4)	42 (53.8)	45 (58.4)	49 (51.6)	$\chi^2 = 1.915$
Deterioration	49 (19.6)	18 (23.1)	13 (16.9)	18 (18.9)	
Depression					
Improvement	85 (34.0)	22 (28.2)	25 (32.5)	38 (40.0)	0.222
About the same	111 (44.4)	33 (42.3)	38 (49.4)	40 (42.1)	χ^2 =5.711
Deterioration	54 (21.6)	23 (29.5)	14 (18.2)	17 (17.9)	
Anxious					
Improvement	93 (37.2)	25 (32.1)	29 (37.7)	39 (41.1)	0.476
About the same	92 (36.8)	27 (34.6)	30 (39.0)	35 (36.8)	$\chi^2 = 3.510$
Deterioration	65 (26.0)	26 (33.3)	18 (23.4)	21 (22.1)	
Drowsy					
Improvement	84 (33.6)	21 (26.9)	24 (31.2)	39 (41.1)	0.203
About the same	66 (26.4)	19 (24.4)	24 (31.2)	23 (24.2)	$\chi^2 = 5.945$
Deterioration	100 (40.0)	38 (48.7)	29 (37.7)	33 (34.7)	
Appetite					
Improvement	102 (40.8)	29 (37.2)	31 (40.3)	42 (44.2)	0.889
About the same	72 (28.8)	23 (29.5)	22 (28.6)	27 (28.4)	$\chi^2 = 1.069$
Deterioration	76 (30.4)	26 (33.3)	24 (31.2)	26 (27.4)	
Wellbeing					
Improvement	115 (46.0)	35 (44.9)	37 (48.1)	43 (45.3)	0.348
About the same	53 (21.2)	12 (15.4)	20 (26.0)	21 (22.1)	$\chi^2 = 4.453$
Deterioration	82 (32.8)	31 (39.7)	20 (26.0)	31 (32.6)	
Short of breath					
Improvement	72 (28.8)	24 (30.8)	22 (28.6)	26 (27.4)	0.777
About the same	88 (35.2)	25 (32.1)	31 (40.3)	32 (33.7)	$\chi^2 = 1.774$
Deterioration	90 (36.0)	29 (37.2)	24 (31.2)	37 (38.9)	
Distress					
Improvement	101 (40.4)	29 (37.2)	37 (48.1)	35 (36.8)	0.505
About the same	70 (28.0)	22 (28.2)	21 (27.3)	27 (28.4)	$\chi^2 = 3.324$
Deterioration	79 (31.6)	27 (34.6)	19 (24.7)	33 (34.7)	

Note: MCID cutoff for improvement/ deterioration was ≥1 point. If the sign was negative, it indicated a decrease in ESAS score and was interpreted as improvement in the symptom. If the sign was positive, it indicated an increase in the symptom interpreting as deterioration. When the result of subtraction was 0, it was coded as "about the same." This approach was adopted from Hui and colleagues (Hui D, et al. Minimal clinically important differences in the Edmonton Symptom Assessment Scale in cancer patients: A prospective, multicenter study. Cancer. 2015 Sep 1;121(17):3027-35. doi: 10.1002/cncr.29437. Epub 2015 Jun 8).

regardless of session length—mattered more than the massage session duration. This interpretation derived from the interaction effect analysis where the decrease in distress lasted up to Time 3 (follow-up) in a significant level only for Arms 1 and 2 (multiple massage sessions) but diminished for Arm 3 (one massage session). Pain findings were consistent across all study arms, where only short-term improvements were found regardless of frequency and massage duration. No consistent patterns emerged regarding patient feelings of "peace" suggesting that more research is required to understand massage impact on this variable. Comparisons of the 10- and 20-minute massage durations when controlling for the same frequency (three sessions) determined that 20-minute sessions were not more effective than 10-minute sessions for distress, peace, and pain. To summarize: although between-group analysis demonstrated all dosages were beneficial for outcome measures, the within-group analysis revealed more consistent (or long-lasting) benefits for more sessions of massage and that 10 minutes of massage is sufficient for patients to benefit.

Several points deserve further discussion. First, the choice to focus on overall QoL as a primary outcome closely aligns with a participant population receiving palliative care with any underlying diagnosis and for any indication. Other massage therapy studies in the palliative care and advanced illness populations to date have focused either on specific diagnostic conditions (e.g., cancer) or the intervention impact on pain and other specific symptoms.[44–46] While a symptom-driven focus strengthens specific generalizability, the

Table 5
Pearson Correlation Coefficient for the Association between ESAS and McGill Score

ESAS Scale	McGill Scale						
Variables	McGill Total	Quality of Life	Physical Symptom	Psychological Wellbeing	Physical Wellbeing	Support	Existential
Distress[a]	−0.61[b]	−0.29[b]	−0.43[b]	−0.61[b]	−0.40[b]	−0.36[b]	−0.39[b]
Peace[a]	0.55[b]	0.33[b]	0.26[b]	0.52[b]	0.36[b]	0.49[b]	0.44[b]
Pain	−0.51[b]	−0.18[b]	−0.49[b]	−0.42[b]	−0.28[b]	−0.32[b]	−0.29[b]
Tiredness	−0.47[b]	−0.16[a]	−0.49[b]	−0.40[b]	−0.22[b]	−0.25[b]	−0.26[b]
Nausea	−0.50[b]	−0.22[b]	−0.32[b]	−0.50[b]	−0.26[b]	−0.40[b]	−0.31[b]
Depression	−0.70[b]	−0.32[b]	−0.41[b]	−0.81[b]	−0.39[b]	−0.50[b]	−0.43[b]
Anxiety	−0.67[b]	−0.34[b]	−0.39[b]	−0.72[b]	−0.40[b]	−0.47[b]	−0.46[b]
Drowsy	−0.42[b]	−0.22[b]	−0.41[b]	−0.32[b]	−0.27[b]	−0.24[b]	−0.28[b]
Appetite	−0.37[b]	−0.19[b]	−0.29[b]	−0.31[b]	−0.22[b]	−0.26[b]	−0.24[b]
Wellbeing	−0.64[b]	−0.36[b]	−0.45[b]	−0.57[b]	−0.43[b]	−0.45[b]	−0.47[b]
Short of breath	0.11	0.09	0.05	0.08	0.13	0.08	0.09
ESAS total	−0.75[b]	−0.34[b]	−0.59[b]	−0.72[b]	−0.43[b]	−0.49[b]	−0.47[b]

[a]Denoted for new items added for the purpose of this study.
[b]Correlation is significant at the 0.01 level (2-tailed).

broadened approach used in this study better reflects massage delivered in real-world settings. This real-world approach broadened study eligibility considerably, particularly given that clinical palliative care at the study institution is expressly delivered based on overall clinical need rather than specific underlying disease, physical symptom burden, or prognosis. Findings from this study may therefore be applicable to many more patients living with advanced illness.

This study's use of highly trained massage therapists with considerable experience treating extremely ill patients in hospital settings distinguishes it from others that used nonmassage specialized clinicians or lay people to provide the massage intervention.[47] Emphasizing therapist skill sets and professional experiences likely improved treatment adherence through a complex study in a large and busy inpatient setting. For example, therapists were able to easily adjust work with participants around hospital bed/chair positioning or medical equipment present (e.g., oxygen supplementation, intravenous lines or gastrostomy tubing, prosthetics, wound dressings, etc.). Study therapists were also skilled at collaborating with medical and nursing teams to assure intervention delivery did not interfere with concomitant hospital care, likely contributing to a high study completion rate. In addition, treatment interventions were specifically designed to focus on individual participant preferences and situations, free of the confines of a specific manual protocol or verbal script.[48] This decision was notably different from most massage therapy studies that focus more on mechanistic aspects of step-by-step contact, designed to remove the human variables inherent in an intervention of this type.[40,42,49,50] The patient centered approach not only reflects clinical care best-practices, it likely contributes to the results having more real-world applicability.

Finally, the busyness of contemporary hospital care does not typically lend itself to a traditional 45 or 60-minute massage session. For example, one study found a median of 3.5 health care provider visits per hour to patient rooms.[21] By demonstrating that consecutive daily massage sessions improve QoL more than a single massage, and that 10-minute sessions are just as effective as 20-minute sessions, our study's findings signal pragmatic strategies to better integrate massage into hospital settings and their busy, complex workflow. Future studies may explore these implications further: perhaps shorter intervention times facilitate broader

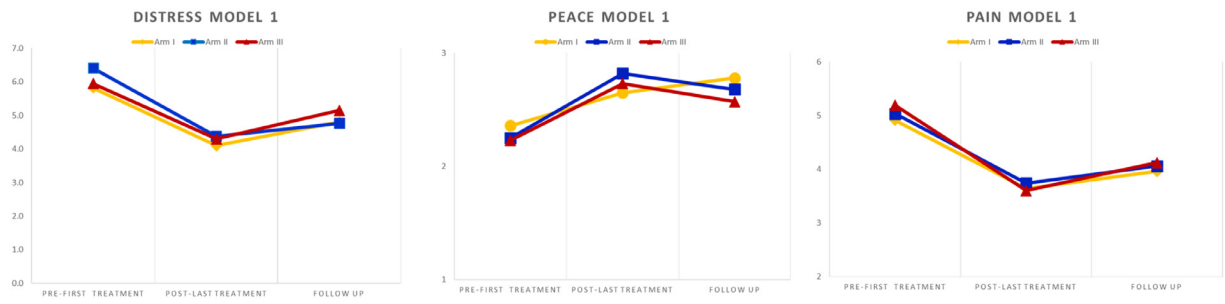

Fig. 3. Group means for distress, peace and pain across time.

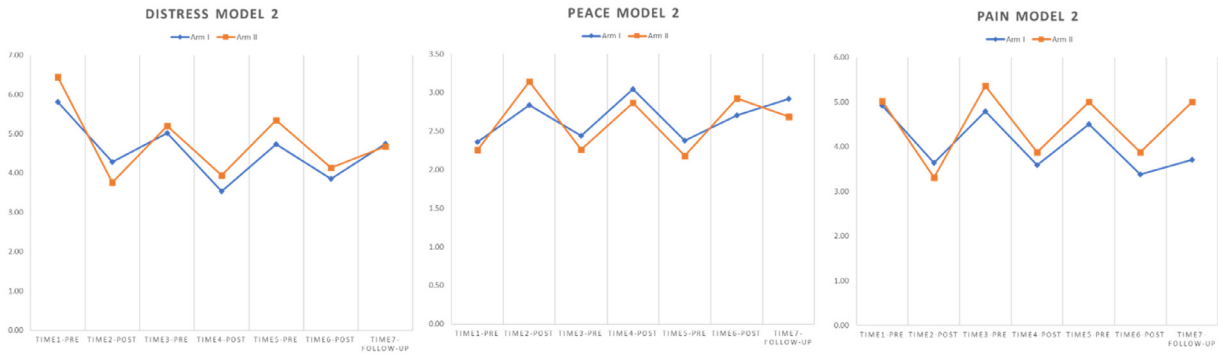

Fig. 4. Group means for distress, peace and pain across time.

access to hospital-based massage for the same cost; perhaps patients with advanced illness prefer shorter massage times given competing demands of hospital care.

Limitations

Several limitations to this study deserve attention. The study did not include a "no massage" control arm. This approach was chosen because massage has already been shown to improve pain and other disease related symptoms.[13,14] Still, the lack of a notreatment comparator limits interpretation of findings. As a massage intervention study, selection bias plays a role; some eligible patients approached to participate simply were either not interested to participate (perhaps due to unfamiliarity with massage, or prior massage experiences outside of this setting) or unable to participate (perhaps due to concomitant medical therapies). In addition, the employed survey measures likely generated survey fatigue in some participants, raising the possibility that some responses were given quickly before much reflection. Finally, while the study coordinator obtained baseline and postintervention survey data from participants, therapist engagement in survey collection immediately prior and post massage may have introduced respondent bias. Future research should use data collection strategies more separated from intervention delivery processes.

Conclusion

This study supports the benefits of massage beyond dosage in palliative care, providing a groundwork for trained massage therapists to deliver appropriate massage treatments as a part of in-patient care for complex palliative patients. Our results reveal that more sessions of massage might be beneficial with a duration of 10 minutes sufficient to benefit patients when performed by a trained massage therapist. Additionally, our results indicate the high rate of willingness to receive massage by patients across all three study arms, providing insight into patient-centered care and respecting patients' preferences in choosing modalities in palliative care. The demonstrated impact of relatively small doses of time with a massage therapist suggests that further study is warranted to evaluate the impact of multiple short interventions each day to increase cumulative pain and symptom improvement on par with accepted pharmacologic interventions.

Disclosures and Acknowledgments

Conflict of Interest

The authors have no other conflicts to report.

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Appendix A

This supplementary table provides representative descriptions of individualized treatment applications and therapist observations from the massage therapy in palliative care dosing study. The massage therapy treatment approach used in the study is reflective of real-world massage and clinical reasoning responsive to patient and environmental needs. All applied interventions reflected real-world and patient/situation appropriate therapeutic massage care delivered by massage therapist employees of Healwell. Healwell therapists are licensed massage therapists, specially trained to work with fragile and medically complex hospitalized individuals and deliver massage to patients with serious progressive illnesses such as

Pt Details Session Duration	Areas of Focus	Pt Response	Techniques	Other
Male; 52; necrosis and infection in lower leg 10-Minutes	Hands, face and neck	Pain remained steady, but peacefulness increased and distress decreased	Gentle compressions, thumb glides on forehead and across chin; kneading of pt hands; small, circular strokes to posterior neck All strokes were delivered using WPS 1−2 (Walton Pressure Scale 1−5)	Pt stated that pain has been his primary experience in recent memory, but the massage changed that
Female; 64; pain in lower back and ribs secondary to metastatic cancer 20-Minutes	Feet, neck, hands, upper chest	Pt fell asleep during session; before falling asleep, remarked that the light, but connected touch was soothing	Gentle compressions, thumb glides on forehead, cheeks and lateral neck; kneading of hands; slow, connected glides across sternum to shoulders (adjusting for medport); compressions and unidirectional glides to feet All strokes were delivered using WPS 1 (Walton Pressure Scale 1−5)	Pt was only comfortable lying on L side, so supported pt in moving to that position and placed appropriate bolters (created from pillows and sheets) to maximize rest
Female; 27; global pain secondary to sickle cell pain crisis 10-Minutes	Hips, feet, head	Pt was afraid to receive massage because "everything hurts"; therapist assured her that she could stop the session at any time and described some simple, gentle techniques with which she would begin; pt agreed to receive massage, but remained wary	Adjusted strokes/contact to pt respiratory patterns (sinking when pt exhaled; lightening when pt inhaled) and began with gentle, full-handed compressions at pt hips and upper legs; therapist checked in with pt verbally and by facial expressions throughout session, progressing only with positive feedback All strokes were delivered using WPS 0.5−1 (Walton Pressure Scale 1−5)	Pt dozed throughout session; quietly thanked the therapist and asked when she could come back
Male; 73; ACKD 20-Minutes	Chest, neck, head, hands, feet	Pt reported pain and itching from swelling in lower extremities; mild nausea and pt was generally slow to respond to questions and therapist introduction; therapist slowed the pace and limited the complexity of her questions in order to gain consent from pt; pt was quietly moaning on each exhalation	Therapist worked slowly, beginning with pt head, neck and chest using gentle, full-handed strokes that matched pt breathing, while slowly modulating to suggest a slower breathing pattern; therapist quietly narrated her work to assure pt of the session plan and to continue to remind pt that he could ask her to stop what she was doing at any time; about halfway through the session, pt breathing had begun to slow and self-soothing moans had ceased All strokes were delivered using WPS 1−2 (Walton Pressure Scale 1−5)	Pt grasped therapist hand at the end of session and said, "You are a blessing. Thank you."

cancer or heart failure. Each study therapist possessed a minimum of 40 hours of oncology massage training and a minimum of 60 hours of hospital-based massage therapy education, in addition to a baseline of 500 or more hours of standard massage therapy education. All therapists were considered research personnel for the study, credentialed through Medstar Health Research Institute, trained in study protocol and

procedures, and facilitated point-of-care data collection via electronic tablet.

Appendix B

Missing analysis found that 81.96% of the data to be complete. Further investigation using little's MCAR test revealed that the data was missing completely at random ($\chi 2 = 8159.52$, DF = 8511, $P = 0.997$); hence, it was appropriate to proceed with multiple imputations to estimate missing data (Catellier et al., 2005; Rubin, 1996; Schafer & Graham, 2002). Multiple imputation is a procedure that replaces missing values by estimating regression equations while accounting for correlations in the dataset. Based on these patterns, replacement values are generated for the missing values.

- Catellier, D. J., Hannan, P. J., Murray, D. M., et al. (2005). Imputation of missing data when measuring physical activity by accelerometry. Med Sci Sports Exerc, 37(11 Suppl), S555−S562. doi:10.1249/01.mss.0000185651.59486.4e
- Rubin, D. B. (1996). Multiple Imputation after 18+ Years. Journal of the American Statistical Association, 91(434), 473−489. Available at: http://www.scopus.com/inward/record.url?eid=2-s2.0-0030539070&partnerID=40&md5=d8e8262cd3fbc93a91c1b64a978ecd01
- Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. Psychol Methods, 7(2), 147-177. doi:10.1037//1082-989X.7.2.147

References

1. Thomas DA, Maslin B, Legler A, et al. Role of alternative therapies for chronic pain syndromes. Curr Pain Headache Rep 2016;20:29.

2. Johnson JR, Crespin DJ, Griffin KH, et al. Effects of integrative medicine on pain and anxiety among oncology inpatients. J Natl Cancer Inst Monogr 2014;2014:330–337.

3. Griffin KH, Nate KC, Rivard RL, et al. Referrals to integrative medicine in a tertiary hospital: findings from electronic health record data and qualitative interviews. BMJ Open 2016;6:e012006.

4. O'Gara T, Kemper KJ, Birkedal J, et al. Survey of conventional and complementary and alternative therapy in patients with low back pain. J Surg Orthop Adv 2016;25:27–33.

5. Goel AR, Henderson CR, Reid MC. Do palliative care providers use complementary and integrative medicine? a nationwide survey. J Pain Symptom Manage 2022;63:599–609.

6. Jones D, Cohen L, Rieber AG, et al. Complementary and alternative medicine use in minority and medically underserved oncology patients: assessment and implications. Integr Cancer Ther 2018;17:371–379.

7. Dyer NL, Surdam J, Srinivasan R, et al. The impact of individualized complementary and integrative health interventions provided in clinical settings on quality of life: a systematic review of practice-based research. J Integr Complement Med 2022;28:618–640.

8. Zeng YS, Wang C, Ward KE, et al. Complementary and alternative medicine in hospice and palliative care: a systematic review. J Pain Symptom Manage 2018;56. 781-94.e4.

9. Mao JJ, Ismaila N, Bao T, et al. Integrative medicine for pain management in oncology: society for integrative oncology-ASCO guideline. J Clin Oncol 2022: 3998–4024.

10. Gilmour J, Harrison C, Asadi L, et al. Hospitals and complementary and alternative medicine: managing responsibilities, risk, and potential liability. Pediatrics 2011;128 (Supplement_4):S193–S1S9.

11. More hospitals offering complementary and alternative medicine services [press release]. 2011 American Hospital Association Press Release. Available at: https://www.aha.org/press-releases/2011-09-07-more-hospitals-offering-complementary-and-alternative-medicine-services. Accessed February 16, 2023.

12. Phutrakool P, Pongpirul K. Acceptance and use of complementary and alternative medicine among medical specialists: a 15-year systematic review and data synthesis. Syst Rev 2022;11:10.

13. Gulbahar Eren M, Gok Metin Z. Classical massage and relaxation exercise on symptom status and quality of life in advanced stage patients with heart failure: a randomized controlled trial. Holist Nurs Pract 2022;36:E1–E11.

14. Wang T, Zhai J, Liu XL, et al. Massage therapy for fatigue management in breast cancer survivors: a systematic review and descriptive analysis of randomized controlled trials. Evid Based Complement Alternat Med 2021;2021:9967574.

15. Boyd C, Crawford C, Paat CF, et al. The impact of massage therapy on function in pain populations-a systematic review and meta-analysis of randomized controlled trials: part III, surgical pain populations. Pain Med 2016;17:1757–1772.

16. Crawford C, Boyd C, Paat CF, et al. The impact of massage therapy on function in pain populations-a systematic review and meta-analysis of randomized controlled trials: part I, patients experiencing pain in the general population. Pain Med 2016;17:1353–1375.

17. Boyd C, Crawford C, Paat CF, et al. The impact of massage therapy on function in pain populations-a systematic review and meta-analysis of randomized controlled trials: part II. Pain Med. 2016;17:1553–1568.

18. Berger L, Tavares M, Berger B. A Canadian experience of integrating complementary therapy in a hospital palliative care unit. J Palliat Med 2013;16:1294–1298.

19. Schütze T, Längler A, Zuzak TJ, et al. Use of complementary and alternative medicine by pediatric oncology patients during palliative care. Support Care Cancer 2016;24:2869–2875.

20. Van Hyfte GJ, Kozak LE, Lepore M. A survey of the use of complementary and alternative medicine in Illinois hospice and palliative care organizations. Am J Hosp Palliat Care 2014;31:553–561.

21. Cohen B, Hyman S, Rosenberg L, et al. Frequency of patient contact with health care personnel and visitors: implications for infection prevention. Jt Comm J Qual Patient Saf 2012;38:560–565.

22. Kellogg KM, Puthumana JS, Fong A, et al. Understanding the types and effects of clinical interruptions and distractions

recorded in a multihospital patient safety reporting system. J Patient Saf 2021;17:e1394–e1400.

23. Kim SK, Min A, Jeon C, et al. Clinical outcomes and cost-effectiveness of massage chair therapy versus basic physiotherapy in lower back pain patients: a randomized controlled trial. Medicine (Baltimore) 2020;99:e19514.

24. Hargett J, Criswell A, Palokas M. Nonpharmacological interventions for acute pain management in patients with opioid abuse or opioid tolerance: a scoping review. JBI Evid Synth 2022;20:2697–2720.

25. Miladinia M, Jahangiri M, Kennedy AB, et al. Determining massage dose-response to improve cancer-related symptom cluster of pain, fatigue, and sleep disturbance: a 7-arm randomized trial in palliative cancer care. Palliat Med 2022;37:108–119.

26. Vitek SM, Bhagra A, Erickson EE, et al. Optimizing delivery to meet demand for integrative medicine services in an academic hospital setting: a pilot study. Explore (NY) 2021;17:340–343.

27. Johnson JR, Crespin DJ, Griffin KH, et al. The effectiveness of integrative medicine interventions on pain and anxiety in cardiovascular inpatients: a practice-based research evaluation. BMC Complement Altern Med 2014;14:486.

28. Walton T. Medical conditions and massage therapy: A decision tree approach. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2011.

29. Cohen SR, Mount BM, Tomas JJ, et al. Existential well-being is an important determinant of quality of life. Evidence from the McGill quality of life questionnaire. Cancer 1996;77:576–586.

30. Cohen SR, Mount BM, Bruera E, et al. Validity of the McGill quality of life questionnaire in the palliative care setting: a multi-centre Canadian study demonstrating the importance of the existential domain. Palliat Med 1997;11:3–20.

31. Bruera E, Kuehn N, Miller MJ, et al. The Edmonton Symptom Assessment System (ESAS): a simple method for the assessment of palliative care patients. J Palliat Care 1991;7:6–9.

32. Cutillo A, O'Hea E, Person S, et al. The distress thermometer: cutoff points and clinical use. Oncol Nurs Forum 2017;44:329–336.

33. Steinhauser KE, Voils CI, Clipp EC, et al. "Are you at peace?": one item to probe spiritual concerns at the end of life. Arch Intern Med 2006;166:101–105.

34. Hui D, Shamieh O, Paiva CE, et al. Minimal clinically important differences in the Edmonton Symptom Assessment Scale in cancer patients: a prospective, multicenter study. Cancer 2015;121:3027–3035.

35. Vickers AJ. How to randomize. J Soc Integr Oncol 2006;4:194–198.

36. Dziura JD, Post LA, Zhao Q, et al. Strategies for dealing with missing data in clinical trials: from design to analysis. Yale J Biol Med 2013;86:343–358.

37. Blankers M, Koeter MW, Schippers GM. Missing data approaches in eHealth research: simulation study and a tutorial for nonmathematically inclined researchers. J Med Internet Res 2010;12:e54.

38. Cox BE, McIntosh K, Reason RD, et al. Working with missing data in higher education research: a primer and real-world example. Rev High Educat: J Associat Study High Educat 2014;37:377–402.

39. Treiman DJ. Quantitative data analysis: Doing social research to test ideas. 1st. ed San Francisco, CA: Jossey-Bass; 2009.

40. Rapaport MH, Schettler PJ, Larson ER, et al. Six versus twelve weeks of Swedish massage therapy for generalized anxiety disorder: preliminary findings. Complement Ther Med 2021;56:102593.

41. Perlman AI, Ali A, Njike VY, et al. Massage therapy for osteoarthritis of the knee: a randomized dose-finding trial. PLoS One 2012;7:e30248.

42. Sherman KJ, Cook AJ, Kahn JR, et al. Dosing study of massage for chronic neck pain: protocol for the dose response evaluation and analysis of massage [DREAM] trial. BMC Complement Altern Med 2012;12:158.

43. Cook AJ, Wellman RD, Cherkin DC, et al. Randomized clinical trial assessing whether additional massage treatments for chronic neck pain improve 12- and 26-week outcomes. Spine J 2015;15:2206–2215.

44. Havyer RD, Lapid MI, Dockter TJ, et al. Impact of massage therapy on the quality of life of hospice patients and their caregivers: a pilot study. J Palliat Care 2022;37:41–47.

45. Genik LM, McMurtry CM, Marshall S, et al. Massage therapy for symptom reduction and improved quality of life in children with cancer in palliative care: a pilot study. Complement Ther Med 2020;48:102263.

46. Kutner JS, Smith MC, Corbin L, et al. Massage therapy versus simple touch to improve pain and mood in patients with advanced cancer: a randomized trial. Ann Intern Med 2008;149:369–379.

47. Moosvi K, Schoppee TM, Xavier S, et al. Feasibility and burden of lay caregivers providing daily massages to patients with cancer receiving hospice and palliative care. Am J Hosp Palliat Care 2022;39:1475–1483.

48. Miladinia M, Baraz S, Zarea K, et al. Massage therapy in patients with cancer pain: a review on palliative care. 2017;6: e37356.

49. Kinkead B, Schettler PJ, Larson ER, et al. Massage therapy decreases cancer-related fatigue: results from a randomized early phase trial. Cancer 2018;124:546–554.

50. Larson ER, Kinkead B, Edwards SA, et al. Model structure for protocol adherence utilizing a manualized therapeutic massage intervention. J Complement Integr Med 2018;16. /j/jcim.2019.16.issue-2/jcim-2016-0118/jcim-2016-0118.xml.