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Effectiveness of the structured family meeting intervention for advanced cancer patients and caregivers based on dyadic illness management theory

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Abstract: To investigate the effect of the structured family meeting intervention based on the dyadic illness management theory on the quality of life and unmet needs of patients with advanced cancer and their family caregivers. A randomized controlled trial was conducted from July 2020 to July 2022 in a tertiary cancer hospital. Eighty advanced cancer patient-caregiver dyads were randomly assigned to the intervention group or the control group in a 1:1 ratio. The control group received routine palliative care, whereas the intervention group received routine palliative care plus a dyadic illness management theory-based structured family meeting intervention delivered three times during hospitalization. Outcomes were assessed at baseline (T0) and three days before discharge (T1). The primary outcome was patients' quality of life, measured using the McGill Quality of Life Questionnaire. Secondary outcomes included patients' unmet needs, caregivers' quality of life, and caregivers' unmet needs. Intervention effects were analyzed using repeated-measures ANOVA, with group, time, and the group $\times$ time interaction included in the model. Seventy-eight dyads completed the study and were included in the complete-case analysis. Repeated-measures ANOVA showed significant group $\times$ time interactions for patients' quality of life ($F(1,76) = 11.90, P < 0.001$, partial $\eta^2 = 0.135$), patients' unmet needs ($F(1,76) = 15.07, P < 0.001$, partial $\eta^2 = 0.165$), caregivers' quality of life ($F(1,76) = 20.68, P < 0.001$, partial $\eta^2 = 0.214$), and caregivers' unmet needs ($F(1,76) = 15.92, P < 0.001$, partial $\eta^2 = 0.173$). Compared with the control group, the intervention group showed greater short-term improvements in quality of life and greater reductions in unmet needs from T0 to T1. A brief two-week structured family meeting intervention, grounded in dyadic illness management theory, shows preliminary promise in improving short-term quality of life and reducing selected unmet needs for advanced cancer patients and their family caregivers. These early benefits appear to be associated with enhanced dyadic communication and more collaborative need management during the intervention period.

Keywords: advanced cancer; caregivers; structured family meeting; quality of life; unmet needs

1. Introduction

Global cancer statistics from the World Health Organization indicate approximately 20 million new cases in 2022, projected to reach 35 million by 2050, establishing cancer as a major public health concern [1]. Compared to patients in early or intermediate stages, those with advanced disease endure greater symptom burden and psychological distress, leading to significantly reduced quality of life [2]. Their primary family caregivers often experience anxiety, depression, and compromised physical and mental health during long-term caregiving, which can indirectly affect patient outcomes [3,4]. The 2018 U.S. National Consensus Project

for Quality Palliative Care guidelines emphasize that palliative care should aim to improve the quality of life for both patients and their families, addressing the physical, psychological, social, and spiritual needs of the patient and the primary caregiver [5].

The family meeting is a primary format for communication between the palliative care team, the patient, and family members. It facilitates information exchange, needs assessment, care planning discussion, and emotional support. It not only helps establish shared care goals and strategies but also addresses the multifaceted needs of both patients and caregivers, thereby enhancing overall quality of life [6–8]. To enhance intervention efficacy, Nelson first proposed the concept of the “structured family meeting” in 2007 [9], outlining three key phases: pre-meeting preparation, the meeting process, and documentation. Family meetings may be helpful in reducing family caregiver distress and enhancing their preparedness for the caregiving role. Structured family meetings emphasize personalized intervention based on the specific needs of patients and caregivers, enhancing standardization and effectiveness.

In 2018, based on the Interdependence Theory and related research on the Actor–Partner Interdependence Model (APIM), Lyons [10] proposed the Theory of Dyadic Illness Management. Its core aspect of this theory include: Dyadic appraisal (shared appraisal and the congruence between patient and care partner appraisals); Dyadic management behaviors (collaborative actions such as shared decision-making, general health behaviors of both members, and care planning); and Dyadic health (physical and mental health of the patient-caregiver dyad as an interdependent unit). This theory emphasizes that the patient and caregiver should be viewed as an interdependent dyad and that illness management is a dyadic phenomenon, rather than being limited to the individual level of either the patient or the caregiver [11].

Although family-based and caregiver-focused supportive care interventions have been examined in previous studies, evidence remains limited regarding structured family meeting interventions explicitly grounded in dyadic illness management theory and implemented for advanced cancer patient–caregiver dyads in the Chinese inpatient palliative care context. In this study, the term ‘dyads’ refers to the paired units consisting of a patient and his/her primary family caregiver (patient-caregiver dyads). Existing intervention protocols often lack a comprehensive pre-meeting assessment phase and may not sufficiently address the interaction and interdependence within the patient–caregiver dyad. Therefore, the present study evaluated a locally adapted structured family meeting intervention based on dyadic illness management theory as an incremental contribution to dyadic supportive care for advanced cancer patients and their caregivers.

2. Materials and methods

2.1. Study design

This prospective, randomized controlled superiority trial is conducted at the Department of Integrated Therapy, Fudan University Shanghai Cancer Center, Shanghai, China. The study protocol was approved by the Institutional Review Board of Fudan University Shanghai Cancer Center (approval No. 2011226-19). According to the inclusion and exclusion criteria, eligible advanced cancer patient–caregiver dyads were recruited after providing written informed consent. A total of 80 dyads were randomly assigned to the intervention group or the control group in a 1:1 ratio using a random number table. The control group received routine palliative care,

whereas the intervention group received routine palliative care plus the structured family meeting intervention. The intervention and outcome assessments were conducted during hospitalization. Baseline assessment was performed before the intervention, and follow-up assessment was conducted three days before discharge. The planned inpatient care period was approximately two weeks in both groups. After one dyad in each group was lost to follow-up, 78 dyads were included in the complete-case analysis. The flow chart is shown in **Figure 1**.

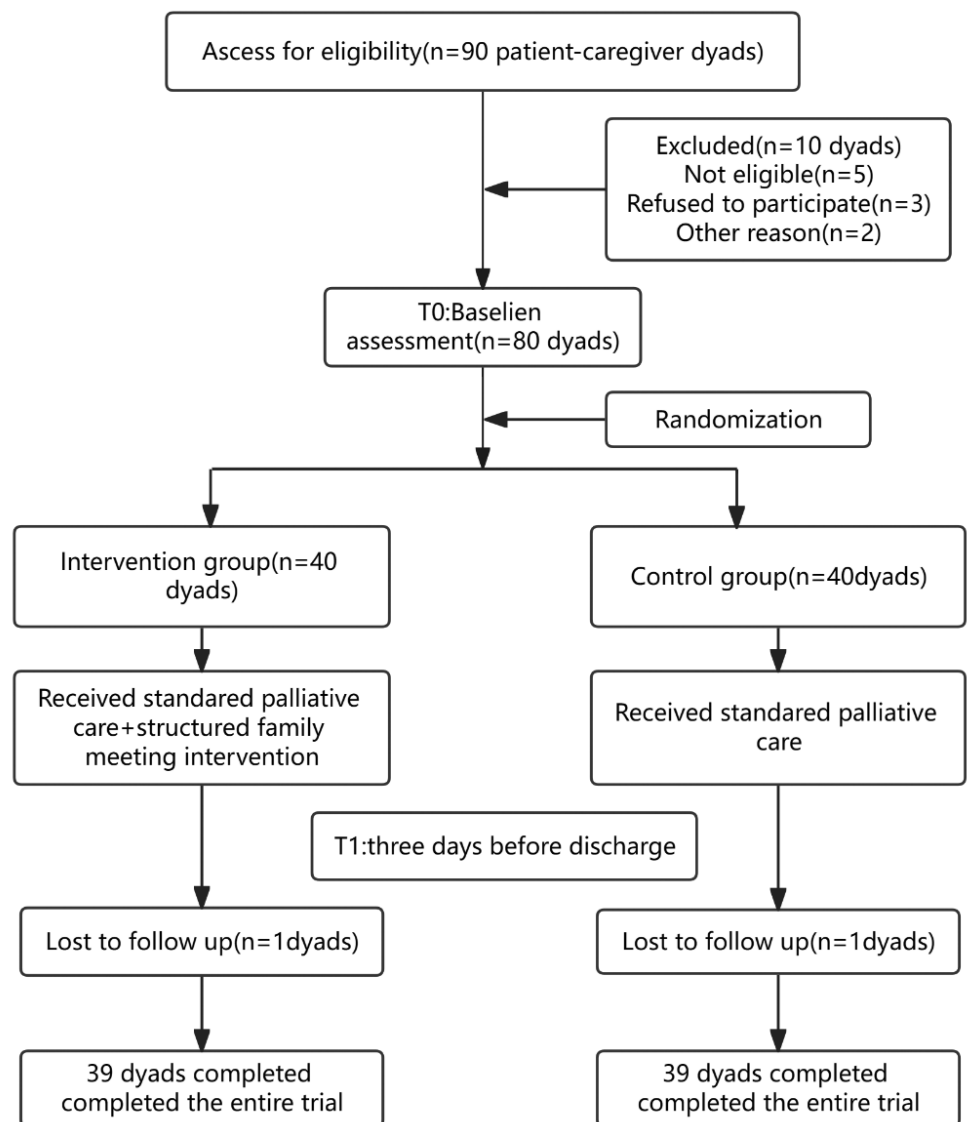


Figure 1. CONSORT flow diagram of the study.

2.2. Participants

The inclusion and exclusion criteria for subjects are shown in **Table 1**. This table summarizes the eligibility criteria for enrollment. Patients were required to have stage IV cancer, be aged ≥ 18 years, receive palliative care, have a designated primary caregiver, maintain clear consciousness, and have an estimated life expectancy of ≥ 2 weeks. Exclusion criteria for patients included severe cognitive impairment or inability to complete questionnaires. Caregivers were required to be the primary family member providing care for more than 4 hours per day, aged ≥ 18 years, and able to communicate clearly. Both patients and caregivers had to provide informed consent.

Table 1. Inclusion and exclusion criteria for subjects.

Subjects	Criteria for inclusion	Criteria for exclusion
Patients	1. Pathologically confirmed stage IV cancer, or recurrent/metastatic disease 2. Receiving palliative care 3. Age ≥ 18 years 4. Having a designated primary family caregiver 5. Clear consciousness and ability to communicate 6. Estimated life expectancy ≥ 2 weeks 7. Both patient and caregiver provided informed consent	Patients with severe cognitive impairment or who were unable to complete questionnaires
Caregivers	1. Primary family member providing care (> 4 hours/day) 2. Age ≥ 18 years 3. Clear consciousness and ability to communicate	

2.3. Randomization and allocation concealment

An independent statistician who was not involved in participant recruitment, intervention delivery, or outcome assessment generated the randomization sequence using a block randomization method. A fixed block size of 4 was used with a 1:1 allocation ratio to ensure balance between the intervention group and the usual care group. Within each block, the six possible permutations of two A (intervention) and two B (control) assignments were randomly ordered using a random number table. The allocation sequence was then printed on cards, sealed in sequentially numbered opaque envelopes, and stored in a locked cabinet.

After baseline data collection, a research assistant who had no role in participant enrollment or intervention delivery opened the next envelope in sequence and assigned each dyad (patient and their primary caregiver) to the intervention group or standard care group according to the allocation indicated.

2.4. Blinding

Due to the nature of the intervention, neither participants nor the medical staff involved in the intervention can be blinded to the allocation. However, data gatherers, outcome evaluators, and data analysts will be blinded until the statistical analysis has been completed. The results data are entered in separate sheets to enable for analysis without exposing the allocation status.

2.5. Sample size calculation

The sample size formula for comparing the means of two samples is adopted to calculate the sample size [12]: $n1 = n2 = 2 \times [(Z_{\alpha}/2 + Z_{\beta}) \times \sigma/\delta]^2$, $n1$ and $n2$ are the required contents of the two samples, respectively. Z_{α} and Z_{β} are the Z values corresponding to the probability of type I and type II errors, respectively. σ is the standard deviation of the study indicator and δ is the difference between the two overall means of the study indicator. In this study, the quality of life (QoL) of advanced cancer patients is the primary outcome indicator, and by reviewing similar literature, we learned that $\sigma = 22.60$, $\delta = 14.07$ [13]. Substitution into the formula indicated that approximately 41 patient-caregiver dyads were required per group. Considering the feasibility of recruitment, a total of 80 patient-caregiver dyads were enrolled and randomized, with 40 dyads assigned to each group. During follow-up,

one dyad in each group was lost to follow-up. Therefore, 78 dyads were included in the complete-case analysis.

2.6. Intervention

2.6.1. Control group

The control group received standard palliative care, including symptom management, medication guidance, dietary advice, psychological support, and health education. Healthcare professionals communicated about the patient's condition and provided care guidance during routine ward rounds and nursing procedures, offering explanations and support in response to questions from patients or caregivers. No structured family meetings were conducted.

2.6.2. Intervention group

The intervention group received the standard care plus the structured family meeting intervention. The protocol was developed by the research team based on the dyadic illness management theory, preliminary literature review, and finalized after expert consultation and revision. Participants included the attending physician, a palliative care-certified primary nurse, the patient, and the primary family caregiver. Other professionals (e.g., psychologist, nutritionist, social worker, volunteer) were invited as needed. Meetings were held in a quiet, private room or at the bedside, with written records kept. Three structured meetings were conducted: within 48 hours of admission (after baseline assessment), during hospitalization, and three days before discharge (prior to outcome assessment). Each meeting lasted 30-60 minutes. The first meeting focused on establishing communication, conducting needs assessment, and clarifying meeting goals. The second centered on information exchange, emotional support, and shared decision-making regarding primary concerns. The third meeting summarized previous discussions, confirmed care consensuses, and planned for subsequent steps.

2.6.3. Structured family meeting

Prior to each meeting, the primary nurse reviewed medical records, consulted the attending physician about the patient's condition, treatment, symptoms, and prognosis. Unmet needs were assessed using the Advanced Cancer Patients' Needs Questionnaire-29 (ACNQ-29 patients) and Questionnaire about the Needs of Dependents of Advanced Cancer Patients (CNQ-PAC caregivers). Communication patterns, interactions, and shared concerns within the dyad were evaluated via interviews and observation. Based on this, the healthcare team determined the meeting's focus, typically encompassing symptom management, illness understanding, caregiving roles, goal alignment, and psychological support. All three meetings followed a structured four-phase process: (1) opening, including introductions, clarification of purpose, agenda setting, and ground rules; (2) information exchange, including medical and nursing updates as well as patients' and caregivers' expressions of understanding, concerns, and needs; (3) discussion and shared decision-making, including question-and-answer interactions, development of tailored support plans, facilitation of dyadic communication, and consensus-building on goals and care plans, with communication aids (e.g., life education cards, which designed to help patients and family caregivers discuss topics related to death, dying, and end-of-life care. They typically contain questions, statements, or images that prompt reflection on life values, personal wishes, and medical decisions.) used when appropriate; and (4) summary, including a recap of key agreements,

clarification of next steps, and confirmation of understanding. Within 24-48 hours post-meeting, the primary nurse provided a summary and followed up on agreed plans during subsequent care. The detailed schedule and content of the three meetings are presented in **Supplementary 1** and **Supplementary 2**.

2.7. Measures

The primary outcome indicator of this study was the patients' McGill Quality of Life Questionnaire (MqoL). Secondary outcome measures included patients' unmet needs, caregivers's QoL and unmet needs.

2.7.1. Demographic questionnaire

Collected data on age, gender, education, etc., for patients and caregivers.

2.7.2. McGill quality of life questionnaire (MQOL)

The McGill Quality of Life Questionnaire (MQOL) scale is used to measure the quality of life of patients with life-threatening diseases from diagnosis to death [14]. After revision, this scale demonstrates superior psychometric properties compared to other quality of life assessment tools. MQOL comprises four dimensions (psychological, physiological, personal existence, and social support) with 16 items and one global score item. Each item evaluates patients' subjective experiences on a 10-point scale, serving as a reliable indicator of quality of life.

2.7.3. Advanced cancer patients' needs questionnaire-29 (ACNQ-29)

This scale was developed by Duan [15]. through item screening of the original ACNQ scale to form a new simplified version. The simplified version comprises four dimensions, namely physiological, psychological, mental, and social, with a total of 29 items. The Cronbach's α coefficient for ACNQ-29 is 0.923, and the cumulative contribution rate is 75.478%, indicating that the scale demonstrates good reliability and validity, making it suitable for use in this study.

2.7.4. Caregiver quality of life index-cancer (CQOL-C)

This scale, developed by the National Medical Center and Beckman Research Institute, is used to measure the quality of life of cancer patient caregivers [16]. It has a test-retest reliability of $r = 0.98$ and internal consistency of Cronbach's $\alpha = 0.69$, comprising 4 dimensions (physical health, mental health, social adaptation, and spiritual health) with a total of 37 items. The Chinese version retained 35 items. Liu [17] reported an internal consistency coefficient of 0.704 and a test-retest reliability of $r = 0.841$ for the Chinese version, which is at a good level and can be used in this study.

2.7.5. Needs of dependents of advanced cancer patients

This scale was developed by Song [18] to investigate the needs of family members of hospitalized patients with advanced cancer in China. The questionnaire comprises seven dimensions: family members' own health status, healthcare-related behaviors, disease knowledge, symptom control for patients, psychological support for patients, hospice care knowledge, and funeral support, totaling 36 demand items. Items are scored using a 5-point Likert scale. The overall Cronbach's α coefficient of the questionnaire is 0.93, with Cronbach's α coefficients for each dimension ranging from 0.785 to 0.93. Each item shows positive correlation with the total score, with correlation coefficients ranging from 0.442 to 0.667. The scale demonstrates good reliability and validity, making it suitable for use in this study.

2.8. Data collection

Baseline data (T0) were collected within 48 hours of admission for both groups.

Outcome data (T1) were collected three days before discharge, after the intervention for the intervention group and after a comparable period for the control group. Questionnaires were administered under researcher guidance.

2.9. Statistical analysis

Data were analyzed using SPSS version 26.0. Of the 80 randomized patient-caregiver dyads, two dyads, one from each group, had no T1 outcome data and were excluded. Therefore, the analysis was conducted as a complete-case analysis including 78 dyads, with 39 dyads in each group. This was not a full intention-to-treat analysis, and no imputation for missing data was performed because attrition was low and balanced between groups. Continuous variables are presented as mean $\pm$ standard deviation (SD), and categorical variables are presented as frequencies and percentages. Baseline characteristics were compared between groups using independent-samples t-tests, chi-square tests, or Fisher's exact tests, as appropriate.

For the primary and secondary outcomes, intervention effects were analyzed using repeated-measures ANOVA, with group as the between-subject factor and time as the within-subject factor. The model included group, time, and the group $\times$ time interaction. The group $\times$ time interaction was used to evaluate whether changes from T0 to T1 differed between groups. Effect sizes were reported using partial eta squared (partial η^2), and between-group differences in change scores were reported with 95% confidence intervals. Total scores were considered the main outcomes, whereas subdomain analyses were considered exploratory because of the increased risk of type I error due to multiple comparisons. A two-sided P value < 0.05 was considered statistically significant.

3. Results

3.1. Participant characteristics

Seventy-eight dyads completed the study. There were no significant differences in baseline characteristics between the two groups of patients regarding gender, age, religion, education level, marital status, monthly family income, or payment method for medical expenses ($P > 0.05$). Similarly, no significant differences were found between the two groups of caregivers regarding gender, age, religion, education level, marital status, or relationship to the patient ($P > 0.05$). Details are shown in **Table 2** and **Table 3**.

Table 2. Comparison of general characteristics of patients at baseline

Variable	Intervention Group ($n = 39$)	Control Group ($n = 39$)	χ^2	P
Gender			0.051	1.000
Male	19 (48.7)	20 (51.3)		
Female	20 (51.3)	19 (48.7)		
Age (years)			3.028	0.273 ^a
≤ 39	3 (7.7)	6 (15.4)		
40-60	18 (46.2)	11 (28.2)		
≥ 61	18 (46.2)	22 (56.4)		
Religion			0.394	0.755 ^a

Continuation Table:

Variable	Intervention Group (n = 39)	Control Group (n = 39)	χ^2	P
Buddhism	7 (17.9)	5 (12.8)		
None	32 (82.1)	34 (87.2)		
Education Level			5.694	0.123 ^a
Primary school or below	3 (7.7)	10 (25.6)		
Junior high school	16 (41.0)	11 (28.2)		
Senior high school or technical secondary school	9 (23.1)	11 (28.2)		
College or above (including junior college)	11 (28.2)	7 (17.9)		
Marital Status			-	1.000 ^a
Single	2 (5.1)	3 (7.7)		
Married	37 (94.9)	36 (92.3)		
Monthly Family Income (CNY)			3.384	0.340 ^a
< 3000	1 (2.6)	5 (12.8)		
3000~5000	9 (23.1)	10 (25.6)		
5001~10000	18 (46.2)	13 (33.3)		
> 10000	11 (28.2)	11 (28.2)		
Medical Payment			-	1.000 ^a
Medical insurance	39 (100)	38 (97.4)		
Out-of-pocket payment	0 (0)	1 (2.6)		

Note: a Fisher's exact test.

Table 3. Comparison of General Characteristics of Caregivers Between Groups

Item	Intervention Group (n = 39)	Control Group (n = 39)	χ^2	P
Gender			0.000	1.000
Male	16 (41.0)	16 (41.0)		
Female	23 (59.0)	23 (59.0)		
Age (years)			1.043	0.572
≤ 39	6 (15.4)	9 (23.1)		
40-60	22 (56.4)	18 (46.2)		
≥ 61	11 (28.2)	12 (30.8)		
Religion			-	0.675 ^a
Buddhism	2 (5.1)	4 (10.3)		
None	37 (94.9)	35 (89.7)		
Education Level			4.751	0.198

Continuation Table:

Item	Intervention Group (n = 39)	Control Group (n = 39)	χ^2	P
Primary school or below	2 (5.1)	8 (20.5)		
Junior high school	13 (33.3)	11 (28.2)		
Senior high school or technical secondary school	8 (20.5)	9 (23.1)		
College or above (including junior college)	16 (41.0)	11 (28.2)		
Marital Status			-	1.000 ^a
Single	1 (2.6)	2 (5.1)		
Married	38 (97.4)	37 (94.9)		
Relationship to Patient			1.082	0.850 ^a
Spouse	24 (61.5)	22 (56.4)		
Parent	2 (5.1)	4 (10.3)		
Child	10 (25.6)	11 (28.2)		
Sibling	3 (7.7)	2 (5.1)		

Note: a Fisher's exact test.

3.2. Patient Outcomes

3.2.1. Primary outcome- Quality of Life

Repeated-measures ANOVA showed a significant time $\times$ group interaction for MQOL total scores, $F = 11.90$, $P < 0.001$, partial $\eta^2 = 0.135$, indicating that changes in quality of life from T0 to T1 differed significantly between the intervention and control groups. See **Table 4**.

Table 4. Repeated-measures analysis of MQOL scores Between Groups Before and After Intervention

Group	T0	T1	Difference in change (95% CI)	F (Time X group)	P	partial η^2
Intervention Group (n = 39)	86.05 $\pm$ 10.64	103.23 $\pm$ 8.59	9.21(3.88, 14.53)	11.90	< 0.001	0.135
Control Group (n = 39)	88.00 $\pm$ 9.55	95.97 $\pm$ 8.37				

3.2.2. Unmet Needs

Repeated-measures ANOVA showed a significant group $\times$ time interaction for the ACNQ-29 total score, $F = 15.07$, $P < 0.001$, partial $\eta^2 = 0.165$. Exploratory dimension-level analyses showed significant group $\times$ time interactions for the psychological and social dimensions, but not for the physical or spiritual dimensions. See **Table 5**.

Table 5. Repeated-measures analysis of ACNQ-29 scores Between Groups Before and After Intervention

Variable	time	Intervention Group (n = 39)	Control Group (n = 39)	Difference in change (95% CI)	F (Time X group)	P	partial η^2
Physical Dimension	T0	14.56 $\pm$ 2.49	15.54 $\pm$ 2.53	-0.56(-1.60, 0.48)	1.16	0.284	0.015

Continuation Table:

Variable	time	Intervention Group (<i>n</i> = 39)	Control Group (<i>n</i> = 39)	Difference in change (95% CI)	F (Time X group)	<i>P</i>	partial η^2
Psychological Dimension	T1	13.46 ± 1.94	15.00 ± 2.25				
	T0	51.38 ± 8.24	53.56 ± 11.09	-5.54(-8.64, -2.43)	12.64	< 0.001	0.143
Spiritual Dimension	T1	45.97 ± 7.53	53.69 ± 9.98				
	T0	11.62 ± 5.43	12.28 ± 4.61	-1.51(-3.19, 0.17)	3.23	0.076	0.041
Social Dimension	T1	9.26 ± 4.46	11.44 ± 4.50				
	T0	5.08 ± 1.51	5.56 ± 1.70	-0.87(-1.52, -0.22)	7.19	0.009	0.086
Total Score	T1	4.10 ± 1.33	5.46 ± 1.71				
	T0	82.64 ± 13.88	86.95 ± 16.69	-8.49(-12.84, -4.13)	15.07	< 0.001	0.165
	T1	72.79 ± 10.88	85.59 ± 14.73				

3.3. Caregiver Outcomes

3.3.1. Quality of Life

Repeated-measures ANOVA showed a significant group × time interaction for CQOL-C scores, $F = 20.68$, $P < 0.001$, partial $\eta^2 = 0.214$, indicating that changes in caregivers' quality of life from T0 to T1 differed significantly between the intervention and control groups. See **Table 6**.

Table 6. Repeated-measures analysis of CQOL-C Scores Between Groups Before and After Intervention

Group	T0	T1	Difference in change (95% CI)	F (Time X group)	<i>P</i>	partial η^2
Intervention Group (<i>n</i> = 39)	198.23 ± 9.59	231.62 ± 13.14	17.08(9.60,24.56)	20.68	< 0.001	0.214
Control Group (<i>n</i> = 39)	200.54 ± 12.84	216.85 ± 15.80				

3.3.2. Unmet Needs

Repeated-measures ANOVA showed a significant group × time interaction for the CNQ-PAC total score, $F(1,76) = 15.92$, $p < 0.001$, partial $\eta^2 = 0.173$, indicating that changes in caregivers' unmet needs from T0 to T1 differed significantly between the intervention and control groups. Significant group × time interactions were also observed for healthcare professional-related behaviors, patient symptom control, and bereavement support, whereas the other dimensions showed no significant interactions. See **Table 7**.

Table 7. Repeated-measures analysis of CNQ-PAC Scores Between Groups Before and After Intervention

Variable	Time	Intervention Group (<i>n</i> = 39)	Control Group (<i>n</i> = 39)	Difference in change (95% CI)	F (Time X group)	<i>P</i>	partial η^2
Disease Knowledge	T0	22.44 ± 5.04	21.74 ± 4.39	-2.15(-5.30, 0.99)	1.86	0.177	0.024
	T1	17.77 ± 7.31	19.23 ± 4.78				

Continuation Table:

Variable	Time	Intervention Group (n = 39)	Control Group (n = 39)	Difference in change (95% CI)	F (Time X group)	P	partial η^2
Healthcare Professional-Related Behaviors	T0	30.56 ± 5.84	30.10 ± 6.48	-7.59(-11.37, -3.81)	16.01	< 0.001	0.174
	T1	22.18 ± 7.00	29.31 ± 5.52				
Patient Symptom Control	T0	13.33 ± 2.91	13.49 ± 3.19	-2.08 (-3.98, -0.17)	4.72	0.033	0.058
	T1	10.92 ± 4.11	13.15 ± 3.96				
Hospice Care Knowledge	T0	15.00 ± 3.76	14.59 ± 3.96	-1.41 (-3.25, 0.43)	2.34	0.131	0.030
	T1	13.13 ± 3.74	14.13 ± 3.89				
Patient Psychological Support	T0	10.18 ± 2.97	10.90 ± 4.96	-1.33 (-2.98, 0.32)	2.59	0.112	0.033
	T1	8.26 ± 2.79	10.31 ± 4.69				
Caregiver's Own Health	T0	25.38 ± 7.42	24.64 ± 7.26	-1.03 (-3.21, 1.16)	0.87	0.353	0.011
	T1	24.28 ± 6.57	24.56 ± 7.26				
Bereavement Support	T0	17.21 ± 3.79	17.28 ± 6.00	-2.59 (-4.80, -0.38)	5.44	0.022	0.067
	T1	14.36 ± 4.59	17.03 ± 4.11				
Total Score	T0	134.10 ± 20.64	132.74 ± 23.53	-18.18 (-27.25, -9.11)	15.92	< 0.001	0.173
	T1	110.90 ± 20.17	127.72 ± 16.86				

4. Discussion

This study examined the effectiveness of a structured family meeting intervention on the quality of life and unmet needs of patients with advanced cancer and their caregivers. The findings indicated that the intervention was associated with significant short-term improvements in quality of life and reductions in unmet needs among both patients and caregivers. These results suggest that this structured family meeting approach may be a promising strategy to address supportive care needs.

Recent evidence indicates that caregiver-focused and dyadic interventions may have beneficial effects on quality of life, psychological well-being, and supportive care outcomes among patients with advanced cancer and their caregivers [19]. However, systematic reviews and meta-analyses also suggest that the effects are often modest, heterogeneous, and more consistently observed in the short term, while longer-term benefits remain uncertain [20,21]. Therefore, the findings of the present study should be interpreted as preliminary evidence of short-term in-hospital benefit rather than evidence of sustained effectiveness. Compared with previous family-based or caregiver-focused interventions, the contribution of this study lies mainly in applying dyadic illness management theory to a structured family meeting model and implementing it in a Chinese inpatient palliative care context.

The intervention was associated with improvements in patients' quality of life and reduced their unmet needs. The mechanism likely involves facilitated need identification, information exchange, and shared decision-making within the structured meeting. This process appeared to provide patients a platform to express needs, reduces uncertainty through clear information from healthcare providers, and may enhance their sense of control and participation, which may contribute to improved psychosocial well-being and overall quality of life. This aligns with prior research highlighting the role of family meetings in improving communication and care experience. The dyadic approach further fosters mutual support within the patient-caregiver unit, potentially alleviating patient anxiety related to communication gaps.

The intervention was also associated with improvements in caregivers' quality of life and reduced unmet needs, particularly regarding healthcare professional interaction, symptom management, and psychological/bereavement support. The structured meetings appeared to provide a formal setting for caregivers to voice concerns, receive targeted guidance, participate in decision-making, and potentially shift from a passive role to an active partner. This change may enhance caregiving competence, confidence, and may help reduce burden, as supported by literature. Notably, no significant changes were observed in the "caregivers' own health" dimension in either group, which may be attributed to the fact that caregivers' health problems are often driven by long-term accumulated physical strain and psychological stress, making them less responsive to short-term interventions [22].

Several limitations of this study should be acknowledged. First, this was a single-center study, which may limit the generalizability of the findings. Second, the lack of long-term follow-up restricts our ability to evaluate the sustained effects of the intervention that longer-term efficacy remains to be established through future studies with extended follow-up. Third, quality of life was assessed only during the study period, and longer-term longitudinal assessments are needed to better capture its dynamic changes over time.

5. Conclusion

The present study provides preliminary evidence that a brief, locally adapted structured family meeting intervention grounded in dyadic illness management theory may improve short-term quality of life and reduce selected unmet needs among advanced cancer patients and their caregivers during hospitalization. Rather than representing a wholly new intervention concept, this study should be viewed as an incremental advance in applying a dyadic theoretical framework to structured family meetings within the Chinese inpatient palliative care setting. Further multicenter studies with larger samples and longer post-discharge follow-up are needed to confirm these findings and determine whether the observed benefits can be sustained over time.

6. Limitation

Several limitations of this study should be acknowledged. First, the intervention duration was relatively short, consisting of only two weeks with three structured family meetings. Consequently, the outcome assessments were confined to the hospitalization period. This design provides, at best, evidence of short-term in-hospital benefits. Future studies with extended intervention periods and post-discharge follow-up (e.g., at 1, 3, and 6 months) are needed to evaluate the durability

of these effects.

Second, this trial was not prospectively registered in a publicly accessible clinical trial registry. We acknowledge that this omission is a limitation, as prospective registration is a key marker of research transparency and helps prevent selective reporting of outcomes. We encourage future researchers in this field to ensure prospective trial registration before the enrollment of the first participant.

Third, this was a single-center study conducted in a specific hospital setting, which may limit the generalizability of our findings to other populations, healthcare systems, or cultural contexts. The sample size, while adequate for detecting the primary outcome based on our power calculation, was relatively modest, and the participants were all recruited from one institution, which may introduce selection bias. Multicenter studies with larger and more diverse samples are warranted to confirm and extend our findings.

Fourth, several subdomain outcomes were examined in this study. Although total scores were considered the main outcomes, the multiple subdomain-level analyses may increase the risk of type I error. Therefore, findings from subdomain analyses should be interpreted as exploratory and should be confirmed in future studies.

Supplementary Materials: Additional file 1. Standard Operating Procedure (SOP) for Structured Family Meetings Based on Dyadic Illness Management Theory. Additional file 2. Forms of Structured Family Meetings.

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Standard Operating Procedure(SOP) for the Structured Family Meeting Intervention Based on Dyadic Illness Management

1. Program Overview

Item	content
Program Name	Structured Family Meeting Intervention Based on Dyadic Illness Management Theory
Theoretical Framework	Dyadic Illness Management Theory
Target Population	Patients with advanced cancer (pathologically confirmed Stage IV) and their primary family caregiver
Intervention Sessions	3 sessions in total (within 48 hours of admission, during hospitalization, 3 days before discharge)
Outcome Measures	Primary: Patients'Quality of life Secondary: patients' unmeet needs,caregivers's QoL and unmeet needs

2. Staff Qualifications and Training

To ensure intervention fidelity, all personnel must meet the following standards:

Role	Qualification	Training Content
Facilitator	Attending physician or specialized palliative care nurse	1. Concepts of Dyadic Illness Management Theory; 2. Bad news disclosure and communication skills (SPIKES model); 3. Interpretation of assessment tools
Coordinator	Primary nurse	1. Organization and environment setup; 2. Standardized assessment procedures; 3. Meeting documentation and follow-up
Assessment Criteria	Pass simulated family meeting assessment with score > 90 before enrolling patients	Training duration: 4 hours; Assessment format: OSCE (Objective Structured Clinical Examination)

3. Standardized Operating Procedures (SOP)

3.1 Phase 1: Baseline Assessment and Pre-meeting Preparation (within 48 hours of admission)

Goal: Complete eligibility screening and baseline data collection; determine focus of the first meeting.

Step	Content	Tool/Form	Person in charge
1. Eligibility Screening	Review medical records to confirm Stage IV, estimated survival ≥ 2 weeks, alert and oriented	Enrollment Screening Form	Researcher
2. Baseline Quality of Life Assessment	Patient: McGill Quality of Life Questionnaire (MQOL) •Caregiver:CancerCaregiver Quality of Life Scale (CQOL-C)	MQOL CQOL-C	Primary nurse
3. Baseline Needs Assessment	•Patient:Advanced Cancer Patients Needs Assessment Brief Scale (ACNQ-29) •Caregiver:Questionnaire on Needs of Family Members of Advanced Cancer Patients (CNQ-PAC)	ACNQ-29 CNQ-PAC	Primary nurse

Continuation Table:

Step	Content	Tool/Form	Person in charge
4. Meeting Planning	Morning handover to discuss assessment results, identify patient-caregiver dyadic conflict points, determine meeting priorities	Meeting Planning Form	Medical-Nursing Team

3.2 Phase 2: Structured Family Meeting Implementation

General procedure: Each meeting includes the following 4 steps, lasting 30-60 minutes.

Step	Key Content and Script
1. Opening	• Introduction: "Hello, I am Dr. X, and this is Nurse X." • Purpose: "We've invited you today to discuss the next steps in treatment goals and care arrangements, and to hear your thoughts." • Rules: Respect, confidentiality, and allowance for differing opinions.
2. Information Exchange	• Physician: Reports current disease status, treatment focus, and prognosis. • Nurse: Supplements symptom management status and home care essentials. • Assessment: Provides feedback based on T0 assessment results (e.g., "The assessment shows that your pain is currently affecting your quality of life...").
3. Discussion and Decision-Making	• Facilitate interaction: Encourage direct communication between patient and caregiver (e.g., "Did you hear what they just said they were worried about?"). • Tool assistance: Use life education cards as needed to guide patient expression of end-of-life treatment preferences (e.g., intubation, CPR). • Reach consensus: Develop a specific, actionable care plan (e.g., pain management protocol, discharge destination).
4. Summary	• Facilitator restates consensus: "So what we have agreed upon is... correct?" • Confirm mutual understanding and schedule next communication time.

Differentiated Focus of the Three Meetings:

Session	Timing	Core Goal
1st Meeting	Within 48 hours of admission	Establish rapport and baseline alignment: Based on T0 assessment results, identify patient and family priority needs.
2nd Meeting	During hospitalization	Problem-solving and adjustment: In-depth communication regarding current major conflicts (e.g., poorly controlled pain, division of caregiving responsibilities).
3rd Meeting	3 days before discharge	Summary and transitional care: Confirm post-discharge care arrangements, community resource referrals, and bereavement preparation support.

3.3 Phase 3: Outcome Assessment and Follow-up (3 days before discharge)

Goal: Evaluate intervention effects

Step	Content	Tool
1. Outcome Measurement	Reassess quality of life and needs, compare with T0 data	MQOL, CQOL-C ACNQ-29, CNQ-PAC
2. Documentation	Complete "Structured Family Meeting Record Form" and file in medical record	Meeting Record Form
3. Referral Planning	Contact community or follow-up nurses based on decisions to ensure continuity of care	Referral Form

4. Quality Control and Fidelity Monitoring

To ensure reproducibility of the intervention, the following quality control measures are implemented:

1. Standardized Toolkit: All meetings must use the uniform "Meeting Record Form" and "Assessment Scales"; arbitrary deletion of items is strictly prohibited.
2. Process Auditing: The research team leader randomly selects 20% of meeting records and audio recordings weekly to ensure complete implementation of the 4 steps.
3. Fidelity Standard: Core element completion rate for a single meeting must be $> 95\%$ (i.e., at least 8.5 out of 9 agenda items completed); those not meeting the standard must undergo retraining.
4. Ethical Compliance: Strict implementation of informed consent, protection of patient privacy, and confidentiality of meeting content.

Appendix: Life Education Cards

Category of Life Education Card	Description
Life Journey	<i>Life Journey</i> is both a life education teaching tool and a board game suitable for family members to play together. The game integrates four life stages—adolescence, young adulthood, middle age, and old age—covering topics such as education, romantic relationships, career, retirement, and death. Family members choose their own life stage and roll dice to experience the uncertainties of life, expressing current difficulties through communication and fostering mutual understanding. 
A Thick Life	<i>A Thick Life</i> is a fun and warm language-interactive life education board game. All players are encouraged to share joyful events, happy moments, hardships, embarrassing experiences, and regrets in life. When our lives become sufficiently "thick," fate favors us! In the game, saying thank you, expressing love, apologizing, and saying goodbye become essential actions, as they determine your subsequent fate in the game. 
52 Ultimate Questions of Life	This is a card deck designed for death education group activities. Centered around the theme of death, the cards explore its impact and meaning from multiple perspectives including medicine, law, psychology, folklore, and philosophy. Through discussion, participants are helped to understand death and gain the courage to face it directly. 
Exploring Life Values	This is a deep reflection on one's own life value and meaning, as well as a bridge connecting the deeper souls of people. Through the game rules, participants truly experience choice, loss, and gain: - Life Values: Reflect on "why I live" and identify the goals one pursues in life. - Loss and Impermanence: Experience the changes brought by the "unknown," learning to approach the truth of life amidst regret. - Interpersonal Connection: See others' philosophies of life through sharing, understanding differences in values and respecting them. 

Structured Forms and Checklists for the Structured Family Meeting Intervention

Form 1: Enrollment Screening Form

Purpose: Ensure that only patients meeting the inclusion/exclusion criteria enter the study, thereby ensuring sample homogeneity.

Structured Family Meeting Based on Dyadic Illness Management Theory – Enrollment Screening Form

File Number: _____	Screening Date: 202__ Year __ Month __ Day
Study Center: Fudan University Shanghai Cancer Center	Screener Signature: _____
Patient Basic Information	Initials: _____ Medical Record Number: _____ Diagnosis: _____ TNM Stage: ____ (Confirm Stage IV / Recurrent/ Metastatic)
Inclusion Criteria Checklist (All must be met)	☐ Pathologically confirmed Stage IV cancer ☐ Estimated survival $\geq$ 2 weeks ☐ Age $\geq$ 18 years ☐ Has a fixed primary family caregiver ☐ Alert and oriented ☐ Both patient and caregiver have signed informed consent
Exclusion Criteria Checklist (If any present, exclude)	☐ Severe cognitive impairment or mental illness preventing cooperation ☐ Patient or caregiver refuses to participate in the study
Screening Conclusion	☐ Meets inclusion criteria, assigned to: ☐ Intervention group ☐ Control group ☐ Does not meet inclusion criteria, reason: _____

Form 2: Meeting Planning Form

Purpose: Translates results from pre-meeting assessment tools (ACNQ-29/CNQ-PAC) to guide the specific discussion focus of the first meeting.

Structured Family Meeting Based on Dyadic Illness Management Theory – Meeting Planning Form

Patient Name:	Meeting Session: ☐ 1st / ☐ 2nd / ☐ 3rd
Planned Date:	Facilitator: _____
Baseline Assessment Results Review (T0 data) / Outcome Measurement Results (T1 data)	Patient Quality of Life (MQOL): _____ points / _____ points Caregiver Quality of Life (CQOL-C): _____ points / _____ points Patient Unmet Needs (ACNQ-29): _____ points / _____ points Caregiver Unmet Needs (CNQ-PAC): _____ points / _____ points
Needs Analysis	Dimension - Patient's Main Issues (ACNQ-29) - Caregiver's Main Issues (CNQ-PAC) Physiological/Symptoms: ☐ Poor pain control ☐ Fatigue ☐ Sleep disturbance ☐ Lack of symptom management knowledge ☐ Heavy physical burden Psychological/Emotional: ☐ Anxiety/fear ☐ Depression ☐ Fear of death ☐ High psychological stress ☐ Inability to cope with patient's emotions Social/Information: ☐ Financial difficulties ☐ Unclear treatment information ☐ Poor communication with medical staff ☐ Lack of bereavement knowledge Spiritual/Existential: ☐ Loss of sense of meaning in life ☐ Regret ☐ Inadequate bereavement preparation
Core Goal(s) of This Meeting	Primary Goal: _____ <i>Example: Clarify patient's attitude toward "invasive resuscitation measures"; resolve caregiver's concerns about analgesics.</i> Secondary Goal: _____
Proposed Meeting Attendees	☐ Patient ☐ Spouse ☐ Adult children ☐ Attending physician ☐ Responsible nurse ☐ Social worker (as needed) ☐ Dietitian (as needed) ☐ Other: _____
Remarks	

Form 3: Structured Family Meeting Record Form

File Number:	Meeting Session: ☐ 1st ☐ 2nd ☐ 3rd	Date:																
Patient Name:	Facilitator:	Location: ☐ Conversation room ☐ Bedside																
1. Attendee Sign-in	Medical Team: ☐ Attending physician _____ ☐ Primary nurse _____ ☐ Psychologist (as needed) _____ ☐ Social worker (as needed) _____ ☐ Other _____	Patient/Family: Patient/Family:: ☐ Patient _____ ☐ Spouse _____ ☐ Adult children _____ ☐ Other _____																
2. Standardized Procedure Execution Record	<i>Please check (✓) completed steps:</i>	Step / Agenda 1. Opening / ☐ Introduce attendees ☐ State meeting purpose ☐ Set confidentiality/respect rules 2. Information Exchange / ☐ Physician reports disease status/prognosis ☐ Nurse supplements symptom management points ☐ Provide feedback on T0 assessment results (MQOL/ACNQ) 3. Discussion & Decision-Making / ☐ Facilitate direct patient-caregiver dialogue ☐ Use life education cards ☐ Reach specific care consensus 4. Summary																
3. Dyadic Needs & Consensus Record	Dimension Patient Views/Needs Caregiver Views/Concerns Consensus & Decisions--- --- --- --- <table border="0"> <tr> <td>Physiological/Symptoms</td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td>Physiological/Symptoms</td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td>Social/Information</td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td>Spiritual/Existential</td> <td> </td> <td> </td> <td> </td> </tr> </table>		Physiological/Symptoms				Physiological/Symptoms				Social/Information				Spiritual/Existential			
Physiological/Symptoms																		
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4. Meeting Outcomes	Next Steps in Care Plan: _____ Referral Needed: ☐ Social work ☐ Nutrition ☐ Psychology ☐ Community ☐ None needed																	
5. Signatures for Confirmation	Facilitator Signature: _____ Recorder Signature: _____ Patient/Family Signature: _____																	

Form 4: Referral Form

Purpose: Output of the third family meeting (before discharge) to ensure continuity of post-discharge care, reflecting "whole-chain management."

Structured Family Meeting Based on Dyadic Illness Management Theory – Discharge Referral Form

Patient Name: _____	Medical Record Number: _____
Discharge Date: _____	
Care Consensus Reached During Hospitalization	Primary Care Goal: ☐ Comfort-focused ☐ Active treatment ☐ Home palliative care ☐ Other: _____ Advance Care Planning (ACP) Confirmation: ACP/DNR signed: ☐ Yes ☐ No Patient's Primary Wishes: _____
Post-Discharge Specific Needs	Category Specific Need Content Referral Needed? Receiving Unit / Person in charge --- --- --- --- Symptom Management ☐ PCA maintenance ☐ Wound care ☐ Catheter care ☐ Yes ☐ No _____ Caregiver Support ☐ Home care training ☐ Caregiver request ☐ Wheelchair/equipment ☐ Yes ☐ No _____ Psychological/Spiritual ☐ Bereavement support ☐ Psychological counseling ☐ Religious support ☐ Yes ☐ No _____ Social Resources ☐ Financial assistance ☐ Community coordination ☐ Yes ☐ No _____
Emergency Contacts	Primary Contact: _____ Relationship: _____ Phone: _____ Secondary Contact: _____ Relationship: _____ Phone: _____
Signatures	Attending Physician Signature: _____ Responsible Nurse Signature: _____ Patient/Family Signature: _____ Date: _____