

# Application of interdisciplinary collaborative hospice care for terminal geriatric cancer patients: A prospective randomised controlled study

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## Research Article

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# Abstract

## Background

Hospice care (HC) is specialized medical care for terminal patients who are nearing the end of life. Interdisciplinary collaborative hospice care (ICHC) is where experts from different disciplines and patients/caregivers form a treatment team to establish shared patient care goals. However, the ICHC efficacy has not been frequently studied in the terminal geriatric cancer patients (TGCPs) population. This study aimed to gain insight into ICHC provided to TGCPs by an ICHC team and identify factors to ameliorate multidimensional HC.

## Methods

166 TGCPs were equally divided into ICHC group and life-sustaining treatments (LSTs) group as control. The scores of these questionnaires [such as EORTC QLQ-C30, Hamilton Anxiety Scale], the median survival time (MST), symptoms improvement, the median average daily cost of drugs (MADDC), the median total cost of drugs (MTDC) in the last 2 days, and medical care satisfaction were observed in both groups.

## Results

After treatment, the emotional function and symptoms in the ICHC group were statistically higher improvement than those in the LSTs group ( $P < 0.05$ ). The MADDC and the MTDC in the last 2 days were statistically lower in the ICHC group than those in the LSTs group ( $P < 0.01$ ). In addition, the overall satisfaction situation and the cooperation ability in the ICHC group were statistically higher than those in the LSTs group ( $P < 0.01$ ).

## Conclusion

The ICHC could provide TGCPs with coordinated, comfortable, high-quality, and humanistic care.

## Introduction

Palliative care (PC) is defined as a patient-centered approach to care in advanced disease, which delivers early comprehensive care for advanced patients focusing on the quality of life (QoL), relief of symptoms, and treatment options. Whereas hospice care (HC) is different from PC, HC intervenes terminal phase when disease-modifying treatments stop. HC is part of PC that focuses on terminal patients (TPs) who have life-threatening diseases and a life expectancy of a few days or weeks<sup>[1–5]</sup>. Due to the limitations of treatment awareness, cultural differences, clinical uncertainties, and the excessive expectations of

patients/their families, most cancer patients receive LSTs from the diagnosis to death, causing them not to receive HC.

However, the benefit of LSTs for TPs is controversial<sup>[3, 6, 7]</sup>. The 2015 Quality of Death Index, a tool to measure PC quality, shows that, in the ranking of 80 countries/regions in the world, the comprehensive score of death quality in mainland China is 23.3 (full score 100), ranking 71st<sup>[8]</sup>. A study has shown that about 90% of cancer patients in Beijing cannot obtain HC<sup>[9]</sup>. With the intensification of population aging and the continuous improvement of QoL requirements, older patients have an increasing demand for HC. Among them, terminal geriatric cancer patients (TGCPs) are a unique group with special disease development processes and complicated treatment needs<sup>[9]</sup>. In addition, the attention and accessibility of HC in current social and clinical work is still lack<sup>[1, 3]</sup>, and most TGCPs are forced to undergo too many examinations, may be susceptible to "overtreatment" and increase their vulnerability risk. LSTs make patients suffering tremendously. How to eliminate or reduce uncomfortable symptoms of TGCPs and improve their QoL is an urgent clinical problem that needs to be resolved.

The care needs of TGCPs include cancer management, individual care needs, and addressing comorbidities<sup>[10]</sup>. HC is frequently delivered by specialists. Professional HC currently faces increasing resource constraints, and continued growth in HC needs. There is a growing realization that merely increasing health professionals and improving professional HC are insufficient to ensure continued and better HC for TGCPs<sup>[11]</sup>. High-quality HC will therefore need to adapt to provide appropriate services for changing populations, require more resources, and new service models<sup>[12]</sup>. Which maybe needs multi-participation being a team including patients, their families, and volunteers, etc<sup>[13-15]</sup>. Different members take on complementary roles and working cooperatively to develop a care plan individualized to TGCPs' needs/preferences, reducing uncomfortable symptoms of TGCPs, improving QoL, and then providing a high-quality HC. Interdisciplinary collaborative practice has become a cornerstone of optimal person-centered management in the current complex health care climate and limitations of resources, interdisciplinary communication is critical to team collaboration and health care outcomes<sup>[16-19]</sup>. "Interdisciplinary collaborative approach" is that experts, patients, their families, etc from different disciplines form a team to establish a collaborative treatment goal to achieve a more comprehensive, integrated, and coordinated approach to patient care. Interdisciplinary collaborative hospice care (IHC) teams deliver care for more complex needs in all kinds of settings. So, the IHC is a method of implementing individualized HC for TGCPs.

At present, there are few studies on the implementation of HC for TGCPs, especially the IHC mode of TGCPs. To this end, this study intended to compare and explore the effects of IHC and LSTs on TGCPs in various aspects, to provide a reference for clinical treatment.

## Materials And Methods

### General information

The subjects of the study were 166 cases of TGCPs with an expected survival period of fewer than 3 months following the natural course of the disease, who were admitted to Ganzhou Cancer Hospital from January 2018 to September 2021. They were unable to be treated/relieved with the existing medical technology, and the conditions would be drastically changed with obvious discomfort.

Inclusion criteria included: All were diagnosed as stage III-IV solid malignant tumors by histopathology or cytopathology according to 8th edition of the International Anti-Cancer Alliance and American Cancer Federation TNM Staging, they were in the terminal stage and knew their condition and physical status, ECOG-PS scores 3 points, Palliative Prognosis Index  $\geq 6$  points, They chose death in hospital and their cause of death were related to a malignant tumor, and they had good compliance, voluntary participation in this study.

Exclusion criteria included: Patients who hospitalized time less than 72 hours, had communication difficulties, were merged with other serious diseases, or died due to unexpected complications (such as infection, bleeding, etc.), voluntarily withdraw from halfway, who had participated or were participating in other clinical trials within 3 months.

The study subjects were randomly divided into control and experimental group. Characteristics of TGCPs are described in Table 1. Those basic data of the two groups were no significant statistical ( $P > 0.05$ ) (Table 1). This study complied with the relevant requirements of the Declaration of Helsinki of the World Medical Association. Also was approved by the Ethics Committee and the Institutional Review Board of the Ganzhou Cancer Hospital.

Table 1  
General information for both groups of patients ( $\bar{x} \pm s$ , n = 83)

Groups	Gender/cases		Age (years) $\bar{x} \pm s$	Diseases (cases)			
	M	F		Lung cancer	Colorectal cancer	Stomach cancer	Uterine cancer
LSTs	41	42	69.20 $\pm$ 2.92	21	20	23	18
ICHC	40	43	69.52 $\pm$ 2.99	22	18	22	21
$\chi^2/(t)$ value	0.024		(0.682)	0.251			
<i>P</i> value	0.877		0.496	0.969			

Note: M: male, F: female.

## Treatment methods

### Control group treatment (LSTs)

We used LSTs to treat the control group. In this group, physicians provided active treatment, necessary symptoms management and communication, etc. When necessary, pharmacists provided medication consultation and monitoring. Nurses performed nursing evaluation and care. The patient families provided daily care and emotional communication, and patients participated in the whole process.

## **Experimental group treatment (ICHC)**

We used ICHC to treat the experimental group. ICHC team contained diverse professionals working within the practice—i.e., physicians, clinical pharmacists, nurses, nutritionists, psychologists, patients, family caregivers, etc. Our ICHC team providing holistic hospice care and optimal collaboration is based on four core competency domains of values and ethics, roles and responsibilities, communication, and teamwork. Our ICHC team provided a curriculum focused on team building, knowledge, and skills of TGCPs and HC, quality improvement assessment methods, also access to expert consultation and community resources using a hybrid learning model. The ICHC team members engaged in shared problem solving and vision, flexible role definitions were developed that allow each profession to work at the top of their scope of practice. Such as physicians provided HC, comprehensive disease evaluation, symptom management, bereavement counseling, timely handling of the reasonable demands of patients and their families, providing spiritual support, and effective communication, etc. Clinical pharmacists provided medication consultation, medication oversight and suggestions regarding the most effective ways to relieve symptoms, medication guidance, medication evaluation, etc. Nurses performed nursing evaluation, symptom recording, daily comfort and targeted care, psychological counseling. etc.

All treatment plans, diagnoses, and treatment measures have obtained the informed consent of patients and their families. In addition, the use of symptoms management drugs referred to the HC of the World Health Organization and the International Palliative Care and Hospice Care Association and related guidelines<sup>[13, 14, 20, 21]</sup>.

## **Observation index**

### **Assessment of proximal clinical treatment outcome**

The MSTs after treatments were compared between the two groups of patients to evaluate the proximal clinical treatment outcome. Survival time is the time interval between the date of admission and death; MST = mean survival time  $\pm$  standard deviation (SD).

### **Assessment of the improvement of the total degree of function, symptoms, and general health status**

The European Organization for Research and Treatment of Cancer Quality-of-Life-Questionnaire-Core-30 version 3.0 (EORTC QLQ-C30 V3.0) and Hamilton Anxiety Scale (HAMA) were used to systematically evaluate the improvement of the total degree of function, symptoms, and general health status of the two groups of patients before and after treatment. All scale scores were objectively scored by full-time personnel who had been trained to master the evaluation method of the evaluation table, and the

corresponding questionnaire or scale interview records on the first day of admission (before treatment) and before death (under conscious state after treatment), and the QLQ-C30 and HAMA scale scores of the two groups of patients were recorded at the same time.

EORTC QLQ-C30 V3.0 is a core scale for predicting the QoL of cancer patients<sup>[22]</sup>, which has 30 items, including general health status and quality of life domain, functional domains, symptomatic areas, and individual measurement item areas. Among them, the symptomatic area item score and the functional area item or the overall health status/quality of life area were negatively or positively correlated with the quality of life, respectively. The total scores were standardized and the scores were in the range of 0-100 points. In this study, we conducted research with reference to some items of the scale<sup>[22]</sup>.

HAMA is a commonly used scale for anxiety assessment<sup>[23]</sup>. The scale has 14 items, and each item has a score of 0–4 points. The scores of all items are added together, the higher score represents more anxiety.

## **Assessment of the collaborative ability of the medical process**

Modified face-to-face cooperative confidence questionnaire (mFCCQ) scores were used to assess the cooperative ability of team members<sup>[24]</sup>. mFCCQ covers 7 aspects in the treatment process, including communication patency, participation, mutual understanding, etc. Each aspect deals with medical staff, patients, patient families, and each has a corresponding item for investigation. Each item has a score of 1–5 points, and the total score is between 7–35. A higher score represents better collaboration ability.

## **Assessment of healthcare satisfaction**

Factor analysis of the 16-item scale measure of patients care satisfaction (FAMCARE-P16) was used to assess healthcare satisfaction. The scale has 16 items, and each item has a score of 1–5 points. The total score is between 16–80 points<sup>[25]</sup>. The higher the score, the better the satisfaction.

In addition, a self-designed questionnaire was used to investigate the overall treatment satisfaction of patients/their families. It includes the treatment and care of patients by medical staff, the acceptance and support of medical staff on patients/their families, also the management of patients' symptoms. If the item is affirmed or denied, it is counted as 1 point or 0 points respectively. The corresponding item scores can be superimposed, and the full score of the three items is 3 points. Proposed evaluation standard: Both the patient and those families fully approve the entire treatment process at the same time, they are considered satisfied (total 6 points). The total score is between 3–5 points is considered basically satisfied. Both parties agree that  $\leq 1$  item is considered dissatisfied (total 0–2 points). Total satisfaction rates = (number of satisfactory cases + number of basic satisfactory cases)  $\times$  100%  $\div$  total number of cases.

## **Assessment of the burden of symptoms**

The MADDs in the short term from admission to death and the MTDCs in the last 2 days of the two groups were used to systematically assess the symptoms burden and medical resource utilization. Average daily drug cost(ADDC) = total drug cost during the patient's hospitalization ÷ survival time; MADD = ADDC ± SD; MTDC in the last 2 days = The average total drug cost in the last 2 days ± SD.

## Statistical analysis

Statistical analysis was performed using SPSS 23.0 software. The measurement data conforming to the normal distribution were expressed by the Mean ± SD, and the t-test was performed. The measurement data of the non-normal distribution was expressed by M (P25, P75), and the Wilcoxon rank-sum test was used. The count data were expressed by the case (or percentage), and the  $\chi^2$  test.  $P < 0.05$  indicated that the difference was statistically significant.

## Results

166 TGCPs were randomly divided into ICHC group and LSTs group, the ICHC group treated with ICHC, and the LSTs group treated with LSTs. The corresponding MSTs after treatments were collected between the two groups of patients to evaluate the short-term clinical treatment effect. The corresponding QLQ-C30 and HAMA scale scores on the first day of admission and before death were collected for the assessment of the improvement of the total degree of function, symptoms, and general health status. The corresponding mFCCQ records, FAMCARE-P16 scale scores, and self-designed questionnaire records after treatment were collected to the assessment of the cooperative ability of team members and the healthcare satisfaction corresponding to different treatments. The MADDs of patients and the MTDCs in the last 2 days after treatment were collected for the assessment of the corresponding symptom burden and medical resource utilization.

Table 2 shows the MST of the two groups of patients during the terminal stage. After treatment, there was no significant statistical between the two groups ( $P > 0.05$ ) (Table 2). Table 3 shows the improvements in the functional domains, overall health status, and symptoms of the two groups of patients. After treatment, the LSTs group only pain and constipation improved significantly compared with before treatment ( $P < 0.01$ ), while the degree of emotional function and the field of symptoms for the ICHC group improved significantly ( $P < 0.01$ ), and those were significantly better than in the LSTs group ( $P < 0.05$ ) (Table 3).

Table 2

The proximal median survival times for both groups of patients [days, M (P25, P75), n]

Groups	median survival times (days)			
	Lung cancer(n = 21, 22)	Colorectal cancer (n = 20, 18)	Stomach cancer (n = 23, 22)	Uterine cancer (n = 19, 21)
LSTs	9.60(8.20, 11.15)	10.85(10.35, 12.00)	11.70(10.90, 12.60)	12.50(11.90, 13.50)
ICHC	9.45(8.20,10.72)	10.70(10.12, 11.72)	11.55(10.75, 12.25)	12.30(11.20, 12.90)
<i>Z value</i>	-0.401	-0.483	-0.852	-1.288
<i>P value</i>	0.688	0.629	0.394	0.198

Table 3

Improvements in the functional domains, overall health status and symptoms of the two groups of patients [scores,  $\bar{x} \pm s$ , n = 83]

Observation indicators	Before therapy		T value	P value	After therapy		T value	P value
	LSTs	ICHC			LSTs	ICHC		
Physical function	36.17 ± 6.57	35.72 ± 5.79	-0.468	0.641	35.32 ± 6.79	35.19 ± 6.22	-0.131	0.896
Role function	43.62 ± 7.09	43.34 ± 6.69	-0.259	0.796	42.74 ± 7.55	42.95 ± 7.36	0.187	0.852
Emotional function*	51.45 ± 8.81	51.42 ± 8.72	-0.018	0.986	52.04 ± 11.16	55.92 ± 12.35 <sup>a</sup>	2.123	0.035
Cognitive function	52.64 ± 9.86	52.37 ± 9.46	-0.177	0.860	52.30 ± 11.65	52.48 ± 11.34	0.101	0.919
Social function	43.84 ± 7.73	43.29 ± 8.00	-0.454	0.651	43.66 ± 9.05	43.47 ± 9.25	-0.136	0.892
Overall health function	26.76 ± 8.16	26.07 ± 8.11	-0.544	0.587	26.60 ± 9.14	27.04 ± 9.65	0.297	0.767
Tiredness*	81.57 ± 9.40	82.36 ± 8.37	0.575	0.566	80.18 ± 9.91	76.47 ± 10.78 <sup>a</sup>	-2.308	0.022
Nausea and vomiting*	84.46 ± 9.69	84.64 ± 9.04	0.124	0.901	82.51 ± 10.43	78.16 ± 11.44 <sup>a</sup>	-2.560	0.011
Pain <sup>#</sup>	86.94 ± 10.18	86.92 ± 9.79	-0.016	0.988	78.13 ± 10.47 <sup>a</sup>	28.52 ± 9.64 <sup>a</sup>	-31.753	< 0.001
Shortness of breath <sup>#</sup>	74.98 ± 11.73	75.30 ± 10.94	0.185	0.854	73.13 ± 13.03	67.54 ± 14.17 <sup>a</sup>	-2.645	0.009
Insomnia <sup>#</sup>	82.37 ± 10.01	83.08 ± 9.48	0.470	0.639	80.28 ± 11.40	74.46 ± 13.59 <sup>a</sup>	-2.989	0.003
Loss of appetite <sup>#</sup>	85.76 ± 9.98	85.78 ± 9.46	0.016	0.987	83.39 ± 11.19	78.37 ± 12.74 <sup>a</sup>	-2.693	0.008
Delirium <sup>#</sup>	83.98 ± 10.06	84.89 ± 9.27	0.610	0.543	81.13 ± 12.05	75.24 ± 14.59 <sup>a</sup>	-2.836	0.005
Constipation <sup>#</sup>	85.39 ± 9.41	85.89 ± 8.89	0.356	0.722	80.29 ± 11.60 <sup>a</sup>	72.99 ± 15.31 <sup>a</sup>	-3.462	0.001

Note: Comparison the two groups after treatment and before treatment, <sup>a</sup> $P < 0.01$ ; after treatment, compared with the LSTs, \* $P < 0.05$ , # $P < 0.01$ .

Observation indicators	Before therapy		<i>T value</i>	<i>P value</i>	After therapy		<i>T value</i>	<i>P value</i>
	LSTs	ICHC			LSTs	ICHC		
Anxiety <sup>#</sup>	37.16 ± 9.99	37.63 ± 9.96	0.303	0.762	34.63 ± 11.69	15.75 ± 7.18 <sup>a</sup>	-12.533	< 0.001

Note: Comparison the two groups after treatment and before treatment, <sup>a</sup>*P*<0.01; after treatment, compared with the LSTs, \**P*< 0.05, #*P*< 0.01.

Table 4 shows the collaboration ability and the overall satisfaction situation between two groups of team members. The results showed those in the ICHC group were significantly better than in the LSTs group (*P* < 0.01) (Table 4). Table 5 shows the MADDs and the MTDCs in the last 2 days. The results showed those in the ICHC group were significantly lower than in the LSTs group (*P* < 0.01) (Table 5).

Table 4

Collaboration ability and the overall satisfaction situation between two groups of team members [scores, cases (%) or  $\bar{x} \pm s$ , n = 83]

Groups	MFCQ scores recognized by different members			mFCCQ mean score
	Medical staff	Patients	Patient's family or caregiver	
LSTs	19.66 ± 6.56	18.20 ± 6.72	18.59 ± 6.64	18.82 ± 6.62
ICHC	29.47 ± 3.26 <sup>#</sup>	30.07 ± 3.22 <sup>#</sup>	28.90 ± 3.72 <sup>#</sup>	29.48 ± 3.37 <sup>#</sup>
<i>T value</i>	12.198	14.516	12.343	13.067
<i>P value</i>	< 0.001	< 0.001	< 0.001	< 0.001

  

Groups	Satisfaction situation			Overall satisfaction	FAMCARE-P16 score
	Satisfaction	Basic satisfaction	Dissatisfaction		
LSTs	13(15.66)	31(37.35)	39(46.99)	44(53.01)	42.96 ± 15.15
ICHC	54(65.06) <sup>#</sup>	18(21.69) <sup>*</sup>	11(13.25) <sup>#</sup>	72(86.75) <sup>#</sup>	67.51 ± 7.72 <sup>#</sup>
$\chi^2/(t)$ value	41.816	4.864	22.303	22.303	(13.153)
<i>P value</i>	< 0.001	0.027	< 0.001	< 0.001	< 0.001

Note: Compared with LSTs, \**P*< 0.05, #*P*< 0.01.

Table 5

The median average daily drug costs of patients and the median total drug costs in the last 2 days  
[yuan, M (P<sub>25</sub>, P<sub>75</sub>), n = 83]

Groups	Median average daily drug cost (yuan)	Median total drug cost in the last 2 days (yuan)
LSTs	712.60(643.57, 823.10)	2127.51(1867.20, 2406.38)
ICHC*	493.58(435.10, 573.20)	1435.81(1276.37, 1712.30)
Z value	-8.854	-8.835
P value	< 0.001	< 0.001
Note: Compared with LSTs, *P < 0.01.		

## Discussion

The TPs are chronically consumed due to the disease itself, and the different treatments in the early stage caused reactions such as nausea and vomiting, pain, etc., which will lead to metabolic disorders and QoL progressive decline<sup>[25,26]</sup>. TGCPs are a particular group with complicated disease trajectories, often accompanied by problems in physical function, emotion, and cognition which increase their vulnerability<sup>[27-29]</sup>. The incidence of moderate or severe pain in advanced cancer patients is about 70%<sup>[30]</sup>. Pain will affect the patient's feelings, emotions, other aspects and also bring psychological burdens such as anxiety and fear to the families<sup>[21,30-32]</sup>. For this reason, TGCPs suffer from many symptoms both physically, mentally, and psychologically, resulting in poor QoL. Therefore, how to reduce the symptoms of TGCPs and improve the QoL has important clinical significance.

HC focuses on the management of TPs' symptoms and meeting their overall reasonable needs, aimed at improving QoL, prevention and relief of suffering, affirmation of life, and making them pass away in peace and dignity<sup>[1-3]</sup>. And the guidelines emphasize that physical symptoms, psychological, and spiritual needs require to be optimized for the entire treatment process of cancers<sup>[13,14]</sup>. So, the participation of multiple parties should be required for high-quality HC<sup>[1-3,13,14]</sup>. Terminal cancers are a type of restrictive disease. Studies have shown that LSTs may not improve QoL and clinical benefits<sup>[6,7,32]</sup>. Therefore, there is much concern about the treatment options for TGCPs and whether LSTs need to be accepted.

At present, there is no unified evaluation standard or interventions model for the treatment of TGCPs. Therefore, we implemented comprehensive management of symptoms and collected STs, alleviation in functional areas and symptom areas, daily drug costs, collaboration ability, etc. These were to evaluate the clinical outcomes of the two groups of patients after treatment with different modes.

It was firstly found that the incidence of some symptoms of TGCPs was high and had an impact on the QoL. In terms of emotional function and symptoms, patients undergoing ICHC had improved significantly

compared to before treatment ( $P < 0.01$ ), and the degree of improvement was significantly better than those of LSTs ( $P < 0.05$ ). There was no significant statistical in the MST between the two groups ( $P > 0.05$ ), suggesting that ICHC reduced emotional and mental stress disturbances, and relieved patients' symptoms, improved their QoL, but had no significant impact on patient's survival time. Symptoms such as pain, etc were negatively correlated with the QoL of patients<sup>[33–35]</sup>. HC could relieve symptoms of TPs, thereby improving QoL, but it had little effect on the survival time of TPs<sup>[36]</sup>. There were no relevant reports on the improvement of symptoms and survival time of TGCPs after the ICHC treatment. Our study was consistent with them.

In addition, there was a gap in the overall MST of receiving ICHC (10–12 days) between our study and a study from the USA (19 days)<sup>[37]</sup>, suggesting that the overall MST of HC in our study is relatively short and needs to be improved. It may be due to the less understanding and acceptance of HC service. Our study found that, compared with LSTs, ICHC had significantly fewer MADDs and MTDCs incurred in the last 2 days ( $P < 0.01$ ), with the decrease rate of about 30%, suggesting that ICHC can reduce medical care, resource utilization rates, and cost. This is consistent with other reports on HC/PC which also greatly reduced medical expenses<sup>[38–40]</sup>. Other studies mainly focused on the treatment impact on overall medical insurance costs, but not on ADDCs. Our study investigated the impact of TGCPs on the MADDs and the MTDCs in the last 2 days.

In addition, ICHC was significantly better than LSTs in healthcare satisfaction and collaboration capabilities ( $P < 0.01$ ), suggesting that ICHC can meet the reasonable needs of patients and caregivers, enhance doctor-patient trust, and improve medical satisfaction. Which may be associated with ICHC's core intervention measures consisting of patient-centered, effective collaboration, participation, and communication of team members throughout the process.

Based on the above results, the overall MST for HC used in China is relatively short, and there is a gap in the outcome of interventions between China and developed countries in Europe and America, which may be due to factors such as the late start of HC in China, lack of understanding of HC, and cultural differences. Although ICHC had no significant impact on the proximal survival time of TGCPs, it had a positive impact in reducing the suffering and improving the QoL of patients, reducing the burden of symptoms, reducing the waste of medical resources, and strengthening doctor-patient collaboration and participation. ICHC could provide TGCPs with coordinated, comfortable, high-quality, and humanistic care.

This study has the following limitations. Firstly, the sample size is relatively small, this study did not in multi-site practices or large healthcare systems. Secondly, the included research subjects are relatively limited. Further, there may be a difference in the scoring among members, and the time points of the scale scores are relatively small. Because of these factors, large-scale prospective multi-center research based on the advanced, optimal, and feasible treatment concept for TGCPs is still needed.

## Declarations

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**Data availability:** Not applicable.

**Code availability:** SPSS, version 23.0 (IBM Corp, Armonk, NY) was used for all analyses.

**Authors' contributions:** All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Yong Liu, Qinghua Pan, and Huasheng He. The first draft of the manuscript was written by Yong Liu, Xiaomao Wang, and Zhiping Liu. Yin Shen, Houwen Zou, and Zuochoo Huang conducted the literature searching, screening, and quality assessment. All authors contributed to this manuscript and have consented to the submission of this paper.

**Ethics approval:** The work was approved and registered as a service evaluation by the Ethics Committee and the Institutional Review Board of the Ganzhou Cancer Hospital (registration numbers: 2018001).

Consent to participate: All treatment plans, diagnoses, and treatment measures had obtained the informed consent of patients and their families.

Consent for publication: All authors consented to publish this paper.

Data sharing: There are no additional data associated with this manuscript.

## References

1. Hyden K, Gelfman L, Dionne-Odom JN et al (2020) Update in Hospice and Palliative Care. *J Palliat Med* 23(2):165–170
2. Akgun KM (2017) Palliative and End-of-Life Care for Patients with Malignancy. *Clin Chest Med* 38(2):363–376
3. End-of-life (2012) care: the neglected core business of medicine. *Lancet* 379(9822):1171
4. Organization WH. WHO definition of palliative care. Available at: <https://www.who.int/health-topics/palliative-care> (2018, Accessed 13 May 2021)
5. Tatum PE, Mills SS (2020) Hospice and Palliative Care: An Overview. *Med Clin North Am* 104(3):359–373
6. Mrig EH, Spencer KL (2018) Political economy of hope as a cultural facet of biomedicalization: A qualitative examination of constraints to hospice utilization among U.S. end-stage cancer patients. *Soc Sci Med* 200:107–113
7. Wright AA, Keating NL, Ayanian JZ et al (2016) Family Perspectives on Aggressive Cancer Care Near the End of Life. *JAMA* 315(3):284–292
8. Unit TEI. The 2015 Quality of Death Index Ranking Palliative Care across the World. Available at: <https://perspectives.eiu.com/healthcare/2015-quality-death-index> (2015, Accessed 23 December 2020)
9. Yin Z, Li J, Ma K et al (2017) Development of Palliative Care in China: A Tale of Three Cities. *Oncologist* 22(11):1362–1367
10. Hui D, Bruera E (2016) Integrating palliative care into the trajectory of cancer care. *Nat Rev Clin Oncol* 13(3):159–171
11. Vanderstichelen S, Cohen J, Van Wesemael Y et al (2019) Perspectives on Volunteer-Professional Collaboration in Palliative Care: A Qualitative Study Among Volunteers, Patients, Family Carers, and Health Care Professionals. *J Pain Symptom Manage* 58(2):198–207 e197

12. Dodd S, Preston N, Payne S et al (2020) Exploring a New Model of End-of-Life Care for Older People That Operates in the Space Between the Life World and the Healthcare System: A Qualitative Case Study. *Int J Health Policy Manag* 9(8):344–351
13. Ferrell BR, Temel JS, Temin S et al (2017) Integration of Palliative Care Into Standard Oncology Care: ASCO Clinical Practice Guideline Update Summary. *J Oncol Pract* 13(2):119–121
14. Dans M, Smith T, Back A et al (2017) NCCN Guidelines Insights: Palliative Care, Version 2.2017. *J Natl Compr Canc Netw* 15(8):989–997
15. H O SS (2018) S T, et al. Palliative Care in the Global Setting ASCO Resource-Stratified Practice Guideline. *J Glob Oncol* 4:1–24
16. Andres TM, McGrane T, McEvoy MD et al (2019) Geriatric Pharmacology: An Update. *Anesthesiol Clin* 37(3):475–492
17. Mariano C, Hanson LC, Deal AM et al (2016) Healthcare satisfaction in older and younger patients with cancer. *J Geriatr Oncol* 7(1):32–38
18. Giuliani MM, Greenberg SA, McDonald MV et al (2018) Geriatric Interdisciplinary Team Training 2.0: A collaborative team-based approach to delivering care. *J Interprof Care* 32(5):629–633
19. Gellis ZD, Kim E, Hadley D et al (2019) Evaluation of interprofessional health care team communication simulation in geriatric palliative care. *Gerontol Geriatr Educ* 40(1):30–42
20. De Lima L, Radbruch L (2018) The International Association for Hospice and Palliative Care: Advancing Hospice and Palliative Care Worldwide. *J Pain Symptom Manage* 55(2S):S96–S103
21. A S, JW B. Updates in palliative care - recent advancements in the pharmacological management of symptoms. *Clin Med (Lond)* 2018; 18(1):11–16
22. NK A (1993) S A, B B, et al. The European Organization for Research and Treatment of Cancer QLQ-C30 a quality-of-life instrument for use in international clinical trials in oncology. *J Natl Cancer Inst* 85(5):365–376
23. Thompson E (2015) Hamilton Rating Scale for Anxiety (HAM-A). *Occup Med (Lond)* 65(7):601
24. Fujita J, Fukui S, Ikezaki S et al (2017) Analysis of team types based on collaborative relationships among doctors, home-visiting nurses and care managers for effective support of patients in end-of-life home care. *Geriatr Gerontol Int* 17(11):1943–1950
25. Zimmermann C, Swami N, Krzyzanowska M et al (2014) Early palliative care for patients with advanced cancer: a cluster-randomised controlled trial. *Lancet* 383(9930):1721–1730
26. Ullrich A, Ascherfeld L, Marx G et al (2017) Quality of life, psychological burden, needs, and satisfaction during specialized inpatient palliative care in family caregivers of advanced cancer patients. *BMC Palliat Care* 16(1):31
27. Cheng KK, Nicholson C (2018) Prioritizing the integration of geriatric oncology and palliative care. *J Geriatr Oncol* 9(6):690–692
28. EK M, PJ C, DN C et al (2020) Hospice Utilization in Elderly Patients With Brain Metastases. *J Natl Cancer Inst* 112(12):1251–1258

29. Mullen MM, Cripe JC, Thaker PH (2019) Palliative Care in Gynecologic Oncology. *Obstet Gynecol Clin North Am* 46(1):179–197
30. van den Beuken-van Everdingen MH, Hochstenbach LM, Joosten EA et al. Update on Prevalence of Pain in Patients With Cancer: Systematic Review and Meta-Analysis. *J Pain Symptom Manage* 2016; 51(6):1070–1090 e1079
31. Mercadante S (2018) Treating breakthrough pain in oncology. *Expert Rev Anticancer Ther* 18(5):445–449
32. H W, A D, A S, et al. Updates in palliative care - overview and recent advancements in the pharmacological management of cancer pain. *Clin Med (Lond)* 2018; 18(1):17–22
33. Knaul FM, Farmer PE, Krakauer EL et al (2018) Alleviating the access abyss in palliative care and pain relief - an imperative of universal health coverage: the Lancet Commission report. *Lancet* 391(10128):1391–1454
34. Bovero A, Leombruni P, Miniotti M et al (2016) Spirituality, quality of life, psychological adjustment in terminal cancer patients in hospice. *Eur J Cancer Care (Engl)* 25(6):961–969
35. Gramling R, Ingersoll LT, Anderson W et al (2019) End-of-Life Preferences, Length-of-Life Conversations, and Hospice Enrollment in Palliative Care: A Direct Observation Cohort Study among People with Advanced Cancer. *J Palliat Med* 22(2):152–156
36. Harris PF. Review (2017) Palliative care improves quality of life and symptom burden but does not affect mortality at 1 to 3 months. *Ann Intern Med* 166(6):JC31
37. Organization NHaP. Facts & Figures: Hospice Care in America. Available at: <https://www.nhpc.org/hospice-facts-figures/> (2018, Accessed 22 April 2020)
38. A M, K B, R DS, et al. Impact of palliative home care support on the quality and costs of care at the end of life a population-level matched cohort study. *BMJ Open* 2019; 9(1):1–9
39. May P, Garrido MM, Cassel JB et al (2016) Palliative Care Teams' Cost-Saving Effect Is Larger For Cancer Patients With Higher Numbers Of Comorbidities. *Health Aff (Millwood)* 35(1):44–53
40. Fiala MA, Gettinger T, Wallace CL et al (2020) Cost differential associated with hospice use among older patients with multiple myeloma. *J Geriatr Oncol* 11(1):88–92

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