BMC Palliative Care

RESEARCH Open Access

Factors influencing the survival time of patients with advanced cancer at the end of life: a retrospective study

Xinyu Hu[1†], Yang Chen[2,3†], Chuan Zhang[2], Jianjun Jiang[2,3], Xin Xu[1] and Meiying Shao[1*]

Abstract

Background Predicting the survival time of patients at the end of life can provide more accurate treatment and care programs for patients. The purpose of this study was to investigate the factors impacting 14-day survival at the end of life.

Method This was a retrospective study. Patients with advanced cancer admitted to the Department of Palliative Medicine in a tertiary hospital in China in 2021 were included and classified into group A (survival time ≤ 14 days) or group B (survival time > 14 days). Patient demographic characteristics, palliative performance scale (PPS) scores, Barthel index scores, Fracture Risk Assessment Scale (FRAIL) scale scores, clinical features and laboratory test results were extracted from medical records. Univariable and multivariable logistic regression analyses were used to identify predictors of death within 14 days. Survival time was compared between frail and nonfrail patients.

Results A total of 261 patients were included (122 in group A and 139 in group B), with a median survival time of 17 (13.04, 20.96) days. There were significant differences in age, FRAIL score, PPS, Barthel index, dyspnea, edema, C-reactive protein and white blood cell count between the two groups. According to the multivariable logistic regression analysis, the PPS could predict the risk of death within 14 days (OR = 6.818, 95% CI = 3.944–11.785, $p < 0.001$). The median survival time was 48 (33.71, 62.29) days in the nonfrail group ($n = 34$) and 15 (12.46, 17.54) days in the frail group ($n = 227$) ($p < 0.001$).

Conclusions A lower PPS increases the risk of 14-day mortality in patients at the end of life. Frailty may shorten the survival time of patients at the end of life.

Keywords End of life, Survival prognosis, Palliative performance scale, FRAIL scale score, Barthel index

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Background

According to data released by the National Bureau of Statistics of China, at the end of 2022, there were 280.04 million people aged 60 and above in China, accounting for 19.8% of the national population. China has an aging society [1]. In 2022, there were approximately 4.82 million new cancer cases and 3.21 million cancer deaths in China [2]. Since 2017, the Chinese government has promoted palliative care nationwide, covering 185 cities (districts), through established palliative care facilities, provided education and training about palliative care, and promoted the idea of palliative care [3]. As a result, China's mortality rate rose from 71 to 53 [4]. Nevertheless, there is still a regional imbalance in the development of palliative care in China. The number of medical institutions and palliative care practitioners cannot meet the needs of palliative care. If the survival time of patients at the end of life can be predicted, arranging patient care locations receiving hospice care at home, in the community, or in tertiary palliative care hospitals can be facilitated. Accurate prediction of the survival time of patients at the end of life can provide a basis for prioritizing palliative care services and preventing the waste of medical resources.

Survival time prediction can help patients at the end of life receive appropriate treatment at the right time, improve quality of life, and allow patients and their families to be prepared with no regrets [5]. Survival prediction is a key component in the management of patients at the end of life. It is especially important for sensible decision-making, good resource allocation, and the improvement of quality of care [6, 7]. Previous researchers have screened out factors that can independently predict the survival time of patients and developed survival prediction assessment scales and tools. Feinstein and colleagues suggested that clinical features and hematological parameters were independent predictors of disease and outcome [8].

The Palliative Performance Scale (PPS) [9] was developed based on Karnofsky Performance Status (KPS) by Anderson in Canada in 1996 to measure the functional performance of patients receiving palliative care. Several studies have verified that this tool can be directly used to predict the survival of patients. The PPS is seldom used in Chinese patients at the end of life. Therefore, there is a lack of prediction data to provide evidence.

Frailty is characterized by reduced physiologic reserves, which leads to greater vulnerability [10]. Frailty is not unique to the elderly [11, 12] population. 3% of patients aged 37–73 years in the study were considered frail. Frailty is also an indicator of palliative care. Although frailty is not considered a disease, it is associated with advanced age and the end stage of chronic disease, both of which are indicators of the need for palliative care. However, the prevalence and impact of frailty in end-of-life care are unknown.

The objective of this study was to investigate the impact of PPS, the FRAIL scale score, the Barthel index, end-stage symptoms, signs and laboratory test results on the 14-day survival of Chinese patients at the end of life.

Methods

Study subjects

Patients were admitted to the Department of Palliative Medicine of West China Fourth Hospital of Sichuan University from January 2021 to December 2021. The inclusion criteria were as follows: (1) were over 18 years old at admission; (2) had a definite diagnosis of malignant tumor, recurrence, progression or metastasis, were unable to continue antitumor treatment, and were undergoing palliative treatment; and (3) had a known date of death. The exclusion criteria were as follows: (1) unknown date of death, (2) incomplete medical records, and (3) supportive treatment during antitumor therapy. The flowchart of the inclusion and exclusion criteria is shown in Fig. 1.

Methods

This was a retrospective study. The demographic characteristics (age, sex), symptoms, signs, and laboratory test results of the patients were collected from the patients' electronic medical records. Antitumor treatment history included surgery, radiotherapy, chemotherapy, targeted therapy, and immunotherapy. Symptoms reported by the patient and caregiver at admission and within the first 24 h included intestinal obstruction, fatigue, pain and dyspnea. The signs included systolic blood pressure, edema, and cachexia. The laboratory tests included C-reactive protein (CRP), white blood cell (WBC) count, lymphocyte (LYM) count, hemoglobin (Hb), albumin (ALB) and fecal occult blood, which were obtained from the first report within two days after admission. Laboratory indicators were classified as normal or abnormal according to laboratory reference ranges. Albumin (ALB) levels were classified as ≥26 g/L or <26 g/L according to the literature [13]. Survival time was calculated from the date of admission to the date of death. For multiple admissions, the last hospitalization medical record was used. According to the survival time, the patients were classified into ≤14-day group (group A) and >14-day group (group B) [14].

PPS evaluation included 5 aspects of patients' ambulation, activity or evidence of disease, self-care, intake and consciousness level. PPS assessment results are stratified into 11 grades ranging from 0 to 100%, and the higher the grade is, the better the functional status. In this study, the PPS score was used to define the 10% group, 20–30% group, 40–50% group and ≥60% group. The Barthel index

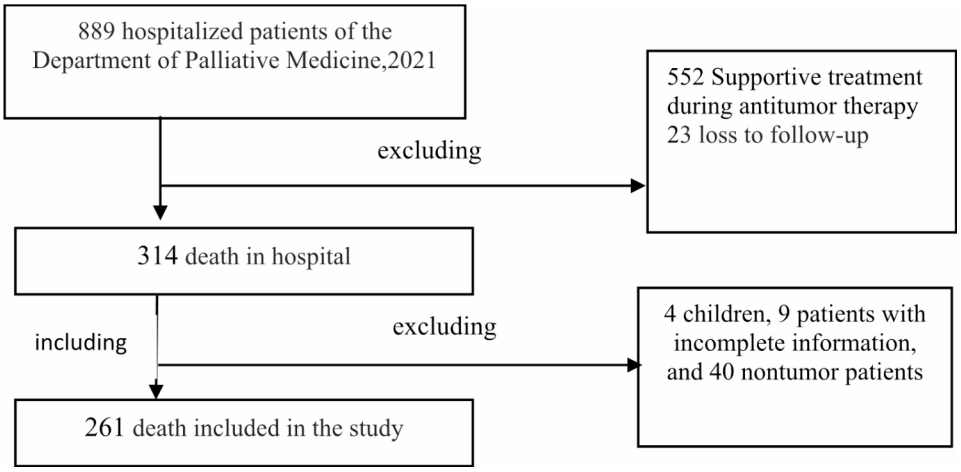

Fig. 1 The flowchart of inclusion and exclusion criteria

is used to assess the patient's dependence on others for activities of daily living on a 100-point scale; the categories used in this study were disability (score: 100), moderate disability (score: 60–95) and severe disability (score: 0–55). Frailty was assessed using the 5-item FRAIL scale, which includes five criteria: fatigue, resistance, ambulation, illnesses, and loss of weight [15]. Frailty level was identified by the number of criteria met. Individuals who met none of the criteria were considered "robust"; those who met one or two criteria were considered "prefrail," and those who met three to five criteria were defined as "frail." We also classified patients into the nonfrail group, which included robust and prefrail patients, and the frail group, which included frail patients.

The demographic characteristics, symptoms, signs, laboratory test results, frailty status, PPS score and Barthel index were analyzed and compared among patients with different survival times. Univariate and multivariate analyses were used to establish a combined influence formula for the influence of various indicators on survival time.

Statistical analysis

The Statistical Package for Social Science (SPSS) for Windows version 21.0 was used to calculate descriptive statistics and to obtain the frequency and percentage distributions. Normally distributed data are described by the mean±standard deviation, and nonnormally distributed data are described by the interquartile range (IQR) and median. Quantitative data were analyzed by t tests or rank sum tests, and categorical data were analyzed by chi-square tests. The Kaplan–Meier method was used to analyze the associations of different frailty levels and PPSs with the survival time of patients at the end of life. When $p<0.05$, the difference was considered statistically significant. Variables for which a significant difference between group A and group B was identified were included in the univariate logistic regression analysis. Multivariate logistic regression analysis was used to identify the independent risk factors affecting survival time ($p<0.05$).

The discrimination ability of prognostic factors and cutoff values was determined by the area under the receiver operating characteristic curve (AUC). The McNemar test was used to calculate the consistency between the predicted and actual values.

Ethics

The study was conducted in accordance with the principles of the Declaration of Helsinki, and the study protocol was approved by the ethics committee of West China Fourth Hospital of Sichuan University (No. HXSY-EC-20230077). Because of the retrospective nature of the study, patient consent for inclusion was waived by the ethics committee of West China Fourth Hospital of Sichuan University.

Results

Demographic characteristics

A total of 889 patients were hospitalized in the Department of Palliative Medicine of West China Fourth Hospital of Sichuan University in 2021, and 314 patients died. After excluding 4 children, 9 patients with incomplete information, and 40 nontumor patients, we ultimately included 261 adult cancer patients. The average age was 64.70±14.24 years, and the median survival time was 17 (13.04, 20.96) days. There were 122 and 139 patients in group A and group B, respectively. The sex, age groups and antitumor therapy used are listed in Table 1.

Differences between groups A and B

There were significant differences in age group, FRAIL score, PPS and Barthel index between the two groups (Table 1). In group A, 96.7% of patients were frail, and 95.1% had a Barthel index≤55. Meanwhile, in group B,

Table 1 Demographic characteristics, FRAIL scale scores, PPS scores and Barthel index scores between groups A and B

Variable		Survival days		*p*
		≤ 14 days	>14days	
No.	261	122	139	
Gender	no (%)			
	male	61(50.0)	75(54.0)	
	female	61(50.0)	64(46.0)	0.523
Age, years	M(SD)	66.1 (15.0)	63.5 (13.5)	0.128
	no (%)			
	< 70	67(54.9)	96(69.1)	
	≥ 70	55(45.1)	43(30.9)	**0.019**
Antitumor therapy	no (%)			
	none	38(31.1)	32(23.0)	
	done	84(68.9)	107(77.0)	0.139
Cancer types	no (%)			
	Lung	29(50.0)	29(50.0)	
	Gastrointestinal	61(47.7)	67(52.3)	
	Urogenital	11(35.5)	20(64.5)	
	others	21(47.7)	23(52.3)	0.596
Frail	no (%)			
	robust	0(0.0)	5(3.6)	
	Prefrail	4(3.3)	25(18)	
	frail	118(96.7)	109(78.4)	**<0.001**
Frailty	no (%)			
	No frail	4(3.3)	30(21.6)	
	frail	118(96.7)	109(78.4)	**<0.001**
PPS	no (%)			
	10%	30(24.6)	4(2.9)	
	20-30%	68(55.7)	24(17.3)	
	40-50%	24(19.7)	91(65.5)	
	≥ 60%	0(0.0)	20(14.4)	**<0.001**
Barthel index	no (%)			
	100	0((0.0)	4(2.9)	
	60–95	6(4.9)	41(29.5)	
	0–55	116(95.1)	94(67.6)	**<0.001**

78.4% were frail, and 67.6% had a Barthel score ≤ 55. PPS 10% was reported in 24.6% and 2.9% of patients in group A and group B, respectively, while PPS 20–30% was reported in 55.7% and 17.3%, PPS 40–50% was reported in 19.7% and 65.5%, and PPS ≥ 60% was reported 0.0% and 14.4%, respectively. A total of 80.3% of the patients in group A and 20.2% of the patients in group B had a PPS of 10–30%.

Dyspnea, edema, CPR and WBC were significantly different between the two groups. (see Tables 2 and 3). The number of metastases, the number of hospitalizations within one year, and the number of comorbidities were not significantly different between groups A and B (Table 4).

Table 2 Differences in symptoms and signs between groups A and B

Variable		Survival days		*p*
		≤ 14 days	>14days	
No.		122	139	
Intestinal obstruction	no (%)			
	none	102(83.6)	111(79.9)	
	yes	20(16.4)	28(20.1)	0.435
Fatigue	no (%)			
	none	84(68.9)	90(64.7)	
	yes	38(31.1)	49(35.3)	0.483
Pain	no (%)			
	none	42(34.4)	49(35.3)	
	yes	80(65.6)	90(64.7)	0.889
Dyspnea	no (%)			
	none	89(73.0)	121(87.1)	
	yes	33(27.0)	18(12.9)	**0.004**
Systolic blood pressure	no (%)			
	≥ 90	112(91.8)	133(95.7)	
(mmHg)	<90	10(8.2)	6(4.3)	0.192
Edema	no (%)			
	none	65(53.3)	104(74.8)	
	yes	57(46.7)	35(25.2)	**<0.001**
Cachexia/ emaciation	no (%)			
	none	49(40.2)	69(49.6)	
	yes	73(59.8)	70(50.4)	0.125

Associations between multiple factors and a survival time ≤ 14 days

Variables for which a significant difference between group A and group B was identified were included in the univariate logistic regression analysis. Age (≥70 years, < 70 years), PPS (10%, 20–30%, 40–50%, ≥ 60%), FRAIL scale (nonfrail, frail), edema (yes, no), CPR (<50 vs. ≥50 mg/L) and WBC count (normal, abnormal) were selected as the independent variables. According to the multivariable logistic regression analysis of age, frailty, edema, etc., a significant effect persisted for one variable. A decreased PPS increased the risk of death within 14 days (OR=6.818, 95% CI.3.944–11.785; $p<0.001$) (Table 5). Age, frailty, edema, dyspnea, CPR and WBC count were not significantly correlated in predicting the risk of death within 14 days according to the multivariate analysis.

The cutoff value of the PPS for 14-day survival

The prognostic determinant of the PPS was identified using logistic regression to establish a cutoff. According to the ROC curve, the PPS for predicting 14-day survival had an AUC of 0.888 (95% CI 0.849–0.928). The cutoff value of the PPS for 14-day survival was less than or equal to 30% (sensitivity 80.3%, specificity 79.9%) according to the Youden index. The concordance index is the probability of concordance between the predicted and observed responses based on the survival times of the subjects.

Table 3 Differences in laboratory test results between groups A and B

Variable	Total	Survival days		*p*
		≤ 14 days	>14days	
No.	261	122	139	
CPR, mg/L, M(IQR)	65.9(21.7, 121.0)	89.8(34.4, 150.0)	53.3(14.1, 97.5)	**<0.001**
<50 mg/L, no (%)		39(32.0)	68(48.9)	
≥ 50 mg/L, no (%)		83(68.0)	71(51.1)	0.005
WBC, $\times 10^9$, M(IQR)	8.9(5.8, 14.6)	11.7(7.1, 17.1)	7.7(5.5, 11.7)	**<0.001**
4–10 $\times 10^9$, no (%)		43(35.2)	78(56.1)	
Abnormal, no (%)		79(64.8)	61(43.9)	0.001
Lym, $\times 10^9$, M(IQR)	0.7(0.4, 0.9)	0.6(0.4, 0.9)	0.7(0.5, 0.9)	0.119
≥ 1.1 $\times 10^9$, no (%)		18(14.8)	26(18.7)	
<1.1 $\times 10^9$, no (%)		104(85.2)	113(81.3)	0.395
Hb, g/L, M(IQR)	95(77.5, 114.0)	92.0(72.0, 113.0)	97(81, 115)	0.311
ALB, no (%)				
<26 g/L		19(15.6)	15(10.8)	
≥ 26 g/L		103(84.4)	124(89.2)	0.252
Occult blood, no (%)				
negative		76(62.3)	91(65.5)	
positive		46(37.7)	48(34.5)	0.594

Table 4 Differences in comorbidities, metastases, and hospitalizations within 1 year between groups A and B

	Number of comorbidities M(IQR)	Number of metastases M(IQR)	Hospitalizations within 1 year M(IQR)
≤ 14 days	2(1,3)	2(1,3)	2(1, 2.25)
>14days	2(1,3)	2(1,3)	2(1, 2)
p	0.053	0.940	0.316

PPS cutoff values ≤ 30% of the predicted results were consistent with the actual values ($p=0.678$, $\kappa=0.601$).

Frailty, PPS level and survival time

According to the FRAIL scale, 5 patients were robust, 29 were prefrail, and 227 were frail. Due to the small number of robust patients, we ultimately classified the patients into a nonfrail group (FRAIL scale score 0–2) and a frail group (FRAIL scale score 3–5). Thirty-four patients were in the nonfrail group, and the rest were in the frail group. The median survival time was 48 (33.71, 62.29) days in the nonfrail group and 15 (12.46, 17.54) days in the frail group. The survival time in the nonfrail group was longer

Table 5 Logistic regression analysis: predictors of survival within 14 days

	Univariable analysis		Multivariable analysis	
	OR (95% CI)	*p*	OR (95% CI)	*p*
Age < 70 vs. ≥ 70	1.833(1.104–3.041)	**0.019**	1.417(0.746–2.692)	0.287
Frailty No frail vs. frail	8.119(2.770–3.796)	<**0.001**	1.712(0.475–6.173)	0.411
PPS ≥ 60%,40–50%, 20–30%, 10%	8.258(4.958–13.752)	<**0.001**	6.818(3.944–11.785)	<**0.001**
Edema No vs. Yes	2.606(1.545–4.395)	<**0.001**	1.756(0.918–3.361)	0.089
Dyspnea No vs. Yes	2.493(1.319–4.709)	**0.005**	1.853(0.834–4.115)	0.130
WBC 4–10 $\times 10^9$ vs. abnormal	2.349(1.425–3.874)	**0.001**	1.527(0.802–2.907)	0.198
CPR <50 vs. ≥50 mg/L	2.038(1.230–3.379)	**0.006**	0.818(0.416–1.610)	0.561

than that in the frail group ($p<0.001$). The results are shown in Fig. 2.

The median survival time was 5 (95% CI. of 2.148–7.852) days in the PPS 10% and 10 (95% CI.7.833–12.167) days in the PPS 20–30% and 31 (95% CI. 27.716–34.284) days in PPS 40–50%, 65 (95% CI. 38.704–91.296) in PPS≥60%, respectively. The survival time of patients with a high PPS was longer than that of patients with a low PPS ($p<0.001$). The results are shown in Fig. 3.

Discussion

Survival prediction allows physicians to provide appropriate advice to advanced cancer patients and their families at the end of life, such as for the discontinuation of antineoplastic therapy, the discontinuation of life support therapy, and the provision of comfort care [16]. Survival time has an important impact on choices made by patients in palliative care, such as the place of death, the mode of care, the financial planning, and the mode of farewell [17].

It is common for clinicians to make overly optimistic or pessimistic survival predictions for advanced patients [18, 19]. Survival time is determined by the interaction of multiple complex factors [20], especially at the end of life. Studies have shown that [5] the prognostic factors in patients with advanced disease are different from those in patients with early disease. The prognostic factors in patients with early disease are mainly related to clinicopathological classification and treatment methods, while those in patients with advanced disease are mainly related to clinical symptoms and signs, biochemical test results, physical status and other factors. In our study, the prognostic factors for survival time were screened from among demographic characteristics, PPS, FRAIL scale, Barthel index, symptoms, signs and laboratory examination. In the simple association analysis, significant differences in age group, PPS, FRAIL scale, Barthel index, edema, dyspnea, CPR and WBC count were found between the two groups. Multivariate analysis eliminated confounding factors and concluded that the PPS was associated with the risk of death within 14 days.

The PPS was developed based on the Karnofsky Performance Scale (KPS) and used to assess the functional performance of patients in palliative care. A meta-analysis of 17 studies confirmed that PPS is a strong predictor of survival in palliative care patients, but whether the results can be applied to patients of different races and from different countries needs to be confirmed by follow-up studies [21]. The tool can be used in both cancer and noncancer patients, and its content is relatively simple and easy to use. However, there is no unified standard for the cutoff point in each study. Survival estimates ranged

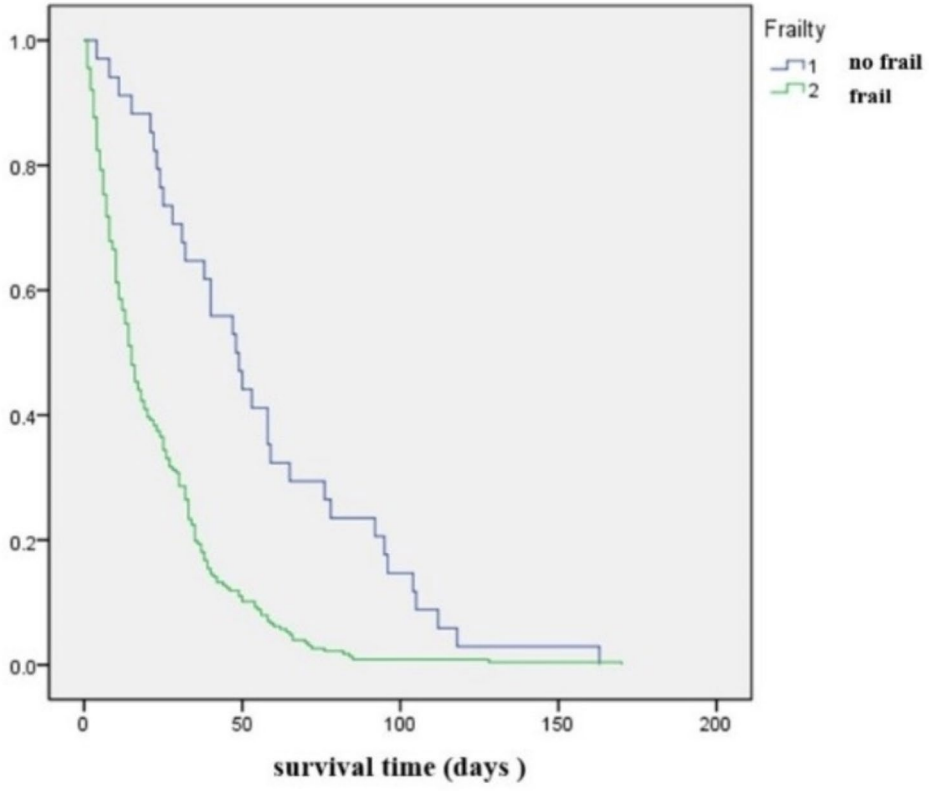

Fig. 2 K–M survival curve according to the Frail Scale

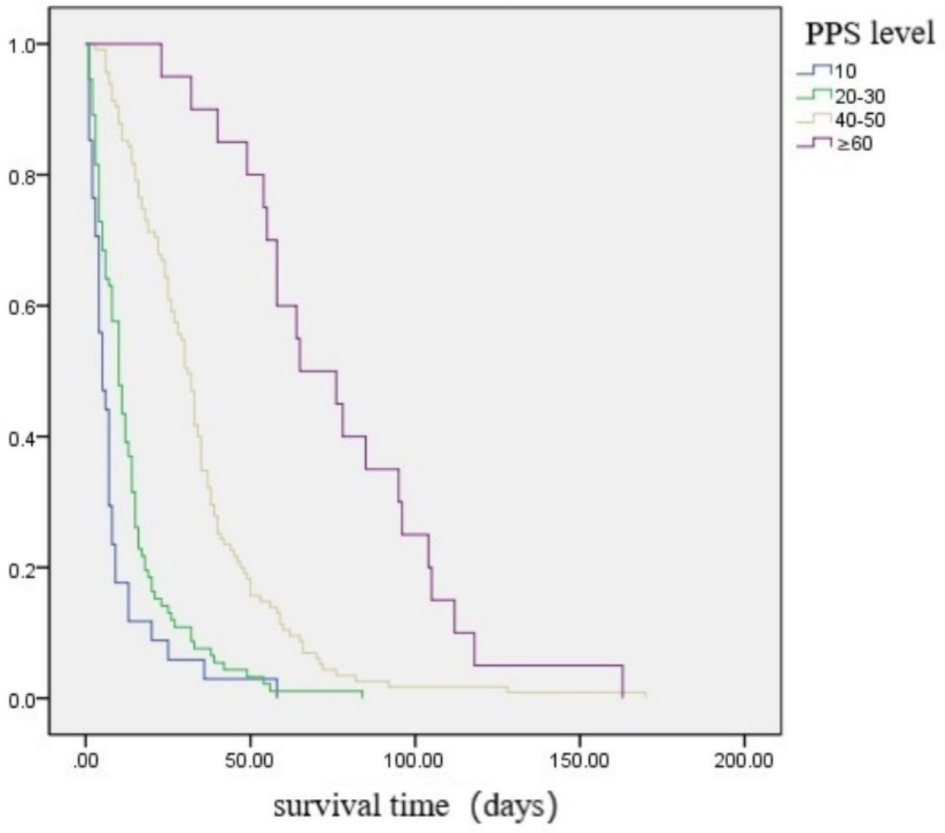

Fig. 3 Kaplan–Meier survival curve according to PPS

from 1 to 3 days for patients with PPSs of 10% compared with 5 to 36 days for those with scores of 30%. In this study, PPSs of 10% and 20–30% accounted for a high proportion of deaths within 14 days, consistent with reports using PPSs of 40% as the cutoff point for referral to palliative care [22]. The difference is that the institution in our study was a tertiary palliative care institution, and PPS≤30% was used as one of the indicators to predict death within 14 days. A PPS≥40%, combined with other predictors, can be used as a criterion for the referral of patients to tertiary palliative care facilities.

Functional status is potentially associated with survival time [23]. The Barthel Index has been used to assess functional independence since 1965 and is widely used in elderly patients and patients with neurological diseases [24–27]. When applying the index in palliative care, patients with low scores or weekly decreases had poor prognoses, independent functioning of patients was assessed, and patients were guided to the selection of treatment and the place of death [28]. Neoplastic diseases affect daily living activities and instrumental activities of daily living and reduce the independence of elderly patients [29]. Among patients with advanced disease, those with a lower Barthel index had a lower palliative performance score and shorter survival time. Functional assessment by the Barthel index showed a high prevalence of severe impairment in performing basic ADLs [30]. In this study, 95.08% of the patients who died within 14 days were dependent, and 67.63% of the patients who survived more than 14 days were dependent.

Frailty was first applied to geriatric patients and is defined as [31] 'a biologic syndrome of decreased reserve and resistance causing vulnerability to adverse outcomes'. Prefrailty and frailty were significantly associated with mortality for all age groups in men and women after adjustment for confounders [11]. More than half of elderly cancer patients meet the criteria for frailty or prefrailty [32], and 79.6% of elderly cancer patients meet the criteria for frailty [29]. Patients with frailty have decreased adaptability, which is associated with adverse events and increases the risk of mortality [11]. In a 10-year follow-up of people aged 30–79 years in China, the mortality of frail people was 36.7 per 1000 person-years for all-cause cancer and 6.9 per 1000 person-years for cancer. The risk of mortality in frail cancer patients was greater than that in nonfrail cancer patients in the <50 years, 50–64 years and >65 years age groups [12]. In our study, 96.72% of the cancer patients who died within 14 days were frail, while 78.41% of the patients who died after 14 days were frail.

The median survival time was 48 (33.71, 62.29) days in the nonfrail group and 15 (12.46, 17.54) days in the frail group. Patients in the frail group had a shorter survival time than patients in the nonfrail group at the end of life, suggesting that frailty may be one of the predictors of death at the end of life. However, in the multivariable analysis, frailty had little association with the risk of death within 14 days. The reason may be that patients in our study were at the end of life, and the survival time ranged from 1 to 170 days. The incidence of frailty in the 261 patients was 222 (87.0%). At the end of life, the prevalence of frailty was high in both groups. The relationship between frailty and the risk of death in patients at the end of life needs to be further confirmed by expanding the study population and extending the observation time.

The PPS, Barthel index, and Frail scale score overlapped for ambulation and activity. Finally, the PPS and Frail Scale were selected for multifactor evaluation. According to the Barthel index, disability accounted for 80.5% of the deaths and was more common in patients with a survival time ≤ 14 days. The prevalence of frailty and dependence was greater than that in the other groups, which was consistent with the correlation between frailty and the Barthel index.

Among the end-of-life factors, dyspnea, fatigue, intestinal obstruction, fatigue, disturbance of consciousness, pain, gastrointestinal bleeding, respiration and blood pressure, and blood oxygen saturation are related to survival [33, 34]. However, the present study suggested that only dyspnea and edema were significantly different between the two groups. The results suggested that there may be differences in the prediction of end-of-life survival time by symptoms and signs in different regions and populations. However, this needs to be further verified. Alanine transaminase, white blood count, C-reactive protein, platelet count, urea, lymphocyte count, neutrophil count, albumin, and alkaline phosphatase are laboratory indicators that have been associated with end-of-life outcomes [33, 35]. The abnormalities in CPR and WBC count in group A were greater than those in group B, which was likely related to the decline in immunity and multiple organ function in patients who died.

Age, PPS, FRAIL score, edema status, dyspnea status and white blood cell count were used in the multivariable analysis. These indicators are reliable and easy to assess. The results showed that age, FRAIL scale score, CPR, WBC count, edema and dyspnea had little contribution to the logistic regression equation, while PPS had a substantial contribution to the prediction of mortality risk within 14 days. The PPS has 5 items and 10 grades, including ambulation, activity evidence of disease, self-care, intake and consciousness level, to summarize the performance of patients at the end of life, which can be used to predict survival time. Our study was a single-center retrospective study with a small sample size. The study time could be extended, and the number of patients could be increased to further study the influence of frailty, PPS and other indicators on survival at the end of life.

Conclusions

A decrease in PPS increased the risk of death within 14 days in patients with advanced cancer. The prevalence of frailty and disability was high at the end of life. Frailty may shorten the survival time of patients at the end of life.

Acknowledgements
The authors gratefully acknowledge the patients and participants involved in this study.

Author contributions
Xinyu Hu and Yang Chen helped in data collection, data analysis and writing. Chuan Zhang, Jianjun Jiang and Xin Xu helped with data analysis and editing. Yang Chen and Meiying Shao helped in conceptualization, and editing. The author(s) read and approved the final manuscript.

Funding
Sichuan Natural Science Foundation Project (2024NSFSC0550).

Data availability
The data used and analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
The study was conducted in accordance with the principles of the Declaration of Helsinki. This study was approved by the medical ethics committee of West China Fourth Hospital of Sichuan University (No. HXSY-EC-20230077). Because of the retrospective nature of the study, patient consent for inclusion was waived by the ethics committee of West China Fourth Hospital of Sichuan University.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 27 September 2023 / Accepted: 29 November 2024
Published online: 02 December 2024

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