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Original Article

Ten-year Experience and Evolving of Palliative Care at a Tertiary Medical Center in Taiwan

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Abstract

Background: Palliative care (PC) improves quality of life for patients with life-threatening illnesses. Despite global efforts, PC access remains limited. This study evaluated the 10-year trends of PC coverage and its impact on survival among advanced cancer patients at a tertiary medical center in Taiwan. **Materials and Methods:** A retrospective cohort study was conducted on 6096 hospitalized Stage IV cancer patients who died or were critically discharged between 2010 and 2020. Patients were categorized into PC and non-PC groups. Survival outcomes were analyzed using Kaplan–Meier curves and log-rank tests. **Results:** Of the cohort, 2792 patients received PC, and 3304 did not. PC recipients were older and had more comorbidities. The PC coverage rate increased annually over the decade. Patients receiving PC showed significantly better overall survival compared to those without PC, particularly in colon, esophageal, liver, lung, oral, prostate, and upper gastrointestinal cancers ($P < 0.05$). **Conclusion:** PC integration steadily improved over 10 years and was associated with survival benefits in several cancer types. These findings support early PC incorporation into oncology practice, though heterogeneity across malignancies warrants further investigation.

Keywords: Advanced cancer, hospital-based palliative care, palliative care, retrospective cohort study, survival outcomes

Introduction

Palliative care (PC) is a specialized medical approach aimed at improving the quality of life (QoL) for patients and their families facing life-threatening or life-limiting illnesses. It focuses on the prevention and relief of suffering through early identification, comprehensive assessment, and management of physical, psychosocial, and spiritual problems associated with serious illness and is applicable across all stages of disease alongside curative or life-prolonging therapies.[1]

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This model of care is particularly relevant for individuals with advanced cancers, progressive neurologic conditions, and end-stage organ failure. Among these, cancer patients constitute a key population due to the high burden of symptoms and psychosocial distress throughout the disease trajectory.[2] The American Society of Clinical Oncology recommends integrating PC into standard oncologic care within 8 weeks of

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diagnosis for patients with advanced cancers to address these complex needs.[3]

However, access to PC remains severely limited worldwide. According to The Lancet Commission, over 61 million people globally experience serious health-related suffering annually, with more than 80% residing in low-and middle-income countries (LMICs), where <10% have access to appropriate palliative services. Alarmingly, these regions receive <1% of the global opioid supply necessary for pain control.[4] Even in high-income countries, disparities persist in the timing and delivery of palliative services.

The benefits of timely PC are well established. In a landmark randomized controlled trial, Temel *et al*. demonstrated that patients with metastatic nonsmall-cell lung cancer who received early PC had significantly improved QoL, reduced depressive symptoms, less aggressive care at the end of life, and even prolonged survival compared to those receiving standard oncologic care alone (median survival: 11.6 vs. 8.9 months).[5] Similarly, the ENABLE II study found that early, structured palliative interventions led to better patient-reported outcomes and mood in patients with advanced cancer.[2] These findings highlight the importance of not only increasing PC coverage but also ensuring its timely integration into routine cancer care.

In Taiwan, the development of hospital-based PC programs has expanded over the past decade, supported by national policy and accreditation incentives.[6-8] However, real-world data regarding the timing, coverage rate, and clinical impact of integrated PC services within tertiary medical centers remain limited.

This study aimed to (1) analyze the annual PC coverage rate among deceased cancer patients at Tri-Service General Hospital in Taiwan over a 10-year period and (2) explore the potential survival benefit associated with integrated PC services in patients with advanced-stage malignancies.

Materials and Methods

Study design and setting

This retrospective cohort study was conducted at Tri-Service General Hospital in Taiwan, evaluating patients with advanced cancer who were hospitalized and either deceased or critically discharged between January 1, 2010, and December 31, 2020.

Data collection and outcome measures

We conducted a comprehensive review of medical records to collect data on patient demographic information, cancer type, timing of PC initiation, and time of death. The time interval from the first PC contact to death was calculated for each patient in PC group.

Referral to PC at our institution is guided by an institutional PC team, which regularly educates oncology clinicians on the indications for PC referral, including advanced cancer, significant symptom burden, poor prognosis, and impaired QoL, in accordance with national and international guidelines. However, the decision to initiate PC ultimately remains individualized and at the discretion of the treating physician.

All hospitalized Stage IV cancer patients with confirmed death or critical discharge were enrolled. Inclusion criteria were as follows: (1) a confirmed diagnosis of Stage IV cancer, (2) no loss to follow-up until death, and (3) complete medical records available for review.

For the survival benefit analysis, patients were divided into two cohorts: (1) PC group: stage IV cancer patients who received PC physician consultation or interdisciplinary PC from the institutional PC team and (2) non-PC group: stage IV cancer patients with no record of PC referral or team involvement.

It should be noted that PC in our cohort functioned as a supportive service in parallel with ongoing disease-directed treatments. Patients in the PC group frequently continued to receive anticancer therapies, palliative radiotherapy, and transfusion support as determined by the clinical team and based on individual patient needs. PC interventions were not mutually exclusive with active cancer treatment, but rather aimed to optimize symptom control, provide psychosocial support, and facilitate shared decision-making.

Statistical analysis

PC Coverage rate was defined as the proportion of deceased patients who received PC services before death. It was calculated as follows: Coverage Rate (%) = (Number of patients who received PC before death/Number of deceased patients) ×100%.

Kaplan–Meier survival curves were generated for subgroup analysis across various cancer types. Log-rank tests were used to compare survival between groups. $P < 0.05$ was considered statistically significant.

Categorical variables were presented as numbers and percentages, whereas continuous variables were expressed as means and standard deviations. For comparing characteristics between the PC and control groups, we used the Chi-square test or Fisher's exact test for categorical variables, as appropriate. The Wilcoxon rank-sum test or Kruskal–Wallis test was applied for continuous variables, depending on the number of groups being compared. Overall survival (OS) was calculated as the duration from the initial diagnosis of Stage IV cancer to the date of death, for both PC and non-PC groups. The Kaplan–Meier method was used to estimate the interval between the initial diagnosis of Stage IV cancer and death, and OS. The differences between survival curves were assessed using the log–rank test.

Analyses were performed using R version 4.1.0 (R Foundation for Statistical Computing, Vienna, Austria). Specifically, the survival analysis was conducted using the "survival" package, and the "survminer" package was used for generating Kaplan–Meier plots.

This study was approved by the ethics review boards of Tri-Service General Hospital (No. B202505108; Approval Date: May 16, 2025). All applicable international, national, and/or institutional guidelines for the care and use of animals were

followed. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. These data were obtained from medical records in a fully anonymized and de-identified manner. The consent was waived by the ethics committee.

Results

A total of 6096 hospitalized cancer patients who either died or were critically discharged between January 1, 2010, and December 31, 2020, were included in this study. Among them, 3304 patients did not receive PC (non-PC group) and 2792 patients received PC (PC group) [Table 1].

The mean age was significantly higher in the PC group compared to the non-PC group (68.31 ± 13.54 years vs. 66.82 ± 13.66 years, $P < 0.001$). Gender distribution was similar between the two groups, with males accounting for 63.7% in the non-PC group and 64.5% in the PC group ($P = 0.488$).

Regarding comorbidities, several conditions were more prevalent among patients who received PC. Compared to the non-PC group, the PC group had significantly higher rates of dementia (8.8% vs. 5.9%, $P < 0.001$), cerebrovascular disease (22.1% vs. 13.7%, $P < 0.001$), chronic pulmonary disease (26.6% vs. 17.9%, $P < 0.001$), liver disease (30.6% vs. 24.2%, $P < 0.001$), hemiplegia (6.2% vs. 3.0%, $P < 0.001$), and renal disease (16.7% vs. 11.7%, $P < 0.001$). Conversely, the prevalence of congestive heart failure (6.6% vs. 8.1%, $P = 0.028$) and peripheral vascular disease (5.6% vs. 4.1%, $P = 0.009$) was significantly lower in the PC group.

Other comorbidities, including myocardial infarction, rheumatologic disease, diabetes mellitus, and AIDS, showed no statistically significant differences between groups. The median number of days between the first PC contact and death among PC patients was 55.97 ± 155.24 days.

The proportion of hospitalized cancer patients receiving PC services increased steadily from 2010 to 2020 at Tri-Service General Hospital [Figure 1]. This upward trend reflects enhanced institutional efforts in integrating PC into standard oncologic care over the past decade.

We further analyzed the distribution of cancer types between PC and non-PC groups [Table 2]. In the PC group, lung cancer accounted for the largest proportion (38.6%), followed by oral (11.9%), colon (9.2%), rectal (6.6%), and liver cancer (6.6%). The non-PC group was characterized by lung (32.4%), prostate (10.1%), nasopharyngeal carcinoma (8.9%), colon (7.8%), and oral cancer (7.7%) as the most frequent diagnoses.

Analysis of annual trends from 2010 to 2020 revealed that the percentage of lung cancer patients receiving PC increased over time, whereas the distribution of other cancer types, such as colon, oral, rectal, and liver cancer, remained relatively stable. Prostate cancer showed an increasing trend in the non-PC group during the latter half of the decade. The distributions of less common cancers, including breast and gynecologic cancers, were consistently low in both groups.

The median OS for the non-PC group was 427.0 days (95% confidence interval [CI]: 406.5–445.0), while for the PC group it was 505.0 days (95% CI: 470.0–537.0). The Kaplan-Meier

Table 1: Baseline patient characteristics and comorbidities

Variables	Non-PC group (n=3304), n (%)	PC group (n=2792), n (%)	P
Age	66.82±13.66	68.31±13.54	<0.001
Gender			0.488
Male	2103 (63.7)	1801 (64.5)	
Female	1201 (36.3)	991 (35.5)	
Height (cm)	162.33±12.00	163.23±9.33	-
Weight (kg)	62.01±15.11	60.90±35.32	-
Comorbidities			
Myocardial infarction	71 (2.1)	52 (1.9)	0.428
Congestive heart failure	268 (8.1)	185 (6.6)	0.028
Peripheral vascular disease	136 (4.1)	155 (5.6)	0.009
Dementia	194 (5.9)	246 (8.8)	<0.001
Cerebrovascular disease	454 (13.7)	617 (22.1)	<0.001
Chronic pulmonary disease	593 (17.9)	743 (26.6)	<0.001
Rheumatological disease	53 (1.6)	50 (1.8)	0.573
Peptic ulcer disease	758 (22.9)	727 (26.0)	0.005
Liver disease	799 (24.2)	854 (30.6)	<0.001
Diabetes mellitus	812 (24.6)	729 (26.1)	0.170
Hemiplegia	99 (3.0)	174 (6.2)	<0.001
Renal disease	385 (11.7)	466 (16.7)	<0.001
AIDS	3 (0.1)	2 (0.1)	1.000[#]
Days between PC and death (days)	55.97±155.24	-	-

[#]Testing by Fisher's exact test, Wilcoxon test, or Kruskal–Wallis test, respectively. PC: Palliative care, AIDS: Acquired immunodeficiency syndrome

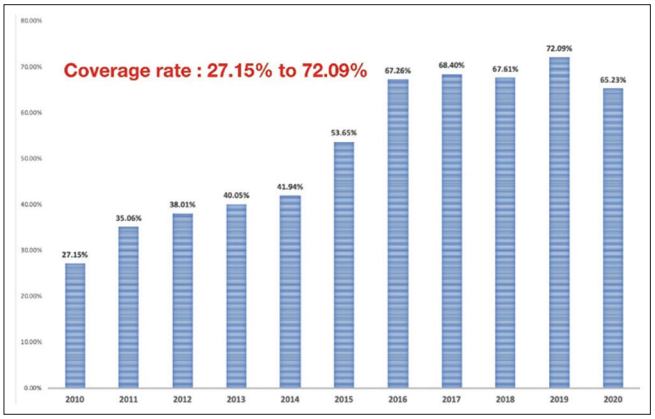

Figure 1: Annual Palliative Care Coverage Rate from 2010 to 2020 at Tri-Service General Hospital. The proportion of hospitalized cancer patients receiving palliative care services showed a consistent upward trend over the 10-year period, reflecting increasing integration of palliative care into standard oncologic management

Table 2: Cancer type distribution by palliative care status from 2010 to 2020

Cancer type	PC group (%)	Non-PC group (%)
Lung	38.6	32.4
Oral	11.9	7.7
Colon	9.2	7.8
Rectal	6.6	4.7
Liver	6.6	7.3
NPC	6.3	8.9
Upper GI	6	5.9
Breast	5.1	6.1
Prostate	4.6	10.1
Esophagus	3.4	3.2
Gynecologic	1	4.6
Urothelial	0.8	1.3

PC: Palliative care, NPC: Nasopharyngeal carcinoma, GI: Gastrointestinal

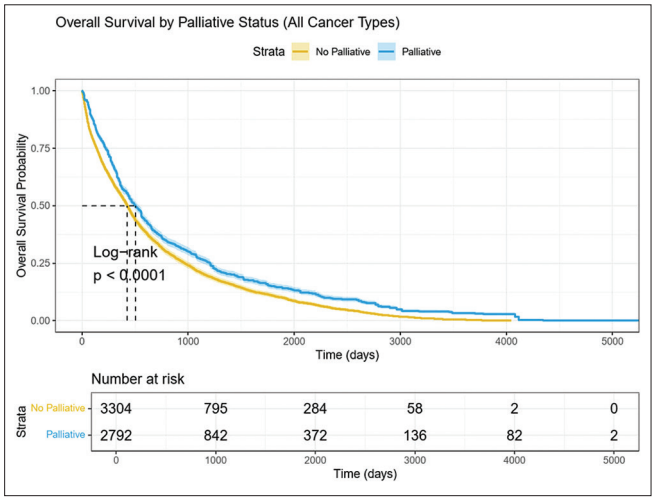

Figure 2: Kaplan–Meier Curves for Overall Survival Between Palliative Care and Control Groups in Advanced Cancers. Patients who received palliative care demonstrated significantly improved overall survival compared to those who did not receive palliative care (log-rank test, $P < 0.05$)

survival analysis demonstrated that patients who received PC had significantly better OS compared to those who did not (log–rank test, $P < 0.05$) [Figure 2].

Subgroup analyses by cancer type revealed a positive survival effect associated with PC in patients with colon cancer, esophagus cancer, liver cancer, lung cancer, oral cancer, prostate cancer, and upper gastrointestinal cancer [Figure 3a-g]. In these subgroups, patients receiving PC exhibited longer median survival times compared to controls, with statistical significance achieved across all mentioned cancers. In contrast, a negative survival trend was observed in certain other cancer subgroups [Figure 4], indicating heterogeneity in survival benefits depending on tumor type.

Discussion

This retrospective cohort study analyzed PC utilization among 6096 hospitalized cancer patients at Tri-Service General Hospital, Taiwan, from 2010 to 2020. Results showed a steady increase in annual PC coverage rates over 10 years, reflecting the growing integration of PC into standard cancer management. Patients receiving PC were older and had a higher prevalence of comorbidities such as dementia, cerebrovascular, pulmonary, and liver diseases. Survival analyses revealed significantly improved OS in patients receiving PC compared to non-PC groups, especially notable in cancers including colon, esophagus, liver, lung, oral cavity, prostate, and upper gastrointestinal tract. However, heterogeneity in survival benefits was observed across different cancer types. The findings underscore the clinical value of the timely integration of specialized PC in oncology practice, despite variability in effectiveness among specific malignancies.

Globally, significant disparities exist in PC access, particularly between LMICs.[4] Despite its proven benefits in improving QoL for patients with serious illnesses, PC remains underutilized in LMICs due to multiple barriers, including limited policy support,[9] insufficient training of healthcare providers,[1] and inadequate access to essential medications. Sociocultural and spiritual factors also profoundly influence perceptions and acceptance of PC services, creating additional layers of complexity.[10] In our study, we observed the PC coverage rate annually increasing over 10 years in Taiwan. This may be contributing to establishing national policies to integrate PC into healthcare systems, enhancing educational programs for medical professionals, policymakers, and the community, and ensuring the availability of essential medications.[11]

The integration of early PC into standard oncology treatment has demonstrated several clinical benefits, notably in patients with advanced cancers.[12] Early intervention with PC aims to proactively manage symptoms, address emotional and psychosocial challenges, and enhance overall QoL for both patients and their caregivers.[13,14] First, it provides effective management of distressing physical symptoms such as pain, dyspnea, fatigue, nausea, and anorexia, which improves patients' daily functioning and comfort. In a landmark randomized trial, Temel *et al*. demonstrated that patients with metastatic nonsmall-cell lung cancer who received early PC reported significantly better QoL (FACT-L score: 98.0 vs. 91.5, $P = 0.03$) and fewer depressive symptoms compared to those receiving standard care.[5] Second, PC offers psychological and emotional support that helps patients cope with the stress and existential distress of serious illness. Greer *et al*. found that early PC promoted the use of approach-oriented coping strategies, which significantly mediated improvements in QoL and reduced depressive symptoms over time.[15] Third, PC emphasizes communication about prognosis and care goals, facilitating shared decision-making and aligning treatment with patients' values. Zimmermann *et al*., in a cluster-randomized trial, reported that early PC led to improvements in spiritual well-being and greater satisfaction with care (as measured by QUAL-E and FAMCARE scores).[16] In summary, PC improves QoL not only by alleviating physical suffering but also by addressing the psychological, social, and communication needs of patients and their families.

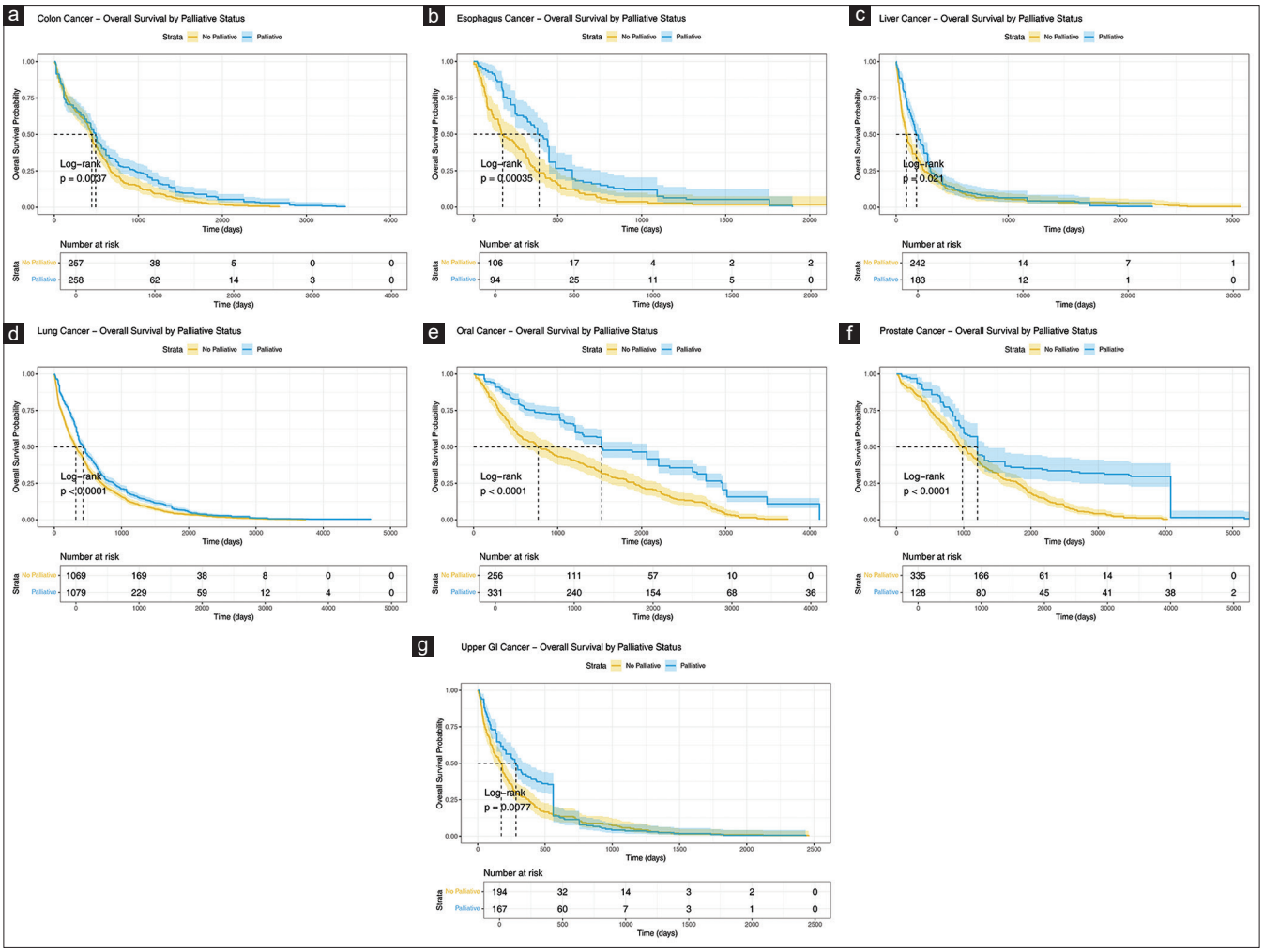

Figure 3: Kaplan–Meier Curves Showing Positive Survival Trends Associated with Palliative Care in Specific Cancer Types. (a) Colon cancer, (b) Esophagus cancer, (c) Liver cancer, (d) Lung cancer, (e) Oral cancer, (f) Prostate cancer, and (g) Upper gastrointestinal cancer. Across these malignancies, patients who received palliative care exhibited prolonged survival compared to control groups (log-rank tests, $P < 0.05$ for each)

Several clinical studies have provided evidence supporting the positive impact of early PC. Our findings align with previous research, including the landmark study by Temel *et al*.,[5] which demonstrated survival benefits of early PC in metastatic non-small-cell lung cancer. Similar to their findings of extended survival (2.7 months), our study also showed significant survival improvements in several cancer types, particularly in cancers of colon, esophagus, liver, lung, oral cavity, prostate, and upper gastrointestinal tract. Similarly, Ramirez and Verma highlighted that early PC not only improved QoL but also positively impacted caregiver outcomes, reducing caregiver burnout and improving bereavement adjustment.[17] The benefits of early PC also include earlier referrals to hospice, potentially less aggressive interventions at end-of-life, and enhanced patient and family satisfaction.[17] Contrastingly, the recent EPIC trial, a multicenter randomized phase 3 study focusing on metastatic upper gastrointestinal cancers, did not find a significant difference in OS between patients receiving early PC and those receiving standard oncological care alone.[18] This highlights the variability of PC outcomes across different cancer types and healthcare settings. While our retrospective analysis suggests potential survival benefits associated with PC in certain cancer types, we acknowledge that establishing definitive causal relationships between PC intervention and survival improvement remains challenging. The observed associations may be influenced by various confounding factors that are difficult to control for in retrospective studies.

Moreover, the effectiveness of early PC on improving QoL has been supported across several studies using validated assessment tools. Zimmermann *et al*. employed the FACIT-Sp and QUAL-E scales in their cluster-randomized trial and found that early PC significantly improved end-of-life QoL and patient satisfaction, despite a non-significant primary endpoint at 3 months.[16] Temel *et al*. used the FACT-L scale in patients with metastatic nonsmall-cell lung cancer and reported a significant QoL improvement at 12 weeks, alongside reduced depression and longer survival.[5] Greer *et al*. further explored psychological mechanisms, demonstrating that early PC enhances approach-oriented coping, which mediates improved QoL and mood as measured by FACT-G and PHQ-9.[15] These

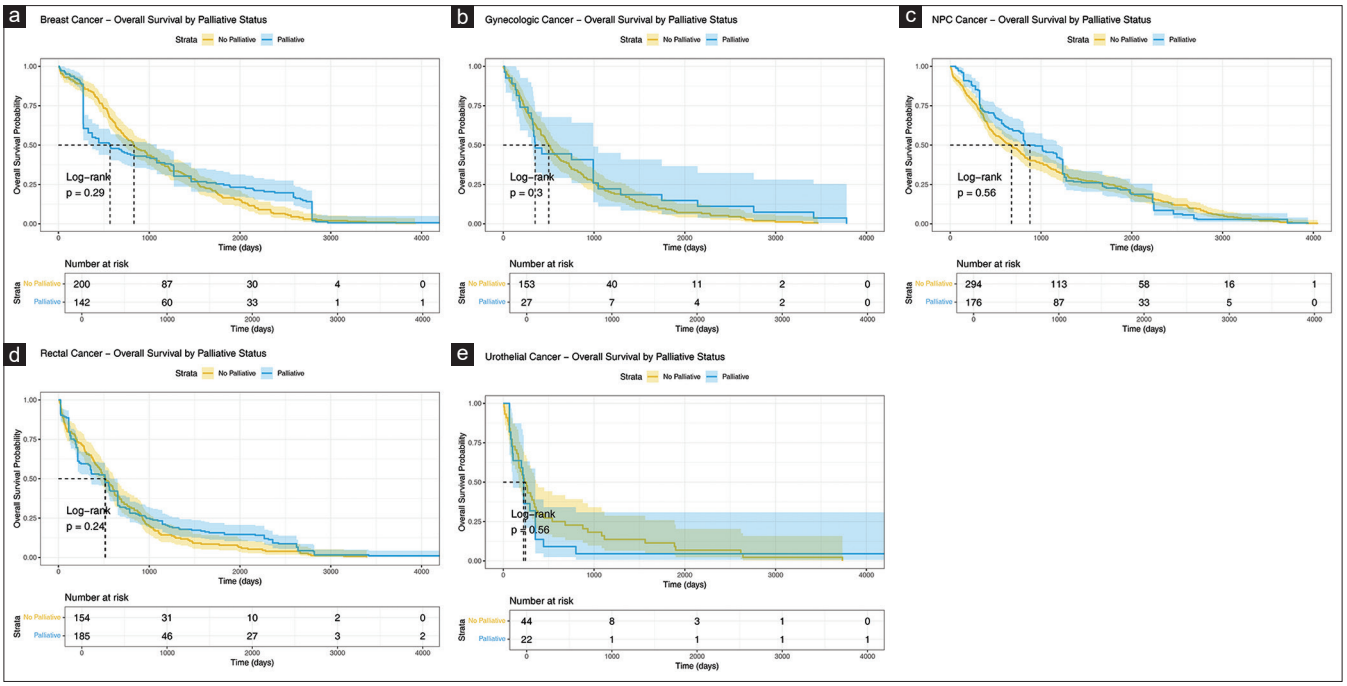

Figure 4: Kaplan–Meier Curves Showing Neutral or Negative Survival Trends Associated with Palliative Care in Other Cancer Types. In some malignancies, the association between palliative care involvement and overall survival was neutral or less pronounced, indicating variability in palliative care outcomes based on cancer type. (a) Breast cancer, (b) Gynecologic cancer, (c) Nasopharyngeal carcinoma, (d) Rectal cancer, and (e) Urothelial cancer

findings collectively highlight the multidimensional benefits of early PC, suggesting that beyond symptom management, it empowers patients with adaptive coping strategies, enhances psychosocial support, and improves both subjective well-being and clinical outcomes. Although our study could not directly evaluate changes in patient-reported QoL, future prospective research is warranted to more comprehensively assess the multidimensional benefits of PC beyond survival outcomes.

Beyond the statistical findings regarding survival outcomes, it is essential to acknowledge the fundamental humanistic value of PC that cannot be fully captured through quantitative analysis. PC's core philosophy centers on providing compassionate, patient-centered approaches that address physical symptoms while also attending to psychological, social, and spiritual needs.[19,20] These aspects – the relief of suffering, preservation of dignity, emotional support for both patients and families, and facilitation of meaningful conversations about goals of care – represent immeasurable benefits that extend far beyond survival metrics.[21,22] While our study focused on measurable outcomes like survival, we recognize that the comfort, compassion, and holistic support provided through PC interventions may contribute significantly to patients' overall well-being during their cancer journey. These humanistic elements, though difficult to quantify, represent the heart of PC practice and likely influence patients' experiences in ways that survival statistics alone cannot reflect.

This study has several limitations. The retrospective design of this study introduces inherent limitations, including selection bias and potential heterogeneity in the delivery of PC across different years, as new clinical practices and guidelines were implemented over time. In addition, the individualized nature of palliative interventions and the lack of standardized referral criteria in real-world practice may have influenced patient selection and outcomes. Being confined to a single tertiary medical center reduces generalizability to other settings. The heterogeneity in PC efficacy across cancer types suggests confounders like tumor biology and disease progression that were not fully adjusted for. A significant limitation is our inability to assess patient-centered outcomes such as quality-of-life improvements and symptom burden reduction – primary aims of PC that cannot be quantified from retrospective medical records. Future prospective research may be warranted to more comprehensively assess the multidimensional benefits of PC. This restricts our assessment to survival data alone, making our findings hypothesis-generating rather than conclusive. Despite robust statistical methods, residual confounding factors, including socioeconomic status and caregiver support, may have influenced outcomes.

Conclusion

Our retrospective analysis suggests a potential association between PC and survival outcomes in certain cancer types, though this relationship varied considerably across different malignancies. These observations should be interpreted with caution, given the inherent limitations of retrospective data. Future prospective, multicenter studies with rigorous methodology are needed to address the confounding factors identified in our study and further explore the complex interplay between palliative interventions, QoL, and survival outcomes.

Data availability statement

The data presented in this study are available on request from the corresponding author due to privacy, legal, and ethical reasons.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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