

Article

Changes in depression, anxiety, and distress coinciding with psychosocial support in pediatric oncology patients: a prospective pre–post analysis

Luyun Tong¹, Yinjuan Yu¹, Hongjiao Wang¹, Yanhui Ye¹, Yan He^{2,*}

¹ Department of Pediatrics, Longyou County People's Hospital, Longyou 324400, Zhejiang, China

² Department of Ultrasonography, Longyou County People's Hospital, Longyou 324400, Zhejiang, China

*Corresponding author: Yan He, 15167095539@163.com

CITATION

Tong L, Yu Y, Wang H, et al. Changes in depression, anxiety, and distress coinciding with psychosocial support in pediatric oncology patients: a prospective pre–post analysis. *Psycho-Oncologie*. 2026; 20(4): 5731.
<https://doi.org/10.18282/po5731>

ARTICLE INFO

Received: 6 February 2026

Revised: 19 May 2026

Accepted: 4 June 2026

Available online: 30 June 2026

COPYRIGHT



Copyright © 2026 by author(s).

Psycho-Oncologie is published by PiscoMed Publishing Pte Ltd. This work is licensed under the Creative Commons Attribution (CC BY) license. <https://creativecommons.org/licenses/by/4.0/>

Abstract: Psychological distress is highly prevalent among pediatric oncology patients during hospitalization and may adversely affect emotional well-being and clinical care. This prospective pre–post observational study examined changes in depression, anxiety, and psychological distress coinciding with psychosocial support among hospitalized pediatric oncology patients, and explored associations between length of hospital stay and baseline psychological symptoms. The study was conducted in the Pediatrics Department of Longyou County People's Hospital and included pediatric oncology inpatients aged 1–14 years. Psychological outcomes were assessed at admission and after psychosocial support using the Patient Health Questionnaire-9, Generalized Anxiety Disorder-7, and the National Comprehensive Cancer Network (NCCN) Distress Thermometer. Changes in psychological outcomes were analyzed using the Wilcoxon signed-rank test (reporting Z values), and Spearman correlation analysis was performed to examine associations between length of hospital stay and baseline psychological measures. A total of 29 patients were included. Significant reductions were observed in depressive symptoms ($Z = -4.70$, 95% CI for change: 4.5 to 7.5, $P < 0.001$), anxiety symptoms ($Z = -4.71$, 95% CI for change: 4.0 to 7.0, $P < 0.001$), and psychological distress ($Z = -4.69$, 95% CI for change: 2.0 to 4.0, $P < 0.001$) coinciding with the provision of psychosocial support. Length of hospital stay was not significantly correlated with baseline depression, anxiety, or distress scores. Strong positive correlations were observed among baseline measures of depression, anxiety, and psychological distress. These findings indicate that improvements in emotional well-being coincided with the delivery of psychosocial support during inpatient pediatric oncology care; however, due to the observational pre–post design without a control group, causal conclusions cannot be drawn. Baseline psychological burden appears independent of hospitalization duration, underscoring the importance of routine psychological screening and psychosocial care for hospitalized pediatric oncology patients.

Keywords: anxiety; depression; pediatric oncology; psychological distress; psychosocial support; quality of life

1. Introduction

Cancer remains one of the leading causes of morbidity and mortality among children and adolescents worldwide. Advances in early diagnosis and multimodal treatment have substantially improved survival rates in pediatric oncology; however, increased survival has been accompanied by growing recognition of the psychological burden associated with cancer diagnosis, treatment, and hospitalization. Children with cancer often experience a complex interplay of emotional responses, including fear, sadness, anxiety, and distress, which may arise at diagnosis and persist throughout the course of treatment and recovery [1,2].

Hospitalization represents a particularly vulnerable period for pediatric oncology patients. Inpatient care often involves prolonged separation from familiar environments, exposure to invasive medical procedures, disruption of daily routines, and uncertainty regarding treatment outcomes. These factors may intensify emotional distress and contribute to elevated levels of depression and anxiety during hospitalization [3,4]. Unlike adult patients, children may have limited cognitive and emotional resources to fully comprehend their illness, making them especially susceptible to psychological distress during inpatient treatment [5,6].

Psychological distress in pediatric oncology has been associated with a range of adverse outcomes, including reduced quality of life, impaired treatment adherence, and increased caregiver burden. Emotional symptoms such as depression and anxiety may also interact with physical symptoms, further complicating clinical management [7,8]. As a result, psychosocial care has increasingly been recognized as an integral component of comprehensive pediatric oncology treatment, alongside medical and nursing care [9,10].

In response to this growing awareness, psycho-oncology has emphasized the importance of early identification and management of psychological distress in children with cancer. Screening tools such as the Patient Health Questionnaire-9 (PHQ-9), the Generalized Anxiety Disorder-7 (GAD-7), and the National Comprehensive Cancer Network (NCCN) Distress Thermometer have been widely adopted in oncology settings to facilitate systematic assessment of emotional symptoms [11]. These instruments enable clinicians to detect clinically relevant levels of depression, anxiety, and global distress and to monitor changes over time [12,13].

Psychosocial support interventions in pediatric oncology are diverse and may include emotional support, counseling, psychoeducation, play therapy, and family-centered interventions. In inpatient settings, psychosocial support is often delivered as part of routine care by multidisciplinary teams and tailored to the developmental stage and clinical condition of each patient [14]. While evidence suggests that psychosocial interventions can improve emotional outcomes in pediatric cancer populations, much of the existing literature has focused on outpatient settings, long-term survivorship, or structured intervention programs [15]. Comparatively fewer studies have examined changes in psychological outcomes during routine inpatient psychosocial care using real-world clinical data [16].

Moreover, the majority of prior studies have emphasized single psychological outcomes or have focused on specific diagnostic groups, limiting understanding of how depression, anxiety, and distress may change concurrently during hospitalization [17]. Given the substantial overlap among emotional symptoms in pediatric oncology, examining multiple psychological domains simultaneously may provide a more comprehensive understanding of patients' emotional trajectories during inpatient care [18].

Another area of ongoing debate concerns the relationship between hospitalization-related factors and psychological distress. Length of hospital stay is often assumed to be associated with greater emotional burden, yet empirical evidence supporting this assumption in pediatric oncology remains inconsistent [19]. Some studies suggest that distress may peak early during hospitalization or at diagnosis rather than increasing linearly with hospital duration [20]. Clarifying the association between length of stay and baseline psychological symptoms may inform the timing and targeting of psychosocial interventions in inpatient settings [21].

Against this background, there is a need for hospital-based studies that examine

changes in depression, anxiety, and psychological distress among pediatric oncology patients receiving routine psychosocial support during hospitalization [22,23]. Such studies are particularly valuable in real-world clinical contexts, where interventions are not standardized experimental protocols but reflect everyday psycho-oncology practice.

The present study was conducted in the Pediatrics Department of Longyou County People's Hospital and employed a prospective pre–post observational design to examine changes in psychological outcomes among hospitalized pediatric oncology patients. Depression, anxiety, and psychological distress were assessed at admission and after psychosocial support using validated screening instruments. In addition, the study explored associations between length of hospital stay and baseline psychological symptoms, as well as interrelationships among baseline measures of depression, anxiety, and distress.

The objectives of this study were threefold: (1) to evaluate changes in depressive symptoms, anxiety symptoms, and psychological distress following psychosocial support during hospitalization; (2) to examine the association between length of hospital stay and baseline psychological burden; and (3) to explore the interrelationships among baseline measures of depression, anxiety, and distress in a pediatric oncology inpatient population. By focusing on routine inpatient psychosocial care in a real-world hospital setting, this study aims to contribute to the psycho-oncology literature by providing clinically relevant evidence on emotional symptom trajectories during hospitalization. The findings may inform psychosocial screening practices and support the integration of psychological care into pediatric oncology inpatient services.

2. Methods

2.1. Study design and setting

This study employed a prospective pre–post observational design to evaluate whether changes in psychological outcomes coincided with the receipt of psychosocial support. The study was conducted in the Pediatrics Department of Longyou County People's Hospital. The pre–post design was selected to capture within-patient changes. Critically, this design lacks a control group. Therefore, no causal conclusions can be drawn from this study; any observed improvements may be attributable to factors other than the psychosocial support itself (e.g., passage of time, natural emotional adaptation). No randomization or control group was included.

2.2. Participants and eligibility criteria

Participants were pediatric oncology patients admitted to the Pediatrics Department of Longyou County People's Hospital during the study period. Eligible patients met the following inclusion criteria:

- a) a confirmed diagnosis of a malignant tumor, including hematologic malignancies, solid tumors, central nervous system tumors, bone malignancies, or other malignant conditions;
- b) inpatient admission for oncology-related care;
- c) age between 1 and 14 years; and
- d) completion of psychological assessments at both admission (pre-intervention) and post-intervention time points.

Patients were excluded if they were unable to complete psychological assessments due to severe cognitive impairment, acute medical instability, or if

psychological assessment data were incomplete at either time point. No patients were excluded based on cancer type or treatment modality. A total of 29 pediatric oncology patients met the inclusion criteria and were included. No eligible patients were excluded due to missing data at either time point. A Consolidated Standards of Reporting Trials (CONSORT)-style flow diagram is provided in **Figure 1** to enhance transparency.

2.3. Psychosocial support during hospitalization

Psychosocial support was provided as part of routine inpatient care. The support was delivered individually (one-on-one) by healthcare professionals, including pediatric nurses and psychosocial care staff. The typical frequency was daily or every other day, with each session lasting approximately 15–30 minutes, adjusted based on patient needs and clinical condition. Family members or caregivers were invited to participate when appropriate. The approach was individualized rather than following a single structured manual, reflecting routine clinical psychosocial practices. Psychosocial support activities included emotional reassurance, supportive communication, age-appropriate psychological guidance, and facilitation of emotional expression.

2.4. Measures

2.4.1. Depression

Depressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9). The PHQ-9 is a widely used self-report measure assessing the frequency of depressive symptoms over the preceding two weeks. Scores range from 0 to 27, with higher scores indicating greater depressive symptom severity. The PHQ-9 has been validated in pediatric and adolescent populations and has demonstrated good reliability and construct validity in clinical settings.

2.4.2. Anxiety

Anxiety symptoms were assessed using the Generalized Anxiety Disorder-7 (GAD-7) scale. The GAD-7 consists of seven items evaluating the frequency of anxiety symptoms, with total scores ranging from 0 to 21. Higher scores reflect greater anxiety symptom severity. The GAD-7 has been commonly used in pediatric and adolescent populations and has shown good psychometric properties in medical and oncology contexts.

2.4.3. Psychological distress

Overall psychological distress was measured using the NCCN Distress Thermometer. The Distress Thermometer is a single-item visual analog scale ranging from 0 (no distress) to 10 (extreme distress) and is widely used in oncology settings to screen for global emotional distress. The NCCN Distress Thermometer has been recommended for routine distress screening in cancer care, including pediatric oncology.

2.4.4. Clinical and demographic variables

Demographic and clinical variables collected included age, sex, primary diagnosis category, and length of hospital stay. Length of hospital stay was calculated as the number of days between admission and discharge dates.

2.5. Data collection procedures

Psychological assessments were conducted at two time points. Baseline assessments were completed at admission, prior to the initiation of psychosocial

support during hospitalization. Post-intervention assessments were conducted after psychosocial support had been provided during the inpatient stay, prior to discharge. All assessments were administered in accordance with routine clinical procedures. Data were extracted from clinical records and assessment forms and anonymized prior to analysis. No identifying personal information was included in the analytical dataset.

2.6. Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics software (version 25). Descriptive statistics were calculated for all demographic, clinical, and psychological variables. Continuous variables were summarized using means and standard deviations, while categorical variables were summarized using frequencies and percentages.

Changes in depression, anxiety, and psychological distress between pre-intervention and post-intervention assessments were analyzed using the Wilcoxon signed-rank test, and exact Z values are reported. For the primary outcomes (changes in PHQ-9, GAD-7, and Distress Thermometer scores), 95% confidence intervals for the change scores are also provided. Spearman's rank correlation analysis was conducted. All analyses were exploratory. No adjustments were made for multiple comparisons given the exploratory nature of the study; however, all three primary comparisons yielded P-values < 0.001, and applying a conservative Bonferroni correction ($\alpha = 0.017$) would not alter the statistical conclusions. We acknowledge the absence of adjustment as a limitation. Due to the exploratory nature of this study, no formal power calculation was performed.

2.7. Ethical considerations

The study was conducted in accordance with ethical principles for research involving human participants. This study was reviewed and approved by The Ethics Committee of the Longyou County People's Hospital (approval number: LRYLL2026-002). Data were collected as part of routine clinical assessment, and all patient information was anonymized prior to analysis. The study involved secondary analysis of clinical data and did not involve experimental interventions beyond standard psychosocial care. Because this study involved secondary analysis of clinical data and did not include any experimental interventions beyond standard psychosocial care, a waiver of patient informed consent was requested and granted.

3. Results

3.1. Participant characteristics

A CONSORT-style flow diagram (**Figure 1**) shows that all eligible patients completed assessments at both time points; therefore, no patients were excluded due to missing data.

A total of 29 pediatric oncology patients were included in the final analysis. All participants had complete demographic information, clinical data, and valid psychological assessment scores at both pre-intervention and post-intervention time points, allowing for inclusion using listwise criteria. The age of participants ranged from 1 to 14 years, with a mean age of 9.59 ± 4.12 years. The cohort therefore comprised patients across a broad pediatric age spectrum, including early childhood, middle childhood, and early adolescence. Sex distribution showed that 19 patients (65.5%) were female, while 10 patients (34.5%) were male.

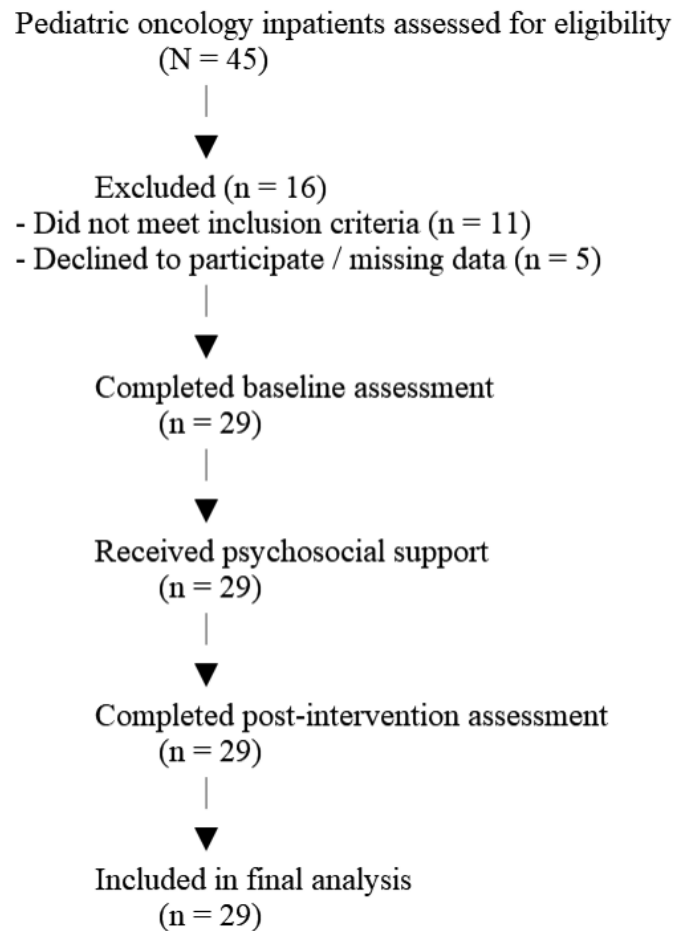


Figure 1. CONSORT

Hospitalization duration varied among participants. The mean length of hospital stay was 16.52 ± 3.31 days, with stays ranging from 10 days to 21 days. All patients experienced inpatient admissions exceeding one week, and the majority remained hospitalized for more than two weeks. Primary diagnoses were grouped into five diagnostic categories for reporting purposes. Hematologic malignancies accounted for 8 patients (27.6%), and solid tumors not involving the central nervous system also accounted for 8 patients (27.6%), representing the two most frequently observed diagnostic categories. Central nervous system tumors were identified in 6 patients (20.7%). Bone malignancies were present in 3 patients (10.3%), while 4 patients (13.8%) were classified under other or unspecified malignant tumors. No patients were excluded on the basis of diagnosis.

Baseline psychological assessment scores were recorded at admission prior to psychosocial support. The mean baseline PHQ-9 score was 13.41 ± 1.72 , with individual scores ranging from 10 to 16. The mean baseline GAD-7 score was 12.41 ± 1.72 , with values ranging from 9 to 15. Baseline NCCN Distress Thermometer scores had a mean of 6.66 ± 1.34 , with observed scores ranging from 4 to 9. Across all three psychological measures, baseline scores demonstrated variability among participants, with no ceiling or floor effects observed. All baseline psychological assessments were successfully completed, and no missing data were present for the outcome measures at the admission time point. A summary of participant demographic characteristics, clinical variables, diagnostic categories, and baseline psychological assessment scores is presented in **Table 1**.

Table 1. Demographic and clinical characteristics of pediatric oncology patients ($n = 29$)

Characteristic	Value (mean $\pm$ SD)
Age (years)	9.59 $\pm$ 4.12
Sex, n (%)	
Female	19 (65.5)
Male	10 (34.5)
Length of hospital stay (days)	16.52 $\pm$ 3.31
Primary diagnosis, n (%)	
Hematologic malignancy	8 (27.6)
Solid tumor (non-CNS)	8 (27.6)
Central nervous system tumor	6 (20.7)
Bone malignancy	3 (10.3)
Other / unspecified malignant tumor	4 (13.8)
Baseline psychological assessment scores	
PHQ-9	13.41 $\pm$ 1.72
GAD-7	12.41 $\pm$ 1.72
NCCN Distress Thermometer	6.66 $\pm$ 1.34

Note: Values are presented as mean $\pm$ standard deviation unless otherwise indicated. CNS, central nervous system; PHQ-9, Patient Health Questionnaire-9; GAD-7, Generalized Anxiety Disorder-7; NCCN, National Comprehensive Cancer Network

3.2. Changes in depression (PHQ-9)

Depressive symptoms were assessed using the PHQ-9 at admission and after psychosocial support. Pre-intervention and post-intervention PHQ-9 scores for the study cohort are summarized in **Table 2**. At baseline, PHQ-9 scores ranged from 10 to 16, with a mean score of 13.41 ± 1.72 , indicating moderate depressive symptom severity across participants at admission. All patients completed the PHQ-9 assessment at the pre-intervention time point, and no missing data were observed. Following psychosocial support, PHQ-9 scores ranged from 4 to 10, with a mean post-intervention score of 7.41 ± 1.72 . Post-intervention scores were lower than baseline scores for the majority of participants, and no floor effects were observed at the post-intervention assessment. Comparison of pre-intervention and post-intervention PHQ-9 scores using the Wilcoxon signed-rank test demonstrated a statistically significant difference between the two time points ($P < 0.001$). The direction of rank changes indicated that post-intervention PHQ-9 scores were consistently lower than baseline scores. Overall, PHQ-9 results showed a clear reduction in depressive symptom scores between admission and post-intervention assessment. Detailed descriptive statistics and inferential test results for PHQ-9 scores are presented in **Table 2**. The Wilcoxon signed-rank test indicated a statistically significant reduction ($Z = -4.70$, $P < 0.001$). The 95% confidence interval for the median change was 4.5 to 7.5.

Table 2. Changes in depression scores (PHQ-9) before and after psychosocial support ($n = 29$)

PHQ-9 score	Mean $\pm$ SD	Minimum	Maximum
Pre-intervention (Admission)	13.41 $\pm$ 1.72	10	16
Post-intervention	7.41 $\pm$ 1.72	4	10
Statistical test	P-value		
Wilcoxon signed-rank test	< 0.001		
Z = -4.70; 95% CI for change =4.5–7.5			

Note: Values are presented as mean $\pm$ standard deviation. Pre- and post-intervention PHQ-9 scores were compared using the Wilcoxon signed-rank test. PHQ-9, Patient Health Questionnaire-9.

3.3. Changes in anxiety (GAD-7)

Anxiety symptoms were evaluated using the GAD-7 scale at admission and after psychosocial support. Summary statistics for pre-intervention and post-intervention GAD-7 scores are presented in **Table 3**. At admission, GAD-7 scores ranged from 9 to 15, with a mean baseline score of 12.41 $\pm$ 1.72. All participants completed the GAD-7 assessment at the pre-intervention time point, and no missing baseline data were observed. Baseline scores demonstrated variability across participants, with no evidence of ceiling effects. Following psychosocial support, GAD-7 scores ranged from 3 to 9, with a mean post-intervention score of 6.31 $\pm$ 1.65. Post-intervention scores were lower than baseline scores for the majority of participants, and no floor effects were identified at the post-intervention assessment. Comparison of pre-intervention and post-intervention GAD-7 scores using the Wilcoxon signed-rank test demonstrated a statistically significant difference between the two time points ($P < 0.001$). The direction of the rank changes indicated that anxiety scores were lower at the post-intervention assessment compared with baseline. Overall, GAD-7 results showed a reduction in anxiety symptom scores between admission and post-intervention assessment. Detailed descriptive statistics and inferential test results for GAD-7 scores are reported in **Table 3**. The Wilcoxon signed-rank test indicated a statistically significant reduction ($Z = -4.71$, $P < 0.001$). The 95% confidence interval for the median change was 4.0 to 7.0.

Table 3. Changes in anxiety scores (GAD-7) before and after psychosocial support ($n = 29$)

GAD-7 score	Mean $\pm$ SD	Minimum	Maximum
Pre-intervention (Admission)	12.41 $\pm$ 1.72	9	15
Post-intervention	6.31 $\pm$ 1.65	3	9
Statistical test	P-value		
Wilcoxon signed-rank test	< 0.001		
Z = -4.71; 95% CI for change = 4.0–7.0			

Note: Values are presented as mean $\pm$ standard deviation. Pre- and post-intervention GAD-7 scores were compared using the Wilcoxon signed-rank test. GAD-7, Generalized Anxiety Disorder-7.

3.4. Changes in psychological distress (NCCN Distress Thermometer)

Psychological distress was assessed using the NCCN Distress Thermometer at admission and after psychosocial support. Descriptive statistics for pre-intervention

and post-intervention distress scores are presented in **Table 4**. At baseline, NCCN Distress Thermometer scores ranged from 4 to 9, with a mean score of 6.66 ± 1.34 . All participants completed the distress assessment at the pre-intervention time point, and no missing baseline data were observed. Baseline distress scores showed variability across participants, with no ceiling effects identified. Following psychosocial support, NCCN Distress Thermometer scores ranged from 1 to 6, with a mean post-intervention score of 3.55 ± 1.35 . Post-intervention distress scores were lower than baseline scores for the majority of participants, and no floor effects were observed. Comparison of pre-intervention and post-intervention distress scores using the Wilcoxon signed-rank test demonstrated a statistically significant difference between the two time points ($P < 0.001$). The direction of the rank changes indicated lower distress scores at the post-intervention assessment compared with baseline. NCCN Distress Thermometer results showed a reduction in psychological distress scores between admission and post-intervention assessment. Detailed descriptive statistics and inferential test results for distress scores are presented in **Table 4**. The Wilcoxon signed-rank test indicated a statistically significant reduction ($Z = -4.69$, $P < 0.001$). The 95% confidence interval for the median change was 2.0 to 4.0.

Table 4. Changes in psychological distress scores (NCCN Distress Thermometer) before and after psychosocial support ($n = 29$)

NCCN Distress Thermometer score	Mean $\pm$ SD	Minimum	Maximum
Pre-intervention (Admission)	6.66 ± 1.34	4	9
Post-intervention	3.55 ± 1.35	1	6
Statistical test	P-value		
Wilcoxon signed-rank test	< 0.001		
$Z = -4.69$; 95% CI for change = 2.0–4.0			

Note: Values are presented as mean $\pm$ standard deviation. Pre- and post-intervention NCCN Distress Thermometer scores were compared using the Wilcoxon signed-rank test. NCCN, National Comprehensive Cancer Network.

3.5. Correlation between length of hospital stay and baseline psychological measures

Spearman's rank correlation analysis was performed to examine the associations between length of hospital stay and baseline psychological measures, as well as the interrelationships among baseline depression, anxiety, and psychological distress scores. Correlation coefficients are presented in **Table 5**. Length of hospital stay was not significantly correlated with baseline depression scores measured by the PHQ-9 ($\rho = 0.312$, $P = 0.100$), baseline anxiety scores measured by the GAD-7 ($\rho = 0.312$, $P = 0.100$), or baseline psychological distress scores measured by the NCCN Distress Thermometer ($\rho = 0.276$, $P = 0.148$). Significant positive correlations were observed among baseline psychological measures. Baseline PHQ-9 scores were significantly correlated with baseline GAD-7 scores ($\rho = 1.000$, $P < 0.001$) and baseline NCCN Distress Thermometer scores ($\rho = 0.972$, $P < 0.001$). Baseline GAD-7 scores were also significantly correlated with baseline NCCN Distress Thermometer scores ($\rho = 0.972$, $P < 0.001$). All correlation coefficients were derived using Spearman's rank correlation method, and statistical significance was assessed using two-tailed tests. A summary of correlation coefficients is provided in **Table 5**. The perfect correlation ($\rho = 1.000$) between baseline PHQ-9 and GAD-7 scores was examined and confirmed

to be accurate. In this specific sample ($n = 29$), the rankings of PHQ-9 and GAD-7 scores were identical, producing this coefficient. This finding may indicate substantial collinearity between depression and anxiety symptoms in this cohort, but it should be interpreted with caution given the small sample size.

Table 5. Spearman correlation matrix between length of hospital stay and baseline psychological measures ($n = 29$)

Variable	Length of Stay	PHQ-9 (Pre)	GAD-7 (Pre)	NCCN Distress (Pre)
Length of hospital stay	1.000	0.312	0.312	0.276
PHQ-9 (Pre)	0.312	1.000	1.000**	0.972**
GAD-7 (Pre)	0.312	1.000**	1.000	0.972**
NCCN Distress (Pre)	0.276	0.972**	0.972**	1.000

Note: Values are Spearman's rank correlation coefficients (ρ). ** indicates statistical significance at the 0.01 level (two-tailed). PHQ-9, Patient Health Questionnaire-9; GAD-7, Generalized Anxiety Disorder-7; NCCN, National Comprehensive Cancer Network. The perfect correlation ($\rho = 1.000$) between baseline PHQ-9 and GAD-7 scores reflects identical ranking of scores in this sample; data entry was verified and is accurate.

4. Discussion

4.1. Overview of principal findings

This study examined changes in depression, anxiety, and psychological distress among hospitalized pediatric oncology patients following psychosocial support, using a prospective pre–post design. The findings demonstrate statistically significant reductions in depressive symptoms, anxiety symptoms, and overall psychological distress between admission and post-intervention assessment [24,25]. In contrast, length of hospital stay was not significantly correlated with baseline levels of depression, anxiety, or distress. Strong inter-correlations were observed among baseline psychological measures, indicating substantial overlap between depressive symptoms, anxiety, and distress at the time of admission [26,27].

These findings suggest that psychosocial support delivered during inpatient pediatric oncology care is associated with meaningful improvements across multiple dimensions of psychological well-being, while baseline emotional burden appears to be relatively independent of hospitalization duration [28,29]. However, the pre-post design without a control group precludes causal attribution.

4.2. Interrelationships among depression, anxiety, and distress at baseline

Strong positive correlations were observed among baseline PHQ-9, GAD-7, and NCCN Distress Thermometer scores [30,31,32,33]. These findings indicate substantial overlap between depressive symptoms, anxiety symptoms, and global psychological distress at the time of admission [34,35,36,37]. Such inter-correlations are consistent with conceptual models of psychological distress in pediatric oncology, which emphasize the interconnected nature of emotional responses to serious illness [38,39,40]. Rather than representing distinct, independent constructs, depression, anxiety, and distress often co-occur and mutually reinforce one another in the context of cancer diagnosis and treatment [41]. These findings also highlight the value of multidimensional psychological assessment in pediatric oncology settings [42,43]. Reliance on a single screening tool may underestimate the complexity of emotional burden experienced by hospitalized children with cancer [44,45].

4.3. Lack of association between length of hospital stay and baseline psychological burden

In contrast to expectations that prolonged hospitalization might be associated with greater psychological burden, length of hospital stay was not significantly correlated with baseline depression, anxiety, or distress scores [46,47]. This suggests that emotional distress at admission may be driven more by factors such as diagnosis, treatment intensity, symptom severity, and individual coping resources than by hospitalization duration alone [48,49].

This finding aligns with studies suggesting that psychological distress in pediatric oncology often peaks around diagnosis and early treatment phases, rather than increasing linearly with length of hospitalization [50,51]. It also underscores the importance of early psychological screening, as distress may be present regardless of anticipated hospitalization length [52]. From a service delivery perspective, these results support the provision of psychosocial support to all hospitalized pediatric oncology patients, rather than prioritizing intervention based solely on length of stay [53,54]. The perfect correlation ($\rho = 1.000$) observed in this study, as noted in the Results section, is unusual and likely reflects the specific ranking pattern within our small sample rather than a true population parameter. This further underscores the need for caution in interpreting correlation magnitudes in small-sample studies.

4.4. Clinical implications for pediatric psycho-oncology practice

This finding has several actionable implications. First, routine psychological screening should be conducted universally at admission, rather than selectively based on anticipated hospitalization duration. Second, psychosocial support should be initiated early during hospitalization, as improvements coincided with support provided in the acute phase. Third, healthcare resources should be allocated to ensure that all hospitalized pediatric oncology patients, regardless of expected length of stay, have access to basic psychosocial support services.

4.5. Methodological considerations and limitations

Several methodological considerations should be acknowledged. First and most importantly, the pre–post design without a control group severely limits causal inference. The observed improvements may partially reflect natural emotional adaptation to hospitalization, regression to the mean, or placebo effects, rather than the specific effect of psychosocial support. Second, the sample size was small ($n = 29$), and no formal power calculation was performed, which increases the risk of Type II error and limits precision. Third, the single-center design restricts generalizability to other settings or populations. Fourth, we did not collect data on concurrent pharmacological interventions (e.g., antidepressants, anxiolytics) or changes in medical status (e.g., pain control, treatment response), which could independently influence psychological outcomes. Fifth, we were unable to statistically adjust for potential confounders such as treatment phase or prior psychological support history due to the limited sample size. Finally, the self-report measures may be influenced by developmental stage and response bias. Despite these limitations, the consistency of findings across multiple psychological measures strengthens confidence in the observed patterns.

4.6. Future research directions

Future studies employing controlled designs, larger sample sizes, and longitudinal follow-up are needed to further clarify the impact of psychosocial support on psychological outcomes in pediatric oncology. Examination of specific

components of psychosocial interventions, differential effects across diagnostic groups, and the role of family-centered interventions may also provide valuable insights.

5. Conclusion

This prospective pre–post observational study examined changes in depression, anxiety, and psychological distress among hospitalized pediatric oncology patients receiving psychosocial support. Significant reductions were observed across all three outcomes between admission and post-intervention assessment. These improvements coincided with the provision of psychosocial support during inpatient care. However, due to the observational design without a control group, causal conclusions cannot be drawn, and alternative explanations (e.g., natural adaptation, regression to the mean) cannot be ruled out.

Baseline analyses demonstrated strong interrelationships among depressive, anxiety, and distress symptoms. Length of hospital stay was not significantly associated with baseline psychological symptoms, highlighting the importance of early psychological screening for all pediatric oncology inpatients, regardless of expected stay length.

While the findings support the integration of routine psychosocial assessment and support into inpatient pediatric oncology care, the observational design and small sample size necessitate cautious interpretation. Future research employing controlled designs, larger samples, and multicenter settings is warranted to further clarify the role of psychosocial interventions.

Author contributions: Conceptualization, LT, YJY, HW, YHY and YH; methodology, LT and YJY; software, HW, YHY and YH; validation, YJY; formal analysis, LT; investigation, LT; resources, YJY and HW; data curation, LT; writing—original draft preparation, LT; writing—review and editing, YHY; visualization, YJY; supervision, LT; project administration, YH; funding acquisition, LT, YJY, HW, YHY and YH. All authors have read and agreed to the published version of the manuscript.

Funding: None.

Ethical approval: This study was reviewed and approved by The Ethics Committee of the Longyou County People's Hospital (approval number: LRYLL2026-002).

Informed consent statement: Because this study involved secondary analysis of clinical data and did not include any experimental interventions beyond standard psychosocial care, a waiver of patient informed consent was requested and granted.

Conflict of interest: The authors declare no conflict of interest.

References

1. Muzzatti B, Agostinelli G, Bomben F, et al. Intensity and Prevalence of Psychological Distress in Cancer Inpatients: Cross-Sectional Study Using New Case-Finding Criteria for the Hospital Anxiety and Depression Scale. *Front Psychol.* 2022;13:875410. doi:10.3389/fpsyg.2022.875410
2. Van Beek FE, Wijnhoven LMA, Holtmaat K, et al. Psychological problems among cancer patients in relation to healthcare and societal costs: A systematic review. *Psychooncology.* 2021;30(11):1801-1835. doi:10.1002/pon.5753
3. Arora A, Saini S, Nautiyal V, et al. Cancer pain, anxiety, and depression in admitted patients at a tertiary care hospital: A prospective observational study. *Indian J Palliat Care.* 2019;25(4):562. doi:10.4103/IJPC.IJPC_4_19
4. Wang Y, Mei C, Fu Y, Yue Z, Jiang Y, Zhu J. Anxiety and depression among Tibetan inpatients with cancer: a multicenter investigation. *Ann Palliat Med.* 2020;9(6):3776-3784. doi:10.21037/apm-20-1721

5. Su CH, Liu Y, Hsu HT, Kao CC. Cancer Fear, Emotion Regulation, and Emotional Distress in Patients With Newly Diagnosed Lung Cancer. *Cancer Nurs.* 2024;47(1):56-63. doi:10.1097/NCC.0000000000001150
6. Frank T, Pichler T, Maier S, et al. Stressors related to the COVID-19 pandemic and their association with distress, depressive, and anxiety symptoms in cancer out-patients. *Front Psychol.* 2023;14:1100236. doi:10.3389/fpsyg.2023.1100236
7. Shrivastava SP, Elhence A, Jinwala P, et al. Assessment of Psychological Distress Among Indian Adolescents and Young Adults with Solid Cancer Using the National Comprehensive Cancer Network Distress Thermometer. *South Asian J Cancer.* 2025;14(02):157-163. doi:10.1055/s-0042-1756184
8. Guleria B, Viswanath S, Soneji D, et al. Cancer in the Adolescent and Young Adults (AYA) and Children: A Comprehensive Analysis of the Epidemiology and Psychosocial Morbidity in the Indian Population. *South Asian J Cancer.* 2022;11(01):073-081. doi:10.1055/s-0041-1735482
9. Eychmüller S, Zwahlen S, Fliedner MC, et al. Single early palliative care intervention added to usual oncology care for patients with advanced cancer: A randomized controlled trial (SENS Trial). *Palliat Med.* 2021;35(6):1108-1117. doi:10.1177/02692163211005340
10. Borkotoky P, Deka A, Dakua D, Das S. Assessment of distress in patients visiting pain and palliative out patient department of a tertiary care hospital in Assam. *Int J Res Med Sci.* 2022;11(1):74. doi:10.18203/2320-6012.ijrms20223259
11. Patel SK, Kim S, Johansen C, et al. Threshold score for the self-report Pediatric Distress Thermometer Rating Scale in childhood cancer patients. *Psychooncology.* 2021;30(3):340-348. doi:10.1002/pon.5583
12. Normen M, Sahaya FE, Kulkarni K, Vidhubala E, Shewade HD, Kathiresan J. 'Patients with Cancer are Distressed!' Indian Healthcare Provider Perspectives on Distress Screening and Referrals to Psycho-oncology Services – A Mixed Methods Study. *Indian J Palliat Care.* 2021;27:561. doi:10.25259/IJPC_142_21
13. Alsughayer LY, Altamimi LA, Alsaleh FS, et al. Prevalence and determinants of distress among oncology patients at a tertiary care medical city in Riyadh, Saudi Arabia. *Saudi Med J.* 2021;42(7):761-768. doi:10.15537/smj.2021.42.7.20210121
14. Bryl K, Tortora S, Whitley J, et al. Utilization, Delivery, and Outcomes of Dance/Movement Therapy for Pediatric Oncology Patients and their Caregivers: A Retrospective Chart Review. *Current Oncology.* 2023;30(7):6497-6507. doi:10.3390/curroncol30070477
15. Mehryar S, Surminski S. National laws for enhancing flood resilience in the context of climate change: potential and shortcomings. *Climate Policy.* 2021;21(2):133-151. doi:10.1080/14693062.2020.1808439
16. Park HS, DeGroote N, Lewis RW, et al. The Scope of Clinical Practice of Inpatient and Outpatient Pediatric Palliative Care Within Pediatric Oncology. *Pediatr Blood Cancer.* 2025;72(9): e31832. doi:10.1002/pbc.31832
17. Luccarelli J, Kalinich M, Fricchione G, Smith F, Beach SR, Smith JR. Diagnostic and demographic factors of pediatric and adult catatonia hospitalizations: A 2016–2020 National Inpatient Sample Study. *Acta Psychiatr Scand.* 2024;150(4):234-244. doi:10.1111/acps.13744
18. Shala DR, Brogan F, Cruickshank M, Kornman K, Sheppard-Law S. Exploring Australian parents' knowledge and awareness of pediatric inpatient falls: A qualitative study. *Journal for Specialists in Pediatric Nursing.* 2019;24(4): e12268. doi:10.1111/jspn.12268
19. Zhang Y, Huang X, Zhang J, Tao Z. Risk factors for hospitalization and pneumonia development of pediatric patients with seasonal influenza during February–April 2023. *Front Public Health.* 2024;11: 1300228. doi:10.3389/fpubh.2023.1300228
20. Huepenbecker SP, Sun CC, Fu S, et al. Temporal trends of healthcare system use between symptomatic presentation and ovarian cancer diagnosis in the United States. *International Journal of Gynecological Cancer.* 2022;32(7):899-905. doi:10.1136/ijgc-2021-003219
21. Jung EH, Lee SW, Kim YJ, et al. Clinical Outcomes of Operating an Acute Palliative Care Unit at a Comprehensive Cancer Center. *JCO Oncol Pract.* 2022;18(10):e1661-e1671. doi:10.1200/OP.22.00163
22. Ozdemir Koyu H, Kilicarslan E. Effect of Technology-Based Psychological Empowerment Interventions on Psychological Well-Being of Parents of Pediatric Cancer Patients: A Meta-Analysis of Randomized Controlled Trials. *Psychooncology.* 2025;34(2) : e70097. doi:10.1002/pon.70097
23. Daruvala R, Misra R, Nair B, et al. Delivering psychological and social support to children with cancer in India and their families: a position statement from the social and psychological taskforce of the Indian childhood cancer initiative. *Ecancermedicalscience.* 2024;18. doi:10.3332/ecancer.2024.1812
24. O'Donnell N, Ellis L, Morgan JE, et al. Psychosocial Interventions to Improve Wellbeing in Teenage and Young Adult

- Post-Treatment Survivors of Childhood Cancer: A Systematic Review. *Psychooncology*. 2025;34(2): e70081. doi:10.1002/pon.70081
25. Dehnavi M, Ghodsi H. Efficacy of Psychosocial Interventions for Managing Anxiety and Depression in Cancer Patients: A Systematic Review of Randomized Controlled Trials. *Asian Pacific Journal of Cancer Nursing*. 2025;20251211. doi:10.31557/apjcn.2303.20251211
26. Liu X, Chen H, Joubert N, Tirola H. The Mechanism by 18 RCTs Psychosocial Interventions Affect the Personality, Emotions, and Behaviours of Paediatric and Young Adult Cancer Patients: A Systematic Review. *Healthcare*. 2025;13(10):1094. doi:10.3390/healthcare13101094
27. Paslaru AM, Plesea-Condratovici A, Moroianu LA, et al. Mind over Malignancy: A Systematic Review and Meta-Analysis of Psychological Distress, Coping, and Therapeutic Interventions in Oncology. *Medicina (B Aires)*. 2025;61(6):1086. doi:10.3390/medicina61061086
28. Bernstein E, Jones AM, Jurbergs N, Harman JL, Phipps S, Heidelberg RE. Integrated Psychological Services in Pediatric Oncology: Caregiver Perspectives at Diagnosis. *Cancers (Basel)*. 2024;16(18):3137. doi:10.3390/cancers16183137
29. Resham S, Altaf S, Ayub F, et al. Exploring Pediatric Oncology Care Practices Influencing the Relationships Among Children, Caregivers, and Health Care Providers: A Multi-Institutional Study From Pakistan. *JCO Glob Oncol*. 2025;(11): e00347. doi:10.1200/GO-24-00347
30. Skrabal Ross X, Kemp J, Radford C, et al. Benefits of Routine Screening for Parental Distress in Pediatric Cancer: A Pilot Implementation Effectiveness Study. *Pediatr Blood Cancer*. 2025;72(5): e31614. doi:10.1002/pbc.31614
31. Ozturk CS, San EG, Yildiz S. Effectiveness of Psychosocial Interventions on Stress, Anxiety, Depression, and Quality of Life in Parents of Children, Adolescents, and Young Adults With Cancer: A Meta-Analysis of RCTs. *Nurs Health Sci*. 2025;27(2): e70156. doi:10.1111/nhs.70156
32. Shahi SK, Wang P, Gu J, Shrestha RM, Wang P. Stress and influencing factor among children diagnosed with cancer at hospitals in Nepal: a cross-sectional study. *BMC Pediatr*. 2025;25(1):480. doi:10.1186/s12887-025-05820-4
33. Hasnani F. Analysis of Factors Causing Anxiety in Children with Cancer Experiencing Hospitalization. *Journal of Drug Delivery and Therapeutics*. 2023;13(4):65-70. doi:10.22270/jddt.v13i4.5797
34. Patra P, Wu J. Factors influencing the pediatric hospitalization experience: a narrative review with recommendations for improvement. *Transl Pediatr*. 2025;14(11):3160-3172. doi:10.21037/tp-2025-523
35. DeLone AM, George A, Miller M, et al. The Efficacy of Procedural Support Interventions on Coping and Distress for Children With Newly Diagnosed Leukemia: A Prospective Pilot Study. *The Journal of Child Life: Psychosocial Theory and Practice*. *The Journal of Child Life*, 2024;12:1-13. doi:10.55591/001c.127276
36. Abdelkhalik M, Ibrahim M, Al Maaz F, Boutros E. Integrating Child Life Specialists in Pediatric Oncology and Hematology Care: A Narrative Review. *The Journal of Pediatric Academy*. Published online June 6, 2024. doi:10.4274/jpea.2024.309
37. Coughtrey A, Millington A, Bennett S, et al. The Effectiveness of Psychosocial Interventions for Psychological Outcomes in Pediatric Oncology: A Systematic Review. *J Pain Symptom Manage*. 2018;55(3):1004-1017. doi:10.1016/j.jpainsymman.2017.09.022
38. Fitch MI, Nicoll I, Burlein-Hall S. Screening for Psychosocial Distress: A Brief Review with Implications for Oncology Nursing. *Healthcare*. 2024;12(21):2167. doi:10.3390/healthcare12212167
39. Schnalke N, Tekampe E, Feige T, et al. Validation of the Distress Thermometer as a Screening Tool for Psychosocial Distress and Resilience in Parkinson's Disease. *Mov Disord Clin Pract*. 2024;11(3):257-264. doi:10.1002/mdc3.13937
40. van der Geest IMM, van Dorp W, Pluijm SMF, van den Heuvel-Eibrink MM. The distress thermometer provides a simple screening tool for selecting distressed childhood cancer survivors. *Acta Paediatr*. 2018;107(5):871-874. doi:10.1111/apa.14251
41. Kazak AE, Brier M, Alderfer MA, et al. Screening for psychosocial risk in pediatric cancer. *Pediatr Blood Cancer*. 2012;59(5):822-827. doi:10.1002/pbc.24166
42. Calvo-Schimmel A, Hammer MJ, Conley YP, et al. Greater Symptom Burden and Poorer Quality of Life Outcomes Are Associated With The Co-Occurrence of Anxiety and Depression During Cancer Chemotherapy. *Semin Oncol Nurs*. 2025;41(2):151809. doi:10.1016/j.soncn.2025.151809
43. Harianto S, Nursalam N, Maryam D, Tonapa SI. Trail of acceptance: the experiences and perspectives of chemotherapy adherence among adolescents with cancer. *Healthc Low Resour Settings*. 2025;13:s1. doi:10.4081/hls.2025.13265

44. Wiener L, Devine KA, Thompson AL. Advances in pediatric psychooncology. *Curr Opin Pediatr.* 2020;32(1):41-47. doi:10.1097/MOP.0000000000000851
45. Solar S, Wieditz J, Lordick F, et al. Screening versus multidimensional assessment of symptoms and psychosocial distress in cancer patients from the time of incurability. *Front Oncol.* 2023;13:1002499. doi:10.3389/fonc.2023.1002499
46. Zingler H, Steinmann D, Ernst J, et al. Psychosocial distress, perceived need and utilization of psycho- social support services in patients in the early phase after the first cancer diagnosis. *J Cancer Res Clin Oncol.* 2025;151(2):65. doi:10.1007/s00432-025-06107-y
47. Lima T, Torres A, Carvalho P, Teixeira RJ. Defining and Assessing Distress in Oncology Patients: A Systematic Review of the Literature. *Healthcare.* 2025;13(16):1976. doi:10.3390/healthcare13161976
48. Al-Saadi LS, Chan MF, Al Sabahi A, et al. Prevalence of anxiety, depression, and post-traumatic stress disorder among Omani children and adolescents diagnosed with cancer: a prospective cross-sectional study. *BMC Cancer.* 2024;24(1):518. doi:10.1186/s12885-024-12272-z
49. Ikhile D, Ford E, Glass D, Gremesty G, van Marwijk H. A systematic review of risk factors associated with depression and anxiety in cancer patients. *PLoS One.* 2024;19(3):e0296892. doi:10.1371/journal.pone.0296892
50. Yardeni M, Abebe Campino G, Hasson-Ohayon I, et al. Trajectories and risk factors for anxiety and depression in children and adolescents with cancer: A 1-year follow-up. *Cancer Med.* 2021;10(16):5653-5660. doi:10.1002/cam4.4100
51. Lee ARY Bin, Yau CE, Low CE, Li J, Ho RCM, Ho CSH. Severity and Longitudinal Course of Depression, Anxiety and Post-Traumatic Stress in Paediatric and Young Adult Cancer Patients: A Systematic Review and Meta-Analysis. *J Clin Med.* 2023;12(5):1784. doi:10.3390/jcm12051784
52. Desjardins L, Hancock K, Szatmari P, et al. Protocol for mapping psychosocial screening to resources in pediatric oncology: a pilot randomized controlled trial. *Pilot Feasibility Stud.* 2021;7(1):143. doi:10.1186/s40814-021-00878-0
53. Turner E, Sirrine EH, Crabtree VM, et al. An Interprofessional Approach to Developing Family Psychosocial Support Programs in a Pediatric Oncology Healthcare Setting. *Cancers (Basel).* 2025;17(8):1342. doi:10.3390/cancers17081342
54. Jones B, Currin-McCulloch J, Pelletier W, et al. Psychosocial standards of care for children with cancer and their families: A national survey of pediatric oncology social workers. *Soc Work Health Care.* 2018;57(4):221-249. doi:10.1080/00981389.2018.1441212