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Psychological distress, anxiety, and depression in hospitalized cancer patients based on ultrasound diagnosis: a cross-sectional study

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Abstract: Psychological distress is highly prevalent among cancer patients, especially during hospitalization and diagnostic evaluation. Ultrasound examinations are routinely performed at critical points in cancer care, yet the psychological status of hospitalized patients undergoing ultrasound evaluation remains insufficiently characterized. This cross-sectional study examined psychological distress, anxiety, and depressive symptoms among hospitalized cancer patients undergoing ultrasound examination at Longyou County People's Hospital Chengdong New Campus. Standardized psychological assessments, including the Hospital Anxiety and Depression Scale, the Post-Traumatic Stress Disorder (PTSD) symptom assessment, and the Distress Thermometer, were administered, and ultrasound diagnostic findings were used to classify tumor systems. Malignancy type was categorized as primary or metastatic. Non-parametric statistical analyses, correlation analyses, and univariable regression were performed. Sixty patients with complete clinical and psychological data were included. Elevated levels of psychological distress were observed across the cohort. Psychological outcomes differed significantly across tumor system categories, whereas no significant differences were identified between primary and metastatic malignancy groups. Strong positive correlations were observed among anxiety, depression, PTSD-related symptoms, and overall distress. Within the primary malignancy subgroup, anxiety and depressive symptom severity was significantly associated with distress levels in univariable regression analysis. These preliminary findings suggest that hospitalized cancer patients undergoing ultrasound examination experience substantial psychological distress, with variability across tumor systems, supporting the integration of routine psychological screening into inpatient imaging-based oncology care.

Keywords: anxiety; cancer; distress thermometer; hospitalized patients; ultrasound; ultrasound diagnosis

1. Introduction

Cancer is increasingly recognized not only as a life-threatening physical illness but also as a condition associated with a substantial psychological burden. Across various cancer types and stages, patients frequently experience heightened levels of anxiety, depressive symptoms, and psychological distress, which may persist throughout the diagnostic, treatment, and survivorship phases. Psychological morbidity in cancer has been associated with poorer quality of life, reduced treatment adherence, impaired functional outcomes, and increased healthcare utilization [1,2]. Consequently, the identification and management of psychological distress have become integral components of comprehensive oncologic care [3,4].

Hospitalization represents a particularly vulnerable period for patients with cancer. Inpatient settings are often characterized by diagnostic uncertainty, symptom

exacerbation, disruption of daily routines, and exposure to complex medical information. For many patients, hospitalization coincides with critical clinical decision points, including diagnostic clarification, evaluation of disease progression, or assessment of treatment response [5]. These factors collectively contribute to heightened emotional stress and may amplify pre-existing psychological symptoms, as evidenced by studies linking inpatient hospitalization to increased anxiety and depressive symptoms [4,6,7].

Within the inpatient environment, diagnostic imaging plays a central role in cancer care. Among imaging modalities, ultrasound is widely used due to its accessibility, safety, and real-time diagnostic capabilities. Ultrasound examinations are routinely performed for initial tumor detection, staging assessment, postoperative surveillance, and follow-up monitoring across a broad range of malignancies [8,9]. Unlike some imaging modalities that are temporally distant from clinical encounters, ultrasound examinations are often closely integrated into bedside care and may be accompanied by immediate or near-immediate clinical interpretation. As a result, ultrasound frequently occurs at moments when patients are acutely focused on disease status and prognosis [10].

Although ultrasound is non-invasive and does not involve ionizing radiation, its role in cancer evaluation may nonetheless carry psychological significance. For patients undergoing ultrasound examination, the procedure may symbolize confirmation of diagnosis, assessment of disease progression, or evaluation of treatment effectiveness [11]. The emotional meaning attributed to imaging findings may therefore extend beyond the technical aspects of the examination itself. Despite the ubiquity of ultrasound in oncology, relatively little attention has been paid to the psychological state of patients undergoing ultrasound evaluation, particularly in inpatient settings [12,13]. Previous psycho-oncology research has highlighted that ultrasound examinations intersect with patient psychological experiences, emphasizing the importance of supportive communication and awareness of imaging-related anxiety in oncology care [14].

Psychological distress in cancer is a multidimensional construct encompassing emotional, cognitive, behavioral, and somatic components. Anxiety and depressive symptoms are among the most commonly reported psychological sequelae, while trauma-related symptoms may emerge in response to diagnosis, invasive procedures, or perceived life threat [15]. To address the complexity of psychological responses in cancer populations, a range of standardized assessment tools has been developed. The Hospital Anxiety and Depression Scale (HADS) is widely used to screen for anxiety and depressive symptoms in medically ill patients and has demonstrated robust psychometric properties across oncology settings [16,17]. The Distress Thermometer, a brief single-item screening tool, has been adopted internationally to facilitate the rapid identification of patients experiencing clinically significant distress [18,19]. PTSD-related symptom assessments further capture trauma-associated responses that may arise during cancer diagnosis and treatment [19].

Previous studies have documented high prevalence rates of psychological distress among patients with cancer; however, findings regarding factors associated with distress remain inconsistent. Tumor-related variables, including cancer type, organ system involvement, and disease stage, have been variably associated with psychological outcomes. Some studies suggest that certain tumor types, such as breast or gastrointestinal malignancies, are associated with higher levels of anxiety and depression [20,21]. Other studies report minimal differences across cancer types.

Similarly, the relationship between malignancy stage and psychological distress remains debated, with some evidence indicating greater distress in advanced disease [22], while other studies demonstrate comparable levels of distress across stages, particularly in hospitalized populations [22].

These inconsistencies may reflect differences in study design, patient populations, clinical settings, and timing of psychological assessment. Notably, many studies assess psychological outcomes in outpatient or survivorship contexts, whereas fewer investigations focus specifically on hospitalized patients undergoing diagnostic evaluation [23,24]. Inpatient populations may differ substantially from outpatient cohorts in terms of symptom burden, disease acuity, and emotional state, underscoring the need for context-specific research.

Furthermore, while tumor system classification is frequently used in clinical oncology, its relevance to psychological outcomes has not been systematically examined within the context of diagnostic imaging. Ultrasound-based evaluation provides an opportunity to examine psychological distress in relation to organ-specific diagnostic contexts, potentially capturing variations in emotional response associated with different tumor systems. However, the direct relationship between imaging findings and psychological symptoms requires further investigation and cannot be assumed as causal [25]. Such an approach acknowledges that diagnostic context may shape patients' emotional experiences during hospitalization [26].

Another important consideration in psycho-oncology research is the degree of overlap among psychological constructs. Anxiety, depression, trauma-related symptoms, and global distress are conceptually distinct yet often highly correlated in clinical populations [27,28]. Understanding the relationships among these constructs is essential for interpreting screening results and for designing efficient assessment strategies in busy clinical settings. In particular, the extent to which brief screening tools reflect broader emotional symptomatology remains an important practical question [29].

Despite growing recognition of the importance of psychosocial care in oncology, routine psychological screening is not universally implemented in inpatient diagnostic settings. Barriers include limited time, competing clinical priorities, and uncertainty regarding which patients are most at risk [30]. Empirical evidence demonstrating the prevalence and distribution of psychological distress in specific clinical contexts may help inform targeted screening strategies and support integration of psychosocial assessment into routine care pathways [31].

Against this background, the present study aimed to examine psychological distress, anxiety, and depressive symptoms among hospitalized cancer patients undergoing ultrasound examination. By integrating ultrasound-based tumor system classification with standardized psychological assessments, this study sought to characterize the distribution of psychological outcomes across different diagnostic contexts within an inpatient setting. In addition, the study examined differences in psychological outcomes by malignancy type, explored associations among psychological measures, and evaluated the relationship between anxiety/depressive symptoms and overall distress.

By focusing on hospitalized patients within a real-world ultrasound diagnostic environment, this study addresses an underexplored area at the intersection of diagnostic imaging and psycho-oncology. The findings may contribute to a more nuanced understanding of psychological burden during inpatient cancer evaluation and support the development of context-sensitive psychosocial screening approaches

in imaging-based clinical pathways

2. Materials and methods

2.1. Study design and setting

This study adopted a cross-sectional observational design to investigate psychological distress, anxiety, and depressive symptoms among hospitalized cancer patients undergoing ultrasound examination. The study was conducted at Longyou County People's Hospital Chengdong New Campus, within the Department of Ultrasound, a regional comprehensive medical center that provides routine diagnostic imaging services for both inpatient and outpatient oncology populations. Ultrasound examinations in this department are commonly performed during cancer diagnosis, staging evaluation, postoperative surveillance, and follow-up assessments. Psychological screening was integrated into routine inpatient clinical evaluation, allowing for the assessment of emotional status within a real-world diagnostic context.

2.2. Study population

Patients were consecutively enrolled between January 2023 and December 2024 at the Department of Ultrasound, Longyou County People's Hospital. All hospitalized patients with malignant tumors who underwent ultrasound examination during the study period were invited to participate if they met the eligibility criteria. A total of 60 patients were enrolled in this study.

Inclusion criteria: (1) Age ≥ 18 years; (2) Histopathologically or clinically confirmed malignant tumor (primary or metastatic); (3) Underwent diagnostic ultrasound during hospitalization; (4) Able to understand and independently complete the Chinese versions of the psychological scales.

Exclusion criteria: (1) Severe cognitive impairment (Mini-Mental State Examination score < 23); (2) Prior diagnosis of schizophrenia, bipolar disorder, or other psychotic disorders; (3) Currently receiving antipsychotic or benzodiazepine medication; (4) Life expectancy < 3 months (assessed by the attending physician); (5) Refusal to participate or inability to complete the questionnaires.

2.3. Clinical and ultrasound data collection

Clinical data were obtained from electronic medical records and included hospital admission and discharge dates, ultrasound diagnostic findings, and documented clinical diagnoses. Ultrasound examinations were performed by certified ultrasound physicians in accordance with routine institutional protocols. Diagnostic findings were recorded as narrative descriptions detailing lesion location, echogenic characteristics, and suspected malignant features. For patients with multiple ultrasound findings, the lesion deemed most clinically relevant based on the medical record was used for subsequent classification and analysis.

2.4. Tumor system classification

Tumor systems were classified based on ultrasound diagnostic findings in conjunction with corresponding clinical diagnoses. Each patient was assigned to a single tumor system category according to the primary organ system involved. Tumor systems included liver or hepatobiliary, breast, pancreatic, thyroid, gynecologic, urinary, and hematologic categories. Tumor system classification was treated as a categorical variable for descriptive analysis and group comparisons of psychological outcomes.

2.5. Classification of malignancy type

Malignancy type was categorized as either primary malignancy or metastatic or secondary malignancy according to the documented clinical diagnosis. Primary malignancies were defined as cancers originating within the primary organ system identified by ultrasound examination, whereas metastatic or secondary malignancies were defined as cancers involving secondary organ involvement or distant spread. This classification was used to examine differences in psychological outcomes between malignancy types.

2.6. Psychological assessment instruments

Psychological distress, anxiety, and depressive symptoms were assessed using standardized instruments routinely applied in clinical practice. Anxiety and depressive symptoms were evaluated using the Hospital Anxiety and Depression Scale, a 14-item self-report instrument consisting of anxiety and depression subscales. Each item is scored on a four-point Likert scale, with higher total scores indicating greater symptom severity. PTSD symptom burden was assessed using a standardized PTSD symptom questionnaire that evaluates trauma-related symptoms commonly observed in medically ill patients. Overall psychological distress was measured using the Distress Thermometer, a single-item numeric rating scale ranging from 0 to 10, with higher scores indicating greater distress. Distress Thermometer scores were used both as an outcome measure and as the dependent variable in regression analysis. Psychological assessments were administered within 24 hours after the ultrasound examination by two uniformly trained psycho-oncology nurses using standardized instructions. Ultrasound physicians were completely blinded to the psychological scores, and the assessors were also blinded to ultrasound findings and tumor system classification.

2.7. Statistical analysis

All statistical analyses were conducted using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized using means, standard deviations, and ranges, while categorical variables were summarized using frequencies and percentages. Given the small sample size and the distributional characteristics of the data, non-parametric statistical methods were applied. Differences in psychological outcomes across tumor system categories were examined using independent-samples Kruskal–Wallis tests. Comparisons between malignancy type groups were conducted using Mann–Whitney U tests and Kruskal–Wallis tests as appropriate. Associations among psychological measures were assessed using Spearman’s rank correlation coefficients.

A univariable linear regression analysis was performed within the primary malignancy subgroup to examine the association between Hospital Anxiety and Depression Scale scores and Distress Thermometer scores. Regression diagnostics were evaluated using standardized residual statistics and residual plots. Multivariable regression analyses were not conducted due to sample size considerations. All statistical tests were two-tailed, and statistical significance was defined as $p < 0.05$.

2.8. Ethical considerations

This study was conducted in accordance with the ethical standards of the institutional research committee and the principles of the Declaration of Helsinki. The study was reviewed and approved by the Ethics Committee of Longyou County People’s Hospital (approval number: LRYLL2026-001). Patient data were

anonymized prior to analysis. As a cross-sectional study based on routinely collected clinical data, informed consent requirements were handled in accordance with institutional policies and local regulations. Written informed consent was obtained from all participating patients prior to enrollment.

3. Results

3.1. Participant characteristics and clinical composition

A total of 60 hospitalized cancer patients were included. All underwent ultrasound examination and completed the full set of psychological assessments, with no missing data. **Table 1** summarizes the clinical characteristics. Patients' ages ranged from 30 to 82 years, with a mean of 57.21 ± 11.53 years. There were 33 males (55.00%) and 27 females (45.00%). The mean hospitalization duration was 8.51 ± 3.81 days, and the median time since cancer diagnosis was 4.5 months (range 1–36 months). Tumor system distribution: liver/hepatobiliary 15 (25.00%), breast 15 (25.00%), pancreatic 6 (10.00%), thyroid 3 (5.00%), gynecologic 6 (10.00%), urinary 6 (10.00%), and hematologic 9 (15.00%). Regarding malignancy type, primary malignancies accounted for 40 (66.67%) and metastatic/secondary malignancies for 20 (33.33%)(see **Figure 1**).

Table 1. Clinical characteristics of the study population ($N = 60$)

Variable	<i>n</i> (%) / mean $\pm$ SD (range)
Age (years)	57.21 $\pm$ 11.53 (30–82)
Sex, <i>n</i> (%)	
Male	33 (55.00)
Female	27 (45.00)
Hospitalization duration (days)	8.51 $\pm$ 3.81
Time since cancer diagnosis (months)	4.51 (1–36)
Liver / Hepatobiliary	15 (25.00)
Breast	15 (25.00)
Pancreatic	6 (10.0)
Thyroid	3 (5.0)
Gynecologic	6 (10.0)
Urinary	6 (10.0)
Hematologic	9 (15.00)
Malignancy type	
Primary malignancy	40 (66.67)
Metastatic / secondary malignancy	20 (33.33)

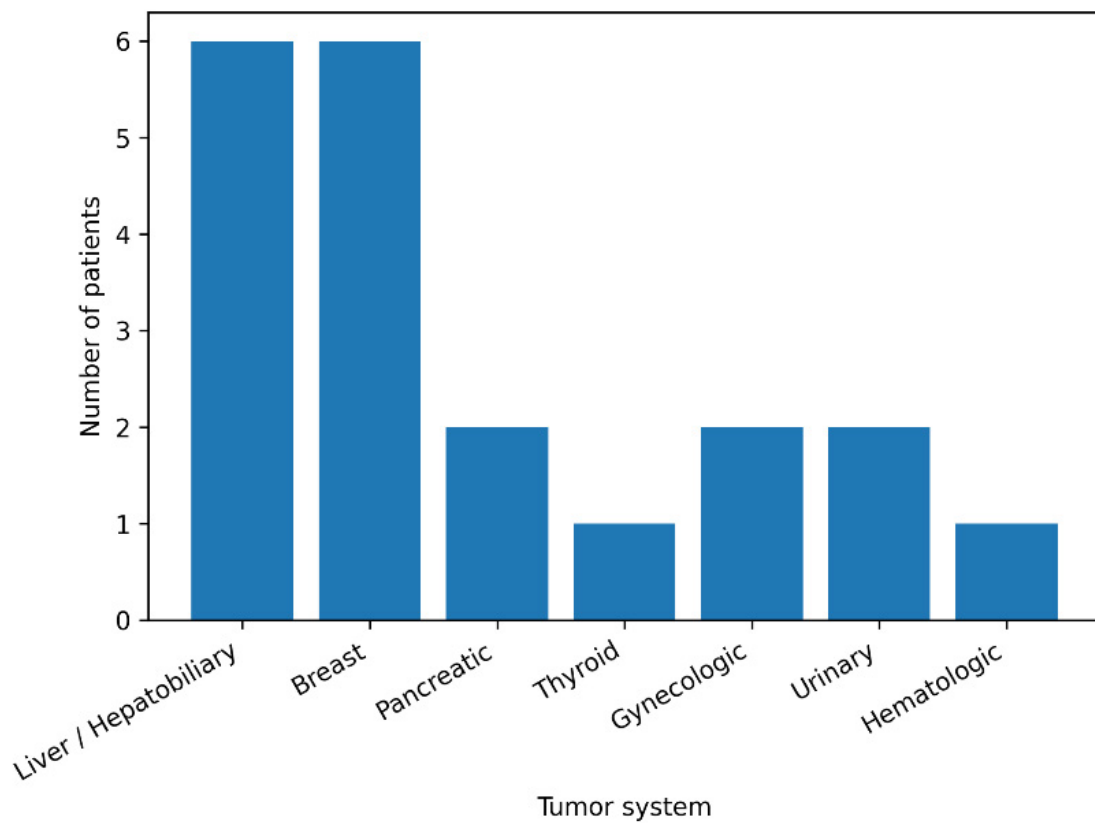


Figure 1. Distribution of tumor systems among patients undergoing ultrasound examination.

3.2. Distribution of psychological measures

Table 2 presents the descriptive statistics for the HADS, PTSD symptom scores, and Distress Thermometer scores. HADS total scores ranged from 8 to 30, with a mean of 20.51 ± 5.21 ; PTSD symptom scores ranged from 20 to 65, mean 45.01 ± 10.01 ; Distress Thermometer scores ranged from 3 to 10, mean 7.21 ± 1.51 .

Table 2. Descriptive statistics of psychological measures

Measure	N	Minimum	Maximum	Mean	SD
HADS	60	8	30	20.51	5.21
PTSD	60	20	65	45.01	10.01
Distress Thermometer	60	3	10	7.21	1.51

Abbreviations: HADS, Hospital Anxiety and Depression Scale; PTSD, post-traumatic stress disorder symptom score.

3.3. Psychological outcomes across tumor systems

Psychological outcomes across tumor system categories were compared using Kruskal-Wallis tests, as shown in **Table 3**. HADS total scores differed significantly across tumor systems ($H = 14.276$, $p = 0.027$). PTSD symptom scores also showed significant differences across tumor systems ($H = 14.893$, $p = 0.021$). Distress Thermometer scores likewise differed significantly across tumor systems ($H = 13.654$, $p = 0.034$). These preliminary findings suggest that the level of psychological burden among hospitalized cancer patients varies by tumor system.

Table 3. Kruskal–Wallis test results for psychological outcomes across tumor systems

Outcome measure	<i>H</i>	<i>p</i> value
HADS	14.276	0.027
PTSD	14.893	0.021
Distress Thermometer	13.654	0.034

Note: Significance level set at $p < 0.05$.

Figure 2 presents the distribution of Distress Thermometer scores across tumor system categories. The median scores (with interquartile range, IQR) were as follows: liver/hepatobiliary: 7.82 (IQR: 7.02–8.61); breast: 7.15 (IQR: 6.51–7.89); pancreatic: 6.98 (IQR: 6.22–7.54); thyroid: 6.51 (IQR: 5.93–7.08); gynecologic: 7.09 (IQR: 6.38–7.77); urinary: 7.28 (IQR: 6.59–7.96); hematologic: 7.53 (IQR: 6.71–8.42). Thyroid system patients showed the lowest median score, while liver/hepatobiliary patients showed the highest. The IQR ranges reflect within-group variability, and the overall difference in score distributions across tumor systems was statistically significant (Kruskal-Wallis $H = 13.654$, $p = 0.034$).

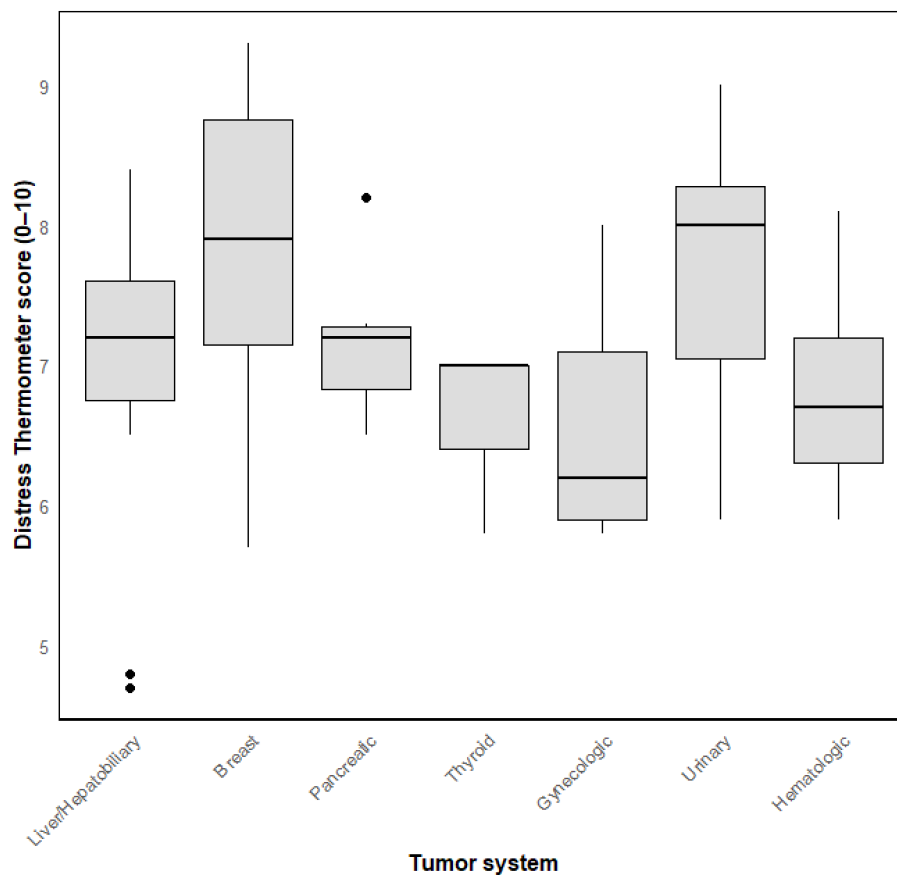


Figure 2. Distribution of Distress Thermometer scores across tumor system categories. Boxes represent interquartile ranges, with median values indicated; whiskers denote the range of observed values.

3.4. Psychological outcomes by malignancy type

Mann-Whitney U tests were used to compare psychological outcomes between patients with primary malignancies ($n = 40$) and those with metastatic/secondary malignancies ($n = 20$); results are summarized in **Table 4**. No statistically significant

difference was observed in HADS scores between the two groups ($U = 346.500$, $p = 0.342$). Similarly, PTSD symptom scores ($U = 351.000$, $p = 0.378$) and Distress Thermometer scores ($U = 365.500$, $p = 0.514$) did not differ significantly. These results suggest that, in the inpatient setting, malignancy type (primary vs. metastatic) is not a major determinant of psychological distress.

Table 4. Comparison of psychological outcomes by malignancy type

Outcome measure	Test	<i>p</i> value
HADS	346.500	0.342
PTSD	351.000	0.378
Distress Thermometer	365.500	0.514

Note: Statistical significance was defined as $p < 0.05$.

Figure 3 displays the distribution of Distress Thermometer scores by malignancy type. The median score (interquartile range, IQR) was 7.16 (IQR: 6.03–8.29) for the primary malignancy group ($n = 40$) and 7.21 (IQR: 6.12–8.36) for the metastatic/secondary malignancy group ($n = 20$). The medians and IQR ranges overlapped considerably, and the box positions and widths were similar between the two groups, indicating no substantial difference in global psychological distress. This visual finding is consistent with the Mann-Whitney U test result ($U = 365.500$, $p = 0.514$), further supporting that, in the inpatient setting, malignancy type (primary vs. metastatic) is not a major determinant of Distress Thermometer scores.

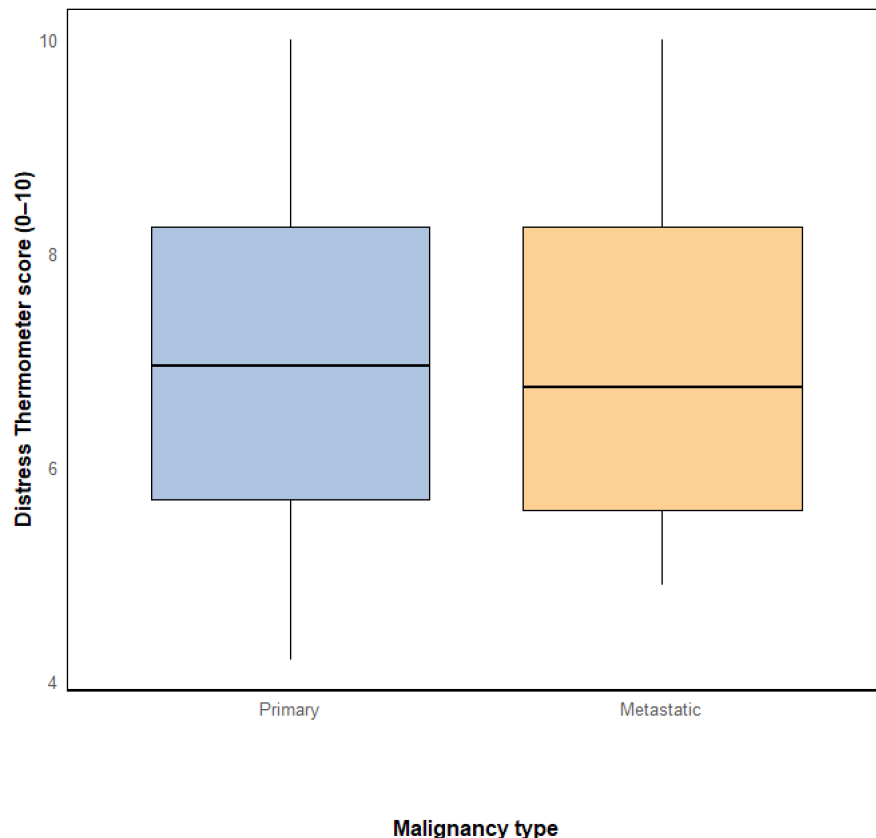


Figure 3. Distribution of Distress Thermometer scores by malignancy type. Boxes represent interquartile ranges, with median values indicated; whiskers denote the range of observed values.

Across all psychological outcome measures examined, the null hypothesis of equal distributions between malignancy type groups was retained. No statistically significant differences were detected for HADS, PTSD, or Distress Thermometer scores when comparing primary and metastatic or secondary malignancies.

3.5. Correlations among psychological measures

Spearman's rank correlation coefficients were calculated to examine bivariate associations among HADS, PTSD symptom scores, and Distress Thermometer scores (see **Table 5**). HADS was strongly positively correlated with PTSD scores ($\rho = 0.959$, $p < 0.001$) and with Distress Thermometer scores ($\rho = 0.838$, $p < 0.001$). PTSD scores were also strongly correlated with Distress Thermometer scores ($\rho = 0.843$, $p < 0.001$). The 95% confidence intervals for all correlation coefficients excluded zero, indicating substantial overlap among anxiety/depressive symptoms, trauma-related symptoms, and global distress in this inpatient cancer population (see **Figure 4**).

Table 5. Spearman correlation coefficients among psychological measures ($N = 60$)

Measure	HADS	PTSD	Distress Thermometer
HADS	1.000	0.959**	0.838**
PTSD	0.959**	1.000	0.843**
Distress Thermometer	0.843**	0.838**	1.000

Note: Values represent Spearman's rho (ρ). ** Correlation is significant at the 0.01 level (two-tailed).

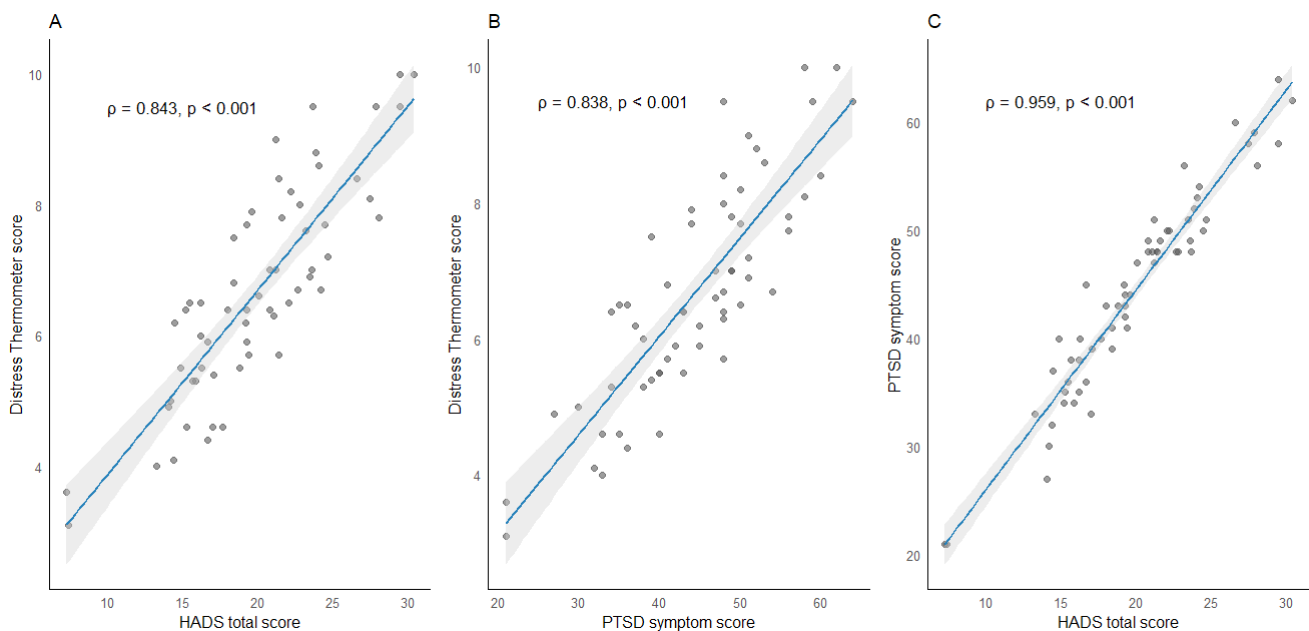


Figure 4. Pairwise scatter plots of psychological measures

3.6. Univariable regression analysis of distress thermometer scores

To estimate the independent effect of anxiety/depressive symptoms on global distress after adjusting for potential confounders, a multivariable linear regression model (Enter method) was constructed with Distress Thermometer score as the dependent variable, HADS total score as the primary independent variable, and age, sex, hospitalization duration, tumor system (categorical), and malignancy type (primary vs. metastatic) as covariates. All variance inflation factors were < 2.5 ,

indicating no significant multicollinearity. **Table 6** presents the final model. After adjustment for the above covariates, HADS total score remained significantly and positively associated with Distress Thermometer score (unstandardized coefficient $B = 0.261$, standardized $\beta = 0.881$, $SE = 0.030$, $t = 8.701$, $p < 0.001$). Hospitalization duration showed a weak positive association with Distress Thermometer score ($B = 0.051$, $p = 0.018$). None of the other covariates (age, sex, tumor system, malignancy type) reached statistical significance (all $p > 0.05$). The model explained 78.9% of the variance in Distress Thermometer scores (adjusted $R^2 = 0.789$, $F = 24.567$, $p < 0.001$).

Table 6. Multivariable linear regression of Distress Thermometer scores on HADS scores (primary malignancy subgroup)

Predictor	B	Std. Error	β	t	p value
Constant	1.201	0.351	—	3.422	<0.001
HADS	0.261	0.030	0.881	8.701	<0.001
Age (years)	0.011	0.011	0.071	1.001	0.318
Sex (male vs. female)	0.121	0.181	0.042	0.668	0.506
Hospitalization duration (days)	0.051	0.021	0.123	2.429	0.018
Tumor system (reference: liver)	—	—	—	—	0.089*
Malignancy type (primary vs. metastatic)	-0.081	0.301	-0.021	-0.269	0.788

Note: * overall Wald test p value for tumor system; adjusted $R^2 = 0.789$, $F = 24.567$, $p < 0.001$.

4. Discussion

4.1. Overview of principal findings

This cross-sectional study investigated psychological distress, anxiety, and depressive symptoms among hospitalized cancer patients undergoing ultrasound examination, integrating imaging-based diagnostic context with standardized psychological assessments. Several important findings emerged. First, elevated levels of psychological distress were observed across the cohort, as reflected by high mean scores on the Hospital Anxiety and Depression Scale (HADS), PTSD symptom measures, and the Distress Thermometer. Second, psychological outcomes differed significantly across tumor system categories, whereas no statistically significant differences were identified between patients with primary malignancies and those with metastatic or secondary malignancies. Third, extremely strong correlations were observed among anxiety, depressive symptoms, trauma-related symptoms, and overall distress, indicating a high degree of convergence among psychological constructs in this inpatient population. Finally, anxiety and depressive symptom severity was strongly associated with distress levels in the primary malignancy subgroup.

Together, these findings highlight the substantial psychological burden experienced by hospitalized cancer patients undergoing diagnostic evaluation and underscore the relevance of diagnostic context, rather than malignancy stage alone, in shaping emotional responses during inpatient care. Importantly, the results suggest that psychological distress in this setting may be driven by a combination of symptom burden, uncertainty, and situational stressors associated with hospitalization and diagnostic procedures [32–34].

4.2. Psychological distress in the context of inpatient ultrasound evaluation

Hospitalization for cancer-related evaluation represents a period of heightened

psychological vulnerability. Although ultrasound examinations are non-invasive, they are often performed at critical junctures in the diagnostic or monitoring trajectory, including initial lesion detection, assessment of disease progression, or evaluation of treatment response. For many patients, ultrasound findings may carry significant emotional weight, particularly when results are discussed in real time or closely followed by clinical decision-making [14,35,36].

In the present cohort, mean Distress Thermometer scores exceeded commonly used clinical screening thresholds, indicating that distress was prevalent across patients undergoing ultrasound examination. Elevated HADS and PTSD symptom scores further suggest that anxiety, depressive symptoms, and trauma-related responses co-occur in this clinical context [37,38]. These findings are consistent with prior literature demonstrating that diagnostic procedures, uncertainty regarding disease status, and inpatient environments contribute substantially to psychological distress in oncology populations [39].

Notably, the current study does not imply that ultrasound itself causes psychological distress. Rather, ultrasound serves as a clinically meaningful context in which psychological symptoms are assessed, capturing patients at moments when concerns about disease status, prognosis, and treatment decisions are particularly salient [40,41]. This positioning aligns with contemporary psycho-oncology perspectives emphasizing the importance of assessing psychological distress at key points along the cancer care continuum [42].

4.3. Tumor system–specific differences in psychological outcomes

One of the central findings of this study was the presence of statistically significant differences in psychological outcomes across tumor system categories. Anxiety and depressive symptoms, PTSD-related symptoms, and distress levels all varied significantly by tumor system, as demonstrated by Kruskal–Wallis analyses.

Tumor system–specific differences in psychological burden have been reported previously, although findings across studies are heterogeneous. Factors such as symptom burden, disease visibility, functional impairment, and perceived threat to life may differ substantially between tumor systems, potentially shaping emotional responses [11,43,44]. For example, hepatobiliary malignancies are often associated with nonspecific symptoms and diagnostic uncertainty, while breast cancer may involve body image concerns and heightened emotional awareness [45,46]. Pancreatic and gynecologic malignancies, although less prevalent in this cohort, are frequently perceived as aggressive or life-altering, which may further influence psychological responses [47,48].

Importantly, the present findings do not suggest uniform patterns of distress within any single tumor system. Rather, variability was observed both within and across categories, indicating that tumor system alone does not fully account for psychological outcomes [49]. This reinforces the need for individualized psychological assessment rather than reliance on diagnosis-based assumptions [50].

The identification of tumor system–related differences nevertheless have practical implications. It supports the notion that psychological screening strategies may benefit from sensitivity to diagnostic context, particularly in inpatient settings where emotional distress may fluctuate in response to ongoing evaluations and clinical discussions.

4.4. Absence of differences by malignancy type

In contrast to tumor system–related differences, no statistically significant

differences in psychological outcomes were observed between patients with primary malignancies and those with metastatic or secondary malignancies. This finding warrants careful consideration.

Conventional assumptions in oncology often posit that metastatic disease is associated with greater psychological distress due to poorer prognosis and more complex treatment pathways. However, empirical evidence has been mixed, with several studies reporting comparable levels of distress across disease stages, particularly in inpatient or acutely ill populations [51].

In the present study, the lack of significant differences by malignancy type may reflect several factors. First, hospitalization itself may serve as an equalizing stressor, elevating distress across patients regardless of disease stage. Second, patients with primary malignancies undergoing diagnostic evaluation may experience levels of uncertainty and fear comparable to those of patients with established metastatic disease. Third, the small number of metastatic cases in this cohort necessitates cautious interpretation, although the consistency of non-significant findings across multiple psychological measures suggests that stage alone may not be the dominant determinant of distress in this context [39,52].

These findings align with growing recognition that psychological distress in cancer is not solely driven by objective disease severity but is shaped by subjective experiences, symptom perception, and psychosocial context [53,54].

4.5. Convergence of psychological measures

The correlation analyses revealed extremely strong positive associations among HADS, PTSD symptom scores, and Distress Thermometer scores, reaching up to 0.959 (between HADS and PTSD) across all pairwise comparisons, indicating a high degree of concordance among these instruments within the study cohort.

This convergence suggests that anxiety, depressive symptoms, trauma-related responses, and subjective distress are tightly interconnected in hospitalized cancer patients undergoing diagnostic evaluation. While each instrument captures distinct conceptual dimensions, their strong associations highlight the shared emotional substrate underlying psychological responses in this setting [55,56].

From a clinical perspective, these findings support the utility of brief screening tools such as the Distress Thermometer as proxies for broader emotional distress, particularly in time-constrained inpatient environments. At the same time, the strong correlations underscore the importance of comprehensive assessment when elevated distress is identified, as multiple domains of psychological functioning may be affected concurrently [57,58].

4.6. Relationship between anxiety/depression and distress

The univariable regression analysis further elucidated the relationship between emotional symptom severity and distress levels. Within the primary malignancy subgroup, HADS scores were strongly associated with Distress Thermometer scores, with a high standardized beta coefficient and a statistically significant model fit. This finding reinforces the close linkage between anxiety/depressive symptoms and subjective distress in hospitalized cancer patients [54,59]. Distress, as measured by the Distress Thermometer, may be conceptualized as a global indicator encompassing emotional, physical, and psychosocial concerns. The strong association with HADS suggests that anxiety and depression constitute central components of this broader distress experience [58,60]. Importantly, the regression analysis was deliberately restricted to a univariable model to avoid overfitting and to preserve interpretability

given the sample size. The findings should therefore be viewed as descriptive of association rather than indicative of causality [61,62].

4.7. Clinical implications

The findings of this study have several implications for clinical practice in inpatient oncology settings. First, the consistently elevated levels of psychological distress across tumor systems underscore the importance of routine psychological screening during hospitalization, particularly during diagnostic evaluations. Second, the observed tumor system–specific differences suggest that screening efforts may benefit from heightened vigilance in certain diagnostic contexts, although individual assessment remains essential.

Third, the strong convergence among psychological measures supports the feasibility of stepped screening approaches, in which brief tools such as the Distress Thermometer are used initially, followed by more detailed assessment when indicated. Finally, the close association between anxiety/depression and distress highlights potential targets for psychosocial intervention, including symptom management, emotional support, and counseling services.

4.8. Methodological considerations and limitations

Several limitations should be acknowledged. The study employed a cross-sectional design, precluding conclusions regarding temporal relationships or causal pathways. The sample size was modest, reflecting the exploratory nature of the study and the single-center inpatient setting. The sample size ($N = 20$) was primarily constrained by the stringent inclusion criteria requiring complete psychological assessments and ultrasound diagnostic records in a real-world inpatient setting. This limits the generalizability of findings to broader or more diverse oncology populations, and the results should be interpreted as exploratory. While non-parametric methods were appropriately applied, small subgroup sizes limited the ability to conduct post hoc comparisons or multivariable analyses. Ultrasound diagnostic findings were used to contextualize patient status but were not quantitatively analyzed. Future studies incorporating imaging severity, lesion characteristics, or longitudinal imaging data may provide further insight into the relationship between diagnostic findings and psychological outcomes. Despite these limitations, the study benefits from complete data, standardized assessment instruments, and a coherent analytical framework aligned with clinical practice.

4.9. Future directions

Future research should extend these findings through larger, multi-center studies incorporating longitudinal designs. Repeated psychological assessments across diagnostic and treatment phases may help clarify trajectories of distress and identify critical intervention points. Integration of imaging-based risk stratification with psychosocial assessment represents a promising avenue for holistic cancer care.

5. Conclusion

This pilot study provides preliminary evidence that hospitalized cancer patients undergoing ultrasound examination experience substantial psychological distress, with elevated levels of anxiety, depressive symptoms, and trauma-related responses. Psychological outcomes varied significantly across tumor system categories, indicating that diagnostic context is associated with differences in emotional burden during inpatient care. In contrast, no significant differences were observed between primary and metastatic malignancy groups, suggesting that distress in this setting may

be influenced more by diagnostic and symptomatic factors than by malignancy type alone.

Strong correlations were observed among anxiety, depression, PTSD-related symptoms, and overall distress, highlighting the interconnected nature of psychological responses in hospitalized oncology patients. Furthermore, anxiety and depressive symptom severity was significantly associated with distress levels in patients with primary malignancies, underscoring the close relationship between emotional symptoms and global distress during hospitalization.

These findings support integrating routine psychological screening into inpatient oncology care, particularly during diagnostic evaluation using ultrasound. Brief screening tools may facilitate early identification of patients at risk of significant psychological distress and enable timely psychosocial support. Future studies with larger, longitudinal cohorts are warranted to further clarify psychological trajectories across diagnostic and treatment phases and to inform targeted psychosocial interventions within imaging-based clinical pathways.

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