Article

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Effect of Club-Style Psychological Counselling Service on Anxiety and Depression in Patients With Haematology Undergoing Chemotherapy With Totally Implantable Venous Access Port

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Abstract

Background: To explore the associations between club-style psychological counselling and anxiety, depression, treatment compliance, quality of life (QoL) and totally implantable venous access port (TIVAP)-related adverse events in patients with haematological diseases undergoing TIVAP chemotherapy.

Methods: This retrospective observational cohort study included 146 patients (January 2024–October 2025). Participants were allocated into the observation group (70 cases, routine nursing + club-style psychological counselling) and control group (76 cases, routine nursing alone) according to recorded medical resource accessibility and patients' voluntary service selection. Data were extracted from electronic medical records, nursing documents and psychological assessment records. Assessments were conducted at baseline (1–2 days pre-first chemotherapy), 4-week follow-up, and study end (1–2 days post-last chemotherapy) using Generalized Anxiety Disorder-7 (GAD-7), Patient Health Questionnaire-9 (PHQ-9), a self-developed treatment compliance scale, and European Organization for Research and Treatment of Cancer QoL Questionnaire-Core 30 (QLQ-C30). TIVAP-related adverse events were also recorded. Repeated-measures analysis of variance (ANOVA) with Bonferroni correction was used to compare changes over time and between groups. Missing data were processed via multiple imputation by chained equations (MICE) and complete-case sensitivity analysis. Outcome assessors were blinded to group assignment during original scale evaluation.

Results: At baseline, no significant between-group differences were observed in all indicators between groups ($p > 0.05$). At 4-week follow-up and study end, GAD-7 and PHQ-9 scores in the observation group were significantly lower than their respective baseline values and those of the control group at matched time points (all adjusted $p < 0.001$, Cohen's d > 0.80). The control group showed no significant changes in GAD-7 or PHQ-9 scores across time points ($p > 0.05$). At study end, the observation group had higher treatment compliance scores [(52.42 $\pm$ 4.15) vs. (45.22 $\pm$ 5.25), $p < 0.001$], better QLQ-C30 functional dimension scores, and lower symptom dimension scores (post-hoc adjusted $p < 0.001$). No significant between-group difference was found in the incidence of TIVAP-related adverse events (4.3% vs. 6.6%, Fisher's exact test $p = 0.807$).

Conclusions: This retrospective cohort study only reveals correlative differences rather than causal effects. Club-style psychological counselling was correlated with milder anxiety and depression, higher treatment compliance, and better QoL among patients with haematological diseases receiving TIVAP chemotherapy, without correlating with elevated TIVAP adverse event risk. The multi-component service model provides exploratory real-world evidence for clinical psychological nursing optimisation; however, the inherent study limitations restrict causal inference and generalisability.

Keywords

haematological neoplasms; chemotherapy; venous access devices; anxiety; depression

Submitted: 22 May 2026 Revised: 19 September 2026 Accepted: 23 September 2026 Online First: 25 November 2026
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Introduction

Haematologic diseases (e.g., leukaemia, lymphoma, and multiple myeloma) are typically highly malignant and require prolonged treatment, with chemotherapy serving as a core therapeutic modality for improving prognosis [1–3]. The totally implantable venous access port (TIVAP) is widely used in haematological chemotherapy due to its advantages of long indwelling time, low infection risk, and minimal impact on daily activities [4,5]. However, factors such as TIVAP implantation trauma, long-term foreign-body sensation, cumbersome maintenance, chemotherapy-induced adverse reactions (e.g., nausea, vomiting, and alopecia), and disease prognosis uncertainty, can impose substantial physical and mental burden on patients, leading to a higher incidence of anxiety and depression than that observed in patients with ordinary tumours [6]. These negative emotions can reduce treatment compliance, impair immune function, exacerbate side effects, and compromise quality of life (QoL) and treatment outcomes [7,8], highlighting the need for targeted psychological support.

Current psychological support models for patients with tumour (e.g., individual counselling, group support, and cognitive behavioural therapy [CBT]) [9] are limited by single formats, low participation, and poor scalability, failing to meet the personalised needs of patients receiving TIVAP chemotherapy [10]. Club-style psychological counselling, a novel group support model integrating professional counselling, peer sharing, and health education, has shown potential as a psychological support for chronic disease patients in China [11].

Existing studies on anxiety and depression among patients with haematological chemotherapy mostly focus on influencing factors, with few specifically targeting patients receiving TIVAP chemotherapy [12,13]. Additionally, the application of club-style psychological counselling in oncology remains exploratory, and its efficacy in alleviating anxiety and depression in this specific population has not been systematically evaluated. To date, real-world evidence regarding the use of the club-style counselling model in this specific population remains limited, leaving a gap in targeted psychological nursing evidence for TIVAP recipients. Therefore, this retrospective cohort study aimed to explore the correlations between club-style psychological counselling and anxiety and depression in patients with haematological diseases undergoing TIVAP chemotherapy, thereby providing real-world evidence for optimising clinical psychological nursing.

Materials and Methods

Study Subjects

This retrospective cohort study included 146 patients with haematological diseases undergoing TIVAP chemotherapy (January 2024–October 2025) at Zhongnan Hospital of Wuhan University. The study was approved by the Ethics Committee of Zhongnan Hospital of Wuhan University (Ethics Approval No.: [2026145K]) and complied with the Declaration of Helsinki, with informed consent obtained from all patients or their families.

Inclusion criteria: (1) Diagnosis of hematologic diseases (leukaemia, lymphoma, and multiple myeloma) confirmed by pathology or bone marrow puncture; (2) Chemotherapy through a TIVAP after implantation; (3) Age ≥18 years, with intact consciousness and cognition and the ability to complete scale assessments; (4) Complete primary outcome data, including all three-wave psychological scale scores and nursing follow-up records.

Exclusion criteria: (1) Severe mental disorders or history thereof; (2) Severe organ failure unable to tolerate chemotherapy or assessments; (3) Incomplete data due to disease progression, transfer, or withdrawal; (4) Language communication barriers; (5) Participation in other psychological service studies.

Patient screening and grouping: A total of 186 eligible patients were retrieved from electronic medical archives. Forty patients were excluded: 25 with incomplete scale assessment data, 6 with severe mental disorders, 9 lost to follow-up due to treatment abandonment or hospital transfer. The remaining 146 patients were divided into the observation group (n = 70, routine nursing + club-style psychological counselling) and control group (n = 76, routine nursing alone). Group allocation was determined by patients' voluntary application for club counselling and ward medical resource supply records, which may introduce selection bias.

Missing data handling: No missing values were present in the primary outcome measures (three-wave GAD-7 and PHQ-9 total scores), as complete data for these measures were required by the inclusion criteria. However, sporadic missing values were observed in a subset of baseline covariates (e.g., social support scale and comorbidity details) and secondary outcome measures (e.g., individual items of the self-developed compliance scale and QLQ-C30), with an overall missing rate of <5% across all non-primary variables. Multiple imputation by chained equations (MICE) for primary analysis was used for the primary

Actas Esp Psiquiatr 2026;1–12. https://doi.org/10.62641/aep.2336 | ISSN:1578-2735
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analysis; missingness was assumed to be missing at random (MAR) based on Little's Missing Completely at Random (MCAR) test ($p > 0.05$), and 20 imputed datasets were generated with predictive mean matching for continuous variables. Complete case analysis was adopted for sensitivity verification to test the robustness of results.

Study Methods

Data Collection

Baseline data (demographics, disease information, and social support), service-related records, and outcome indicators (anxiety, depression, compliance, QoL, and adverse events) were collected by reviewing electronic medical records, nursing documentation, and psychological assessment files.

Nursing Care Methods

(1) Control group: Patients received routine haematology nursing care in accordance with institutional clinical practice guidelines, including routine admission orientation, disease and chemotherapy education, vital sign monitoring, physical symptom management, TIVAP maintenance guidance, and discharge instructions [14].

(2) Observation group: Patients received routine nursing plus club-style psychological counselling.

Operational definition of club-style psychological counselling: This was a closed, fixed small-group psychological service model led by a multidisciplinary medical team, integrating structured psychological counselling, peer mutual sharing, TIVAP-specific health education, family participation workshops, progressive relaxation training, and continuous WeChat online interaction. The programme followed unified activity themes, session duration, and quality control standards [11].

The counselling programme lasted 4–8 weeks [mean 6 weeks, 2 sessions weekly, 60–90 min per session: 45–60 min offline group activities, 15–30 min online real-time Question and Answer (Q&A)]. The heterogeneous service duration was determined by individualised chemotherapy cycles, hospitalisation lengths, and patients' physical tolerance [11].

Service team composition: 1 associate chief physician of haematology, 2 certified TIVAP specialist nurses, 2 second-level psychological counsellors, 2 nursing assistants. The standardised 8-week service content was divided into five fixed phases:

(1) Week 1: Group ice-breaking, trust establishment, and baseline psychological assessment. Initial group construction is the core prerequisite for stable psychological service, consistent with group psychotherapy operation specifications for patients with tumours [15].

(2) Weeks 2–3: Thematic cognitive behavioural counselling targeting chemotherapy-related anxiety, TIVAP maintenance-related anxiety, and depression rumination. Targeted CBT service for vascular access-related negative emotions follows the psychological service framework proposed by international oncology nursing guidelines [15].

(3) Weeks 4–5: Peer experience sharing and positive coping case communication. Homologous peer-support module was informed by evidence-based research on group support for patients receiving chemotherapy [16].

(4) Weeks 6–8: Progressive muscle relaxation training, family support workshops, and TIVAP standardised maintenance training. Relaxation training and family-based support are mature modules recommended in chronic cancer psychological care guidelines [10].

(5) Full-cycle continuous online interaction: Daily psychological consultation was provided through an exclusive WeChat group throughout the service period.

Service fidelity and quality control: Uniform service implementation manual and standardised activity record forms were used to ensure consistent delivery. Patient attendance was recorded for each session, and weekly team case discussion were conducted. A fidelity checklist was completed after every session to quantify service standardisation. All activity attendance records were extracted for subgroup exposure analysis.

Outcome Assessment Tools

Primary Outcomes

Patients' anxiety and depression were assessed by the Generalized Anxiety Disorder-7 (GAD-7) and the Patient Health Questionnaire-9 (PHQ-9), respectively.

(1) GAD-7 scale: The original version was developed by Spitzer *et al*. [17], and the Chinese version was validated for use in the Chinese population by Ying *et al*. [18]. The scale consists of seven items focusing on core anxiety symptoms (e.g., "Feeling nervous, anxious, or on edge"), each rated on a 4-point scale (0 = Not at all, 1 = Several

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days, 2 = More than half the days, 3 = Nearly every day), with a total score ranging from 0 to 21. According to the original scale [17], total scores of 0–4, 5–9, 10–14, and 15–21 represent minimal/no, mild, moderate, and severe anxiety, respectively. The Cronbach's α coefficient of the scale in the present study was 0.863.

(2) PHQ-9 scale: The original version was developed by Kroenke *et al*. [19], and the Chinese version was validated for use in the Chinese population by Ye *et al*. [20]. The scale includes nine items covering core depressive symptoms (e.g., "Little interest or pleasure in doing things", "Feeling down, depressed, or hopeless"), each rated on the same 4-point scale as the GAD-7, with a total score ranging from 0 to 27. Standard grading: 5–9 = mild depression, 10–14 = moderate depression, $\geq$15 = severe depression [21]. The Cronbach's α coefficient of the scale in the present study was 0.875.

Assessment time points: Baseline (1–2 days before the first chemotherapy after TIVAP implantation), 4 weeks after follow-up, and the end of follow-up (1–2 days after the last chemotherapy). All scale evaluators were blinded to patients' group assignment during original assessment to avoid detection bias for subjective emotional outcomes.

Secondary Outcomes

(1) Treatment compliance: Treatment compliance was assessed using a self-developed 15-item compliance questionnaire, constructed based on clinical nursing practice guidelines and clinical literature regarding cancer chemotherapy and vascular access care [12,22]. The questionnaire covers five operational clinical dimensions: adherence to the scheduled chemotherapy, daily TIVAP nursing, dietary adherence, medication adherence, and regular follow-up (15 items in total). Each item is rated on a 1–4 Likert scale, with a total score of 15–60 points; higher scores reflect better compliance. Content validity was evaluated by a multidisciplinary expert panel (content validity index [CVI] = 0.92), and the internal consistency in the present study was good (Cronbach's α = 0.856). The questionnaire was analysed as a continuous measure at baseline and study end; categorical compliance grade classifications were not used because externally validated population cutoff values were unavailable.

(2) Quality of life: Quality of life was assessed by the European Organization for Research and Treatment of Cancer QoL Questionnaire-Core 30 (QLQ-C30) at baseline and study end [23–25]. The scale consists of 30 items, with a standardised score ranging from 0 to 100; higher functional/global health scores and lower symptom scores indicate better quality of life. Internal consistency was good in the present study (Cronbach's α = 0.892).

(3) Incidence of TIVAP-related adverse events: All TIVAP-related complications occurring during follow-up, including local pocket infection, port-related bloodstream infection, catheter thrombosis, lumen obstruction, and subcutaneous haematoma, were fully recorded. Diagnostic criteria for each TIVAP-related complication followed the international Infectious Diseases Society of America (IDSA) catheter-associated infection guidelines and standardised TIVAP complication classification standards published by the American Association for Vascular Access (AVA) [22]. Local pocket infection was defined as erythema, swelling, tenderness or purulent exudation at the implantation site; port-related bloodstream infection was defined by concordant pathogens identified in paired port and peripheral blood cultures; catheter thrombosis was confirmed via upper-extremity venous duplex ultrasonography; catheter obstruction was defined as impaired infusion or aspiration function without mechanical malposition; subcutaneous haematoma was diagnosed by palpable subcutaneous effusion after implantation. Total adverse event incidence was calculated as the proportion of patients experiencing at least one event during follow-up.

Statistical Methods

SPSS 26.0 (IBM Corp., Armonk, NY, USA) and R 4.2.1 (R Foundation for Statistical Computing, Vienna, Austria) were used for statistical analyses. Normality test (Shapiro–Wilk) and homogeneity of variance test (Levene) were performed for all continuous data. Normally distributed continuous data were expressed as mean $\pm$ standard deviation ($\bar{x} \pm$ s), whereas non-normally distributed continuous data are presented as median (interquartile range [IQR]). Longitudinal changes in continuous outcomes were analysed using repeated measures analysis of variance (ANOVA) with group $\times$ time interaction effect calculation, Cohen's d effect size and 95% confidence intervals (CIs) reported for all intergroup contrasts. Intergroup comparisons at single time points: Independent samples *t*-test (normally distributed data)/Mann–Whitney U test (non-normally distributed or ordinal data). Categorical data were compared using Fisher's exact test when expected cell frequencies were low; ordered categorical variables were analysed using the rank–sum test.

Multiple comparison correction: Bonferroni correction was restricted to post-hoc multiple pairwise comparisons and simple effect analyses following statistically sig-

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nificant interaction or main effects in repeated measures ANOVA, in order to control Type I error rate inflation. Specifically, the adjusted p-values (p_{adj}) were calculated as $p_{adj} = \min(1, k \times p_{raw})$, where k is the number of pairwise comparisons. Statistically significant differences for post-hoc pairwise comparisons were then evaluated against the standard significance threshold of $p_{adj} < 0.05$, which is mathematically equivalent to evaluating unadjusted p-values against an adjusted significance level of $\alpha = 0.05/k$. Single hypothesis tests (e.g., baseline group comparisons, overall ANOVA F-tests, and Fisher's exact tests for clinical adverse events) were evaluated using unadjusted p values. Two-tailed $p < 0.05$ was considered statistically significant. Post-hoc power analysis was conducted using G*Power software (version 3.1.9.7; Heinrich-Heine-Universität Düsseldorf, Düsseldorf, North Rhine-Westphalia, Germany) based on the enrolled sample size (n = 70 vs. n = 76) and observed effect sizes, setting two-tailed $\alpha = 0.05$, to quantify the statistical power ($1 - \beta$) for primary psychological outcomes and secondary outcomes.

Results

Comparison of General Baseline Data

A total of 146 patients were enrolled (observation group, n = 70; control group, n = 76). Stratified χ^2 test and independent samples t-test showed no significant intergroup differences in age, gender, haematological disease type, risk/staging stratification, chemotherapy intensity, TIVAP indwelling time, comorbidity distribution, anti-anxiety/depressant medication use, and chemotherapy cycle counts (all $p > 0.05$). Baseline characteristics were generally balanced between groups, though unmeasured confounding factors could not be fully eliminated due to retrospective non-random grouping (Table 1, Ref. [22,26–29]).

Comparison of Anxiety and Depression Scores

Baseline GAD-7 and PHQ-9 scores showed no significant intergroup differences (adjusted $p > 0.05$). For GAD-7 scores, repeated-measures ANOVA demonstrated significant main effects for Group ($F(1,144) = 48.62$, $p < 0.001$, $\eta_p^2 = 0.252$) and Time ($F(2,288) = 112.45$, $p < 0.001$, $\eta_p^2 = 0.438$), as well as a significant group × time interaction effect ($F(2,288) = 54.18$, $p < 0.001$, $\eta_p^2 = 0.273$). Similarly, for PHQ-9 scores, significant main effects were observed for Group ($F(1,144) = 42.15$, $p < 0.001$, $\eta_p^2 = 0.226$) and Time ($F(2,288) = 98.34$, $p < 0.001$, $\eta_p^2 = 0.406$), along with a significant group × time interaction effect ($F(2,288) = 46.72$, $p < 0.001$, $\eta_p^2 = 0.245$). Following the significant interaction effects, post-hoc simple effect analyses showed that at 4-week follow-up and study end, the observation group exhibited significantly lower anxiety and depression scores compared with its own baseline and the control group at matched time points (all post-hoc adjusted $p < 0.001$, Cohen's $d > 0.80$). The control group had no significant changes in emotional scores throughout follow-up (all $p > 0.05$). The control group had no significant changes in emotional scores throughout follow-up (all $p > 0.05$). Subgroup analysis stratified by service duration (4–5 weeks vs. 6–8 weeks) showed longer service exposure associated with more significant reductions in GAD-7/PHQ-9 scores (Tables 2 and 3). Post-hoc power analysis confirmed that with $\alpha = 0.05$ and the observed effect sizes (Cohen's $d > 0.80$), the sample size of 146 patients provided strong statistical power ($1 - \beta > 0.99$) to detect significant group × time interaction and post-hoc simple differences in GAD-7 and PHQ-9 scores.

Comparison of Secondary Outcomes Between the Two Groups

Comparison of Treatment Compliance

Baseline total compliance and all five dimension scores showed balanced intergroup distribution (adjusted $p > 0.05$). At study end, the observation group exhibited significantly higher total compliance scores and individual dimension scores compared with the control group (all adjusted $p < 0.001$, Table 4).

Comparison of Quality of Life (QLQ-C30 Scores)

Baseline QLQ-C30 functional, global health status, and symptom dimension scores were comparable between groups (adjusted $p > 0.05$). At study end, the observation group had significantly higher functional and global health scores and lower symptom burden scores than the control group (all adjusted $p < 0.001$). Table 5 supplemented standardised dimension definition descriptions in footnote, with each time point's intergroup t, 95% CI and adjusted p directly listed under corresponding data.

Comparison of the Incidence of TIVAP-Related Adverse Events

The incidence of TIVAP-related adverse events was 4.3% (3/70, 1 infection, 1 catheter obstruction, 1 local haematoma) in the observation group and 6.6% (5/76, 2 infections, 2 obstructions, 1 haematoma) in the control group. Fisher's exact test was adopted because of the low expected

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Table 1. Comparison of general baseline data between the two groups [n (%)/$\bar{x} \pm s$].

General data	Observation group (n = 70)	Control group (n = 76)	Test statistic	*p* value
Age (years)	48.56 ± 11.42	47.92 ± 10.85	$t = 0.347$	0.729
Gender	-	-	$\chi^2 = 0.002$	0.967
Male	38 (54.29)	41 (53.95)	-	-
Female	32 (45.71)	35 (46.05)	-	-
Disease type	-	-	$\chi^2 = 0.421$	0.810
Leukaemia	26 (37.14)	32 (42.11)	-	-
Lymphoma	23 (32.86)	24 (31.58)	-	-
Multiple myeloma (MM)	21 (30.00)	20 (26.32)	-	-
Leukaemia risk stratification [26] (26/32 cases)	-	-	$\chi^2 = 0.006$	0.940
Standard-risk	10 (38.46)	12 (37.50)	-	-
High-intermediate-risk	16 (61.54)	20 (62.50)	-	-
Lymphoma Ann Arbor staging [27] (23/24 cases)	-	-	$\chi^2 = 0.013$	0.908
Stage I~II	9 (39.13)	9 (37.50)	-	-
Stage III~IV	14 (60.87)	15 (62.50)	-	-
MM R-ISS staging [28] (21/20 cases)	-	-	$\chi^2 = 0.042$	0.837
R-ISS stage I~II	8 (38.10)	7 (35.00)	-	-
R-ISS stage III	13 (61.90)	13 (65.00)	-	-
Treatment stage	-	-	$\chi^2 = 0.001$	0.981
Initial treatment	45 (64.29)	49 (64.47)	-	-
Retreatment	25 (35.71)	27 (35.53)	-	-
Chemotherapy regimen intensity [22]	-	-	$\chi^2 = 0.001$	1.000
High-intensity	22 (31.43)	24 (31.58)	-	-
Moderate-intensity	35 (50.00)	38 (50.00)	-	-
Low-intensity	13 (18.57)	14 (18.42)	-	-
TIVAP indwelling duration (months)	2.1 ± 0.8	2.2 ± 0.7	$t = 0.805$	0.422
With comorbidities	18 (25.71)	20 (26.32)	$\chi^2 = 0.007$	0.934
Use of anti-anxiety/antidepressant drugs	5 (7.14)	6 (7.89)	$\chi^2 = 0.030$	0.863
Number of chemotherapy cycles	4.2 ± 1.3	4.3 ± 1.2	$t = 0.483$	0.630

Note: a. Treatment stage definitions refer to [22,26,29]; b. Chemotherapy intensity classification refers to supplementary clinical guidelines; c. Comorbidities include hypertension, diabetes, chronic cardiopulmonary disease; d. Normally distributed data: $\bar{x} \pm s$, independent samples *t*-test; categorical data: n (%), χ^2 test; All reported *p*-values for baseline comparisons represent original, unadjusted *p*-values without multiple comparison corrections, as these tests are descriptive and intended solely to evaluate intergroup balance ($p > 0.05$ indicates balanced baseline characteristics between groups). TIVAP, totally implantable venous access port; R-ISS, Revised International Staging System.

cell frequencies, and no significant intergroup difference was observed ($p = 0.807$, Table 6). Post-hoc power analysis indicated low statistical power ($1 - \beta = 0.12$) for detecting intergroup differences in adverse event rates due to low overall event frequencies and small sample size.

Discussion

At baseline, the mean GAD-7 and PHQ-9 scores across both groups were above 10 points, corresponding to moderate anxiety and depression according to standard scale criteria and reflecting a substantial baseline psychological burden in this patient cohort. This emotional strain may reflect multiple compounding stressors, including the high malignancy and uncertain prognosis of haematologic neoplasms, acute chemotherapy-related toxicities, physical trauma and maintenance requirements of TIVAP implantation, ongoing financial pressure, and restricted social interaction. Unaddressed anxiety and depression can compromise patient well-being and treatment adherence, highlighting the need for structured and targeted psychological support for patients with haematological diseases receiving TIVAP chemotherapy.

After receiving standardised club-style service, the observation group showed reductions in anxiety and depression scores at 4 weeks and study end compared with baseline and the control group, whereas no significant changes were observed in the control group. These findings may

Actas Esp Psiquiatr 2026;1–12. https://doi.org/10.62641/aep.2336 | ISSN:1578-2735
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Table 2. Comparison of GAD-7 scores between the two groups at different time points (points, $\bar{x} \pm s$).

Group	Number	Baseline	4 weeks post-service	Study end
Observation group	70	13.25 ± 3.12	8.68 ± 2.75*	6.32 ± 2.41*
Control group	76	12.98 ± 3.05	11.85 ± 2.92	11.56 ± 2.87
Intergroup *t* (baseline)	-	0.528	-	-
95% CI, adjusted *p* (baseline)	-	[–0.74, 1.28], 0.598	-	-
Intergroup *t* (4 weeks)	-	-	–6.755	-
95% CI, adjusted *p* (4 weeks)	-	-	[–4.10, –2.24], <0.001	-
Intergroup *t* (study end)	-	-	-	–11.979
95% CI, adjusted *p* (study end)	-	-	-	[–6.10, –4.38], <0.001

Note: (1) Intragroup comparison: repeated measures ANOVA with group × time interaction analysis; Overall RM-ANOVA statistics: Group effect F(1,144) = 48.62, $p < 0.001$, $\eta_p^2 = 0.252$; Time effect F(2,288) = 112.45, $p < 0.001$, $\eta_p^2 = 0.438$; group × time interaction effect F(2,288) = 54.18, $p < 0.001$, $\eta_p^2 = 0.273$. Intergroup comparison: independent samples *t*-test; Bonferroni correction was applied specifically for post-hoc simple effect analyses across multiple time points; (2) Symbol definitions: $*p_{adj} < 0.001$ vs. baseline within the same group. Intergroup pairwise differences are explicitly detailed in the dedicated rows below (Intergroup *t* and 95% CI, adjusted *p*) and are no longer duplicated with superscript symbols; (3) Cohen's d effect sizes reported in supplementary results. GAD-7, Generalized Anxiety Disorder-7; CI, confidence interval; ANOVA, analysis of variance.

Table 3. Comparison of PHQ-9 scores between the two groups at different time points (points, $\bar{x} \pm s$).

Group	Number	Baseline	4 weeks post-service	Study end
Observation group	70	14.62 ± 3.45	9.85 ± 3.02*#	7.26 ± 2.87*#
Control group	76	14.35 ± 3.38	13.28 ± 3.21	12.95 ± 3.15
Intergroup *t* (baseline)	-	0.477	-	-
95% CI, adjusted *p* (baseline)	-	[–0.85, 1.39], 0.634	-	-
Intergroup *t* (4 weeks)	-	-	–6.652	-
95% CI, adjusted *p* (4 weeks)	-	-	[–4.45, –2.41], <0.001	-
Intergroup *t* (study end)	-	-	-	–11.421
95% CI, adjusted *p* (study end)	-	-	-	[–6.67, –4.71], <0.001

Note: (1) Intragroup comparison: repeated measures ANOVA with group × time interaction analysis; Overall RM-ANOVA statistics: Group effect F(1,144) = 42.15, $p < 0.001$, $\eta_p^2 = 0.226$; Time effect F(2,288) = 98.34, $p < 0.001$, $\eta_p^2 = 0.406$; group × time interaction effect F(2,288) = 46.72, $p < 0.001$, $\eta_p^2 = 0.245$; all *p* values adjusted via Bonferroni multiple comparison correction; (2) Symbol definitions: $*p < 0.05$ vs. baseline within the same group; $^{\#}p < 0.05$ vs. control group at identical time point; (3) Cohen's d effect sizes reported in supplementary results. PHQ-9, Patient Health Questionnaire-9; CI, confidence interval; ANOVA, analysis of variance.

be explained by multi-component service mechanisms supported by existing literature. First, professional cognitive counselling may help correct catastrophic cognition toward disease and TIVAP-related complications, reducing irrational fear of treatment. Targeted cognitive behavioural service may modify patients' negative automatic thoughts about malignant disease and indwelling vascular devices, consistent with findings from previous oncology studies [17,30]; Second, peer sharing may establish empathy and reduce loneliness, thereby enhancing psychological resilience among patients with cancer. Homologous patient peer support creates a safe emotional expression environment, buffers disease-related psychological pressure, and improves coping ability with chemotherapy distress [9,31]. Third, progressive relaxation training may provide practical strategies for daily emotional regulation and help relieve acute stress responses. Guided relaxation and breathing training can reduce the secretion of stress hormones and ease anxiety symptoms in patients receiving chemotherapy, consistent with the findings of Mahdizadeh *et al.* [7]; Fourth, family participation workshops may strengthen family emotional support, potentially reducing patients' maintenance anxiety. Adequate family care and collaborative disease management can significantly mitigate patients' fear of TIVAP daily nursing and long-term treatment burden [10,32]; Fifth, continuous online support through WeChat may extend psychological service effects beyond offline group sessions. Real-time online psychological follow-up eliminates time and space limitations of offline group counselling and avoids emotional relapse after service termination [33].

Consistent with previous research on group psychological service in oncology [32], this study observed posi-

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Table 4. Comparison of treatment compliance between the two groups (points, $\bar{x} \pm$ s/n (%)).

Indicator	Group	Baseline score ($\bar{x} \pm$ s)	Baseline *t* (95% CI), adjusted *p*	Endpoint score ($\bar{x} \pm$ s)	Endpoint *t* (95% CI), adjusted *p*
Continuous dimension scores ($\bar{x} \pm$ s)					
Total score	Observation group (70)	38.65 ± 4.82	*t* = 0.791 [–1.02, 2.36], 0.430	52.42 ± 4.15*#	*t* = 9.229 [5.66, 8.74], <0.001
	Control group (76)	37.98 ± 5.03		45.22 ± 5.25	
Timely chemotherapy	Observation group (70)	7.82 ± 1.35	*t* = 0.734 [–0.32, 0.66], 0.464	11.23 ± 1.05*#	*t* = 8.369 [1.21, 1.95], <0.001
	Control group (76)	7.65 ± 1.42		9.65 ± 1.23	
Daily TIVAP nursing	Observation group (70)	7.56 ± 1.28	*t* = 0.618 [–0.38, 0.66], 0.537	10.86 ± 1.12*#	*t* = 8.052 [1.22, 2.02], <0.001
	Control group (76)	7.42 ± 1.35		9.24 ± 1.31	
Dietary guidance	Observation group (70)	7.34 ± 1.21	*t* = 0.604 [–0.37, 0.63], 0.547	10.54 ± 1.08*#	*t* = 7.018 [0.98, 1.74], <0.001
	Control group (76)	7.21 ± 1.28		9.18 ± 1.26	
Medication taking	Observation group (70)	7.68 ± 1.32	*t* = 0.647 [–0.36, 0.66], 0.519	10.32 ± 1.15*#	*t* = 6.519 [0.94, 1.76], <0.001
	Control group (76)	7.53 ± 1.38		8.97 ± 1.35	
Regular follow-up	Observation group (70)	7.25 ± 1.18	*t* = 0.419 [–0.42, 0.64], 0.676	9.47 ± 1.02*#	*t* = 6.984 [0.93, 1.65], <0.001
	Control group (76)	7.17 ± 1.25		8.18 ± 1.21	

Note: (1) All dimensional and total compliance scores are presented as continuous variables ($\bar{x} \pm$ s) and compared between groups using independent samples *t*-tests; (2) *$p_{adj} < 0.05$ vs. baseline within group; #$p_{adj} < 0.05$ vs. control group at endpoint; all *p*-values were adjusted using the Bonferroni method. CI, confidence interval; TIVAP, totally implantable venous access port.

tive correlations between club-style counselling and higher treatment compliance and better QLQ-C30 scores. Several components of the counselling programme may have contributed to these findings. Alleviated negative emotions may enable patients to accept standardised treatment rationally, while systematic TIVAP nursing education incorporated into the club activities may have improved patients' recognition of standardised maintenance. Peer positive behavioural incentives jointly form a positive cycle of improved emotion–higher adherence–better self-care. Functional dimension improvements and reduced symptom burden further reflect the holistic physical-mental benefits correlated with the multi-dimensional counselling model.

No statistically significant intergroup difference was detected in the incidence of TIVAP-related adverse events ($p = 0.807$). This finding only indicates the absence of a correlative increase in adverse events associated with club-style psychological counselling, rather than definitive evidence that the service reduces complication risk, limited by insufficient statistical power for binary safety endpoints in this sample. Potential favourable trends may derive from standardised TIVAP maintenance training delivered by specialist nurses in psychological counselling sessions, which improves patient self-care proficiency; improved emotional status may also indirectly modulate immune function and lower infection susceptibility [34]. Larger prospective cohorts are required to validate safety-related associations.

This retrospective observational cohort study has several inherent limitations restricting causal inference and generalisability:

(1) Selection bias: Group allocation was based on medical resource availability and patients' voluntary service choice, with unmeasured confounding variables, including intrinsic motivation, social support reserve, disease psychological readiness, and socioeconomic status, could not be fully controlled in this retrospective non-randomised design. The study can only report associations, not causal effects of the counselling service.

(2) Non-randomised single-centre design and small sample size: Post-hoc power analysis confirmed adequate power for primary continuous psychological outcomes, but low power for binary TIVAP-related adverse event endpoint, limiting the ability to detect between-group differences in this low-frequency outcome. These findings cannot be generalised to patients treated in other regions, healthcare settings, or hospital levels.

(3) Heterogeneous service exposure duration: Service duration varied from 4 to 8 weeks according to individual chemotherapy cycles and physical tolerance. This time heterogeneity may introduce confounding to outcome interpretation, and we did not perform subgroup analysis stratified by service duration given the limited clinical meaningful difference of 1–3-week time window. The multi-component integrated model cannot distinguish independent contributions of single service modules, such as peer sharing, relaxation training, and family workshops, limiting mechanistic interpretation. No external standard-

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Table 5. Comparison of QLQ-C30 scores (points, $\bar{x} \pm s$).

Dimension	Group	Number	Baseline	Endpoint	*t*	95% CI	Adjusted *p*
Functional dimensions							
Physical function	Observation group	70	52.34 ± 8.12	68.32 ± 8.56*#	7.872	[8.64, 14.44]	<0.001
	Control group	76	51.89 ± 8.35	56.78 ± 9.12	-		-
Role function	Observation group	70	50.12 ± 9.05	65.45 ± 9.23*#	7.443	[8.24, 14.20]	<0.001
	Control group	76	49.65 ± 9.21	54.23 ± 8.98	-		-
Cognitive function	Observation group	70	55.34 ± 8.21	70.12 ± 8.34*#	6.904	[6.98, 12.58]	<0.001
	Control group	76	54.89 ± 8.45	60.34 ± 8.76	-		-
Emotional function	Observation group	70	48.65 ± 8.32	72.56 ± 7.89*#	10.245	[11.21, 16.57]	<0.001
	Control group	76	48.12 ± 8.56	58.67 ± 8.45	-		-
Social function	Observation group	70	51.23 ± 9.15	66.78 ± 9.01*#	7.744	[8.44, 14.22]	<0.001
	Control group	76	50.78 ± 9.32	55.45 ± 8.67	-		-
Global health status	Observation group	70	53.45 ± 8.67	69.34 ± 8.76*#	7.671	[8.50, 14.40]	<0.001
	Control group	76	52.98 ± 8.89	57.89 ± 9.23	-		-
Symptom dimensions							
Fatigue	Observation group	70	48.65 ± 8.34	32.45 ± 7.65*#	–9.954	[–15.85, –10.59]	<0.001
	Control group	76	48.12 ± 8.56	45.67 ± 8.34	-		-
Nausea and vomiting	Observation group	70	45.34 ± 8.12	28.67 ± 7.34*#	–8.918	[–13.99, –8.91]	<0.001
	Control group	76	44.89 ± 8.35	40.12 ± 8.12	-		-
Pain	Observation group	70	43.21 ± 8.45	30.23 ± 7.89*#	–8.895	[–14.81, –9.41]	<0.001
	Control group	76	42.78 ± 8.67	42.34 ± 8.56	-		-
Independent single symptoms							
Dyspnea	Observation group	70	40.12 ± 8.23	25.34 ± 7.56*#	–8.024	[–13.01, –7.87]	<0.001
	Control group	76	39.65 ± 8.45	35.78 ± 8.12	-		-
Insomnia	Observation group	70	42.34 ± 8.56	28.67 ± 7.89*#	–5.623	[–10.22, –4.90]	<0.001
	Control group	76	41.89 ± 8.78	36.23 ± 8.34	-		-
Appetite loss	Observation group	70	44.56 ± 8.34	26.78 ± 7.65*#	–8.446	[–13.71, –8.51]	<0.001
	Control group	76	44.12 ± 8.56	37.89 ± 8.21	-		-
Constipation	Observation group	70	41.23 ± 8.45	27.34 ± 7.78*#	–6.078	[–10.75, –5.47]	<0.001
	Control group	76	40.78 ± 8.67	35.45 ± 8.32	-		-
Diarrhea	Observation group	70	38.65 ± 8.21	24.56 ± 7.45*#	–6.265	[–10.67, –5.55]	<0.001
	Control group	76	38.12 ± 8.43	32.67 ± 8.15	-		-

Note: (1) Functional dimension scores (0–100): higher values represent better function; symptom scores (0–100): higher values represent more severe symptoms, following official EORTC QLQ-C30 scoring conversion criteria; (2) The reported *t*-values, 95% CIs, and adjusted *p*-values in the table represent the intergroup comparison between the Observation group and Control group at the study end, calculated using independent samples *t*-tests; (3) *adjusted $p < 0.05$ vs. baseline within group; #adjusted $p < 0.05$ vs. control group at study end; all *p*-values were adjusted using the Bonferroni method. QLQ-C30, QoL Questionnaire-Core 30; CI, confidence interval.

Table 6. Comparison of the incidence of adverse events between the two groups (%).

Group	Infection	Catheter obstruction	Local haematoma	Total incidence of adverse events
Observation group (n = 70)	1 (1.4%)	1 (1.4%)	1 (1.4%)	3 (4.3%)
Control group (n = 76)	2 (2.6%)	2 (2.6%)	1 (1.3%)	5 (6.6%)
Statistical test	-	-	-	Fisher's exact test
p-value	-	-	-	0.807

Note: Contingency table theoretical frequencies <5 in partial cells, Fisher's exact test applied for intergroup comparison; $p > 0.05$ indicates no statistically significant difference in complication incidence.

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ised service manual validation exists for the club model.

(4) Short-term follow-up: Follow-up was limited to chemotherapy cycles (4–8 weeks), allowing assessment of short-term cross-sectional associations but not the persistence or recurrence of psychological symptoms or longer-term trends in TIVAP-related complications.

(5) Subjective measurement bias: All outcomes rely on patient self-reported scales; no objective physiological indicators (e.g., cortisol and inflammatory cytokines) were incorporated. The self-designed compliance scale lacks external population validation, and although assessors were blinded to grouping, patient self-report bias cannot be excluded.

(6) Limited fidelity tracking: Only basic session attendance records were collected, without sustained long-term adherence monitoring. Therefore, the relationship between long-term engagement with the service and clinical outcomes could not be assessed.

Compared with previous tumour psychological support research, which has often focused on general cancer populations or individual cognitive therapy, few studies have specifically examined patients receiving TIVAP chemotherapy. The club-style model integrates offline closed group service and continuous online follow-up, with targeted TIVAP maintenance education embedded into psychological counselling, forming population-specific nursing characteristics absent from conventional universal group services. In contrast to previous group-based psychological care studies that have reported limited standardisation of service procedures and fidelity evaluation [30], the present study supplemented complete implementation flow and quality control checklists to improve reproducibility of the model.

For clinical practice, hospital haematology departments can reference this multi-component club framework to develop standardised psychological nursing protocols for patients receiving TIVAP chemotherapy. Hospitals with limited psychological manpower can adopt phased modular service to reduce implementation burden. However, clinical application must acknowledge the study's observational limitations and avoid overinterpreting correlative differences as definite therapeutic effects.

Subsequent research should adopt prospective, multicentre randomised controlled trial designs to eliminate selection bias and support causal inference; extend follow-up duration to $\geq$12 months to evaluate sustained long-term emotional and safety outcomes; integrate objective physiological biomarkers to offset self-report measurement bias; split service modules to analyse independent effects of each component; optimise personalised service protocols stratified by age, disease risk, and baseline emotional severity; and establish unified national implementation standards for club-style psychological counselling to promote large-scale clinical application.

Conclusions

This retrospective observational cohort study identified associations rather than causal effects. Club-style psychological counselling was associated with milder anxiety and depression, higher treatment compliance, and improved QoL among patients with haematological diseases receiving TIVAP chemotherapy, with no significant association with elevated TIVAP-related adverse events. The multi-dimensional integrated service model combining professional counselling, peer mutual aid, family participation, and continuous online follow-up matches the unique psychological demands of this patient population, providing exploratory real-world observational evidence for optimising clinical psychological nursing. Critical limitations including retrospective non-randomised grouping, single-centre small sample, short follow-up, and unvalidated self-designed compliance scale restrict the reliability and extrapolation of findings. Further prospective, multi-centre, large-sample randomised trials are required to validate the observed associations and establish standardised, reproducible clinical service protocols.

Availability of Data and Materials

All experimental data included in this study can be obtained by contacting the corresponding author if needed.

Author Contributions

HLL designed and conducted the research, collected and analyzed the data, and drafted the manuscript. JJZ conceived the research design, supervised the study implementation, and finalized the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

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Ethics Approval and Consent to Participate

The study was approved by the Ethics Committee of Zhongnan Hospital of Wuhan University (Ethics Approval No.: [2026145K]) and complied with the Declaration of Helsinki, with informed consent obtained from all patients or their families.

Acknowledgment

Not applicable.

Funding

This research received no external funding.

Conflict of Interest

No conflicts of interest for this article.

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