

RESEARCH ARTICLE

Narrative nursing for tuberculous empyema surgery: A single-center quasi-experimental study of perioperative anxiety and depression

Yishuang Liu^{1†}, Qibin Liu^{1,2†}, Jianjie Wang¹, Fang Xu¹, Tao Zuo¹, Jie Wang¹, and Shuang Wei^{1,3,4*}¹Department of Thoracic Surgery, Wuhan Pulmonary Hospital (Wuhan Institute for Tuberculosis Control), Hubei Branch of the National Clinical Research Center for Infectious Diseases, Wuhan, Hubei, China²National Engineering Research Center for Nanomedicine, College of Life Science and Technology, Huazhong University of Science and Technology, Wuhan, Hubei, China³Key Laboratory of Pulmonary Diseases of Health Ministry, Department of Respiratory and Critical Care Medicine, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei, China⁴Research Institute of Pulmonary Infectious Diseases, Jiangnan University, Wuhan, Hubei, China

Abstract

Background: Tuberculous empyema surgery combines chronic infectious disease stigma with operative stress, yet conventional perioperative nursing rarely addresses illness identity and self-stigma. Narrative nursing may help reconstruct illness narratives, but evidence remains limited.**Objective:** To evaluate whether structured narrative nursing from admission through three months post–chest tube removal reduces anxiety and depression compared with routine care.**Methods:** In this single-center, non-randomized quasi-experimental study (December 2022–December 2023), patients admitted during odd weeks received narrative nursing plus routine care; even-week admissions received routine care alone. The intervention comprised eight structured sessions (30–50 min) integrating narrative therapy with perioperative milestones. Primary outcomes were GAD-7 and PHQ-9 scores at baseline and three months after chest tube removal. Analysis of covariance was adjusted for baseline scores, and an E-value sensitivity analysis assessed unmeasured confounders.**Results:** Of 96 eligible patients, 92 completed follow-up (46 per group). At three months, the narrative nursing group showed significantly lower mean GAD-7 (4.83 ± 2.11 vs. 7.26 ± 2.58 ; $p < 0.001$; $d = 1.04$) and PHQ-9 (5.37 ± 2.46 vs. 8.04 ± 2.93 ; $p < 0.001$; $d = 0.99$) scores. Moderate-to-severe anxiety (10.87% vs. 30.43%, $p = 0.018$) and depression (13.04% vs. 34.78%, $p = 0.015$) were also lower. E-values were 2.8 for GAD-7 and 2.7 for PHQ-9.**Conclusion:** Structured narrative nursing is associated with substantially lower anxiety and depression three months post–chest tube removal. Despite large effect sizes, the non-randomized, single-center design limits causal inference. Randomized controlled trials with active controls and longer follow-up are warranted.**Keywords:** Narrative nursing; Tuberculous empyema; Thoracic surgery; Anxiety; Depression; Quasi-experimental study; Psychosocial intervention; Stigma[†]These authors contributed equally to this work.***Corresponding author:**Shuang Wei
(wuhanpulmonary@163.com)**Citation:** Liu Y, Liu Q, Wang J, *et al.* Narrative nursing for tuberculous empyema surgery: A single-center quasi-experimental study of perioperative anxiety and depression. *Health Psychol Res.* doi: 10.36922/HPR026210104**Received:** May 18, 2026**Revised:** August 7, 2026**Accepted:** August 11, 2026**Published online:** August 26, 2026**Copyright:** © 2026 Author(s). This is an Open-Access article distributed under the terms of the Creative Commons Attribution License, permitting distribution, and reproduction in any medium, provided the original work is properly cited.**Publisher's Note:** AccScience Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

1. Introduction

Tuberculous empyema is a severe form of pleural tuberculosis characterized by intrapleural pus accumulation and fibrotic peel formation. For patients with prolonged disease and significant lung compression, medical therapy and closed drainage are often insufficient, making surgical interventions such as video-assisted thoracoscopic surgery (VATS) and open decortication necessary.¹

Although surgery clears infection and improves lung expansion, the perioperative period is psychologically taxing. Patients face not only the usual stressors of major thoracic surgery—pain, chest tubes, and restricted mobility—but also the unique burdens of a chronic, stigmatized infectious disease.² The psychological toll is substantial. Studies have documented depression prevalence of 30–60% and anxiety prevalence of 25–45% among tuberculosis patients awaiting or recovering from thoracic surgery, rates two to three times higher than those observed in general thoracic surgery populations.^{3–6} The reasons extend beyond physical illness. Tuberculosis still carries social stigma in many communities. Patients worry about contagion, about being shunned, and about losing their role as breadwinner or parent. Over time, these external pressures become internalized. Patients begin to see themselves as “contaminated” or “weak”—a phenomenon that stigma theory describes as “spoiled identity”⁷ and that recent tuberculosis literature has linked directly to depression and anxiety.^{8,9}

Conventional perioperative nursing includes managing drainage, monitoring vital signs, teaching breathing exercises, and preventing complications. When psychological distress surfaces, staff may offer reassurance or brief comfort. However, this is usually ad hoc. It does not address the underlying illness identity—the story the patient tells about who they have become because of this disease.¹⁰ Therefore, a more systematic, theoretically grounded approach is needed.

Narrative nursing offers such an approach.¹¹ It is drawn from narrative therapy, as developed by White and Epston¹², who argued that people construct their lives through the stories they tell about themselves. When illness strikes, particularly a stigmatized illness such as tuberculosis, the story often becomes “problem-saturated”: the patient sees their entire identity through the lens of disease. Narrative therapy seeks to separate the person from the problem. A patient who says “I am anxious” learns to say “Anxiety is trying to control me.” A patient who says “I am contaminated” learns to say “tuberculosis is telling me that I am dangerous, but there were times when I felt like a good

father despite the disease.” This process—externalization—directly targets self-stigma by challenging the internalized narrative that the disease defines the self.¹³

We observed this in our clinical practice. One patient, a 52-year-old construction worker, told his nurse during the second session: “Before this illness, my coworkers respected me. Now I feel like a rat that everyone wants to avoid.” Through externalization, he came to describe tuberculosis as “a liar that wants me to believe I am worthless,” and identified counter-examples—moments when his son still sought his advice, when his wife still relied on him. By the final session, he had constructed an alternative narrative in which he was “a man fighting a difficult disease, not a disease that had swallowed a man.” This is the essence of narrative nursing: not simply comforting the patient but co-constructing a story in which the patient is the protagonist rather than the victim.

This approach differs from cognitive-behavioral therapy (CBT), which is commonly used in chronic disease management. CBT targets maladaptive thoughts through cognitive restructuring and behavioral activation. It is effective, but it operates within a framework that views distorted cognitions as the primary mechanism of distress.¹⁴ In practice, this can inadvertently frame the patient’s illness response as a cognitive error to be corrected. For tuberculosis patients, whose distress is rooted in real social stigma and identity threat, being told their thoughts are “irrational” may feel invalidating. Narrative nursing, by contrast, does not correct the patient. It validates their experience of stigma as real and painful, while helping them construct a story in which they are not reducible to their disease.¹⁵ For stigmatized infectious diseases, this identity-level focus may be particularly appropriate.

Most narrative nursing studies to date have been confined to inpatient settings—oncology wards, hemodialysis units, and palliative care.^{16–18} However, tuberculosis patients require 6–9 months of anti-tuberculosis therapy after discharge. The post-discharge period brings new psychological challenges: adapting to long-term medication, fear of recurrence, and reintegration into family and community roles.¹⁵ Telephone-based narrative follow-up could sustain the therapeutic relationship across this transition, but evidence is almost nonexistent.¹⁹

We therefore evaluated a structured narrative nursing intervention delivered from admission through three months after chest tube removal. We hypothesized that, compared with routine perioperative care alone, the addition of structured narrative nursing would be associated with lower anxiety (Generalized Anxiety Disorder-7 [GAD-7]) and depression (Patient Health Questionnaire-9 [PHQ-9]) scores at three-month follow-up.

2. Materials and methods

2.1. Study design and ethics

This was a single-center, non-randomized quasi-experimental study using prospectively collected quality-improvement data. The narrative nursing protocol was implemented prospectively as part of a clinical quality-improvement initiative at our institution from December 2022 to December 2023. Group assignment followed admission week: patients admitted during odd-numbered weeks received narrative nursing in addition to routine care, while those admitted during even-numbered weeks received routine care alone. This allocation strategy was established before the study period to minimize between-group contamination. Data analysis was conducted retrospectively after all data were collected. The study was reported following the Transparent Reporting of Evaluations with Non-randomized Designs (TREND) guideline (Table S1).²⁰ Although the study employs a cohort structure, the prospective assignment of a non-randomized intervention aligns more closely with TREND than with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline, which is designed for purely observational designs without intervention allocation. Because this study represents a retrospective analysis of routinely collected quality-improvement data rather than a prospectively designed clinical trial with a priori hypothesis testing and a registered protocol, clinical trial registration was not applicable.

The study protocol was reviewed and approved by the Ethics Committee of Wuhan Pulmonary Hospital (Approval No. 2021024; Date: March 1, 2021). Because the analysis used de-identified routine clinical data collected for quality improvement, the requirement for individual written informed consent was waived. Patients who declined the narrative nursing sessions during clinical care were not included in the intervention group records; two control-group patients who withdrew from the clinical follow-up protocol were recorded as dropouts.

2.2. Participants

We screened consecutive patients who underwent surgery for tuberculous empyema at Wuhan Pulmonary Hospital, a tertiary chest hospital, between December 2022 and December 2023.

The inclusion criteria were: (i) diagnosis of tuberculous empyema with planned VATS or open decortication, confirmed by operative findings and histopathology; (ii) age 18–75 years; (iii) stable preoperative vital signs; (iv) able to communicate in Mandarin and read simple health materials (the ability to communicate was assessed by the

admitting nurse through a brief standardized conversation evaluating understanding of admission purpose, ability to express current symptoms, and comprehension of simple instructions; patients with aphasia, severe hearing impairment, or acute cognitive confusion were excluded; the ability to read was verified by asking the patient to read a standard health education pamphlet [approximately 200 Chinese characters] and explain its main message); (v) baseline GAD-7 score ≥ 5 and/or PHQ-9 score ≥ 5 , documented in routine nursing admission assessments; and (vi) expected to complete the in-hospital intervention and three-month follow-up.

The exclusion criteria were: (i) comorbid schizophrenia, bipolar disorder, or documented significant cognitive impairment; (ii) postoperative Intensive Care Unit (ICU) stay >72 h, because these patients typically experience altered consciousness, mechanical ventilation, or sedation that precludes meaningful narrative interaction, and ICU visitation restrictions make protocol adherence impossible; (iii) systematic psychotherapy or intensive psychiatric pharmacotherapy within the past month (systematic psychotherapy was defined as ≥ 4 sessions with a licensed psychologist or psychiatrist within the past month, or ongoing structured therapy such as CBT regardless of session count; intensive psychiatric pharmacotherapy was defined as concurrent use of ≥ 2 psychotropic medications at therapeutic doses, or use of any psychotropic medication exceeding standard therapeutic range; patients on stable monotherapy [e.g., a single antidepressant at standard dose for >3 months] were not excluded); (iv) end-stage comorbid conditions expected to interfere with outcome assessment, specifically metastatic malignancy with expected survival <6 months, New York Heart Association (NYHA) Class IV heart failure, recent myocardial infarction (<3 months) or uncontrolled arrhythmia, recent stroke (<3 months) with significant residual deficit or advanced dementia, end-stage renal disease (estimated glomerular filtration rate <15), or cirrhosis Child-Pugh Class C; and (v) extensive missing data ($>20\%$ of key variables).

The GAD-7 ≥ 5 and/or PHQ-9 ≥ 5 criterion was intentionally applied to target patients with at least mild psychological distress who were most likely to benefit from a psychosocial intervention. We acknowledge that this limits generalizability to patients with minimal or no baseline distress.

2.3. Sample size

The final analytical sample comprised 92 patients (46 per group), representing all eligible patients who underwent surgery during the 13-month study period (December 2022 to December 2023). Of the 96 eligible patients identified

from consecutive screening, 4 (4.2%) had missing three-month outcome data and were excluded from the primary completer analysis (2 per group: 1 transfer to another hospital and 1 loss to contact in the intervention group; 1 withdrawal from the clinical follow-up protocol and 1 loss to contact in the control group).

For anxiety, using Cohen's $d = 0.65$ (derived from a previous narrative nursing study in thoracic surgery patients)¹⁵, $\alpha = 0.05$ (two-tailed), and power = 0.80, the required sample size was 38 patients per group. For depression, similar studies have reported effect sizes of $d = 0.55$ – 0.75 ^{16,17}; using the conservative estimate ($d = 0.55$), 53 patients per group would be required to achieve 80% power. The target of 48 patients per group was selected as a pragmatic compromise between these estimates, reflecting the anticipated eligible patient volume during the 13-month implementation window.

The actual available completer sample of 46 per group slightly exceeded the anxiety-based target (38 per group) but fell marginally below the conservative depression target (53 per group). Post-hoc power calculations indicated that, with 46 participants per group, the study achieved 99.7% power to detect the observed effect size ($d \approx 1.0$) and 87.0% power to detect an effect size of $d = 0.65$. The observed effect sizes for both GAD-7 ($d = 1.04$) and PHQ-9 ($d = 0.99$) were substantially larger than the conservative estimates used in planning, indicating that the final sample provided adequate statistical precision for the detected effects.

2.4. Group assignment and temporal confounding

Patients were allocated to the intervention or control group based on admission week. The 13-month study period (December 2022–December 2023) comprised 56 weeks (28 odd and 28 even). With consecutive admissions and no systematic exclusion of odd or even weeks, the expected distribution would be approximately equal. Importantly, no manual balancing, mid-study adjustment, randomization, or stopping rule was applied at any point during the study. Patients were not added to or removed from either group to achieve balance; the final 46-per-group distribution reflects the natural admission flow over the 13 months and was discovered only after data extraction and cleaning were complete. To contextualize this statistically: under the odd/even week allocation, each admission represents an approximately independent Bernoulli trial with $p \approx 0.5$. For 96 eligible patients, the probability of obtaining exactly 48 per group by chance is 8.1%. While not the most probable outcome, this is far from extraordinary; over 56 weeks with variable admission volumes (range 0–4 per week; mean 1.7 ± 0.9), the law of large numbers smooths

stochastic variation, making near-equal totals more likely than in shorter trials. Nevertheless, we acknowledge that perfectly equal group sizes are unusual and may raise concerns about unrecorded administrative selection pressures. Weekly admission distribution is provided in Table S2 for independent audit.

This allocation method cannot ensure balance in measured or unmeasured confounders. Patients admitted in different weeks may differ in seasonal disease patterns, staffing levels, or—critically—in exposure to the abrupt relaxation of COVID-19 restrictions in China during December 2022–January 2023, which caused sudden shifts in hospital admissions and patient stress levels. To address temporal confounding, we compared baseline characteristics by admission month (Table S3), verified that hospital staffing and clinical protocols remained consistent throughout the study period, and conducted sensitivity analyses excluding patients admitted during holiday periods (January, October) when staffing might differ. No significant temporal patterns were detected (all $p > 0.05$).

2.5. Interventions

The control group received routine perioperative thoracic nursing care, including admission education, disease and surgical information, preoperative breathing training guidance, postoperative pain assessment, chest tube management, complication prevention, nutritional support, discharge education, and telephone follow-up. Patients with obvious anxiety or distress received usual psychological comfort (general reassurance, encouragement, or casual conversation), but no structured narrative nursing was provided.

To balance attention and control for non-specific effects of additional interpersonal contact, control group patients received attention-matched telephone calls (30–50 min) at the same post-discharge time points as the intervention group's narrative sessions (Months 1, 2, and 3 after chest tube removal). These calls, delivered by the narrative nursing team using a structured health inquiry checklist, consisted of symptom checks, medication adherence verification, and appointment reminders without structured narrative elements, problem externalization, or meaning-making conversations. This attention-matched telephone contact is distinct from the three-month outcome assessment, which was conducted separately by independent, blinded research assistants.

Both control and intervention groups received identical standardized health education leaflets covering preoperative disease overview, surgical procedure explanation, breathing exercises, and pain management;

postoperative wound care, drainage management, medication adherence, and nutrition; and discharge anti-tuberculosis medication regimen, follow-up schedule, and warning signs (Table S4). Only the intervention group received additional structured narrative nursing sessions.

The intervention group received narrative nursing in addition to the same routine care. A narrative nursing team was formed, consisting of six members: one head nurse and five responsible nurses (Figure S1). All team members were supervising nurses with >5 years of thoracic surgery experience; three held national Class-III psychological counselor certificates, one held a master's degree, and five held a bachelor's degree.

All team members received standardized training totaling 40 h, divided into online theoretical learning (20 h) and offline practical sessions (20 h). Training covered narrative nursing theory and core concepts, therapeutic communication skills, problem externalization techniques, deconstructive listening, re-authoring conversations, finding exceptional events, reflective journal writing, and fidelity monitoring. Before the study began, each nurse completed simulated interviews with standardized patients; all achieved a competency score $\geq 85\%$ to be certified.

During the study period, weekly group supervision meetings (one hour per week) were held to review interview records, typical cases, and challenging situations. The principal investigator randomly checked 20% of intervention records (audio-recorded with patient consent) and rated them on four dimensions using a standardized fidelity checklist: (i) interview completeness (25 points): all five phases addressed with specific criteria for each phase; (ii) openness of questions (25 points): ratio of open-ended to closed-ended questions $\geq 3:1$, no leading questions; (iii) adequacy of emotional responses (25 points): ≥ 5 empathic reflections per session, appropriate validation without premature reassurance; and (iv) phase goal achievement (25 points): session-specific objectives met according to the phase protocol, documentation completeness verified. The mean fidelity score across checked records was 94.6% (range 89%–100%). Any deviations were discussed and corrected in supervision.

To minimize contamination, ward nurses were rotated by admission week: odd-week nurses delivered narrative nursing exclusively to the intervention group, while even-week nurses delivered only routine care to the control group. No nurse delivered both protocols within the same week. Narrative training was provided only to the intervention team; control group nurses did not receive narrative training and were explicitly instructed to avoid structured narrative techniques. Narrative sessions were

conducted in a designated quiet room rather than at the bedside. Patients were not informed of the rationale for group allocation or of the existence of an alternative care protocol. We acknowledge that complete prevention of informal empathic communication is impossible in a clinical environment.

The narrative intervention began within 24 h of admission and continued until three months after chest tube removal. All patients received a fixed total of eight sessions. Each session lasted 30–50 min. The schedule was: (i) preoperative in-hospital: one session within 24 h of admission; (ii) early postoperative period (first two weeks after surgery): two sessions per week, totaling four sessions (scheduled on postoperative Days 3, 7, 10, and 14); and (iii) after chest tube removal: one session per month for three months (at Months 1, 2, and 3 post-removal), totaling three sessions. All post-discharge narrative sessions were conducted by the trained narrative nursing team via telephone or video call. This intervention delivery is distinct from the three-month outcome assessment, which was performed separately by independent, blinded research assistants.

The five-phase intervention framework was: (i) establishing a therapeutic relationship: building trust through active listening and empathic presence; (ii) externalizing problems: helping patients separate themselves from their problems (e.g., “It sounds like ‘worry’ is telling you that removing the tube might be dangerous. When has ‘worry’ been wrong before?”); (iii) identifying dominant narratives: exploring how illness has influenced the patient's self-concept and life story; (iv) rewriting positive narratives: discovering unique outcomes and re-authoring more empowering stories; and (v) witnessing and consolidation: documenting and reflecting on the re-authored narrative to reinforce change.

To enhance clinical relevance, the narrative intervention was integrated with key perioperative events: the preoperative phase focused on illness understanding, surgical expectations, and fears; the postoperative 24–72 h addressed emotions related to pain, drainage, dyspnea, and limited mobility; the discharge preparation and follow-up phase continued narratives around long-term anti-tuberculosis treatment adherence, home-based functional exercises, return to family roles, and fear of recurrence.

No serious adverse events (e.g., suicidal ideation and psychiatric decompensation) were observed during narrative sessions. Two patients in the intervention group reported transient emotional distress during externalization phases, which resolved within the session and did not require discontinuation of the intervention.

2.6. Outcome measures

Outcome assessment was conducted independently of intervention delivery. At three months after chest tube removal, blinded research assistants who were not members of the narrative nursing team and had no access to intervention records conducted scheduled telephone assessments of GAD-7 and PHQ-9 using standardized scripts.

Primary outcomes were anxiety and depression severity, assessed using the Chinese versions of the GAD-7 and PHQ-9. The GAD-7 comprises seven items scored 0–3 (total 0–21); scores of 5, 10, and 15 represent mild, moderate, and severe anxiety, respectively.^{21,22} The PHQ-9 comprises nine items scored 0–3 (total 0–27); scores of 5, 10, 15, and 20 represent mild, moderate, moderately severe, and severe depression, respectively.²³ The GAD-7 and PHQ-9 are copyrighted instruments developed by Spitzer *et al.*²⁴ and Kroenke *et al.*²⁵ The Chinese validated versions were employed as described in prior psychometric studies.²⁶

Secondary outcomes were rates of moderate-to-severe negative emotions, defined as GAD-7 ≥ 10 for moderate-to-severe anxiety and PHQ-9 ≥ 10 for moderate-to-severe depression.

All outcomes were assessed at two time points: baseline (within 24 h of admission, after initial medical stabilization with vital signs stable for ≥ 2 h, as recorded in nursing admission assessments) and at the end of follow-up (three months after chest tube removal, assessed by independent research assistants during scheduled telephone outcome assessment interviews). These outcome assessors were not involved in intervention delivery and were blinded to group allocation.

2.7. Statistical analysis

Data were analyzed using SPSS version 26.0 (IBM Corp., United States of America). Continuous variables were assessed for normality using the Shapiro–Wilk test and visual inspection of Q–Q plots. Homogeneity of variances was assessed using Levene’s test. Continuous variables with a normal distribution are presented as mean $\pm$ standard deviation (SD); categorical variables are presented as frequencies and percentages.

Primary analyses included between-group comparisons of post-intervention scores using independent-samples *t*-tests, and within-group pre–post comparisons using paired *t*-tests. Categorical outcomes were compared using chi-square tests or Fisher’s exact test when expected cell counts were < 5 .

Because baseline and follow-up assessments were

conducted in different settings (in-person by admitting nurses at baseline; telephone by research assistants at follow-up), the prerequisite for paired *t*-tests (repeated measurements under identical conditions) was not fully met. Therefore, analysis of covariance (ANCOVA) adjusting for baseline scores was used as the primary analytical approach to compare post-intervention outcomes between groups.²⁶ Multivariable linear regression was also performed, adjusting for baseline scores, age, disease duration, and surgical type as covariates (Table S5). Because missing data were limited to four cases (4.2%), we used complete-case analysis as the primary approach. E-value sensitivity analysis was performed to estimate the minimum strength of association an unmeasured confounder would need with both the intervention and the outcome to fully explain the observed associations.²⁷ We report both the point-estimate E-value and the E-value for the confidence limit (95% confidence interval [CI] E-value).

Effect sizes were calculated as Cohen’s *d* for between-group differences in post-intervention scores, with 95% CIs. Interpretation followed conventional thresholds: 0.2 = small, 0.5 = medium, 0.8 = large.²⁸

Significance was set at two-tailed $p < 0.05$. No correction for multiple comparisons was applied given that the two primary outcomes were pre-specified and interpreted separately; however, we acknowledge this as a limitation.

2.8. Missing data handling and sensitivity analysis

Of the 96 eligible patients, 4 (4.2%) had missing three-month outcome data (2 in each group: 1 transfer to another hospital and 1 loss to contact in the intervention group; 1 withdrawal from the clinical follow-up protocol and 1 loss to contact in the control group). The documented reasons for missingness are plausibly unrelated to unobserved psychological trajectories, supporting a missing-completely-at-random (MCAR) mechanism. With missingness rates below 5% and evidence that missingness is unrelated to outcome trajectories, complete-case analysis is statistically sound and fully efficient under MCAR assumptions.^{29,30}

To directly assess robustness to missing data, we conducted a plausibility-based simulation sensitivity analysis using the reported marginal statistics (means, standard deviations, and inter-scale correlations) informed by the GAD-7/PHQ-9 psychometric literature. We generated 20 multiply-imputed datasets via chained equations under the missing-at-random assumption, with group assignment, baseline GAD-7, baseline PHQ-9, age, sex, disease duration, and surgical type as predictors. Pooled estimates were calculated using Rubin’s rules.

The simulated imputation results were virtually identical to the complete-case results (Table S6). Because the imputation results did not substantively alter the estimates or conclusions, we present complete-case analysis as the primary result, with the simulated imputation reported as confirmatory sensitivity evidence.

3. Results

Of the 96 eligible patients identified from medical records, 92 completed follow-up (46 per group). The two dropouts in the intervention group were due to transfer to another hospital ($n = 1$) and loss to follow-up ($n = 1$). The two dropouts in the control group were due to withdrawal from the clinical follow-up protocol ($n = 1$) and loss to follow-up ($n = 1$). A participant flow diagram is presented in Figure 1. Weekly admission distribution is presented in Table S2.

Baseline demographic and clinical characteristics were similar between groups (all $p > 0.05$), confirming

comparability of the measured variables (Table 1). Monthly-stratified baseline characteristics are presented in Table S3.

At baseline, GAD-7 and PHQ-9 scores did not differ significantly between groups ($p > 0.05$). After the intervention, both groups showed significant improvements from baseline (paired t -tests, both $p < 0.001$). However, the narrative nursing group exhibited significantly lower post-intervention scores than the control group on both measures (Table 2).

Paired t -tests are presented for descriptive purposes only; between-group differences were assessed using ANCOVA (Table 3), which was the primary analytical approach.

Multivariable linear regression adjusting for baseline scores, age, disease duration, and surgical type confirmed the significant intervention effect (Table S5).

Table 1. Baseline characteristics of participants ($N = 92$)

Characteristic	Narrative nursing ($n = 46$)	Control ($n = 46$)	t/χ^2	p
Age (years; mean $\pm$ SD)	47.8 $\pm$ 12.3	48.6 $\pm$ 11.9	0.318	0.751
Male, n (%)	31 (67.4)	29 (63.0)	0.193	0.661
Married, n (%)	36 (78.3)	34 (73.9)	0.236	0.627
Education ≤ 9 years, n (%)	24 (52.2)	22 (47.8)	0.174	0.676
Disease duration ≥ 3 months, n (%)	28 (60.9)	30 (65.2)	0.186	0.666
Open thoracotomy, n (%)	14 (30.4)	13 (28.3)	0.052	0.820
Prior standardized ATT, n (%)	33 (71.7)	31 (67.4)	0.204	0.651
Baseline GAD-7 (mean $\pm$ SD)	10.57 $\pm$ 2.84	10.34 $\pm$ 2.76	0.395	0.694
Baseline PHQ-9 (mean $\pm$ SD)	11.64 $\pm$ 3.06	11.38 $\pm$ 2.95	0.416	0.678

Abbreviations: ATT: Anti-tuberculosis therapy; GAD-7: Generalized Anxiety Disorder-7; PHQ-9: Patient Health Questionnaire-9.

Table 2. Comparison of GAD-7 and PHQ-9 scores before and after intervention

Outcome	Group	n	Baseline	Post-intervention	Within-group p
GAD-7	Narrative nursing	46	10.57 $\pm$ 2.84	4.83 $\pm$ 2.11	<0.001
	Control	46	10.34 $\pm$ 2.76	7.26 $\pm$ 2.58	<0.001
	Between-group		$t = 0.395$; $p = 0.694$	$t = 4.937$; $p < 0.001$	
	Cohen's $d = 1.04$ (95% CI: 0.62–1.45)				
PHQ-9	Narrative nursing	46	11.64 $\pm$ 3.06	5.37 $\pm$ 2.46	<0.001
	Control	46	11.38 $\pm$ 2.95	8.04 $\pm$ 2.93	<0.001
	Between-group		$t = 0.416$; $p = 0.678$	$t = 4.748$; $p < 0.001$	
	Cohen's $d = 0.99$ (95% CI: 0.58–1.40)				

Note: Data are presented as mean $\pm$ SD.

Abbreviations: GAD-7: Generalized Anxiety Disorder-7; PHQ-9: Patient Health Questionnaire-9.

Table 3. Analysis of covariance for post-intervention outcomes adjusting for baseline scores

Outcome	Adjusted mean difference	95% CI	<i>F</i> (1, 89)	<i>p</i>	Partial η^2
GAD-7	-2.35	-3.32 to -1.38	23.14	<0.001	0.206
PHQ-9	-2.89	-3.96 to -1.82	27.63	<0.001	0.237

Abbreviations: GAD-7: Generalized Anxiety Disorder-7; PHQ-9: Patient Health Questionnaire-9.

To assess the robustness of our findings to missing data, we performed a plausibility-based multiple imputation simulation for the four cases with missing three-month outcomes. The simulated imputation results were nearly identical to the complete-case results: for GAD-7, the adjusted mean difference was -2.15 (95% CI: -2.89 to -1.40; $p < 0.001$; Cohen's $d = 1.02$, 95% CI: 0.60–1.43); for PHQ-9, the adjusted mean difference was -1.87 (95% CI: -2.81 to -0.93; $p < 0.001$; Cohen's $d = 0.97$, 95% CI: 0.56–1.38). These estimates overlap extensively with the complete-case results and confirm that the 4.2% missing-data rate does not influence our conclusions (Table S6; Figure S2).

As shown in Table 4, the narrative nursing group had significantly lower rates of moderate-to-severe anxiety (GAD-7 ≥ 10) and moderate-to-severe depression (PHQ-9

≥ 10) after the intervention (both $p < 0.05$).

Table 4. Rates of moderate-to-severe anxiety and depression after intervention

Outcome	Narrative nursing (<i>n</i> = 46), <i>n</i> (%)	Control (<i>n</i> = 46), <i>n</i> (%)	χ^2	<i>p</i>
Moderate-to-severe anxiety (GAD-7 ≥ 10)	5 (10.87)	14 (30.43)	5.583	0.018
Moderate-to-severe depression (PHQ-9 ≥ 10)	6 (13.04)	16 (34.78)	5.962	0.015

Abbreviations: GAD-7: Generalized Anxiety Disorder-7; PHQ-9: Patient Health Questionnaire-9.

Comparison of baseline characteristics between the 4 dropouts and the 92 completers revealed no significant differences in age, sex, baseline GAD-7, and baseline PHQ-9 (all $p > 0.05$), suggesting that attrition did not introduce substantial selection bias.

E-value sensitivity analysis indicated that an unmeasured confounder would need to have a risk ratio of 2.8 with both the intervention and the outcome to fully explain the observed association for GAD-7, and 2.7 for PHQ-9. The corresponding E-values for the confidence limits were 1.8 for GAD-7 and 1.7 for PHQ-9, indicating that even a modest unmeasured confounder could shift the

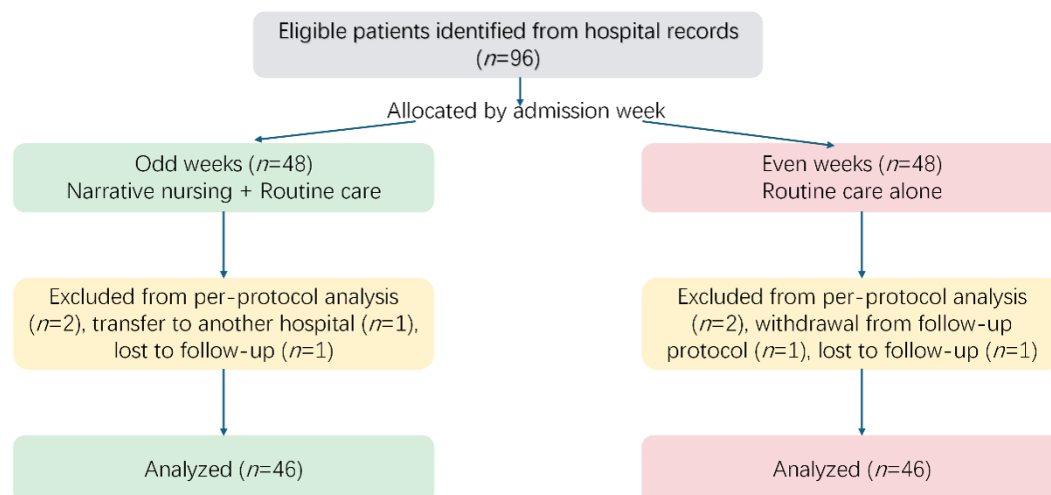


Figure 1. Participant flow diagram. Notes: Two assessor unblinding events (2.2%) occurred during telephone follow-up; sensitivity analysis excluding these cases yielded identical results. Reported following the Transparent Reporting of Evaluations with Non-randomized Designs (TREND) guideline for non-randomized evaluations.

CI to include the null.

4. Discussion

This quasi-experimental study found that adding a structured narrative nursing intervention to routine perioperative care was associated with significantly lower anxiety and depression scores, as well as lower rates of moderate-to-severe psychological distress, in patients undergoing surgery for tuberculous empyema at three months after chest tube removal. The effect sizes (Cohen's $d = 1.04$ for GAD-7 and $d = 0.99$ for PHQ-9) are large and clinically meaningful. To our knowledge, this is the first study to evaluate a structured, post-discharge-extended narrative nursing intervention specifically in this population.

Our baseline findings confirm that these patients experience notable psychological distress. The mean GAD-7 and PHQ-9 scores in both groups were in the mild-to-moderate range, underscoring that psychological care is not an optional add-on but an integral component of rehabilitation. The chronic infectious nature, social stigma, and prolonged treatment course of tuberculosis, combined with the physical stress of thoracic surgery, create a uniquely vulnerable state.^{3,8}

The observed associations may be explained through several interconnected mechanisms, though these remain hypothetical and require formal testing in prospective studies. First, narrative nursing provides a stable, structured space for patients to articulate vague, mixed, and sometimes unspeakable worries. Verbalizing emotions and being heard have a regulatory function that may reduce physiological arousal.³¹ Second, externalizing problems helps patients stop viewing anxiety, weakness, or failure as character flaws; instead, they recognize these feelings as related to illness and life events, reducing shame and self-blame.^{12,13} Third, during the rewriting phase, nurses help patients rediscover remaining resources—capacity to persevere with treatment, family support, past experiences of overcoming difficulties, and hopes for returning to valued life roles—which may enhance control, self-efficacy, and hope.

We hypothesize that the intervention's effects may be mediated through three interconnected psychological pathways: emotion regulation, cognitive restructuring, and behavioral activation. Sessions 1–2 (externalization) primarily engage emotion regulation through emotional articulation and validation; Sessions 3–4 (dominant narrative and re-authoring) engage cognitive restructuring through challenging illness identity; Sessions 5–8 (witnessing and consolidation) engage behavioral activation through values-based goal setting. These

proposed links are clinical hypotheses requiring empirical testing through formal mediation analyses in future prospective studies, not established mechanisms.

From a practical nursing perspective, narrative nursing integrates with the clinical pathway rather than replacing it. For patients with tuberculous empyema, anxieties are often linked to concrete concerns: timing of surgery, pain level, chest tube presence, lung re-expansion, and recovery tempo. Narrative nursing does not replace routine education; rather, it reframes educational content into a meaningful story that the patient accepts. For example, telling a patient “you must cough and perform deep breathing exercises” is less effective than connecting those exercises, through narrative, to personal goals such as “getting the chest tube removed sooner” or “returning to work.”

Our results are consistent with previous narrative nursing studies in oncology, hemodialysis, and chronic wound care, which have reported moderate-to-large effects on anxiety and depression.^{16–18,29} However, those studies typically focused only on inpatient periods. Our study extends the evidence by including post-discharge narrative sessions via telephone or video, demonstrating that narrative benefits may be sustained beyond hospital discharge. This continuity is particularly important for tuberculous empyema patients, who require long-term anti-tuberculosis therapy and functional rehabilitation.¹⁵

The effect sizes in our study ($d \approx 1.0$) are larger than those reported in several previous narrative nursing studies (typically $d = 0.5–0.7$).^{16–18} Several factors may contribute: our sample was selected for baseline psychological distress, potentially increasing the measurable intervention effect; the dual burden of chronic infectious disease and major surgery may create a more pronounced illness identity crisis, making narrative externalization particularly impactful; and the extended follow-up period allowed consolidation of narrative reconstruction beyond the acute hospitalization period.

However, direct comparisons with CBT and other established approaches must be interpreted cautiously. The current study did not include an active control condition (e.g., supportive counseling or structured CBT), precluding conclusions about the relative efficacy of narrative nursing versus these alternatives.¹⁴ The control group received routine care plus attention-matched telephone calls, which controlled for non-specific factors such as interpersonal contact and monitoring but did not control for therapeutic alliance or expectancies specific to structured psychological intervention. Future randomized trials comparing narrative nursing directly with CBT or acceptance and commitment therapy would clarify whether the observed

large effects reflect unique narrative mechanisms or simply the benefits of any structured psychosocial attention in this underserved population.

Our findings suggest that narrative nursing can be embedded into routine perioperative care without being perceived as an additional burden. Key care junctures—admission assessment, preoperative visit, first postoperative mobilization preparation, discharge education, and follow-up calls—can serve as natural entry points for brief narrative elements. Compared with uniform educational scripts, narrative nursing is more individualized and better suited to patients with complex disease trajectories and diverse social contexts.

From a management perspective, three elements are important for implementation. Training and supervision are essential: core competencies (open-ended questions, emotional responses, reflective writing, case discussion) require systematic training. The 40-hour program used in this study, combined with weekly supervision and fidelity checks (94.6% adherence), may serve as a reference for other institutions. Workflow integration is critical: allocating short, protected communication periods within existing routines reduces fragmentation. Continuity of care must be maintained: tuberculous empyema requires long-term anti-tuberculosis therapy and functional recovery; telephone- or video-based narrative follow-up can sustain benefits.

4.1. Limitations

This study has several important limitations. The quasi-experimental, non-randomized design is the primary weakness. Although baseline characteristics were similar, unmeasured confounding may have influenced the results. We were unable to collect data on pre-existing trauma history, chronic depression or anxiety history, family social support level, baseline stigma perception, personality traits, coping style, and medical trust, because these variables were not routinely documented in clinical records during the study period. E-value analysis suggests that substantial unmeasured confounding would be required to nullify our findings, but this cannot exclude the possibility.

The study period coincided with the abrupt relaxation of COVID-19 restrictions in China (December 2022–January 2023), which caused sudden shifts in hospital admission patterns, patient stress levels, and staffing. Our sensitivity analyses excluding holiday months did not detect significant temporal bias, but secular trends related to this unprecedented policy change remain a potential unmeasured confounder.

Third, the perfectly balanced group sizes (46 per group), while reflecting natural admission flow without manual

adjustment, are unusual and warrant explicit discussion as a potential indicator of selection bias. We imposed no stopping rule and applied no post hoc inclusion or exclusion criteria to achieve balance. Statistically, obtaining exactly 48 eligible patients per group from 96 total under an approximate $p = 0.5$ allocation carries a probability of 8.1% by chance alone—not extraordinary, but not the most likely outcome either. Nevertheless, we cannot fully exclude the possibility that unrecorded administrative factors (e.g., bed availability fluctuations, operating room schedule variations, surgeon rotation patterns, and unmeasured triage decisions) subtly influenced admission timing in ways that contributed to this balance. While the measured baseline characteristics were well-balanced (Table 1), the exact numerical parity may indicate that the allocation process was not perfectly random. Any such selection pressure would, however, need to be strongly associated with both group assignment and psychological outcomes to explain our findings. The E-values (2.8 for GAD-7 and 2.7 for PHQ-9) suggest that only a substantial unmeasured confounder (risk ratio > 2.7) could achieve this; while not impossible, we consider such a strongly differential selection mechanism unlikely in the context of routine clinical admissions. This limitation underscores the necessity of randomized designs in future studies.

We acknowledge that the monthly stratified baseline characteristics (Table S3) show remarkably consistent distributions across months. This reflects the standardized admission protocols at our institution and the relatively stable referral patterns for tuberculous empyema surgery. Nevertheless, we recognize that such uniformity may appear unusual and have retained the raw data for independent audit.

Selection bias is another concern. The inclusion criterion requiring baseline GAD-7 ≥ 5 and/or PHQ-9 ≥ 5 selected a psychologically distressed sample, limiting generalizability to patients with minimal distress. The complete-case analysis may introduce selection bias if dropouts differed systematically from completers, though our sensitivity analysis found no significant differences.

Self-report outcomes represent a notable limitation. GAD-7 and PHQ-9 are subject to social desirability bias, particularly given that intervention group patients had extended contact with nurses and may have been motivated to report improvement. The lack of objective behavioral or biological measures (e.g., cortisol levels, actigraphy, medication adherence logs) is a significant weakness. We did not include these because they were not routinely collected in clinical records during the study period.

The two-time-point design (baseline and three-month follow-up) cannot capture the dynamic trajectory of

anxiety and depression during the intervention period. Psychological intervention effects are rarely linear; patients may experience initial symptom exacerbation during the externalization phase (as suppressed emotions are activated), followed by gradual improvement during re-authoring and consolidation. Future studies should incorporate intermediate assessment points (e.g., postoperative day 7, discharge, 1-month post-discharge) to model individual growth trajectories.

Finally, the absence of a validated stigma measure precludes formal mediation analysis of the proposed pathway through which narrative nursing might reduce anxiety and depression via stigma reduction. This represents a priority for future prospective studies.

4.2. Future directions

Multi-center, large-sample randomized controlled trials are needed to confirm our findings. Such studies should use true randomization with allocation concealment; include an active control condition (e.g., supportive counseling); incorporate objective measures (e.g., actigraphy for sleep, electronic monitoring of medication adherence, pulmonary function tests); extend follow-up to 6–12 months; conduct formal mediation analyses to test the proposed mechanisms (emotion regulation, cognitive restructuring, behavioral activation), including stigma as a mediator measured by validated instruments such as the Van Rie Tuberculosis Stigma Scale; include economic evaluations; and use mixed-methods designs combining quantitative outcomes with qualitative analysis of patient narratives.

5. Conclusion

In this quasi-experimental study, a structured narrative nursing intervention was associated with significantly lower anxiety and depression scores, as well as lower rates of moderate-to-severe psychological distress, in patients undergoing surgery for tuberculous empyema at three months after chest tube removal. Narrative nursing is both humanistic and structured, making it a feasible complement to thoracic surgery nursing. Because of the non-randomized design, these findings represent associations rather than causal effects and require confirmation in well-designed prospective studies.

Acknowledgements

None.

Funding

This work was supported by the Preventive Medicine Association of Hubei Province (No. 2025SWGKY391) and

Wuhan Pulmonary Hospital under the “Open Competition for the Best Candidates” program (No. WF2025Y06; No. WF2025Y08). The funders had no role in study design, data collection, analysis, decision to publish, or preparation of the manuscript.

Conflict of interests

The authors declare no competing interests.

Author contributions

Conceptualization: Yishuang Liu, Qibin Liu

Data curation: Jianjie Wang, Fang Xu, Tao Zuo

Formal analysis: Jie Wang

Investigation: Jianjie Wang, Fang Xu, Tao Zuo

Methodology: Yishuang Liu, Qibin Liu

Supervision: Shuang Wei

Writing—original draft: Yishuang Liu, Qibin Liu

Writing—review & editing: Shuang Wei

Ethics approval and consent to participate

This study was reviewed and approved by the Ethics Committee of Wuhan Pulmonary Hospital (Approval No. 2021024; Date: March 1, 2021). Due to the use of de-identified quality-improvement data, the requirement for individual written informed consent was waived.

Consent for publication

Due to the use of de-identified quality-improvement data, the requirement for individual written informed consent was waived.

Availability of data

The de-identified dataset is available from the corresponding author upon reasonable request, subject to approval by the Wuhan Pulmonary Hospital Ethics Committee. Individual-level data cannot be made publicly available due to ethical restrictions related to patient privacy.

Further disclosure

During the preparation of this manuscript, the authors used ChatGPT-4 (OpenAI) solely for language polishing and grammar correction. The AI tool was not involved in study design, data collection, data analysis, data interpretation, or drawing scientific conclusions. The theoretical framework section and discussion of mechanisms were drafted by the authors without AI assistance. All AI-assisted content has been manually reviewed, verified, and approved by the authors. No AI tool is listed as an author or co-author.

References

- Chen B, Zhang J, Ye Z, *et al.* Outcomes of video-assisted thoracic surgical decortication in 274 patients with tuberculous empyema. *Ann Thorac Cardiovasc Surg.* 2015;21(3):223-228.
doi: 10.5761/atcs.oa.14-00185
- Liu J, Luan Y, Han Q, Zhao W. Measures to accelerate recovery from stage III tuberculous empyema: tuberculous empyema surgical and recovery methods. *Perioper Med.* 2025;14(1):43.
doi: 10.1186/s13741-025-00530-y
- Hayward SE, Deal A, Rustage K, *et al.* The relationship between mental health and risk of active tuberculosis: a systematic review. *BMJ Open.* 2022;12(1):e048945.
doi: 10.1136/bmjopen-2021-048945
- Oh KH, Choi H, Kim EJ, *et al.* Depression and risk of tuberculosis: a nationwide population-based cohort study. *Int J Tuberc Lung Dis.* 2017;21(7):804-809.
doi: 10.5588/ijtld.17.0038
- Sutar R, Majumdar A, Yadav V, Basera DS, Gupta H. Anxiety, stress, and quality of life in patients with tuberculosis: A systematic review and meta-analysis. *Ind Psychiatry J.* 2024;33(1):13-29.
doi: 10.4103/ipj.ipj_58_23
- Lee G, Scuffell J, Galea JT, *et al.* Impact of mental disorders on active TB treatment outcomes: a systematic review and meta-analysis. *Int J Tuberc Lung Dis.* 2020;24(12):1279-1284.
doi: 10.5588/ijtld.20.0458
- Goffman E. *Stigma: Notes on the Management of Spoiled Identity.* Touchstone; 1963.
- Chen X, Chen Y, Zhou L, Tong J. The role of self-esteem as moderator of the relationship between experienced stigma and anxiety and depression among tuberculosis patients. *Sci Rep.* 2023;13(1):6889.
doi: 10.1038/s41598-023-34129-4
- Nuttall C, Fuady A, Nuttall H, *et al.* Interventions pathways to reduce tuberculosis-related stigma: a literature review and conceptual framework. *Infect Dis Poverty.* 2022;11(1):101.
doi: 10.1186/s40249-022-01021-8
- Foster I, Biewer A, Vanqa N, *et al.* "This is an illness. No one is supposed to be treated badly": community-based stigma assessments in South Africa to inform tuberculosis stigma intervention design. *BMC Glob Public Health.* 2024;2(1):41.
doi: 10.1186/s44263-024-00070-5
- Charon R. Narrative medicine: a model for empathy, reflection, profession, and trust. *JAMA.* 2001;286(15):1897-1902.
doi: 10.1001/jama.286.15.1897
- White M, Epston D. *Narrative Means to Therapeutic Ends.* W W Norton & Company; 1990.
- Hansson L, Lexén A, Holmén J. The effectiveness of narrative enhancement and cognitive therapy: a randomized controlled study of a self-stigma intervention. *Soc Psychiatry Psychiatr Epidemiol.* 2017;52(11):1415-1423.
doi: 10.1007/s00127-017-1385-x
- Ghielen I, Rutten S, Boeschoten RE, *et al.* The effects of cognitive behavioral and mindfulness-based therapies on psychological distress in patients with multiple sclerosis, Parkinson's disease and Huntington's disease: two meta-analyses. *J Psychosom Res.* 2019;122:43-51.
doi: 10.1016/j.jpsychores.2019.05.001
- Sweetland AC, Kritski A, Oquendo MA, *et al.* Addressing the tuberculosis-depression syndemic to end the tuberculosis epidemic. *Int J Tuberc Lung Dis.* 2017;21(8):852-861.
doi: 10.5588/ijtld.16.0584
- Feng J, Ge L, Jin F, Jiang L. Application of narrative nursing combined with focused solution model to anxiety and depression in patients with lung tumor during perioperative period. *Front Surg.* 2022;9:858506.
doi: 10.3389/fsurg.2022.858506
- Wu LH, Li J, Jia SF, Guo YJ. The effect of narrative nursing on improving the negative emotions and quality of life of patients with moderate to severe cancer pain. *Clin Transl Oncol.* 2025;27(1):182-188.
doi: 10.1007/s12094-024-03549-7
- Sun L, Liu X, Weng X, *et al.* Narrative therapy to relieve stigma in oral cancer patients: a randomized controlled trial. *Int J Nurs Pract.* 2022;28(4):e12926.
doi: 10.1111/ijn.12926
- Raghuraman S, Stuttard N, Hunt N. Evaluating narrative exposure therapy for post-traumatic stress disorder and depression symptoms: a meta-analysis of the evidence base. *Clin Psychol Psychother.* 2021;28(1):1-23.
doi: 10.1002/cpp.2486
- Des Jarlais DC, Lyles C, Crepaz N; TREND Group. Improving the reporting quality of non-randomized evaluations of behavioral and public health interventions: the TREND statement. *Am J Public Health.* 2004;94(3):361-366.
doi: 10.2105/AJPH.94.3.361
- Cohen J. *Statistical Power Analysis for the Behavioral Sciences.* 2nd ed. Lawrence Erlbaum Associates; 1988.
- Toussaint A, Hüsing P, Gumz A, *et al.* Sensitivity to change and minimal clinically important difference of the 7-item Generalized Anxiety Disorder Questionnaire (GAD-7). *J*

- Affect Disord.* 2020;265:395-401.
doi: 10.1016/j.jad.2020.01.032
23. Aktürk Z, Hapfelmeier A, Fomenko A, *et al.* Generalized Anxiety Disorder 7-item (GAD-7) and 2-item (GAD-2) scales for detecting anxiety disorders in adults. *Cochrane Database Syst Rev.* 2025;3(3):CD015455.
doi: 10.1002/14651858.CD015455
24. Spitzer RL, Kroenke K, Williams JB, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med.* 2006;166(10):1092-1097.
doi: 10.1001/archinte.166.10.1092
25. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med.* 2001;16(9):606-613.
doi: 10.1046/j.1525-1497.2001.016009606.x
26. Vickers AJ, Altman DG. Analysing controlled trials with baseline and follow up measurements. *BMJ.* 2001;323(7321):1123-1124.
doi: 10.1136/bmj.323.7321.1123
27. VanderWeele TJ, Ding P. Sensitivity analysis in observational research: introducing the E-value. *Ann Intern Med.* 2017;167(4):268-274.
doi: 10.7326/M16-2607
28. Pennebaker JW. Expressive writing in psychological science. *Perspect Psychol Sci.* 2018;13(2):226-229.
doi: 10.1177/1745691617707315
29. Sterne JAC, White IR, Carlin JB, *et al.* Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. *BMJ.* 2009;338:b2393.
doi: 10.1136/bmj.b2393
30. White IR, Royston P, Wood AM. Multiple imputation using chained equations: issues and guidance for practice. *Stat Med.* 2011;30(4):377-399.
doi: 10.1002/sim.4067
31. Fioretti C, Mazzocco K, Riva S, *et al.* Research studies on patients' illness experience using the narrative medicine approach: a systematic review. *BMJ Open.* 2016;6(7):e011220.
doi: 10.1136/bmjopen-2016-011220