

Review

Reporting and measurement of anxiety and depression outcomes in advance care planning for patients with cancer: a scoping review

Xiao-xiao Li¹, Zhen-peng Huang^{1,*}, Kong-jin Quan¹

¹ Faculty of Nursing, Guangxi University of Chinese Medicine 530000, Nanning, China

* Corresponding author: Zhen-peng Huang, huang_zhenpeng@126.com

CITATION

Li X, Huang Z, Quan K. Reporting and measurement of anxiety and depression outcomes in advance care planning for patients with cancer: a scoping review. *Psycho-Oncologie*. 2026; 20(7): 5837. <https://doi.org/10.18282/po5837>

ARTICLE INFO

Received: 22 April 2026

Revised: 30 June 2026

Accepted: 14 July 2026

Available online: 3 August 2026

COPYRIGHT



Copyright © 2026 by author(s).

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

Abstract: Background/Objective: Advance care planning (ACP) is increasingly used in oncology and palliative care; however, evidence regarding its effects on anxiety and depression remains inconsistent. This scoping review aimed to map ACP intervention studies that reported anxiety and/or depression outcomes among adults with cancer, summarize intervention and assessment characteristics, and identify research gaps. **Methods:** PubMed, Embase, Web of Science, CNKI, Wanfang Data, and VIP were searched from inception to April 6, 2026. Eligible studies included adults with cancer, evaluated ACP-related interventions, and reported anxiety and/or depression outcomes measured using standardized instruments. **Results:** Of the 1,390 records identified, 12 were included. Interventions included structured ACP conversations, mindfulness-based ACP, acceptance and commitment therapy-integrated ACP, video- or decision-aid-based ACP, family-centered ACP, and multidisciplinary team-based ACP. Outcomes were assessed using heterogeneous instruments, including the Hospital Anxiety and Depression Scale (HADS), the seven-item Generalized Anxiety Disorder scale (GAD-7), the eight-item and nine-item Patient Health Questionnaires (PHQ-8 and PHQ-9), the State subscale of the State-Trait Anxiety Inventory (STAI-S), the Self-Rating Anxiety Scale (SAS), the Self-Rating Depression Scale (SDS), psychosocial items from the Integrated Palliative Care Outcome Scale (I-POS) psychosocial items, and the Templer Death Anxiety Scale (T-DAS). Some studies have reported significant reductions in anxiety, depression, emotional distress, and death anxiety, whereas others reported only trends or no ACP-specific effects. A few studies reported transient worsening or worsening confined to the comparison groups. **Conclusion:** The effects of ACP on anxiety and depression in patients with cancer remain unclear. Future research should standardize psychological outcome measures, clarify assessment timing, report baseline distress and effect estimates, and distinguish between anxiety, depression, death anxiety, state anxiety, and broader psychological distress.

Keywords: advance care planning; cancer; anxiety; depression; psychological distress; scoping review

1. Introduction

Cancer is a major public health concern worldwide. In 2022, approximately 20 million new cancer cases and 9.7 million cancer-related deaths were reported worldwide, and the global burden continues to increase [1]. In addition to physical suffering, patients with cancer frequently experience psychological distress. A systematic review estimated that anxiety and depression affect approximately 10-40% of patients with cancer, a prevalence markedly higher than that in the general population, and are associated with impaired quality of life, poor treatment adherence, and adverse clinical outcomes [2]. Therefore, anxiety and depression are important concerns in comprehensive cancer care [3].

Advance care planning (ACP) is a patient-centered process that enables

individuals with decision-making capacity to discuss, clarify, and document their values, preferences, and wishes for future medical care [4]. The core components include communicating with healthcare professionals and family members, understanding the prognosis and treatment options, completing advance directives, and appointing a surrogate decision-maker [5]. ACP is widely recognized as a means of promoting patient autonomy, improving end-of-life care, and aligning care with patient preferences and is incorporated into palliative care, shared decision-making, and serious illness communication frameworks [6-8].

The psychological effects of ACP in patients with cancer are clinically important but complex. ACP may reduce uncertainty and support adjustment by improving illness understanding, enhancing perceived control, facilitating communication, and preparing patients and families for future decisions [9-12]. Conversely, explicit discussions of disease progression, death, treatment limitations, and end-of-life decisions may evoke distress, particularly in patients with high psychological vulnerability or limited acceptance of the illness [13]. Baseline anxiety and depression may also affect patients' willingness, readiness, and ability to participate in ACP [14]. These factors complicate the evaluation and interpretation of psychological outcomes related to ACP.

Although ACP has been widely studied in cancer care, previous reviews have focused mainly on advance directive completion, end-of-life care quality, goal-concordant care, patient-family communication, decision-making, and healthcare utilization [15,16]. Anxiety and depression have received less systematic attention and are often treated as secondary or exploratory outcomes, despite their potential effects on quality of life, treatment adherence, ACP participation, and future treatment preferences [17-19]. Studies also vary substantially in terms of intervention format, facilitator, content, measurement instruments, assessment timing, and reporting methods [20]. Consequently, the reported psychological effects are inconsistent, with some studies suggesting benefits and others finding no significant effect [21,22]. This inconsistency may reflect differences in intervention effectiveness and heterogeneity in outcome measurement, reporting, and interpretation.

Therefore, a systematic mapping of anxiety and depression outcomes in cancer-related ACP intervention studies is required. This scoping review examines how these outcomes are incorporated, measured, reported, and interpreted. The findings may clarify methodological gaps underlying the inconsistent findings and support more rigorous evaluation of psychological outcomes in future ACP research.

This review addressed the following questions:

1. Which ACP intervention studies involving adults with cancer included anxiety and/or depression-related outcomes?
2. What were the intervention contexts, core ACP elements, facilitators, and doses?
3. Which psychological constructs, instruments, assessment time points, comparators, and reporting approaches were used?
4. What outcome patterns, worsening signals, and methodological or reporting gaps were evident across study designs?

2. Materials and methods

2.1. Study design

This scoping review followed the methodological framework developed by Arksey and O' Malley and the Joanna Briggs Institute (JBI) guidance for scoping

reviews [23,24]. Reporting followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist [25].

2.2. Inclusion criteria

Studies were eligible if they met all of the following criteria:

1. Population: Adults aged 18 years or older with cancer.
2. Concept: ACP-related interventions included structured ACP conversations, value clarification, discussions of care preferences, surrogate decision-maker designation, and advance directive completion.
3. Outcomes: Anxiety, depression, or closely related psychological outcomes.
4. Study design: Randomized controlled trials, quasi-experimental studies, pre-post studies, and other interventional designs.
5. Language: English or Chinese.

2.3. Exclusion criteria

Studies were excluded if they met any of the following criteria:

1. Population: Non-cancer populations, participants younger than 18 years, or mixed populations from which cancer-specific data could not be extracted separately.
2. Concept: Palliative care, end-of-life care, or general supportive care studies that did not include ACP as a core intervention component.
3. Outcomes: No anxiety, depression, related psychological outcomes, or standardized measurement instruments.
4. Study design: Systematic or narrative reviews, editorials, expert consensus statements, conference abstracts, case reports, and dissertations.
5. Language: Languages other than English or Chinese.

2.4. Search strategy

A comprehensive search was conducted using PubMed, Embase, Web of Science Core Collection, CNKI, Wanfang Data, and VIP. The final search, performed on April 6, 2026, covered each database from its inception to the search date. The strategy comprised three concept blocks: ACP-related, cancer-related, and anxiety/depression-related terms. English-language databases were searched using English subject headings and free-text terms. Chinese databases were searched using Chinese variants of advance care planning, advance directives, living wills, goal-of-care discussions, and surrogate decision-making, which were not applied to English-language databases. No restrictions were imposed on the publication year. During screening, eligibility was limited to English and Chinese full-text publications because the review team could reliably assess these languages, and Chinese databases were searched specifically to capture China-based ACP literature. Trial registries and gray literature were not searched. The full database-specific strategies, fields, search dates, limits, and retrieval counts are provided in **Appendix 1**.

2.5. Study selection and data extraction

All records were imported into EndNote software. Duplicates were removed automatically and manually verified by two reviewers using the title, authors, year, journal, DOI, and abstract. Two reviewers independently screened the titles and abstracts and assessed potentially eligible full texts against the predefined criteria. Disagreements were resolved through discussion and consultation with a third reviewer when necessary.

The extracted data included study characteristics and ACP components. For

anxiety- and depression-related outcomes, we recorded the construct, instrument, assessment timing, comparator, statistical approach, results, statistical significance, effect estimates, p values, confidence intervals, and any reported worsening.

2.6. Methodological quality appraisal

To support interpretation, randomized controlled trials were appraised using the JBI Checklist for Randomized Controlled Trials, and quasi-experimental studies were appraised using the JBI Checklist for Quasi-Experimental Studies. Appraisal findings informed the interpretation of the mapped evidence but were not used as exclusion criteria. Two reviewers independently appraised the methodological quality of the included studies using appropriate JBI critical appraisal checklists. Disagreements were resolved through discussion and consultation with a third reviewer when necessary.

3. Results and discussion

3.1. Study selection

A database search identified 1,390 records. After 286 duplicates were removed, 1,104 records were subjected to title and abstract screening. Of these, 909 were excluded because of ineligible concept (n = 383), ineligible population (n = 329), or ineligible study design (n = 197). The full texts of 195 reports were assessed, and 183 were excluded because they lacked an eligible anxiety/depression outcome or standardized measure (n = 146), were not published in Chinese or English (n = 9), had an ineligible study design (n = 21), or contained overlapping data (n = 7). Twelve studies were included in the scoping review. The selection process is illustrated in Figures 1 and 2.

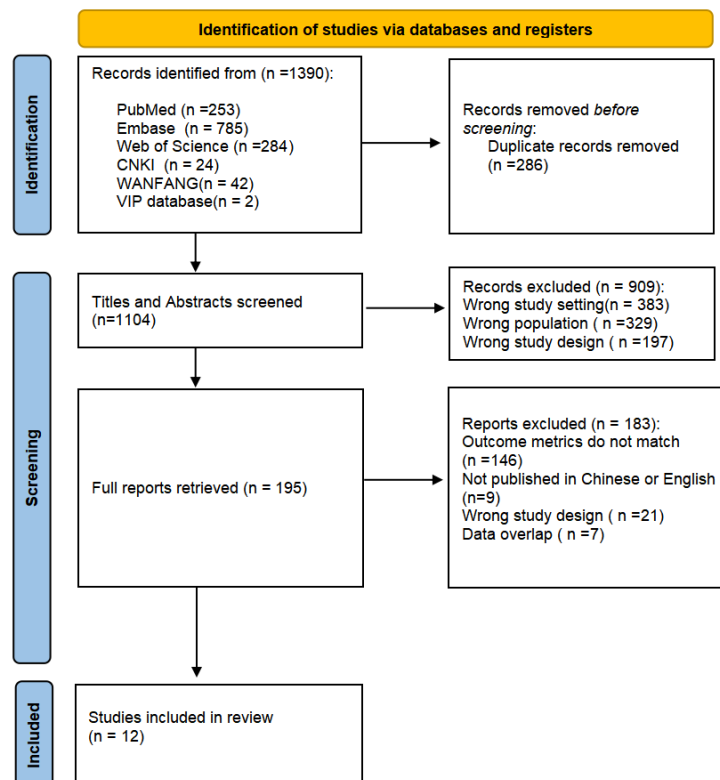


Figure 1. PRISMA flow diagram of study selection.

Schematic flow of the review design

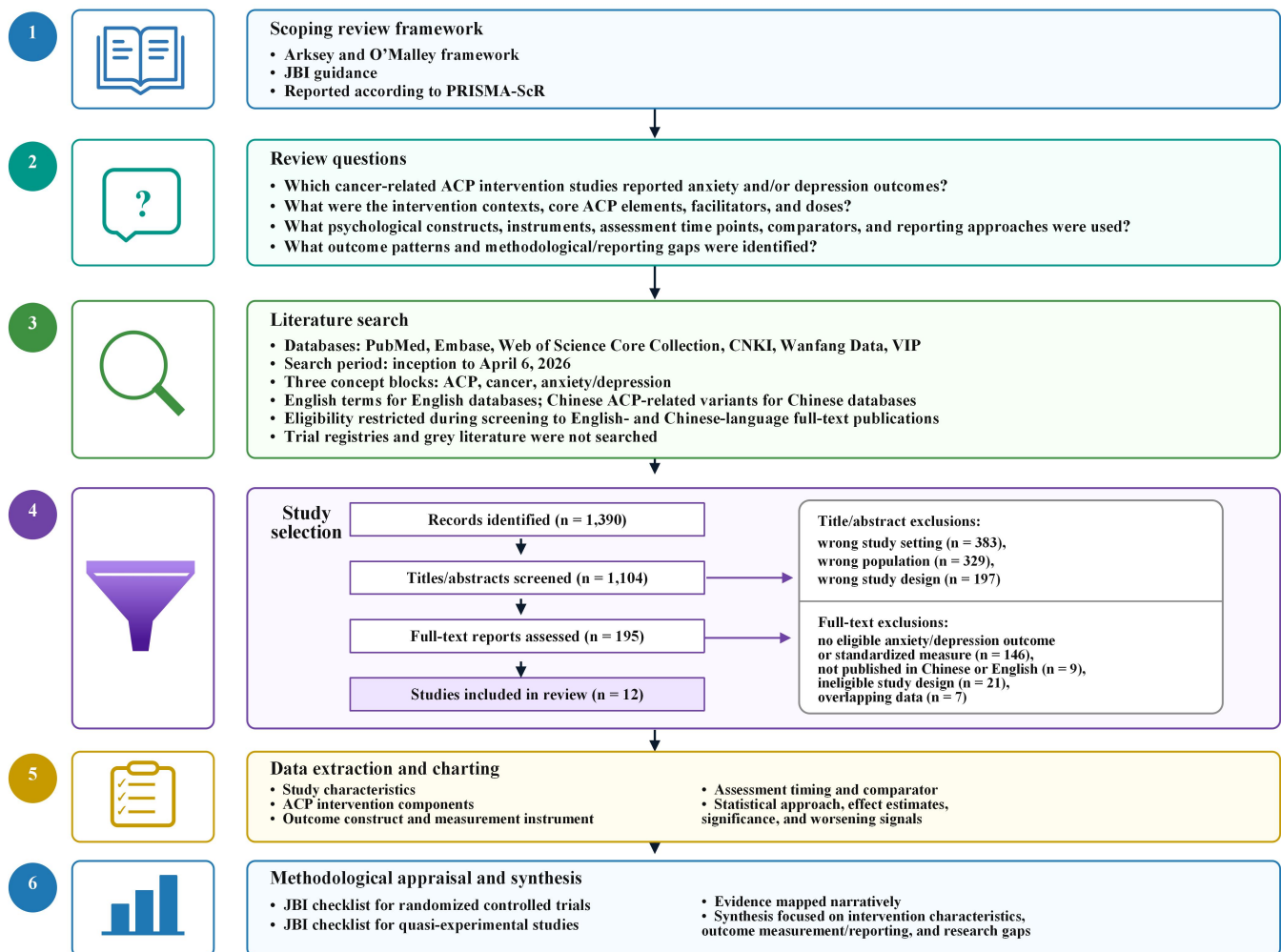


Figure 2. Schematic flow of the review design.

3.2. Study characteristics

The 12 studies [21,26-36] comprised six from the United States, five from China, and one from Italy. Nine were randomized controlled trials, and three were quasi-experimental studies. Most of the enrolled patients had advanced, metastatic, recurrent, terminal, or serious cancer; one study focused on major cancer surgery, and another included patients with stage I-IV breast cancer. The sample sizes ranged from 13 to 460 participants. Interventions varied in setting, format, content, provider, and dose and included acceptance and commitment therapy (ACT), mindfulness-based, nurse-led, video- or decision aid-based, family-centered, and multidisciplinary team-led ACP. The core components included value clarification, preference discussions, surrogate designation, advance directive completion, end-of-life education, family communication, and individualized care planning. The providers included nurses, social workers, psychologists, researchers, mindfulness instructors, physicians, and multidisciplinary teams. The intervention doses ranged from a single brief session to repeated sessions over several weeks or months. **Table 1** summarizes the characteristics of the studies and interventions.

Table 1. Study characteristics and ACP intervention features

Study	Design / control	Sample and cancer	ACP context and delivery	Core ACP elements	Facilitator and dose
Arch 2020 [26]	United States; QED; no control	n=35 enrolled; mixed advanced cancer; mean age 61.8 y	Community oncology; in-person group ACT plus online modules/check-ins	Values clarification; cognitive defusion; health-care agent; ACP goals; advance-directive completion	Social worker + psychologist; 4 x 2-h groups + 3 online modules + daily check-ins
Arch 2026 [27]	United States; RCT; usual supportive care	n=240 randomized (121/119); advanced cancer; mean age 63.1 y	Community oncology; remote group video sessions plus online modules/check-ins	ACT-based Valued Living; values and meaning; proxy choice; values discussions; advance directives	Clinical social workers; 5 weekly 2-h sessions + online modules/check-ins
Aslakson 2019 [28]	United States; RCT; control video	n=92 (45/47); mixed cancers before major surgery; mean age 60.4 y	Preoperative clinic; 6-min ACP video plus usual surgical consent discussion	Surgical risk preparation; surrogate identification; prompt to discuss care preferences	Study staff + surgeons; one clinic viewing, with home rewatch link
Catania 2021 [29]	Italy; QED; routine nursing	n=187 enrolled; analytic n=98 (53/45); advanced cancer; mean age 73.9 vs 70.5 y	Hospice inpatient units; nurse-patient/family education, I-POS assessment and team care planning	QoL and symptom assessment; psychosocial needs; emotional support; goals/preferences discussion	Trained nurses within palliative team; 10-15 min sessions; T0, T1, T2 assessments
Epstein 2018 [30]	United States; pilot RCT; video-only/usual care	n=151 randomized; 99 completed measures; advanced GI cancer; mean age 61 y	GI oncology clinic; values interview + care-goals video; follow-up at about 1 month	Goals, concerns and supports; CPR/ventilation education; limited/comfort care options; values narrative	Trained research team; about 20-min intervention + 1-month review
Hsu 2025 [21]	Taiwan, China; RCT; standard care	n=77 (39/38); older adults with advanced cancer; age 71.2 vs 73.4 y	Oncology clinic; nurse-led ACP consultation using cartoon decision aid	ACP/advance-directive education; EOL treatments; care-preference exploration	Trained ACP nurse; one 30-40 min conversation
Johns 2020 [31]	United States; QED; no control	n=13 patient-caregiver dyads; mixed advanced cancer; patient mean age 62.9 y	Academic cancer center; group mindfulness intervention with embedded ACP education	Mindfulness; POST and ASCO booklet; values discussion; support for informed refusal of ACP	Mindfulness facilitator; 6 weekly 2-h sessions + home practice

Continuation Table:

Study	Design / control	Sample and cancer	ACP context and delivery	Core ACP elements	Facilitator and dose
Lin 2024 [32]	China; RCT; routine care	n=90 recurrent ovarian cancer patients (45/45); age 46.31 vs 49.98 y	First hospitalization after recurrence; 1-month ACP with family meeting, booklet/video and phone/WeChat follow-up	Five Wishes framework; life review; care-preference expression; EOL plan; plan revision according to patient wishes	ACP team: physicians, nurses, psychotherapists and head nurse; admission, day-2, discharge and post-discharge contacts
Mosher 2024 [33]	United States; pilot RCT; usual care	n=55 patient-caregiver dyads; mixed advanced cancer; mean age 70.6 y	Oncology clinics; group mindfulness plus ACP education and dyadic communication	MBSR; mindful speaking/listening; ASCO guide; POST form; values/preferences discussion	Certified mindfulness teachers; 6 weekly 2-h sessions + home practice
Tang 2019 [34]	China; RCT; sham symptom education	n=460 dyads; mixed terminal/advanced cancer; age <=55: 39.1%, 56-65: 36.5%, >=65: 23.4%	From terminal-cancer recognition until withdrawal/death; repeated ACP with booklet/video and psychological support	Readiness assessment; stage-tailored intervention; EOL discussion; life-sustaining treatment education	Trained oncology/palliative interventionists; weekly inpatient or monthly outpatient; mean 5.99 sessions
Wang 2026 [35]	China; RCT; standard breast cancer care	n=90 randomized; 80 analyzed; breast cancer stages I-IV; age 54.68 vs 55.28 y	Tertiary hospital; 2-week intervention plus family follow-up within 1 month	Family meetings/interviews; ACP booklet; Heart-to-Heart cards; video; Five-Wishes-like document	Multidisciplinary ACP team; 3 hospital sessions + family follow-up
Deng 2023 [36]	China; RCT; routine nursing	n=120 (60/60); mixed advanced cancers; age 41.13 vs 38.51 y	Inpatient care; 3-month ACP nursing intervention with structured interview and video education	ACP understanding; medical situation; treatment/care wishes; individualized plan; counseling/simulation	ACP team; weekly 40-60 min interview for 3 months

Notes. ACP = advance care planning; ACT = acceptance and commitment therapy; AD = advance directive; ASCO = American Society of Clinical Oncology; EOL = end of life; I-POS = Integrated Palliative Care Outcome Scale; MDT = multidisciplinary team; POST = Physician Orders for Scope of Treatment; QED = quasi-experimental design; RCT = randomized controlled trial; UC = usual care.

3.3. Outcome measurement and reporting

Anxiety, depression, and distress were assessed using the Hospital Anxiety and Depression Scale (HADS-A and HADS-D), the total HADS score, the seven-

item Generalized Anxiety Disorder scale (GAD-7), the eight-item and nine-item Patient Health Questionnaires (PHQ-8 and PHQ-9), the State subscale of the State-Trait Anxiety Inventory (STAI-S), the Self-Rating Anxiety Scale (SAS), the Self-Rating Depression Scale (SDS), psychosocial items from the Integrated Palliative Care Outcome Scale (I-POS), and the Templer Death Anxiety Scale (T-DAS). The assessment timing varied from baseline and immediate post-intervention measurements to multiple follow-ups. The statistical methods included within-group pre-post analyses, between-group comparisons, mixed models, generalized estimating equations (GEE), hierarchical linear modeling, standardized response means, and t-tests.

Regarding anxiety, some studies reported significant reductions in HADS-A, GAD-7, SAS, T-DAS, or combined HADS subscale scores. Others reported only within-group or time-related decreases without ACP-specific between-group effects, no group differences, or borderline results. Regarding depression, some studies reported significant improvements in HADS-D, PHQ-8, SDS, and I-POS scores, whereas others found no significant effect or only a trend. A few worsening signals were reported: transient postoperative increases in HADS total scores in both arms of a surgical trial, worsening anxiety in the comparison group at T2 in a quasi-experimental study, and increased distress thermometer scores in the intervention arm of a pilot RCT. **Table 2** presents details of the outcome measurements.

Table 2. Measurement and reporting of anxiety- and depression-related outcomes

Study	Patient outcome and instrument	Assessment time points	Comparison basis	Key reported result	Interpretation	Worsening reported
Arch 2020 [26]	Anxiety/depression; HADS-A/HADS-D	Baseline; after session 2; 1 week and 2 months post-intervention	Within-group pre-post/follow-up models	HADS-A $b=-2.36$, $p<0.01$; HADS-D $b=-2.20$, $p<0.01$ at follow-up	Significant improvement in both	No
Arch 2026 [27]	Anxiety/depression; GAD-7/PHQ-8	Baseline; 3.5 weeks; 6 weeks; 14 weeks	Condition x time mixed models	Anxiety: no effect. PHQ-8 lower at follow-up (change difference -1.18 , $p=0.031$); overall depression interaction trend $p=0.059$	No anxiety effect; depression improvement signal	No
Aslakson 2019 [28]	Emotional distress; HADS total	Baseline; preoperative consent; 1 week and 1 month after surgery	Between-arm comparisons at each visit	No significant group differences; HADS rose transiently after surgery in both arms	No ACP-video effect	Transient postsurgical HADS increase in both arms
Catania 2021 [29]	Anxiety/depression; I-POS psychosocial items	T0 within 3 days; T1 7 +/- 3 days; T2 15 +/- 3 days	Nonequivalent pre/post group analyses	Depression interaction $F=6.202$, $p=0.004$. Patient anxiety only borderline at T1 ($p=0.062$); control anxiety worsened at T2 ($p=0.019$)	Depression improved; anxiety trend only	comparison group anxiety worsened at T2

Continuation Table:

Study	Patient outcome and instrument	Assessment time points	Comparison basis	Key reported result	Interpretation	Worsening reported
Epstein 2018 [30]	Anxiety/depression; GAD-7/PHQ-9	Baseline and about 1 month	Pre-post change-score comparisons	GAD-7: $p=0.764/0.713$. PHQ-9: $p=0.641/0.160$ for P-COCC vs comparators	No significant anxiety/depression effect	Distress thermometer increased in P-COCC
Hsu 2025 [21]	anxiety; STAI-S	Baseline; 2 weeks; 1 month	GEE group, time and group x time effects	Group x time not significant ($p=.399/.771$); anxiety decreased over time in both groups	No ACP-specific anxiety effect	No
Johns 2020 [31]	Anxiety/depression; GAD-7/PHQ-8	Baseline; post-intervention; 1 month post-intervention	Within-group SRM from baseline	PHQ-8 improved at post and 1 month ($p=0.013/0.001$); GAD-7 improved at 1 month ($p=0.020$)	Significant within-group improvement	No
Lin 2024 [32]	Patient anxiety/depression; SAS/SDS	Baseline and 1 month after intervention	Within-group pre/post and post-intervention between-group tests	Post-intervention SAS: 50.34 vs 59.99, $p<0.001$. Post-intervention SDS: 49.13 vs 54.38, $p<0.001$	Both anxiety and depression improved more with ACP	No
Mosher 2024 [33]	Anxiety/depressive symptoms; GAD-7/PHQ-8	Baseline; post-intervention; 1 month post-intervention	Dyadic multilevel group x time models	Depression: trend favoring intervention ($F=2.97$, $p=0.06$). Anxiety: no effect ($F=1.52$, $p=0.22$)	No significant group effect; depression trend only	No
Tang 2019 [34]	Anxiety/depression; HADS-A/HADS-D	Baseline; every 3-4 weeks until withdrawal or death	Adjusted hierarchical linear modeling	Anxiety $b=-0.583$, $p=0.004$; depression $b=-0.533$, $p=0.038$	Significant reduction in both	No
Wang 2026 [35]	Death anxiety; T-DAS	Baseline and 1 month	Pre/post and post-intervention between-group t tests	Intervention 32.48 to 25.28; control 32.68 to 31.53; post-group $t=7.390$, $p<0.001$	Death anxiety significantly reduced	No
Deng 2023 [36]	Anxiety/depression; SAS/SDS	Before and after 3-month intervention	Within-group and post-intervention between-group t tests	Post-group SAS $t=5.210$, $p<0.001$; post-group SDS $t=7.900$, $p<0.001$	Significant improvement in both	No

Notes. HADS-A/HADS-D = Hospital Anxiety and Depression Scale-Anxiety/Depression; GAD-7 = Generalized Anxiety Disorder 7-item scale; PHQ-8/PHQ-9 = Patient Health Questionnaire-8/9; SAS = Self-Rating Anxiety Scale; SDS = Self-Rating Depression Scale; STAI-S = State-Trait Anxiety Inventory-State subscale; T-DAS = Templer Death Anxiety Scale. **Table 2** is limited to measurement, statistical basis and outcome interpretation. GEE = generalized estimating equations; P-COCC = Person-Centered Oncologic Care and Choices; SRM = standardized response mean.

3.4. Methodological quality

Methodological quality was appraised using the JBI checklists for randomized controlled and quasi-experimental studies. Among the nine RCTs, the scores ranged from 7/13 to 11/13. Common limitations included unclear allocation concealment, lack of blinding, attrition, and incomplete intention-to-treat analyses. Among the three quasi-experimental studies, the scores ranged from 5/7 to 7/9. Common limitations included baseline imbalances, unclear outcome measurement consistency, and a lack of control groups. The full appraisal results are provided in **Supplementary Tables S1-S4**.

4. Discussion

This scoping review mapped the measurement and reporting of anxiety and depression outcomes of ACP interventions for patients with cancer. Both intervention characteristics and psychological outcome reporting were highly heterogeneous. Some studies reported improvements in anxiety, depression, or death anxiety, whereas others found only non-significant trends or no ACP-specific effects.

Previous reviews have focused largely on ACP documentation, goal-concordant care, end-of-life communication, healthcare utilization, decisional conflict, and broad patient or caregiver outcomes [37-40]. Psychological outcomes are often secondary or exploratory, and inconsistent measurement may obscure the true psychological effects of ACP. This review examined the conceptualization, measurement, reporting, and interpretation of anxiety and depression outcomes in cancer-related ACP intervention studies. Identifying the potential sources of heterogeneity provides a methodological basis for more consistent and clinically meaningful future studies.

The included studies suggest that psychological benefits are more likely when ACP is delivered as a structured, repeated, and interactive process that incorporates value clarification, family communication, and emotional support [27,31]. ACP is a complex, multicomponent communication process rather than a single standardized treatment. International consensus recommendations describe it as involving the identification of values, reflection on serious illness scenarios, clarification of future care goals and preferences, discussions with family members and healthcare professionals, and documentation or review of preferences when appropriate [37]. However, ACP trials vary substantially in intervention characteristics, outcome domains, and measurement approaches [38]. Facilitated, individualized discussions with repeated reviews, family involvement, and attention to emotional concerns may be more likely to affect psychological outcomes than brief, document-focused interventions [41,42]. ACP may act through improved knowledge, autonomous motivation, communication competence, and shared decision-making within a trusting relationship rather than direct symptom reduction alone [41].

Assessment timing may partly explain these inconsistent findings. Because ACP addresses prognosis, future deterioration, treatment limitations, surrogate decision-making, and end-of-life preferences, it may temporarily activate illness- or death-related concerns, particularly in patients with advanced cancer [43]. However, ACP may reduce uncertainty over time by clarifying values and goals, strengthening perceived control, facilitating communication, and preparing patients and surrogates for future decisions [44,45]. Psychological effects may therefore be delayed, nonlinear, and influenced by the informational and emotional support available after ACP discussions. No included studies reported sustained ACP-specific worsening of anxiety or depression; a few worsening signals were transient or not specific to

ACP [28-30]. Thus, the available evidence does not indicate sustained ACP-specific psychological harm, although emotional responses should be monitored when ACP is conducted near major treatment decisions or end-of-life discussions.

Baseline psychological distress may modify the effects of ACP. Psychosocial intervention research in cancer has shown that pre-intervention distress moderates outcomes; the effects on anxiety and depression are generally small when baseline distress is low and greater when it is high [46]. In metastatic cancer, anxiety and depression may impede ACP engagement, information comprehension, decision-making confidence, trust in clinicians, and satisfaction with end-of-life decisions [43]. Psychological distress should therefore be considered not only an ACP outcome but also a factor shaping readiness, participation, preferences, and responsiveness.

Another concern is conceptual heterogeneity. Anxiety, depression, death anxiety, state anxiety, fear of cancer recurrence or progression, and general psychological distress are related but distinct constructs. In psycho-oncology, distress is a broad, multifactorial experience involving psychological, social, spiritual, and physical dimensions and is not synonymous with anxiety or depression [47]. HADS assesses anxiety and depressive states in medical outpatients, whereas GAD-7 and PHQ-9 assess generalized anxiety symptoms and depressive symptom severity, respectively [48-50]. The STAI distinguishes between state and trait anxiety [51]. Death anxiety and fear of cancer recurrence or progression reflect existential and cancer-specific concerns and should not be equated with general anxiety [52,53]. Combining these outcomes without clear conceptual distinctions could lead to imprecise conclusions.

This study has certain limitations. First, the small number of included studies and their concentration in the United States and China may limit generalizability. Second, variations in intervention format, provider, dose, disease stage, outcome measures, and follow-up timing limited comparability. Third, the studies assessed different constructs, including general anxiety and depression, state anxiety, death anxiety, and broader psychological distress, complicating the interpretation of the overall outcome patterns. Finally, restricting eligibility to Chinese- and English-language publications may have excluded relevant studies in other languages.

5. Conclusion

Anxiety and depression outcomes in cancer-related ACP studies are highly heterogeneous in terms of measurement, reporting, and interpretation. The current evidence does not show a consistent effect of ACP on anxiety or depressive symptoms. Future studies should standardize outcome selection and assessment timing, report baseline distress, effect estimates, and process outcomes, and distinguish between general anxiety, depression, death anxiety, state anxiety, and broader distress. Process outcomes should include readiness, communication quality, decisional confidence, and family preparedness. These improvements will help identify the conditions under which ACP may support the psychological well-being of patients with cancer.

Supplementary materials: The following supporting information is available in separate files: **Appendix 1**, Database-specific search strategies; **Supplementary Tables S1-S4**, methodological quality appraisal using JBI critical appraisal checklists.

Author contributions: Conceptualization, XL, KQ, and ZH; data curation, XL and KQ; formal analysis, XL and KQ; funding acquisition, ZH; investigation, XL and

ZH; methodology, XL and ZH; project administration, ZH; resources, XL; software, XL; supervision, ZH; validation, XL and ZH; visualization, XL; writing-original draft preparation, XL; writing-review and editing, XL and ZH. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Guangxi Plateau Discipline: Nursing (Rehabilitation & Wellness) (Document No. 2 [2026] of the Department of Education of Guangxi for Scientific Research).

Ethical approval: Not applicable.

Informed consent statement: Not applicable.

Data availability statement: All data generated or analyzed during this review are included in this article and its supplementary materials.

Acknowledgments: Not applicable.

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

References

1. Bray F, Laversanne M, Sung H, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2024, 74(3): 229-263. doi: 10.3322/caac.21834.
2. Mitchell AJ, Chan M, Bhatti H, et al. Prevalence of depression, anxiety, and adjustment disorder in oncological, haematological, and palliative-care settings: a meta-analysis of 94 interview-based studies. *Lancet Oncol*. 2011, 12(2): 160-174. doi: 10.1016/S1470-2045(11)70002-X.
3. Gonçalves F, Gaudêncio M, Paiva I, et al. Evaluation of emotional distress in oncology palliative patients: Edmonton Symptom Assessment System (ESAS) and Palliative Outcome Scale (POS)-a Portuguese cross-sectional study. *Cancers (Basel)*. 2024, 16(24): 4232. doi: 10.3390/cancers16244232.
4. Sudore RL, Lum HD, You JJ, et al. Defining advance care planning for adults: a consensus definition from a multidisciplinary Delphi panel. *J Pain Symptom Manage*. 2017, 53(5): 821-832.e1. doi: 10.1016/j.jpainsymman.2016.12.331.
5. Sudore RL, Heyland DK, Lum HD, et al. Outcomes that define successful advance care planning: a Delphi panel consensus. *J Pain Symptom Manage*. 2018, 55(2): 245-255.e8. doi: 10.1016/j.jpainsymman.2017.08.025.
6. van Teunenbroek KC, Mulder RL, van Heel DAM, et al. A Dutch paediatric palliative care guideline: a systematic review and recommendations on advance care planning and shared decision-making. *BMC Palliat Care*. 2024, 23(1): 270. doi: 10.1186/s12904-024-01568-3.
7. Miyashita J, Shimizu S, Shiraishi R, et al. Culturally adapted consensus definition and action guideline: Japan's advance care planning. *J Pain Symptom Manage*. 2022, 64(6): 602-613. doi: 10.1016/j.jpainsymman.2022.09.005.
8. Ferrell BR, Temel JS, Temin S, et al. Integration of palliative care into standard oncology care: American Society of Clinical Oncology clinical practice guideline update. *J Clin Oncol*. 2017, 35(1): 96-112. doi: 10.1200/JCO.2016.70.1474.
9. Chen CH, Chou WC, Chen JS, et al. An individualized, interactive, and advance care planning intervention promotes transitions in prognostic awareness states among terminally ill cancer patients in their last six months-a secondary analysis of a randomized controlled trial. *J Pain Symptom Manage*. 2020, 60(1): 60-69.e6. doi: 10.1016/j.jpainsymman.2020.01.012.
10. Kishino M, Koffman J, Hamano J, et al. Family-integrated advance care planning for cancer patients: a mixed-methods feasibility study. *J Pain Symptom Manage*. 2025, 69(6): 620-632.e1. doi: 10.1016/j.jpainsymman.2025.03.001.
11. Goswami P. End-of-life preparedness and quality of advance care planning discussions in patients with advanced metastatic cancer. *Oncol Nurs Forum*. 2025, 52(1): 70-80. doi: 10.1188/25.ONF.70-80.
12. Green MJ, Schubart JR, Whitehead MM, et al. Advance care planning does not adversely affect hope or anxiety among patients with advanced cancer. *J Pain Symptom Manage*. 2015, 49(6): 1088-1096. doi: 10.1016/j.jpainsymman.2014.11.293.
13. Jimenez G, Tan WS, Virk AK, et al. Overview of systematic reviews of advance care planning: summary of evidence and global lessons. *J Pain Symptom Manage*. 2018, 56(3): 436-459.e25. doi: 10.1016/j.jpainsymman.2018.05.016.
14. Solar S, Wieditz J, Lordick F, et al. Screening versus multidimensional assessment of symptoms and psychosocial distress in

- cancer patients from the time of incurability. *Front Oncol.* 2023, 13: 1002499. doi: 10.3389/fonc.2023.1002499.
15. Yeun YR. The effects of advance care planning on decision conflict and psychological distress: a systematic review and meta-analysis of randomized controlled trials. *J Hosp Palliat Care.* 2021, 24(3): 144-153. doi: 10.14475/jhpc.2021.24.3.144.
16. Prigerson HG, Viola M, Maciejewski PK, et al. Advance care planning (ACP) to promote receipt of value-concordant care: results vary according to patient priorities. *PLoS One.* 2023, 18(1): e0280197. doi: 10.1371/journal.pone.0280197.
17. Kelly EP, Henderson B, Hyer M, et al. Intrapersonal factors impact advance care planning among cancer patients. *Am J Hosp Palliat Care.* 2021, 38(10): 1215-1221. doi: 10.1177/1049909120962457.
18. Kroon LL, van Roij J, Korfage IJ, et al. Perceptions of involvement in advance care planning and emotional functioning in patients with advanced cancer. *J Cancer Surviv.* 2021, 15(3): 380-385. doi: 10.1007/s11764-021-01020-y.
19. Arrieta O, Angulo LP, Núñez-Valencia C, et al. Association of depression and anxiety on quality of life, treatment adherence, and prognosis in patients with advanced non-small cell lung cancer. *Ann Surg Oncol.* 2013, 20(6): 1941-1948. doi: 10.1245/s10434-012-2793-5.
20. Brinkman-Stoppelenburg A, Rietjens JA, van der Heide A. The effects of advance care planning on end-of-life care: a systematic review. *Palliat Med.* 2014, 28(8): 1000-1025. doi: 10.1177/0269216314526272.
21. Hsu YH, Wang MH, Hu WY, et al. Effects of advance care planning on hope, anxiety, attitudes, and behavioral intentions in older adults with cancer: a randomized controlled study. *Support Care Cancer.* 2025, 33(9): 822. doi: 10.1007/s00520-025-09866-z.
22. Johnson SB, Butow PN, Bell ML, et al. A randomised controlled trial of an advance care planning intervention for patients with incurable cancer. *Br J Cancer.* 2018, 119(10): 1182-1190. doi: 10.1038/s41416-018-0303-7.
23. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol.* 2005, 8(1): 19-32. doi: 10.1080/1364557032000119616.
24. Peters MDJ, Godfrey C, McInerney P, et al. Scoping reviews (2020). In: Aromataris E, Lockwood C, Porritt K, et al., editors. *JBIManual for Evidence Synthesis.* JBI; 2024.
25. Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med.* 2018, 169(7): 467-473. doi: 10.7326/M18-0850.
26. Arch JJ, Fishbein JN, Ferris MC, et al. Acceptability, feasibility, and efficacy potential of a multimodal acceptance and commitment therapy intervention to address psychosocial and advance care planning needs among anxious and depressed adults with metastatic cancer. *J Palliat Med.* 2020, 23(10): 1380-1385. doi: 10.1089/jpm.2019.0398.
27. Arch JJ, Mitchell JL, Schmiede SJ, et al. Valued Living intervention to increase advance care planning and well-being in depressed and anxious adults with advanced cancer: randomized trial in community oncology clinics. *Cancer.* 2026, 132(6): e70349. doi: 10.1002/cncr.70349.
28. Aslakson RA, Isenberg SR, Crossnohere NL, et al. Integrating advance care planning videos into surgical oncologic care: a randomized clinical trial. *J Palliat Med.* 2019, 22(7): 764-772. doi: 10.1089/jpm.2018.0209.
29. Catania G, Zanini M, Signori A, et al. Providing a nurse-led complex nursing intervention focused on quality of life assessment on advanced cancer patients: the INFO-QoL pilot trial. *Eur J Oncol Nurs.* 2021, 52: 101961. doi: 10.1016/j.ejon.2021.101961.
30. Epstein AS, O'Reilly EM, Shuk E, et al. A randomized trial of acceptability and effects of values-based advance care planning in outpatient oncology: Person-Centered Oncologic Care and Choices. *J Pain Symptom Manage.* 2018, 56(2): 169-177.e1. doi: 10.1016/j.jpainsymman.2018.04.009.
31. Johns SA, Beck-Coon K, Stutz PV, et al. Mindfulness training supports quality of life and advance care planning in adults with metastatic cancer and their caregivers: results of a pilot study. *Am J Hosp Palliat Care.* 2020, 37(2): 88-99. doi: 10.1177/1049909119862254.
32. Lin ML, Tao XH, Wu CJ, et al. Application and value of advance care planning in patients with recurrent ovarian cancer. [in Chinese] *Modern Nurse.* 2024, 31(17): 92-95. doi: 10.19792/j.cnki.1006-6411.2024.17.022.
33. Mosher CE, Beck-Coon KA, Wu W, et al. Mindfulness to enhance quality of life and support advance care planning: a pilot randomized controlled trial for adults with advanced cancer and their family caregivers. *BMC Palliat Care.* 2024, 23(1): 232. doi: 10.1186/s12904-024-01564-7.
34. Tang ST, Chen JS, Wen FH, et al. Advance care planning improves psychological symptoms but not quality of life and preferred end-of-life care of patients with cancer. *J Natl Compr Canc Netw.* 2019, 17(4): 311-320. doi: 10.6004/

jncn.2018.7106.

35. Wang R, Gao R, Pei S, et al. Family-centered advance care planning in patients with breast cancer: a randomized controlled trial in China. *Omega (Westport)*. 2026, 302228261421702. doi: 10.1177/00302228261421702.
36. Deng LL. Application of advance care planning in patients with advanced cancer. [in Chinese] *Journal of Clinical Nursing*. 2023, 22(4): 23-25.
37. Rietjens JAC, Sudore RL, Connolly M, et al. Definitions and recommendations for advance care planning: An international consensus supported by the European Association for Palliative Care. *Lancet Oncol*. 2017, 18(9): e543-e551. doi: 10.1016/S1470-2045(17)30582-X.
38. McMahan RD, Tellez I, Sudore RL. Deconstructing the complexities of advance care planning outcomes: what do we know and where do we go? A scoping review. *J Am Geriatr Soc*. 2021, 69(1): 234-244. doi: 10.1111/jgs.16801.
39. Malhotra C, Shafiq M, Batcagan-Abueg APM. What is the evidence for efficacy of advance care planning in improving patient outcomes? A systematic review of randomised controlled trials. *BMJ Open*. 2022, 12(7): e060201. doi: 10.1136/bmjopen-2021-060201.
40. Zhang S, Li J, Zhang Y, et al. Effects of advance care planning for patients with advanced cancer: a meta-analysis of randomized controlled studies. *Int J Nurs Stud*. 2025, 168: 105096. doi: 10.1016/j.ijnurstu.2025.105096.
41. Lin CP, Evans CJ, Koffman J, et al. The conceptual models and mechanisms of action that underpin advance care planning for cancer patients: a systematic review of randomised controlled trials. *Palliat Med*. 2019, 33(1): 5-23. doi: 10.1177/0269216318809582.
42. Kishino M, Ellis-Smith C, Afolabi O, et al. Family involvement in advance care planning for people living with advanced cancer: a systematic mixed-methods review. *Palliat Med*. 2022, 36(3): 462-477. doi: 10.1177/02692163211068282.
43. Arch JJ, Bright EE, Finkelstein LB, et al. Anxiety and depression in metastatic cancer: a critical review of negative impacts on advance care planning and end-of-life decision making with practical recommendations. *JCO Oncol Pract*. 2023, 19(12): 1097-1108. doi: 10.1200/OP.23.00287.
44. Fried TR, Bullock K, Iannone L, et al. Understanding advance care planning as a process of health behavior change. *J Am Geriatr Soc*. 2009, 57(9): 1547-1555. doi: 10.1111/j.1532-5415.2009.02396.x.
45. Li Y, Liang S, Huang L, et al. A feasibility trial of advance care planning for patients with terminal cancer in primary hospitals. *BMC Palliat Care*. 2025, 24: 278. doi: 10.1186/s12904-025-01920-1.
46. Schneider S, Moyer A, Knapp-Oliver S, et al. Pre-intervention distress moderates the efficacy of psychosocial treatment for cancer patients: a meta-analysis. *J Behav Med*. 2010, 33(1): 1-14. doi: 10.1007/s10865-009-9227-2.
47. Riba MB, Donovan KA, Andersen B, et al. Distress management, Version 3.2019, NCCN Clinical Practice Guidelines in Oncology. *J Natl Compr Canc Netw*. 2019, 17(10): 1229-1249. doi: 10.6004/jncn.2019.0048.
48. Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. *Acta Psychiatr Scand*. 1983, 67(6): 361-370. doi: 10.1111/j.1600-0447.1983.tb09716.x.
49. Spitzer RL, Kroenke K, Williams JBW, et al. 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.
50. Kroenke K, Spitzer RL, Williams JBW. 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.
51. Spielberger CD, Gorsuch RL, Lushene R, et al. *Manual for the State-Trait Anxiety Inventory*. Palo Alto: Consulting Psychologists Press; 1983.
52. Lebel S, Ozakinci G, Humphris G, et al. From normal response to clinical problem: definition and clinical features of fear of cancer recurrence. *Support Care Cancer*. 2016, 24(8): 3265-3268. doi: 10.1007/s00520-016-3272-5.
53. Sharpe L, Curran L, Butow P, et al. Fear of cancer recurrence and death anxiety. *Psychooncology*. 2018, 27(11): 2559-2565. doi: 10.1002/pon.4783.

Appendix 1. Database-specific search strategies

Table A1. Full database-specific search strategies and records retrieved

Databaseandplatform	Searchdetails	Fullsearchstrategy	Recordsretrieved(n)
Web of Science (Web of Science Core Collection)	Date searched: 6 April 2026 Field(s): TS = Topic (title, abstract, author keywords, Keywords Plus) Limits: No database filters applied	TS = (("advance care planning" OR ACP OR "advance directive*" OR "living will*" OR "goals of care" OR "serious illness conversation*") AND (cancer* OR neoplasm* OR tumor* OR tumour* OR malignan*) AND (anxiety OR anxious OR depression OR depressive))	284
PubMed (PubMed)	Date searched: 6 April 2026 Field(s): MeSH; Title/Abstract Limits: No database filters applied	("Advance Care Planning"[Mesh] OR "advance care planning"[Title/Abstract] OR ACP[Title/Abstract] OR "advance directive*"[Title/Abstract] OR "living will*"[Title/Abstract] OR "goals of care"[Title/Abstract] OR "serious illness conversation*"[Title/Abstract]) AND ("Neoplasms"[Mesh] OR cancer*[Title/Abstract] OR neoplasm*[Title/Abstract] OR tumor*[Title/Abstract] OR tumour*[Title/Abstract] OR malignan*[Title/Abstract]) AND ("Anxiety"[Mesh] OR anxiety[Title/Abstract] OR anxious[Title/Abstract] OR "Depression"[Mesh] OR depression[Title/Abstract] OR depressive[Title/Abstract])	253
Embase (Embase)	Date searched: 6 April 2026 Field(s): Emtree; Title/Abstract Limits: No database filters applied	('advance care planning'/exp OR 'advance care planning':ti,ab OR ACP:ti,ab OR 'advance directive':ti,ab OR 'living will':ti,ab OR 'goals of care':ti,ab OR 'serious illness conversation':ti,ab) AND ('neoplasm'/exp OR cancer*:ti,ab OR neoplasm*:ti,ab OR tumor*:ti,ab OR tumour*:ti,ab OR malignan*:ti,ab) AND ('anxiety'/exp OR anxiety:ti,ab OR anxious:ti,ab OR 'depression'/exp OR depression:ti,ab OR depressive:ti,ab)	785
VIP (VIP Chinese Science and Technology Periodical Database)	Date searched: 6 April 2026 Field(s): M = title or keywords Limits: No database filters applied	M = (预先照护计划 OR 预先照护计划 OR 预先医疗照护计划 预先医疗照护计划 OR 预先医疗 OR ACP OR 预先指示 OR 生前预嘱 OR 医疗照护目标 OR 代理决策) AND (癌症 OR 肿瘤 OR 恶性肿瘤 OR 癌) AND (焦虑 OR 抑郁 OR 心理 OR 情绪 OR 心理痛苦 OR 心理困扰 OR 精神心理 OR 死亡焦虑)	2
Wanfang Data (Wanfang Data)	Date searched: 6 April 2026 Field(s): Title or keywords Limits: No database filters applied	题名或关键词 : (预先照护计划 OR 预先照护计划 OR 预先医疗照护计划 OR 预先医疗照护计划 OR 预先医疗 OR ACP OR 预先指示 OR 生前预嘱 OR 医疗照护目标 OR 代理决策) AND (癌症 OR 肿瘤 OR 恶性肿瘤 OR 癌) AND (焦虑 OR 抑郁 OR 心理 OR 情绪 OR 心理痛苦 OR 心理困扰 OR 精神心理 OR 死亡焦虑)	42

Continuation Table:

Databaseandplatform	Searchdetails	Fullsearchstrategy	Recordsretrieved(n)
CNKI (China National Knowledge Infrastructure)	Date searched: 6 April 2026 Field(s): Topic / title / abstract / keywords Limits: No database filters applied	(预先照护计划 + 预先照护计划 + 预先医疗照护计划 + 预先医疗照护 计划 + 预先医疗 + ACP + 预先指示 + 生前预嘱 + 医疗照护目标 + 代 理决策) AND (癌症 + 肿瘤 + 恶性肿瘤 + 癌) AND (焦虑 + 抑郁 + 心 理 + 情绪 + 心理痛苦 + 心理困扰 + 精神心理 + 死亡焦虑)	24
Total database records			1,390

Table notes:

1. CNKI = China National Knowledge Infrastructure; MeSH = Medical Subject Headings; TS = Topic; VIP = Chinese Science and Technology Periodical Database.
2. All six electronic databases were searched on 6 April 2026. Records retrieved refer to raw database records before deduplication.
3. “No database filters applied” indicates that no automatic database filters for publication year, document type, or language were applied during the database search. Eligibility was restricted to English- and Chinese-language full-text publications during screening.
4. The search strategy was structured around three concept blocks: ACP-related terms, cancer-related terms, and anxiety/depression-related terms. Within each concept block, terms were combined with OR; the three concept blocks were combined with AND.
5. For Chinese databases, ACP-related terms included Chinese variants corresponding to advance care planning (预先照护计划 , 预先医疗照护计划 , 预先医疗照护计划 , 预先医疗照护计划 , 预先指示 , 生前预嘱), advance directives/living wills (预先指示 , 生前预嘱), goals-of-care discussions (医疗照护目标), and surrogate decision-making (代理决策).
6. In CNKI, the plus sign (+) denotes OR, consistent with the CNKI advanced-search syntax used at the time of searching. In VIP, M denotes the title-or-keyword field.
7. English databases use English terms; Chinese databases use Chinese terms; Chinese terms are not suitable for English databases.

Supplementary Material

Methodological Quality Appraisal of Included Studies Using JBI Critical Appraisal Checklists

Scoring note. Y = yes; N = no; U = unclear; NA = not applicable. Yes responses were assigned 1 point; No and Unclear responses were assigned 0 points; NA items were excluded from the denominator.

Supplementary Table S1. JBI randomized controlled trial item questions

Item	Appraisal question
R1	Was true randomization used for assignment of participants to treatment groups?
R2	Was allocation to treatment groups concealed?
R3	Were treatment groups similar at baseline?
R4	Were participants blind to treatment assignment?
R5	Were those delivering treatment blind to treatment assignment?
R6	Were outcome assessors blind to treatment assignment?
R7	Were treatment groups treated identically other than the intervention of interest?
R8	Was follow-up complete, and if not, were differences between groups in terms of their follow-up adequately described and analyzed?
R9	Were participants analyzed in the groups to which they were randomized?
R10	Were outcomes measured in the same way for treatment groups?
R11	Were outcomes measured in a reliable way?
R12	Was appropriate statistical analysis used?
R13	Was the trial design appropriate, and any deviations from the standard randomized controlled trial design accounted for in the conduct and analysis of the trial?

Supplementary Table S2. Methodological quality appraisal of randomized controlled trials

Study	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	Score
Arch et al., 2026	Y	Y	Y	N	N	U	Y	Y	Y	Y	Y	Y	Y	10/13
Aslakson et al., 2019	Y	Y	Y	Y	U	Y	Y	Y	N	Y	Y	Y	Y	10/13
Epstein et al., 2018	Y	U	Y	N	N	U	Y	U	N	Y	Y	Y	Y	7/13

Continuation Table:

Study	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	Score
Hsu et al., 2025	Y	Y	Y	Y	N	N	Y	Y	N	Y	Y	Y	Y	10/13
Lin et al., 2024	Y	U	Y	N	N	U	Y	Y	Y	Y	Y	Y	Y	9/13
Mosher et al., 2024	Y	Y	Y	N	N	U	Y	Y	Y	Y	Y	Y	Y	10/13
Tang et al., 2019	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11/13
Wang et al., 2026	Y	U	Y	N	N	Y	Y	Y	N	Y	Y	Y	Y	9/13
Deng, 2023	Y	U	Y	N	N	U	Y	Y	Y	Y	Y	Y	Y	9/13

Supplementary Table S3. JBI quasi-experimental item questions

Item	Appraisal question
Q1	Is it clear in the study what is the 'cause' and what is the 'effect' (i.e., is there no confusion about which variable comes first)?
Q2	Were the participants included in any comparisons similar?
Q3	Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?
Q4	Was there a control group?
Q5	Were there multiple measurements of the outcome both pre and post the intervention/exposure?
Q6	Was follow-up complete, and if not, were differences between groups in terms of their follow-up adequately described and analyzed?
Q7	Were the outcomes of participants included in any comparisons measured in the same way?
Q8	Were outcomes measured in a reliable way?
Q9	Was appropriate statistical analysis used?

Supplementary Table S4. Methodological quality appraisal of quasi-experimental studies

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Score
Arch et al., 2020	Y	NA	NA	N	N	Y	Y	Y	Y	5/7
Catania et al., 2021	Y	N	Y	Y	Y	Y	U	Y	Y	7/9
Johns et al., 2020	Y	NA	NA	N	N	Y	Y	Y	Y	5/7