

Review

A study of the impact of psychological interventions in the application of nursing care to neurosurgical oncology patients: A systematic review

Yanan Qi

Department of Neurosurgery, The Affiliated People's Hospital of Ningbo University, Ningbo, China; qiyanan0207@163.com

CITATION

Qi Y. A study of the impact of psychological interventions in the application of nursing care to neurosurgical oncology patients: A systematic review. *Psycho-Oncologie*. 2025; 19(3): 3658. <https://doi.org/10.18282/po3658>

ARTICLE INFO

Received: 19 December 2024
Revised: 12 February 2025
Accepted: 19 February 2025
Available online: 15 September 2025

COPYRIGHT



Copyright © 2025 by author(s).
Psycho-Oncologie is published by
PiscoMed Publishing Pte. Ltd. This
work is licensed under the Creative
Commons Attribution (CC BY)
license.

Abstract: Neurosurgical oncology patients face substantial psychological and cognitive burdens that complicate recovery and diminish quality of life. Nurses, through their continuous presence, are uniquely positioned to deliver psychological interventions that alleviate these challenges. This systematic review, conducted in line with PRISMA 2020, synthesized 20 studies published between 2010 and 2025 examining nurse-led psychological interventions, including cognitive-behavioural therapy, mindfulness, psychoeducation, supportive counselling, relaxation training, and multimodal approaches—in adults with brain tumours. Findings consistently demonstrated reductions in anxiety and depression, enhanced coping, resilience, and quality of life, and, in several cases, improvements in adherence, pain management, and hospital length of stay. Mechanisms of benefit included strengthened coping strategies, therapeutic alliance, and self-efficacy, while effects were moderated by patient characteristics, intervention design, and healthcare context. Interventions targeting cognitive decline, such as goal management training and digital rehabilitation tools, showed promise but were constrained by small samples and short follow-up. Despite methodological heterogeneity, the evidence supports embedding psychological interventions into nursing practice as a feasible, effective, and ethically essential component of neurosurgical oncology care. Future priorities include larger multicentre trials with standardized outcomes, extended follow-up, and evaluation of cultural and economic factors to guide implementation and ensure equitable access to psychosocial support.

Keywords: neurosurgical oncology; psychological interventions; nursing care; quality of life; psychosocial support

1. Introduction

1.1. Neurosurgical oncology and the psychosocial burden

Neurosurgical oncology has become a critical field as advancements in surgical techniques have significantly improved survival rates for patients with primary and metastatic brain tumors. However, these advancements are accompanied by substantial postoperative challenges. Patients often experience significant neurological deficits, including cognitive impairments, which complicate their recovery and adaptation to life post-surgery. The surgical approach, particularly for high-grade gliomas and other malignant tumors, can lead to complications such as seizures, fatigue, and varying degrees of functional impairment [1,2]. A meta-analysis highlights the impact of intraoperative stimulation mapping (ISM) on surgical outcomes, emphasizing the delicate balance between maximizing tumor resection and minimizing postoperative morbidity [1].

The emotional toll of cancer surgery is profound, as patients frequently grapple with anxiety, depression, and uncertainty regarding their prognosis and fear of

recurrence [3]. Various studies indicate a clear correlation between the extent of surgical intervention and the resultant cognitive and psychological adversities faced by patients. For example, research suggests that postoperative neurological deficits can manifest early and often remain prevalent, compounding the psychological burden and affecting patients' quality of life [3].

Cognitive changes post-surgery, such as memory lapses and executive dysfunction, heighten the vulnerability of patients as they navigate their post-treatment journey [4]. Indeed, assessments reveal that significant cognitive decline can occur even in the absence of overt neurological deficits, intensifying the complexity of the recovery process, which intertwines both physical and psychological dimensions [3,5]. This interconnectedness of physical recovery challenges and emotional health highlights the necessity for comprehensive postoperative support systems to facilitate better overall outcomes for patients.

1.2. Central role of nursing in psychological support

The psychosocial dimension of care has emerged as a central determinant of quality of life in patients with cancer, where both patients and their family caregivers experience significant psychological distress. This distress adversely affects the emotional well-being of patients and is linked to poorer treatment adherence, extended hospital stays, and compromised rehabilitation outcomes. Specifically, psychological well-being shapes the patient's recovery process and importantly influences the family members who are crucial to their care [6,7]. Research indicates that family caregivers often endure psychological burdens similar to or even exceeding those of patients themselves, further complicating the care dynamics and influencing patient adjustments [8,9].

Nursing care plays a pivotal role in managing these multidimensional challenges. Nurses are uniquely positioned within the healthcare system to bridge the gap between medical treatment and much-needed psychosocial support [10]. Their continuous presence at the bedside allows for early identification of distress, enabling them to implement supportive interventions that promote resilience and coping strategies [11]. As nursing practice evolves, there is a noticeable shift from a strictly biomedical focus to a more holistic, patient-centered approach that increasingly incorporates psychological interventions as essential components of oncology care [12,13]. This shift illustrates the necessity for an integrated model of care that addresses both physical and emotional needs, ultimately enhancing the overall quality of life for patients and their families.

1.4. Gaps in the evidence and need for synthesis

Given the psychological vulnerability of neurosurgical oncology patients and the central role of nurses in providing holistic care, there is a pressing need to consolidate existing knowledge. A systematic review of psychological interventions applied in nursing contexts will clarify their effectiveness, highlight mechanisms of action (e.g., coping, resilience, self-efficacy), and identify patient or intervention characteristics that may moderate outcomes [14,15]. Such synthesis is crucial for guiding evidence-based practice and ensuring equitable access to psychosocial support across healthcare systems.

1.5. Aim and objectives of the review

This review therefore aims to systematically evaluate the impact of psychological interventions delivered within nursing care on neurosurgical oncology patients. Specifically, it seeks to:

- a) Identify and categorize the types of psychological interventions integrated into nursing practice in neurosurgical oncology.
- b) Assess their effectiveness on psychological outcomes such as anxiety, depression, coping, resilience, and quality of life, as well as on clinical and nursing outcomes including adherence, recovery trajectory, pain management, and hospital length of stay.
- c) Explore mediators such as coping strategies, therapeutic alliance, and self-efficacy that may explain observed effects.
- d) Examine moderators, including patient characteristics (e.g., age, gender, tumor type), intervention features (e.g., intensity, duration, timing), and healthcare setting.
- e) Highlight methodological gaps and propose directions for future research and clinical application.

By integrating these dimensions, this review will provide a comprehensive understanding of how psychological interventions embedded in nursing care can contribute to improved patient-centered outcomes in neurosurgical oncology. Ultimately, the findings aim to support the translation of psycho-oncology principles into routine nursing protocols, advancing the goal of holistic, multidisciplinary cancer care.

2. Literature review

2.1. Conceptual framework

The integration of psychological interventions into nursing care for neurosurgical oncology patients has gained increasing attention in recent decades, reflecting the recognition that cancer care extends beyond physiological management to encompass psychological well-being and treatment adherence. The conceptual framework for this review situates psychological interventions as the independent variable (IV), with psychological and clinical/nursing outcomes as the dependent variables (DVs). The framework also considers mediating processes such as coping strategies, therapeutic alliance, and self-efficacy, alongside moderating factors including patient characteristics, intervention parameters, and healthcare contexts [16,17]. This structure aligns with biopsychosocial models of oncology care and supports a hypothesis model in which psychological interventions enhance coping and resilience, thereby improving psychological and clinical outcomes, with the strength of these associations moderated by contextual and individual differences [18].

2.2. Psychological interventions within nursing care

Psychological interventions embedded in nursing practice are diverse and multifaceted, encompassing cognitive-behavioral therapy (CBT), mindfulness-based interventions, supportive counseling, psychoeducation, and relaxation training. Each of

these modalities addresses the psychological burden associated with neurosurgical oncology, such as fear of recurrence, uncertainty about prognosis, and existential distress that accompanies life-threatening illness [19,20]. CBT has been widely applied in oncology populations, demonstrating efficacy in reducing maladaptive thought patterns, alleviating anxiety and depressive symptoms, and fostering adaptive coping [21,22]. For instance, structured CBT delivered by oncology nurses has been shown to reduce distress in patients undergoing brain tumor surgery by reframing catastrophic thoughts and reinforcing problem-solving approaches [23].

Mindfulness-based practices, including mindfulness-based stress reduction (MBSR), similarly target psychological symptoms through attentional regulation and acceptance, enhancing patients' capacity to tolerate uncertainty and physical discomfort [24,25]. Nursing-led mindfulness programs have been particularly feasible in inpatient neurosurgical settings, as they can be integrated into pre-operative education and post-surgical recovery protocols [26]. Supportive counseling, characterized by active listening, empathy, and emotional validation, has long been a cornerstone of therapeutic nursing practice [25]. Unlike structured psychotherapies, it emphasizes presence and relationship yet can significantly alleviate isolation and existential anxiety. Psychoeducation equips patients with knowledge about disease trajectory, treatment procedures, and symptom management, being consistently linked with improved treatment adherence and reduced decisional conflict, particularly in complex neurosurgical oncology pathways [22]. Finally, relaxation training, including guided imagery, progressive muscle relaxation, and breathing exercises, helps address physiological arousal, thereby reducing stress and pain perception [27]. These interventions are rarely applied in isolation; rather, they are frequently combined in multimodal nursing protocols tailored to individual patient needs. Their inclusion in nursing care reflects the holistic ethos of oncology nursing, viewing psychosocial support as integral rather than adjunctive to biomedical management [28].

2.3. Psychological and clinical outcomes

The outcomes of psychological interventions can be classified into two interrelated domains: psychological outcomes and clinical/nursing outcomes. Psychological outcomes primarily encompass reductions in anxiety and depression, enhanced resilience, improved coping, and better overall quality of life [29–31]. Anxiety and depression are prevalent among neurosurgical oncology patients, often linked to uncertainty about disease progression and the functional consequences of brain tumors or neurosurgical procedures. Meta-analyses consistently demonstrate that cognitive behavioral therapy (CBT) and mindfulness interventions reduce symptom severity, while supportive counseling can alleviate emotional distress [30,31]. Resilience, defined as the capacity to adapt and maintain psychological equilibrium in the face of adversity, is increasingly recognized as a critical target. Studies suggest that interventions fostering acceptance, meaning-making, and problem-focused coping strengthen resilience, which, in turn, predicts better long-term psychological adjustment [29,32].

Clinical and nursing outcomes extend the scope of evaluation to adherence to treatment, recovery trajectory, pain management, and length of hospital stay. For instance, psychoeducation interventions improve adherence by reducing informational

gaps and enhancing patient confidence in managing complex treatment regimens [33]. Mind–body practices such as relaxation training and guided imagery have demonstrated efficacy in reducing peri-operative pain and opioid consumption, which may indirectly shorten hospitalization [34]. Additionally, psychological interventions that alleviate pre-surgical anxiety have been associated with faster post-operative recovery and fewer complications, indicating that psychological well-being can exert tangible effects on clinical outcomes [34,35].

2.4. Coping, therapeutic alliance, and self-efficacy

The mechanisms through which psychological interventions exert their effects are often mediated by coping strategies, the therapeutic alliance between nurse and patient, and patients' sense of self-efficacy and resilience. Coping strategies are central mediators; interventions that promote problem-focused coping (e.g., planning, seeking information) and adaptive emotion-focused coping (e.g., acceptance, positive reframing) are associated with superior outcomes compared to avoidance or denial [36,37]. Cognitive-behavioral therapy (CBT) interventions particularly aim to restructure maladaptive coping while fostering more adaptive strategies, directly reducing distress and indirectly enhancing adherence and recovery [38,39]. The therapeutic alliance, defined as the collaborative and trust-based relationship between nurse and patient, has been identified as a key mediator in psychosocial interventions.

A strong alliance facilitates openness, adherence to intervention protocols, and a greater willingness to engage in adaptive coping [39,40]. Nursing care inherently provides unique opportunities to cultivate this alliance, as nurses maintain close, ongoing contact with patients throughout their treatment trajectory [39,41]. Self-efficacy, or the belief in one's ability to manage challenges, also mediates the impact of psychological interventions. Patients with higher self-efficacy are more likely to adhere to rehabilitation exercises, communicate symptoms effectively, and engage actively in care decisions [42,43]. Interventions that provide skills training, relaxation techniques, or psychoeducation consistently enhance self-efficacy, thereby improving psychological resilience and overall quality of life [44,45].

2.5. Patient, intervention, and contextual factors

The effects of psychological interventions are not uniform; they are moderated by patient characteristics, intervention factors, and healthcare settings. Patient factors such as age, gender, tumor type, disease stage, and baseline psychological status influence responsiveness [46]. Younger patients often demonstrate greater benefits from psychoeducation due to their higher baseline information needs, while older patients may benefit more from supportive counseling and mindfulness approaches that address existential concerns [47]. Baseline psychological distress also moderates outcomes, with those experiencing greater initial distress typically showing the largest symptom reductions [46]. Intervention factors, including duration, intensity, mode of delivery, and timing relative to surgery, shape effectiveness. For example, brief interventions may reduce acute pre-surgical anxiety but may be insufficient for long-term resilience, whereas longer, structured programs sustain benefits over months [48].

Delivery mode—whether face-to-face, group-based, or digital—affects accessibility and acceptability, impacting patient engagement [49]. Timing also matters; pre-operative interventions can mitigate anticipatory anxiety, while post-operative interventions support recovery and adjustment [50]. Healthcare settings provide additional moderating conditions, as specialized oncology units may offer more resources and training for psychological interventions, whereas general wards may prioritize biomedical management [51]. Rehabilitation centers, in contrast, may facilitate more intensive psychosocial support integrated with physical rehabilitation, while cultural and institutional factors also influence outcomes, affecting both patient expectations and the capacity of healthcare providers to deliver interventions [52,53].

2.6. Hypothesis model

Synthesizing these variables, the hypothesis model underlying this review posits that psychological interventions within nursing care improve psychological outcomes—such as reduced anxiety and depression, enhanced resilience and coping, and improved quality of life—as well as clinical outcomes like treatment adherence, recovery, pain management, and length of stay [54,55]. These effects are mediated by coping strategies, therapeutic alliance, and self-efficacy, while being moderated by patient characteristics, intervention parameters, and healthcare contexts [56,57]. This model aligns with contemporary psycho-oncology frameworks that emphasize the interconnectedness of mind and body in cancer care [58,59]. It suggests that nursing interventions targeting psychological adaptation not only enhance emotional well-being but also contribute to improved biomedical outcomes, reinforcing the integral role of psychological care in oncology nursing [55].

2.7. Synthesis of evidence

The empirical literature provides converging support for a conceptual framework indicating that psychological interventions, when integrated into nursing care, can enhance psychological and clinical outcomes among oncology patients [60,61]. However, relevant studies indicate that evidence for this claim remains limited, particularly concerning neurosurgical oncology populations specifically [62]. Meta-analytic evidence suggests effect sizes for reductions in anxiety and depression; smaller but significant effects have also been observed for treatment adherence [63]. Mediation analyses identify coping and self-efficacy as key mechanisms, while moderator analyses emphasize the need for tailoring interventions based on patient demographics and clinical contexts [64,65]. Despite these promising findings, several limitations persist; many studies suffer from small sample sizes and variability in intervention protocols, along with limited follow-up durations [66]. Moreover, there is a dearth of research examining the interaction of multiple moderators, such as the interplay between patient age and intervention duration or delivery mode. Future research should adopt more robust study designs, extend follow-up periods, and explore multi-level models to capture the complexities inherent in oncology care environments [67].

3. Methods

3.1. PRISMA 2020 guideline adherence

This systematic review will be conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines, ensuring transparency and reproducibility in study selection, data extraction, and synthesis.

3.2. Eligibility criteria

This review followed the PRISMA 2020 guidelines. Studies were eligible if they met the PICOS framework: the population consisted of adults with neurosurgical oncology conditions (e.g., gliomas, meningiomas, pituitary tumors, and brain metastases); the intervention involved psychological interventions applied in nursing care (e.g., cognitive behavioral therapy, mindfulness, psychoeducation, supportive counseling, relaxation training); the comparator was standard care, pharmacological management only, or other psychosocial interventions; and the outcomes included psychological outcomes (anxiety, depression, resilience, quality of life) and nursing/clinical outcomes (treatment adherence, recovery, symptom control). Eligible study designs were randomized controlled trials, quasi-experimental studies, cohort studies, case-control studies, reviews, and systematic reviews. We included peer-reviewed studies published in English between 2010 and 2025. Exclusion criteria were pediatric populations, conference abstracts, editorials, and articles without relevant outcomes.

3.3. Search strategy and study selection

A comprehensive search was conducted in PubMed and Web of Science using the following Boolean string:

Web of Science (WoS),

```
TS = (("neurosurgical oncology" OR "brain tumor*" OR glioma* OR
meningioma* OR "pituitary tumor*"
OR "pituitary neoplasm*" OR "brain metastasis*" OR "intracranial
neoplasm*")
AND
("psychological intervention*" OR "psychosocial intervention*" OR
"cognitive behavioral therapy*" OR CBT
OR mindfulness OR "supportive counseling" OR psychoeducation OR
"relaxation training"
OR "nursing intervention*" OR "nursing care")
AND
(anxiety OR depression OR resilience OR "quality of life" OR QOL OR
coping OR "mental health"
OR "psychological outcome*" OR "clinical outcome*" OR "nursing
outcome*")
AND
("randomized controlled trial" OR RCT OR "controlled clinical trial"
OR "quasi-experimental" OR cohort OR "case control"))
```

and PubMed,

```
((("neurosurgical procedures"[MeSH] OR "brain neoplasms"[MeSH] OR
"glioma"[MeSH] OR glioma* OR meningioma*
OR "pituitary neoplasms"[MeSH] OR "brain metastases"[MeSH] OR
"intracranial neoplasm*"))
)
AND
(
("psychological intervention*" OR "psychosocial intervention*" OR
"cognitive behavioral therapy"[MeSH]
OR "cognitive behavioral therapy*" OR CBT OR mindfulness OR
"supportive counseling" OR psychoeducation
OR "relaxation training" OR "nursing intervention*" OR "nursing
care")
)
AND
(
(anxiety[MeSH] OR depression[MeSH] OR resilience OR "quality of
life"[MeSH] OR QOL
OR coping OR "mental health"[MeSH] OR "psychological outcome*" OR
"clinical outcome*" OR "nursing outcome*")
)
AND
(
("randomized controlled trial"[Publication Type] OR "controlled
clinical trial"[Publication Type]
OR "clinical trial"[Publication Type] OR "quasi-experimental" OR
cohort OR "case control"))
```

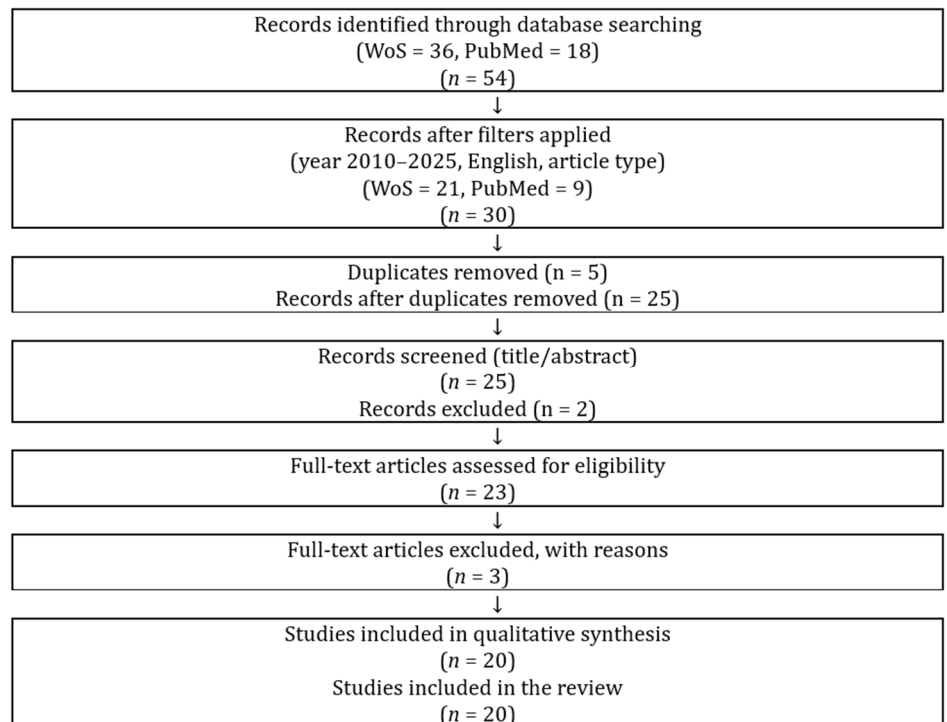


Figure 1. PRISMA 2020 flow diagram of literature search and study selection.

The search strings combined keywords and controlled vocabulary related to neurosurgical oncology, psychological interventions, nursing care, and study design. The study selection process is illustrated in the PRISMA 2020 flow diagram (**Figure 1**). A total of 54 records were identified (36 from WoS and 18 from PubMed). After removal of 5 duplicates, 25 unique records remained for screening. Following title and abstract

screening, 2 records were excluded. Full-text assessment was performed for 23 articles, of which 3 were excluded with reasons. Finally, 20 studies met all inclusion criteria and were included in the review.

4. Results and discussions

This chapter presents the results of the systematic review, with a particular focus on the impact of psychosocial and nursing interventions in neurosurgical oncology. Structured in accordance with the PRISMA 2020 guidelines, the findings encompass psychological, cognitive, functional, and quality-of-life outcomes among patients with primary brain tumors, gliomas, and brain metastases. A total of twenty studies were ultimately included following a rigorous screening and eligibility process, and Chapter 3 has been updated to reflect the corrected inclusion count.

4.1. Characteristics and findings of included studies

Table 1 presents a summary of the 20 included studies that examined psychosocial and nursing interventions in neurosurgical oncology. Each study is outlined with its key characteristics and principal findings to facilitate clarity and comparison.

Table 1. Summary of included studies on psychosocial and nursing interventions in neurosurgical oncology.

Authors	Population	Intervention	Key Outcomes
Shi et al. [68]	110 brain tumor surgery patients (glioma, meningioma, astrocytoma, metastasis), China	High-quality nursing (education, reassurance, infection/DVT prevention, psychological support)	Reduced anxiety and depression, improved QOL, prognosis, and self-efficacy, and lowered complication rates.
Ashery et al. [69]	50 brain tumor surgery patients, Egypt	Rehabilitation nursing (education, seizure/wound/diet care, relaxation, lifestyle coaching)	Reduced anxiety, depression, and stress, with improved psychological and physical well-being.
Dong et al. [70]	106 glioma surgery patients, China	Comprehensive nursing (personalized plans, pre-op counseling, music therapy, post-op monitoring)	Reduced anxiety and depression, fewer complications, and improved QOL.
Zhao & Xu [71]	108 glioma patients (I–IV), China	CBT-based comprehensive nursing (education, relaxation, reframing, peer sharing, follow-up)	Reduced fear of progression, anxiety, depression, and fatigue, while improving QOL.
Jiang et al. [72]	102 women with brain metastasis after breast cancer surgery, China	Empowerment theory-based nursing (education, MDT, family/peer support, behavior change)	Reduced anxiety and depression, increased compliance, QOL, and satisfaction.
Xiao et al. [73]	162 brain tumor patient's post-craniotomy + caregivers, China	Continued psychological care (handbook, follow-up, counseling, family support)	Lowered anxiety and depression in patients and families, improved compliance, reduced seizures.
Caponnetto et al. [74]	Adults with brain cancer (glioma, meningioma, mixed), multi-country	CBT, Goal Management Training, psychoeducation (ReMind app), VR rehab, neurofeedback, MBCT, eHealth	CBT, GMT, VR, MBCT, and eHealth tools effectively reduced distress and improved cognition and QOL.

Table 1. (Continued).

Authors	Population	Intervention	Key Outcomes
McDougall et al. [75]	Adults with brain tumors (glioma, meningioma, pituitary, others) + carers	Psychosocial interventions: nurse-led education, CBT, EMDR, psychoeducation, workshops	Reduced behavioral and affective symptoms in patients; improved knowledge and lowered distress in caregivers.
Bayumi et al. [76]	50 adult brain tumor patients, Egypt	Nurse-led sessions (lectures, posters, films, role-plays, booklet)	Reduced headache pain, anxiety, and fatigue within one month.
Gaber et al. [77]	50 adult brain tumor patients (20–60 yrs), Egypt	Nurse-led educational program: 4 sessions (20–30 min) using lectures, posters, films, role-plays, Arabic booklet on surgery risks, seizure care, wound/diet care, stress reduction, chemo/radiotherapy guidance	Significantly reduced pain, anxiety, and fatigue, supporting integration into rehabilitation and discharge care.
Deng et al. [78]	138 glioma surgery patients, China	Fast-track surgery (FTS) nursing: education, counseling, mobilization, pain management	Reduced pain, anxiety, and depression; shorter hospital stays; higher satisfaction.
Madu & Ajibade [79]	Pediatric & adult CNS tumor patients	Patient-centered care + precision medicine + early palliative care	Improved symptom control, dignity, QOL, adherence; reduced emotional distress.
Boele et al. [80]	Adults with primary/metastatic brain tumors + caregivers	Nurse-led screening, CBT, PST, dyadic interventions, ACP, palliative integration	Reduced distress, anxiety, and depression; improved coping, resilience, caregiver mastery, and QOL.
Young et al. [81]	Adults with diffuse gliomas, multi-country	Recognition & treatment of mental/behavioral disorders (CBT, EMDR, psychoeducation, exercise, telehealth)	Early recognition critical; psychosocial interventions improved mood and QOL; untreated depression shortened survival.
Mishaan et al. [82]	Brain tumor patients (benign & malignant)	Comprehensive nursing (assessment, education, symptom management, psychological support, MDT, palliative integration)	Reduced anxiety and depression, increased empowerment, resilience, and QOL.
Ghadimi et al. [83]	Adults with glioblastoma	Cognitive decline management (neuroprotective drugs, cognitive rehab, psychosocial support)	Cognitive impairment predicted survival; rehab and neuroprotective agents improved QOL and function.
Shah et al. [84]	250 brain tumor patients, Pakistan	Coping and support (education, counseling, family/social support, spirituality, financial strategies)	Family and spirituality supported well-being, while financial strain worsened distress.
Najafi et al. [85]	1025 glioblastoma patients across 18 early-phase trials	Immuno-oncology therapies: DC vaccines, viral/tumor vaccines, CAR-T, checkpoint inhibitors	Immunotherapies were safe and feasible; some showed survival signals, but evidence remains preliminary.
Nixon et al. [23]	12 neurosurgical nurses caring for brain tumor patients, UK	Nurses' approaches to spiritual needs (listening, emotional sensitivity, religious support, family involvement, privacy)	Nurses viewed spiritual support as vital but felt underprepared and constrained by the acute setting.

4.2 Discussions and future perspectives

4.2.1. Psychological burden in neurosurgical oncology

The diagnosis and treatment of brain tumors place patients at the intersection of profound medical, psychological, and existential challenges. Unlike other cancers, brain tumors directly affect the organ that governs identity, cognition, and emotional regulation. The resulting distress extends beyond fear of disease progression to encompass disorientation, altered self-image, and uncertainty about autonomy. Across multiple randomized controlled trials and quasi-experimental studies, nursing interventions have demonstrated measurable success in addressing these challenges. For example, Shi et al. [68] found that high-quality perioperative nursing reduced anxiety and depression, while improving overall quality of life and prognosis in patients undergoing brain tumor surgery. Similarly, Dong et al. [70] showed that comprehensive nursing combining education, counseling, and supportive care not only reduced psychiatric symptoms but also lowered complication rates after glioma surgery. These results demonstrate that psychological morbidity is not an inevitable byproduct of neurosurgical oncology but a treatable domain when systematically targeted.

Further, studies focusing on specific symptom clusters such as fatigue and pain reinforce the inseparability of psychological and physical well-being. Both Bayumi et al. [76] and Gaber et al. [77] reported that structured nurse-led educational programs in Egypt significantly reduced headache pain, anxiety, and fatigue in brain tumor patients. These findings highlight the universal applicability of nursing-led psychological support across cultural contexts, showing that even in resource-limited settings, appropriately structured interventions can meaningfully reduce patient suffering.

4.2.2. Mechanisms underlying therapeutic benefit

The effectiveness of psychosocial and nursing interventions across neurosurgical oncology, as summarized in the master table, appears to be mediated by several recurring pathways. Coping strategies, therapeutic alliance, self-efficacy, and empowerment represent the dominant mechanisms by which psychological interventions influence outcomes. For instance, Zhao and Xu [71] incorporated cognitive-behavioral therapy principles into perioperative care and demonstrated reductions in fear of progression, depression, and anxiety. These results suggest that restructuring maladaptive cognitions enables patients to engage with treatment more constructively.

Similarly, Jiang et al. [72] showed that empowerment theory-based nursing fostered greater compliance and satisfaction in women with brain metastases, highlighting the importance of active patient involvement. Empowerment was not only linked to improved psychological well-being but also to practical outcomes such as adherence and rehabilitation compliance. This finding, reported in the master table, demonstrates that the benefit of psychological interventions extends beyond subjective symptom relief, influencing measurable clinical endpoints.

The therapeutic alliance, often understated in oncology, was shown to be a central determinant of success. Xiao et al. [73] illustrated that continued psychological care after craniotomy-built trust and continuity, leading to reductions in anxiety and depression not only for patients but also for their caregivers. This underscores that psychological recovery is relational: nurses act as mediators of trust, information, and hope, facilitating resilience within both patients and families.

4.2.3. Rehabilitation as a psychosocial process

Rehabilitation following neurosurgery is typically described in physiological terms as regaining mobility, controlling seizures, or restoring function. Yet the studies synthesized in the master table emphasize that rehabilitation is also a psychosocial journey. El Ashery et al. [69] found that patients receiving rehabilitation-focused nursing interventions had improved psychological outcomes, alongside better physical functioning. Similarly, fast-track surgery (FTS) nursing, as reported by Deng et al. [78], shortened hospital stays, reduced pain, and improved satisfaction, with reductions in anxiety and depression occurring in parallel.

These findings illustrate that emotional distress impedes functional recovery. Patients struggling with fear, depression, or existential concerns may withdraw from physical rehabilitation, delay mobilization, or demonstrate poor adherence to post-surgical regimens. Conversely, interventions that stabilize emotional well-being empower patients to engage actively in their rehabilitation, accelerating recovery trajectories. This synergy suggests that psychosocial interventions should not be conceptualized as adjunctive to rehabilitation but as intrinsic to its success.

4.2.4. Families, caregivers, and the spiritual dimension

The relational burden of neurosurgical oncology extends well beyond the patient. Families and caregivers, often thrust into unexpected roles, face immense psychological strain. Xiao et al. [73], as reported in the master table, demonstrated that continued psychological care not only benefited patients but also alleviated caregiver distress, improving compliance with follow-up and reducing seizure recurrence. McDougall et al. [75] added further evidence that psychoeducation, relaxation training, and caregiver-inclusive interventions improve behavioral outcomes in patients and reduce stress in caregivers.

Yet, despite recognition of the family unit's importance, spiritual and existential needs remain frequently overlooked. Nixon et al. [23] found that neurosurgical nurses identified spirituality as vital in brain tumor care but felt ill-prepared and constrained by the acute care environment to address it adequately. This echoes broader literature in psycho-oncology emphasizing that patients' existential and spiritual concerns are often left unmet. Shah et al. [84] further illustrated the role of spirituality as a protective factor in low- and middle-income contexts, where family cohesion and faith-based coping provided significant resilience. However, financial burden and inadequate physician communication compounded distress, showing that systemic and cultural factors profoundly mediate psychological outcomes. Together, these studies argue for a family- and spirituality-centered model of neurosurgical oncology care, where psychosocial interventions are explicitly extended to caregivers and spiritual dimensions are addressed as part of holistic care.

4.2.5. Cognitive decline as a psychosocial and prognostic challenge

Cognitive decline represents one of the most disabling sequelae of brain tumors and their treatment. As noted in the master table, reviews by Young et al. [81] and Ghadimi et al. [83] consistently show that cognitive impairment is both a quality-of-life issue and an independent prognostic marker. Depression, memory impairment, and executive dysfunction are strongly linked to reduced survival, emphasizing that addressing cognition is not only palliative but prognostic.

Caponnetto et al. [74] highlighted the promise of interventions such as Goal Management Training, mindfulness-based therapies, virtual reality rehabilitation, and neurofeedback, which have demonstrated improvements in attention, memory, and coping. The ReMind iPad app, while producing mixed cognitive results, showed high adherence and feasibility, suggesting that digital health interventions may offer scalable solutions. These findings call for cognitive assessment and support to be standardized within neurosurgical oncology, ensuring that cognition is treated as a clinical endpoint in its own right.

4.2.6 Novel directions and ethical imperatives

Beyond psychosocial interventions, novel biomedical therapies introduce additional dimensions to care. Najafi et al. [85], summarized in the master table, reported that immuno-oncology therapies—including dendritic cell vaccines, CAR-T, and checkpoint inhibitors—are feasible and safe, with preliminary survival benefits in glioblastoma. However, most of these trials neglect to integrate psychosocial support, despite evidence that psychological well-being influences adherence and treatment tolerance. This represents a missed opportunity to bridge biomedical innovation with psychosocial oncology.

Narrative contributions such as those by Madu and Ajibade [79], Boele [80], and Mishaan et al. [82] stress that palliative integration, precision medicine, and psychosocial support should not be sequenced separately but embedded from diagnosis. Nurses are uniquely positioned as bridges between oncology, palliative, and psychosocial domains, tasked with translating complex treatment plans into patient-centered experiences. This ethical imperative resonates with the foundational principles of psycho-oncology: addressing suffering in its full biological, psychological, and existential scope.

4.2.7 Global and cultural perspectives

The diversity of settings in the included studies highlights how cultural and systemic contexts shape psychosocial care. In high-income contexts, digital tools such as VR rehabilitation, telehealth, and neurofeedback dominate research agendas [74]. These interventions reflect technological optimism and resource availability. In contrast, studies from low- and middle-income settings [76,77,84] emphasize the role of family support, spirituality, and low-cost educational interventions, reflecting pragmatic approaches where systemic resources are limited.

Both contexts yield valuable insights: high-resource innovations demonstrate what is possible, while low-resource approaches show what is feasible. As illustrated across the master table, nurses serve as the common thread across contexts, capable of tailoring interventions to cultural and institutional realities. This adaptability highlights the universality of nursing as the anchor of psychosocial oncology care.

4.2.8 Clinical and research implications

This synthesis, grounded in the evidence summarized in the master table, establishes psychosocial and nursing interventions as central to neurosurgical oncology, not as peripheral adjuncts. They alleviate distress, enhance adherence, improve functional and cognitive recovery, and extend benefits to caregivers. However, challenges remain. The heterogeneity of methodologies, limited sample sizes, and short

follow-up periods hinder generalization. Standardized measures for psychological and cognitive outcomes are urgently needed. Large-scale multicenter randomized trials, especially in neuro-oncology, would provide the evidence base required to embed these interventions in clinical guidelines.

Economic evaluations are also critical. While studies from Egypt and Pakistan demonstrate feasibility, resource allocation remains a barrier to implementation in many contexts. Demonstrating the cost-effectiveness of psychosocial interventions could provide the leverage necessary for policy-level adoption. Furthermore, future research should explore how cultural, spiritual, and socioeconomic moderators influence intervention outcomes, ensuring that care is equitable and context-sensitive.

5. Conclusions

This review shows that psychological interventions integrated into nursing care can alleviate distress and support recovery in neurosurgical oncology. Consistent benefits were observed for anxiety, depression, coping, and resilience, with some evidence for improvements in treatment adherence, pain management, and quality of life. Nurse-led interventions are particularly valuable, as their continuous presence enables early identification of distress and delivery of feasible, patient-centered strategies such as psychoeducation, relaxation training, and supportive counseling.

Despite these promising findings, limitations in the current literature restrict definitive conclusions. Most studies involve small samples, short follow-up periods, and heterogeneous intervention protocols, making comparisons difficult. Cognitive outcomes, long-term functioning, and survival effects remain underexplored. Mechanisms of benefit such as coping, self-efficacy, and therapeutic alliance are frequently proposed but insufficiently tested. Moderating factors, including patient characteristics, timing of intervention, and cultural or healthcare context, also require further study.

From a clinical perspective, pragmatic integration of low-risk psychological strategies into peri-operative and rehabilitation pathways appears justified, particularly when adapted to cultural expectations and extended to caregivers. Spiritual and existential dimensions, though often overlooked, should be incorporated into holistic nursing care. Future priorities include large, multi-center trials with standardized outcomes, longer follow-up, and economic evaluations to establish cost-effectiveness. Mixed-methods studies could further clarify mechanisms and contextual moderators. In summary, nurse-delivered psychological interventions hold promise for improving patient-centered outcomes in neurosurgical oncology, but careful, context-sensitive implementation and more rigorous research are needed before uniform adoption into guidelines.

Ethical approval: Not applicable.

Informed consent statement: Not applicable.

Conflict of interest: The author declares no conflict of interest.

References

- Gerritsen JKW, Arends L, Klimek M, et al. Impact of intraoperative stimulation mapping on high-grade glioma surgery outcome: A meta-analysis. *Acta Neurochir (Wien)*. 2019; 161(1): 99-107. doi: 10.1007/s00701-018-3732-4
- Rotim K, Splavski B, Vrbanić F, Rotim A. Strategies for the prevention of complications in brain glioma surgery. *Journal of Applied Health Sciences*. 2021; 7(2): 115-120. doi: 10.24141/1/7/2/1
- Zetterling M, Elf K, Semnic R, et al. Time course of neurological deficits after surgery for primary brain tumours. *Acta Neurochir (Wien)*. 2020; 162(12): 3005-3018. doi: 10.1007/s00701-020-04425-3
- Sughrue ME, Rutkowski MJ, Shangari G, et al. Risk factors for the development of serious medical complications after resection of meningiomas. *Journal of Neurosurgery*. 2011; 114(3): 697-704. doi: 10.3171/2010.6.jns091974
- De Witte E, Satoer D, Colle H, et al. Subcortical language and non-language mapping in awake brain surgery: The use of multimodal tests. *Acta Neurochir (Wien)*. 2015; 157(4): 577-588. doi: 10.1007/s00701-014-2317-0
- Zhao H, Li X, Zhou C, et al. Psychological distress among Chinese patients with breast cancer undergoing chemotherapy: Concordance between patient and family caregiver reports. *Journal of Advanced Nursing*. 2022; 78(3): 750-764. doi: 10.1111/jan.15004
- Trevino KM, Prigerson HG, Maciejewski PK. Advanced cancer caregiving as a risk for major depressive episodes and generalized anxiety disorder. *Psychooncology*. 2018; 27(1): 243-249. doi: 10.1002/pon.4441
- Shaffer KM, Jacobs JM, Coleman JN, et al. Anxiety and depressive symptoms among two seriously medically ill populations and their family caregivers: A comparison and clinical implications. *Neurocrit Care*. 2017; 27(2): 180-186. doi: 10.1007/s12028-016-0358-3
- Mehnert A, Koch U. Psychosocial care of cancer patients—International differences in definition, healthcare structures, and therapeutic approaches. *Supportive Care in Cancer*. 2005; 13(8): 579-588. doi: 10.1007/s00520-005-0779-6
- Grunfeld E, Coyle D, Whelan T, et al. Family caregiver burden: Results of a longitudinal study of breast cancer patients and their principal caregivers. *CMAJ Canadian Medical Association Journal*. 2004; 170(12): 1795-1801. doi: 10.1503/cmaj.1031205
- Mosher CE, Jaynes HA, Hanna N, Ostroff JS. Distressed family caregivers of lung cancer patients: An examination of psychosocial and practical challenges. *Supportive Care in Cancer*. 2013; 21(2): 431-437. doi: 10.1007/s00520-012-1532-6
- Katz LF, Fladeboe K, King K, et al. Trajectories of child and caregiver psychological adjustment in families of children with cancer. *Health Psychology*. 2018; 37(8): 725-735. doi: 10.1037/hea0000619
- Carlson LE, Angen M, Cullum J, et al. High levels of untreated distress and fatigue in cancer patients. *British Journal of Cancer*. 2004; 90(12): 2297-2304. doi: 10.1038/sj.bjc.6601887
- Araceli T, Fischl A, Haj A, et al. Psycho-oncological burden in patients with brain metastases undergoing neurological surgery. *Frontiers in Oncology*. 2024; 14: 1463467. doi: 10.3389/fonc.2024.1463467
- Çınaroğlu M, Ahlatcioğlu EN, Prins J, Nan M. Psychopathology in cancer patients and the role of cognitive behavioral therapy. *Clinical Cancer Investigation Journal*. 2024; 12(5): 49-59. doi: 10.51847/itecyotbqlp
- Fjorback LO, Arendt M, Ørnbøl E, et al. Mindfulness-based stress reduction and mindfulness-based cognitive therapy—A systematic review of randomized controlled trials. *Acta Psychiatrica Scandinavica*. 2011; 124(2): 102-119. doi: 10.1111/j.1600-0447.2011.01704.x
- Kaneko M, Ryu S, Nishida H, et al. Nurses' recognition of the mental state of cancer patients and their own stress management—A study of Japanese cancer-care nurses. *Psychooncology*. 2013; 22(7): 1624-1629. doi: 10.1002/pon.3191
- Cañadas-De la Fuente GA, Gómez-Urquiza JL, Ortega-Campos EM, et al. Prevalence of burnout syndrome in oncology nursing: A meta-analytic study. *Psychooncology*. 2018; 27(5): 1426-1433. doi: 10.1002/pon.4632
- Chan EA, Tsang PL, Ching SSY, et al. Nurses' perspectives on their communication with patients in busy oncology wards: A qualitative study. *PLoS One*. 2019; 14(10). doi: 10.1371/journal.pone.0224178
- Ortega-Campos E, Vargas-Román K, Velando-Soriano A, et al. Compassion fatigue, compassion satisfaction, and burnout in oncology nurses: A systematic review and meta-analysis. *Sustainability (Switzerland)*. 2020; 12(1): 1-12. doi: 10.3390/SU12010072
- Banerjee SC, Manna R, Coyle N, et al. Oncology nurses' communication challenges with patients and families: A qualitative study. *Nurse Educ Pract*. 2016; 16(1): 193-201. doi: 10.1016/j.nepr.2015.07.007

22. Duarte J, Pinto-Gouveia J. Effectiveness of a mindfulness-based intervention on oncology nurses' burnout and compassion fatigue symptoms: A non-randomized study. *Int J Nurs Stud.* 2016; 64: 98-107. doi: 10.1016/j.ijnurstu.2016.10.002
23. Nixon AV, Narayanasamy A, Penny V. An investigation into the spiritual needs of neuro-oncology patients from a nurse perspective. *BMC Nurs.* 2013; 12(1). doi: 10.1186/1472-6955-12-2
24. Lv X. Psychological intervention on reducing stress of nurses caring for terminally ill cancer patients: A quasi-experimental study. *Alpha Psychiatry.* 2024; 24(6): 252-256. doi: 10.5152/alphapsychiatry.2023.231232
25. Barış Eren N. A stress management tool in nurses: Mindfulness-based stress reduction. *Black Sea Journal of Health Science.* 2023; 6(3): 508-510. doi: 10.19127/bshealthscience.1274065
26. Bazarko D, Cate RA, Azocar F, Kreitzer MJ. The impact of an innovative mindfulness-based stress reduction program on the health and well-being of nurses employed in a corporate setting. *J Workplace Behav Health.* 2013; 28(2): 107-133. doi: 10.1080/15555240.2013.779518
27. Salvarani V, Rampoldi G, Ardenghi S, et al. Protecting emergency room nurses from burnout: The role of dispositional mindfulness, emotion regulation and empathy. *J Nurs Manag.* 2019; 27(4): 765-774. doi: 10.1111/jonm.12771
28. Said Z, Kheng GL. A review on mindfulness and nursing stress among nurses. *Analitika.* 2018; 10(1): 31. doi: 10.31289/analitika.v10i1.1589
29. Molina Y, Yi JC, Martinez-Gutierrez J, et al. Resilience among patients across the cancer continuum: Diverse perspectives. *Clin J Oncol Nurs.* 2014; 18(1): 93-101. doi: 10.1188/14.CJON.93-101
30. Li M, Xie X, Xu H, Li H. A psychological nursing intervention for patients with breast cancer on inflammatory factors, negative emotions and quality of life. *Iran J Public Health.* 2022; 51(9): 2041-2047. doi: 10.18502/ijph.v51i9.10559
31. Seiler A, Jenewein J. Resilience in cancer patients. *Front Psychiatry.* 2019; 10: 208. doi: 10.3389/fpsy.2019.00208
32. Liu S, Chai J, Jia Y, et al. The mediating role of perceived social support in the effect of the calm intervention on quality of life in patients following breast cancer surgery. Preprint posted online July 20, 2023. doi: 10.21203/rs.3.rs-3087962/v1
33. Cape J, Whittington C, Buszewicz M, et al. Brief psychological therapies for anxiety and depression in primary care: meta-analysis and meta-regression. *BMC Med.* 2010; 8: 38. doi: 10.1186/1741-7015-8-38
34. Liesto S, Sipilä R, Aho T, et al. Psychological resilience associates with pain experience in women treated for breast cancer. *Scand J Pain.* 2020; 20(3): 545-553. doi: 10.1515/sjpain-2019-0137
35. van Roij J, Brom L, Sommeijer D, et al. Self-care, resilience, and caregiver burden in relatives of patients with advanced cancer: Results from the eQuiPe study. *Supportive Care in Cancer.* 2021; 29(12): 7975-7984. doi: 10.1007/s00520-021-06365-9
36. Bennett M, Walters K, Drennan V, Buszewicz M. Structured pro-active care for chronic depression by practice nurses in primary care: A qualitative evaluation. *PLoS One.* 2013; 8(9). doi: 10.1371/journal.pone.0075810
37. Pettersen Sandtrø H, Glavin K, Størksen HT, et al. Mothers and public health nurses' experiences of sleep problems in children aged 6 months to 3 years: A qualitative study. *J Clin Nurs.* 2023; 32(15-16): 4852-4867. doi: 10.1111/jocn.16586
38. Volgemute K, Vazne Z, Krauksta D. An intervention into imagery and self-efficacy: Enhancing athletic achievements of alpine skiers. *Educ Sci (Basel).* 2024; 14(5): 513. doi: 10.3390/educsci14050513
39. Thomas T, Althouse A, Sigler L, et al. Stronger therapeutic alliance is associated with better quality of life among patients with advanced cancer. *Psychooncology.* 2021; 30(7): 1086-1094. doi: 10.1002/pon.5648
40. Zugai JS, Stein-Parbury J, Roche M. Therapeutic alliance in mental health nursing: An evolutionary concept analysis. *Issues Ment Health Nurs.* 2015; 36(4): 249-257. doi: 10.3109/01612840.2014.969795
41. Hanney WJ, Dhalla F, Kelly C, et al. The influence of personality type on patient outcome measures and therapeutic alliance in patients with low back pain. *NeuroSci.* 2023; 4(3): 186-194. doi: 10.3390/neurosci4030017
42. Cookson A, Daffern M, Foley F. Relationship between aggression, interpersonal style, and therapeutic alliance during short-term psychiatric hospitalization. *Int J Ment Health Nurs.* 2012; 21(1): 20-29. doi: 10.1111/j.1447-0349.2011.00764.x
43. Somers TJ, Wren AA, Shelby RA. The context of pain in arthritis: Self-efficacy for managing pain and other symptoms. *Curr Pain Headache Rep.* 2012; 16(6): 502-508. doi: 10.1007/s11916-012-0298-3
44. Hsieh WL, Yeh ST, Liu WI, et al. Improving medication adherence in community-dwelling patients with schizophrenia through therapeutic alliance and medication attitude: A serial multiple mediation model. *Patient Prefer Adherence.* 2022; 16: 1017-1026. doi: 10.2147/PPA.S351848
45. Johansen R, Iversen VC, Melle I, Hestad KA. Therapeutic alliance in early schizophrenia spectrum disorders: A cross-sectional study. *Ann Gen Psychiatry.* 2013; 12: 14. doi: 10.1186/1744-859X-12-14

46. Weiss LA, Westerhof GJ, Bohlmeijer ET. Can we increase psychological well-being? The effects of interventions on psychological well-being: A meta-analysis of randomized controlled trials. *PLoS One*. 2016; 11(6). doi: 10.1371/journal.pone.0158092
47. Klein JP, Berger T, Schröder J, et al. The EVIDENT-trial: Protocol and rationale of a multicenter randomized controlled trial testing the effectiveness of an online-based psychological intervention. *BMC Psychiatry*. 2013; 13. doi: 10.1186/1471-244X-13-239
48. Holtmaat K, van der Spek N, Witte BI, et al. Moderators of the effects of meaning-centered group psychotherapy in cancer survivors on personal meaning, psychological well-being, and distress. *Supportive Care in Cancer*. 2017; 25(11): 3385-3393. doi: 10.1007/s00520-017-3757-x
49. de la Torre-Luque A, Gambara H, López E, Cruzado JA. Psychological treatments to improve quality of life in cancer contexts: A meta-analysis. *International Journal of Clinical and Health Psychology*. 2016; 16(2): 211-219. doi: 10.1016/j.ijchp.2015.07.005
50. Walker AL, Witteveen AB, Otten RHJ, et al. Resilience-enhancing interventions for antepartum depressive symptoms: Systematic review. *BJPsych Open*. 2022; 8(3): e89. doi: 10.1192/bjo.2022.60
51. Carolan S, Harris PR, Cavanagh K. Improving employee well-being and effectiveness: Systematic review and meta-analysis of web-based psychological interventions delivered in the workplace. *J Med Internet Res*. 2017; 19(7). doi: 10.2196/jmir.7583
52. Troy AS, Ford BQ, McRae K, et al. Change the things you can: Emotion regulation is more beneficial for people from lower than from higher socioeconomic status. *Emotion*. 2017; 17(1): 141-154. doi: 10.1037/emo0000210
53. Ahmadi Forooshani S, Izadikhah Z, Renzaho AMN, O'Connor PJ. Effectiveness of psychological interventions on young refugees' social adjustment: A meta-analysis. *J Refug Stud*. 2021; 34(1): 976-992. doi: 10.1093/jrs/fez035
54. Ruiz Hernández C, Gómez-Urquiza JL, Pradas-Hernández L, et al. Effectiveness of nursing interventions for preoperative anxiety in adults: A systematic review with meta-analysis. *J Adv Nurs*. 2021; 77(8): 3274-3285. doi: 10.1111/jan.14827
55. Feng Y, Ma C, Feng Z, et al. Clinical effects of basic nursing combined with psychological intervention on treatment compliance of patients with Influenza-A(H1N1). *Pak J Med Sci*. 2024; 40(7). doi: 10.12669/pjms.40.7.8675
56. Joseph A, Jose TP. Coping with distress and building resilience among emergency nurses: A systematic review of mindfulness-based interventions. *Indian Journal of Critical Care Medicine*. 2024; 28(8): 785-791. doi: 10.5005/jp-journals-10071-24761
57. Zhang H, Xia Z, Yu S, et al. Interventions for compassion fatigue, burnout, and secondary traumatic stress in nurses: systematic review and network meta-analysis. *Nurs Health Sci*. 2025; 27(1). doi: 10.1111/nhs.70042
58. Lu Y, Xu MY, Lu L, et al. Quality of care combined with mindfulness-based stress reduction intervention in patients undergoing arterial interventional embolization for liver tumors. *World J Gastrointest Surg*. 2025; 17(6). doi: 10.4240/wjgs.v17.i6.105826
59. Zhang W, Wu HX, Zhong H, et al. Psychological and behavioral intervention improves the quality of life and mental health of patients suffering from differentiated thyroid cancer treated with postoperative radioactive iodine-131. *Neuropsychiatr Dis Treat*. Published online May 2016; 1055. doi: 10.2147/NDT.S105460
60. Bolier L, Haverman M, Westerhof GJ, et al. Positive psychology interventions: A meta-analysis of randomized controlled studies. *BMC Public Health*. 2013; 13(1). doi: 10.1186/1471-2458-13-119
61. Soklaridis S, Lin E, Lalani Y, Rodak T, Sockalingam S. Mental health interventions and supports during COVID-19 and other medical pandemics: A rapid systematic review of the evidence. *Gen Hosp Psychiatry*. 2020; 66: 133-146. doi: 10.1016/j.genhosppsych.2020.08.007
62. Buselli R, Corsi M, Veltri A, et al. Mental health of Health Care Workers (HCWs): A review of organizational interventions put in place by local institutions to cope with new psychosocial challenges resulting from COVID-19. *Psychiatry Res*. 2021; 299. doi: 10.1016/j.psychres.2021.113847
63. Warth M, Kessler J, Koehler F, et al. Brief psychosocial interventions improve quality of life of patients receiving palliative care: A systematic review and meta-analysis. *Palliat Med*. 2019; 33(3): 332-345. doi: 10.1177/0269216318818011
64. Wakefield S, Kellett S, Simmonds-Buckley M, et al. Improving Access to Psychological Therapies (IAPT) in the United Kingdom: A systematic review and meta-analysis of 10-years of practice-based evidence. *British Journal of Clinical Psychology*. 2021; 60(1): 1-37. doi: 10.1111/bjc.12259
65. Hooper JJ, Saulsman L, Hall T, Waters F. Addressing the psychological impact of COVID-19 on healthcare workers: Learning from a systematic review of early interventions for frontline responders. *BMJ Open*. 2021; 11(5). doi: 10.1136/bmjopen-2020-044134

66. Chen Q, Shen S, Liang Y, et al. Analysis of mental health of healthcare workers and its influencing factors in three consecutive years. *WORK: A Journal of Prevention, Assessment & Rehabilitation*. 2025; 80(3): 1296-1303. doi: 10.1177/10519815241289827
67. Gómez-Durán EL, Martín-Fumadó C, Forero CG. Psychological impact of quarantine on healthcare workers. *Occup Environ Med*. 2020; 77(10): 666-674. doi: 10.1136/oemed-2020-106587
68. Shi B, Wang L, Huang S. Effect of high-quality nursing on psychological status and prognosis of patients undergoing brain tumor surgery. 2021; 13(10): 11974-11980.
69. Ashery R, Asker A, Dardier R, et al. Effect of implementing a designed rehabilitation nursing intervention for brain surgery's patients on their physical and psychological status. *Egyptian Journal of Health Care*. 2024; 15(1): 434-449.
70. Dong H, Zhang XL, Deng CX, Luo B. Effects of comprehensive nursing on postoperative complications, mental status and quality of life in patients with glioma. *World J Clin Cases*. 2022; 10(22): 7825-7831. doi: 10.12998/wjcc.v10.i22.7825
71. Zhao YH, Xu Y. Effect of comprehensive nursing based on cognitive behavior on psychological function of glioma patients. *Neuropsychiatr Dis Treat*. 2021; 17: 777-785. doi: 10.2147/NDT.S286164
72. Jiang R, Liu H, Jiang X, et al. Impact of Empowerment theory-based nursing intervention on the quality of life and negative emotions of patients diagnosed with brain metastasis post breast cancer surgery. *J Multidiscip Healthc*. 2024; 17: 2303-2312. doi: 10.2147/JMDH.S463044
73. Xiao N, Zhu D, Xiao S. Effects of continued psychological care toward brain tumor patients and their family members' negative emotions. *J Cancer Res Ther*. 2018; 14(8): S202-S207. doi: 10.4103/0973-1482.181184
74. Caponnetto P, Schilirò G, Maglia M, et al. Psychological and neuropsychological clinical impact in brain cancer patients and evidence-based psychological intervention: A systematic review of the literature. *Health Psychol Res*. 2024; 12. doi: 10.52965/001c.91408
75. McDougall E, Breen LJ, Nowak AK, et al. Psychosocial interventions for personality and behavior changes in adults with a brain tumor: A scoping review. *Neurooncol Pract*. 2023; 10(5): 408-417. doi: 10.1093/nop/npad031
76. Abou Elazayiem Bayumi H, Mokhtar Mohamed Gaber E, Mostafa Shehata A, Omar Ibrahim Elmowafy A. Effect of Nurse-Led Intervention on Headache Pain, Anxiety, and Fatigue Levels among Patients with Brain Tumors. *Egyptian Journal of Health Care*. 2022;13(2):1843-1854. doi: 10.21608/ejhc.2022.270427
77. Mokhtar Mohamed Gaber E, Abou Elazayiem Bayumi H, Mostafa Shehata A, Omar Ibrahim Elmowafy A. Effect of nurse-led intervention on headache pain, anxiety, and fatigue levels among patients with brain tumors. *Egyptian Journal of Health Care*. 2022; 13(4): 1431-1442.
78. Deng YH, Ruan J, Wang SQ, Yang YM, Mu L. Effects of nursing care in fast-track surgery on postoperative pain, psychological state, and patient satisfaction with nursing for glioma. *World J Clin Cases*. 2021; 9(20): 5435-5441. doi: 10.12998/wjcc.v9.i20.5435
79. Madu C, Mofiyinfoluwa AV. Patient-centered care in precision medicine and end-of-life care in neuro-oncology: The role of nursing in enhancing quality of life and treatment outcomes. *World Journal of Biology Pharmacy and Health Sciences*. 2025;22(3):230-238. doi: 10.30574/wjbphs.2025.22.3.0518
80. Boele FW, Weimer JM, Proudfoot J, et al. The effects of SmartCare© on neuro-oncology family caregivers' distress: A randomized controlled trial. *Supportive Care in Cancer*. 2022; 30(3): 2059-2068. doi: 10.1007/s00520-021-06555-5
81. Young JS, Al-Adli N, Sibih YE, et al. Recognizing the psychological impact of a glioma diagnosis on mental and behavioral health: A systematic review of what neurosurgeons need to know. *J Neurosurg*. 2023; 139(1): 11-19. doi: 10.3171/2022.9.JNS221139
82. Mishaan M, Al Shamary M, Mulawwah W, et al. Nursing care for patients with brain tumors: A comprehensive approach. *Letters in High Energy Physics*. 2023; 23(2).
83. Ghadimi K, Abbas I, Karandish A, et al. Cognitive decline in glioblastoma (GB) patients with different treatment modalities and insights on untreated cases. *Current Oncology*. 2025; 32(3): 152. doi: 10.3390/currncol32030152
84. Shah NZ, Masroor T, Zahid N, et al. Factors affecting well-being in brain tumor patients: An LMIC perspective. *Front Psychol*. 2023; 14. doi: 10.3389/fpsyg.2023.1117967
85. Najafi M, Jahanbakhshi A, Finocchi Ghersi S, et al. Clinical effects of immuno-oncology therapy on glioblastoma patients: A systematic review. *Brain Sci*. 2023; 13(2). doi: 10.3390/brainsci13020159