



Review Article

Perioperative Anxiety and Depression in Older Adults: Epidemiology and Treatment

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ABSTRACT

The intervals before and after major surgery is a high-risk period for older adults; in this setting, anxiety and depression are common and serious problems. We comprehensively reviewed current evidence on perioperative anxiety and depression in older adults, focusing on epidemiology, impact, correlates, medication risks, and treatment. Principles of perioperative mental healthcare are proposed based on the findings. Prevalence estimates of clinically significant anxiety and depression range from 5% to 45% for anxiety and 6% to 52% for depression, depending on surgical populations and measurement tools. Anxiety and depression may increase risk for surgical complications and reduce patient participation during rehabilitation. Medical comorbidities, pain, insomnia, cognitive impairment, and delirium are common co-occurring problems. Concomitant uses of central nervous system acting medications (benzodiazepines, anticholinergics, and opioids) amplify the risks of delirium and falls. Based on these findings, we propose that anxiety and depression care should be part of perioperative management in older adults; components include education, psychological support, opioid-sparing pain management, sleep management, deprescribing central nervous system active medications, and continuation and optimization of existing antidepressants. More research is needed to test and improve these care strategies. (Am J Geriatr Psychiatry 2023; 31:996–1008)

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Highlights

- **What is the primary question addressed by this study?**

What is the current evidence regarding perioperative anxiety and depression in older adults?

- **What is the main finding of this study?**

Perioperative anxiety and depression are common. Medical comorbidities, pain, insomnia, cognitive impairment, and delirium are common co-occurring problems. Principles of perioperative mental health-care are proposed based on the findings.

- **What is the meaning of the finding?**

Treatment should not only target anxiety and depression, but also co-occurring problems in older adults during this period.

INTRODUCTION

Most surgical patients are older adults.¹ The perioperative period is a high-risk period for older adults, and new management programs including prehabilitation and postoperative enhanced recovery are trying to improve surgical and functional outcomes.² Anxiety and depression may negatively impact the recovery process; for example, patients with anxiety or depression are more likely to drop out from cardiac rehabilitation,³ and patients with depression show poorer participation in rehabilitation after hip fracture.⁴ Many perioperative management programs have begun to incorporate psychological interventions to reduce this negative impact.² Therefore it is important that the geriatric mental health field incorporate its expertise into perioperative care. Accordingly, this narrative review aims to synthesize the growing evidence on perioperative anxiety and depression in older adults with a specific emphasis on understanding their prevalence, impact, correlates, medication risks, and treatment. Based on the review, we propose principles of perioperative anxiety and depression care in older adults.

We included studies with participants aged older than 60 or mixed-age populations with a mean age older than 60. To promote the credibility of this narrative review, we reviewed all articles from PubMed searches using MeSH terms (Table S1). Relevant references from the articles were reviewed, and hand searches from Embase and Web of Science were performed. We prioritized meta-analyses, systematic reviews, and studies with appropriate methodology (i.e., for correlates of perioperative anxiety and

depression, we chose studies that controlled for possible confounders to support the hypothesis) published within the past 10 years. The perioperative period covers the *preoperative period*: from scheduled surgery, preoperative preparation visits (where providers take a medical history, perform a physical examination, review medications, and inform a patient about surgery choices and risks of surgery that may require additional care after surgery, in order to prepare the patient physically and mentally for surgery), and hospital admission until surgery; and *postoperative period*: hospital care after surgery (such as monitoring for infections, pain, mobility, nutrition, and bowel movements) and postoperative rehabilitation after hospital discharge. The duration of the preoperative and postoperative period varies, depending on each patient and the individual surgical setting; for example, the preoperative period can be very brief for a patient undergoing emergency surgery for an acute injury, and the postoperative period can last several months for a patient undergoing rehabilitation.⁵ Based on the literature, perioperative anxiety and depression in this review refer to clinically significant anxiety and depression (typically based on a measurement scale cutoff score) present during the perioperative period, including both long-standing mood disorders and emergent symptoms.

TOOLS TO DETECT PERIOPERATIVE ANXIETY AND DEPRESSION AND THEIR PREVALENCE

From the literature search results (Table S2), the Hospital Anxiety and Depression Scale (HADS) is the most widely used scale.^{6–14} This 14-item

questionnaire excludes physical symptoms of anxiety and depression to prevent "noise" in hospitalized patients. A cutoff of greater than or equal to 8 for the anxiety and depression subscales is the most commonly used and has sensitivity and specificity each approximately 80% compared to the Diagnostic and Statistical Manual of Mental Disorders (DSM) diagnosis of major depressive disorder, dysthymia, adjustment disorder, generalized anxiety disorder, and specific phobia.¹⁵ Other tools that have been used to measure perioperative anxiety include the Hamilton Anxiety Rating Scale (HAM-A),¹⁶ State-Trait Anxiety Inventory (STAI),¹⁷ Brief Symptom Inventory (BSI),¹⁸ Self-rating Anxiety Scale (SAS),¹⁹ Generalized Anxiety Disorder scale (GAD-7),²⁰ and Visual Analog Scale for Anxiety (VAS-A).²¹ Several tools are used to measure perioperative depression, including Patient Health Questionnaire (PHQ)-9,²² Beck Depression Inventory (BDI),¹⁹ PHQ-8,²³ Brief Symptom Inventory (BSI),¹⁸ Geriatric Depression Scale (GDS)-30,²⁴ GDS-5,²⁵ Center for Epidemiologic Studies Depression Scale (CES-D),²⁶ Depression Scale (DEPS),²⁷ and Hamilton Depression Rating Scale (HAM-D).²⁸

Studies have shown a wide range of prevalence estimates of perioperative anxiety (from 5% to 45% preoperatively^{17,29} and 5%–38% postoperatively^{9,19}) and depression (from 11% to 34% preoperatively^{14,27} and 6%–52% postoperatively^{23,24}); the prevalence varies by surgical populations, measurement tools, measurement cutoff scores, and time of measurement (Table S2). For example, a study in lung cancer surgery found that depression increased from 12% on the day before surgery to 19% at 2 weeks postoperatively, while anxiety remained stable (8%–9%), and postoperative dyspnea and pain were significant correlates for depression in this study.¹² Another study in mitral valve surgery found that, compared to the preoperative surgical admission period, depression increased at 1 week postoperatively (from 15% to 20%) while anxiety decreased (from 33% to 28%).⁶ The increase in depression early after surgery was also observed in another cardiac surgery study by Horne et al,³⁰ which found that depression was associated with longer hospital stay, suggesting complications following surgery can be an aggravating factor. A study in hip or knee arthroplasty showed anxiety and depression were highest during the waiting list period (18%–22% at several months before surgery) compared to 3 months (7%–14%) and 1 year (9%

–13%) postoperatively,⁷ during which the prevalence was close to the community prevalence (10%–11%).³¹

IMPACT ON POSTOPERATIVE MEDICAL COMPLICATIONS AND MORTALITY

Medical complications can make patients feel anxious and depressed; poor health status makes older adults feel sad or frustrated because they feel the loss of control over their lives.³² Alternatively, negative moods can present as or complicate medical symptoms. For example, postoperative nausea and vomiting are five times more likely in patients with anxiety sensitivity despite controlling for nausea/vomiting prophylaxis, surgical technique, postoperative opioid administration, and age (mean age of participants = 51 years).³³ In patients with coronary artery disease with positive exercise stress test (mean age = 55 years) who underwent a CO₂-induced panic attack experiment, 81% of patients with comorbid panic disorder and developed a panic attack during the test had myocardial perfusion defect, compared to 46% in controls (without panic disorder), which suggested that panic attacks may lead to transient ischemic episode among patients with panic disorder who have preexisting high-risk coronary artery disease.³⁴ Furthermore, anxiety includes biased interoception of the body that can manifest as somatic illnesses.³⁵ An increased risk of complications among those with depression has also been observed; for example, the risk of a complication (assessed by at least Grade I from the Clavien-Dindo postsurgical complication classification: in renal system surgery, it includes transient creatinine elevation or wound infection) after prostatectomy is 79% higher among patients with moderate to severe depression and anxiety (PHQ-4 ≥6) compared to those with normal anxiety and depression (PHQ-4 = 0–2), after controlling for age and clinical covariates.³⁶

The association between perioperative anxiety or depression and mortality has been examined primarily in patients with cardiovascular disease and shows mixed results. Depression is related to immune system dysregulation,³⁷ and unhealthy habits in depression, such as inactivity, may expose patients to higher cardiovascular risks.³⁸ Patients who undergo coronary artery bypass graft surgery and have depression show higher levels of an inflammatory marker (Troponin T) and a higher cardiovascular

risk compared with age and sex-matched nondepressed patients.³⁹ In patients with preoperative depression, higher mortality (hazard ratio 1.65 [1.37–1.99]) and death/rehospitalization for myocardial infarction, heart failure, and stroke are observed during 7 years of follow-up after coronary artery bypass graft surgery after controlling for other risk factors.⁴⁰ However, another study in patients undergoing coronary revascularization shows postoperative new-onset depression is associated with decreased mortality during hospital readmission (<90 days after discharge),⁴¹ and a study in coronary stenting patients suggests preoperative anxiety is associated with lower mortality after 5 years of follow-up.⁴² Other studies were conducted in arthroplasty patients and found that perioperative anxiety and/or depression are not associated with increased hospital mortality.^{43–45}

AGE AND PERIOPERATIVE ANXIETY AND DEPRESSION

Age itself does not appear to be a risk factor for perioperative depression or anxiety; studies of adults undergoing surgery (mean age <60 y) from our search (Table S1) showed that older age is associated with lower anxiety^{46–49} and possibly depression.⁵⁰ When exposed to the same stressors, older adults are more likely to control their emotions and feel less stress than their younger counterparts.⁵¹ A potential confounder of this trend is that young adults undergoing surgery are more likely to have increased medical comorbidities than age-comparable groups; thus they are at higher risk for mental health problems. However, older adults are less accurate than younger adults in recognizing symptoms of anxiety and depression,⁵² and less likely to seek help if these conditions occur.⁵³ Studies in older patients (mean age >60 years) showed a less conclusive trend: compared to “younger old,” “older old” reported lower anxiety in esophageal cancer surgery⁸ but higher anxiety in coronary artery procedures^{11,42,54}; lower depression in arthroplasty¹⁴ but higher depression in open heart surgery,²⁶ percutaneous coronary intervention¹¹ esophageal cancer surgery,⁸ and lung cancer surgery.¹²

CORRELATES

There are numerous, interrelated correlates of perioperative anxiety and depression in older adults. Many studies have found that pain is closely related to perioperative anxiety and depression; for example, pain is independently associated with anxiety in gastrointestinal surgery⁵⁵ and arthroplasty⁵⁶ and independently associated with depression in lung cancer surgery.¹² Pain directly causes mood dysregulation (i. e., the anterior cingulate gyrus, a brain region associated with mood regulation, becomes more active when peripheral pain is escalated), while anxiety and depression can lead to a higher perception of pain (i. e., the serotonin and norepinephrine depletions found in depression and anxiety downregulate the pain-modulating serotonergic and noradrenergic neurons in the periaqueductal gray, resulting in an intensification of small pain signals from the body).⁵⁷ Lower subjective physical function and having higher number of medical comorbidities is independently associated with anxiety and depression, such as observed in arthroplasty¹⁴ and cataract surgery.²⁵ Lack of sleep on preoperative nights has been reported to cause preoperative anxiety,⁵⁸ and the hyperarousal state in anxiety and depression conversely can result in insomnia. Older adults who cope with stress using helplessness and avoidance report higher preoperative and postoperative anxiety than those who use flexible, resourceful, and rational coping mechanisms.⁵⁹ Patients with preoperative mood problems are more likely to follow negative moods after surgery.^{17,60}

Cognitive impairment is a common co-occurring condition in older patients and may increase the risk of anxiety and depression. Poorer cognitive function is associated with greater preoperative and postoperative anxiety and depression.⁶¹ Patients with cognitive impairment frequently felt devalued during the surgical time because their respect and dignity were being ignored: patients with dementia reported that their basic needs (e.g., toileting and feeding) were often unmet during hospitalization, and they and their family members were reluctant to call for help from hospital staff.⁶² Adequate pain control is another primary concern, given their difficulties in expressing themselves, and self-reporting pain measurement may not be a sufficient indicator.⁶³ Postoperative cognitive dysfunction,

although the pathogenesis is inconclusive,⁶⁴ is also common in older patients, occurring 71% at one week and 47% at 3 months following coronary artery bypass graft surgery.⁶⁵ Therefore, perioperative care of older adults should focus on communicating needs to reduce anxiety and depression, especially in patients with pre-existing cognitive impairment during the postoperative period, where cognition could be worse. Observational strategies are recommended in addition to self-reports of pain from patients with cognitive impairment.⁶³

Delirium is another common co-occurring condition in older surgical patients. The relationship of delirium with perioperative anxiety and depression is complex. A meta-analysis of patients undergoing spine surgery suggested that anxiety and depression are associated with postoperative delirium (odds ratio 1.74 [1.04–2.44] for anxiety and 2.50 [1.52–3.49] for depression).⁶⁶ Anxious and depressed older adults often have sleep dysregulation, which may precipitate delirium.⁶⁷ Anxiety and depression also share a common pathophysiology with delirium, such as disturbances in inflammatory and stress biology.^{68,69} Anxiety and depression can also occur as features of delirium and remain after delirium has resolved. One-third of patients recall delirium experiences, and 86% of these patients are distressed by the experiences.⁷⁰ Psychosis in delirium can be a frightening experience for patients, and after recovering from delirium, patients may have significant negative memories of their experience.⁷¹ Consequently, postoperative delirium is a risk factor for post-traumatic stress disorder in older adults.⁷²

In summary, perioperative anxiety and depression in older patients are related to pain, medical comorbidities, poor sleep, and negative coping styles. Cognitive impairment and delirium are not only common co-occurring problems in older patients but may also confer additional risk of anxiety and depression. However, many risk factors, such as inadequate pain control and poor sleep before an operation day, are modifiable with awareness and proper management.

PERIOPERATIVE RISKS OF COMMONLY PRESCRIBED CENTRAL NERVOUS SYSTEM (CNS) MEDICATIONS

Older adults are increasingly prescribed CNS medications, often multiple in one patient.⁷³ Therefore,

there is an important role for specialists to reduce or minimize CNS medications. The use of potentially inappropriate medications such as benzodiazepines and anticholinergics were found in 56% of older adults who use antidepressants.⁷⁴ These medications, often prescribed by multiple providers, are common in older adults with mood disorders and have an impact on safety (e.g., delirium and falls⁷⁵). This problem of CNS medications and their risks is greatly amplified in the perioperative period. Prompt management of CNS medications can begin early after surgery is scheduled to reduce the existing risk of polypharmacy during hospital admission. Some commonly co-prescribed CNS medications include benzodiazepines, anticholinergics, and opioids.

Benzodiazepines and benzodiazepine receptor agonist hypnotics (Z-drugs) are the most psychotropic medications prescribed as needed in hospitalized older adults,⁷⁶ even though according to the American Geriatrics Society 2019's Beers Criteria, the risks of cognitive impairment, delirium, falls, and fractures from benzodiazepines and Z-drugs outweigh the benefits of these drugs.⁷⁵ Abrupt discontinuation of benzodiazepines and Z-drugs, particularly in long-term users, can cause withdrawal syndrome, such as anxiety, agitation, and sympathetic hyperactivity.⁷⁷ However, benzodiazepines can be safely discontinued without significant withdrawal symptoms by tapering,⁷⁸ for example, reducing the dose by 10%–25% from the initial dose every 2 weeks.⁷⁹ Nonpharmacological approaches for insomnia, such as sleep hygiene, relaxation, and cognitive therapy, are preferred over pharmacological treatments.⁷⁹ Melatonin and melatonin receptor agonists (ramelteon), which are not associated with postoperative delirium in older adults, may be tried for insomnia.⁸⁰ A meta-analysis in adults showed melatonin could improve postoperative sleep quality, although the effect on preoperative sleep quality is insignificant.⁸¹

Almost one-fifth of older adults hospitalized for cancer surgery are users of long-term anticholinergic medications, and the use of these medications is independently associated with delirium.⁸² There are approximately 50 drugs with strong centrally acting anticholinergic effects that the 2019 Beers Criteria recommended avoiding in older adults because they can cause confusion, including first-generation antihistamines, antimuscarinics, antispasmodics, muscle relaxants, antiparkinsonian agents, and some

psychiatric medications (please refer to www.geriatricscareonline.org for details). Anticholinergics are less likely to cause withdrawal events, and most can be stopped without tapering.⁸³

Opioids have deliriogenic properties, and the American Geriatrics Society recommended minimizing their use, instead optimizing pain control with nonopioid medications (gabapentin, paracetamol, and nonsteroidal anti-inflammatory agents).⁸⁴ However, adequate pain control is crucial to reduce the risk of delirium,⁸⁴ and nonopioid medications may also increase the risk of delirium; thus the use of opioids is a careful risk versus benefit consideration. Regional anesthesia techniques are a viable means of reducing perioperative pain without the risk of introducing new medications.⁸⁵ In long-term opioid users, an abrupt reduction can lead to hyperalgesia and increase the need for postoperative analgesics and is not recommended perioperatively.⁸⁶

ANTIDEPRESSANT USE

The perioperative period is a challenging time to start new antidepressants for several reasons. First, the preoperative period is often short (days to weeks) and starting an antidepressant at that time may be less likely to provide benefits “just in time.” Second, accurately judging the need for chronic treatment of an anxiety or depressive disorder in acute medical settings is challenging given the co-occurrence of time-limited stress and demoralization, as well as medical issues such as delirium. Third, hyponatremia from the syndrome of inappropriate antidiuretic hormone secretion (SIADH) caused by selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs) commonly occurs in the first 2–4 weeks after initiation of medication.⁸⁷ On the other hand, inadvertent stopping/holding of existing antidepressants as patients transition through multiple settings or in preparation for surgery can exacerbate anxiety and depression through discontinuation syndrome or subtherapeutic doses.⁵⁸ Further, existing antidepressants may be underdosed: studies have reported that the dose of antidepressants was subadequate in 8%–47% of older adults with depressive disorder.^{88,89}

Based on these considerations, it may be best to optimize the dose of existing antidepressants and,

where safe, maintain their use throughout the perioperative period, but not to initiate new medications at this time unless indicated. While continuing antidepressants, some caution should be exercised. Serotonergic antidepressants (SSRIs, venlafaxine, clomipramine, duloxetine) can increase the risk of bleeding through their antiplatelet activity: a meta-analysis found an association with increased transfusion (odds ratio 1.19 [1.09–1.30]), although not with reoperation for bleeding event.⁹⁰ Furthermore, perioperative medications such as opioids and ondansetron can trigger serotonin syndrome in patients taking serotonergic antidepressants and should be differentiated from other conditions, such as delirium.⁹¹

CURRENT EVIDENCE OF TREATMENT

A literature search (Table S1) for randomized controlled trials (RCTs) found 30 RCTs of nonpharmacological and pharmacological treatment for perioperative anxiety and depression in older adults (see details of each RCT in Table S3).

Nonpharmacological Interventions

The summary of the interventions and outcomes of nonpharmacological RCTs in older adults is shown in Table 1. Psychological support^{92–95} and education^{96–101} are the two most widely studied interventions; they have evidence to improve anxiety and depression, and some studies^{94,101} also demonstrate a sustained effect after the intervention. Enhancing patient education by applying technologies (e.g., video¹⁰⁰ or virtual reality⁹⁸) to describe surgical procedures helps patients imagine what to expect, potentially reducing anxiety while saving time for healthcare professionals. Brief cognitive behavioral intervention,¹⁰² reminiscence therapy,¹⁰³ and motivational interview¹⁰⁴ help anxiety and/or depression, but the drawbacks are that they can require mental health professionals who may not be available in perioperative settings. A study of mindfulness in the perioperative setting has not established its benefit in older adults¹⁰⁵; however, a systematic review supported the feasibility and acceptability of mindfulness for anxiety and depression in older adults,¹⁰⁶ and another qualitative study found that older adults relied on mindfulness to

TABLE 1. Randomized Controlled Trials of Nonpharmacological Interventions for Perioperative Anxiety and Depression in Older Adults

Intervention	Outcomes	Interventionist	Format and Duration	Sustainability of the Effect After the End of the Intervention
Psychological support ^{92–95}	Decreased anxiety and depression.	Nurse or psychologist.	Individually or in groups x 1–8 sessions, 30–90 min/session.	Eight weekly sessions reduced anxiety and depression up to 3 mo. ⁹⁴
Education ^{96–101}	Decreased anxiety and depression.	No health professional is needed for the booklet, video, or virtual reality.	Individually x 1–5 sessions, 5–60 min/session.	Four weekly sessions of pain neuroscience education and joint mobilization reduced pain catastrophizing and fear of movement up to 4 mo. ¹⁰¹
Brief cognitive-behavioral intervention ¹⁰²	Decreased depression.	Nurse.	Individually x 4 sessions, 15–60 min/session.	No difference between the intervention and control groups at 8 wk.
Reminiscence therapy ¹⁰³	Decreased anxiety and depression.	Psychologist.	In group x 6 sessions, 20–40 min/session.	N/A
Mindfulness intervention ¹⁰⁵	Decreased anxiety and depression in age <60 y but not in those >60 y.	Certified trainer.	In group x 4 sessions, 90–120 min/session.	N/A
Music therapy ^{107–111}	Decreased anxiety. The music of choice may be better than scheduled music.	No health professional is needed.	Individually x 1 session, 10–60 min.	N/A
Motivational interview ¹⁰⁴	Decreased anxiety.	Nurse.	In group x 3 sessions, 40 min/session.	N/A
Guided imagery / hypnosis ^{112–114}	The live session may decrease anxiety, but the recorded session did not differ from the absence of intervention.	Any script reader.	Individually x 1 session, 10–70 min/session.	N/A
Massage therapy ^{115–118}	Decreased anxiety.	Massage therapist.	Individually x 1–2 sessions, 10–20 min/session.	N/A
Respiratory sinus arrhythmia (RSA)-biofeedback ¹¹⁹	Decreased depression.	Machine-trained users.	Individually x 5 sessions. Each session was 15 min with the machine + 30 min of self-practice.	N/A

Abbreviations: N/A: no data available.

cope with perioperative anxiety and depression.⁵⁸ Therefore, the effect of mindfulness should be further investigated. Music therapy^{107–111} and other relaxation techniques (guided imagery/hypnosis,^{112–114} massage^{115–118}) are feasible interventions to reduce anxiety, but the anxiolytic effect may be transient. Respiratory sinus arrhythmia (RSA) biofeedback, aimed at synchronizing heart rate and breathing to counter vagal inhibition associated with depression, has shown promise in a cardiac surgical setting;¹¹⁹ the intervention can be guided by a machine, but patients also need to practice it by themselves, which can limit adherence. In summary,

nonpharmacological treatment is safe and effective for anxiety and depression. Using application-based or web-based psychotherapy and education are important workarounds for medical providers.

Somatic Treatment

There are a few medication studies, including three RCTs for perioperative anxiety and depression in older adults. Premedication with gabapentin 600 mg orally significantly decreased preoperative anxiety compared to diazepam 0.15 mg/kg in patients with cataract (N = 28 per group).¹²⁰ Another study in

TABLE 2. Principles of Perioperative Anxiety and Depression Care in Older Adults

Intervention	Rationale	Concept of Actions	Challenges	Solutions
Education and psychological support	They are practical and have more robust evidence for anxiety and depression.	Step-by-step explanation of patient care. Clarify and summarize the content. The application of video or 3D images is encouraged. Include patient and caregiver decisions. Express verbal and nonverbal empathy.	How much information should older adults have? Time-consuming and need for healthcare care providers for education and/or psychotherapy.	Start with an overview and emphasize steps that need patient cooperation. Application-based or web-based interventions. Give the patient 'take-home' materials.
Opioid-sparing pain management	Pain is associated with anxiety and depression. Opioid increases the risk of delirium and falls.	Non-opioid analgesics (acetaminophen, NSAIDs, and GABA analogs) are preferred. Incorporate regional / neuraxial anesthesia to reduce opioid use. Add nonpharmacologic pain control, such as behavioral activation.	Long-term opioid users experience hyperalgesia and increase postoperative analgesic needs. Patients with cognitive impairment have limited ability to express pain.	Long-term opioid users should not abruptly discontinue opioids. Before surgery, a tapering plan should be discussed. Implementation of observational strategies, such as PAINAD scale.
Sleep management	Lack of sleep can cause anxiety and may precipitate delirium.	Screen and treat sleep disorders before surgery. Maintain good sleep environment in a hospital, such as quiet and dim light, avoiding interruptions at nighttime, and using earplugs and eye masks. ¹²⁵ Nonpharmacological approaches for insomnia such as sleep hygiene, relaxation, and cognitive therapy are preferred.	In a time-limited setting or when non-pharmacological interventions for insomnia are insufficient, what pharmacotherapy can be used?	Melatonin and melatonin receptor agonists (ramelteon) that do not cause delirium ⁸⁰ can be tried.
Deprescribing CNS active medications	Benzodiazepines and anticholinergics can precipitate delirium.	Review of the indication of CNS active medications. Compare risks versus benefits of continuation. Discuss deprescribing with patients and make plan: start with the drug with the fewest withdrawal symptoms. Most anticholinergic drugs can be stopped without tapering. Benzodiazepines require tapering to avoid withdrawal symptoms. Follow-up recurring or withdrawal symptoms.	Insufficient professionals (e.g., pharmacists and psychiatrists) and the need for cross-discipline care management (e.g., inpatient and outpatient transition, as well as transition across specialties)	Train other health professionals, such as nurses, nurse assistants, or social workers, and have a pharmacist or physician cover the management. Case management/patient navigators can help provide support during multiple transitions.
Optimization of antidepressants	The subtherapeutic dose is the reason for the ineffectiveness of the antidepressant. Antidepressant withdrawal symptoms can cause anxiety.	Preoperatively, assess the reasons for the prescribing of subtherapeutic dose prescription; if no logical explanation (e.g., drug interactions), discuss dose escalation with the patient. Follow-up adverse effects. Postoperatively, assess whether the antidepressant is in place and check if it has been restarted; if it is not appropriate for any reason (e.g., need for NPO), restart it.		

Abbreviations: PAINAD scale: pain assessment in advanced dementia scale.

cataract patients found that preoperative melatonin 3 mg sublingually was superior to a placebo in decreasing preoperative, operative, and postoperative anxiety (N = 30 per group).¹²¹ Another study that gave 10 mg of escitalopram from the preanesthetic period until day 6 postoperatively in patients undergoing knee arthroplasty with catastrophizing pain found that it was superior to placebo for depression but not different from placebo for anxiety (N = 59 per group).¹²²

Neurostimulation treatments have been used perioperatively. Navigated transcranial magnetic stimulation has been used preoperatively for precise motor and language mapping before brain surgery; it also shows a potential benefit in motor improvement in stroke patients postoperatively.¹²³ A randomized, double-blind study showed that two sessions (20 minutes each) of preoperative transcranial direct current stimulation effectively reduced pain after hallux valgus surgery compared to sham control.¹²⁴ Despite this, we are aware of no studies of these promising treatments for perioperative anxiety or depression.

PRINCIPLES OF PERIOPERATIVE CARE FOR ANXIETY AND DEPRESSION

Based on the evidence previously discussed, we propose principles of perioperative care of anxiety and depression in older adults in [Table 2](#), including: 1) Provide education and psychological support, since they are safe, practical, and have more robust evidence in reducing anxiety and depression. 2) Use opioid-sparing pain management to reduce the risk of delirium and falls. 3) Adopt sleep hygiene and management techniques to reduce anxiety and the risk of delirium. 4) Deprescribe CNS active medications to reduce the risk of delirium. 5) Optimize the dose of pre-existing antidepressants to effectively treat anxiety or depression and avoid discontinuation syndrome during surgical admission.

CONCLUSIONS AND RECOMMENDATIONS

Perioperative anxiety and depression are common and may negatively impact surgical complications

and patient participation during rehabilitation. Older patients are vulnerable to mood disorders through multiple medical comorbidities and pain. The safety concerns related to CNS medications in older adults are amplified during the perioperative period. The principles of perioperative anxiety and depression care include education and psychological support, opioid-sparing pain management, sleep management, deprescribing CNS active medications, and the continuation and optimization of most antidepressants. Future studies may differentiate anxiety and depression that emerged during the perioperative period from pre-existing mood disorders (i.e., chronic mood disorders that occur before scheduled surgery) because their risk factors and management may be different. More studies are needed on the impact of perioperative anxiety and depression (i.e., complications, mortality, length of stay) as well as randomized controlled trials of treatments (i.e., behavioral, pharmacological, and neurostimulation interventions). Management strategies need to consider the context of co-occurring multiple comorbidities and the prescription of CNS medications. The information and recommendations in this narrative review should be viewed as a starting point, given that the concept of perioperative mental health is itself a new concept and area for research. More research is needed on this important and increasingly common issue for the health and well-being of older adults.

AUTHOR CONTRIBUTIONS

MS: review articles, writing the original draft, and review and editing of the work. EL: conception, supervision, writing of the original draft, and review and editing of the work. JA: review and editing of the work. MA: review and editing of the work.

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