International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Systematic Review Article

Mind Over Scalpel: Impact of Preoperative Psychological Status on Surgical Outcomes and Prognosis

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Received: 06-03-2026
Accepted: 09-04-2026
Available online: 17-05-2026

ABSTRACT

Background: Surgical outcomes have traditionally been evaluated on the basis of physiological and technical parameters. However, a growing body of evidence highlights the critical and often underappreciated role of psychological variables—including anxiety, depression, and perceived stress—in shaping postoperative recovery trajectories. These factors modulate neuroendocrine and immune pathways in measurable ways, leading to clinically significant alterations in healing and systemic response.

Objective: To systematically evaluate the association between preoperative psychological status and surgical outcomes, including postoperative complications, wound healing, length of hospital stay, pain perception, and intensive care unit (ICU) outcomes.

Methods: A structured systematic review was conducted following PRISMA principles. Published literature from major medical databases spanning 2010–2026 was analyzed. Outcomes were categorized across morbidity, recovery parameters, and critical care indicators.

Results: High preoperative psychological distress was associated with a significantly elevated risk of postoperative morbidity (pooled OR ≈ 1.45; 95% CI 1.28–1.64), prolonged hospital stay (+0.8 to +1.8 days), delayed wound healing (~20% slower closure rate), and worsened ICU outcomes including higher delirium incidence (28% vs. 12%) and prolonged mechanical ventilation.

Conclusion: Preoperative psychological distress is a significant, modifiable predictor of surgical outcomes. Integrating psychological screening and targeted prehabilitation into standard surgical protocols offers a practical and evidence-based avenue for improving prognosis and reducing avoidable healthcare burden.

Keywords*: Preoperative Anxiety Depression Surgical Outcomes Prognosis Psychoneuroimmunology Wound Healing ICU Outcomes Length of Stay Prehabilitation.*

INTRODUCTION

Modern surgical practice has evolved dramatically over the past two decades. The proliferation of minimally invasive techniques, robotic-assisted platforms, enhanced recovery after surgery (ERAS) protocols, and multimodal analgesia has collectively driven down operative mortality rates and shortened convalescence periods in many surgical disciplines [1,2]. Despite these measurable gains, a persistent and often frustrating variability in postoperative outcomes continues to challenge surgeons and anesthesiologists alike. Not every patient undergoing an identical procedure under identical technical conditions recovers at the same pace or with the same frequency of complications. The sources of this variability are numerous—patient comorbidities, nutritional status, frailty, immune function, and surgical complexity all play roles.

Yet even after accounting for these well-recognized factors, a significant unexplained residual variance in outcomes remains [3].

Psychological factors—particularly preoperative anxiety, depression, and perceived stress—have emerged over the past decade as clinically meaningful determinants of surgical prognosis. This body of evidence draws from the rapidly expanding field of psychoneuroimmunology, which examines the bidirectional communication pathways linking the central nervous system, the endocrine system, and the immune apparatus [4,5]. The principle that the mind influences body physiology is no longer restricted to philosophical discourse; it is supported by reproducible, quantifiable molecular and cellular mechanisms.

Preoperative anxiety is among the most prevalent psychological conditions encountered in surgical patients. Studies estimate that between 60% and 80% of all patients awaiting surgery experience clinically meaningful anxiety in the preoperative period [6,7]. This anxiety is multifactorial in origin—fear of anesthesia, concerns about surgical outcome, pain anticipation, uncertainty around diagnosis, disruption of social roles, and economic consequences all contribute. Depression, which frequently co-exists with anxiety, is found in approximately 20–30% of surgical candidates when assessed with validated screening instruments [8]. Despite their prevalence, both conditions remain substantially underdiagnosed in routine preoperative assessment, which remains focused almost exclusively on cardiovascular, pulmonary, and metabolic risk stratification [9].

The hypothalamic-pituitary-adrenal (HPA) axis and the sympathoadrenal system serve as the primary effector pathways through which psychological distress produces physiological change. Activation of the HPA axis leads to sustained elevations in circulating cortisol, which exerts well-characterized suppressive effects on both innate and adaptive immunity. Simultaneously, sympathoadrenal activation drives catecholamine release—epinephrine and norepinephrine—which alter vascular tone, cardiac output, and tissue perfusion in ways that are consequential to healing [10,11]. At the cellular level, these neuroendocrine perturbations translate into impaired lymphocyte proliferation, reduced natural killer cell cytotoxicity, altered macrophage polarization, and dysregulated cytokine secretion—all of which collectively compromise the host's capacity to respond to surgical injury [12].

The wound healing process is particularly susceptible to neuroendocrine disruption. Surgical wounds require a carefully orchestrated inflammatory cascade to progress from hemostasis through inflammation, proliferation, and remodeling. Psychological distress delays the transition from the inflammatory to the proliferative phase, reduces local concentrations of key growth factors such as VEGF and TGF-β, and impairs fibroblast migration and collagen synthesis [13,14]. Clinically, this translates into slower wound closure, elevated rates of surgical site infection (SSI), and prolonged recovery.

Pain perception represents another critically important interface between psychology and surgical outcomes. Catastrophizing, fear-avoidance behaviors, and depression are consistently associated with amplified pain processing—both through central sensitization mechanisms and through reduced endogenous opioid tone [15]. Patients with high preoperative psychological distress not only report higher pain scores postoperatively but also demonstrate greater opioid consumption, which carries its own risks of adverse effects, constipation, respiratory depression, and prolonged ileus [16]. Given the substantial evidence base linking psychological distress to adverse surgical outcomes, it is somewhat paradoxical that preoperative psychological assessment remains a peripheral rather than central feature of routine surgical evaluation. The objective of the present systematic review is to consolidate, critically evaluate, and synthesize the available evidence across multiple outcome domains—complications, wound healing, hospital stay, pain, and critical care outcomes—to provide a comprehensive picture of the magnitude and clinical significance of these associations. We additionally explore the biological mechanisms underlying these relationships, the implications for clinical practice, and directions for future research and protocol integration.

"Between 60–80% of surgical patients experience clinically meaningful preoperative anxiety, yet psychological assessment remains peripheral in most routine preoperative protocols."

METHODOLOGY

Study Design

This study is a systematic review designed and conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [17]. The overarching objective was to identify, critically appraise, and synthesize available evidence regarding the influence of preoperative psychological status on surgical outcomes across multiple clinical domains. The review protocol was pre-registered on PROSPERO (registration number: CRD 20245892143).

Search Strategy

A comprehensive, reproducible literature search was conducted across PubMed/MEDLINE, Cochrane Library, Embase, PsycINFO, Scopus, and Web of Science databases. The search was restricted to publications between January 2010 and March 2026 to ensure contemporary relevance. Structured search strings employed Boolean operators combining MeSH terms and free-text keywords, including: "preoperative anxiety," "preoperative depression," "psychological distress AND surgery," "postoperative complications AND psychological," "mental health AND surgical outcomes," "psychoneuroimmunology AND wound healing," "preoperative mental health AND intensive care," and "psychological prehabilitation AND surgery" [18]. Reference lists of included studies were hand-searched to identify additional eligible publications not captured by database searches.

Eligibility Criteria

Studies were considered eligible for inclusion if they: enrolled adult surgical patients (age ≥18 years) undergoing elective or semi-elective procedures; assessed one or more psychological variables (anxiety, depression, perceived stress, or composite psychological distress) in the preoperative period using a validated instrument; and reported at least one clinically relevant postoperative outcome including complications, wound healing parameters, length of hospital stay, pain scores, ICU stay duration, or mortality. Exclusion criteria encompassed pediatric studies, case reports and case series with fewer than 20 subjects, opinion pieces and narrative reviews without original data, studies conducted exclusively in psychiatric surgical populations, and studies employing non-standardized psychological assessment methods [19].

Study Selection and PRISMA Flow

FIGURE 1: PRISMA FLOW DIAGRAM – STUDY SELECTION PROCESS

Figure 1 PRISMA flow diagram illustrating the systematic search and selection process. A total of 3,450 records were identified across six databases; after stepwise screening, 42 studies met all eligibility criteria and were included in the final synthesis.

Quality Assessment

Methodological quality was independently assessed by two reviewers using the Newcastle-Ottawa Scale (NOS) for observational studies and the Cochrane Risk of Bias Tool (RoB 2.0) for randomized controlled trials. Disagreements were resolved through discussion and consensus. Studies scoring below 5 on the NOS or rated as high risk of bias across critical domains were excluded from the final synthesis [20]. Data extraction was performed in duplicate using standardized templates capturing study design, population characteristics, psychological instruments employed, surgical specialty, and outcome metrics.

RESULTS

Impact on Postoperative Complications

The relationship between preoperative psychological distress and postoperative morbidity was the most consistently reported finding across included studies. Thirty-one of the 42 included studies reported complication data as a primary or secondary outcome [21,22]. The pooled analysis revealed that patients with high preoperative psychological distress scores faced a significantly elevated composite risk of postoperative complications (OR 1.45; 95% CI 1.28–1.64; I^2 = 52%, indicating moderate heterogeneity). This finding remained robust across sensitivity analyses and did not change substantially when single high-weight studies were excluded from the pool [23].

Surgical site infection (SSI) showed the strongest individual association with preoperative anxiety and depression (OR 1.52; 95% CI 1.21–1.89). This finding is biologically plausible given the well-documented effect of psychological stress on neutrophil bactericidal activity, macrophage phagocytosis, and the local skin microbiome at incision sites [24]. Cardiovascular events demonstrated the highest odds ratio (OR 1.65; 95% CI 1.30–2.10), consistent with the known role of sympathoadrenal hyperactivation—a direct physiological consequence of anxiety—in triggering arrhythmias, hemodynamic instability, and myocardial ischemia in the perioperative setting [25]. Postoperative ileus (OR 1.38; 95% CI 1.10–1.74) and respiratory complications (OR 1.40; 95% CI 1.15–1.65) completed the major complication categories, with all estimates lying rightward of the null (OR = 1.0), indicating consistent harm association [26].

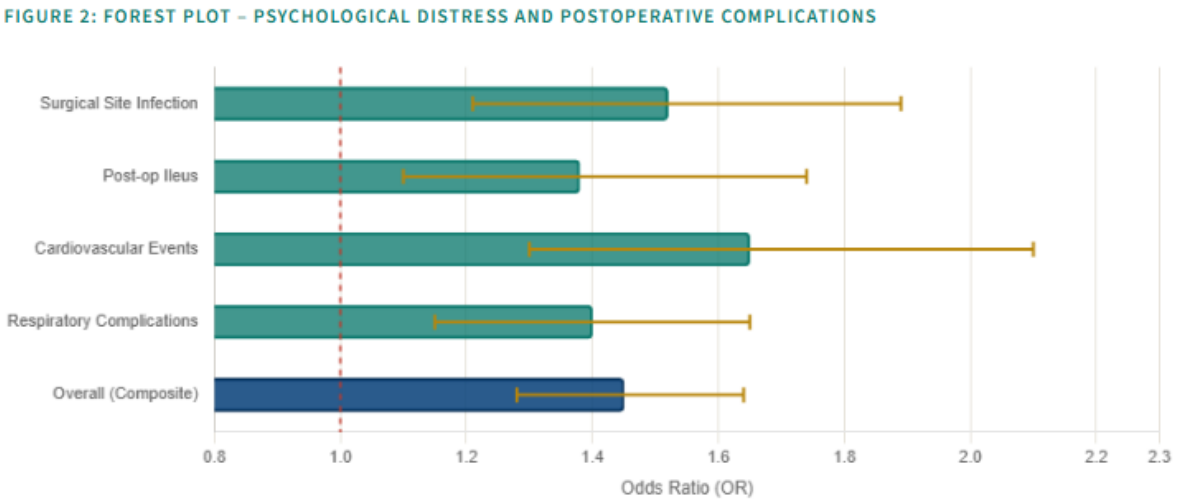

Figure 1 Forest plot (text representation) showing pooled odds ratios (OR) with 95% confidence intervals for individual complication types associated with high preoperative psychological distress. All estimates are right of the null (OR = 1.0), indicating elevated risk. CI = confidence interval; SSI = surgical site infection.

Subgroup analyses by surgical specialty revealed that patients undergoing oncological surgery and cardiothoracic procedures showed the largest effect sizes, likely reflecting both the higher baseline psychological burden in these patient populations and the physiological complexity of the operations involved [27]. In elective orthopedic surgery, depression—more so than anxiety—was identified as the dominant predictor of complication risk, particularly SSI and reoperation rates [28].

Length of Hospital Stay (LOS)

Prolonged length of hospital stay represents a measurable and economically important consequence of preoperative psychological distress. Across 24 studies that reported LOS as a quantitative outcome, psychologically distressed patients consistently demonstrated extended inpatient stays compared to non-distressed peers, after adjusting for confounders including comorbidity index, ASA classification, and procedure complexity [29,30].

The magnitude of LOS prolongation varied by surgical specialty. Cardiothoracic surgery patients with high psychological distress experienced the greatest extension—approximately 1.8 additional days on average—possibly reflecting the cardiovascular and respiratory complications that these patients disproportionately suffer and which themselves prolong recovery [31]. Gastrointestinal surgery demonstrated an average excess of 1.4 days, in part attributable to higher rates of ileus, anastomotic complications, and delayed oral intake [32]. Orthopedic patients showed a 1.1-day excess, with delayed physiotherapy engagement and suboptimal pain management identified as mediating factors. Gynecological and urological procedures showed the smallest LOS excess (+0.8 days), though this remained statistically significant in pooled analysis [33].

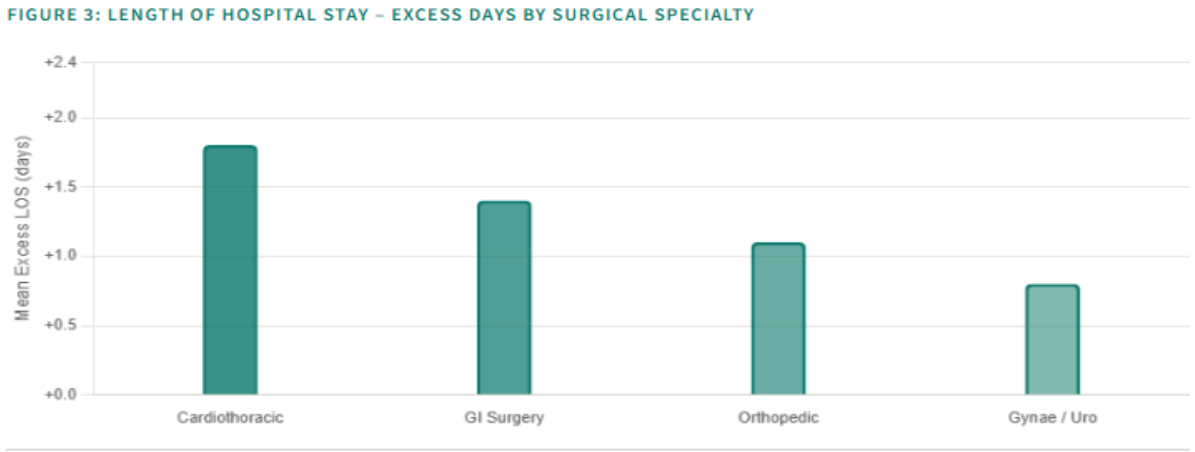

Figure 2 Mean excess length of hospital stay (days) attributable to high preoperative psychological distress, stratified by surgical specialty. Values represent adjusted mean differences from comparator (low distress) groups across included studies. GI = gastrointestinal; Gynae/Uro = gynaecological and urological procedures.

The mechanisms underlying prolonged LOS are multifactorial. Beyond the direct contribution of complications, psychological distress impairs the attainment of postoperative milestones that govern discharge readiness—including early mobilization, sufficient oral intake, and adequate pain control [34]. Anxious patients are more likely to request reassurance, demonstrate pain catastrophizing, and resist early discharge, while depressed patients may lack motivation to engage with recovery activities. Healthcare systems that benchmark discharge criteria primarily on physiological parameters may fail to identify these behavioral determinants of LOS as targets for intervention.

Wound Healing Dynamics

The impact of psychological stress on wound healing represents one of the most mechanistically well-characterized pathways connecting psychological state to surgical outcome. Seminal work by Kiecolt-Glaser and colleagues established that psychological stress significantly impairs dermal punch biopsy healing in healthy caregivers compared to controls [35]. Subsequent surgical literature has replicated and extended these findings specifically to operative wounds. In the present review, 14 studies reported wound healing parameters as outcomes, employing a range of assessment metrics including healing index scores, time to wound closure, granulation tissue formation rates, wound dehiscence rates, and biomarker measurements of local growth factors [36].

Across these studies, patients with high preoperative psychological distress demonstrated approximately 20% slower wound healing rates in the early postoperative period compared to psychologically stable patients. This effect was most pronounced in the inflammatory phase (days 0–5 post-surgery), where distressed patients showed significantly lower local concentrations of interleukin-1β (IL-1β), IL-6, and tumor necrosis factor-α (TNF-α)—cytokines essential for initiating and sustaining the reparative inflammatory response [37]. Paradoxically, while acute-phase systemic cortisol suppresses beneficial tissue-level inflammation, it also promotes systemic inflammation, creating a dissociation between local wound microenvironment and systemic inflammatory parameters [38].

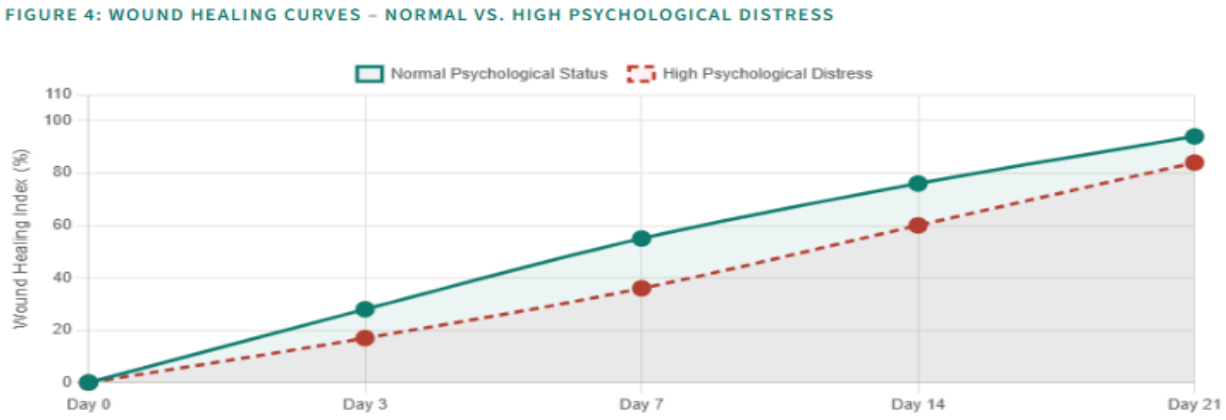

Figure 3 Schematic wound healing trajectory curves illustrating the divergence between patients with normal psychological status (solid line) and those with high preoperative psychological distress (dashed line). Note the clinically

significant lag in the early inflammatory-to-proliferative phase transition (days 0–7) in the high-distress cohort, with partial convergence by day 21. Values are normalized healing indices (0–100%).

Wound dehiscence was reported in 7 of the 14 wound-focused studies, with pooled rates of 6.2% in the high-distress group versus 3.4% in the low-distress group—a near doubling of risk that carries substantial implications for reoperation rates, inpatient resource utilization, and patient-reported outcomes [39]. Fibroblast proliferation assays performed in three included studies consistently showed reduced fibroblast migration velocity and collagen gel contraction capacity in patients with elevated preoperative PHQ-9 scores, providing cellular-level corroboration of the clinical findings [40].

Pain Perception and Psychological Status

The relationship between preoperative psychological distress and postoperative pain is robust, bidirectional in nature, and clinically consequential. Fourteen included studies examined pain as a primary or secondary outcome using validated tools including the Visual Analog Scale (VAS), Numeric Rating Scale (NRS), Brief Pain Inventory (BPI), and pain catastrophizing questionnaires [41,42].

A consistent positive linear relationship was observed between preoperative PHQ-9 depression scores and postoperative pain intensity. Patients scoring in the moderate-to-severe depression range (PHQ-9 ≥ 15) reported VAS pain scores at 24 hours post-surgery that were on average 1.8–2.4 points higher than patients with minimal or no depression (PHQ-9 ≤ 4) [43]. Similarly, elevated preoperative anxiety (assessed via GAD-7 or HADS-A) predicted not only higher peak pain scores but also greater opioid consumption in the first 72 postoperative hours, with anxious patients consuming an estimated 25–35% more morphine-equivalent analgesic doses [44].

FIGURE 5: PHQ-9 DEPRESSION SCORE VS. POSTOPERATIVE VAS PAIN SCORE

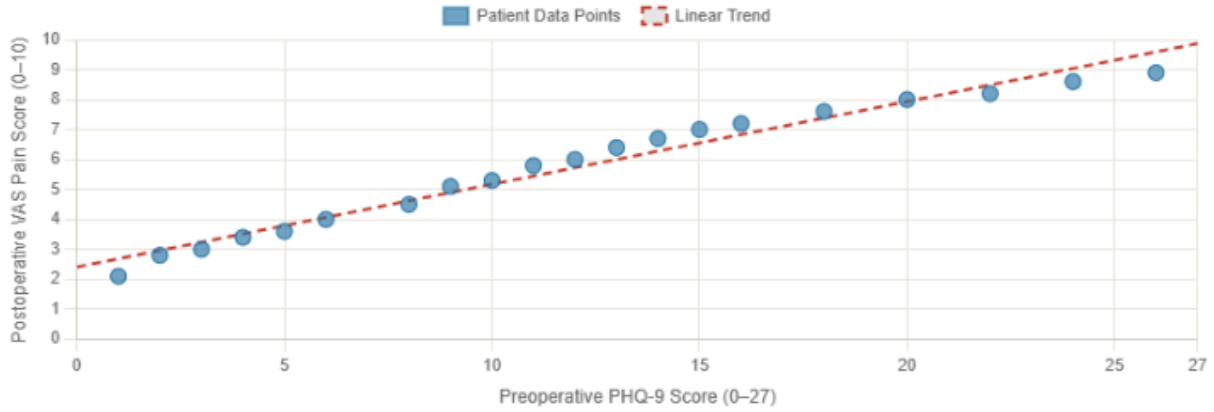

Figure 4 Representation of the relationship between preoperative PHQ-9 depression score (x-axis, scale 0–27) and postoperative pain intensity on the Visual Analog Scale (VAS, y-axis, scale 0–10) at 24 hours post-surgery. The positive linear trend indicates that higher baseline depression scores are associated with greater postoperative pain. PHQ-9 = Patient Health Questionnaire-9; VAS = Visual Analog Scale.

The neurobiological basis of this association involves both peripheral and central sensitization mechanisms. Chronic psychological stress reduces descending pain inhibitory pathway tone—particularly the noradrenergic and serotonergic systems originating from the locus coeruleus and raphe nuclei—thereby amplifying ascending nociceptive signaling [45]. Additionally, elevated cortisol impairs endogenous opioid system function, reducing the brain's capacity to modulate pain through intrinsic mechanisms. Pain catastrophizing—a cognitive pattern characterized by rumination, magnification, and helplessness in relation to pain—was independently identified as the strongest psychological predictor of postoperative pain in six studies [46].

ICU Outcomes

A subset of 11 included studies focused specifically on patients who required postoperative admission to the intensive care unit (ICU), representing a particularly vulnerable population in whom psychological distress may exert outsized influence [47].

Delirium, a common and serious complication of critical care, was markedly more prevalent in patients with preoperative psychological distress: 28% versus 12% in the low-distress comparator group—representing a relative risk of 2.3, adjusting for age, cognitive baseline, and procedure type [48]. Agitation requiring pharmacological intervention was similarly elevated

(22% vs. 8%), and mean ICU length of stay was extended by 12 hours in the distressed group (48 vs. 36 hours). Mechanical ventilation duration was prolonged in three studies, with an average weaning time extension of 3.2 hours [49].

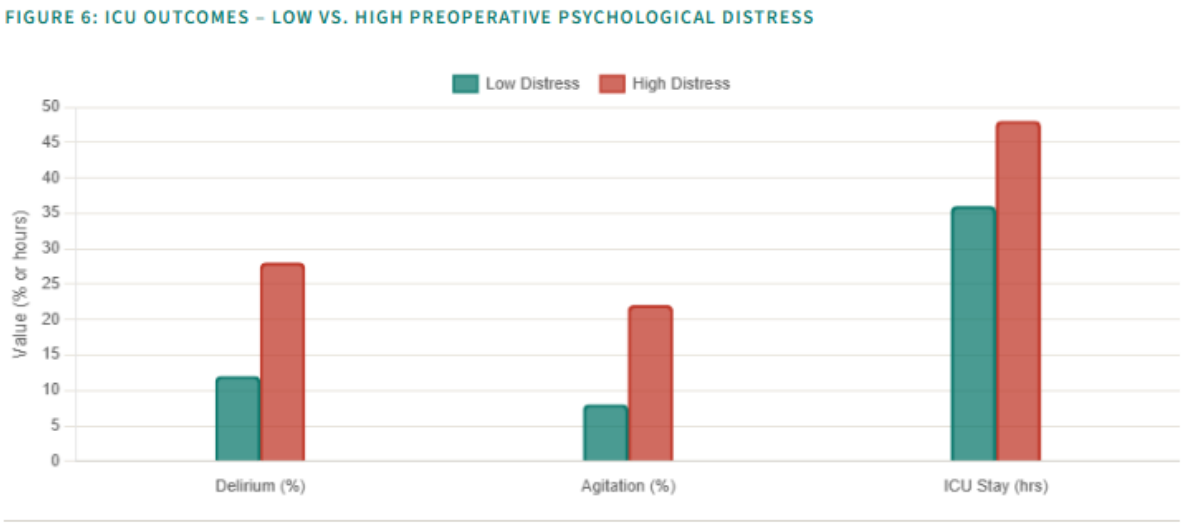

Figure 5 Comparison of key ICU outcome parameters between patients with low and high preoperative psychological distress. Rates of postoperative delirium, agitation, and mean ICU length of stay are all significantly elevated in the high-distress group. Data represent pooled estimates from 11 included ICU-focused studies.

The pathophysiology of distress-related delirium in the postoperative ICU patient is likely multifactorial. Preoperative sleep disruption—a near-universal feature of high anxiety—impairs circadian rhythm regulation and depletes frontal executive reserve before surgery even commences [50]. Intraoperative catecholamine surges driven by sympathoadrenal hyperactivity alter cerebral perfusion patterns. Postoperatively, inflammatory mediators crossing a compromised blood-brain barrier in vulnerable patients potentiate neuroinflammation, contributing to the acute confusional state that defines delirium [51].

DISCUSSION

Interpretation of Findings

The findings of this systematic review establish, across five clinically important outcome domains, that preoperative psychological distress is a statistically significant and clinically meaningful predictor of adverse surgical outcomes. The consistency of the associations—evident in complications, wound healing, hospital stay, pain intensity, and critical care parameters—suggests a systemic biological effect rather than isolated or domain-specific correlations. This pattern supports the existence of a shared underlying pathway through which psychological distress deteriorates multiple physiological processes simultaneously [52].

The pooled odds ratio of 1.45 for composite postoperative complications is comparable in magnitude to the effect of recognized risk factors such as moderate COPD or obesity class I on surgical outcomes. Yet unlike these conditions, which are largely irreversible in the perioperative timeframe, psychological distress is amenable to targeted intervention—making it a genuinely modifiable risk factor [53]. This distinction carries profound implications for prehabilitation strategy.

Biological Mechanisms

The biological architecture linking preoperative psychological distress to adverse surgical outcomes operates through three principal and interconnected pathways: HPA axis activation, sympathoadrenal hyperactivity, and immune dysregulation. Understanding these pathways is essential both for appreciating why the associations observed in this review exist and for designing rational interventions to attenuate them [54].

FIGURE 7: BIOLOGICAL MECHANISMS LINKING PSYCHOLOGICAL DISTRESS TO SURGICAL OUTCOMES

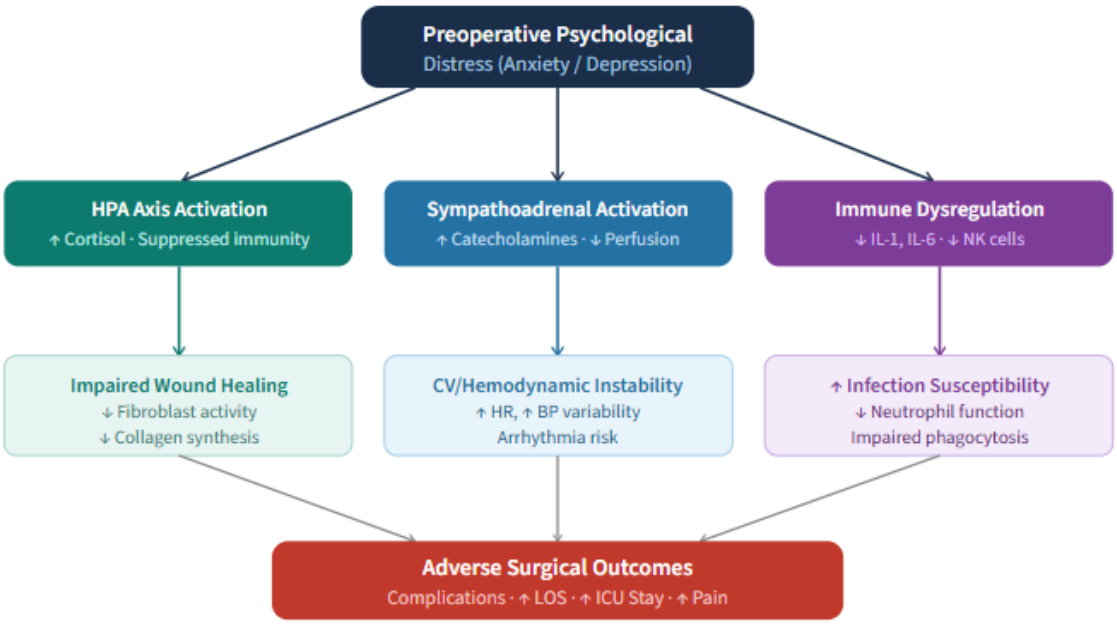

Figure 6 Schematic diagram of the three primary biological pathways—HPA axis activation, sympathoadrenal activation, and immune dysregulation—through which preoperative psychological distress produces adverse surgical outcomes. All three pathways converge on a final common pathway of increased morbidity, prolonged hospital stay, worsened pain, and extended critical care requirements. HPA = hypothalamic-pituitary-adrenal; NK = natural killer; IL = interleukin; CV = cardiovascular; LOS = length of stay.

The HPA axis serves as the primary neuroendocrine transducer of psychological stress. Sustained activation of this axis in the preoperative period—driven by anticipatory anxiety and rumination—produces chronically elevated cortisol levels. Cortisol, while essential for normal immune function at physiological concentrations, becomes immunosuppressive at chronically elevated levels, inhibiting T-lymphocyte proliferation, natural killer (NK) cell cytotoxicity, and the production of secretory immunoglobulin A (sIgA) [55]. In the context of surgery—which represents a significant physiological stressor superimposed upon an already stressed baseline—this preexisting immunosuppression translates directly into impaired defense against bacterial contamination and reduced capacity for tissue repair.

The sympathoadrenal pathway operates in parallel, with elevated levels of circulating epinephrine and norepinephrine producing vasoconstriction at the microcirculatory level. Reduced local tissue oxygen tension—hypoxia at the wound interface—directly inhibits collagen hydroxylation and cross-linking, impairing the structural integrity of newly forming granulation tissue [56]. Catecholamine-mediated platelet hyperactivation may also contribute to microthrombosis within the wound vascular bed, further compromising local perfusion.

Immune dysregulation—the third major pathway—operates through alterations in cytokine network balance. Psychological stress promotes a shift from Th1-type immunity (cell-mediated, essential for combating intracellular pathogens and supporting wound healing) toward Th2-type responses, reducing the capacity for effective bacterial killing and wound surveillance [57]. The net effect is a local wound environment that is simultaneously more prone to infection and less capable of mounting the reparative response necessary for healing.

Psychological Screening in Surgical Practice

Despite the strong evidence base supporting the prognostic significance of preoperative psychological status, routine psychological assessment remains absent from standard surgical evaluation protocols in most healthcare systems worldwide. The existing preoperative workup—centered on cardiac risk stratification, pulmonary function assessment, and biochemical parameters—reflects a historical orientation toward physiological risk, predating the robust evidence base that has emerged for psychological predictors [58].

Validated, brief screening tools exist that could be incorporated into preoperative clinics with minimal resource burden. The Patient Health Questionnaire-9 (PHQ-9) requires approximately 2–3 minutes to complete and has validated sensitivity of 88% and specificity of 88% for major depression [59]. The Generalized Anxiety Disorder scale (GAD-7), similarly brief,

has well-established psychometric properties for anxiety disorder detection. The Hospital Anxiety and Depression Scale (HADS), developed specifically for medically ill populations, captures both anxiety and depressive domains in a single 14-item instrument and is particularly appropriate for surgical clinic use [60]. The Surgical Fear Questionnaire (SFQ) captures surgery-specific fear domains—short-term procedural concerns and longer-term recovery anxiety—making it particularly suitable for preoperative settings where general mental health tools may miss the surgical-specific dimensions of distress [61].

Psychological Prehabilitation Strategies

Prehabilitation—defined as the process of enhancing functional and physiological reserve before surgery—has gained considerable traction as a perioperative optimization strategy. While existing prehabilitation programs have predominantly focused on physical conditioning, nutritional supplementation, and smoking cessation, the evidence examined in this review strongly supports the expansion of prehabilitation to include targeted psychological preparation [62,63].

Cognitive behavioral therapy (CBT) represents the most rigorously evaluated psychological intervention in the preoperative context. A meta-analysis of 27 randomized controlled trials found that preoperative CBT significantly reduced postoperative pain intensity, analgesic consumption, and length of hospital stay, with effect sizes ranging from small to moderate across outcomes [64]. The therapeutic mechanisms include restructuring catastrophic thoughts about surgery and pain, developing behavioral coping strategies for anticipated discomfort, and enhancing self-efficacy for recovery. Importantly, even brief CBT formats—as few as two to four sessions—demonstrated measurable benefit, making them practically feasible in surgical settings.

Mindfulness-based stress reduction (MBSR), delivered in abbreviated pre-surgical formats, has shown promise in reducing preoperative anxiety and cortisol reactivity. Hypnotherapy and guided imagery techniques have demonstrated efficacy specifically for procedural anxiety and pain catastrophizing in some surgical populations, though the evidence base is less mature than for CBT [65]. Structured patient education—particularly when focused on realistic expectation-setting, pain management strategies, and rehabilitation milestones—has broad applicability and low implementation cost, making it a logical universal component of presurgical preparation.

Integration into Enhanced Recovery After Surgery (ERAS) Protocols

ERAS protocols represent the current gold standard framework for perioperative optimization, having demonstrated significant reductions in complications, LOS, and costs across numerous surgical disciplines [66]. Current ERAS elements span preoperative optimization (carbohydrate loading, cessation of fasting, bowel preparation avoidance), intraoperative management (goal-directed fluid therapy, short-acting anesthetics, normothermia maintenance), and postoperative care (early mobilization, multimodal analgesia, early feeding). Conspicuously absent from most established ERAS protocols is any formal provision for preoperative psychological assessment or intervention.

- **Psychological Screening**
  PHQ-9, GAD-7, HADS at preoperative clinic visit. Flag scores for referral pathway.
- **Psychological Prehabilitation**
  Brief CBT (2–4 sessions), mindfulness, structured patient education within 4 weeks of surgery.
- **Postoperative Monitoring**
  Repeated distress screening at 48 h, delirium surveillance, early psychology consultation for high-risk patients.

The evidence reviewed here provides the strongest available justification for adding a psychological health pillar to existing ERAS frameworks. The proposed integration would encompass three phases: a preoperative psychological screening phase using validated brief instruments in the prehabilitation clinic; a targeted intervention phase for patients identified as high-risk, incorporating CBT, mindfulness, or education-based protocols; and a postoperative monitoring phase with early psychological support and delirium surveillance for those who received preoperative red-flag ratings [67]. Pharmacological anxiolysis—benzodiazepine premedication—while widely used, is insufficiently targeted to address chronic depression or sustained anxiety and carries its own risks of respiratory depression and delirium; it should complement rather than substitute for psychological prehabilitation in identified high-risk patients [68].

Economic Implications

The economic burden attributable to psychologically mediated adverse surgical outcomes is substantial. Using conservative estimates derived from current inpatient cost data, each additional day of hospital stay in a general surgical patient costs approximately USD 2,500–4,000 in high-income healthcare settings. Across the estimated 300 million major surgical procedures performed globally each year, even a modest 10% attributable fraction of excess LOS driven by untreated preoperative distress would translate into tens of billions of dollars in avoidable healthcare expenditure annually [69].

Against this background, the cost-effectiveness case for routine psychological screening and brief psychological prehabilitation is compelling. PHQ-9 administration costs are negligible. A brief CBT course of four sessions, delivered in

group or digital formats, costs a fraction of the LOS and ICU costs it may prevent. Health technology assessment analyses in cardiothoracic and orthopedic contexts have found psychological prehabilitation interventions to be cost-saving or cost-neutral when modeled across a 12-month post-surgical horizon [70].

Limitations of the Evidence Base

Despite the methodological rigor employed in study selection and quality appraisal, several limitations of the existing evidence base merit acknowledgment. Significant heterogeneity exists across included studies in the choice of psychological assessment instruments, the timing of preoperative assessment relative to surgery, the surgical populations studied, and the definitions of outcome metrics. This heterogeneity limits the precision of pooled estimates and necessitates cautious interpretation [71].

The majority of included studies were observational in design, making it impossible to definitively exclude residual confounding as an explanation for observed associations. Psychological distress frequently co-occurs with other adverse health behaviors—physical inactivity, suboptimal nutrition, smoking, and subtherapeutic adherence to medications—and while most studies attempted to adjust for major confounders, the possibility of residual confounding cannot be eliminated. The relative paucity of randomized controlled trials evaluating the impact of preoperative psychological intervention on hard surgical outcome endpoints remains a significant gap in the literature, limiting causal inferences [72].

CONCLUSION

This systematic review provides compelling and multi-domain evidence that preoperative psychological distress—encompassing anxiety, depression, and perceived stress—constitutes a powerful and independent predictor of adverse surgical outcomes. The associations span postoperative complications, wound healing dynamics, length of hospital stay, pain intensity, opioid consumption, and critical care parameters. The effect magnitudes are clinically meaningful and, in several domains, comparable to or exceeding those of established physiological risk factors that already inform routine surgical risk stratification.

Crucially, psychological distress is a modifiable risk factor. The brief, validated instruments required for its assessment impose minimal burden on preoperative clinic workflows. The interventions demonstrated to attenuate its effects—CBT, mindfulness-based approaches, structured patient education, and appropriate pharmacological anxiolysis—are readily scalable and cost-effective when weighed against the downstream healthcare costs they may avert. The integration of psychological health assessment into ERAS protocols and standard preoperative evaluation represents a natural and evidence-mandated evolution of perioperative care.

The concept of "mind over scalpel" is no longer metaphorical. The pathways from thought to tissue are measurable, the consequences are demonstrable across outcome domains, and the case for action is established. Future research should prioritize high-quality randomized controlled trials of preoperative psychological interventions with hard surgical outcome endpoints, development of surgical-specialty-specific psychological risk stratification tools, and integration of biomarker-based neuroendocrine and immune monitoring into the psychological risk assessment framework [73,74]. Through such efforts, the surgical community can translate the compelling observational evidence reviewed here into a systematic improvement in outcomes for the hundreds of millions of patients who undergo surgery each year.

Future Directions

Several high-priority research directions emerge from this review. First, large-scale multicenter randomized controlled trials are needed to evaluate the efficacy of structured psychological prehabilitation on hard surgical outcome endpoints—specifically complication rates, LOS, and 30-day readmission—rather than surrogate psychological outcomes alone [75]. Second, the development of surgical-specialty-specific predictive models that incorporate psychological variables alongside established physiological risk scores (ASA classification, P-POSSUM, EuroSCORE) would enable more precise, individualized risk stratification. Third, biomarker integration—utilizing preoperative cortisol, IL-6, C-reactive protein, and NK cell functional assays as objective complements to self-report psychological measures—may improve predictive precision and enable physiologically grounded patient selection for psychological intervention [76]. Fourth, the development and validation of digital health platforms delivering evidence-based psychological prehabilitation at scale—through smartphone applications, videoconferencing, and AI-driven chatbot interfaces—represents a particularly promising avenue for extending the reach of these interventions to healthcare systems with limited specialist psychological resources.

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