Asploro Journal of Biomedical and Clinical Case Reports
(ISSN: 2582-0370)
Review Article
DOI: https://doi.org/10.36502/2026/ASJBCCR.6452

Advances in Nursing Research on Emergence Agitation after General Anesthesia

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Received date: 25 May 2026; **Accepted date**: 09 June 2026; **Published date**: 16 June 2026

Citation: Mao R, Hong C. Advances in Nursing Research on Emergence Agitation after General Anesthesia. Asp Biomed Clin Case Rep. 2026 Jun 16;9(2):117-24.

Abstract

Emergence agitation (EA) after general anesthesia is a common complication during anesthesia recovery. Patients often present with symptoms such as disturbance of consciousness, involuntary limb movements, and emotional agitation, which can potentially lead to unplanned extubation, wound bleeding, and hemodynamic fluctuations. These events seriously threaten the postoperative safety of surgical patients and prolong the recovery period [1,2]. Current clinical studies have shown that the pathogenesis of EA is complex and is affected by multiple factors, such as patient characteristics, anesthesia methods, surgical procedures, and nursing interventions. There are also significant differences in the incidence of agitation among patients of different ages and undergoing different surgical procedures [3,4].

This paper selected 30 representative studies from high-quality journal articles published in China over the past five years. It reviewed the current status of emergence agitation (EA), including its risk factors, core nursing interventions, and auxiliary measures, and synthesized the clinical efficacy of different nursing programs, such as predictive nursing, comprehensive nursing, thermal management nursing, and psychological intervention. The advantages and disadvantages of current anesthesia nursing strategies for EA prevention and control were analyzed. Based on clinical anesthesia nursing experience, this paper proposes targeted optimization strategies to improve the nursing prevention and control system for agitation during the recovery period after general anesthesia. The findings of this review are intended to provide a scientific reference for clinical nurses to implement EA prevention and intervention measures, thereby improving the quality of postoperative recovery and ensuring perioperative patient safety [5].

Keywords

General Anesthesia, Emergence Agitation, Anesthesia Care, Risk Factors, Nursing Intervention, Nursing Research

Introduction

With the continuous development of surgical medical technology, general anesthesia has become the mainstream anesthesia method for clinical surgery because of its stable analgesic and sedative effects and wide range of applications. However, during the

anesthesia recovery stage, emergence agitation (EA) is one of the most common complications. Clinical data show that the incidence of EA in adult patients undergoing non-cardiac surgery under general anesthesia can reach 12.6%, and the incidence of pediatric agitation is as high as 18%. The incidence of agitation in patients undergoing inhalational anesthesia even exceeds 30% [6-8]. When agitation occurs, patients may experience dissociation between consciousness and behavior, and limb movements cannot be controlled autonomously. This not only causes problems such as wound dehiscence, drainage tube dislodgement, and sudden elevation of blood pressure, but also increases the difficulty of nursing operations and the risk of adverse medical events [2].

Anesthesia nursing, as a core component of perioperative nursing, runs through the entire process of preoperative evaluation, intraoperative collaboration, and postoperative recovery, and plays a key role in the prevention, identification, and intervention of EA [9,10]. Compared with pharmacological intervention, nursing intervention offers the advantages of being non-invasive, highly safe, widely applicable, and free from drug-related adverse effects or toxicity, making it suitable for special populations such as the elderly, children, and physically frail individuals [5]. At present, domestic research on EA mainly focuses on the analysis of risk factors and the exploration of pharmacological mechanisms. Few review studies have addressed systematic nursing interventions for EA, and there is a lack of integrated comparisons of the effects of different nursing models [2,3]. Based on the existing literature, this paper focuses on the nursing dimension, systematically analyzes the risk factors of EA, summarizes various nursing intervention measures, and proposes optimization strategies based on challenges encountered in clinical practice, so as to provide theoretical support for the standardized and refined development of anesthesia nursing.

Overview of Emergence Agitation

Definition and Clinical Manifestations:

Emergence agitation (EA) during the recovery period after general anesthesia refers to a pathological state of temporary psychomotor agitation and perceptual disturbance caused by the incomplete recovery of central nervous system function during the early stage of anesthetic drug metabolism, which belongs to a reversible disturbance of consciousness [2]. Typical clinical manifestations include irregular limb movements, emotional irritability, crying and restlessness, incoherent speech, and disorientation. Some patients may also experience hallucinations and resistance to nursing procedures. Patients with severe agitation may exhibit intense struggling and muscle rigidity, which can lead to hemodynamic abnormalities such as tachycardia and elevated blood pressure [1]. According to the severity of agitation, it can be classified as mild, moderate, or severe. Mild agitation is characterized only by slight limb shaking; moderate agitation presents as frequent restlessness and emotional anxiety; and severe agitation is characterized by intense struggling and aggressive behavior, carrying the highest risk of adverse events [3].

Characteristics and Hazards of the Disease:

The onset of EA is sudden and transient. It mostly occurs within 30 minutes before or after extubation, and the duration is usually 5-15 minutes. In a few patients, it may continue for up to 1 hour after awakening [3]. From the perspective of population distribution, children, elderly individuals, and male patients are high-risk groups [1,5,6]. From the perspective of anesthesia, the incidence of agitation associated with inhalational anesthetics such as desflurane and sevoflurane is significantly higher than that associated with propofol-based total intravenous anesthesia [7,8]. From the perspective of surgical type, patients undergoing laparoscopic, abdominal, shoulder arthroscopic, and interventional procedures have a higher risk of agitation [4,11].

The clinical consequences of EA should not be overlooked. For patients, agitation can easily lead to secondary bleeding of surgical wounds, incision dehiscence, dislodgement of indwelling catheters and drainage tubes, and complications such as increased pain, hypoxemia, and shivering. For medical staff, agitation interferes with vital sign monitoring, extubation, and other clinical procedures, thereby increasing the nursing workload. For hospitals, agitation may increase the likelihood of medical disputes and reduce patient satisfaction [1,10]. Relevant

studies have confirmed that the incidence of postoperative infection and prolonged hospitalization in patients with untreated agitation is 2-3 times higher than that in patients with normal recovery [12].

Evaluation Criteria:

Current clinical assessment tools for agitation include the Richmond Agitation-Sedation Scale (RASS), the RASS Sedation Scale, and the Steward Awakening Scale. Among them, the Richmond Scale is mostly used for the evaluation of patients undergoing shoulder arthroscopy and orthopedic surgery. The RASS scale is suitable for laparoscopic minimally invasive surgery, whereas the Steward scale can comprehensively assess a patient's level of consciousness, reflexes, and limb activity [11]. Standardized assessment is the prerequisite for nursing intervention. Clinically, anesthesiologists are required to complete agitation risk assessments every 5-10 minutes after the patient enters the recovery room in order to accurately identify high-risk patients [9].

Analysis of Risk Factors for Emergence Agitation During General Anesthesia

Combined with the data from the 30 studies included in this review, which used methods such as meta-analysis and retrospective analysis, the risk factors for EA can be divided into four categories: patient-related factors, anesthesia-related factors, surgery-related factors, and nursing/environmental factors. These factors may interact with one another and collectively contribute to the occurrence of agitation [1,3].

Patient-Related Factors:

Patient-related factors are the fundamental risk factors for EA and are also key components of nursing assessment. Demographic characteristics: Multiple meta-analyses have shown that the incidence of EA is significantly higher in male patients than in female patients. Elderly patients (≥65 years) and preschool children (2-5 years) are high-risk groups. Male sex and advanced age are independent risk factors for EA [1,5,6]. Basic diseases: Patients with hypertension, diabetes, and obesity have reduced metabolic capacity, slower metabolism of anesthetic drugs, and an increased risk of agitation. The risk of agitation in diabetic patients is 2.869 times that of non-diabetic patients [1]. Psychological status: Patients with negative emotions such as anxiety, depression, and fear before surgery exhibit increased sympathetic nervous system activity during recovery, resulting in a significantly increased incidence of agitation. The OR value for agitation risk in patients with preoperative anxiety was 2.770 [12]. Physiological indicators: Patients with elevated preoperative white blood cell counts, low serum albumin levels, and intraoperative hypothermia exhibit stronger stress responses and are more prone to agitation [13]. Lifestyle habits: Long-term smoking and alcohol consumption increase nervous system sensitivity, leading to dysregulation during anesthesia recovery and a higher probability of agitation [14].

General Anesthesia Recovery Period Agitation Nursing Intervention Measures

Among the 30 articles included in this study, 22 focused on nursing intervention studies, confirming that nursing intervention is the core approach to reducing the incidence and severity of EA [15-17]. Combined with clinical application models, nursing measures are divided into three categories: predictive nursing, comprehensive nursing, and special symptomatic nursing. The clinical applicability of these nursing measures varies, and their effects differ significantly.

Predictive Nursing InterventionI:

Predictive nursing is an active nursing model with risk assessment as its core, in which prevention and control plans are formulated before, during, and after surgery. It is also the most widely used nursing method for the clinical prevention and control of EA and is suitable for various types of patients undergoing general anesthesia [16-18].

Preoperative intervention: Nursing staff complete patient visits one day before surgery, screen high-risk groups such as elderly patients, males, patients with diabetes, and those with preoperative anxiety, and establish high-risk records. Psychological interviews and health education are provided to explain the anesthesia process and precautions during recovery, thereby alleviating patients' unfamiliarity and fear. Studies have shown that preoperative psychological intervention can reduce the incidence of agitation by more than 10% [12]. At the same time, preoperative

preparation is optimized, and fasting duration is reasonably controlled to avoid agitation caused by preoperative hypoglycemia.

Intraoperative intervention: The operating room temperature is strictly controlled, a constant-temperature environment is maintained, limb fixation and thermal protection are ensured, and hypothermia-related stimulation is avoided. Nursing staff cooperate with anesthesiologists to accurately control the dosage of anesthetic drugs and reduce the use of irritating anesthetic agents. Urinary catheterization and drainage tube placement are performed gently to reduce mucosal injury.

Postoperative recovery intervention: After patients are transferred to the recovery room, heart rate, blood pressure, and oxygen saturation are continuously monitored, and the risk of agitation is dynamically evaluated. Oral secretions are removed before extubation to reduce airway irritation, and extubation may be delayed in high-risk patients. Protective measures are prepared in advance to prevent adverse events caused by agitation.

Several controlled trials have confirmed the effectiveness of predictive nursing intervention. According to a study conducted at Houjie Hospital, the incidence of agitation in the predictive nursing group was 13.33%, which was significantly lower than that in the routine nursing group (30.0%) [16]. In abdominal surgery studies, the incidence of agitation in the predictive nursing group was only 2.50%, and the incidence of complications decreased significantly [17]. In gynecological laparoscopic surgery, predictive nursing reduced the incidence of agitation from 30.00% to 12.00%, and fluctuations in vital signs were significantly reduced [19,20]. The advantage of this nursing model is that it avoids controllable risks in advance and reduces the incidence of agitation, making it suitable for widespread clinical application as a basic nursing strategy.

Comprehensive Nursing Intervention:

Comprehensive nursing is an all-round nursing model that integrates psychological, physiological, environmental, and pain management nursing. It focuses on improving the overall comfort of patients during the recovery period and is mostly used for patients with a moderate risk of agitation and multiple underlying diseases [21,22].

Psychological nursing: Patients often have unclear consciousness during the recovery period. Nursing staff communicate in a gentle tone, softly call the patient's name, provide verbal reassurance, and alleviate panic caused by disturbances of consciousness. Psychological status is continuously monitored within 24 hours after surgery to reduce residual negative emotions.

Pain nursing: An individualized analgesic plan is developed according to the degree of surgical trauma, and analgesic pumps are appropriately used after surgery. Analgesic intervention is provided in advance for patients with high pain sensitivity to reduce incision-related pain stimulation.

Environmental nursing: The recovery room environment is optimized by maintaining a temperature of 22-25°C and humidity of 50%-60%, reducing strong light exposure, minimizing equipment noise, and creating a quiet and comfortable recovery environment.

Life care: Sweat and secretions are cleaned promptly, the skin is kept dry, and the limbs are positioned gently to avoid discomfort caused by prolonged compression.

Clinical data indicate that comprehensive nursing can significantly improve the psychological status of patients and reduce the incidence of agitation. In one study involving 128 patients undergoing general anesthesia, the incidence of agitation in the comprehensive nursing group was significantly lower than that in the routine nursing group. Anxiety and depression scores were significantly reduced, and the incidence of adverse events decreased by more than 15% [22]. Another study involving 100 patients showed that the incidence of agitation in the comprehensive nursing group was 6.00%, which was much lower than that in the control group (24.00%), and the recovery time of consciousness was significantly shortened [22]. Comprehensive nursing addresses both physiological and psychological needs and is particularly suitable for

middle-aged and elderly surgical patients with psychological anxiety.

Special Symptomatic Nursing Intervention:

Special symptomatic nursing involves targeted interventions based on the causes of agitation, focusing on factors such as hypothermia, catheter-related stimulation, and pain, thereby addressing key clinical challenges.

Thermal management nursing: Intraoperative warming blankets and fluid warming devices are used to prevent hypothermia. In the recovery room, body temperature is continuously monitored to maintain thermal stability. Studies of shoulder arthroscopic surgery have confirmed that hypothermia is an independent risk factor for agitation, and thermal management nursing can reduce the incidence of agitation by 42% [11].

Catheter-related nursing: The fixation of urinary catheters and drainage tubes is optimized to prevent traction. Lidocaine mucilage is applied to urinary catheters to reduce mucosal irritation, and balloon inflation volume is controlled at 8-10 mL to reduce bladder spasms. During extubation, procedures are performed gently, and secretions are gradually removed to minimize airway stimulation.

Agitation emergency nursing: Patients with mild agitation are managed with verbal reassurance and gentle limb patting. Patients with moderate agitation receive protective fixation using soft restraints to prevent excessive limb movement. Patients with severe agitation require timely administration of sedative medications in cooperation with anesthesiologists. Vital signs are continuously monitored throughout the process, and skin protection is provided during restraint to prevent pressure injuries and abrasions [10].

Nursing Auxiliary Intervention Measures

In addition to routine nursing interventions, pharmacological assistance, non-pharmacological assistance, and information-based risk prediction methods can complement nursing practice, further optimize the prevention and control of EA, establish a diversified intervention system, and improve nursing precision [13,14,23].

Pharmacological-Assisted Nursing:

Nursing staff should be familiar with the pharmacological characteristics of anti-agitation drugs and cooperate with anesthesiologists in medication management. Dexmedetomidine and remifentanil are commonly used protective agents. Dexmedetomidine stabilizes hemodynamics and inhibits neural excitation. In gynecological laparoscopic surgery, its use can reduce agitation scores to 1.04 ± 0.25 while protecting cognitive function [14]. Remifentanil reduces agitation and shortens recovery time by regulating neuroimmune pathways [13]. Propofol provides stable sedation with a very low incidence of agitation and is suitable for physically frail patients [8]. During nursing care, drug dosage and infusion rates should be strictly controlled, and respiratory and hemodynamic parameters should be closely monitored to avoid adverse drug reactions [24].

Non-Pharmacological Adjuvant Intervention:

Non-pharmacological interventions are non-invasive and safe and are mostly used in children and special populations who cannot tolerate medications. Existing studies have confirmed that parental companionship, recorded maternal voices, video communication, white-noise therapy, and visual distraction can alleviate fear during recovery and reduce the incidence of agitation in children [23]. Interventions such as preoperative fluid intake, blindfold-assisted nursing, and audiovisual rehearsal can reduce adverse external stimuli and improve the recovery experience. These interventions are simple to implement, require no additional medical consumables, and are suitable for promotion in primary healthcare institutions. They also represent an important future direction for humanized anesthesia nursing [6].

Risk Prediction Model-Assisted Nursing:

Risk prediction models enable early prediction of agitation and optimize the allocation of nursing resources. A Logistic regression-based EA risk prediction model incorporated risk factors such as sex, age, type of surgery, and indwelling catheterization.

The area under the ROC curve reached 0.842, demonstrating good sensitivity and specificity [25]. Nursing staff can use such models to rapidly identify high-risk patients, increase monitoring frequency for high-risk groups, strengthen nursing interventions, simplify nursing procedures for low-risk groups, improve nursing efficiency, and achieve precision nursing care.

Summary

This article systematically reviews the risk factors, nursing interventions, and auxiliary interventions for EA by summarizing the literature on agitation during recovery from general anesthesia. Studies have confirmed that agitation during the recovery period after general anesthesia is induced by multiple factors, including patient-related factors, anesthesia-related factors, surgical factors, and environmental factors. Male sex, advanced age, inhalational anesthesia, intraoperative hypothermia, preoperative anxiety, and catheter-related stimulation are the core risk factors [1,3,8]. Nursing intervention is the safest and most effective means of preventing and controlling EA. Among these interventions, predictive nursing has the best preventive and control effect and can reduce the incidence of agitation at its source. Comprehensive nursing addresses both physical and psychological needs and improves the quality of patient recovery. Special symptomatic nursing accurately targets the underlying causes and reduces the severity of agitation. Auxiliary measures such as pharmacological interventions, non-pharmacological interventions, and predictive models further improve the nursing intervention system [16,17,22]. Clinical data show that standardized nursing interventions can reduce the incidence of agitation from 25%-36% to less than 20%, stabilize hemodynamics, shorten recovery time, reduce the incidence of postoperative complications, and improve patient satisfaction with nursing care [17,26].

Combined with clinical nursing experience, it is considered that the prevention and control of EA in anesthesia nursing should follow the principle of "prevention first, precise intervention, and whole-process management." This includes preoperative risk screening and psychological counseling, intraoperative strengthening of thermal protection, catheter management, and anesthesia-related nursing care, as well as dynamic assessment and rapid management of agitation during the postoperative recovery stage, thereby forming an integrated perioperative nursing model [10,15]. At the same time, population differences should be considered. For children, emphasis should be placed on humanistic care and distraction techniques. For elderly patients, emphasis should be placed on the control of underlying diseases and thermal protection. For male patients and high-risk groups with diabetes, enhanced monitoring should be implemented to achieve individualized nursing care [5,6].

At present, there are still many deficiencies in the prevention and control of EA in domestic anesthesia nursing: (1) the nursing process is not standardized, and most hospitals have not established standardized nursing protocols for the prevention and control of agitation, resulting in differences in intervention methods among healthcare personnel; (2) management of high-risk groups remains insufficient, especially among children and elderly patients.

In view of these existing problems, and in combination with current industry development trends, future research may be carried out in the following directions: (1) standardize nursing procedures by formulating unified guidelines for the prevention and control of agitation during the recovery period, clarifying standards for preoperative assessment, intraoperative protection, and postoperative intervention, and promoting the standardized development of nursing practice; (2) establish differentiated nursing standards according to age, surgical type, and underlying diseases, and improve specialized nursing procedures for children, elderly patients, and other high-risk populations; (3) promote information-based tools, including risk prediction models and intelligent monitoring equipment, to achieve automatic early warning and dynamic monitoring of agitation and improve nursing precision; (4) further develop humanistic nursing by introducing non-pharmacological approaches such as white-noise therapy, family companionship, and audiovisual interventions to reduce patient anxiety and improve the recovery experience; (5) strengthen the training of healthcare professionals, improve the ability of

anesthesia nurses to identify and manage agitation, standardize procedures related to restraint, medication administration, and extubation, and reduce nursing-related adverse events; and (6) conduct multicenter evidence-based studies integrating data from different regions and hospital levels to optimize nursing intervention programs and improve the generalizability of intervention measures [3,23,24].

In summary, the prevention and control of agitation during the recovery period after general anesthesia depends on systematic, refined, and humanized anesthesia nursing care. In the future, it will be necessary to continuously optimize nursing intervention models, integrate medical technology with nursing services, further improve the EA prevention and control system, minimize the incidence of agitation, ensure patient safety during the perioperative period, and promote the high-quality development of anesthesia nursing practice [2,27].

Conflict of Interest

The authors have read and approved the final version of the manuscript, and the authors declares no conflicts of interest.

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Keywords: General Anesthesia, Emergence Agitation, Anesthesia Care, Risk Factors, Nursing Intervention, Nursing Research