

# Application Status of Enhanced Recovery After Surgery in Perioperative Nursing of Neurosurgery

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**Abstract:** Enhanced recovery after surgery (ERAS) is a strategy of perioperative management aimed to accelerate the rehabilitation of patients through various optimized perioperative managements as well as ongoing adherence to a patient-focused, multidisciplinary, and multimodal approach. ERAS is a good reflection of the perioperative value-based care, which has been widely applied in many surgical fields and shown quick recovery and low morbidity when applied on patients. However, there is a lack of attention on ERAS in neurosurgery. This review aims to describe the current application status of ERAS in neurosurgery and to provide readers with the commonly accepted principles in the perioperative nursing of neurosurgery.

**Keywords:** Application status; Enhanced recovery after surgery; Neurosurgery; Nursing

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## 1. Introduction

Enhanced recovery after surgery (ERAS), which is proposed based on multidisciplinary collaboration, with a view to ensuring the safety of patients, and making patients recover quickly by improving and applying effective diagnosis and nursing measures. ERAS, as a new concept, has been widely applied in many surgical perioperative fields, and it has achieved remarkable effects. Moreover, some corresponding clinical guidelines and protocols have also been developed and implemented successively [1-3]. In fact, the risk of neurosurgery is higher than in other surgeries, and the disability and mortality are higher. Therefore, it is of great necessity for patients to receive scientific and systematic nursing intervention during the perioperative period. ERAS adopts a series of optimized perioperative managements that have been verified to be effective by evidence-based medicine, which is currently quite popular in clinical practice. According to previous studies, the perioperative application of ERAS in neurosurgery is safe and effective [4], which accelerates the postoperative rehabilitation process of patients. This paper summarizes the current situation about the application of ERAS in perioperative nursing of neurosurgery, thus providing commonly accepted principles for the nursing work in neurosurgery.

## 2. Application of ERAS in clinical practice

### 2.1. Proposal and development of ERAS

The concept of ERAS was originally proposed in 2001 by the Danish surgical professor, Henrik Kehlet, also known as the father of ERAS [5]. Subsequently, this new concept and new strategy were gradually recognized and accepted in the clinical practice. In 2001, the collaboration group of "enhanced recovery

after surgery” was firstly set up in Europe. In 2005, a unified ERAS program was put forward by the European Society of Parenteral and Enteral Nutrition (ESPEN) [6]. In 2007, the ERAS concept was introduced into China and applied in the perioperative period of colorectal cancer. At present, ERAS is extensively used in various surgical operations including gastrointestinal surgery, urology, orthopedics, cardiac surgery, and gynecology. As confirmed by related studies, ERAS can reduce stress reaction, relieve surgical trauma, shorten the length of hospital stay, lower medical expenses, accelerate patient rehabilitation, improve medical care technology and service quality, and improve patients’ satisfaction [7-9].

Due to the fact that ERAS is applied throughout the whole process of surgical perioperative period, it is essential to establish a multidisciplinary team (MDT) so as to better implement the ERAS strategy. MDT is an expert group composed of professionals from multiple disciplines. Through the concept of patient-focused service, the team jointly develops a standardized, scientific, individualized, and continuous comprehensive treatment and nursing plan for patients. At the same time, all of the members in this team work together to ensure the implementation of the plan, which is also called the multidisciplinary diagnosis and treatment model [10]. The most important idea of ERAS under MDT is to abandon the conventional single discipline diagnosis and treatment, to establish a bridge for multidisciplinary cooperation and communication, and focus more on the integrity of ERAS implementing process and the coordination between disciplines. MDT-ERAS model, as a new direction for medical development, is focused on patients and involves personnel from multiple related disciplines. In comparison to the single discipline diagnosis and treatment, the MDT model can evaluate the patient’s condition, and make diagnosis and scientific treatment more comprehensively. Under this condition, patients are able to get comprehensive and professional medical care services, so that patient’s satisfaction can be improved [11]. Nursing personnel refers to the participants in the whole process of MDT. As an important implementer of the MDT team, they not only play an important role in communication and coordination among multiple disciplines, but also make a considerable contribution to the development of ERAS.

## **2.2. The role of nursing personnel in ERAS**

Nursing personnel are not only decision-makers and organizers, but also executors and coordinators in ERAS, so that their role is irreplaceable. Among the 20 items summarized in the consensus guidelines for ERAS after gastrectomy, 5 items were completed by nurses independently, and 3 items were completed by nurses in collaboration with multidisciplinary personnel [12]. Apart from that, nurses play a key role in the projects requiring clinical observation and statistics.

Some countries that carry out the ERAS program, such as Australia and Canada, tend to offer special ERAS courses. In addition, nurses need to pass special training courses to obtain the ERAS specialized qualification. It is noteworthy that only nurses with specialized qualifications can implement ERAS nursing measures for patients [13]. ERAS nurses are more closely related to patients compared with other nurses, probably because ERAS nurses master specialized knowledge and skills, which can not only promote the postoperative physical and mental recovery of patients, but also improve their satisfaction [14]. The focus of ERAS should be on the education of related knowledge about patients’ nursing and health guidance [15]. Besides, the work of nurses in the ERAS is focused on the guidance of health knowledge, the prevention of complications, personalized psychological intervention, preparation before discharge from hospital and out-of-hospital follow-up [16].

The ERAS concept is featured by the optimal combination of evidences based on “evidence-based medicine,” but traditional nursing concepts and measures are often inconsistent with it. Therefore, nurses are required to have the determination to break the fixed thinking pattern, to get rid of certain habits and practices, and also to have certain scientific research ability, evidence-based thinking, and professional skills, so as to better play their role in the ERAS program.

### **3. Application of ERAS in perioperative nursing of neurosurgery**

The core projects and measures of the ERAS concept include positive preoperative preparation, preoperative nutrition support, intraoperative optimization of anesthesia, reasonable postoperative analgesia, early activity and eating in postoperative period, and early removal of the drainage tube. It has been proved that all of these measures are safe and effective in the ERAS of neurosurgery <sup>[4]</sup>. With the continuous updating of the nursing concept, nursing personnel should practice the belief of innovation and development to improve themselves, and pay attention to the interpretation and learning of new concepts, in order to make common progress in the overall environment of development.

#### **3.1. ERAS in preoperative nursing**

##### **3.1.1. Psychological evaluation and health guidance**

Nurses play an irreplaceable role in the psychological guidance and health education for patients. Beyond that, the level of professionalism of nurses determines their influence on patients' psychological activities. Due to the higher risk of neurosurgery as well as the involvement of important tissues and nerves, most patients have fears and doubts about the surgery. It is worth mentioning that the psychological status of patients directly influences the early postoperative recovery process. ERAS is focused on timely evaluation and guidance of patients' psychological conditions. Through conducting individualized psychological guidance and various forms of health knowledge education, the patients' preoperative anxiety, depression, fear and other negative psychological conditions can be improved, thereby further reducing the incidence of intraoperative risk and postoperative complications <sup>[17]</sup>.

##### **3.1.2. Preoperative nutritional support**

Arranging specialized nutritionists according to the nutritional status of patients before surgery to offer individualized nutritional intervention and support can improve the patients' immunity, thus improving the prognosis and reducing the incidence of postoperative complications.

#### **3.2. ERAS in intraoperative nursing**

##### **3.2.1. Body temperature management**

Hypothermia is one of the common intraoperative complications during surgical procedures. In addition, neurosurgery is difficult and time-consuming. The longer the operation is, the higher the incidence of hypothermia will be <sup>[18]</sup>. Moreover, the disorder of temperature regulation center induced by anesthesia, intravenous infusion without heating measures, low temperature in the operating room, too few drapes, etc. tend to cause a large discharge of the patient's body heat, thereby leading to intraoperative hypothermia. Patients with intraoperative hypothermia will experience chills, and it is easy to induce stress reaction during the rewarming process, which increases the metabolic rate and the burden of the cardiovascular system, thus increasing the occurrence of various complications in the perioperative process. Indeed, the ERAS concept advocates reducing unnecessary body exposure during intraoperative process, covering insulation blanket, padding heating blanket, adjusting the temperature of operating room to 25°C, heating the infusion liquid to 26°C, monitoring the body temperature changes closely, etc., so as to reduce or avoid intraoperative hypothermia and decrease the body's stress reaction to hypothermia <sup>[4]</sup>.

##### **3.2.2. Infusion and circulation system management**

Excessive infusion during the operation will lead to the circulatory overload of body, aggravate the burden on the heart and lung, and delay the recovery of gastrointestinal function, which will impede the early postoperative recovery. ERAS concept advocates the "goal-directed fluid therapy, and the goal of infusion management under ERAS concept is to minimize the change of body fluid volume. However, insufficient

body fluid volume may lead to hypoperfusion and body dysfunction, and water-sodium retention will lead to complications such as enteroparalysis. Therefore, it is essential to maintain the balance of water inflow and outflow during operation, in order to avoid postoperative cardiopulmonary complications triggered by excessive or insufficient body fluid volume.

### **3.3. ERAS in postoperative nursing**

#### **3.3.1. Postoperative analgesia**

Postoperative patients of neurosurgery tend to suffer from pain at the incision or headache caused by postoperative brain edema, which leads to poor spirit, less activity, loss of appetite, and reluctance to get out of bed in early stage. Consequently, the postoperative recovery process will be affected. The most basic measure of ERAS is the multimodal analgesia. The anesthetist, who can provide minimally invasive anesthesia and optimized analgesia technology and cooperate with surgeons, nurses and rehabilitation specialists to reduce the incidence of postoperative complications and postoperative pain degree, plays a crucial role in accelerating the recovery of patients <sup>[19]</sup>.

#### **3.3.2. Early mobilization and removal of drainage tube**

The incidence of surgical postoperative urinary tract infection is positively associated with the indwelling time of catheter. In addition, the indwelling time of subcutaneous drainage tube, surgical cavity drainage tube, urinary tube and other drainage tubes after surgery could also indirectly affect the patients' mobilization time. Therefore, when conditions allow, early removal is advocated, in order to create prerequisites for early mobilization. According to some studies, postoperative early mobilization can accelerate the recovery of gastrointestinal function, and reduce or lessen brain edema, stress gastrointestinal reaction, hypostatic pneumonia, and deep vein thrombosis caused by prolonged bed rest, thereby promoting postoperative recovery rapidly <sup>[20]</sup>.

#### **3.3.3. Early oral feeding**

One of the important measures to enhance recovery after surgery is postoperative early oral feeding and drinking. General anesthesia is often used in neurosurgery. As indicated by relevant studies, 4 hours after the operation of non-gastrointestinal general anesthesia, patients can drink water and take liquid diet appropriately when they are fully conscious. Early feeding can promote intestinal peristalsis, shorten the anal exsufflation time, reduce insulin resistance, promote immune function recovery, and reduce intracranial infection, surgical incision infection, electrolyte metabolic disorder, stress ulcer and other complications induced by intestinal nutrition deficiency.

### **4. Summary and prospect**

In terms of the ERAS in perioperative nursing of neurosurgery, practices have verified that this model effectively accelerates the process of postoperative recovery of patients, which has great advantages in comparison to the traditional nursing. Although the achievements of ERAS in multiple surgical fields have preliminarily formed consensus and corresponding guidelines of clinical consensus are issued, there is still a lack of guidance from nursing experts as clinical research literature, with only a small sample size in other surgical fields, such as orthopedics and otolaryngology. Thus, it is urgent to issue consensus and guidelines in more fields in order to provide theoretical basis and guidance for the application of ERAS.

Research has confirmed that a single-model or a single-discipline team can no longer meet the growing needs of patients for health. The development of nursing practice and policy requires training nurses with professional qualities and expertise to engage in ERAS nursing and building a nurse-led multidisciplinary cooperative nursing team <sup>[21]</sup>. As for future research, it is important to build a multidisciplinary team for

perioperative recovery and nursing of single diseases, and form a set of efficient, optimized, complete, and practical nursing measure system under the guidance of the ERAS concept to optimize the perioperative nursing experience of neurosurgery patients.

### Disclosure statement

The authors declare no conflict of interest.

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