Optimizing Perioperative Care for Elderly Surgical Patients: A Review of Strategies and Evidence-Based Practices

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ABSTRACT

Thailand has transitioned into an aging society characterized by a notable demographic shift toward senior citizens. This demographic trend underscores the imperative of addressing age-related challenges. The aging process accounts for the progressive deterioration of physical and cognitive functions, often necessitating medical interventions such as medications or surgical procedures. As the elderly population continues to grow, prioritizing strategies to enhance quality of life and mitigate the onset of physical and cognitive impairments becomes increasingly crucial. Prudent patient care is paramount due to the heightened vulnerability of elderly patients and the elevated risk of adverse health outcomes. This review aimed to examine perioperative evaluation and optimization strategies tailored specifically for elderly individuals scheduled for surgery. Special emphasis was placed on preserving postoperative functional capacity and cognitive acuity among this group of patients.

Keywords: Elderly; perioperative; assessment; cognitive function; enhanced recovery after surgery (ERAS) (Siriraj Med J 2024; 76: 465-472)

INTRODUCTION

The global population is experiencing a rapid demographic transition characterized by a notable increase in the elderly population, particularly in the Asia-Pacific region. Thailand is one of the world's leaders in population growth. As of 2023, the proportion of senior citizens in Thailand has surged to 18%, indicating that the nation is a completely aged society. Projections suggest that the proportion will increase to 28% within the next decade, further solidifying Thailand's status as a superaged society.[1-3]

Aging, a natural process marked by a decline in both physical and cognitive capabilities, often precipitates chronic illnesses and mortality. Not only do elderly people experience several physical comorbidities, but they also develop cognitive decline, which affects disease progression and worsens quality of life. Notably, approximately 50% of elderly individuals require surgical interventions.[4] In caring for geriatric patients, managing perioperative procedures demands a comprehensive and multifaceted approach. This complex framework encompasses geriatricians, surgeons, anesthesiologists, and other medical personnel who collaborate synergistically to achieve optimal outcomes. Recommendations advocate for a multidisciplinary framework wherein experts from diverse specialties collaborate to implement a holistic patient preparation and optimization strategy. Furthermore, the adoption of enhanced recovery after surgery (ERAS) protocols has emerged as a promising trend for ensuring expeditious recovery and favorable outcomes, particularly among the geriatric population.

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This review aimed to provide insight into perioperative management strategies tailored for elderly patients undergoing surgical interventions, specifically focusing on preserving cognitive function by implementing ERAS principles.

Preoperative geriatric evaluation and preparation

The elderly population is frequently affected by ≥ 2 chronic conditions, including cardiovascular diseases, respiratory diseases, neurological disorders, metabolic syndromes, or cancer. This convergence of multiple health issues results in a state of multimorbidity, leading to adverse outcomes, including mortality.[5] Moreover, the cumulative decline in physiological systems among elderly people is referred to as frailty, characterized by a loss of bodily homeostasis in response to stressors. Recognized risk factors for frailty include advanced age, low body weight, female sex, social isolation, sedentary lifestyle, smoking, alcohol consumption, malnutrition, and preexisting medical conditions such as diabetes, depression, and cognitive impairment. The most prevalent adverse consequences of frailty are delirium, falls, and functional disability.[6,7]

Comprehensive Geriatric Assessment instrument

The Comprehensive Geriatric Assessment (CGA) instrument is a preoperative assessment and optimization tool devised by geriatricians to facilitate the collection of information related to the health status and functional capacity of elderly patients. The use of the instrument before surgical intervention enables clinicians to gain insight into a patient's condition, thereby aiding in the prevention or appropriate management of potential complications.[8] The components of CGA are outlined in Table 1.[9-29]

Frailty

The components evaluated in the CGA help determine the extent of frailty. Conducting the CGA before surgery provides physicians with valuable information about the causes and aspects of frailty that can be modified. Early detection of frailty prompts strategic interventions to mitigate and prevent adverse outcomes. Examples of such interventions include providing high-intensity exercise training and improving nutrition. The criteria for screening frailty are detailed in Table 2.[30-36]

Brain health initiatives for elderly patients

Abnormal neurological conditions are frequently observed in aging populations. Aging involves the accumulation of damage to various organ systems within the body. Brain aging manifests as a decline in cognition, social skills, and motor performance due to physical changes in the brain, including global atrophy, cortical thinning, and white matter hyperintensity.[37-39] Accelerated brain aging occurs when compensatory mechanisms for repairing brain damage fall below a certain threshold, resulting in reduced cognitive function.[40] Preoperative lifestyle modifications may help delay cognitive deterioration and improve brain function following surgery.

The maintenance of brain health integrity involves three essential approaches[38]:

1. Optimizing modifiable risk factors for brain functional deterioration by avoiding hypertension and hyperlipidemia, abstaining from smoking, ensuring adequate sleep, consuming a healthy diet, maintaining normal blood sugar levels, and engaging in regular exercise to control body weight.
2. Boosting resistance to brain damage by promoting cardiovascular fitness to maintain the neurovascular coupling process and to ensure an adequate oxygen, energy, and nutrient supply to the brain.
3. Supporting brain function strength despite varying degrees of brain damage by enhancing brain activities through neural network connections, which can be facilitated by maintaining a good living environment, preserving healthy cardiovascular conditions, and fostering good mental health.

Additionally, several supplementary approaches can be employed to promote brain health, including engaging in educational or intellectually stimulating activities, participating in cognitive stimulation exercises, engaging in social interaction, and obtaining 7-8 hours of sleep per 24-hour period.[41,42]

Appropriate nutrition is another crucial aspect to consider in a brain health initiative. Various dietary patterns have been proposed to provide essential nutrients for optimal cognitive performance. One such pattern is the Mediterranean diet, which emphasizes a high intake of monounsaturated fats, vegetables, fruits, plant-based proteins, and fish. Research has shown that adhering to a Mediterranean diet can reduce the risk of developing Alzheimer's disease by up to 20%.[43] The Nordic and Okinawan diets are other dietary approaches that promote brain health. The Nordic diet involves the consumption of fish oil along with a diverse array of meats. On the other hand, the Okinawan diet emphasizes the moderate consumption of yellow-orange-green fruits and vegetables. Studies have indicated that adherence to the Nordic diet improves cognitive function compared to baseline levels, while the Okinawan diet helps reduce the risk of ischemic heart and cerebrovascular events.[44,45]

TABLE 1. Components of the Comprehensive Geriatric Assessment (CGA) instrument.[9-29]

Item evaluated	Tools	Details and scoring
Comorbidities	Charlson Comorbidity Index (CCI)[9]	-19 items related to medical conditions such as congestive heart failure, dementia, diabetes, tumor, etc. - Predicting 10-year survival - Scores range from 0 to 37, with 0 reflecting 98% survival while ≥ 7 indicates 0% survival.
	Cumulative Illness Rating Scale (CIRS)[10]	- 14 items related to different organ systems. - Assessment of medical and psychiatric impairment in the elderly. - Scores range from 0 to 56, with higher score indicating greater severity.
Polypharmacy	Number of medications[11]	- > 4 types of medications define polypharmacy. - ≥ 10 types of medications are considered hyper-polypharmacy.
Functional status	Barthel Index for Activities of Daily Living (ADL)[12]	- 10 items assessing the capacity to perform routine activities, ranging from very independent to very dependent requiring assistance. - A score of ≥ 80 indicates physical independence.
	Lawton Instrumental Activities of Daily Living Scale (IADL)[13]	- 8 items with scores ranging from 0 to 8, reflecting low to high functioning. - The higher the score, the greater the ability to perform the activities.
Cognition	Mini Mental State Examination (MMSE)[14,15]	- A 30-point test for measuring cognitive impairment. - A score < 24 indicates cognitive impairment.
	Montreal Cognitive Assessment (MoCA)[16,17]	- A 30-point test where a score < 25 indicates cognitive impairment.
Depression	Geriatric Depression Scale (GDS)[18]	- A 15-item test with a score ≥ 6 indicating depression. The higher the score, the higher the degree of depression.
Nutrition	Mini Nutritional Assessment (MNA)[19]	- 18 questions with a maximum score of 30. - A score ≥ 24 indicates adequate nutritional status.
Falls	Morse Fall Scale[20]	- Scores range from 0 to 125. A score ≤ 20 indicates low or no risk of falls.
	Timed Up and Go Test (TUGT)[21]	- TUGT ≥ 13.5 seconds indicates a greater risk of falls.
Pain	Numerical Rating Scale (NRS)[22]	- A scale from 0 (no pain) to 10 (worst pain). (mild pain: 1-3, moderate: 4-7, and severe 8-10)
	Visual Analogue Scale (VAS)[23]	- A 100 mm blank line denoted as no pain on the left and worst possible pain on the right. (mild pain: 2-17 mm, moderate: 17-47 mm, severe: 47-77mm, and very severe: > 77 mm)
Fatigue	Brief Fatigue Inventory (BFI)[24]	- Assessment of the severity and impact of fatigue. - Scores range from level 1 to 10. Levels ≥ 4 suggest a requirement for intervention.

TABLE 1. Components of the Comprehensive Geriatric Assessment (CGA) instrument.[9-29] (continue)

Item evaluated	Tools	Details and scoring
Social support	Medical Outcomes Study Social Support Scale (MOS-SSS)[25]	- A 19-item self-administered questionnaire. - Higher scores indicate more support.
Delirium	Confusion Assessment Method (CAM)[26] 4 "A"s test (4AT)[27] Nursing Delirium Screening Scale (Nu-DESC)[28,29]	- 4 cardinal features for delirium detection. - Features 1, 2, and 3 or 4 identify delirium. - 4 items with scores ranging from 0 to 12. - A score ≥ 4 suggests delirium. - A 5-item test with scores ranging from 0 to 10. Addition of backward digit count from 30 to 1 helps improve sensitivity. - A score ≥ 2 suggests delirium.

TABLE 2. Assessment of frailty.[30-36]

Test	Components	Scoring
Fried Frailty Index[30]	Slowed walking speed, low physical activity, unintentional weight loss, low energy, and weakness (low grip strength).	Presence of ≥ 3 out of 5 clinical phenotypes indicates frailty, while 1-2 of positive phenotypes reflect pre-frail status.
Simple frailty questionnaire[31,32]	A 5-item scale assessing Fatigue, Resistance, Ambulation, Illness, and Loss of weight.	A total score of 1-2 represents pre-frail while 3-5 represents frail.
The Edmonton Frail Scale[33]	An 11-item questionnaire relating to cognition, health status, functional independence, social support, medications, nutrition, mood, continence, and functional performance, with scores ranging from 0 to 17.	A total score of ≥ 7 indicates frailty.
Clinical Frailty Scale[34]	Clinical judgement with scores ranging from 1 to 7, indicating very fit to severely frail.	The score is assigned following clinical evaluation. Scores of 5, 6, and 7 determine mild, moderate, and severe frailty, respectively.
PRISMA-7 questionnaire[35,36]	Self-evaluation comprising questions related to age, sex, health problems requiring a limit on activities, need for assistance, health problems requiring someone to stay at home, having a person to rely on when in need, and regular use of walking aid.	Answering yes to ≥ 3 questions indicates frailty.
Single evaluation[36]	Timed Up and Go Test (TUGT). Gait speed test (measuring over 4 m).	TUGT > 10 seconds suggests frailty. Walking speed < 0.8 m/sec suggests frailty.

Implementation of ERAS principles for preoperative geriatric patient assessment and preparation

The current trend involves the application of ERAS principles to the geriatric population in clinical practice to facilitate rapid recovery and preserve cognitive function. ERAS protocols are implemented across various surgical specialties, including colorectal, hepatobiliary, gynecological, neurological, orthopedic, and cardiac procedures. Preoperative components of ERAS include patient education and counseling, nutritional support, cardiac and respiratory evaluation, fasting and carbohydrate loading, and the cessation of smoking and alcohol consumption. Importantly, prehabilitation, aimed at enhancing the functional capacity of patients before surgery, is integrated into these protocols.[14,46]

Intraoperative management for geriatric patients

Intraoperative management in the geriatric population poses significant challenges due to their vulnerability to hemodynamic derangement and limited physical and cognitive reserves. Consequently, specialized care is imperative to mitigate the risks of adverse outcomes. Generally, the dosage of anesthetic drugs needs to be reduced in accordance with age-related changes in physiology and pharmacology. Additionally, short-acting agents are preferred, with increased intervals between administrations. Opioids should be used cautiously due to their potential to suppress respiration, stimulate brain activity, and require longer elimination times via hepatic and renal clearance. Benzodiazepines should be avoided to minimize the risk of postsurgical cognitive impairment; however, an anxiety-relief dose ranging between 0.25 and 1 mg is recommended. Other critical considerations include hemodynamic stabilization, adequate hydration, and hypothermia prevention.[47,48]

The core principles of ERAS approaches for intraoperative management include the following:[49-56]

1. Optimization of anesthesia technique and dosage:
   - The preferential use of regional anesthesia when indicated.
   - Alternatively, the use of general anesthesia combined with multimodal analgesia, such as local or epidural anesthesia, to minimize total anesthetic drug consumption.
   - The use of opioid-sparing anesthesia whenever feasible.
   - Adjustment of anesthesia drug dosages to prevent overdose, including reducing induction dosages by 20%–50% in elderly patients.
   - Calculation of minimal alveolar concentrations (MACs) of inhalation agents based on patient age.
   - Utilization of intraoperative depth of anesthesia monitoring.
2. Hemodynamic stabilization:
   - Maintenance of systolic blood pressure above 90–110 mmHg or < 20% reduction from baseline.
   - Minimization of surgical bleeding, with tranexamic acid administration (15–20 mg/kg intravenously) recommended if treatment is necessary.
   - Intravenous fluid administration based on a goal-directed approach.
   - Collaboration with surgeons to facilitate timely interventions during emergencies and advocate for minimally invasive surgical techniques.
3. Avoidance of hypothermia:
   - Implementation of measures to maintain patient warmth, including using heating devices and warm intravenous fluids and avoiding limb exposure.
   - Ensuring patient temperature remains > 35 °C.
4. Prevention of infection:
   - Ensuring that the operating theatre and medical devices are sterile.
   - Administration of preoperative intravenous antibiotics at least 30 minutes before surgery.
5. Preservation of cognitive function:
   - Avoidance of intraoperative benzodiazepine use.
   - Correction of risk factors contributing to cognitive impairment, such as anemia, electrolyte imbalance, intraoperative hypotension, and desaturation.
   - Consideration of alternatives to intensive care unit (ICU) admission, if possible, and extubation promptly after surgery.
   - Implementation of intraoperative brain function monitoring, such as the bispectral index.

Postoperative management for geriatric patients

The ERAS protocol can also be applied for postoperative patient care. However, detailed considerations are required before application to geriatric patients. The key measures include:[49-57]

1. Promotion of early mobilization and in-bed limb exercises.
2. Early removal of drains and catheters within 1 day after the operation.
3. Enhancement of early enteral nutrition.
4. Adequate postoperative pain control:
   - Paracetamol is recommended as the first-line medication for pain control.
   - Nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids are used with caution. NSAIDs pose risks for gastrointestinal bleeding, cardiovascular

events, and renal impairment, while opioids are associated with alterations in postoperative cognition.

5. Appropriate glycemic control:
   - Blood glucose should be maintained between 180–200 mg/dl postoperatively.
6. Prevention of postoperative nausea and vomiting (PONV)
   - Treatment should begin when the PONV risk score is ≥ 3, with the administration of 5-HT receptor antagonists and dexamethasone.
7. Postoperative deep vein thrombosis (DVT) prophylaxis:
   - Application of mechanical prophylaxis by DVT pumps immediately after the operation, and consideration of medical prophylaxis in cases where there are indications, such as patients with a history of DVT/stroke or active cancer.
8. Delirium prevention:
   - Regular nursing care and cognitive assessment.
   - Avoidance of precipitating factors for delirium, such as sleep deprivation, an unfamiliar environment, constipation, urinary retention, physical restraints, inadequate pain control, infection, anemia, and electrolyte imbalance.
9. Preparation for patient discharge:
   - Pain control with multimodal opioid-sparing pain medications.
   - Ensuring that there are no surgical complications or infection.
   - The ability of the patient to walk independently or with minimal assistance.
   - Postdischarge follow-up planning.

CONCLUSION

The demographic makeup of the global population is shifting toward older age groups, with Thailand being among the countries experiencing a significant increase in the elderly population. Aging is often accompanied by declines in functional abilities and changes in physiological systems, leading to a greater proportion of elderly individuals requiring surgical interventions. The adoption of ERAS protocols in perioperative care improves patient outcomes. However, these protocols need to be customized to meet the specific needs of geriatric patients.

The provision of effective care for geriatric patients requires careful attention to several factors. These include conducting thorough preoperative assessments using CGA checklists, evaluating frailty, and preparing patients according to ERAS guidelines. Cognitive health is particularly important, necessitating interventions such as promoting brain health and providing appropriate perioperative management. Modern perioperative care also involves using brain monitoring and the bispectral index to adjust anesthesia depth, avoiding benzodiazepines, and conducting routine postoperative cognitive assessments.

By implementing these strategies, healthcare providers can help preserve functional abilities, slow cognitive decline, and enhance the overall quality of life of geriatric patients.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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