

# Management of Geriatric Anesthesia on Emergency Surgery

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## SUMMARY

In geriatric patients, emergency surgery is more common than elective surgery. The incidence of medical complications increases along with aging while the rate of surgical complications remains constant. Postoperative complications escalates short-term morbidity and mortality and also associated with decreasing long-term survival. The main purposes of geriatric patients' care were to maintain hemodynamics, speed up recovery, and perform an assessment to avoid any further decline in functional capacity. The choice of anesthesia and how to administer anesthesia agents should be adjusted for the geriatric patient.

**Keywords:** geriatric, anesthesia, emergency surgery



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## INTRODUCTION

Emergency surgery can be a significant workload in most health facilities.<sup>1</sup> The number of elective surgery declines in the patients over 65 years old. Eighty years old and older patients are more likely to necessitate emergency surgery than elective surgery. More aged patients correlate with higher rate of medical complications, for example, delirium and pneumonia. Postoperative complications worsen the situation by escalating short-term morbidity and mortality and also reducing long-term survival. Most geriatric patients recover slowly after surgery, it could take about half a year to be fully recover following major surgery, and many could not make it to return to their preoperative state.<sup>2</sup>

Worse outcome indicators incorporate into peri-operative mortality include mortality during the peri-operative period, recognizable from ASA III or IV status, age > 50 years, prior myocardial infarction or heart failure in a year, smoking, and history of cardiovascular, thoracic, abdominal, and neurological surgery. The pre-operative functional status in geriatric patients also leads to a worse outcome. Anesthetic regimens must be adapted to physiological conditions. The effect of anesthesia's depth on a patient's outcome remains uncertain. A well-adjusted and titrated anesthetic regimen, extra vigilant monitoring, and wise fluid and blood transfusion management are keys to the successful management of geriatric patients in surgery.<sup>3</sup>

## DISCUSSION

Peri-operative care in geriatric patients consist of patient-focused care and multidisciplinary care at during surgery until complete recovery. Surgeons and anesthesiologists usually perform this patient-focused care and multidisciplinary care, but nowadays, the national guidelines recommend the involvement of geriatric physicians in geriatric patient care.<sup>4</sup> This includes pre-operative assessment and optimization, supportive decision-making, management of medical complications, rehabilitation, and patient discharge planning (Figure 1).<sup>2</sup>

The downhill trend of mortality and fertility had put the worldwide population into aging. The annual increments of people aged <65 years is 1%, aged 65-79 years is >2%, and the people aged around 80 years is about 3%. The most common procedures performed in over 65 years patients are shown in Table 1.<sup>5</sup>

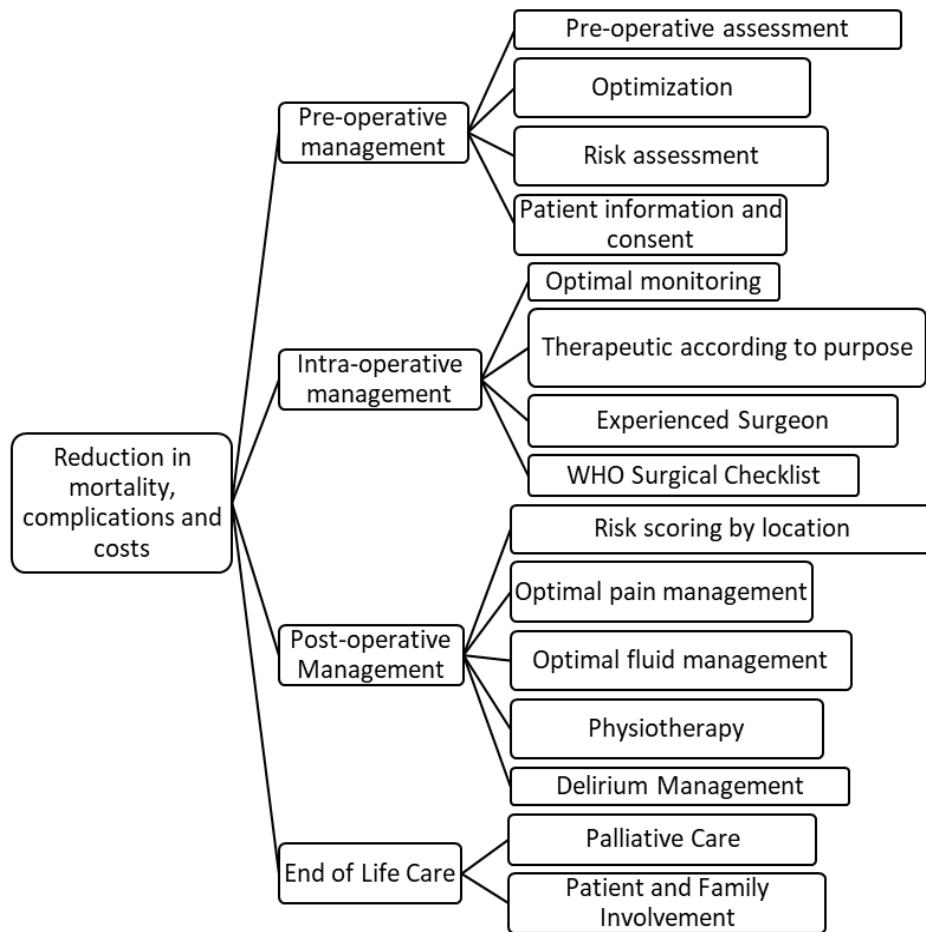
## Pathophysiology and Clinical Manifestations of Geriatrics

### Cardiovascular and respiratory system

The aging process creates several physiological changes of cardiovascular system, probably due to changes in the autonomic nervous system, leading to a decreased cardiac response toward stress.<sup>7</sup> Postural hypotension is common, presenting in about 20% of elderly patients. The increasing prevalence of postural hypotension contributes to a decreased capacity for deal with major stressors such as acute bleeding, surgical procedure, and sepsis.<sup>6</sup> Lung function decreases with aging due to reduced pulmonary compliance and oxygen

**Table 1.** Ten most common surgical procedures performed in >65 years old Patient <sup>5</sup>

Surgical Procedures	Number of surgical procedures (in thousands)
Inguinal and femoral hernia repair	38
Therapeutic procedures on muscles and tendons	44
Therapeutic procedures on joints	19
Cholecystectomy and duct exploration	21
Excision of the semilunar cartilage in the knee	23
Lumpectomy, quadrantectomy of the breast	33
Lens and cataract procedures	342
Decompression and peripheral nerves (carpal tunnel release)	27
Partial excision of bone	15
Trans-urethral excision, drainage, and removal of urinary obstruction	33



**Figure 1.** Surgical management in geriatric patients

diffusion rate, especially in smoker's lung. Mismatch of ventilation/perfusion increases with tidal inhalation in the supine position.<sup>8</sup>

Thoracic wall changes include osteoporosis, kyphosis, rib, cartilage calcification, decreased muscle strength, and decreased lung function. This results in an increased risk of type 2 respiratory failure <sup>6</sup>. Along with the decreased oxidative capacity associated with aging, cardio-pulmonary changes contribute to decreased oxygen uptake and oxygen delivery, leading to a larger risk of peri-operative vital organs ischemia, which worsens the outcome.<sup>9</sup>

**Renal system**

There are some variations inside the decline in renal characteristics associated with aging, nephrotoxic results of comorbid illnesses and long-term unmonitored used of drugs (typically non-steroidal anti-inflammatory drugs or NSAIDs and

ACE inhibitors). Renal feature affects the pharmacokinetics and pharmacodynamics of anesthetics, that is why renal feature must be automatically checked before elective and emergency surgical procedure in the geriatric patient.<sup>9</sup>

**Central nervous system**

Postoperative altered level of consciousness and cognitive dysfunction is relatively higher in aged patients. It could be associated with age-related cerebral and cerebrovascular function decline. This results in the delay of the patient's discharge and functional recovery (Table 2).<sup>9</sup>

**Peripheral nervous system**

Demyelination of some nerves causes a decrease in nerve conduction velocity, which affects many reflex tracts and peripheral sensations.<sup>6</sup>

**Table 2.** Central nervous system changes in aging<sup>6</sup>

Lobe	Function	Clinical correlation
Frontal	Working memory Episodic memory Sorting Organization Abstraction Planning	Atrophy is associated with slow walking times and short strides Gait related to coordination and balance
Temporal	Learning Spatial and episodic memory Face recognition	Alzheimer Dementia
Parietal	Primary somatosensory cortical function Secondary cortical functions are related to visual, auditory, taste, and smell	Poor balance Increased occurrence of falls
Occipital	Primary visual cortex	Delayed visual process

**Table 3.** The minimal component of anesthesia' specific pre-operative assessment in geriatrics<sup>9</sup>

Component	Assessment	Assessment Tool
Medical condition	Comorbid / severity: <ul style="list-style-type: none"> <li>▪ Cardiovascular</li> <li>▪ Respiratory</li> <li>▪ Hematology</li> <li>▪ Renal</li> <li>▪ Nutrition</li> <li>▪ Musculoskeletal</li> </ul>	<ul style="list-style-type: none"> <li>▪ Vital signs, ECG, CPET</li> <li>▪ SpO<sub>2</sub> (pulmonary function test)</li> <li>▪ General check-up</li> <li>▪ Urea, electrolytes, eGFR</li> <li>▪ Bodyweight, BMI, albumin</li> <li>▪ Assessment of the potential for nerve block at the insertion site of anesthesia</li> </ul>
Medication	<ul style="list-style-type: none"> <li>▪ Prior anesthesia</li> <li>▪ Specific anesthesia</li> <li>▪ Drink alcohol</li> <li>▪ Pain intensity</li> <li>▪ Pathological conditions</li> <li>▪ Medication history</li> <li>▪ Anticoagulant therapy</li> <li>▪ Allergy</li> </ul>	<ul style="list-style-type: none"> <li>▪ Asked after the problem related to age</li> <li>▪ Assessment of the airway, teeth</li> <li>▪ Questionnaire</li> <li>▪ Visual analog pain score</li> <li>▪ Radiology</li> <li>▪ NSQIP pre-operative assessment</li> <li>▪ Coagulation examination</li> </ul>
Cognitive	<ul style="list-style-type: none"> <li>▪ Mental capacity</li> <li>▪ Decision-making capacity</li> <li>▪ Communication</li> <li>▪ Risk factors for postoperative delirium</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ask about memory changes in the patient or the patient's caregiver</li> <li>▪ Abbreviated mental test score</li> <li>▪ Sight, hearing, speech</li> <li>▪ NSQIP pre-operative assessment</li> </ul>
Functional capacity	<ul style="list-style-type: none"> <li>▪ Gait and balance</li> <li>▪ Mobility</li> </ul>	<ul style="list-style-type: none"> <li>▪ Walk 6 meters</li> <li>▪ Walking unaided / with a cane / unable to walk</li> <li>▪ Stay at home? (Yes or No)</li> </ul>
Use of functional aids	<ul style="list-style-type: none"> <li>▪ Vision</li> <li>▪ Hearing</li> <li>▪ Mobility</li> <li>▪ Dentures</li> </ul>	<ul style="list-style-type: none"> <li>▪ Spectacles</li> <li>▪ Hearing aid</li> <li>▪ Walking stick, wheelchair</li> </ul>
Risk score	<ul style="list-style-type: none"> <li>▪ Pathologically specific</li> <li>▪ Fragility</li> </ul>	<ul style="list-style-type: none"> <li>▪ Nottingham Hip Fracture Score</li> <li>▪ NSQIP pre-operative assessment</li> </ul>

ECG: electrocardiogram; CPET: Cardiopulmonary exercise test; eGFR: Estimated glomerular filtration rate; NSQIP: National Surgical Quality Improvement Program

#### *Hematology / immunology system*

Anemia is common in aging population (about 10%), especially during surgery. Immunological aging is a multi-factorial impairment of the immune system along the aging

process that decreases the capacity for bacteria eradication and wound healing, leading to organ dysfunction development mediated by inflammation.<sup>9</sup>

**Table 4.** Intra-operative WHO surgical safety checklist for over 75 years old patient<sup>9</sup>

Sign in: before anesthesia induction	Time out: before surgery
<ul style="list-style-type: none"> <li>▪ Have vital signs been recorded (pulse, blood pressure, heart rhythm, SpO<sub>2</sub>, temperature)?</li> <li>▪ Is the patient's resuscitation status known?</li> <li>▪ Does the patient have dentures?</li> <li>▪ Does the patient have pre-operative pressure sores/wound?</li> <li>▪ Is the nerve block area confirmed and marked?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Is the pressure injured tissue/wound closed?</li> <li>▪ How is the patient's hemoglobin concentration?</li> <li>▪ How is the patient's eGFR?</li> </ul>

**Table 5.** Postoperative WHO surgical safety checklist for over 75 years old patient<sup>9</sup>

Sign out: before the patient leaves the operating room
<ul style="list-style-type: none"> <li>▪ How is the patient's body temperature?</li> <li>▪ How is the patient's hemoglobin concentration?</li> <li>▪ Have age, renal function-adjusted postoperative analgesics been prescribed?</li> <li>▪ Has a postoperative fluid administration plan been prescribed?</li> <li>▪ Can the patient be returned safely to the ward?</li> </ul>

## Surgical Management

### Pre-operative

In the peri-operative period, physiological changes in the elderly patient and how they affect the interpretation of the resuscitation protocol should be noted. The peri-operative risk determines the possibility of unwanted outcomes occur following surgery or anesthesia and indicates the cumulative risk of the surgical procedure, patient's pre-morbidity, age, and other pathological conditions (Table 3).<sup>9</sup>

### Intra-operative

Elderly patients require a longer duration in surgical procedure preparation. Functional devices (glasses, hearing aids, dentures) should be removed prior to induction of anesthesia. The patient must be closely monitored during anesthesia. Additional monitoring is needed in elderly patients with regards to peri-operative risk, higher morbidity, and mortality.<sup>9</sup>

Shivering is one of the most common complication following general anesthesia. It could make the patient uneasy and also associated with various health risks. Shivering must be prevented and treated. The drug of choice to treat this is pethidine.<sup>10</sup>

Monitoring activity performed by anesthetists during major or emergency surgery are (1) intra-arterial blood pressure, (2) central venous pressure, (3) monitoring cardiac output, (4) oxygen saturation, and (5) Bispectral Index Monitors (BIS) or an entropy monitor to determine the depth of anesthesia and sedation (Table 4).

### Postoperative

Anesthesiologists are anticipated to diminish the needs or duration of postoperative care requirement with intra-operative anesthetic drugs, blood pressure, body temperature, fluid therapy, and analgesic management. Apart from optimal management, the patient's pathophysiology is also associated with the demand for intensive care after surgery. If intensive care is not immediately available, a postoperative care unit (PACU) with trained care team members should be ready to give postoperative care (Table 5)<sup>9</sup>

### Palliative

Emergency surgical conditions in elderly patients and frail patients require continuous monitoring.<sup>11</sup>

## Complications

### Ischemia

Increasing age and the presents of comorbid disease diminished the physiological endurance of geriatric patients, which increases the risk of ischemia development in a specific organ or general body. The brain and heart require oxygen. If peri-operative ischemia occurs, there is an increased risk of cerebral and cardiac dysfunction. Interventions should decrease oxygen requirement (analgesics, thermoregulation, antibiotics) and increase delivery of oxygen (oxygen, fluids, drugs, and prevention of hypotensive state and anemia).<sup>9</sup> *Postoperative cognitive disorders (postoperative delirium and postoperative cognitive dysfunction)*

Postoperative delirium is a neuro-physiological condition that gradually develops over hours to several days. This disease appears as a change in attention and consciousness from normal and can fluctuate in severity throughout the day. The patient may experience confusion, irritating mood, lethargy, or sleep cycle changes.<sup>12</sup> In contrast to postoperative delirium, postoperative cognitive dysfunction (POCD) affects neuropsychological aspects such as memory, psychomotor speed, information processing, and executive function.<sup>13,14</sup> Patient experience or those close to them report a decline in daily cognitive performance that could last months after surgery.<sup>15</sup>

### Decline of function

Anesthesiologists must play a role in "pre-rehabilitation," which includes strengthening the organ function of the elderly patient to facilitate postoperative rehabilitation and return of the patient to the daily life. It is a multidisciplinary effort involving multilateral communication of potential risks of postoperative morbidity, patient education, fluid therapy and prevention of ischemia, analgesics, thermoregulation, selection of appropriate anesthetic techniques, and care planning of postoperative care.<sup>9</sup>

## Geriatric Anesthesia

### General anesthesia

Complications of general, local, or regional anesthesia are increased in geriatric patients. Postoperative cognitive impairment after general anesthesia is more common compared to local or regional anesthesia. However, experts define no causative relationship between general anesthesia and long-term cognitive impairment. It is important to decrease the dose of anesthetics and analgesic drugs. The amount of propofol infusion was slightly lowered, but the onset time was slower, and maximal cardio-respiratory depression was also delayed. Dexmedetomidine may result in spontaneous ventilation, but prolonged sedation can be worrying in geriatric patients. The healing time from the anesthetic sevoflurane may be slightly shorter than that of propofol, but there is no change in the discharge time for the patient. Neuromuscular block drug dose should be diminished in the geriatric patient.<sup>5</sup>

### Spinal and epidural anesthesia

Hypothermia is also more common in older patients undergoing regional anesthesia. The long-term morbidity is not reduced with regional anesthesia, but it surely is lowering postoperative neurological, pulmonary, cardiac, and endocrine complications. Rapid-acting local anesthetics combined with strong opioids can cut healing time. Recent studies suggest that 4 mg of bupivacaine combined with 20-25 µg of fentanyl resulted in shorter layover time in the PACU room with more stable hemodynamic condition compared to prilocaine 50 mg and fentanyl 25 µg in transurethral prostate surgery patients. Prilocaine is associated with longer patient healing time and incidence of urinary retention.<sup>5</sup>

### Peripheral nerve block

Besides anesthesiologist experience, peripheral nerve blocks have a more significant benefit in geriatric patients. Ilioinguinal block - hypogastric, transverse abdominis plane (TAP), and paravertebral block, had successfully been performed for hernia repair procedure and had superior recovery than general-spinal and local infiltration anesthetics. Paravertebral blockade in breast surgery also has a better outcome than general anesthesia.<sup>5</sup>

## Emergency Surgery

### Vascular emergencies

Careful initiation of resuscitation is the main point, with a target systolic blood pressure below 100mmHg, provided the patient is able to maintain consciousness. Adequate vascular access is required, and the patient should be prepared

and conscious when anesthesia is administered before the surgeon ready to make an incision. Blood pressure monitoring, pulse oximetry, and ECG should be prepared at least during the initial phase. Evaluation of acid-base balance, hemoglobin concentration, and coagulation status should be available to determine fluid therapy.<sup>8</sup>

### Trauma emergency

Femoral fractures are frequent in geriatric patients with high rates of mortality and morbidity. Early geriatric intervention in the acute phase of femoral fracture can reduce mortality and medical complications.<sup>8</sup> The study states that the 1-year mortality rate in geriatric patients with femoral fractures is 27%. In addition, pre-operative pneumonia and COPD can also increase mortality in femur fracture surgery in geriatric patients. The first-month postoperative mortality rate in patients over 80 years is relatively high.<sup>1</sup>

### Intra-abdominal emergency

The majority of patients over 70 years require emergency laparotomy. The most common indications are colon-associated pathologies such as obstruction, perforation, peritonitis, colon ischemia, and rarely, abdominal abscess, sepsis, bleeding, or colitis. Delay in surgery is associated with unfavorable outcomes. In emergency laparotomy, the mortality increases from 6-45% if surgery is performed more than 24 hours after admission. Age alone is a risk factor for emergency laparotomy with an increase of 5% per decade with an estimated 5% of patients over 50 years and a mortality rate of 20% at over 70 years. Pre-operative assessment and optimization such as the surgeon, anesthesiologist, geriatric consultant accurate risk assessment, early antibiotic's administration especially in sepsis, CT scan evaluation and other radiology examination to determine pathology.<sup>8</sup>

## SUMMARY

Anesthesia in emergency surgery of geriatric patients must be carried out carefully, considering physiological and pathological changes that present in geriatric patients. Geriatric patients are at a higher risk of experiencing adverse effects from medications because of known, or often unknown, comorbidities that complicate the complexity of treatments. The improvement of outcome in emergency surgery is specifically challenging in geriatric patients. Monitoring is needed starting from pre-operative, intra-operative, postoperative, until palliative care to reduce complications that may arise.

## ACKNOWLEDGMENT

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## CONFLICT OF INTEREST

None

## REFERENCES

1. Desserud KF, Veen T, Soreide K. Emergency general surgery in the geriatric patient. *Br J Surg*. 2016;103(2):e52-e61. doi:10.1002/bjs.10044
2. Ibitoye S, Braude P. Geriatric perioperative care. *Med (United Kingdom)*. 2021;49(1):51-55. doi:10.1016/j.mpmed.2020.10.004
3. Bhatnagar V, Datta S, Tara S. The perioperative concerns of emergency neurosurgery in elderly patients: A series of three cases. *J Mar Med Soc*. 2017;19(1):58-60. doi:10.4103/jmms.jmms\_7\_17
4. Pel EL, van Wijngaarden E, van Dongen EPA, Noordzij PG. Anesthesia Geriatric Evaluation (AGE): A Care-Ethical Perspective of a Multi-Disciplinary Approach for Tailored Preoperative Interventions. *Gerontol Geriatr Med*. 2019;5:233372141987612. doi:10.1177/2333721419876126

5. Aurini L, White PF. Anesthesia for the elderly outpatient. *Curr Opin Anaesthesiol*. 2014;27(6):563-575. doi:10.1097/ACO.0000000000000135
6. Preston J, Biddell B. The physiology of ageing and how these changes affect older people. *Med (United Kingdom)*. 2021;49(1):1-5. doi:10.1016/j.mpmed.2020.10.011
7. Strom C, Rasmussen LS. Challenges in anaesthesia for elderly. *Singapore Dent J*. 2014;35:23-29. doi:10.1016/j.sdj.2014.11.003
8. Falvo A, Frisenda V, Gregoretta C, Brazzi L. Preoperative care in emergency surgery. In: Bettelli G, ed. *Perioperative Care of the Elderly: Clinical and Organizational Aspects*. Cambridge University Press; 2017:76-80. doi:10.1017/9781316488782.014
9. Griffiths R, Beech F, Brown A, et al. Peri-operative care of the elderly 2014: Association of anaesthetists of great britain and Ireland. *Anaesthesia*. 2014;69(1):81-98. doi:10.1111/anae.12524
10. Fatoni AZ, Isngadi, Jaya W. Perbandingan Efek Pemberian Ondansetron dan Petidin Intravena untuk Mencegah Menggigil Pasca Anestesi Umum. *J Anesthesiol Indones*. 2014;6(2):89-100.
11. Peden C. The emergency surgery in elderly patient: a quality improvement approach. *Anaesthesia*. 2011;66(6):438-440. doi:10.1111/j.1365-2044.2011.06768.x
12. Glover NP, Tola DH, Norcross W, Naumuk L, Tocchi C. Preoperative Cognitive Assessment Recommendations for the Older Adult. *J Perianesthesia Nurs*. 2020;35(5):460-466. doi:10.1016/j.jopan.2020.02.011
13. Fitzpatrick S, Owen K. Postoperative Cognitive Disorders: Postoperative Delirium and Postoperative Cognitive Dysfunction. *Anaesth Tutor Week*. 2018;152(August):1-6.
14. Jin Z, Hu J, Ma D. Postoperative delirium: perioperative assessment, risk reduction, and management. *Br J Anaesth*. 2020;125(4):492-504. doi:10.1016/j.bja.2020.06.063
15. Igwe EO, Nealon J, Mohammed M, et al. Multi-disciplinary and pharmacological interventions to reduce post-operative delirium in elderly patients: A systematic review and meta-analysis. *J Clin Anesth*. 2020;67(December 2019):110004. doi:10.1016/j.jclinane.2020.110004