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Review Article

Geriatric anaesthesia: Challenges and recent updates – A review

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ABSTRACT

Geriatric anaesthesia is a rapidly growing subspecialty due to the rising number of elderly individuals undergoing surgical procedures. Older adults present a unique set of challenges, including physiological changes, polypharmacy, and comorbidities, all of which can significantly influence anaesthetic management. Age-related alterations in pharmacokinetics and pharmacodynamics make dosing and drug selection more complex. Additionally, the elderly are at a higher risk of perioperative complications such as postoperative cognitive dysfunction (POCD) and delirium. Recent advancements in geriatric anaesthesia have focused on better preoperative assessments, personalized anaesthetic strategies, and enhanced recovery protocols to reduce postoperative morbidity. This review aims to explore the challenges faced in anaesthetizing the elderly and highlights recent updates in the field, including the development of frailty assessment tools, use of regional anaesthesia, and the role of multidisciplinary teams in perioperative care. By optimizing perioperative care, including pain management, anaesthetic depth monitoring, and the prevention of delirium, outcomes for elderly patients can be significantly improved. This article provides a comprehensive review of the current state of geriatric anaesthesia, with a focus on both the challenges faced and innovations that have emerged to improve patient care.

1. Introduction

The global population is ageing, and with this demographic shift comes an increasing number of elderly individuals requiring surgical interventions. As life expectancy rises, so does the prevalence of comorbidities such as cardiovascular disease, diabetes, and respiratory conditions, which complicate the perioperative management of older adults. Geriatric anaesthesia is a distinct field within anaesthesiology that addresses the specific needs and challenges associated with providing anaesthetic care to the elderly population.[1–4] It requires a thorough understanding of the physiological changes that occur with ageing and how these changes affect the pharmacokinetics and pharmacodynamics of anaesthetic agents.[5]

The elderly population is not homogenous; within this group, there is significant variability in functional status, frailty, and the presence of multiple chronic conditions. The concept of frailty, which refers to a decreased physiological reserve and an increased vulnerability to stressors, is a critical consideration in the perioperative management of older adults.[6–8] Frail patients are more susceptible to postoperative complications, prolonged hospital stays, and increased mortality.[9]

In addition to the physiological challenges, older adults are more prone to cognitive complications, such as postoperative cognitive dysfunction (POCD) and delirium, both of which can have lasting effects on quality of life. Polypharmacy, common in this population, further complicates anaesthetic management by increasing the risk of drug interactions and adverse effects. This review aims to

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explore the multifaceted challenges of geriatric anaesthesia, including how these issues are being addressed through recent advancements in anaesthetic techniques, assessment tools, and postoperative care protocols. Understanding and addressing the unique needs of the elderly can significantly improve surgical outcomes and quality of life in this vulnerable population.[10]

2. Discussion

2.1. Physiological changes and their impact on anaesthesia

One of the fundamental challenges in geriatric anaesthesia is the significant physiological changes associated with ageing. These changes affect multiple organ systems and have profound implications for how anaesthetic agents are metabolized and how elderly patients respond to both the surgical and anaesthetic stress. The cardiovascular system undergoes marked changes with ageing, including a reduction in cardiac output due to the diminished contractility of the myocardium. The arteries become stiffer, increasing systemic vascular resistance and contributing to hypertension. This vascular stiffness also impairs baroreceptor sensitivity, which regulates blood pressure.[11] As a result, elderly patients may be more prone to perioperative hypotension, leading to reduced perfusion to critical organs, including the brain and kidneys, increasing the risk of ischemic events.

The respiratory system also shows significant changes with age. The lungs lose elasticity, and the chest wall stiffens, which results in decreased lung compliance. There is also a reduction in vital capacity and a tendency towards ventilation-perfusion mismatch, which can impair gas exchange. Furthermore, the respiratory drive becomes less sensitive to carbon dioxide and hypoxia, making elderly patients more prone to hypoventilation, particularly during and after surgery.[12–15]These changes significantly raise the risk of postoperative pulmonary complications such as atelectasis, hypoxemia, and pneumonia, especially after general anaesthesia. This highlights the importance of careful respiratory monitoring and the consideration of non-invasive ventilation strategies in the perioperative period.

Renal function also declines with age, which has critical implications for anaesthesia. The glomerular filtration rate (GFR) decreases, reducing the clearance of many drugs, including anaesthetic agents, leading to prolonged drug action and an increased risk of toxicity. This is particularly relevant for drugs like opioids, which are primarily metabolized by the kidneys. Moreover, reduced renal function increases the risk of postoperative acute kidney injury, especially in patients with pre-existing chronic kidney disease. Therefore, anaesthetic regimens for elderly patients need to account for altered pharmacokinetics by reducing drug dosages and carefully monitoring renal function throughout the perioperative period.[16,17]

The central nervous system (CNS) is also highly susceptible to the effects of ageing, with structural and functional changes that influence the response to anaesthesia. The ageing brain shows reduced cerebral blood flow and a loss of neurons, making elderly patients more vulnerable to neurotoxicity from anaesthetic agents.[17] As a result, they are more sensitive to sedative and hypnotic agents, requiring lower doses to achieve the desired effect. This sensitivity increases the risk of cognitive complications, including postoperative cognitive dysfunction (POCD) and delirium. Careful monitoring of anaesthetic depth is critical to avoid over-sedation, which has been associated with an increased risk of these complications.

2.2. Frailty and preoperative assessment

Frailty is one of the most significant considerations in geriatric anaesthesia, as it is closely linked to poor postoperative outcomes. Frailty refers to a state of reduced physiological reserve and increased vulnerability to stressors such as surgery. It is distinct from chronological age, as not all elderly patients are frail, but frailty increases in prevalence with advancing age. Frail patients are at a higher risk of postoperative complications, including prolonged recovery, functional decline, and mortality.[18]

Preoperative frailty assessment has become an essential part of geriatric anaesthesia, helping to predict which patients are at higher risk for complications. The Fried Frailty Index is one of the most commonly used tools for assessing frailty. It assesses five criteria: unintentional weight loss, weakness (measured by grip strength), exhaustion, slowness (measured by walking speed), and low physical activity. Another widely used tool is the Clinical Frailty Scale, which uses clinical judgment to categorize patients from “very fit” to “severely frail.” These assessments allow clinicians to identify patients who may benefit from more conservative management, such as modifying surgical plans or utilizing less invasive procedures.[19]

Beyond frailty, preoperative assessments in elderly patients should also include comprehensive evaluations of cognitive function, nutritional status, and comorbidities. Cognitive screening tools, such as the Mini-Mental State Examination (MMSE) or Montreal Cognitive Assessment (MoCA), can help identify patients who are at risk of postoperative delirium or POCD. Nutritional status is another important factor, as malnutrition is associated with poorer surgical outcomes. Elderly patients should be screened for malnutrition using tools like the Mini Nutritional Assessment (MNA), and those identified as malnourished may benefit from preoperative nutritional optimization.[20]

Incorporating frailty assessments and comprehensive preoperative evaluations into routine clinical practice allows for better risk stratification and informed decision-making. It also facilitates prehabilitation, a concept that has gained traction in recent years. Prehabilitation involves interventions aimed at improving a patient's physical and nutritional status before surgery to enhance their resilience and improve postoperative outcomes. This approach has been shown to reduce complications, shorten hospital stays, and improve functional recovery in frail elderly patients.

3. Postoperative Cognitive Dysfunction (POCD) and Delirium

One of the most significant concerns in geriatric anaesthesia is the high incidence of postoperative cognitive dysfunction (POCD) and delirium. POCD refers to a decline in cognitive function that persists for weeks or even months after surgery. It manifests as memory impairment, difficulties with executive function, and reduced attention span. Delirium, on the other hand, is an acute state of confusion characterized by fluctuating levels of consciousness, disorganized thinking, and agitation. Both conditions are associated with longer hospital stays, increased healthcare costs, and long-term cognitive decline. [1,20,21]

The pathophysiology of POCD and delirium is not fully understood, but it is believed to involve a combination of factors, including neuroinflammation, oxidative stress, and the direct neurotoxic effects of anaesthetic agents. Ageing is associated with increased neuroinflammation, and surgery itself induces a systemic inflammatory response that may exacerbate this underlying neuroinflammation. Moreover, anaesthetic agents such as volatile inhalational anaesthetics (e.g., sevoflurane and desflurane) and sedatives like benzodiazepines have been implicated in increasing the risk of POCD and delirium.

Several strategies have been developed to minimize the risk of cognitive complications in elderly patients. One of the key approaches is the use of total intravenous anaesthesia (TIVA) with agents like propofol and dexmedetomidine. These agents are associated with a lower risk of cognitive impairment compared to volatile anaesthetics. Propofol, for example, has a rapid onset and short duration of action, which allows for better control over sedation levels. Dexmedetomidine, an alpha-2 agonist, has sedative and analgesic properties but does not depress respiratory function, making it a valuable option in elderly patients. [22,23]

Another important strategy is the use of depth of anaesthesia monitoring, such as the bispectral index (BIS), to avoid excessive anaesthetic depth, which is a known risk factor for POCD and delirium. Studies have shown that maintaining lighter levels of anaesthesia, while still ensuring adequate analgesia and preventing awareness, can reduce the incidence of postoperative cognitive complications. Additionally, multimodal pain management techniques that minimize the use of opioids, which are known to contribute to delirium, are increasingly being employed in elderly patients.

Preventing delirium also involves non-pharmacological strategies, including early mobilization, adequate hydration, and sleep promotion. The use of earplugs and eye masks in the postoperative period has been shown to reduce the incidence of delirium by promoting better sleep quality. Early mobilization and physical therapy are also critical in reducing the incidence and duration of delirium, as immobility is a significant risk factor for cognitive decline in hospitalized elderly patients. (Figure 1)

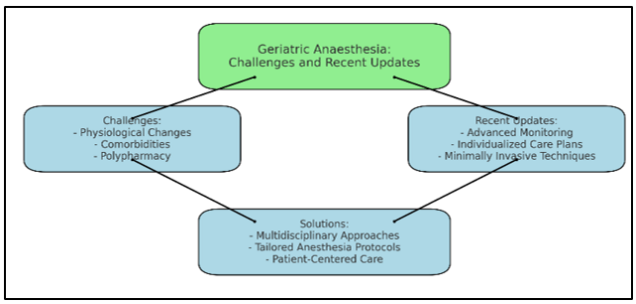

Figure 1: The flow chart demonstrates the Geriatric anaesthesia and challenges and the management.

4. Polypharmacy and Drug Interactions

Polypharmacy, defined as the use of five or more medications, is common in elderly patients and presents a significant challenge in the context of anaesthesia. Older adults are often on medications to manage chronic conditions such as hypertension, diabetes, heart disease, and chronic pain. While these medications are essential for managing comorbidities, they can interact with anaesthetic agents, leading to adverse outcomes. [24,25]

One of the most concerning issues related to polypharmacy is the risk of perioperative hypotension, which can occur when antihypertensive medications, such as beta-blockers and ACE inhibitors, are combined with anaesthetic agents. This can lead to inadequate organ perfusion during surgery, increasing the risk of ischemic injury to the heart, brain, and kidneys. Similarly, anticoagulants and antiplatelet agents, which are commonly used in elderly patients for the prevention of cardiovascular events, increase the risk of bleeding, particularly in surgeries involving regional anaesthesia or neuraxial techniques.

Anaesthetists must carefully review all medications during the preoperative assessment to identify potential drug interactions and adjust perioperative management accordingly. This may involve temporarily discontinuing certain medications, such as anticoagulants or antidiabetic drugs, in the days leading up to surgery. Careful

intraoperative monitoring is also essential to detect and manage any adverse drug interactions that may occur during the anaesthetic process.

Polypharmacy also complicates postoperative care, as elderly patients are at higher risk for drug-related adverse events, including delirium, renal impairment, and respiratory depression. Opioids, for instance, are commonly used for pain management, but their sedative and respiratory depressant effects are more pronounced in elderly patients. To mitigate these risks, multimodal analgesia strategies are increasingly being used, combining non-opioid analgesics such as paracetamol and nonsteroidal anti-inflammatory drugs (NSAIDs) with regional anaesthesia techniques to provide effective pain relief while minimizing opioid use.

5. Regional Anaesthesia vs General Anaesthesia

There is growing evidence that regional anaesthesia may be preferable to general anaesthesia in many elderly patients. Regional anaesthesia, including neuraxial techniques such as spinal and epidural anaesthesia, as well as peripheral nerve blocks, offers several advantages. By avoiding the systemic effects of general anaesthesia, regional techniques reduce the risk of respiratory depression, cognitive dysfunction, and hemodynamic instability, which are common in elderly patients. [26]

However, regional anaesthesia is not without its challenges in older adults. Anatomical changes due to ageing, such as spinal degeneration, reduced intervertebral disc height, and kyphoscoliosis, can make the administration of neuraxial blocks technically difficult. Moreover, the widespread use of anticoagulants in elderly patients poses a risk for spinal hematomas, a rare but serious complication of neuraxial anaesthesia. Therefore, the decision to use regional anaesthesia must be individualized, taking into account the patient's anatomy, medication profile, and the type of surgery.

Nevertheless, regional anaesthesia has been shown to reduce postoperative pain, decrease the need for opioids, and lower the risk of delirium and POCD. For these reasons, regional techniques are increasingly being incorporated into enhanced recovery after surgery (ERAS) protocols for elderly patients undergoing major surgery. When used in combination with multimodal analgesia and early mobilization, regional anaesthesia can contribute to shorter hospital stays, quicker functional recovery, and improved patient satisfaction.

6. Multidisciplinary Approaches and Enhanced Recovery after Surgery (ERAS)

The complexity of managing elderly surgical patients has led to the adoption of multidisciplinary approaches in geriatric anaesthesia. Effective perioperative care requires close collaboration between anaesthetists, geriatricians, surgeons, and nursing staff to address the unique needs of elderly patients. A multidisciplinary team approach allows for comprehensive preoperative assessments, individualized anaesthetic planning, and coordinated postoperative care, all of which are essential for optimizing outcomes in this vulnerable population.

Enhanced Recovery After Surgery (ERAS) protocols have been adapted for elderly patients and are designed to improve outcomes by minimizing the physiological stress of surgery and promoting faster recovery. Key components of ERAS protocols include preoperative optimization, minimal fasting, multimodal analgesia, early mobilization, and the avoidance of unnecessary invasive devices, such as urinary catheters and drains, which can increase the risk of infection and immobility. Studies have shown that ERAS protocols reduce the length of hospital stays, decrease postoperative complications, and improve long-term functional outcomes in elderly patients. [2,13,18,27]

Preoperative optimization under ERAS includes careful management of comorbidities, nutritional support, and prehabilitation programs to improve physical fitness. Intraoperative care focuses on avoiding hypothermia, maintaining hemodynamic stability, and using anaesthetic techniques that minimize the risk of cognitive and respiratory complications. Postoperatively, ERAS emphasizes early mobilization, optimal pain control, and the prevention of delirium through environmental modifications and non-pharmacological interventions.

7. Conclusion

Geriatric anaesthesia requires a comprehensive and individualized approach due to the complex physiological, pharmacological, and psychological changes that occur with ageing. The increasing prevalence of frailty, polypharmacy, and cognitive dysfunction in elderly patients poses significant challenges in perioperative care. Recent advancements in frailty assessments, the use of regional anaesthesia, and the implementation of ERAS protocols have greatly improved surgical outcomes for older adults. However, ongoing research is needed to refine these approaches further and to develop new strategies for managing the unique risks faced by elderly surgical patients. A multidisciplinary approach remains crucial to optimizing care, reducing complications, and improving the quality of life for older adults undergoing surgery.

8. Source of Funding

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9. Conflict of Interest

None.

References

1. Staheli B, Rondeau B. Anesthetic Considerations in the Geriatric Population. StatPearls [Internet]. Treasure Island (FL); 2023.
2. Lim BG, Lee IO. Anesthetic management of geriatric patients. *Korean J Anesthesiol*. 2020;73(1):8–29.
3. Mahender A, Chavan SS, Saroa R, Chauhan M. Recent advances in geriatric anaesthesia. *Indian J Anaesth*. 2023;67(1):152–8.
4. Aceto P, Antonelliincalzi R, Bettelli G, Carron M, Chiumiento F, Corcione A. Perioperative Management of Elderly patients (PriME):Recommendations from an Italian intersociety consensus. *Aging Clin Exp Res*. 2020;32(9):1647–73.
5. Chan S, Ip KY, Irwin MG. Peri-operative optimisation of elderly and frail patients:A narrative review. *Anaesthesia*. 2019;74(S1):80–9.
6. Mohanty S, Rosenthal RA, Russell MM, Neuman MD, Ko CY, Esnaola NF. Optimal perioperative management of the geriatric patient:A Best practices guideline from the American College of Surgeons NSQIP and the American Geriatrics Society. *J Am Coll Surg*. 2016;222(5):930–77.
7. Cuvillon P, Lefrant JY, Gricourt Y. Considerations for the use of local anesthesia in the frail elderly:Current perspectives. *Local Reg Anesth*. 2022;15(15):71–5.
8. Luchting B, Azad S. Pain therapy for the elderly patient: Is opioid-free an option? *Curr Opin Anesthesiol*. 2019;32(1):86–91.
9. Dave DR, Zeiderman M, Li AI, Pereira C. Modified Frailty Index Identifies Increased Risk of Postoperative Complications in Geriatric Patients After Open Reduction Internal Fixation for Distal Radius and Ulna Fractures: Analysis of 5654 Geriatric Patients, From the 2005 to 2017 the National Surgical Quality Improvement Project Database. *Ann Plast Surg*. 2023;90(5S):295–304.
10. Palanca BJA, Avidan MS, Wildes TS, Ju YE, Ching S. Electroencephalography and delirium in the postoperative period. *Br J Anaesth*. 2017;119(2):294–307.
11. Schofield P. The assessment of pain in older people: UK National Guidelines. *Age Ageing*. 2018;47(1):1–22.
12. Lim BG, Lee IO. Anesthetic management of geriatric patients. *Korean J Anesthesiol*. 2020;73(1):8–29.
13. Leibowitz D, Abitbol C, Alcalai R, Rivkin G, Kandel L. Perioperative atrial fibrillation is associated with increased one-year mortality in elderly patients after repair of hip fracture. *Int J Cardiol*. 2017;227:58–60.
14. Nunes JC, Braz JR, Oliveira TS, De Carvalho L, Castiglia YM, Braz LG. Intraoperative and anesthesia-related cardiac arrest and its mortality in older patients: a 15-year survey in a tertiary teaching hospital. *PLoS One*. 2014;9:104041.
15. Smetana GW, Lawrence VA, Cornell JE. American College of Physicians Preoperative pulmonary risk stratification for noncardiothoracic surgery: systematic review for the American College of Physicians. *Ann Intern Med*. 2006;144(8):581–95.
16. Manku K, Bacchetti P, Leung JM. Prognostic significance of postoperative in-hospital complications in elderly patients. I. Long-term survival. *AnesthAnalg*. 2003;96(2):583–92.
17. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J. Frailty in older adults: evidence for a phenotype. *J Gerontol A BiolSci Med Sci*. 2001;56(3):146–56.
18. Kanonidou Z, Karystianou G. Anesthesia for the elderly. *Hippokratia*. 2007;11(4):175–82.
19. Tsui BC, Wagner A, Finucane B. Regional anaesthesia in the elderly: a clinical guide. *Drugs Aging*. 2004;21(14):895–910.
20. Levine WC, Mehta V, Landesberg G. Anesthesia for the elderly: selected topics. *Curr Opin Anaesthesiol*. 2006;19(3):320–4.
21. Mahender A, Chavan SS, Saroa R, Chauhan M. Recent advances in geriatric anaesthesia. *Indian J Anaesth*. 2023;67(1):152–8.
22. Deiner S, Silverstein JH. Anesthesia for geriatric patients. *Minerva Anestesiol*. 2011;77(2):180–9.
23. Kim DK. Nonoperating room anaesthesia for elderly patients. *CurrOpinAnaesthesiol*. 2020;33(4):589–93.
24. Harbi A, Alshaghroud MK, Aljahdali SM, Ghorab MM, Baba FA, Bahadeq R, et al. Regional anesthesia for geriatric population. *Saudi J Anaesth*. 2023;17(4):523–32.
25. Dovjak P. Polypharmacy in elderly people. *Wien Med Wochenschr*. 2022;172(5-6):109–13.
26. Tasch MD. The autonomic nervous system and geriatric anesthesia. *Int Anesthesiol Clin*. 1988;26(2):143–51.
27. Kim SW, Han HS, Jung HW, Kim KI, Hwang DW, Kang SB, et al. Multidimensional frailty score for the prediction of postoperative mortality risk. *JAMA Surg*. 2014;149(7):633–73.

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