

# Anesthetic Management in Geriatric and Comorbid Patients: Clinical Challenges, Risk Stratification, and Outcome-Oriented Strategies

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**Abstract**—The increased life expectancy across the world has resulted in an increasing number of geriatric patients attending surgical procedures with a multitude of comorbidities. Advancing physiological changes, changes in pharmacodynamics and pharmacokinetics, cognitive frailty, and riskiness in the perioperative period are all linked to ageing. Additional complications such as multimorbidity and polypharmacy make these changes very difficult to deal with during anaesthetic management. These are the outcome-based factors of anaesthetic care in geriatric and comorbid patients that have been thoroughly presented in this article. It references anesthesiology, geriatrics, perioperative medicine, and public health based evidence in assessing age-related physiological alterations, risk stratification models, choice of anaesthetic technique, issues related to intraoperative management, and optimization of postoperative outcomes. The cognitive complications, frailty, and patient-centred outcomes are given a special emphasis. New opportunities of digital health, artificial intelligence, and precision medicine in geriatric anaesthesia are also explained. The article concludes that the outcome-oriented, multidisciplinary, and individualised approach to geriatric and comorbid patients perioperative care is safe and effective.

**Index Terms**—Geriatric anesthesia, Comorbid patients, Risk stratification, Perioperative management, Cognitive dysfunction, Outcome-oriented anesthesia

## I. Introduction

One of the most profound demographic shifts that impact the modern healthcare systems is population ageing. The increase in longevity due to the improvement of medical care, better interventions on matters of health and socioeconomic growth has seen an increasing number of older people undergoing surgery. Anaesthetic management of geriatric patients is often complicated due to a high number of chronic comorbidities, a low physiological reserve, and a high susceptibility to perioperative stress (Silverstein et al., 1999; Lim and Lee, 2020). The aged patients have disproportionate morbidity and mortality in perioperative care. Research has continuously shown increased instances of cardiovascular variability, pulmonary complications, postoperative delirium, cognitive dysfunction, and extended hospitalisation among the older groups of surgical patients than their younger counterparts (Liu and Wiener-Kronish, 2003; Prough, 2005). It is important to note that chronological age does not predetermine anaesthetic risk but the interplay between ageing physiology, multimorbidity, weakness, and psychosocial factors that predetermine perioperative outcomes (Bettelli, 2018; Strom et al., 2016). The modern practice in anaesthetics has thus changed the age-based form of decision-making to a more individualised outcome-focused approach that considers focusing on risk stratification, functional assessment, and patient-oriented goals (Bhaskar and Bajwa, 2014; Trivedi and Patel, 2025). The paper summarises the existing literature, such as anaesthetic issues in geriatric and comorbid patients and combines the clinical anesthesiology concept with the wide-angle views of geriatrics, mental health, public health, and digital innovation.

## II. Physiologic changes associated with ageing and Implications of Anaesthetic use

Most of the major organ systems are being impacted by ageing and this has a significant impact on anaesthetic management. The effects of cardiovascular aging include reduced compliance of the arteries, reduced diastolic filling, loss of baroreceptor sensitivity and diminished responsiveness of the  $\beta$ -adrenergic. The changes hinder the capacity of old patients to counter anaesthetic-induced vasodilation or myocardial depression, which puts them at risk of hypotension, myocardial ischemia, and arrhythmias (Liu & Wiener-Kronish, 2003; Edelstein and Metry, 2017). The changes that affect the respiratory system are a decrease in the compliance of the chest wall, alterations in the alveolar surface area, weakening of the respiratory musculature, and loss of the ventilatory responses to hypercapnia and hypoxia. Such changes put the elderly patients at risk of hypoventilation, atelectasis, postoperative pneumonia, and extended ventilatory support (Strom and Rasmussen, 2014; Amornyotin, 2021). The renal and hepatic functions deteriorate with age. The slowing of the renal blood flow, glomerular filtration rate, and elimination of renally excreted drugs increase with a lower renal blood flow and glomerular filtration rate, and the hepatic mass and enzyme activities reduce drug metabolism. As a result, anaesthetic drugs and adjuvant drugs can be accumulated, which further predisposes to further sedation and toxicity (Kotekar et al., 2018; Aurini and White, 2014). The alterations in the central nervous system with age are characterised by neuronal loss, changes in the neurotransmitter activity and hyper-permeability of blood-brain barrier. The alterations increase the vulnerability to anaesthetics, sedatives, and opioids, which also lead to delirium and postoperative cognitive dysfunction (Bhaskar & Bajwa, 2014; Burton et al., 2004).

## III. Multimorbidity, Polypharmacy and Functional Decline

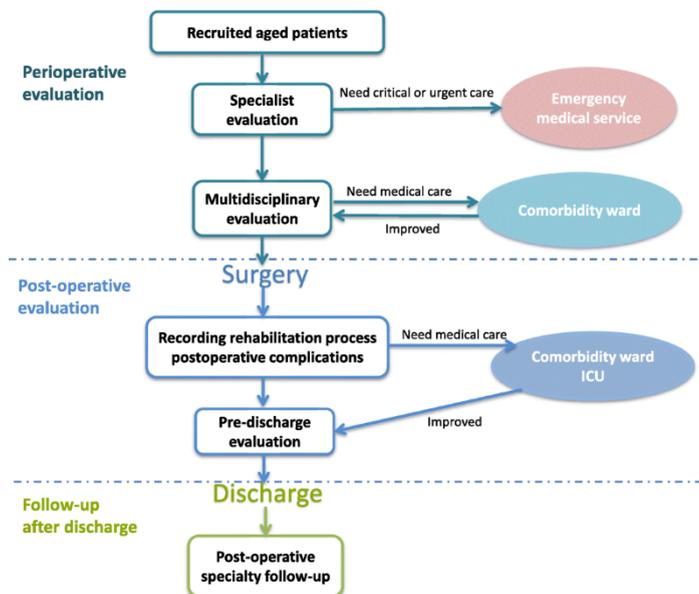
The geriatric patients experience high rates of multimorbidity, and each of them is associated with hypertension, ischemic heart disease, heart failure, diabetes mellitus, chronic obstructive pulmonary disease, chronic kidney disease, cerebrovascular disease, and neurodegenerative disorders (Bettelli, 2011; Lim & Lee, 2020). The presence of numerous chronic conditions not only increases the risk of the perioperative period but also makes determining the anaesthetic more difficult. Multimorbidity is a direct cause of polypharmacy. Older patients are likely to be prescribed several drugs, such as antihypertensives, anticoagulants, antiplatelet drugs, psychotropics, and hypoglycemic medications. Polypharmacy leads to a higher risk of drug interactions, perioperative hypotension, bleeding, and cognitive complications (Prough, 2005; Steadman et al., 2017). Anaesthetic management is also complicated by functional deterioration. The decreased mobility, dysfunctional activities of daily living, and low exercise tolerance are the manifestation of reduced physiological reserve and the strong predictors of postoperative complications and delayed recovery (Strom et al., 2016; Monarch and Wren, 2004).

## IV. Preoperative Evaluation and Risk Basing

Geriatric and comorbid patients require more than a basic evaluation in the preoperative assessment as it should be supplemented with a risk stratification assessment. Its objectives include estimating the perioperative risk, establishing modifiable factors, and harmonising anaesthetic planning and patient-centred outcomes (Bettelli, 2018; Edelstein and Metry, 2017). Risk stratification is anchored on functional capacity assessment. The capability to perform mobility, independence and exercise tolerance is very informative regarding physiological reserve, and is a better predictor of postoperative outcome than chronological age (Strom et al., 2016). Geriatric anaesthesia has developed the use of frailty assessment. Frailty is cumulative decline in physiological functioning and it is directly linked to the postoperative morbidity, postoperative mortality, and postoperative institutionalisation (Bettelli, 2018; Trivedi and Patel, 2025). Cognitive screening is being accepted as imperative. The presence of cognitive impairment is a major cause of postoperative delirium and chronic cognitive impairment (Bhaskar and Bajwa, 2014; Burton et al., 2004). The psychosocial determinants, such as mental health, social support, and health literacy, also have an effect on perioperative resilience. The results of studies regarding the influence of chronic stress, anxiety and

social vulnerability on recovery are supported by evidence of the role of these factors (Ashifa, 2022; Elkin et al., 2025; Zahoor et al., 2025).

**Figure 1 Comprehensive Geriatric Anesthesia Risk–Management Model**



Combined model of geriatric and comorbid perioperative management showing how age-related physiological alterations, multimorbidity and frailty measures are associated with an individualised anaesthetic planning, intraoperative physiological stabilisation and postoperative cognitive-functional recovery. The framework emphasizes outcome based geriatric anesthesia with emphasis on the prevention of delirium, functional independence, as well as multidisciplinary coordination of care.

## V. Selection and Planning of Anaesthetic Technique

The choice of anaesthetic technique in geriatric and comorbid patients should be personal, with a compromise between the needs of surgical operation and the risks of the patient. Although such a course of action is frequently required, general anaesthesia must be carefully titrated according to the treatment of the elderly as they are more sensitive to drugs and their clearance is reduced (Lim and Lee, 2020; Aurini and White, 2014). Regional anaesthesia has a number of advantages, such as less systemic drugs, better analgesia in the postoperative period, and fewer opioids. The regional method is especially helpful in situations involving serious respiratory or cardiovascular comorbidity (Lin et al., 2019; Luger et al., 2014). Integrated anaesthesia methods can be used to achieve a decrease in dose of general anaesthetics without compromising the advantages of regional analgesia. They are being applied in more and more ways to postoperative recovery and outcome-focused anaesthetic protocols (Aurini and White, 2014; Trivedi and Patel, 2025).

## VI. Challenges with the intraoperative Management

The management of geriatric and comorbid patients intraoperative aims at ensuring physiological stability and avoiding secondary injury. The issue of hemodynamic instability is significant because of low cardiovascular reserve. Even short-term hypotension is linked to the risk of myocardial injury, stroke and acute kidney injury among the elderly patients (Liu and Wiener-Kronish, 2003; Steadman et al., 2017). The balance in fluid management should be fine because hypovolemia and fluid overload are not well-tolerated. Individualised, goal-oriented approaches are needed in age-related diastolic dysfunction and renal impairment (Strom and Rasmussen, 2014). The ventilatory management must take into consideration less amount of pulmonary reserve. Postoperative

complications of the lungs are the main conditions that should be minimised by the use of lung-protective ventilation, reasonable oxygen use, and avoiding atelectasis (Amornyotin, 2021). Another important thing to keep in mind is thermoregulation. Elderly patients are likely to develop hypothermia that increases the chances of developing coagulopathy, wound infection, and slow metabolism of drugs (Monarch & Wren, 2004).

## **VII. Cognitive Complications: Postoperative Cognitive Dysfunction and delirium**

Some of the worst adverse outcomes in geriatric anaesthesia include postoperative delirium and postoperative cognitive dysfunction. Delirium is linked to a higher rate of mortality, a longer hospital stay, and a cognitive decline (Bhaskar and Bajwa, 2014; Burton et al., 2004). Among the risk factors, there are increased age, preexisting cognitive impairment, polypharmacy, metabolic disturbances, and perioperative stress. Risk is further aggravated by anaesthetic depth, hypotension, hypoxia, and poor pain management (Strom et al., 2016; Lim and Lee, 2020). The preventive measures consist of excessive sedation avoidance, physiological stability, multimodal analgesia, early mobilisation, and orientation-based postoperative care. The identification of cognitive outcomes as important outcomes is a sign of transition to outcome-based geriatric anaesthesia (Bhaskar & Bajwa, 2014).

## **VIII. Outcome Optimization and Postoperative Management**

The need to provide care after surgery is not a phase but an extension of anaesthetic care. The elderly and comorbid patients can enjoy a better level of surveillance, early complications identification, and proactive intervention (Aurini and White, 2014). Multimodal analgesia reduces the negative effects of opioids and gives sufficient pain management. Functional recovery is aided by regional methods, non-opioid pain treatments, and non-pharmacological treatment (Lin et al., 2019). There is early mobilisation, nutrition, and delirium prevention measures that lead to better results. It is necessary to have multidisciplinary collaboration between anesthesiologists, surgeons, nurses, geriatricians, and rehabilitation specialists (Strom et al., 2016).

## **IX. Outcome-Oriented Quality Metrics Anaesthesia**

Outcome-oriented anaesthesia focuses on patient outcomes that are goal-oriented like functional independence, cognitive preservation, quality of life, and avoidance of institutionalisation. Such results are specifically applicable to geriatric patients (Lim & Lee, 2020; Trivedi and Patel, 2025). The use of outcome measures in the anaesthetic practice helps in the continuous quality improvement and the making of evidence-based decisions. The outcome-based strategies can reconcile the anaesthetic objectives with the most important elements to elderly patients and families.

## **X. Novel Technologies and Digital Innovations**

Artificial intelligence and digital health are gaining more and more impact on the anaesthetic practice. Risk stratification is made possible with the help of predictive analytics and drug dosing and monitoring with the help of decision-support systems (Devi et al., 2025; Shanthy et al., 2025). Precision medicine methods apply anaesthetic management to the individual characteristics of patients. Technology also improves patient interaction, education and follow-up after the operation (Catherine et al., 2025; Vettriselvan, 2025). Technological integration should be accompanied with ethical considerations such as data privacy, algorithm transparency and fair access (Vijayalakshmi et al., 2025).

## **XI. Public Health and Psychosocial Perspectives**

Social determinants of health that affect geriatric anaesthetic outcomes are more widespread. Perioperative resilience and recovery are determined by socioeconomic status, work history, mental health, and community support (Ashifa, 2019; Ashifa, 2022; Rasi & Ashifa, 2019). Mental health

literacy, stress management, and emotional resilience affect the coping capacity and postoperative outcomes (Elkin et al., 2025; Zahoor et al., 2025). Psychosocial approaches will strengthen holistic care of the elderly.

## XII. Future Directions

Ongoing studies ought to be directed toward the improvement of frailty-based risk models, the optimization of cognitive preservation, and the use of digital tools as the routine part of anaesthetic practice. Geriatric-specific skills and the use of interdisciplinary collaboration should be focused on in education and training (Lim and Lee, 2020; Bettelli, 2018).

## XIII. Conclusion

Geriatric and comorbid anaesthetic management is one of the most complicated issues of contemporary anesthesiology. Physiological alterations, multimorbidity, cognitive vulnerability, and psychosocial factors are the age-related factors which require individualised, multidisciplinary, and outcome-related methodologies. Aestheticists can save a lot of lives of elderly patients through thorough preoperative evaluation, specialised anaesthetics, close attention to intraoperative care, and timely postoperative treatment. The transformation of the quality and safety of geriatric anaesthetic care will require further focus on patient-centred metrics, innovation, and interdisciplinary cooperation.

## References

- [1] Amornyotin, S. (2021). Anesthetic consideration for geriatric patients. In *Update in Geriatrics*. IntechOpen.
- [2] Ashifa, K. M. (2019). Developmental initiatives for persons with disabilities: Appraisal on village-based rehabilitation of Amar Seva Sangam. *Indian Journal of Public Health Research & Development*, 10(12), 1257–1261.
- [3] Ashifa, K. M. (2020). Effect of substance abuse on physical health of adolescents. *European Journal of Molecular & Clinical Medicine*, 7(2), 3155–3160.
- [4] Ashifa, K. M. (2020). Effect of sustenance abuse on physical health of adolescents. *European Journal of Molecular & Clinical Medicine*, 7(2).
- [5] Ashifa, K. M. (2020). Physical health hazards of schizophrenia patients. *Systematic Reviews in Pharmacy*, 11(12), 1848–1850.
- [6] Ashifa, K. M. (2021). Analysis on the determinants of health status among tribal communities. *Journal of Cardiovascular Disease Research*, 12(3), 531–534.
- [7] Ashifa, K. M. (2021). Health status of primitive tribal women in India. *Journal of Cardiovascular Disease Research*, 12(5), 772.
- [8] Ashifa, K. M. (2022). A situation analysis of the social well-being of elderly during the COVID-19 pandemic. *International Journal of Health Sciences*, 6(3), 10156–10163.
- [9] Ashifa, K. M., & Ramya, P. (2019). Health afflictions and quality of work life among women working in fireworks industry. *International Journal of Engineering and Advanced Technology*, 8(6S3), 1723–1725.
- [10] Aurini, L., & White, P. F. (2014). Anesthesia for the elderly outpatient. *Current opinion in anesthesiology*, 27(6), 563-575.
- [11] Bettelli, G. (2011). Preoperative evaluation in geriatric surgery: comorbidity, functional status and pharmacological history. *Minerva anesthesiologica*, 77(6), 637.

- [12] Bettelli, G. (2018). Preoperative evaluation of the elderly surgical patient and anesthesia challenges in the XXI century. *Aging Clinical and Experimental Research*, 30(3), 229-235.
- [13] Bhaskar, S. B., & Bajwa, S. J. S. (2014). From pre-operative comorbidities to post-operative cognitive dysfunction: The challenging face of geriatric anaesthesia. *Indian Journal of Anaesthesia*, 58(3), 248-250.
- [14] Burton, D. A., Nicholson, G., & Hall, G. M. (2004). Anaesthesia in elderly patients with neurodegenerative disorders: special considerations. *Drugs & aging*, 21(4), 229-242.
- [15] Catherine, S., Gupta, N., Gopi, E., & Swadhi, R. (2025). Enhancing Patient Engagement and Outcomes Through Digital Transformation: Machine Learning in Medical Marketing. In *Impact of Digital Transformation on Business Growth and Performance* (pp. 285-312). IGI Global.
- [16] Devi, M., Manokaran, D., Sehgal, R. K., Shariff, S. A., & Vettriselvan, R. (2025). Precision Medicine, Personalized Treatment, and Network-Driven Innovations: Transforming Healthcare With AI. In *AI for Large Scale Communication Networks* (pp. 303-322). IGI Global.
- [17] Edelstein, S. B., & Metry, J. E. (2017). Anesthesia considerations for the geriatric patient. *Current Geriatrics Reports*, 6(3), 115-121.
- [18] Elkin, N., Mohammed, A. K., Kılınçel, Ş., Soydan, A. M., Tanrıver, S. Ç., Çelik, Ş., & Ranganathan, M. (2025). Mental health literacy and happiness among university students: A social work perspective to promoting well-being. *Frontiers in Psychiatry*, 16, 1541316.
- [19] Gayathri, R. K., Vettriselvan, R., Rajesh, D., Balakrishnan, R., Kumar, R., & Kavitha, J. (2025). Striking a Balance: Mental Health Challenges and Work-Life Integration among Women Faculty in Indian B-Schools. *Texila International Journal of Public Health*, 13(2).
- [20] Gayathri, R. K., Vettriselvan, R., Rajesh, D., Balakrishnan, R., Kumar, R., & Kavitha, J. (2025). Strategic Role of Human Resource Management in Enhancing Occupational Health and Safety Practices in Business Schools in India. *Texila International Journal of Public Health*, 13(2).
- [21] Jenifer, R. D., Vettriselvan, R., Saxena, D., Velmurugan, P. R., & Balakrishnan, A. (2025). Green Marketing in Healthcare Advertising: A Global Perspective. In *AI Impacts on Branded Entertainment and Advertising* (pp. 303-326). IGI Global.
- [22] Kotekar, N., Shenkar, A., & Hegde, A. A. (2018). Anesthesia issues in geriatrics. In *Anesthesiology: A Practical Approach* (pp. 795-825). Cham: Springer International Publishing.
- [23] Lim, B. G., & Lee, I. O. (2020). Anesthetic management of geriatric patients. *Korean journal of anesthesiology*, 73(1), 8-29.
- [24] Lin, C., Darling, C., & Tsui, B. C. (2019). Practical regional anesthesia guide for elderly patients. *Drugs & Aging*, 36(3), 213-234.
- [25] Liu, L. L., & Wiener-Kronish, J. P. (2003). Perioperative anesthesia issues in the elderly. *Critical care clinics*, 19(4), 641-656.
- [26] Luger, T. J., Kammerlander, C., Luger, M. F., Kammerlander-Knauer, U., & Gosch, M. (2014). Mode of anesthesia, mortality and outcome in geriatric patients. *Zeitschrift für Gerontologie und Geriatrie*, 47(2), 110-124.
- [27] Monarch, S., & Wren, K. (2004). Geriatric anesthesia implications. *Journal of PeriAnesthesia Nursing*, 19(6), 379-384.
- [28] Prough, D. S. (2005). Anesthetic pitfalls in the elderly patient. *Journal of the American College of Surgeons*, 200(5), 784-794.

- [29] Ranganathan, M., Jacob, A., Ashifa, K. M., Kumar, G. J., Anthony, M., Vijay, M., Kumari, R. B. (2024). An investigation of the effects of chronic stress on attention in parents of children with neurodevelopmental disorders. *Universal Journal of Public Health*, 12(1), 37–50.
- [30] Rasi, R. A., & Ashifa, K. M. (2019). Role of community-based programmes for active ageing: Elders self-help group in Kerala. *Indian Journal of Public Health Research & Development*, 10(12).
- [31] Schreiber, A., & Tan, P. M. (2015). Anesthetic Considerations for Geriatric Patients. *Anesthesia complications in the dental office*, 97-102.
- [32] Shanthi, H. J., Gokulakrishnan, A., Sharma, S., Deepika, R., & Swadhi, R. (2025). Leveraging Artificial Intelligence for Enhancing Urban Health: Applications, Challenges, and Innovations. In *Nexus of AI, Climatology, and Urbanism for Smart Cities* (pp. 275-306). IGI Global.
- [33] Silverstein, J. H., Bloom, H. G., & Cassel, C. K. (1999). Geriatrics and anesthesia. *Anesthesiology Clinics of North America*, 17(2), 453-465.
- [34] Steadman, J., Catalani, B., Sharp, C., & Cooper, L. (2017). Life-threatening perioperative anesthetic complications: major issues surrounding perioperative morbidity and mortality. *Trauma surgery & acute care open*, 2(1), e000113.
- [35] Strøm, C., & Rasmussen, L. S. (2014). Challenges in anaesthesia for elderly. *Singapore Dental Journal*, 35, 23-29.
- [36] Strøm, C., Rasmussen, L. S., & Steinmetz, J. (2016). Practical management of anaesthesia in the elderly. *Drugs & aging*, 33(11), 765-777.
- [37] Swadhi, R. (2025). Innovative strategies for widespread adoption in a climate-smart future: Scaling up agroforestry. In *Agroforestry for a Climate-Smart Future* (pp. 473-496). IGI Global.
- [38] Swadhi, R., Gayathri, K., Suresh, N. V., Catherine, S., & Velmurugan, P. R. (2025). Leveraging Machine Learning for Enhanced Patient Engagement and Outcomes: Revolutionizing Healthcare Marketing. In *Impact of Digital Transformation on Business Growth and Performance* (pp. 313-340). IGI Global.
- [39] Swadhi, R., Velmurugan, P. R., Gayathri, K., & Catherine, S. (2026). Evolving critical themes in advanced human resource management: Navigating change in the modern workplace. In *Critical aspects in advanced human resource management* (pp. 75-102). IGI Global.
- [40] Trivedi, J. M., & Patel, J. J. (2025). Evaluation of Tailored Anesthetic Strategies in High-Risk Cardiovascular and Geriatric Patients: A Prospective Observational Study on Perioperative Challenges and Outcomes. *European Journal of Cardiovascular Medicine*, 15, 363-367.
- [41] Venice, A., Swadhi, R., Gayathri, K., Chandra, P., & Sajana, K. P. (2026). Rehabilitation Robotics and Adaptive Motion Planning for Patient-Centric Care. In *Intelligent Motion Control for Human-Centered Systems* (pp. 51-76). IGI Global.
- [42] Vettriselvan, R. (2025). Harnessing innovation and digital marketing in the era of industry 5.0: resilient healthcare SMEs. In *The Future of Small Business in Industry 5.0* (pp. 163-186). IGI Global.
- [43] Vettriselvan, R., & Anto, M. R. (2018). Pathetic health status and working condition of Zambian women. *Indian Journal of Public Health Research & Development*, 9(9), 259-264.
- [44] Vettriselvan, R., & Rajan FSA, A. J. (2019). Occupational Health Issues Faced by Women in Spinners. *Indian Journal of Public Health Research & Development*, 10(1).
- [45] Vettriselvan, R., Deepan, A., Jaiswani, G., Balakrishnan, A., & Sakthivel, R. (2025). Health Consequences of Early Marriage: Examining Morbidity and Long-Term Wellbeing. In *Social, Political, and Health Implications of Early Marriage* (pp. 189-212). IGI Global.

- [46] Vettriselvan, R., Ramya, R., Selvalakshmi, V., Jyothi, P., & Velmurugan, P. R. (2026). Empowering Patients through Knowledge: Educational Strategies in Rehabilitation. In *Holistic Approaches to Health Recovery* (pp. 263-290). IGI Global.
- [47] Vettriselvan, R., Velmurugan, P. R., Varshney, K. R., EP, J., & Deepika, R. (2025). Health Impacts of Smartphone and Internet Addictions Across Age Groups: Physical and Mental Health Across Generations. In *Impacts of Digital Technologies Across Generations* (pp. 187-210). IGI Global.
- [48] Vijayalakshmi, M., Subramani, A. K., Vettriselvan, R., Catherin, T. C., & Deepika, R. (2025). Sustainability and Responsibility in the Digital Era: Leveraging Green Marketing in Healthcare. In *Digital Citizenship and Building a Responsible Online Presence* (pp. 285-306). IGI Global.
- [49] Vijayalakshmi, M., Subramani, A. K., Vettriselvan, R., Velmurugan, P. R., & Hasine, J. (2025). Strategic Collaborations in Medical Innovation and AI-Driven Globalization: Advancing Healthcare Startups. In *Navigating Strategic Partnerships for Sustainable Startup Growth* (pp. 85-110). IGI Global.
- [50] Zahoor, H., Mustafa, N., Ashifa, K. M., Safaei, M., & El Gamil, R. (2025). Unlocking resilience: Emotional intelligence and self-leadership shape stress perception among health students. *International Journal of Innovation and Learning*, 38(4), 395–419.