Effects of Collaborative Care and Multimodal Analgesia with Nerve Blocks on Recovery in Elderly Patients with Hip Fractures

Emery Niyonkuru[1], Baneste NDAYISHIMIYE[2], Xu Zhang[3] and Peng MA*[1]

[1]Affiliated Hospital of Jiangsu University

[2]School of Food Science Engineering, Jiangsu University, Zhenjiang City, Jiangsu Province, China

[3]School of Medicine, Jiangsu University, Zhenjiang City, Jiangsu Province, China

***Correspondence Author**

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ABSTRACT

Hip fractures in elderly patients present significant challenges in pain management and postoperative recovery. Conventional opioid-based analgesia, while commonly used, has limitations such as adverse effects and delayed rehabilitation. In response, a collaborative care approach involving multidisciplinary teams and multimodal analgesia with nerve blocks has been proposed to enhance recovery outcomes in this vulnerable population. This narrative review aimed to investigate the effects of collaborative care and multimodal analgesia with nerve blocks in improving postoperative outcomes for elderly patients with hip fractures.

We conducted thorough research using multiple databases from 2000 to February 2024, such as PubMed, Ovid Medline, Google Scholar, Scopus, Cochrane, and Web of Science. We summarized the findings from 97 papers, which included clinical trials, review articles, observational studies, case reports, and meta-analyses that specifically addressed elderly patients with hip fractures. The review highlighted the effects of collaborative care and multimodal analgesia with nerve blocks in elderly patients with hip fractures. Collaborative care involving multidisciplinary teams and nerve blocks showed promise in reducing opioid requirements, enhancing pain control, expediting recovery, potentially lowering mortality rates, and decreasing postoperative complications.

Conclusion: The integration of collaborative care and multimodal analgesia with nerve blocks holds substantial promise in optimizing recovery outcomes for elderly patients with hip fractures. Further research is warranted to refine these strategies and explore their long-term benefits for patient well-being.

Keywords: Hip fracture, Multimodal analgesia, nerve blocks, collaborative care, elderly patients, recovery outcomes, pain management, functional rehabilitation, postoperative complications.

INTRODUCTION

Hip fractures are a growing global concern, posing a significant burden on healthcare systems and societies. The rise in cases is mainly due to the increasing elderly population. In Europe alone, over 600,000 hip fractures occurred in 2010, with projections estimating a doubling by 2040 due to the increasing number of older adults[1]. Similar trends are observed worldwide, with countries like Japan anticipating a rise from

175,700 cases in 2012 to 320,000 by 2040[2]. The United States echoes this trend, with over 300,000 annual hip fractures in seniors, projected to double by 2040 [3]. The growing number of cases is worsened by the difficult challenges linked to treating hip fractures in older people. Their pre-existing health conditions elevate both morbidity and mortality rates[4]. Studies like the HQMS report demonstrate the vast healthcare resource allocation required, with over 30 million hospital admissions for hip fractures in patients over 65 between 2013 and 2016 in China alone [5]. The high prevalence of hip fractures extends beyond just the initial injury. Complications like post-operative pain, longer hospital stays, and functional decline significantly impact patient well-being[6]. Inadequate pain control impedes movement, delays healing, and elevates the risk of immobility-related complications like deep vein thrombosis, pulmonary embolism, atelectasis, pneumonia, and increased heart rate. Opioid-centric analgesia frequently compromises hip fracture outcomes in elderly and fragile patients[7][8]. Postoperative management of pain remains a significant challenge after hip fracture surgery in the elderly, with a substantial proportion of patients experiencing persistent moderate-to-severe pain or even postoperative pain exacerbation. This ongoing nociceptive input is a well-established risk factor for delirium, a common and detrimental complication in this patient population. Additionally, the frequent use of opioids for pain management can further contribute to the development of delirium. These findings highlight the critical need for the development and implementation of effective multimodal analgesic strategies that prioritize patient outcomes[9][10]. This narrative review explores how a combined approach of nerve blocks and collaborative care impacts recovery outcomes in elderly hip fracture patients. We will evaluate the efficacy of multimodal analgesia, including nerve blocks, in managing postoperative pain. Additionally, the review will assess the influence of collaborative care on enhancing functional rehabilitation and explore the potential of this strategy to reduce complications. Ultimately, we aim to elucidate the synergistic benefits of this comprehensive approach for optimizing recovery, encompassing pain management, functional restoration, and reduced complication rates.

METHODOLOGY

Research was extensively carried out across various databases, such as PubMed, Ovid Medline, Google Scholar, Scopus, Cochrane, and Web of Science, to locate studies published from 2000 to February 2024. The search strategy focused on clinical trials, review articles, observational studies, case reports, and meta-analyses concerning elderly patients with hip fractures. Studies involving younger populations were excluded, with a specific emphasis on seniors aged 60 and above. A combination of keywords and relevant medical subject headings such as “hip fracture,” “elderly,” “collaborative care,” “geriatric care,” “multidisciplinary care,” “perioperative care,” “analgesia,” “pain management,” “recovery,” “mortality,” “mobility,” “multimodal analgesia,” “nerve blocks,” “rehabilitation,” and “hospital stay” was used to ensure precision. This comprehensive approach aimed to gather all available evidence on the effectiveness of nerve blocks and collaborative care in enhancing postoperative outcomes for elderly hip fracture patients, including pain management, mobility, reduction in hospital stay, postoperative complications, and ultimately, decreased mortality rates.

Streamlining Preoperative Care for Better Hip Fracture Outcomes

Hip fractures in elderly patients are a major source of pain, with up to 70% experiencing severe pain within the first day[11]. However, research shows that many don’t receive adequate pain medication before surgery, leading to mental confusion[12]. Effective pain management is crucial to prevent complications. Opioids are traditionally used for surgical pain, but they have side effects like nausea and respiratory depression. Nerve blocks offer a promising alternative[13][14]. Techniques like ultrasound-guided femoral nerve blocks and fascia iliaca compartment blocks have proven effective in reducing preoperative pain and opioid use in hip fracture patients[13][15]. Furthermore, both blind and ultrasound-guided femoral nerve blocks have been shown equally successful in managing preoperative pain [14].

Before surgery, the medical care for hip fractures involves a comprehensive approach with protocols based on evidence[16]. Upon arrival at the emergency department, patients are stabilized and assessed for additional injuries. Basic lab tests (CBC, BMP, PT/INR, urinalysis) are conducted to evaluate anemia, renal function, and coagulation status. Imaging, including lateral femur and anteroposterior pelvis X-rays, is typically done to aid in diagnosis and treatment planning. Timely management can reduce mortality by addressing cardiopulmonary and thromboembolic risks, highlighting the importance of prompt preoperative assessment to optimize outcomes[16]. Delays in hip fracture surgery, primarily caused by operating room unavailability and acute medical issues, were associated with higher mortality and complications. Shorter delays did not show significant effects, but delays exceeding 5 days were linked to increased risks, especially for medical complications, despite some attenuation after adjusting for acute medical conditions[17]. When senior individuals with hip fractures are admitted, it is crucial to gather comprehensive information about each patient and their specific needs. Providing tailored accelerated rehabilitation based on individual capabilities is essential. Monitoring process indicators throughout the transition can help prevent significant deviations from the care plan[18].

Enhancing Nursing Education and Practice for Improved Patient Outcomes

Healthcare professionals and organizations prioritize patient and family education for better health outcomes. The "R.E.A.C.H. to Teach (R: RELATE TOP PATIENT AND FAMILY, E: EDUCATE SIMPLY, A: ASK AND ANSWER QUESTIONS, C: CHECK FOR UNDERSTANDING)" graphic aims to make evidence-based education stick with staff by using principles from the book "Made to Stick."[19]. Additionally, the Calgary Family Intervention Model (CFIM) is a model that assists nurses in providing education to patients and their families directly in the hospital, resulting in improved outcomes for both the patient and their families[20]. Abu-Qamar et al. carried out a comprehensive review indicating that postgraduate education has positive effects on nurses, including the improvement of their knowledge, skills, and potential patient care. These programs seem to strengthen nurses' capabilities in various aspects, from daily care to influencing healthcare policies. However, the review was based on self-reported benefits from nurses, which lack objectivity and do not conclusively demonstrate the impact on patient care[21]. Australia can boost healthcare by investing in postgraduate education for primary care nurses. These nurses, with advanced training, can manage complex care, train others, and better tackle chronic diseases, leading to improved health services overall[22]. Nurses with postgraduate degrees, even those not in advanced practice roles, dedicate more time to advanced activities and contribute more to their workplace compared to nurses without such degrees. This suggests their advanced education benefits the healthcare environment beyond just allowing them to perform specific advanced tasks[23].

Nurses have long emphasized the importance of neurological checks in their practice. These assessments help uncover nerve-related problems, understand their impact on the patient's daily life, and assess the overall impact of illness on the nervous system. In critical care settings, these evaluations play a crucial role in establishing a baseline neurological state, identifying any decline, and monitoring treatment effectiveness. However, the frequency and content of these assessments are unclear, and routine checks may overlook important details and may not always be effective[24]. Over the past decade, advancements have made objectively measuring daily physical activity (PA) much easier. Researchers and clinicians in orthopedics can now leverage these tools to analyze a wider range of PA data. This is particularly important in orthopedics, where injuries directly impact movement and activity levels. Ultimately, treatment goals often focus on improving both function and PA[25].

DISCHARGE PLANNING

When a patient is discharged from the hospital, a well-coordinated strategy (discharge planning) helps

ensure a seamless transition to their next care setting, such as their home. This collaborative effort involves evaluating needs, establishing objectives, devising a plan, implementing it, and following up afterward[26]. Discharge planning has the potential to enhance patient satisfaction and possibly result in shorter hospital stays and fewer readmissions. However, its impact on healthcare expenses, mortality rates, and overall health outcomes is still uncertain[26]. Discharge planning is extremely important, particularly for the elderly, many complicated discharge situations go beyond the typical process. This opinion suggests a classification system consisting of six categories: standard, early, rehabilitation, safety issues, unwilling patients, and postponed discharge. Each category requires specific considerations for healthcare professionals, and implementing this system could enhance education and the quality of care provided[27]. Initially, trainees felt disconnected from discharge planning, but through expansive learning, clarity on physicians' roles emerged. Despite inconsistencies, the program positively influenced physicians' practice and medical education in Taiwan[28].

Benefits of Orthogeriatric Care for Hip Fractures in Elderly Patients

Orthogeriatric care offers a structured approach with evidence-based practices for treating hip fractures in elderly patients, emphasizing early surgery, mobilization, delirium prevention, nutritional support, and comprehensive geriatric assessments[29]. Research by Tobias et al. indicates orthogeriatric models reduce morbidity and mortality in hip fractures, but data on elective orthopedic care for geriatric patients, particularly in arthroplasty, are limited. Preoperative intervention is typically feasible[30]. In a study involving 135 orthogeriatric patients (mean age 78.5 years), both total hip and knee arthroplasty substantially improved physical performance in orthogeriatric patients with osteoarthritis (OA). Total hip replacement results in a significant increase in Short Physical Performance Battery (SPPB) scores as early as 4–6 weeks post-surgery, while knee replacement shows marked improvement in SPPB scores three months after the procedure[31]. Elderly patients with fragility hip fractures require coordinated care from various professionals (orthopedists, anesthesiologists, geriatricians, therapists, and nurses) to minimize complications, mortality, and functional decline. Rehabilitation programs, osteoporosis treatment, fall prevention, and comprehensive geriatric assessments are crucial for their recovery and well-being[32]. Orthogeriatric care for hip fracture patients shows benefits in reducing length of stay, in-hospital mortality, 1-year mortality, and delirium. It may also lower complications and costs, but its impact on functional outcomes is inconclusive. However, the superiority among different orthogeriatric care models remains uncertain due to limited evidence[33]. The study involved 101 patients over 50 with proximal femoral fractures after minor falls, comparing outcomes based on surgery timing within or after 72 hours of admission. Early surgery showed lower mortality and improved outcomes in mobility and hospital stay[34].

Challenges and Considerations for Orthogeriatric Care

Since 2007, a novel clinical pathway introduced in Hong Kong to handle geriatric hip fractures has led to a reduction in hospitalization time, enhanced clinical results, and decreased expenses[35]. Orthogeriatric interdisciplinary management showed promising results in hip fracture patients in their elderly years. An analysis of the economic advantages of interdisciplinary orthogeriatric care in dedicated units shows that lower mortality, care demands, and readmission rates occur in these patients[36]. A meta-analysis explored how interventions during surgery can improve mobility and function after hip fractures. Electrical nerve stimulation (TENS) and structured care programs (ERAS) showed promise in improving physical function, but the benefits of other methods like nerve blocks or early physical therapy were inconclusive. The study highlights the need for further research using standardized measurement techniques to confirm these findings and better understand how perioperative interventions can optimize recovery after hip fractures[37]. Elderly people are more likely to experience difficulties and even pass away as a result of many illnesses, multiple drugs, frailty, osteosarcopenia, nutritional deficiencies, immobility, cognitive impairments, and other chronic conditions. To provide medical care for elderly patients more effectively, trauma clinics have

emerged, working in conjunction with geriatricians and trauma surgeons[30]. The standard of living of elderly patients suffering hip fractures can be improved by providing pain relief and physical activity. In the majority of instances, it is optimal to mobilize and engage in movement on the following day post-surgery[37]. Early surgery and collaboration between doctors, nurses, and rehabilitation specialists may improve outcomes. Anesthesiologists should focus research on reducing delirium, pain management techniques like nerve blocks, and recovery strategies. They may also need a new scoring system to predict patient outcomes[38]. A project aimed to establish outcome measures for assessing orthogeriatric co-management models in hip fracture care. Twelve parameters were outlined, such as mortality, length of hospital stay, complications, readmission rate, mobility, quality of life, pain, daily activities, medication usage, place of residence, costs, patient satisfaction, and falls. Specific time frames for evaluation were set at admission, discharge, 30 days, 90 days, and 1 year after admission[39].

Table 1. Collaborative Care Approach for Elderly Hip Fracture Patients

components	**Description**	**Potential Benefits**
Preoperative Assessment	Interdisciplinary team evaluation, including surgeons, geriatricians, physical therapists, and nurses, to assess individual needs and potential risk factors.	Enhanced care planning, early detection of co-morbidities, and personalized interventions to enhance pre-surgical health.
Multimodal Analgesia	Integrated pain management strategy encompassing nerve blocks, medications, and non-pharmacological techniques.	Effective pain control, reduced opioid dependence, and improved patient satisfaction with pain management.
Postoperative Rehabilitation	Prompt and coordinated rehabilitation program with involvement from physical and occupational therapists.	Enhanced mobility, increased functional independence, and minimized complication risks leading to faster recovery.
Ongoing Monitoring	Continuous monitoring of pain, mobility, and potential complications is conducted by the healthcare team.	Timely identification of issues, prompt intervention, and optimization of the recovery process.
Patient and Family Education	Thorough instruction on pain management, rehabilitation exercises, and post-surgical precautions	Enhanced self-care abilities, increased patient involvement in the recovery process, and decreased anxiety levels for both patients and their families.
Discharge Planning	Coordinated planning for a secure discharge and transition to either home or a rehabilitation facility	Decreased readmission rates, seamless transition to post-acute care, and enhanced long-term outcomes.

Anesthesia Choice for Better Hip Fracture Outcomes

The decision between spinal and general anesthesia for hip fracture surgery should be made by an experienced anesthesiologist in consultation with the surgeon, considering the individual patient's health status, the complexity of the surgery, and the use of anticoagulants. Both options can be safe and effective when chosen appropriately[40]. While general anesthesia remains a viable option, the studies strengthen the case for considering neuraxial anesthesia as a favorable choice for elderly patients undergoing hip fracture surgery, in the absence of specific contraindications. The potential benefits of faster recovery reduced cognitive decline, and improved hemodynamic stability can lead to better overall outcomes for this vulnerable population[19]. The evidence suggests that regional anesthesia provides advantages over general anesthesia for many senior patients undergoing hip fracture surgery. It's linked with a lower risk of

mortality, complications, and readmission. However, careful patient selection and anesthesiologist expertise are crucial for optimal outcomes[20]. A retrospective cohort study conducted in 126 hospitals in New York during 2007-2008 analyzed the link between anesthesia and outcomes for hip fracture surgery. The study included 18,158 patients who underwent hip fracture surgery, out of which 29% received regional anesthesia[16]. The study found that regional anesthesia was associated with lower in-hospital mortality rates (2.4% overall) and fewer pulmonary complications (6.8% vs. 8.1%) compared to general anesthesia. Additionally, regional anesthesia resulted in better outcomes for patients with intertrochanteric fractures. However, no significant differences were observed for femoral neck fractures[16]. Reducing complications can lower healthcare costs tied to extended hospital stays. Peripheral regional anesthesia in hip surgeries is associated with improved hemodynamic stability and minimized occurrence of complications, offering a promising alternative to general or spinal anesthesia, and potentially contributing to cost savings in healthcare[41]. In this patient demographic, localized anesthesia, particularly peripheral and neuraxial nerve blocks, correlates with diminished risks of respiratory issues, postoperative cognitive decline, and shorter stays in the ICU[14]. Postoperative difficulties like hypostatic pneumonia, delirium, and deep vein thrombosis frequently stem from immobilization due to pain, resulting in prolonged hospitalization and heightened healthcare expenses. Commencing analgesic treatment as early as feasible, even before surgery, is paramount to effectively tackle these challenges[42]. A comprehensive review by Guay et al. found that peripheral nerve blocks, compared to traditional pain management approaches for hip fractures, significantly reduce pain, decrease the risk of confusion (postoperative delirium), potentially lower the incidence of chest infections, and expedite mobilization time. These advantages are probably a result of the precise pain management offered by nerve blocks, which could also decrease the requirement for opioid drugs and their related negative effects[43].

The Intricacy of Post-Surgical Pain Management in Elderly Hip Fracture Patients

Older individuals, as a result of changes in how drugs affect the body and preexisting health conditions, are particularly susceptible to experiencing the adverse effects of opioids, such as respiratory depression[44]. Standard surgeries aim to minimize complications, but therapists face a challenge: managing moderate to severe postoperative pain in many patients. This pain can hinder rehabilitation and compromise long-term outcomes, especially for elderly patients with hip fractures[10][45]. After hip surgery, postoperative pain significantly hinders successful rehabilitation. Although there's been considerable study, the best pain relief method remains contentious. Opioids, often used for pain control, bring about adverse effects like nausea, vomiting, dizziness, and urinary problems[46]. Elderly patients present a unique set of hurdles when it comes to postoperative pain management. Physiological changes associated with aging, like decreased kidney function and slower metabolism, can alter how medications work in their bodies. Additionally, the presence of numerous comorbidities like diabetes or heart disease further complicates the picture. These factors can make accurately assessing pain intensity in elderly patients difficult. They might not express pain verbally due to cognitive decline or simply attribute it to "getting old." This can lead to undertreatment and ultimately hinder their recovery[47]. Poor pain control after surgery slows healing and risks blood clots, pneumonia, and heart issues. Opioids in frail patients, especially with hip fractures, can worsen outcomes[7]. Following hip replacement surgery, systemic drugs like acetaminophen, NSAIDs, and opioids are employed for pain relief. Nonetheless, adverse effects of oral opioids can prolong hospitalization and hinder recovery[48]. A significant majority of postoperative patients often endure insufficient pain relief, with many experiencing moderate to severe pain both immediately after surgery and up to two weeks post-discharge[49]. Hip fractures in elderly individuals pose substantial burdens on healthcare systems and societies due to their potential outcomes, including mortality, disability, and increased dependency[50]. Studies have established a 30% one-year mortality rate and significant morbidity, notably the need for prolonged care, associated with hip fractures in older adults[44][51][52]. Other studies show a one-year mortality rate of 8% to 36%, with slower recovery and higher death risk. However, good pre-surgery care, quick surgery, and early movement can improve results and lower death rates[53][54].

Further complicating pain management, elderly patients are more vulnerable to side effects from systemic opioid analgesics. Additionally, the choice of anesthesia (spinal/epidural or general) for hip surgery can impact mortality, yet its use might be limited in patients on anticoagulants[40]. Despite the high volume of surgeries globally, effective perioperative pain control remains a significant unmet need. Therapists often find that postoperative pain is inadequately addressed[10]. Postoperative pain throws a major wrench into rehabilitation efforts following surgeries, particularly those involving the hip. Despite significant research, managing pain effectively remains a complex challenge. Although opioids are frequently utilized for pain management, they come with a significant downside a cocktail of unpleasant side effects like nausea, vomiting, dizziness, and difficulty urinating. These side effects not only make patients miserable but can also prolong hospital stays and delay the crucial process of rehabilitation. This is especially problematic for hip replacement surgery, where regaining mobility and strength is paramount for a successful recovery[46][55].

Severe pain after hip fractures, along with opioid use, significantly increases the risk of delirium, a confused and disoriented state[56][57]. Patients with impaired cognitive function have worse postoperative results after hip fracture, leading to reduced recovery, longer hospital stays, higher mortality, and impacting daily activities and functional abilities[58]. Research indicates that individuals with fractures and cognitive impairment experience higher pain levels compared to those with normal cognitive function. This disparity may arise from inadequate pain medication and delayed pain control in these populations[58].

Strategies to Enhance Postoperative Pain Control

Poor post-surgery pain relief is common. The American Pain Society created evidence-based guidelines for doctors to improve it. These guidelines focus on personalized pain management plans with various strategies, including education, pre-surgery planning, medications, non-drug methods, and aftercare. While some recommendations have strong support, others need more research. This is a positive step towards better post-surgical pain management[59]. A surgical pathway that prioritizes early surgery for hip fractures, such as rapid admissions, medical optimization, regional anesthesia, and timely surgery, has reduced hip fracture mortality[60]. Combining numbing anesthetics and pain-reducing analgesics could be key to better post-surgery pain control[61]. Nerve blocks reduce the use of opioids during surgery without compromising patient comfort or pain relief. Patients report experiencing less pain, feeling more satisfied, and even favoring nerve blocks over general anesthesia or solely using opioids[62]. Chan and colleagues highlighted the beneficial impact of PNBs in effectively decreasing the use of opioids, especially while in the hospital, indicating potential advantages for both patient outcomes and the efficient use of resources[63].

Enhanced recovery after surgery

In the past few years, a growing contingent of healthcare professionals has fervently championed Enhanced Recovery After Surgery (ERAS) strategies, with particular emphasis over the last two decades. These efforts aim to reduce stress responses in patients following major surgery and enhance perioperative outcomes. Surgeon Henrik Kehlet pioneered the use of this approach in patient care back in 1995[64]. Good pain control is crucial for hip fracture patients. When pain isn't managed well, it can lead to delirium, which can significantly increase complications or the risk of death within one year[65]. By effectively managing pain after surgery, patients can move around sooner and leave the hospital faster. This lowers costs and keeps them out of the healthcare environment, where they might be exposed to other risks[65]. Enhanced rehabilitation and multidisciplinary optimization can reduce stress in elderly patients with fractured femoral necks, who are anticipated to have extended hospital stays and mobilization periods following elective abdominal surgery and joint replacement procedures[66]. ERAS protocols commonly incorporate regional anesthesia and analgesia techniques, often involving epidurals or spinal anesthesia. While these methods offer clear advantages, their effects are typically short-lived. Local anesthesia aids in accelerated post-

surgical recovery and improved pain management by minimizing opioid use and reducing associated side effects[67]. Personalized treatment strategies are crucial to addressing both the physical pain and the psychological consequences[68]. An individualized care strategy and a thorough treatment plan that includes a multidisciplinary team of experts such as orthopedic specialists, geriatric doctors, endocrinologists, physical therapists, occupational therapists, nutritionists, respiratory therapists, physician assistants, and nurse case managers led to improved compliance with osteoporosis treatment, reduced risk of falls and fractures, and decreased postoperative mortality[54]. A hospital implements a multidisciplinary team to fight post-surgical pain. Orthopedists spearhead pain relief based on assessments, with anesthesiologists on call for complex cases. Nurses, guided by pain management principles, manage each patient's pain individually, creating a holistic plan that respects the patient's beliefs and understanding of pain[69]. Additionally, various studies have shown that patients treated by orthogeriatric or multidisciplinary teams have a reduced risk of major complications following hip fracture treatment[51].

Challenges and Considerations with New Techniques

Hip fractures in older adults are complex due to existing health problems, weakened bodies, confusion, and frailty. Early surgery and mobilization of patients improve overall health, reduce mortality, and lower the risk of heart attacks, blood clots, and lung infections[70]. However, pain management is challenging, and many patients still experience significant pain a year later. This persistent pain impacts their mobility, daily activities, independence, sleep quality, and energy levels[70]. Traditional anesthesia practices, for instance, might cause unexpected issues later in a patient's care journey[71]. The long-term use of pain medication like NSAIDs, antidepressants, and opioids carries significant risks, as seen with the opioid crisis. These drawbacks, coupled with limited effectiveness for many patients, are fueling efforts to develop personalized treatment plans that match patients with the most beneficial pain management options[72]. Ultrasound-guided nerve blocks are gaining traction for pain relief after hip surgery. These techniques, including lumbar plexus, quadratus lumborum, fascia iliaca, femoral nerve blocks, and others, can reduce opioid use. However, a drawback is potential quadriceps weakness, which can slow down recovery and increase fall risk. Ideally, pain management for hip surgery should promote faster healing and rehabilitation[73]. However, many studies including a study by Niels D. et al. using a new injection technique iliopsoas plane block (IPB) showed no knee weakness after surgery. This method targets specific nerves around the hip joint, potentially lowering fall risks compared to traditional nerve blocks that might weaken the leg muscles[74]. Additionally, hip fracture surgery patients can benefit from a combined approach: pericapsular nerve group(PENG) block before spinal anesthesia for easier positioning and pain control during surgery, plus ongoing pain relief afterward[75]. An additional study describes using ultrasound-guided PENG block for THA pain relief. It worked well on its own and might be combined with other blocks for various hip surgeries. PENG offers an easy, patient-friendly technique with minimal impact on movement[76].

Beyond Opioids: Safer Pain Management for Hip Fractures in Seniors

Since the 1980s, local anesthesia and opioids have been widely employed for managing postoperative pain[70]. Opioids are medications that are very useful analgesics in surgery, particularly when performing a hip replacement[13]. Evaluating and managing pain in the elderly is getting more and harder because of comorbidities and physiologic alterations. The hip fracture pain is typically treated with opioid prescriptions. However, there is a risk associated with opioids that is frequently greater than the benefit they are supposed to provide[47]. Seniors are also more vulnerable to the harmful effects of opioids because of their evolving pharmacodynamics and preexisting medical problems[44].

Opioid pain relief is problematic. Between 1999 and 2016, deaths due to drug overdoses claimed the lives of nearly 630,000 Americans, setting a record in 2016. Canada recorded 2066 deaths linked to opioids in 2018. Approximately 75% of heroin users received their initial dosage from a doctor or surgeon[43]. Metabolic processes, and multiple medical vulnerabilities of elderly patients, including their medical conditions,

polypharmacy, and susceptibility to drug-adverse effects, increase the likelihood of fractures and recurrent fractures post-surgery. To lessen their risk of opioids after surgery, seniors can benefit from PNBs and regional anesthetics[70]. The use of peripheral nerve blocks (PNBs) in surgeries involving upper and lower extremities, like hip fractures, has been validated to offer effective and prolonged pain relief, thereby decreasing opioid requirements. These blocks can be injected via a single-shot injection or a catheter-based system. Furthermore, this method is linked to improved health outcomes and increased patient satisfaction[70].

According to a Simoni et al. statistical analysis, 61.8% of opioid prescriptions are redeemed after surgery, compared to 26.8% that are redeemed before surgery. Despite this, cognitive impairment affects 80% of patients, increasing the risk of falls and hampering recovery due to the negative effects of opioids. To reduce these problems and enhance patient outcomes, a neuraxial strategy is advised[77]. Additionally, it has been shown that peripheral analgesia reduces the amount of opioids needed during surgery[43].

Multimodal Pain Management and Early Mobilization

Multimodal Pain Management

Hip fractures are a growing concern due to an aging population[78]. The mitigation of risks linked to opioid use, including increased morbidity and mortality rates, higher expenses, hospital readmissions, and prolonged stays, can be tackled through the implementation of a multimodal analgesic approach. This strategy involves combining non-opioid medications with nerve block procedures[79]. Utilizing posterior lumbar plexus (LP) blocks effectively manages pain and diminishes the requirement for opioids in total hip arthroplasty (THA). Additionally, it lowers the risk of bleeding. The utilization of peripheral nerve blockades in lower limb surgery delivers enhanced and prolonged analgesic outcomes, promoting stability in the hemodynamic system, reducing urinary retention, minimizing surgical blood loss, and preventing dura mater punctures[80]. Regional anesthesia, particularly femoral blocks, is favored for elderly trauma patients who cannot withstand systemic pain management. Alongside alleviating acute hip fracture pain and reducing opioid reliance and hospital durations, this approach also lowers delirium occurrences. In emergency settings or pre-hospitalization, nerve blocks can be administered to patients requiring them [81]. Femoral nerve blocks (FNB) for managing hip fracture pain are deemed safe and effective for all patients, including those with dementia. A study conducted by Riddell et al. in 2016 revealed no adverse effects linked to FNB. Approximately 46% to 50% of individuals with hip fractures suffer from dementia, yet they receive lesser amounts of opioid pain medication compared to those without dementia. Despite the presence of dementia, FNB remains efficacious in alleviating pain and reducing the need for systemic analgesia[82]. Both the American Society of Anesthesiologists and the US Academy of Orthopedic Surgeons advocate for peripheral nerve blocks (PNBs) as the initial method for pain control following hip fracture surgery[83]. Research conducted by Jakopovic and colleagues indicates that individuals with hip fractures often receive pain management before hospital admission. While the primary goals include sustaining pain relief and mitigating procedure-related pain, patients with multiple medical conditions and polypharmacy express particular concerns regarding the adverse effects of centrally acting analgesics. In such cases, regional nerve blocking emerges as a potential alternative to systemic medication, especially for effective pain relief without the associated risks[84]. In geriatric patients, regional anesthesia protocols, notably ultrasound-guided femoral nerve block (FICB), offer numerous advantages. These include enhanced hemodynamic stability, decreased risk of deep vein thrombosis, improved postoperative cognition, and fewer adverse effects from pain medications, especially in routine hip surgery[85]. Effective pain management, combined with a plan to mitigate nausea and vomiting, is essential in enabling early ambulation and boosting patient satisfaction. Regional anesthesia methods, including neuraxial blocks and nerve blockades, exhibit greater efficacy in the initial three days afterwards surgery compared to systemically administered opioids. Ongoing research aims to enhance the safety of spinal anesthesia and intrathecal drug delivery. Facilitating early

mobilization of individuals with hip fractures and preventing postoperative cognitive dysfunction is paramount for ensuring their successful recovery[86]. Early rehabilitation is crucial, but pain can hinder it. Opioids have limitations and side effects. The integration of multimodal pain management, which combines diverse approaches, presents a more effective means of pain control, mitigates reliance on opioids, and holds the potential for expediting recovery processes[78]. The utilization of multimodal analgesia, integrating nonsteroidal anti-inflammatory drugs alongside regional techniques like peripheral nerve blocks, results in reduced perioperative opioid usage during total hip and knee arthroplasty procedures. Emerging approaches aim to extend opioid-free analgesia and introduce novel nerve blocks for enhanced outcomes[87]. However, pain treatment is challenging due to limited options, varying effectiveness for individuals, and the risks of inadequate control. Personalized pain control tailored to each patient could revolutionize the approach, similar to developments in other medical fields[72]. Multimodal analgesia, combining various pain drugs and techniques, is now widely accepted for better post-surgical pain control. It reduces opioid use, and side effects, and improves outcomes. However, a personalized approach is crucial as individual pain perception varies[88].

EARLY MOBILIZATION

Interventions that concentrate on gait, balance, and functional task training are particularly effective, with minimal adverse events reported[9]. A comprehensive rehabilitation pathway for hip fracture patients involves early and intensive mobility training, chronic care interventions, and access to community services. Cognitive impairment should not preclude rehabilitation. Recovery times vary, necessitating multidisciplinary programs focusing on geriatric assessment, surgery, mobilization, and ongoing exercise. The inclusion of self-efficacy components and caregiver involvement is crucial for successful rehabilitation[89]. A study by Goubar et al. suggests more physiotherapy after hip surgery shortens hospital stays. Daily sessions for at least 2 hours in the first week may be a good benchmark for quality care. Even 30 extra minutes might benefit patients. This could help hospitals justify providing more physiotherapy[8]. Healthcare professionals face significant challenges in delivering postoperative care to patients with hip fractures. These patients often experience high morbidity and mortality rates, necessitating extensive rehabilitation before they can reintegrate into their communities. Administering epidural analgesia following surgery may reduce the likelihood of morbidity and mortality associated with hip fractures by preventing myocardial ischemia and facilitating postoperative rehabilitation[90]. Anterior Cruciate Ligament (ACL) surgery offers several anesthesia options, but peripheral nerve blocks (PNBs) done before surgery (pre-emptive) may be ideal for better pain control after surgery. This approach has shown success in other joint surgeries. While best practices for ACL surgery pain management aren't set yet, PNBs as anesthesia seem promising[91]. Motor-sparing peripheral nerve blocks in multimodal analgesia for joint surgery reduce recovery time, opioid side effects, and hospital stays. Combining distal nerve blocks effectively manages pain without motor complications, improving outcomes and demonstrating efficacy in joint replacement surgery[92]. Research suggests that an iliopsoas block (IPB) may be beneficial for patients undergoing hip arthroplasty. This technique appears to help patients retain more quadriceps strength immediately after surgery and for up to 24 hours following the procedure. Additionally, studies indicate that IPB may contribute to a faster recovery time[73].

Table 2: Peripheral Nerve Blocks for Hip Fracture Surgery in Elderly Patients

Peripheral Nerve Blocks	Most nerve blocks used in hip surgery	Mechanism of Action	Clinical Benefits	Specific Impacts
Administered local anesthesia near nerves to	Femoral nerve, fascia iliaca compartment,	Nerve blocks deliver a local anesthetic	Improved pain control, reduced use ofadditional painmedications, faster functional recovery,	Reduced analgesic use, shortened hospital length of

block pain signals, Providing targeted relief without using systemic drugs.	iliopsoas space muscles, 3-in-1 nerve, quadratus lumborum, pericapsular nerves group, Psoas components, sciatic nerve.	near nerves, disrupting pain signals to provide targeted pain relief without systemic effects.	prevention of complications, improved patient satisfaction, decreased morbidity and the incidence of mortality, decreased readmissions	Stay, decreased readmission rates, reduced cost caused by postoperative complications, lower healthcare resource utilization

Enhancing Hip Fracture Care: Mortality and Nerve Blocks

The impact of early hip surgery on reducing postoperative mortality has been a topic of debate in prior research. Recent findings by Michael Rozenfeld and the team suggest that prompt treatment of hip fractures enhances survival, even for individuals with preexisting health conditions. Effective patient preparation and hospital protocols allow for surgery within 48 hours in most instances without raising mortality rates[93]. Insufficient evidence exists to substantiate the assertion that nerve blocks reduce hip fracture mortality. Guay et al. examined five of seven studies, comprising four femoral nerve (FN) blocks or 3-in-1 blocks and one FN block with iliac crest infiltration. Their review revealed no significant difference in short-term mortality rates (six months): RR 0.72 (95% CI 0.34-1.52); with an I2 statistic of 0%[94]. Nevertheless, robust evidence suggests that regional anesthetics correlate with reduced blood loss, improved pain management, and lower mortality rates in perioperative settings[63].

For optimal perioperative care of hip fracture patients, a multidisciplinary strategy is essential to enhance quality and improve clinical outcomes, leading to reduced hospitalization durations and mortality rates. In hospitals, mortality rates for hip fracture patients decreased from 10% to 3.6% from 2012 to 2017, with significant declines in mortality rates within the first three months and the first year[40]. In cases of hip fractures, nerve blockades can be effective in reducing inpatient mortality rates. Pederson et al. discovered in their study that continuous femoral nerve block (FNB) catheters led to a notable 6% decrease in twelve-month mortality. This outcome may be influenced by various factors. Lees et al. also demonstrated that femoral nerve blocks lower mortality rates across different scenarios (5.5% vs. 15%, P=0.0024)[81]. About 20% of individuals with hip fractures pass away within the first year, while 85% necessitate transfer to post-acute rehabilitation facilities, and 50% experience permanent loss of independence. These factors strain healthcare systems. Nearly all trauma-induced hip fractures require surgical intervention. Pre-surgery, opioids are commonly administered intravenously for pain management, yet they are linked to negative outcomes in older patients[95]. Desai et al. found that elderly individuals with hip fractures experience reduced rates of readmission and overall incidents of death when regional anesthetic procedures, especially peripheral nerve blocks, are utilized[85].

Impact of Collaborative Multimodal Approaches on Postoperative Outcomes

A retrospective study found that orthopedic surgery patients receiving single peripheral nerve block (PNB) or continuous PNB (CPNB) had shorter hospital stays compared to traditional pain management methods[96]. A study on nurses' use of non-drug pain management found emotional support and physical methods most common. Barriers included time, patient resistance, and beliefs. Nurses see these drug-free options as cost-effective and valuable for post-surgical care[97]. The adoption of a multidisciplinary approach for geriatric hip fractures in Japan has yielded expedited surgery and reduced hospital stays, low severe complication and mortality rates, sustained osteoporosis treatment, and reduced medical costs[2]. A

multidisciplinary approach for elderly hip fractures can reduce complications, shorten hospital stays, and improve 1-year survival. Emphasis should be on optimizing health before surgery and identifying risk factors to minimize complications. Early surgery is preferred, but patient health should be the priority[51].

Goubar et al.'s research indicates a link between physiotherapy and earlier discharge following hip fractures. A typical UK hospital admitting 375 such patients annually could potentially save 456 bed days by implementing daily physiotherapy for six to seven days post-surgery, totaling at least 2 hours. This suggests that a minimum of 2 hours of physiotherapy daily within the first postoperative week might serve as a crucial performance metric for quality acute care after hip fracture surgery[8]. A study on hip fractures found a multimodal care plan (optimized care) reduced complications (36% vs 48%) compared to conventional care. While promising, it didn't significantly affect the length of stay or 30-day mortality[66]. Multidisciplinary care centered around rehabilitation for older adults with hip fractures leads to enhanced physical activity levels, gait, and balance, and reduces refracture and one-year mortality rates compared to standard therapy[54]. Surgery often relies on opioids for pain control, but these come with side effects that delay recovery. Preoperative nerve blocks offer a promising alternative. They target specific nerves, numbing the area for pain relief without the downsides of opioids. Studies suggest nerve blocks can lead to shorter hospital stays, better pain control, and faster mobilization after surgery. This allows for earlier physical therapy, reducing complications like pneumonia. By minimizing opioid use, nerve blocks also decrease the risk of side effects and addiction. This multimodal approach, combining nerve blocks with other pain management strategies, has the potential to significantly improve post-surgical recovery[43][92] [53].

Hip fracture recovery struggles with pain and confusion (delirium) that can stall significant early movement. Even with best practices, many patients miss day-one walking and adequate physical therapy. The solution lies likely in improved pain management and other interventions before and after surgery to help patients overcome these hurdles[37]. A study by Verbeek et al. suggests continuous fascia iliaca compartment block offers potential benefits like longer pain relief, faster recovery, reduced reliance on opioids, and shorter hospital stays. It might even be linked to lower mortality rates and less delirium. This makes CFICB a promising approach for improved pain management and overall outcomes in seniors with hip fractures[64].

Table 3. Hip fracture management: challenges and solutions

Aspect	**Challenges**	**Solutions**
Pain Management	Opioid dependence and side effects (addiction, nausea, constipation), difficulty managing pain in elderly patients	Multimodal analgesia: combining opioids with other drugs like NSAIDs and methods including regional nerve blocks, and peripheral nerve blocks: target specific nerves for pain relief without opioid side effects
Complications	Increased risk of pneumonia, blood clots (deep vein thrombosis)	Multimodal analgesia and early mobilization reduced the risk of complications
Rehabilitation	Postoperative pain hinders mobilization	Early mobilization is crucial for recovery, effective pain management strategies like nerve blocks facilitate earlier rehabilitation
Mortality	Increased mortality rates in elderly patients with hip fractures	Early surgery (<48 hours) improves survival rates, multidisciplinary care focused on optimizing patient health before surgery

Hospital Length of Stay	Prolonged hospital stays due to pain and complications	Multimodal pain management including nerve blocks reduces hospital stay, and multidisciplinary care with a focus on early surgery, complications, and rehabilitation
Cognitive Decline	Pain and opioid use can worsen cognitive dysfunction	Regional anesthesia (neuraxial and nerve blocks) may reduce the risk of delirium, and multimodal pain management strategies to minimize reliance on opioids
Readmission rates	High readmission rates	Regional analgesics, ERAS, and multidisciplinary care may reduce the complications related to readmissions

CONCLUSIONS

This review suggests that a multimodal approach for elderly patients with hip fractures holds promise for improved recovery. Combining preoperative evaluation, multimodal pain management with nerve blocks, and collaborative post-surgical care, including coordinated efforts by surgeons, anesthesiologists, nurses, and therapists, appears to lead to faster recovery, reduced complications, and improved functional outcomes. Further research is needed to optimize these combined strategies and explore their long-term benefits for patient well-being.

Competing interests

The authors have declared no competing interests in this article.

Authors' contributions

Emery conceptualized the study design and drafted the initial version of the review. Peng Ma and Baneste revised the manuscript. All authors read and approved the final manuscript before submission to the journal.

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