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EDITORIAL

Mitigating Opioid Dependence in Orthopaedic Surgery: Current Strategies and Future Directions

Hugo Humphries[1,*], Andreas Fontalis[1,2], Warran Wignadasan[1,2], Fares S Haddad[1,2]

[1]Department of Trauma and Orthopaedic Surgery, University College London Hospitals NHS Foundation Trust, London, UK
[2]Division of Surgery and Interventional Science, University College London, London, UK
*Correspondence: humphrieshn@gmail.com (Hugo Humphries)

Abstract

The opioid crisis presents a significant burden to patients and healthcare systems. Orthopaedic surgery involves treating patients with significant pain demands, therefore opioid stewardship in this specialty is an important area in targeting the opioid crisis. A number of strategies have been outlined in the literature to help reduce prescription of opioids for patients with painful orthopaedic conditions. Enhanced recovery after surgery (ERAS) protocols involving multimodal analgesia (MMA) and multi-disciplinary team (MDT) involvement have been proven effective. Pre-operative counselling of patients with clear communication and educational resources helps to educate patients on the negative effects overuse of opioids can have post-operatively. Novel strategies are being investigated to reduce opioid dependence, particularly in the areas of artificial intelligence (AI) and machine learning (ML), which can help predict patients at increased risk of opioid dependence post-operatively and therefore provide personalised treatment to prevent the harmful sequelae.

Key words: opioids; orthopaedics; artificial intelligence

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Countries around the world continue to struggle with opioid addiction. While the opioid crisis has gained considerable attention in the USA, the UK has also been affected, with the highest morphine milligram equivalent (MME) consumption per 1000 inhabitants per day globally in 2019 (Jayawardana et al, 2021). Opioids have a number of adverse effects in clinical practice including nausea, vomiting, sedation, respiratory depression and hyperalgesia. Further concerning complications include addiction, physical dependence, and the risk of illegal distribution or diversion.

Management of pain is a crucial aspect of patient care, and orthopaedic surgical procedures are noted for the intensity of pain they cause (Bertram et al, 2024). Elective orthopaedic surgery ranks among the most commonly performed surgical interventions globally, and pain control is central to patient experience and satisfaction. Given the effectiveness of opioids for acute surgical pain, balancing their prescription with the potential adverse effects is challenging.

Orthopaedic surgeons are among the top opioid prescribers, with high amounts of opioids prescribed post-operatively remaining unused. In orthopaedic surgery, chronic opioid users often experience worse post-operative and functional outcomes,

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delayed return to work, increased pain and higher rates of revision surgery (Berardino et al, 2022). Patients who continue to use opioids 1–2 months following musculoskeletal trauma surgery exhibit greater psychological distress, less effective coping mechanisms and increased disability compared to those not taking opioids (Helmerhorst et al, 2014). Additionally, people who use opioids chronically prior to total knee arthroplasty (TKA) have shown significantly lower Knee Society Scores (KSS) and a higher prevalence of complications (Zywiel et al, 2011).

Opioid prescribing remains at the heart of public health initiatives. In Canada, trends of post-operative opioid use among orthopaedic elective surgery patients from 2004 to 2018 demonstrated a reduction in the initial amount prescribed. This change in prescribing was attributed to opioid reduction public policies introduced over the study time period, highlighting the impact policy can have on prescribing patterns. Since 2016, 36 states in America have set regulations on the prescription of MME doses (Berardino et al, 2022). In England, there was a 457% increase in high dose and long acting opioid prescription from 1998 to 2018 (Roberts and Richards, 2023), although a decrease in prescriptions has been observed since 2016. Policy interventions have likely contributed to the opioid prescription reduction in the UK, with guidelines from the Medicines and Healthcare products Regulatory Agency (MHRA) and National Institute for Health and Care Excellence (NICE) targeting this issue.

Enhanced recovery after surgery (ERAS) is a concept aimed at addressing factors that delay the post-operative recovery. It employs a multi-disciplinary team (MDT) approach and optimises pre, intra and post-operative factors, which has been shown to be effective in reducing opioid consumption in orthopaedic surgery (Kaye et al, 2019). Multimodal analgesia (MMA) is integral to each phase of ERAS, and incorporates different pharmacological as well as non-pharmacological mechanisms such as peripheral nerve blocks to achieve adequate analgesia while reducing opioid use (Kaye et al, 2019). Pain specialist anaesthetists are vital members of the MDT, particularly in managing patients with complex peri-operative pain issues or those requiring high doses of opioids. It is recommended to maintain a low threshold for referring these patients to pain specialists. Based on these collaborations, orthopaedic groups are encouraged to develop tailored opioid-sparing protocols aimed at enhancing patient outcomes (Hatano et al, 2024; van Houtert et al, 2024).

Anxiety has been shown to increase sensitivity to pain (Harmer et al, 2023). Therefore pre-operative education and counselling is an important part of peri-operative care, helping to reduce anxiety and unrealistic expectations that may amplify pain responses. Pre-operative education has been shown to reduce opioid consumption post-operatively (Darville-Beneby et al, 2023). Utilising educational videos to explain post-operative pain management and highlight the adverse effects of excessive opioid use has proven to be a practical and effective method for reducing opioid consumption after surgery (Darville-Beneby et al, 2023). Alongside pre-operative counselling, maintaining effective communication between surgeons and patients around pain management is key.

Total joint arthroplasty (TJA) numbers performed annually continue to increase, as do the waiting lists for these procedures (Scott et al, 2024). Longer time spent on the waiting list has been shown to result in increased opioid prescriptions (Karayiannis et al, 2023). With rising healthcare costs and the limited availability of inpatient beds, there has been a push towards outpatient or day-case surgery. The outcomes of day case surgery for total hip arthroplasty (THA) and total knee arthroplasty (TKA) have been shown to be non-inferior to inpatient surgery (French et al, 2024). A retrospective cohort study reported that patients undergoing outpatient TJA were less likely to receive post-operative opioid prescriptions than those undergoing inpatient TJA (Varady et al, 2021). Additionally, the incidence of transitioning to persistent opioid use was lower among the outpatient group (Varady et al, 2021). While it remains unclear which specific aspects of outpatient surgery contributed to the decreased opioid usage, potential explanations include stringent patient selection criteria and comprehensive multimodal analgesia strategies (Varady et al, 2021). Despite these beneficial results, among a cohort of patients due to undergo hip or knee arthroplasty, 58.3% were uncertain or had no interest in outpatient surgery (Halken et al, 2024). Further patient education initiatives around day case surgery will be required in the future to help patients make informed decisions.

Novel contributions to the opioid reduction armamentarium are vital. Neuromodulatory interventions including cryotherapy, transcutaneous electrical nerve stimulation (TENS) and music therapy have shown heterogeneous results in reducing post-operative opioid use, indicating the need for additional research (Aldanyowi, 2023). Furthermore, recent pharmacological advancements, including the use of dexmedetomidine and ketamine, have demonstrated benefits in minimising opioid consumption (Aldanyowi, 2023).

The management of opioid dependence among orthopaedic patients extends beyond the surgical team, necessitating a collaborative approach. Primary care physicians, rheumatologists, pain specialists and other healthcare professionals who regularly interact with orthopaedic patients can play a key role in delaying the initiation of opioid treatments early in the management of chronic conditions such as osteoarthritis. Practical strategies to avoid opioid prescription in this setting include lifestyle counselling, psychological therapy, non-opioid medications and involvement of MDT members including physiotherapists and dieticians (Berardino et al, 2022). Furthermore, easy access to pain specialists for patients with complex pain needs or those accustomed to high doses of opioids should be facilitated. Particular care must be taken when prescribing opioids to elderly patients, as kidney function declines with aging and the likelihood of polypharmacy interactions increases opioid related side effects such as falls, respiratory depression and delirium.

Predicting orthopaedic patients at risk of increased opioid use and dependence is an area for further research and development. Studies have identified patient specific factors predictive of increased post-operative opioid consumption, with the primary factor being high pre-operative opioid use (Berardino et al, 2022). Risk assessment tools recommended by the American Academy of Orthopaedic Surgeons (AAOS) include the Opioid Risk Tool (ORT) and Screener and Opioid Assessment for Patient with Pain (SOAPP). The use of artificial intelligence (AI) and machine

learning (ML) represents a novel tool in medicine to help predict clinical outcomes (Castagno et al, 2024; Farrow et al, 2024; Lisacek-Kiosoglous et al, 2023). ML models have shown excellent predictive performance for patients at risk of post-operative opioid dependence in patients undergoing TKA (Klemt et al, 2022). In anterior cruciate ligament (ACL) reconstruction patients, predictive models were used to generate a single numerical score based on patient data to risk stratify patients into groups of opioid dependency (Anderson et al, 2020). A systematic review concluded that ML models demonstrated good discriminatory performance in predicting prolonged opioid use in post-operative use after orthopaedic surgery (Krivicich et al, 2024). These models offer a preventative approach to identify patients at high risk of increased opioid use post-operatively and enable personalised opioid reduction strategies. Prior to the widespread adoption of AI models in clinical practice, it is crucial to ascertain their safety and efficacy compared with current practices, and diligent human oversight will be required to regulate this process (Kunze et al, 2023; Leopold et al, 2023).

Orthopaedic surgeons also need to play a pivotal stewardship role in combating the ongoing opioid crisis. While opioids are highly effective for pain relief, they must be used judiciously to mitigate risks associated with both over prescribing and under prescribing. By adhering to clear guidelines, implementing ERAS protocols, involving the MDT, using multimodal analgesia and enhancing communication strategies, we can significantly reduce the opioid burden. These measures will not only improve pain management and function but also enhance patients' quality of life.

Conclusion

This editorial provides an overview of the role opioids play in orthopaedic surgery. It investigates the up to date figures on the current prescribing patterns, as well as current evidence based initiatives that have been shown to decrease opioid prescription. Finally, we look at areas that require future research and development but show potential in reducing the opioid burden.

Key Points

- Orthopaedic surgeons can play an important role in reducing the opioid crisis.
- ERAS, MMA and the MDT have been shown to be effective at reducing post-operative opioid use in orthopaedic patients.
- Outpatient day surgery may be linked to reduced opioid dependence.
- Health care professionals who interact with orthopaedic patients over a long time period should be cognizant of opioid prescriptions.
- AI and ML are tools that can help predict orthopaedic patients at risk of post-operative opioid dependence.
- Novel strategies to reduce opioid dependence such as TENS require further research to verify their effectiveness.

Availability of Data and Materials

All the data of this study are included in this article.

Author Contributions

HH: writing of first draft, revising for important intellectual context. AF: revising for important intellectual context. WW: revising for important intellectual context. FSH: revising for important intellectual context. All authors made substantial contributions to conception and design. All authors gave final approval of the version to be published. All authors agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Ethics Approval and Consent to Participate

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Conflict of Interest

The authors declare no conflict of interest.

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