Peter Stein

Needs Assessment: Postoperative Pain Management Following Total Knee Arthroplasty in Cannabis Users

Executive Summary

In the context of total knee arthroplasty (TKA), preoperative cannabis use poses challenges to postoperative pain management. In addition, as national patterns of cannabis use have shifted, the distinct postoperative presentations and needs of cannabis consumers have become increasingly apparent and acute. Clinicians specializing in postsurgical pain management often report having poor knowledge related to cannabis, as well as low self-efficacy to meet patient needs in this clinical context. These deficits in clinicians' cannabis-related education and training create clinical practice gaps. In turn, these gaps can expose patients to unrecognized cannabis-drug interactions and other postoperative complications of perioperative cannabis use. In addition, clinicians who are unprepared to adjust postoperative analgesic regimens in cannabis users may not sufficiently control those patients' postsurgical pain, and risk relying excessively on opioid medication to control unmanaged pain.

This needs assessment identifies key knowledge and competency gaps to outline educational needs of pain management specialists who care for patients following TKA. In addition to the above identified cannabis-related knowledge gap, this activity will address competency gaps in adjusting person-centered, multimodal postoperative analgesia regimens to achieve optimal pain reduction; patient counseling relevant to pain outcomes in cannabis users; and recognition and management of postoperative complications of perioperative cannabis use. It further describes learning objectives and outcomes, corresponding to these gaps, that can be met through educational activities.

Introduction

Total knee arthroplasty (TKA) is an increasingly common procedure in the aging US population,[1] and volume of TKA will likely continue to increase through the remainder of this decade. Clinical evidence continues to accumulate regarding optimal pain management protocols following TKA. Nevertheless, TKA remains a major, painful procedure, and pain control and functional restoration in this context remain challenging. The current standard of care emphasizes multimodal analgesia,[2] including opioid and nonopioid medications, epidural injection, peripheral nerve blocks and local infiltration analgesia.

Preoperative cannabis consumption presents unusual challenges to person-centered postsurgical care. Pain management specialists can expect to face these challenges more frequently than in the past, as a result of changing attitudes and legislation regarding cannabis

in recent decades.[3] This includes decriminalization for recreational use in multiple US states as well as legalization for medical purposes, including for chronic pain.[4]

Owing at least in part to these social and legal shifts, a substantial proportion of people with severe knee pain receiving TKA is likely to have tried, or currently be consuming, cannabis products to treat pain symptoms, with or without a medical prescription.[5] In addition, these consumers have increasing access to highly potent formulations, both illicit[6] and licit.[7] Together, these factors are creating a rapidly changing context for pain control during and after major surgeries such as TKA.

However, clinician knowledge regarding cannabis tends to lag behind changes in both regulatory and public opinion,[8] in both medicinal (clinician-prescribed) and non-medicinal use of cannabinoids. This holds true for pain management specialists, who also demonstrate deficits in competencies necessary to care for cannabis-using patients. The result is often-underrecognized clinical practice gaps in post-TKA pain management. Increasing these competencies through educational activity would result in better-designed regimens for postoperative analgesia in cannabis-using patients, improved counseling of patients about perioperative cannabis use, and reduced risks to patients from adverse postoperative effects of cannabis use and/or withdrawal.

Table 1. Knowledge and competency gaps, as aligned with education needs, learning objectives, and learning outcomes.

Gap	Education Needs	Learning Objectives	Learning Outcomes
1. Pain management clinicians are unaware of perioperative implications of preoperative cannabis use among patients undergoing TKA, including perioperative adverse events and cannabis-drug interactions *(knowledge)*	Learn about • postoperative adverse effects of cannabis products • cannabis-drug interactions, in patients undergoing TKA	• Discuss potential postoperative adverse effects of preoperative cannabis use in the context of TKA • Identify potential perioperative cannabis-drug interactions in the context of TKA	Pain management clinicians will be aware of potential unintended and adverse perioperative effects of cannabis use, including cannabis-drug interactions, during the TKA clinical process
2. Pain management clinicians have low self-efficacy in managing postoperative multimodal pain therapy regimens for TKA patients who use cannabis *(competency)*	Learn evidence-based, multimodal strategies or protocols for person-centered pain management following TKA in patients who use cannabis	• Integrate elements of a multimodal pain control regimen in a post-TKA patient • Respond to clinical scenarios exemplifying differences in chronic cannabis users in adjusting	Pain management clinicians will have increased fluency and self-efficacy in developing and adjusting multimodal pain control regimens in post-TKA cannabis users

		postoperative pain medication regimens	
3. Pain management clinicians do not routinely screen for and counsel patients regarding cannabis use preoperatively *(competency)*	• Learn nonstigmatizing strategies for counseling perioperative patients about surgical implications of cannabis use • Increase familiarity with currently available tools to screen for preoperative cannabis use	• Develop and critique counseling scripts, to gain competency in counseling perioperative cannabis users • Describe both questionnaire-based and laboratory analysis tools to screen for cannabis use	Pain management clinicians will have improved 1) skills in counseling perioperative cannabis-using patients and 2) facility with subjective (questionnaire) and objective (laboratory) resources to screen for cannabis use
4. Pain management clinicians do not recognize and address post-TKA complications of cannabis use in a timely manner *(knowledge, competency)*	• Recognize postoperative sequelae of cannabis use, including symptoms of cannabis withdrawal syndrome • Manage postoperative complications of cannabis use	• Identify potential post-TKA sequelae of cannabis use • Identify symptoms of cannabis withdrawal syndrome • Execute medical management decisions in response to post-TKA complications of cannabis use	Pain management clinicians will demonstrate improved recognition of, and improved medical management skills in response to, post-TKA complications of cannabis use

Gap 1: Knowledge regarding relevant cannabinoid physiology and perioperative effects of preoperative cannabis consumption among individuals with chronic or severe knee pain *(knowledge gap)*

Medical trainees typically receive little clinical education on cannabis.[9] In parallel, clinicians in fields such as anesthesiology[10] and orthopedics[11] express self-perceived lack of knowledge about cannabinoid pharmacology and mechanisms of action, clinical utility of cannabis, and its potential adverse effects. For example, in a survey with 101 orthopedist respondents, 89% indicated that they were not knowledgeable about analgesic mechanisms of action of cannabidiol.

However, the pharmacological properties and physiological effects of cannabinoids have important postoperative implications for clinical outcomes and patient safety. For example, pain dysregulation appears to be particularly prevalent in long-term cannabis users.[12] Furthermore, patients who use cannabis tend to report higher pain levels at an anatomical surgical site—perioperatively and at 3 months postoperatively—than nonusers.[13] They also report higher perioperative scores of centralized pain. Furthermore, while opioid medication is

a mainstay of postoperative analgesia after major surgeries such as TKA, cannabis users are more likely also to receive opioid therapy for surgical site pain 3 and 6 months after surgery. Such patients may be at greater risk for future opioid dependence than those who discontinue opioid medication sooner.[14] This is particularly concerning because preoperative cannabis users are more likely than nonusers to use opioids concomitantly.[13]

Clinicians also need to be aware of potential interactions between cannabis and commonly prescribed therapies for pain control. These include interactions with perioperative anesthestics, such as tolerance to sevoflurane.[15] Cannabinoids also may interact synergistically with opioids and benzodiazepines—both of which cannabis users disproportionately consume[13]—enhancing their CNS-depressant effects.[16] Up-to-date knowledge about cannabinoid products, and acute and chronic effects of cannabis on the perioperative patient, would help improve postoperative outcomes and alleviate safety concerns in patients receiving TKA.

Gap 2: Evaluating, monitoring, and adjusting multimodal pain therapy regimens *(competency gap)*

Relevant practice guidance documents are sparse, but they emphasize the need to apply person-centered decision making to develop pain control protocols for patients who use cannabis. As highlighted in Gap #1, cannabis users may present with more intense postoperative pain and have higher analgesic requirements[17] than postoperative non-users, and are at risk of complications secondary to potential medication-cannabis interactions. Heightened pain control practices, in turn, include more frequent use of opioid rescue medications.[18] Relying on such a clinical strategy raises concerns about long-term exposure to opioids' known adverse effects, as well as risk of future opioid dependence.

In light of such challenges, clinicians are advised to implement multimodal analgesia postoperatively for patients who are cannabis users.[19] However, in addition to lack of knowledge, anesthesiology clinicians have reported low self-efficacy in adopting, monitoring, and adjusting individualized pain control regimens in their patients who use cannabis.[10] Patient safety and optimal clinical outcomes would benefit from increased clinician competency in adopting evidence-based, multimodal strategies for person-centered pain management following TKA in patients who use cannabis.

Gap 3: Cannabis use screening and counseling *(competency gap)*

A 2023 clinical practice guideline by the American Society of Regional Anesthesia and Pain Medicine (ASRA)[18] recommended routine data collection regarding dose, frequency, method of administration, and most recent dose taken, in patients who use cannabis products. However, clinicians and their patients often do not communicate about cannabis use. For example, among 242 primary care patients in Colorado, US, only about half of cannabis users reported that their physicians were aware of their use.[20] Furthermore, cannabis is historically stigmatized among physicians and medical trainees,[21] which may create further obstacles to constructive

clinician-patient communications and counseling. Taken together, these barriers deprive both patient and clinician of clinically important information, and raise risk of poorer clinical outcomes.

For example, patient expectations regarding analgesic efficacy of cannabis may be inaccurate in a surgical context.[22] In one survey of 501 preoperative patients, over 80% reported believing that his or her regular cannabis use would be beneficial for pain control during postsurgical recovery.[23] Such a patient requires counseling that this expectation has not been borne out by current evidence.[24]

In addition, patients may be unaware of the risk of cannabis withdrawal symptoms (see Gap #4) during recovery from surgery. Routine, effective communication and counseling about cannabis withdrawal could help ensure clinician and patient expectations of postoperative pain-related outcomes are aligned. Such communications can also lead the patient toward participating in their own care, thus creating person-centered care, a recognized priority in perioperative pain management.[18]

Gap 4: Recognizing and addressing postoperative complications of preoperative cannabis use (*knowledge and competency gaps*)

Postoperative upper airway obstruction,[24] severe shivering,[25] and postoperative nausea and vomiting[26] are all enhanced in cannabis users. In addition, some patients, particularly heavy users, who are tapered from cannabinoids preoperatively experience cannabis withdrawal symptoms[24] that may complicate pain management following TKA. These withdrawal symptoms can include anger, irritability or depressed mood, anxiety, sleep disruption, restlessness, discomfort such as abdominal pain, headache, tremor, or fever or chills. One patient reported via email journal, "My mind feels raw, exposed, and very vulnerable. I've been more emotional and even small tasks or problems were overwhelming…. Sleeping is [with] insomnia."[27]

With regard to cannabis withdrawal, decision making to discontinue cannabis preoperatively is complex. Recent guidelines and reviews include tentative recommendations[18] to discontinue cannabis preoperatively, including prescribed products. However, consensus is lacking, and recommended timeframes for cessation vary across studies. Furthermore, best-practice postoperative strategies to manage cannabis withdrawal symptoms are still emerging.[28] Clinicians in pain management need to understand the impact of preoperative cannabis cessation on their patients' postoperative pain trajectories (*knowledge gap*), and should be prepared to manage a range of postoperative adverse effects of cannabis use (*competency gap*). Closing these knowledge and competency gaps will minimize distress and adverse outcomes such as those exemplified in the above mentioned patient's report.

Conclusion

Preoperative cannabis use presents unique challenges for postoperative pain management following TKA. These challenges will evolve in parallel with changing cannabis-related legislation

and patterns of consumption, and will become increasingly evident as scientific research progresses into cannabinoid compounds' effects in humans.

Pain management clinicians must develop knowledge and competencies to screen for cannabis use preoperatively, counsel patients while avoiding stigmatizing language, anticipate postoperative adverse effects of preoperative cannabis consumption, and formulate, monitor, and adjust person-centered pain control regimens for these patients. Providing education and training now in these knowledge domains and competencies will enhance clinical outcomes of TKA and help minimize postoperative risks in cannabis-using patients over the longer term.

References

1. Sloan M, Premkumar A, Sheth NP. Projected volume of primary total joint arthroplasty in the U.S., 2014 to 2030. *JBJS*. 2018;100(17):1455. doi:10.2106/JBJS.17.01617

2. Li J, Ma Y, Xiao L. Postoperative Pain Management in Total Knee Arthroplasty. *Orthop Surg*. 2019;11(5):755-761. doi:10.1111/os.12535

3. Leimer EM, Togioka B. Perioperative Care Considerations for Patients with Cannabis Use. Perioperative Care Considerations for Patients with Cannabis Use. 2023. Accessed January 16, 2025. https://www.cannabisevidence.org/wp-content/uploads/2023/12/Perioperative-Care-Considerations-Dec-2023.pdf

4. Dai H, Richter KP. A National Survey of Marijuana Use Among US Adults With Medical Conditions, 2016-2017. *JAMA Network Open*. 2019;2(9):e1911936. doi:10.1001/jamanetworkopen.2019.11936

5. Deckey DG, Lara NJ, Gulbrandsen MT, Hassebrock JD, Spangehl MJ, Bingham JS. Prevalence of Cannabinoid Use in Patients With Hip and Knee Osteoarthritis. *JAAOS Global Research & Reviews*. 2021;5(2):e20.00172. doi:10.5435/JAAOSGlobal-D-20-00172

6. Abuse NI on D. Cannabis Potency Data | National Institute on Drug Abuse (NIDA). July 16, 2024. Accessed January 3, 2025. https://nida.nih.gov/research/research-data-measures-resources/cannabis-potency-data

7. Pacula RL, Blanchette JG, Lira MC, Smart R, Naimi TS. Current U.S. State Cannabis Sales Limits Allow Large Doses for Use or Diversion. *Am J Prev Med*. 2021;60(5):701-705. doi:10.1016/j.amepre.2020.11.005

8. Gardiner KM, Singleton JA, Sheridan J, Kyle GJ, Nissen LM. Health professional beliefs, knowledge, and concerns surrounding medicinal cannabis – A systematic review. MacLure K, ed. *PLoS ONE*. 2019;14(5):e0216556. doi:10.1371/journal.pone.0216556

9. Evanoff AB, Quan T, Dufault C, Awad M, Jean Bierut L. Physicians-in-training are not prepared to prescribe medical marijuana. *Drug Alcohol Depend*. 2017;180:151-155. doi:10.1016/j.drugalcdep.2017.08.010

10. Clark M, Foster L. Cannabis and anesthesia: improving confidence and knowledge among anesthesia providers. Published online 2022.

11. Li ZI, Chalem I, Berzolla E, et al. Perceptions and Opinions on Cannabidiol in the Orthopaedic Sports Medicine Community. *Orthopaedic Journal of Sports Medicine*. 2023;11(9):23259671231191766. doi:10.1177/23259671231191766

12. Liu CW, Bhatia A, Buzon-Tan A, et al. Weeding Out the Problem: The Impact of Preoperative Cannabinoid Use on Pain in the Perioperative Period. *Anesthesia & Analgesia*. 2019;129(3):874. doi:10.1213/ANE.0000000000003963

13. McAfee J, Boehnke KF, Moser SM, Brummett CM, Waljee JF, Bonar EE. Perioperative Cannabis Use: A Longitudinal Study of Associated Clinical Characteristics and Surgical Outcomes. *Reg Anesth Pain Med*. 2021;46(2):137-144. doi:10.1136/rapm-2020-101812

14. Clarke H, Soneji N, Ko DT, Yun L, Wijeysundera DN. Rates and risk factors for prolonged opioid use after major surgery: population based cohort study. *BMJ*. 2014;348:g1251. doi:10.1136/bmj.g1251

15. Holmen IC, Beach JP, Kaizer AM, Gumidyala R. The association between preoperative cannabis use and intraoperative inhaled anesthetic consumption: A retrospective study. *Journal of Clinical Anesthesia*. 2020;67:109980. doi:10.1016/j.jclinane.2020.109980

16. Irvine D, Meyer T, Williams J, Huang J. Perioperative Considerations of Cannabis Use on Anesthesia Administration. Published online 2022. https://www.apsf.org/wp-content/uploads/newsletters/2022/3702/APSF3702-2022-06-a10-CannabisUse.pdf

17. Alexander JC, Joshi GP. A review of the anesthetic implications of marijuana use. *Baylor University Medical Center Proceedings*. 2019;32(3):364-371. doi:10.1080/08998280.2019.1603034

18. Shah S, Schwenk ES, Sondekoppam RV, et al. ASRA Pain Medicine consensus guidelines on the management of the perioperative patient on cannabis and cannabinoids. *Reg Anesth Pain Med*. 2023;48(3):97-117. doi:10.1136/rapm-2022-104013

19. Davidson EM, Raz N, Eyal AM. Anesthetic considerations in medical cannabis patients. *Curr Opin Anaesthesiol*. 2020;33(6):832-840. doi:10.1097/ACO.0000000000000932

20. Kondrad EC, Reed AJ, Simpson MJ, Nease DE. Lack of Communication about Medical Marijuana Use between Doctors and Their Patients. *J Am Board Fam Med*. 2018;31(5):805-808. doi:10.3122/jabfm.2018.05.170462

21. Jacobs RJ, Colon J, Kane MN, Jacobs RJ, Colon J, Kane MN. Medical Students' Attitudes, Knowledge, and Beliefs about Medical Cannabis: A Qualitative Descriptive Study. *Cureus*. 2022;14(8). doi:10.7759/cureus.28336

22. Jain N, Kunam NR, Moorthy A, Jain N, Kunam NR, Moorthy A. Perception and Belief on Cannabinoids: A Comparative Study of Rheumatology Patients and Primary Care Physicians on the Use of Cannabinoids for Pain Management. *Cureus*. 2021;13(3). doi:10.7759/cureus.13756

23. Khelemsky Y, Goldberg AT, Hurd YL, et al. Perioperative Patient Beliefs Regarding Potential Effectiveness of Marijuana (Cannabinoids) for Treatment of Pain: A Prospective Population Survey. *Reg Anesth Pain Med*. 2017;42(5):652-659. doi:10.1097/AAP.0000000000000654

24. Echeverria-Villalobos M, Todeschini AB, Stoicea N, Fiorda-Diaz J, Weaver T, Bergese SD. Perioperative care of cannabis users: A comprehensive review of pharmacological and anesthetic considerations. *Journal of Clinical Anesthesia*. 2019;57:41-49. doi:10.1016/j.jclinane.2019.03.011

25. Sankar-Maharaj S, Chen D, Hariharan S. Postoperative Shivering Among *Cannabis* Users at a Public Hospital in Trinidad, West Indies. *Journal of PeriAnesthesia Nursing*. 2018;33(1):37-44. doi:10.1016/j.jopan.2016.03.010

26. Suhre W, O'Reilly-Shah V, Van Cleve W. Cannabis use is associated with a small increase in the risk of postoperative nausea and vomiting: a retrospective machine-learning causal analysis. *BMC Anesthesiol*. 2020;20(1):115. doi:10.1186/s12871-020-01036-4

27. Cannabis, Addiction, Withdrawal: A Personal Story | Psychology Today. Accessed February 14, 2025. https://www.psychologytoday.com/us/blog/healing-from-addiction/202405/cannabis-addiction-withdrawal-a-personal-story

28. Allsop DJ, Copeland J, Lintzeris N, et al. Nabiximols as an Agonist Replacement Therapy During Cannabis Withdrawal: A Randomized Clinical Trial. *JAMA Psychiatry*. 2014;71(3):281-291. doi:10.1001/jamapsychiatry.2013.3947