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CORRESPONDENCE

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Associations of cannabis on postoperative pain, length of stay and costs following mitral valve surgery

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To the Editor

Recreational and medicinal cannabis use continues to increase in the United States [1]. Despite a greater interest in the literature, the impacts of cannabis use on many health outcomes remain unclear, and studies evaluating acute inpatient pain outcomes after surgery show mixed results, with analyses demonstrating both increased pain [2–5] and no effects on pain [6–8]. There is little existing research evaluating effects of chronic preoperative cannabis use on postoperative pain in cardiac surgery. A proposed mechanism for increased postoperative pain involves central sensitization caused by cannabis use, similar to chronic opioid use [9]. Cardiac surgery patients, including those undergoing mitral valve surgery, often experience pain requiring intervention, including use of opioid medications [10]. In the present study, we evaluate the effects of cannabis use on acute postoperative inpatient pain in patients undergoing mitral valve replacement.

We queried the National Inpatient Sample (NIS) 2016–2019 for all patients ≥18 years who underwent mitral valve replacement (ICD-10 PCS codes: 02QG0Z, 02QG3Z). The NIS is the largest public inpatient database and was designed to produce national/regional estimates of inpatient utilization [11]. Cannabis use was identified by patients having cannabis use disorder (CUD) reported using NIS Clinical Classification Software Refined (CCSR) codes (MBD019, MBD030). Acute inpatient postoperative pain was evaluated with ICD-10 coding (G89). This group of ICD-10 codes is meant to reflect acute pain sustained during patients' admissions and is open-ended for providers to encode abnormal pain beyond typical expectations. Though this diagnosis is not homogeneously defined with strict criteria, this code grouping was used to indicate pain that was qualitatively characterized as abnormal and excessive by the patients' medical teams. This could encompass varying features per case, including severe pain intensity, duration, or if it was refractory to typical pain management and required medication escalation.

Univariate statistics were calculated using Chi-Squared tests. Logistic regression evaluated the effects of cannabis use disorder on postoperative pain, controlling for race, age, sex, income, year of hospitalization, and various medical comorbidities: alcohol abuse, cancer history, diabetes, hepatic conditions, pulmonary conditions, obesity, peripheral vascular disease, and renal failure.

A total 9,670 patients were included, with 70 (0.72%) having a documented cannabis use disorder. As outlined in Table 1, cannabis users were younger (52.5 vs. 62.1 years; $P = 0.004$), more frequently of Non-White race (31% vs. 17%; $P < 0.001$), and more often had Medicaid insurance (36% vs. 8%; $P = 0.006$). Cannabis users

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Table 1 Cohort demographics

	Non-Users	Cannabis Users	
Characteristic	*N* = 9,690	1, *N* = 70	*p*-value[2]
Age			0.004
Mean (SD)	62.1 (13.2)	52.5 (14.8)	
Age Group (Years)			0.2
18—39	660 (7%)	10 (14%)	
40—59	3,005 (31%)	35 (50%)	
60—79	5,405 (56%)	25 (36%)	
≥ 80	620 (6%)	0 (0%)	
Sex			0.5
Male	6,135 (63%)	50 (71%)	
Female	3,555 (37%)	20 (29%)	
Race			< 0.001
Non-Hispanic White	7,725 (83%)	45 (69%)	
Non-Hispanic Black	595 (6%)	5 (8%)	
Hispanic/Latino	435 (5%)	10 (15%)	
Non-Hispanic Asian	325 (3%)	0 (0%)	
Indigenous American	5 (0%)	5 (8%)	
Other	275 (3%)	0 (0%)	
Unknown	330	5	
Median Income Quartile of ZIP Code			0.5
Quartile One	1,985 (21%)	20 (31%)	
Quartile Two	2,305 (24%)	20 (31%)	
Quartile Three	2,470 (26%)	5 (8%)	
Quartile Four	2,740 (29%)	20 (31%)	
Unknown	190	5	
Health Insurance			0.006
Private	4,215 (44%)	30 (43%)	
Medicare	4,330 (45%)	15 (21%)	
Medicaid	735 (8%)	25 (36%)	
Self-Pay	150 (2%)	0 (0%)	
No Charge	5 (0%)	0 (0%)	
Other	245 (3%)	0 (0%)	
Unknown	10	0	
Year			0.3
2016	2,265 (23%)	15 (21%)	
2017	2,245 (23%)	15 (21%)	
2018	1,680 (17%)	25 (36%)	
2019	1,875 (19%)	15 (21%)	
2020	1,625 (17%)	0 (0%)	
Alcohol Abuse	270 (3%)	5 (7%)	0.3
History of Cancer	155 (2%)	0 (0%)	0.6
Diabetes	1,730 (18%)	10 (14%)	0.7
Liver Disease	375 (4%)	5 (7%)	0.5
Chronic Lung Conditions	1,545 (16%)	20 (29%)	0.2
Obesity	1,395 (14%)	10 (14%)	> 0.9
Peripheral Vascular Disease	895 (9%)	5 (7%)	0.8
Renal Failure	1,225 (13%)	0 (0%)	0.2
Length of Stay			0.033
Mean (SD)	8.3 (7.8)	10.9 (6.5)	
Cost of Care			0.036
Mean (SD)	51,418.8 (38,031.3)	60,184.6 (32,520.6)	
Mortality	175 (2%)	0 (0%)	0.6
Post Op Pain	1,015 (10%)	10 (14%)	0.6

[1] n (%)

[2] Wilcoxon rank-sum test for complex survey samples; chi-squared test with Rao & Scott's second-order correction

had longer LOS than non-users (10.9 vs. 8.3 days; $P=0.033$) and greater costs ($60,184.6 vs. $51,418.8; $P=0.036$). Mortality occurred in no cannabis users and 175 (2%) non-users.

There was no significant difference in postoperative pain between cannabis users and non-users (14% vs. 10%; $P<0.6$). On multivariate regression, patients with cannabis use disorder did not have significantly higher odds of postoperative pain (aOR: 1.15; 95% CI: 0.24–5.56; $P<0.9$).

It is important to note that there are several limitations in this study. First, this study was performed retrospectively and is therefore subject to misclassification. We were unable to quantify opioid use per patient, limiting the ability to identify if cannabis users did not have higher pain because they received larger amounts of analgesics. We quantified chronic cannabis use as patients who have received a diagnosis of cannabis use disorder, which limits our sample of cannabis users to only those with severe enough use patterns to qualify for an overt use disorder. Our study did not capture concomitant drug or tobacco use as potential confounders in our analysis; however, given our negative results it is unlikely that this would have changed our conclusions. The primary outcome was abstracted upon provider documentation of "postoperative pain," which is defined as pain that is excessive and beyond typical. However, due to lack of a homogenous definition of pain, this could create variances in coding. It is hopeful that the large sample size in the study decreases the risk of inaccurate conclusions based on coding variances.

In a national sample of patients undergoing mitral valve surgery, CUD was not associated with acute postoperative pain. Though our findings suggest that preoperative cannabis use does not affect pain after mitral valve surgery, more research is needed to confirm these results. It is also important to note that in many areas of the United States and globally, cannabis use is still illicit and therefore uncontrolled, leaving potential for other dangerous substances to be included in products as adulterants [12, 13]. Pain is not infrequent following cardiac surgery and commonly moderate to severe in as many as 75% of patients [14]. Pain can compromise patient comfort, impede recovery, lead to complications, and is especially troublesome in cardiac surgery because physiologic stress responses can strain the cardiovascular system [15]. High-quality, prospective studies are needed to better understand the effects of cannabis on pain, especially in cardiac surgery where pain is quite common.

Authors' contribution

SS and BF conceptualized and designed the study, developed the research methodology, supervised the overall project, drafted the initial manuscript, and critically revised it for intellectual content throughout. AJ and SP were responsible for data curation and statistical analysis, ensuring the accuracy and validity of the results. They also contributed to creation of figures, tables, and supplementary materials. All authors participated in manuscript editing, provided critical feedback, approved the final version for submission, and agree to be accountable for the integrity and accuracy of the work.

Data availability

The data used in this study is publicly available via the HCUP National Inpatient Sample (NIS). The NIS is a de-identified database reporting inpatient hospital outcomes. Please visit https://hcup-us.ahrq.gov/db/nation/nis/nisdbdocumentation.jsp for further information.

Declarations

Competing interests

The authors declare no competing interests.

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References

1. Shah RM, Saklecha A, Patel AA, Divi SN (2022) Analyzing the impact of cannabinoids on the treatment of spinal disorders. Curr Rev Musculoskelet Med 15(2):133–142. https://doi.org/10.1007/s12178-022-09743-w
2. Sajdeya R, Rouhizadeh M, Cook RL, et al. Cannabis use and acute postoperative pain outcomes in older adults: a propensity matched retrospective cohort study. Reg Anesth Pain Med. Published online June 30, 2024. https://doi.org/10.1136/rapm-2024-105633
3. Liu CW, Bhatia A, Buzon-Tan A et al (2019) Weeding out the problem: the impact of preoperative cannabinoid use on pain in the perioperative period. Anesth Analg 129(3):874–881. https://doi.org/10.1213/ANE.0000000000003963
4. Wiseman LK, Mahu IT, Mukhida K (2022) The effect of preoperative cannabis use on postoperative pain following gynaecologic oncology surgery. J Obstet Gynaecol Can 44(7):750–756. https://doi.org/10.1016/j.jogc.2022.01.018
5. Ekrami E, Sari S, Kopac O et al (2024) Association between cannabis use and opioid consumption, pain, and respiratory complications after surgery: a retrospective cohort analysis. Anesth Analg 139(4):724–733. https://doi.org/10.1213/ANE.0000000000006785
6. Singh M, Bajaj A, Shlimak A et al (2024) Short-term pain outcomes and pain medication utilization among urine toxicology-identified opioid and marijuana users after elective spine surgery. Neurosurgery 94(3):622–629. https://doi.org/10.1227/neu.0000000000002727
7. Ong CB, Puri S, Lebowitz J et al (2023) Preoperative cannabis use does not increase opioid utilization following primary total hip arthroplasty in a propensity matched analysis. Arch Orthop Trauma Surg 143(6):3629–3635. https://doi.org/10.1007/s00402-022-04619-7
8. Wood JT, Sambandam S, Wukich DK, McCrum CL (2022) Self-reported cannabis use is not associated with increased opioid use or costs after hip arthroscopy. Arthroscopy 38(7):2227-2231.e4. https://doi.org/10.1016/j.arthro.2021.12.040
9. Zhang-James Y, Wyon E, Grapsas D, Johnson B (2023) Daily cannabis use may cause cannabis-induced hyperalgesia. Am J Addict 32(6):532–538. https://doi.org/10.1111/ajad.13456
10. van der Merwe J, Casselman F. Mitral Valve Replacement-Current and Future Perspectives. Open J Cardiovasc Surg. 2017;9:1179065217719023. Published 2017 Jul 13. https://doi.org/10.1177/1179065217719023
11. HCUP National Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp
12. Jones AT, Marwan Abu Taha A, Miller GP. The resurgence of synthetic cannabinoid receptor agonists as adulterants in the Era of Cannabis legalization: Lessons from prior epidemics and clinical implications. Neurosci

Biobehav Rev. 2025;170:106043. https://doi.org/10.1016/j.neubiorev.2025.106043
13. Ti L, Tobias S, Maghsoudi N et al (2021) Detection of synthetic cannabinoid adulteration in the unregulated drug supply in three Canadian settings. Drug Alcohol Rev 40(4):580–585. https://doi.org/10.1111/dar.13237
14. Choinière M, Watt-Watson J, Victor JC et al (2014) Prevalence of and risk factors for persistent postoperative nonanginal pain after cardiac surgery: a 2-year prospective multicentre study. CMAJ 186(7):E213–E223. https://doi.org/10.1503/cmaj.131012
15. Jayakumar S, Borrelli M, Milan Z, Kunst G, Whitaker D. Optimising pain management protocols following cardiac surgery: A protocol for a national quality improvement study. *Int J Surg Protoc*. 2019;14:1–8. Published 2019 Jan 11. https://doi.org/10.1016/j.isjp.2018.12.002

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