International Journal of Research in Orthopaedics
Dolgov VS et al. Int J Res Orthop. 2026 Jan;12(1):1-6
http://www.ijoro.org

Original Research Article

DOI: https://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20254199

Retrospective study on pre- and postoperative morphine equivalents demand in patients who underwent rotator cuff repair surgery

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Received: 06 November 2025
Accepted: 10 December 2025

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ABSTRACT

Background: Aim was to evaluate pre- and postoperative morphine milligram equivalent (MME) demands in patients undergoing rotator cuff repair (RCR), and identify demographic or clinical factors associated with postoperative opioid use.
Methods: A retrospective case series of 35 patients was conducted who underwent RCR between 2023 and 2024 at two orthopedic centers. Demographic data, preoperative pain scores, and opioid use (MME) were extracted. Postoperative opioid consumption was assessed at 90 days. Paired comparisons, subgroup analyses (sex, age group, smoking status), and linear regression were performed to evaluate predictors of postoperative opioid use.
Results: Postoperative opioid use at 90 days was significantly lower compared with preoperative levels (mean paired difference-18.3 MME, t=-2.82, p=0.0106, Hedges' g=-0.62). No significant differences in 90-day MME were observed by sex (p=0.951), age group (p=0.271), or smoking status. Preoperative pain severity was not predictive of postoperative opioid use (slope=1.86 MME/point, p=0.411, R^2=0.034).
Conclusions: Patients undergoing RCR demonstrated a significant reduction in opioid use at 90 days postoperatively, with no major demographic or clinical predictors of postoperative demand. These findings suggest that current prescribing practices may exceed actual consumption and highlight the importance of tailoring opioid prescriptions and integrating multimodal analgesia to reduce unnecessary exposure while maintaining adequate pain control.

Keywords: Rotator cuff repair, Opioids, Morphine milligram equivalents, Postoperative pain, Prescribing practices

INTRODUCTION

Rotator cuff repair (RCR) is frequently associated with significant postoperative pain, and opioid therapy remains a mainstay in early management.

However, excessive opioid prescriptions are linked to dependence, prolonged use, and diversion. To better contextualize consumption across patients and institutions, morphine milligram equivalents (MMEs) are commonly used as a standardized measure of analgesic demand.[1-3]

Prior studies have demonstrated that multiple factors influence postoperative opioid use. Prolonged pain and increased opioid requirements have been associated with demographic and clinical factors, including gender, psychological state, and preoperative sleep disturbances.[1,2,4] In addition, multimodal pain protocols have been shown to reduce opioid reliance and improve patient satisfaction after RCR.[3,5,6] Systematic reviews further highlight variability in prescribing practices and emphasize the potential for overprescription in sports medicine procedures.[7,8]

Recent database analyses of opioid-naïve RCR patients have quantified postoperative opioid prescribing in MMEs, reporting a mean 90-day postoperative prescription of 742 MME, with 66% decline in prescribing over the past decade.[9] Despite these reductions, demographic variation persists, with female and younger patients receiving higher amounts.[9] At the institutional level, chart reviews suggest actual opioid consumption is far lower, averaging 82.5 MME, and support prescribing closer to 112.5 MME (approximately 15 tablets of 5-mg oxycodone) for arthroscopic shoulder surgery.[10]

Understanding these patterns is essential to balancing adequate analgesia with minimizing opioid exposure. The present retrospective case series evaluates pre- and postoperative MME demands in patients undergoing RCR, intending to contribute real-world evidence to guide safer, standardized opioid prescribing.

METHODS

Database selection

This retrospective case series study utilized data from AthenaOne healthcare system and the Alpine Ortho Spine Clinic database, spanning from 2023-2024. Study focused on patients who underwent RCR during this period.

Patient selection

Patients were initially identified using current procedural terminology (CPT) codes. RCR was identified using CPT code 23412. A total of 35 patients met the inclusion criteria for RCRs and were included in the final analysis. Inclusion criteria encompassed patients aged 18 years or older at the time of surgery, with complete medical records available in the AthenaOne system or Alpine Ortho Spine Clinic database. Patients were excluded if they had incomplete medical records, concurrent injuries or surgeries, or chronic pain syndromes.

Data extraction

For each included patient, the following was extracted: demographic information such as age, sex, and BMI (Table 1). Preoperative variables were preoperative pain score (VAS/NRS) and preoperative opioid exposure (recorded or convertible to MME, when available). Postoperative outcomes: 90-day postoperative opioid consumption (MME), when recorded.

Statistical analysis

When both pre- and postoperative MME were available for the same patient, paired tests were used; the Shapiro-Wilk signed-rank test was used otherwise. Postoperative MME was compared across subgroups by sex and by age category (<60, 60-70, >70) using t tests and ANOVA. Exploratory linear regression was used to assess the association between preoperative pain (VAS) and postoperative MME. R version 4.3.2 was used for statistical analysis.

Ethical considerations

This study received exemption and approval from the institutional review board of Washington State University. Throughout the data collection and analysis process, patient confidentiality was strictly maintained. Due to the retrospective nature of the study, the requirement for informed consent was waived.

RESULTS

A total of 35 patients who underwent RCR between 2023 and 2024 were included in the analytic cohort. The cohort comprised both males and females spanning a wide age range, with variable availability of preoperative pain scores and opioid exposure.

Postoperative opioid use was significantly reduced compared with preoperative levels. Among patients with MME values, the mean reduction was -18.3 MME, with normality of paired differences confirmed (Shapiro-Wilk p=0.34). A paired t-test demonstrated a significant decline (t=-2.82, df=20, p=0.0106; 95% CI -31.9 to -4.8), corresponding to a medium effect size (Hedges' g=-0.62; 95% CI -1.11 to -0.14). This reduction is visually demonstrated in Figure 1, which illustrates pre- versus postoperative distributions using paired violins with boxplots and individual points.

At 90 days, opioid use did not differ significantly by sex (Shapiro-Wilk p=0.77 for males; p=0.65 for females; t=-0.06, df=14.21, p=0.951; 95% CI -26.05 to 24.59; Hedges' g=-0.03, 95% CI -0.99 to 0.93; Figure 2 A) or by age group (<60, 60-70, >70 years; F [2,19]=1.40, p=0.271; Figure 2 B). The overall trajectory from preoperative baseline to 90 days confirmed the paired analysis, demonstrating a consistent decline in opioid utilization (Figure 3).

Exploratory analyses showed that preoperative pain severity was not predictive of postoperative opioid use. Linear regression estimated a slope of 1.86 MME per point on the visual analog scale (SE=2.21), which was not statistically significant (t=0.84, p=0.411; R^2=0.034; Figure 4 A). Similarly, smoking status did not appear to influence 90-day postoperative opioid use, with smokers and nonsmokers showing comparable distributions (Figure 4B). Anxiety and depression were not associated with higher 90-day postoperative MME or with differential change from pre- to post-op, with non-significant group differences for postoperative MME (anxiety: t=0.78, p=0.448; depression: t=0.16, p=0.872) and for change in MME (anxiety: t=1.44, p=0.183; depression: t=1.61, p=0.125). Osteoarthritis (OA) showed no significant difference in postoperative MME (t=0.87, p=0.420) but trended toward a smaller reduction in MME from pre- to post-op compared with those without OA (mean change -11.5 vs -47.3 MME; t=-2.52, p=0.055).

Table 1: Demographic characteristics of the RCR cohort.

Variables	Total cohort, (n=35)	Male, (n=11)	Female, (n=14)
Age, mean±SD (in years)	60.0±10.2	60.5±9.0	59.3±13.1
Pre-op pain VAS, mean±SD	6.6±2.2	6.7±2.9	6.9±1.5
Pre-op opioid use, n (%)	28 (80)	7 (64)	11 (79)

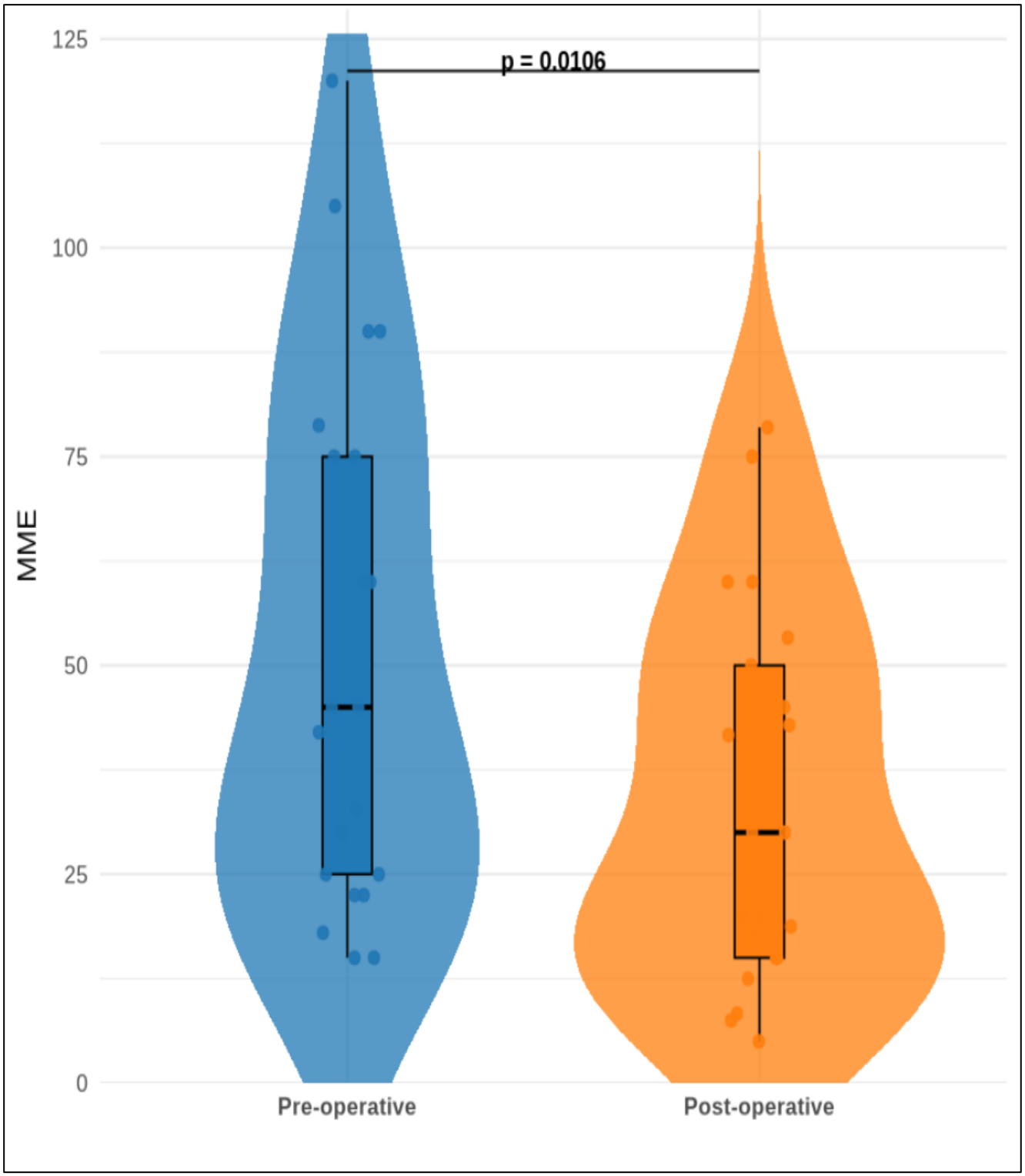

Figure 1: Pre- vs postop MME: paired violins with overlaid boxplots and individual points show the distribution of opioid consumption before surgery and at 90 days post-op. Black diamonds indicate group means.

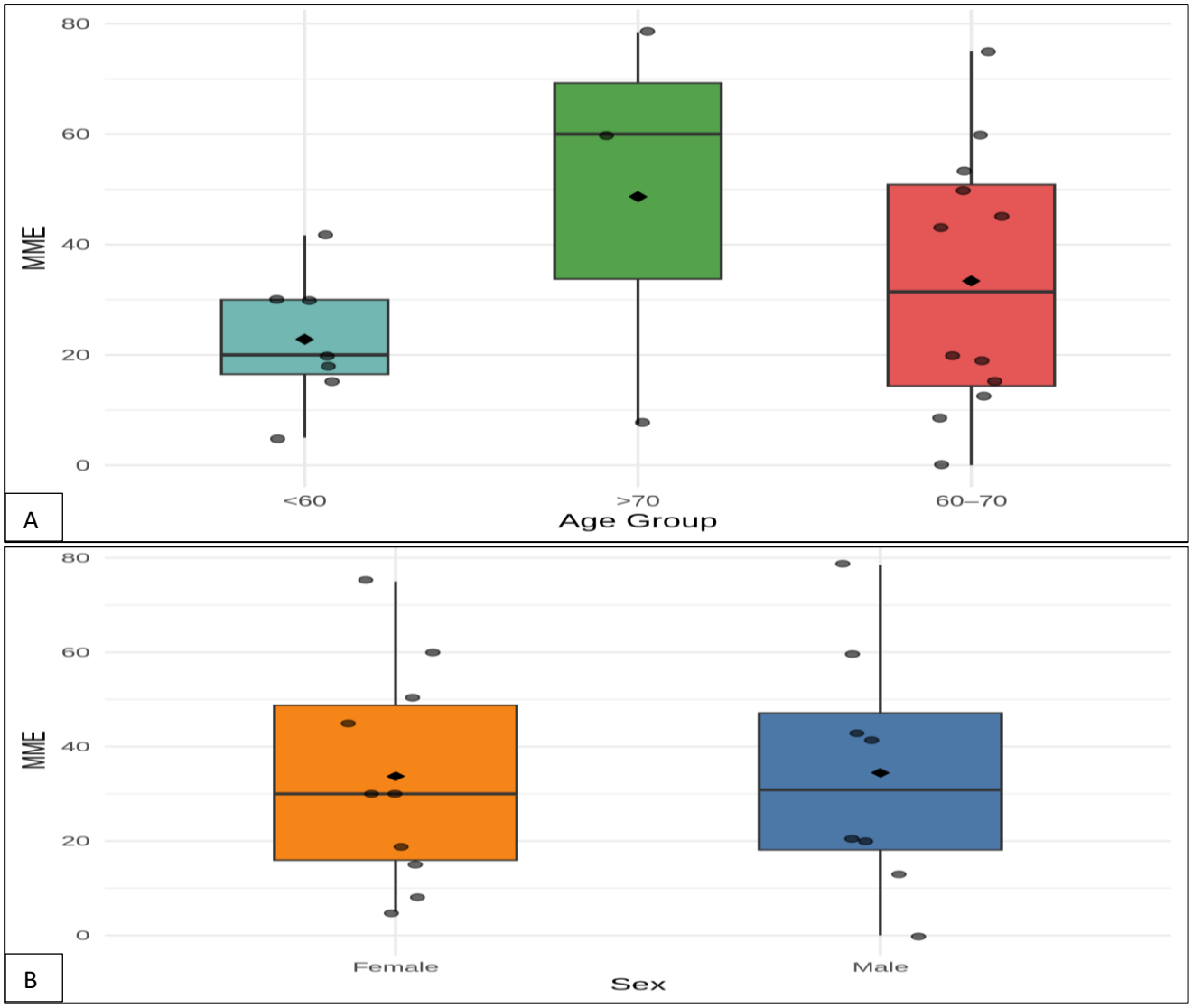

Figure 2 (A and B): A-Postop (90-day) MME by age group: Boxplots with jittered points compare opioid consumption across age categories (<60, 60–70, >70). Black diamonds indicate group means. B-Postop (90-day) MME by sex: Boxplots with jittered points compare opioid consumption between males and females. Black diamonds indicate group means.

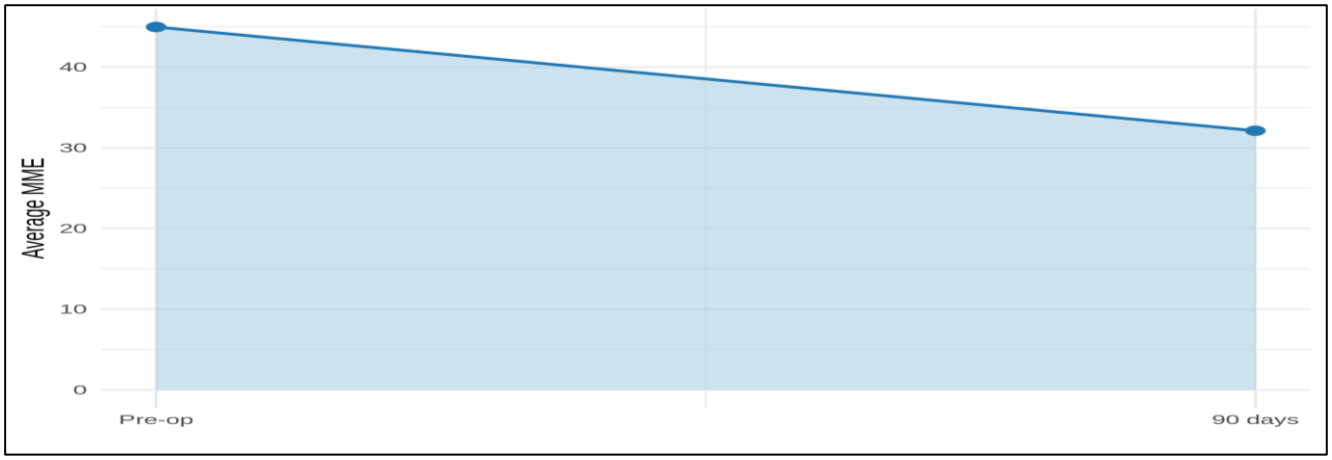

Figure 3: Average MME over time: mean MME at pre-op and 90 days post-op connected to illustrate overall trajectory.

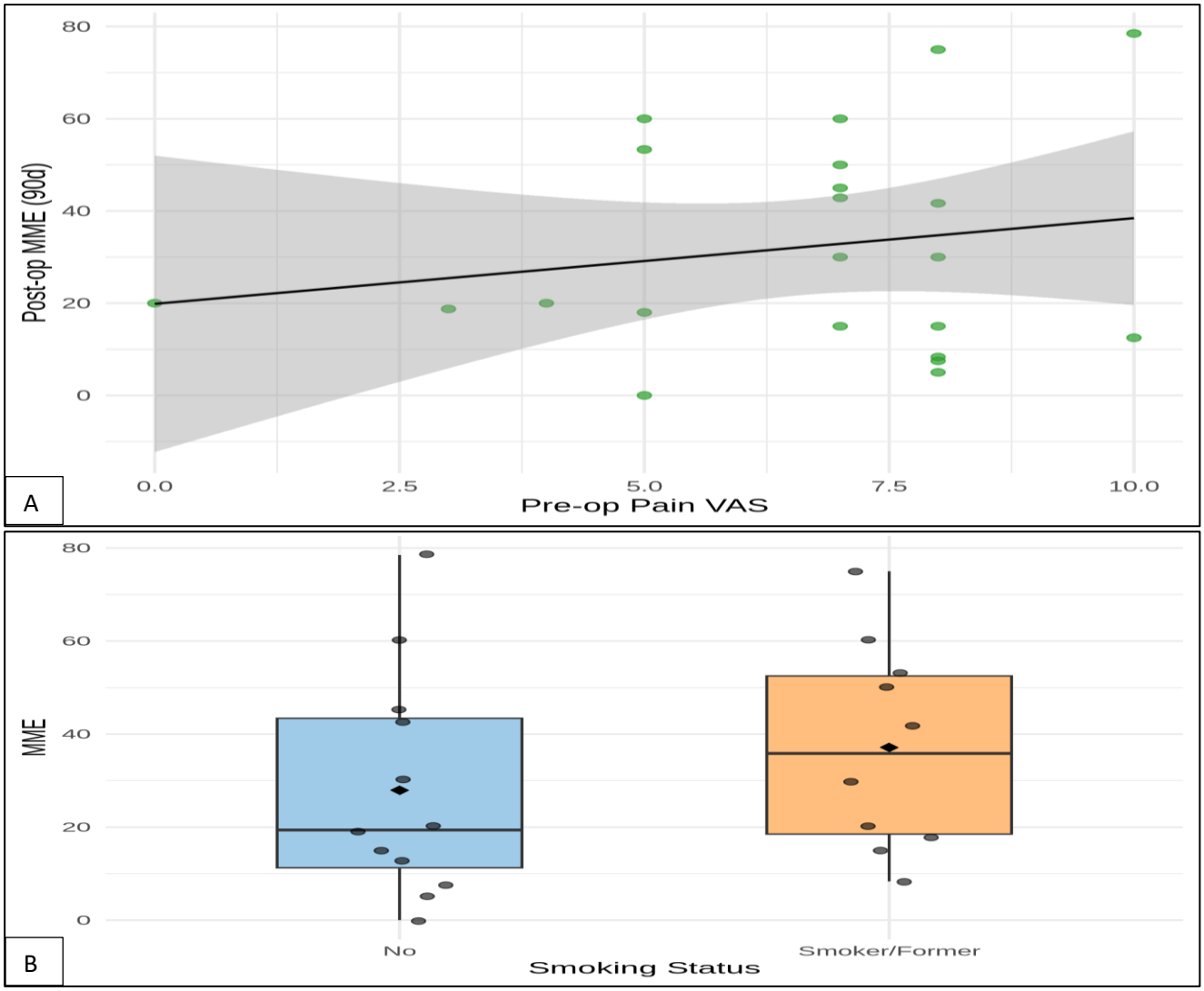

Figure 4 (A and B): Pre-op pain (VAS) vs post-op (90-day) MME: Scatter plot with linear regression line showing the association between baseline pain and postoperative opioid consumption. B-Post-op (90-day) MME by smoking status: Boxplots with jittered points compare opioid consumption between non-smokers and smokers/former smokers. Black diamonds indicate group means.

DISCUSSION

Our study adds to the growing body of evidence characterizing opioid use after RCR. We observed patterns consistent with prior reports showing substantial variability between prescribed and consumed opioids. National cohort data indicate mean prescriptions of ~742 MME over 90 days, although actual patient use is often far lower.[9,10] This discrepancy highlights the need for individualized prescribing guidelines and careful reconciliation of prescription size with expected consumption.

Multifactorial influences on opioid demand have been well described. Gender differences impact early postoperative outcomes and opioid requirements, while sleep disturbance and psychosocial factors are associated with increased pain and higher analgesic consumption.[2,4,6] Multimodal analgesia, incorporating acetaminophen, NSAIDs, regional anesthesia, and patient education, consistently reduces postoperative opioid reliance without compromising pain control.[3,5,7,8,11]

Our findings align with recommendations from the PROSPECT working group, which advocates for procedure-specific multimodal protocols to minimize opioid exposure after RCR.[7] Persistent overprescription remains a concern, as higher periprocedural MMEs are associated with prolonged opioid use and increased risk of dependence.[8,9] Evidence from systematic reviews underscores the effectiveness of non-opioid medications in the perioperative period, further supporting reduction strategies.[11]

Taken together, the data suggests that routine prescribing of large opioid quantities after RCR is unnecessary. Instead, tailoring prescriptions based on demographic risk factors, integrating multimodal strategies, and using

institutional data to calibrate opioid benchmarks may improve safety and reduce postoperative opioid burden.

Limitations

A key limitation of this study is that Washington State's prescription drug monitoring program only retains data for one year on a revolving basis, making long-term follow-up and monitoring difficult while also limiting evaluation of past patients who had undergone repair. Further work with the state would need to be done to gain greater access to narcotic history.

CONCLUSION

This retrospective case series demonstrates a significant reduction in opioid use from the preoperative period to 90 days following the RCR procedure, with no differences by sex, age, preoperative pain severity, or smoking status. Surgical intervention demonstrates a statistical reduction in patient pain reduction, ultimately reducing narcotic demand. These findings reinforce that actual postoperative opioid requirements are modest compared to typical prescription sizes reported in national cohorts. Routine overprescription remains a concern, underscoring the need for procedure-specific multimodal pain management protocols and institutional benchmarking to better align prescribing for true patient demand. Future studies with larger cohorts and longer follow-ups are warranted to refine individualized prescribing strategies and further reduce unnecessary opioid exposure while maintaining effective analgesia.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Dolgov VS, Tiwana HS, Schmidt C, Pham QP, Schmitz MA. Retrospective study on pre- and postoperative morphine equivalents demand in patients who underwent rotator cuff repair surgery. Int J Res Orthop 2026;12:1-6.