Cutting Through Confusion: MOUD Management in Surgery Patients

Mary Butala, PharmD, PGY1 Resident Atrium Health Cabarrus; Leah Moreau, PharmD, PGY1 Resident Atrium Health Cabarrus; Josephine Ariella Lovings, PharmD, PGY1 Resident Atrium Health Cabarrus

March 25, 2026

Disclosures

The planner(s) and speaker(s) have indicated that there are no relevant financial relationships with any ineligible companies to disclose.

Learning Objectives

At the end of this session, learners should be able to:

- Review the agents utilized for the treatment of opioid use disorder, including their mechanism of action and place in therapy.
- Differentiate between guideline-recommended perioperative pain management strategies for patients with opioid use disorder.
- Develop acute pain plans for post-surgical patients on medications for opioid use disorder (MOUD) therapy.

Outline

- Review the medications utilized to treat opioid use disorder (OUD).
- Review current guideline recommendations for perioperative management.
- Address common challenges and concerns surrounding OUD management during the perioperative period.
- Compare MOUD agents and their perioperative considerations.
- Apply principles through a mock post-surgical MOUD plan.

Abbreviation Key

- ASAM – American Society of Addiction Medicine
- BUP – buprenorphine
- ER – extended release
- FDA – U.S. Food and Drug Administration
- IM – intramuscular
- MOR – mu-opioid receptor
- MOUD – medication for opioid use disorder
- NPO – nothing per orem
- NSAID – nonsteroidal anti-inflammatory drug
- OUD – opioid use disorder
- OTP – opioid treatment program
- PET – positron emission tomography
- SAMHSA – Substance Abuse and Mental Health Services Administration
- SL – sublingual
- TDD – total daily dose
- UDS – urine drug screen
- VA – Veterans Affairs

Background: Opioid Epidemic and MOUD

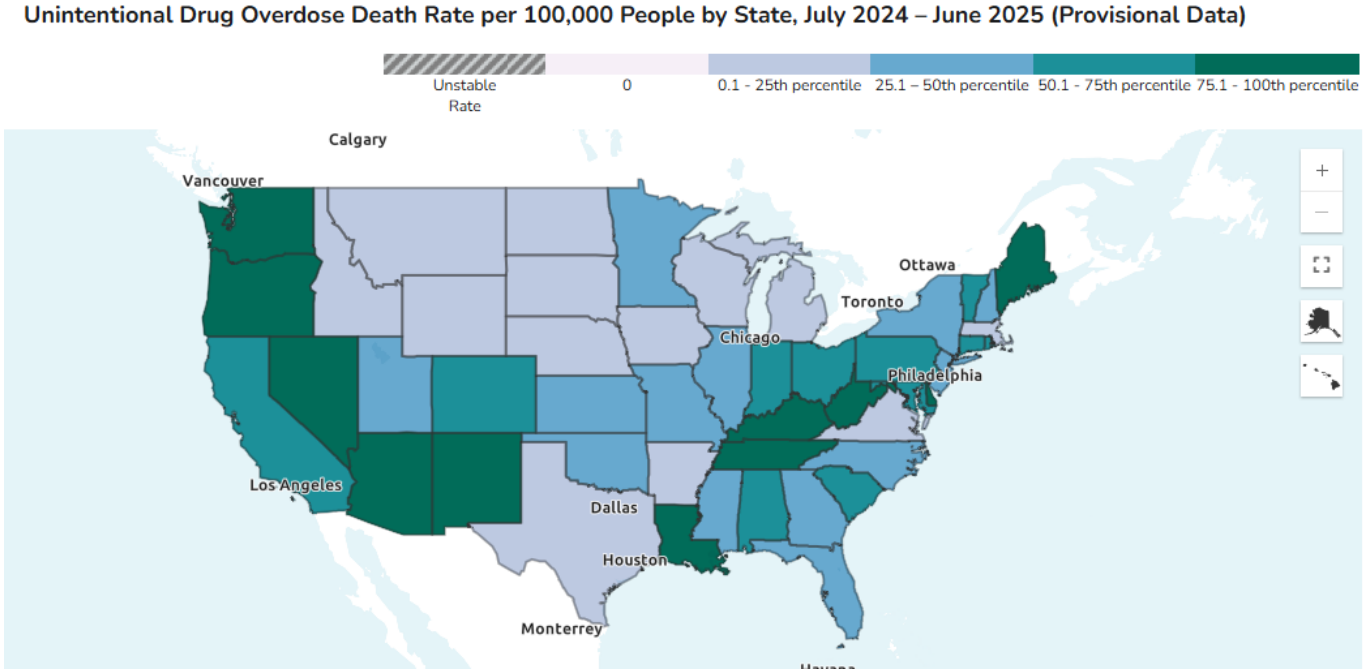
Key Definitions

- Medication for opioid use disorder (MOUD) refers to the use of medication specifically FDA approved for the treatment of opioid use disorder (OUD).
- OUD: chronic medical condition characterized by compulsive opioid use despite harmful consequences to health, social life, or responsibilities at work or home.

ADVOCATE HEALTH

BHG "MAT vs MOUD: What's the Difference?" Behavioral Health Group, 31 Mar 2025

National Overdose Statistics/Prevalence of OUD

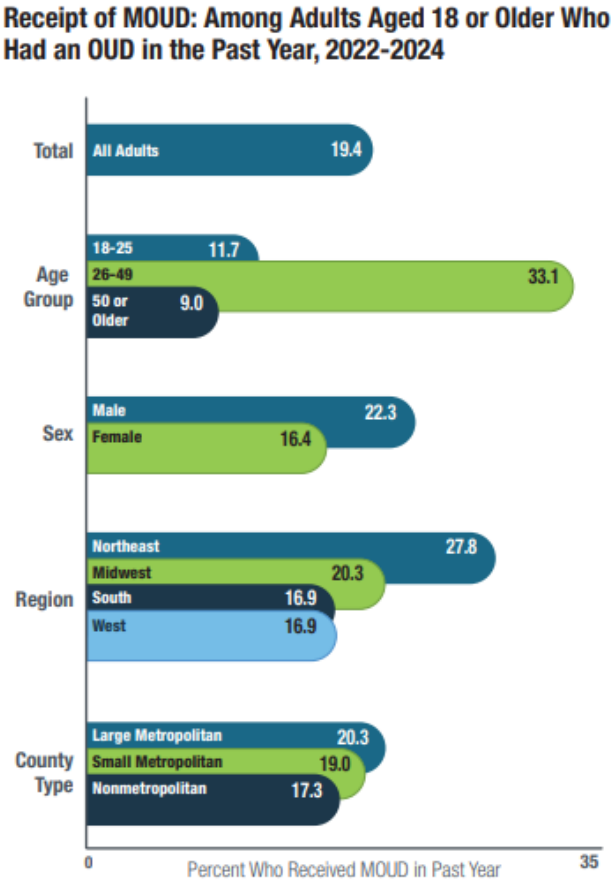


ADVOCATE HEALTH

CDC, 2020 Overdose Death Rates, 2025

MOUD Statistics

- About 1 in 5 (19.4%) of the 5.0 million adults who had an OUD in the past year, received MOUD in that period.
- 17,000+ substance use disorder facilities in the US.



ADVOCATE HEALTH

SAMHSA. NSDUH Data Spotlight. 2025;3(2).

MOUD Agents

Medication Treatment for OUD

Agent	Mechanism	FDA Approved Formulations for OUD	Therapeutic Dose Range	Success Rate
Buprenorphine ± Naloxone	Partial MOR agonist	**Bup with Naloxone:** SL tablets (Zubsolv®, Suboxone) SL film (Cassipa®, Suboxone®) Buccal film (Belbuca®, Bunavail®) **Bup without Naloxone:** SL tablets (Subutex®) ER injection (Brixadi®, Sublocade®)	12-32* mg/day	Up to 80% retention rate Decreases risk overdose by 59% Decreases risk opioid-related death by 38%
Methadone	Full MOR agonist	Oral solution Dissolvable tablet	80-120+ mg/day	Up to 85% retention rate Decreases risk overdose by 59% Decreases risk opioid-related death by 59%
Naltrexone	MOR antagonist	ER IM Injection (Vivitrol®) Oral tablets	380 mg monthly	Up to 55% retention rate No association with reduction in risk overdose or opioid related death

Larochelle MR, et al. *Ann Int Med*. 2018;169(3):137-145.
Wakemake SE, et al. *JAMA* 2020;3(2).
Krupitasky E. et l. Lancet. 2011;377(9776):1506-1513.
Smith K, et al. J Clin Pharmacol. 2022;62(4):449-462.
Kohan L, et al. Reg Anesth Pain Med. 2021;46(10):840-859.
National Institute on Drug Abuse. National Institute of Health. 2021.

*expressed in SL bup equivalents

ADVOCATE HEALTH

Mu-Opioid Receptor (MOR) Affinity

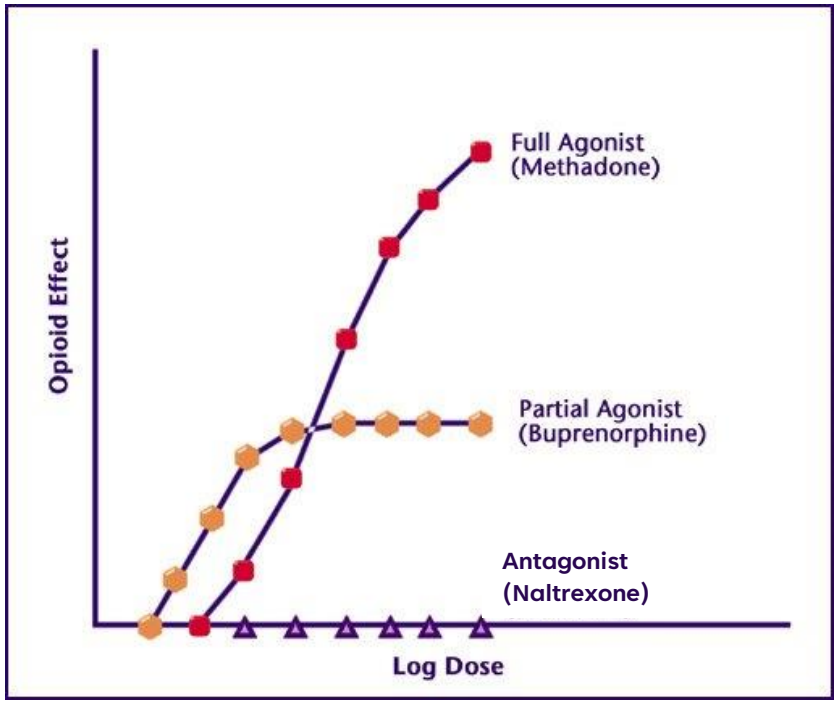
Low Affinity (K_i > 100nM)		Moderate Affinity (K_i 1-100nM)		High Affinity (K_i < 1nM)	
Drug	K_i(nM)	Drug	K_i(nM)	Drug	K_i(nM)
Tramadol	12486	Hydrocodone	41.58	Oxymorphone	0.4055
Codeine	734.2	Oxycodone	25.87	**Naltrexone***	**0.4**
Meperidine	450.1	**Methadone**	**3.378**	Hydromorphone	0.3654
		Fentanyl	1.346	**Buprenorphine**	**0.2157**
		Morphine	1.168	Sufentanil	0.1280

*Only MOR antagonist included due to use in OUD

Volpe et al. Regul Toxicol Pharm. 2011;59(3):385-390
Zádor et al. Eur J Pharmacol. 2017;809;111-121.

ADVOCATE HEALTH

MOUD Mechanism of Action



National Alliance of Advocates for Buprenorphine *Treatment Through Technical Explanation of Buprenorphine*. NAABT.

ADVOCATE HEALTH

Provider Concerns with MOUD

Uncertainty/lack of experience managing MOUD

Fear of causing overdose when providing additional opioids

Concern for MOUD interference with effective analgesia

ADVOCATE HEALTH

Kohan L, et al. Reg Anesth Pain Med. 2021;46(10):840-859.

Patient Concerns with MOUD

- Fear of inadequate pain control
- Anxiety surrounding procedures
- Exposure to potential relapse triggers
- Worry about stigma or being labeled "drug-seeking"

ADVOCATE HEALTH

Kohan L, et al. Reg Anesth Pain Med. 2021;46(10):840-859.

Clinical Challenges with MOUD

Disruption of treatment for OUD

Interference with full opioid agonists

Complex pain control needs

ADVOCATE HEALTH

Kohan L, et al. Reg Anesth Pain Med. 2021;46(10):840-859.

Risks of Uncontrolled Pain & MOUD Discontinuation

- 50-90% chance of OUD relapse if MOUD is discontinued
- Abrupt cessation while supplementing with opioids misused in the past can trigger relapse
- May lead to illicit substance-seeking behavior
- Increased risk of overdose

Quaye ANA, et al. Pain Med. 2019;20(7):1395-1408.
Ling W, et al. Addiction. 2009;104(2):256-265.

ADVOCATE HEALTH

Perioperative Management of MOUD

ADVOCATE HEALTH

General Principles

- Goal: balance continuation of MOUD with effective post-operative pain control.
- Utilize multimodal analgesia: NSAIDs, acetaminophen, ketamine, regional blocks, gabapentinoids, etc.
- Supplemental opioids may be used but often require higher doses in patients on MOUD.
- Prevent relapse: ensure rapid resumption of MOUD post-op and clear follow-up plan.
- Emphasize interdisciplinary collaboration across surgery, anesthesia, pain, and addiction teams.

Quaye ANA, et al. Pain Med. 2019;20(7):1395-1408.
Ling W, et al. Addiction. 2009;104(2):256-265.

General Principles

- Recommendations to hold buprenorphine and methadone during perioperative period are outdated.
- Every effort should be made to continue buprenorphine and methadone in this setting.

Quaye ANA, et al. Pain Med. 2019;20(7):1395-1408.
Ling W, et al. Addiction. 2009;104(2):256-265.

Use and Outcomes of MOUD Among Patients With OUD Undergoing Surgery (2025)

Design	• Retrospective cohort study. • Evaluated patients 18-64 years old undergoing both major and minor surgical procedures. • Compared surgical patients with OUD to those without OUD and examined outcomes among OUD patients with vs without MOUD.
Outcomes	• Perioperative opioid prescribing patterns • Persistent opioid use • 30-day readmissions • Emergency department visits
Results	Among patients with OUD (MOUD vs no MOUD): • Lower perioperative opioid use (53.7% vs 82.9%), $p < 0.0001$ • Lower persistent opioid use (13.8% vs 56.7%), $p < 0.0001$ • Fewer ED visits (18.3% vs 22.3%), $p < 0.0001$ • Lower readmission rates (4.8% vs 7.2%), $p < 0.0001$
Conclusions	• **Continuation of MOUD in surgical patients is associated with improved perioperative outcomes.** • Reduction of persistent postoperative opioid use highlights MOUD's role in preventing relapse and prolonged opioid exposure postoperatively.

ADVOCATE HEALTH

Li et al. Ann Surg Open 2025;6(3):e598

Buprenorphine ± Naloxone

ADVOCATE HEALTH

Pharmacologic Considerations

ADVOCATEHEALTH

MOR Affinity

- Human-carfentanil positron emission tomography (PET) utilized to provide direct insight into MOR occupancy and availability at various buprenorphine doses.
  - Dose range where buprenorphine has additive analgesic effects when used with full opioid agonist.
  - Time intervals between buprenorphine and full agonist administration to optimize receptor availability.

ADVOCATE HEALTH

Volpe et al. Regul Toxicol Pharm. 2011;59(3):385-390

Dose Related MOR Availability

Trial	Measure	Results	
Zubieta et al (2000)	Reduction in MOR availability	2mg: 36-50% 16mg: 79-95%	
Greenwald et al (2003)	Reduction in MOR availability	2mg: 41% 16mg: 80% 32mg: 84%	
Greenwald et al (2007, 2014)	Availability of MOR	1mg: 71-85% 2mg: 53-72% 4mg: 36-55% 8mg: 11-22%	12mg: 13-24% 16mg: 9-20% 24mg: 4-15% 32mg: 2-12%

Quaye et al. Pain Med. 2019;20(7):1395-1408.
Malinoff et al. Am J Ther. 2005;12(5):379-384.
Greenwald et al. Drug Alcohol Depend. 2014;144:1-11.
Zubieta et al. Neuropsychopharmacol. 2000;23(3):326-334.
Greenwald et al. Neuropsychopharmacol. 2003;28(11):2000-2009.
Greenwald et al. Biol Psychiatry. 2007;61(1):101-110.

Surgical Considerations

ADVOCATEHEALTH

Surgical Considerations

Urgency of procedure

- Non-emergent
- Emergent

Severity of expected pain

- Dictates anticipated opioid requirements post-operatively

ADVOCATE HEALTH

Warner et al. Mayo Clin Proc. 2020;95(6):1253-1267

Severity of Expected Pain by Procedure

Low Anticipated Opioid Requirements

- Invasive non-surgical procedures
- Outpatient procedures
- Laparoscopic procedures
- Distal extremity orthopedic surgery

Moderate-High Anticipated Opioid Requirements

- Major surgical procedures
  - Thoracotomy
  - Open-abdominal procedure
  - Major spine surgery

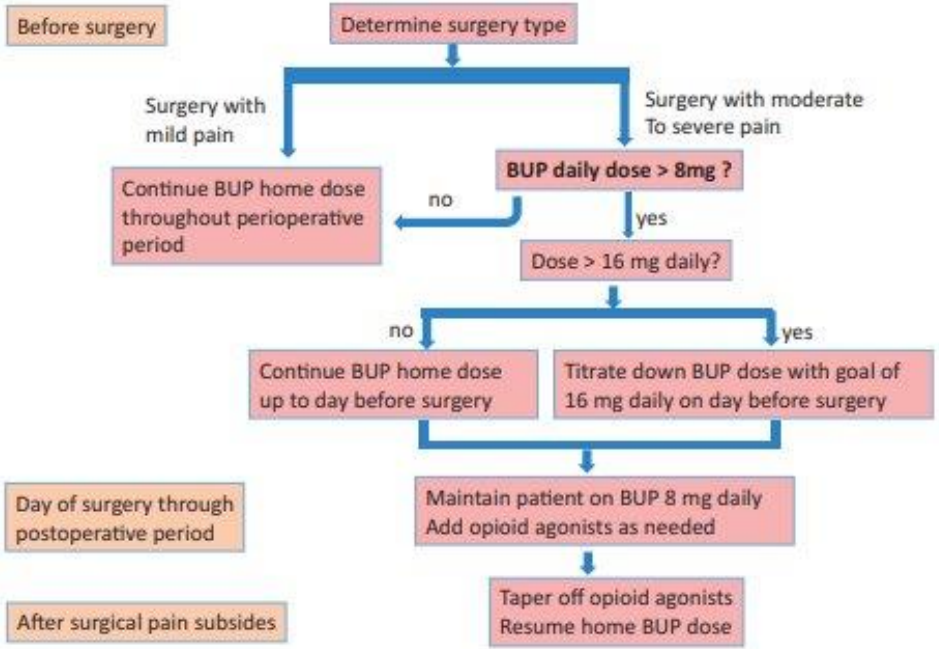
ADVOCATE HEALTH

Warner et al. Mayo Clin Proc. 2020;95(6):1253-1267

Guideline Recommendations and Supporting Literature

ADVOCATEHEALTH

Massachusetts General Protocol



ADVOCATE HEALTH

Quaye et al. Pain Med. 2020;20(7):1395-1408

Massachusetts General Protocol

Design	• Retrospective observational study • Patients on buprenorphine undergoing major surgical procedures

Methods	• Comparison of perioperative continuation versus holding buprenorphine
	  ○ Post-anesthesia care unit (PACU) pain scores
	  ○ Postoperative outpatient dispensing

Exclusion Criteria	• Minor procedures • Transdermal buprenorphine patches • Buprenorphine for chronic pain management • Emergent surgery

ADVOCATE HEALTH

Quaye et al. Pain Med. 2020;21(19):1995-1960

Massachusetts General Protocol

Data Collection	Outpatient opioid utilization: • Number of full MOR agonist prescriptions filled • Total amount of full MOR agonist dispensed (in MME) Postoperative buprenorphine adherence: • Number of buprenorphine prescriptions filled Postoperative pain level: • Pain scores in PACU (0-10)	
Baseline Characteristics	**Mean buprenorphine dose (mg):** • Continued: 17.7 • Held: 15.1 **Age (years):** • Continued: 50.3 • Held: 51.1	**Surgical Type (%)** Orthopedic • Continued: 50 • Held: 53 Abdominal • Continued: 21 • Held: 18 Cardiothoracic • Continued: 11 • Held: 12 Urology/gynecology • Continued: 8 • Held: 18

ADVOCATE HEALTH

Quaye et al. Pain Med. 2020;21(19):1995-1960

Massachusetts General Protocol

Results	N = 55 (continued (38): held (17))
	• Opioids prescriptions dispensed outpatient
	  ○ 53% continued vs 82% held (p = 0.011)
	• MME of full MOR agonist dispensed
	  ○ Mean 229 continued vs 521 held (p = 0.033)
	• Buprenorphine continued postoperatively
	  ○ 91% continued vs 88% held (p = 0.324)
	• PACU pain score
	  ○ Mean 2.9 continued vs 7.6 held (p < 0.001)

Conclusions	• Significantly less full MOR agonist use in postoperative continuation group. • Effect pain control can improve when buprenorphine is continued perioperatively.
Impact	Evidence to support the continuation of buprenorphine at a moderate dose
Limitations	• Single-center, nonrandomized. • Patients in held group may have more difficult to control pain. • Did not account for regional anesthetic use.

Quaye et al. Pain Med. 2020;21(19):1995-1960

American Society of Regional Anesthesia and Pain Medicine Recommendations (2021)

- Avoid routine tapering of buprenorphine preoperatively.
- Continue preoperative dose of buprenorphine unless inadequate pain relief requires a decrease.
- In patients receiving > 16mg/day with anticipated high postoperative opioid needs, tapering to ≤ 16 mg/day may be considered.
- Discontinuation of buprenorphine can increase the risk of OUD recurrence or harm.

ADVOCATE HEALTH

Kohan et al. Reg Anesth Pain Med 2021;46:840-859

VA Practice Guidelines (2022)

- Buprenorphine treatment should not be routinely discontinued in the perioperative period.
- A buprenorphine taper to ≤16 mg/day can be considered for patients prescribed higher doses of buprenorphine with anticipated postsurgical pain.
- In situations where a full opioid agonist is needed to adequately control perioperative pain, it is recommended that opioids with similar lipophilicity and binding affinity toward MOR be used.

ADVOCATE HEALTH

VA Pharmacy. Buprenorphine for MOUD Perioperative Guidelines, 2022.

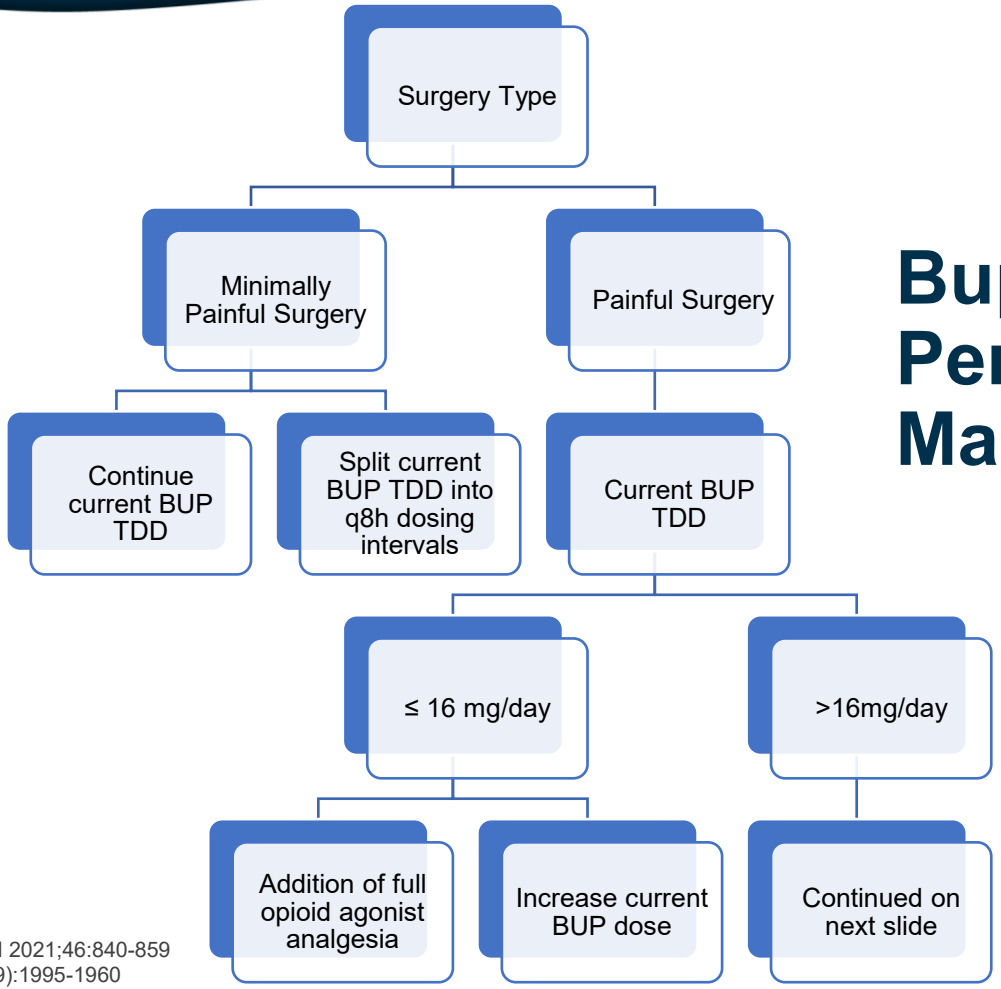
MOR Affinity

Low Affinity (K_i > 100nM)		Moderate Affinity (K_i 1-100nM)		High Affinity (K_i < 1nM)	
Drug	K_i (nM)	Drug	K_i (nM)	Drug	K_i (nM)
Tramadol	12486	Hydrocodone	41.58	Oxymorphone	0.4055
Codeine	734.2	Oxycodone	25.87	Naltrexone	0.4
Meperidine	450.1	Methadone	3.378	**Hydromorphone**	**0.3654**
		Fentanyl	1.346	**Buprenorphine**	**0.2157**
		Morphine	1.168	Sufentanil	0.1280

Volpe et al. Regul Toxicol Pharm. 2011;59(3):385-390
Zádor et al. Eur J Pharmacol. 2017;809;111-121.

ADVOCATE HEALTH

Buprenorphine: Perioperative Management

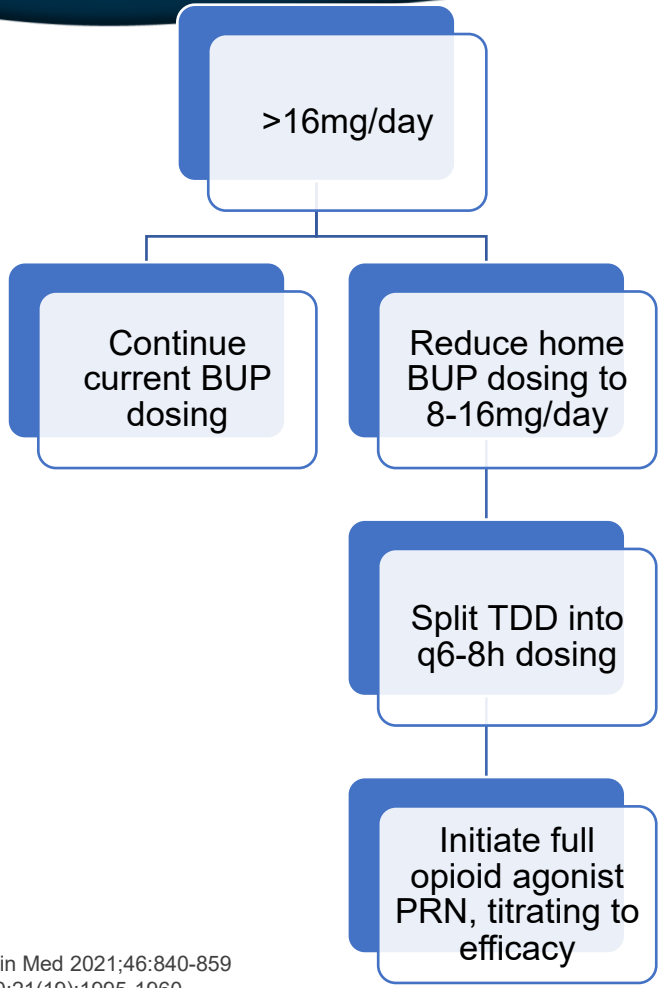


BUP TDD expressed in SL buprenorphine equivalents

Kohan et al. Reg Anesth Pain Med 2021;46:840-859
Quaye et al. Pain Med. 2020;21(19):1995-1960
VA Pharmacy. Buprenorphine for MOUD Perioperative Guidelines, 2022.

ADVOCATE HEALTH

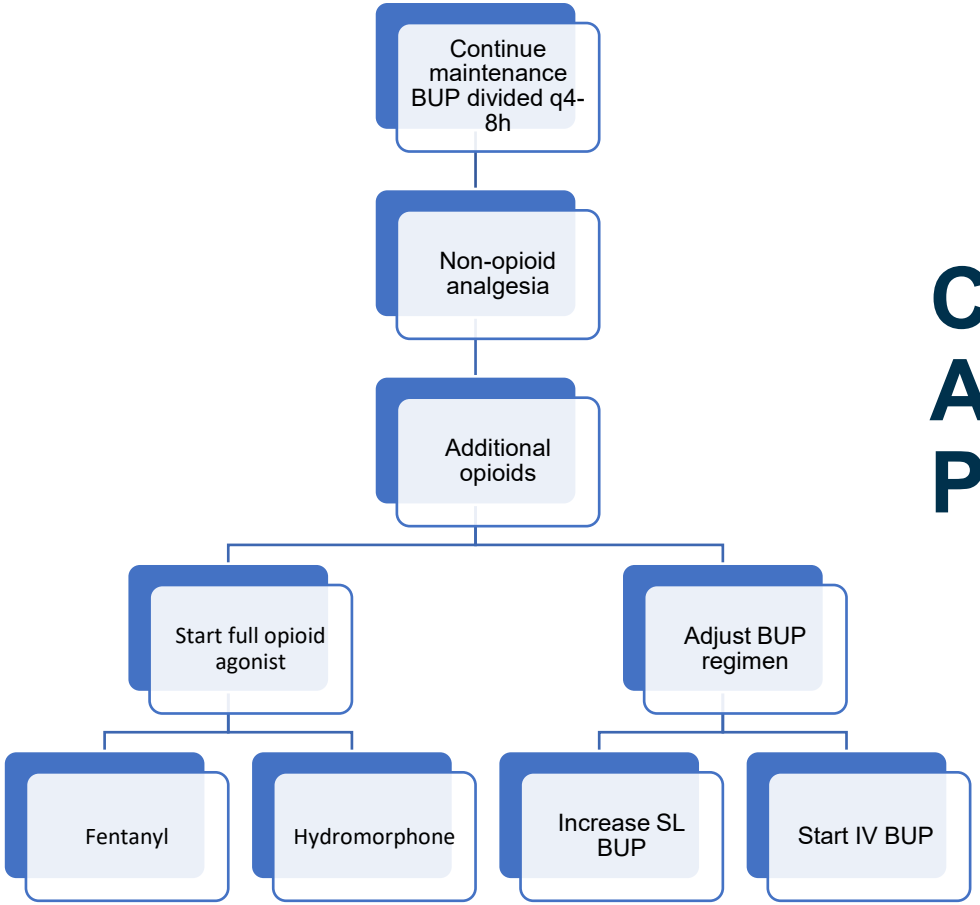
Buprenorphine: Perioperative Management



BUP TDD expressed in SL buprenorphine equivalents

Kohan et al. Reg Anesth Pain Med 2021;46:840-859
Quaye et al. Pain Med. 2020;21(19):1995-1960
VA Pharmacy. Buprenorphine for MOUD Perioperative Guidelines, 2022.

ADVOCATE HEALTH



CA Bridge Acute Pain Protocol (2019)

BUP TDD expressed in SL buprenorphine equivalents

ADVOCATE HEALTH

CA Bridge. Acute Pain Management in Patients on Buprenorphine for Opioid Use Disorder, 2019

Assessment Question #1

A 45 YO man with OUD maintained on buprenorphine-naloxone 16 mg/day is scheduled for an elective laparoscopic cholecystectomy. He has been stable on therapy for 2 years without relapse.

What is the most appropriate recommendation for this patient?

a. Discontinue buprenorphine 72 hours before surgery to allow full agonist opioids to work
b. Continue buprenorphine at the same dose and use multimodal analgesia post-operatively
c. Convert buprenorphine to methadone one week prior to surgery
d. Hold buprenorphine the morning of surgery only, then resume on post-op day 1

Methadone

ADVOCATE HEALTH

Pharmacologic Considerations

α-elimination half-life: 8-12 hours

- Responsible for analgesic effect

β-elimination half-life: 30-60 hours

- Responsible for withdrawal suppression

Binds to ~30% of the mu-opioid receptors, allowing additional activity from other opioid agonists

Can cause QTc prolongation

SAMHSA. Medications for Opioid Use Disorder. 2021.
ASAM. National Practice Guideline for the Treatment of Opioid Use Disorder. 2020.
Harrison et al. Anesthesiol Clin. 2018;36(3)L345-359.

American Society of Addiction Medicine (ASAM) Guideline Recommendations

Discontinuation before planned surgery is NOT recommended

Doses may be skipped during the NPO period before surgery

- Withdrawal not expected in first 24-48 hours
- IV:PO Conversion 1:2

Dividing home dose into 3-4 daily doses can maximize analgesic properties of methadone

High-potency IV full opioid agonists can be used perioperatively for analgesia

ADVOCATE HEALTH

ASAM. National Practice Guideline for the Treatment of Opioid Use Disorder. 2020.
Harrison et al. Anesthesiol Clin. 2018;36(3)L345-359.

Substance Abuse and Mental Health Services Administration Guideline Recommendations

- Patients should receive their full usual daily dose of methadone, barring contraindications
- Contact patient's opioid treatment program (OTP) directly to confirm the outpatient methadone dose
- Home methadone dose should not be considered a dose for pain management
- Prescribe short-acting opioids scheduled, not as needed. Patients will likely need higher doses of due to opioid tolerance.

ADVOCATE HEALTH

SAMHSA. Medications for Opioid Use Disorder. 2021.

Assessment Question #2

A 56 YO F treated with methadone 90 mg daily for OUD presents for emergency total hip replacement. She received her methadone dose this morning. She reports severe pain (10/10) post-operatively.

What is the best approach to managing her pain?

a. Withhold methadone post-operatively and switch to PRN IV morphine
b. Decrease methadone dose by 50% and add hydrocodone-acetaminophen
c. Continue her full methadone dose and treat acute pain with multimodal analgesia and short-acting opioids
d. Discontinue methadone and begin a PCA with no basal rate

Naltrexone

ADVOCATE HEALTH

Pharmacologic Considerations

Full opioid antagonist

- Causes precipitated withdrawal in patients actively on opioids
- Competitive antagonism allows for MOR blockade to be overcome with high doses of opioids

Half-life

- Oral tablet: ~ 4 hours
- Intramuscular injection: 5-10 days
  - Gradual decline in MOR blockade over 4 weeks, more easily overcome in weeks 3-4

Oral formulation used off label for OUD

- Only recommended in select patient groups

Smith K, et al. J Clin Pharmacol. 2022;62(4):449-462.
ASAM. National Practice Guideline for the Treatment of Opioid Use Disorder. 2020.
Ward EN, et al. Anesth Analg. 2018;127(2):539-547.

Therapeutic Considerations

- No physical dependence associated with naltrexone use
  - Naltrexone withdrawal is NOT a concern
- Larger place in therapy for alcohol dependence
- Lack of proven mortality benefit in OUD when compared to methadone or buprenorphine
  - Benefit mainly in reducing cravings

SAMHSA. Medications for Opioid Use Disorder. 2021.
ASAM. National Practice Guideline for the Treatment of Opioid Use Disorder. 2020.
Harrison et al. Anesthesiol Clin. 2018;36(3)L345-359.

ASAM Guideline Recommendations

Oral naltrexone

- Should be discontinued 72 hours before surgery if pain management with opioids is anticipated

Extended-release injectable naltrexone

- Should be discontinued 30 days before anticipated surgery
- Oral naltrexone may be used temporarily until 72 hours prior to surgery

Naltrexone should not be resumed until patient has been off all opioids for 3-7 days

ADVOCATE HEALTH

ASAM. National Practice Guideline for the Treatment of Opioid Use Disorder. 2020.

When IM Naltrexone is NOT Held

Elective/Planned Surgery	• Reschedule to allow for recommended discontinuation timeline
Emergency Surgery	• Large doses of high-affinity opioids can be used to overcome MOR blockade

ADVOCATE HEALTH

SAMHSA. Medications for Opioid Use Disorder. 2021

Postoperative Pain Management Considerations

- Non-opioid multimodal analgesia should be prioritized over high-dose opioid agonists, particularly when naltrexone cannot be discontinued perioperatively
- Doses 6-20 times typical opioids have been needed in animal models to overcome MOR blockade
- Patients are still at risk of respiratory depression, so require close monitoring while using high dose opioids
- Patients may be more sensitive to opioids if proper discontinuation of naltrexone has occurred

ADVOCATE HEALTH

Harrison et al. Anesthesiol Clin. 2018;36(3)L345-359.

Assessment Question #3

A 38 YO M on extended-release IM naltrexone 380 mg monthly is admitted for a femur fracture after a car accident. His last injection was 2 weeks ago. He requires urgent orthopedic surgery.

Which of the following are appropriate post-operative pain management strategies?

a. Use standard opioid doses post-op; naltrexone blockade is minimal at 2 weeks
b. Use high dose opioids to overcome MOR blockade
c. Delay surgery until naltrexone fully wears off
d. Prioritize non-opioid multimodal analgesia and regional anesthesia techniques

Final Summary

ADVOCATE HEALTH

Conclusions

There is an increasing population of patients on MOUD

Achievement of perioperative pain management in patients on MOUD is multifactorial and highly patient specific

Benefits of continuing methadone and buprenorphine ± naloxone perioperatively outweigh the risks

Higher doses of full MOR agonists and optimization of multimodal analgesics likely required to achieve pain control when MOUD is continued

Questions?

Mary Butala, PharmD
mary.butala@advocatehealth.org

Leah Moreau, PharmD
leah.moreau@advocatehealth.org

Josephine Ariella Lovings, PharmD
josephine.lovings@advocatehealth.org

References

- Acute Pain Management in Patients on Buprenorphine Treatment for Opioid Use Disorder. CA Bridge Emergency and Critical Care Protocol. November 2019
- Alford D, Compton P, Samet J. Acute pain management for patients receiving maintenance methadone or buprenorphine therapy. Ann Int Med. 2006; 144(2):127-134.
- BHG "MAT vs MOUD: What's the Difference?" Behavioral Health Group, 31 Mar 2025.
- Greenwald MK, Comer SD, Fiellin DA. Buprenorphine maintenance and mu-opioid receptor availability in the treatment of opioid use disorder: implications for clinical use and policy. Drug Alcohol Depend. 2014 Nov 1;144:1-11. doi: 10.1016/j.drugalcdep.2014.07.035. Epub 2014 Aug 19. PMID: 25179217; PMCID: PMC4252738.
- Greenwald MK, Johanson CE, Moody DE, Woods JH, Kilbourn MR, Koeppe RA, Schuster CR, Zubieta JK. Effects of buprenorphine maintenance dose on mu-opioid receptor availability, plasma concentrations, and antagonist blockade in heroin-dependent volunteers. Neuropsychopharmacology. 2003 Nov;28(11):2000-9. doi: 10.1038/sj.npp.1300251. PMID: 12902992.
- Greenwald M, Johanson CE, Bueller J, Chang Y, Moody DE, Kilbourn M, Koeppe R, Zubieta JK. Buprenorphine duration of action: mu-opioid receptor availability and pharmacokinetic and behavioral indices. Biol Psychiatry. 2007 Jan 1;61(1):101-10. doi: 10.1016/j.biopsych.2006.04.043. Epub 2006 Sep 1. PMID: 16950210.
- Harrison TK, Kornfeld H, Aggarwal AK, Lembke A. Perioperative Considerations for the Patient with Opioid Use Disorder on Buprenorphine, Methadone, or Naltrexone Maintenance Therapy. *Anesthesiol Clin*. 2018;36(3):345-359. doi:10.1016/j.anclin.2018.04.002
- Kohan, L., Potru, S., Barreveld, A. M., Sprintz, M., Lane, O., Aryal, A., Emerick, T., Dopp, A., Chhay, S., & Viscusi, E. (2021). Buprenorphine management in the perioperative period: educational review and recommendations from a multisociety expert panel. *Regional anesthesia and pain medicine*, *46*(10), 840–859. https://doi.org/10.1136/rapm-2021-103007
- Li, A. H., Huang, Y., Martins, S. S., Suzuki, Y., Ferris, J. S., Xu, X., Hershman, D. L., & Wright, J. D. (2025). Use and Outcomes of Medication for Opioid Use Disorder Among Patients With Opioid Use Disorder Undergoing Surgery. *Annals of surgery open : perspectives of surgical history, education, and clinical approaches*, *6*(3), e598. https://doi.org/10.1097/AS9.0000000000000598
- Malinoff HL, Barkin RL, Wilson G. Sublingual buprenorphine is effective in the treatment of chronic pain syndrome. Am J Ther. 2005 Sep-Oct;12(5):379-84. doi: 10.1097/01.mjt.0000160935.62883.ff. PMID: 16148422.
- National Alliance of Advocates for Buprenorphine *Treatment Through Technical Explanation of Buprenorphine*. NAABT.
- Perioperative Pain Management Guidance for Patients on Chronic Buprenophine Therapy Undergoing Elective or Emergent Procedures. VA Pharmacy Benefit Management Services, Medical Advisory Panel. February 2022
- Quaye, A. N., & Zhang, Y. (2019). Perioperative Management of Buprenorphine: Solving the Conundrum. *Pain medicine (Malden, Mass.)*, *20*(7), 1395–1408. https://doi.org/10.1093/pm/pny217
- Smith K, Wang M, Abdukalikov R, et al. Pain Management Considerations in Patients With Opioid Use Disorder Requiring Critical Care. *J Clin Pharmacol*. 2022;62(4):449-462. doi:10.1002/jcph.1999
- The ASAM National Practice Guideline for the Treatment of Opioid Use Disorder: 2020 Focused Update. (2020). *Journal of addiction medicine*, *14*(2S Suppl 1), 1–91. https://doi.org/10.1097/ADM.0000000000000633
- Volpe, D. A., McMahon Tobin, G. A., Mellon, R. D., Katki, A. G., Parker, R. J., Colatsky, T., Kropp, T. J., & Verbois, S. L. (2011). Uniform assessment and ranking of opioid μ receptor binding constants for selected opioid drugs. *Regulatory toxicology and pharmacology : RTP*, *59*(3), 385–390. https://doi.org/10.1016/j.yrtph.2010.12.007
- Warner, N. S., Warner, M. A., Cunningham, J. L., Gazelka, H. M., Hooten, W. M., Kolla, B. P., & Warner, D. O. (2020). A Practical Approach for the Management of the Mixed Opioid Agonist-Antagonist Buprenorphine During Acute Pain and Surgery. *Mayo Clinic proceedings*, *95*(6), 1253–1267. https://doi.org/10.1016/j.mayocp.2019.10.007
- Zubieta J, Greenwald MK, Lombardi U, Woods JH, Kilbourn MR, Jewett DM, Koeppe RA, Schuster CR, Johanson CE. Buprenorphine-induced changes in mu-opioid receptor availability in male heroin-dependent volunteers: a preliminary study. Neuropsychopharmacology. 2000 Sep;23(3):326-34. doi: 10.1016/S0893-133X(00)00110-X. PMID: 10942856.

ADVOCATE HEALTH