Alcohol use disorder in the perioperative period: a summary and recommendations for anesthesiologists and pain physicians

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ABSTRACT

Excessive alcohol consumption and alcohol use disorder (AUD) increase the risk of perioperative morbidity and mortality. Aspiration, malnutrition, coagulopathies, seizures, and hemodynamic alterations are only a few of the major concerns related to acute alcohol intoxication and AUD. There are also numerous physiological effects, changes in medication metabolism and pharmacology, and adverse events related to chronic alcohol consumption. These are all important considerations for the anesthesiologist in the perioperative management of a patient with AUD. Pain perception and thresholds are altered in patients with acute and chronic alcohol use. Medications used to manage AUD symptoms, particularly naltrexone, can have significant perioperative implications. Patients on naltrexone who continue or stop this medication in the perioperative period are at an increased risk for undertreated pain or substance use relapse. This review highlights key considerations for the anesthesiologist and pain physician in the perioperative management of patients with active AUD (or those in recovery). It discusses the effects of acute and chronic alcohol use on pain perception and thresholds, provides guidance on the perioperative management of naltrexone and low-dose naltrexone, and reviews a multimodal approach to pain management.

INTRODUCTION: AUD AND THE ANESTHESIOLOGIST

Significant alcohol use can have profound perioperative implications; when compared with non-risky users and those who abstain. One in six adults binge drink, with about 25% of those adults consuming up to eight drinks during a binge session.[1] Those with heavy alcohol use (see table 1) were revealed to have a 168% increase in mortality risk in the perioperative period.[2] Patients who abuse alcohol are more likely to experience postoperative delirium (POD). This surgical complication leads to functional decline, cognitive impairment, longer hospital stays and increases mortality. Alcohol abuse is considered an independent risk factor for POD.[3] Alcohol use disorder (AUD) is the most prevalent substance use disorder (SUD) and is characterized by concerning or excessive patterns of alcohol use despite adverse consequences that are known or unknown to the patient (see online supplemental figure 1). Globally, 5.9% of deaths (7.6% in men and 4.0% in women) are attributable to AUD.[4] In the USA, it is estimated nearly one-third of Americans, at some point in their lives, will meet the Diagnostic and Statistical Manual 5th edition (DSM-V) criteria for AUD; with a prevalence of approximately 14% of adults.[4 5] According to recent data, Native Americans have the highest rates of AUD (9.2%), followed by non-Hispanic Caucasians (5.9%), African Americans (5.6%), Hispanic and Latinx Americans (5.1%), Native Hawaiian and Pacific Islanders (3.5%) and lastly Asian-Americans (3.0%).[6] Young adults, age 18–25, have the highest prevalence of AUD (10.7%).[4] This is consistent with a higher prevalence of overall SUDs in this age group.[7] Prior to the CoVID-19 pandemic, over US$200 billion was spent annually on alcohol-related healthcare expenditures.[8] Since the start of the pandemic, approximately 20% of the US population has since reported an increase in their alcohol consumption.[9] AUD continues to be underdiagnosed and undertreated; with less than 10% of patients seeking treatment, and those who do typically have severe disease.[4 5]

The incidence of alcohol misuse in surgical patients has been quoted to be as high as 50%, although prevalence may vary depending on screening tools.[10] Surgical patients with heavy alcohol consumption are: (1) predisposed to increased morbidity and wound infection; (2) more likely to require an intensive care unit admission; and (3) more likely to have an increased length of stay.[2] As such, alcohol use has been deemed a modifiable risk factor for improved perioperative outcomes.[2] The mechanism behind these poor alcohol-related outcomes is multifactorial but likely involves preexisting organ dysfunction such as seen in alcoholic cardiomyopathy, immunodeficiency leading to increased risk of infection, imbalance of the coagulation cascade with coagulopathy, an amplified stress response and poor wound healing.[2] Anesthesiologists and pain physicians are in a unique position as they are able to change the course of a patients disease by screening for AUD, enacting appropriate preoperative interventions and positively impacting the patients outcome.[11 12] This paper aims to review the incidence and implications of AUD, review treatment options used in AUD, improve knowledge of changes in pain perceptions and thresholds in this patient population, discuss perioperative management of naltrexone and low-dose naltrexone (LDN) and outline a multimodal approach to postoperative pain management.

Table 1 Alcohol use disorder diagnosis per DSM-V criteria and alcohol use severity levels per National Institute on Alcoholism and Alcohol Abuse[13 73 74]

Severity	Male	Female
Moderate drinking	2 drinks or less per day	1 drink or less per day
Binge drinking	5 or more standard drinks in 2 hours	4 or more standard drinks in 2 hours
Heavy alcohol use	5 or more standard drinks on any given day and more than 15 drinks in a week	4 or more drinks on any given day and 8 or more drinks in a week
Alcohol dependence	Experiences at least minor withdrawal symptoms when abstinent	
Alcohol use disorder (AUD)	Experience≥2 items related to drinking in a 12-month period. Examples include: ► Repeated failure to fulfill obligations. ► Repeated drinking in hazardous situations ► Tolerance ► Withdrawal or alcohol use to avoid withdrawal. ► Drinking more or longer than intended ► Desire/unsuccessful attempts to stop or reduce drinking	

A standard drink=14 g of alcohol.[74]
DSM-V, Diagnostic and Statistical Manual 5th edition.

DIAGNOSIS OF AUD

According to the DSM-V, the diagnosis of AUD requires at least two of the criteria shown in table 1 to occur within a 12-month period. This table defines alcohol use severity levels, including moderate drinking, binge drinking, heavy alcohol use, alcohol dependence and AUD (the DSM-V term for alcohol 'addiction').

Patients with AUD compulsively use alcohol regardless of its harmful effects.[4 5] They frequently demonstrate cravings and are often unable to cease alcohol use despite failure to complete social, occupational, or financial obligations. Perpetuating this cycle is an increase in alcohol metabolism and clearance rate, progressively raising a patient's tolerance.[13] Like all SUDs, comprehensive AUD treatment involves pharmacological and psychosocial interventions (see online supplemental table 1).

ALCOHOL PHARMACOLOGY

The metabolites of alcohol, referred to here as ethanol or ethyl alcohol, have significant effects on most organs in the body.[14] The primary mechanism by which ethanol affects the central nervous system (CNS) is the manipulation of ligand-gated ion channels and voltage-dependent calcium channels, resulting in either an enhancing or inhibitory effect on neurotransmitter systems in the CNS, depending on the receptor type.[15] Ethanol's predominant effect is a result of gamma-amino butyric acid (GABA) A potentiation.[16] GABA functions as the primary inhibitory neurotransmitter in the CNS and alcohol-induced potentiation of GABA-A receptors has a significant inhibitory effect on neuronal excitability, decreasing the amplitude and frequency of certain impulses in the brain.[17] Ethanol's effect on GABA-A has a similar mechanism to other medications like barbiturates, benzodiazepines and anesthetics.[18]

PHYSIOLOGICAL EFFECTS OF ALCOHOL USE: CLINICAL CONCERNS AND CONSIDERATIONS

AUD has effects on many physiological processes. The significance of these effects should be considered. The effects have been summarized and stratified based on organ system in table 2. Additionally, see online supplemental table 2 for a complete list of considerations.

FDA-APPROVED MEDICATION TREATMENTS FOR AUD

There are three FDA-approved medication treatments for AUD: disulfiram, acamprosate and naltrexone. Table 3 offers a summary of these medications.

Disulfiram, an older medication, and aversive agent approved by the FDA for alcohol dependence in 1951, inhibits the action of aldehyde dehydrogenase, an enzyme which functions to reduce the blood levels of acetaldehyde. Acetaldehyde is associated with 'hangovers' and can result in facial flushing, nausea and an increase in heart rate. The combination of disulfiram and ethanol can result in the symptoms described above as well as hypotension, vomiting, abdominal discomfort and, in rare cases, cardiovascular collapse. Because of its age and hepatotoxic effects, clinicians prefer acamprosate and naltrexone.

Acamprosate is thought to exert its effect on AUD via modulation of glutamatergic transmission and is FDA approved to maintain abstinence in patients with AUD who are abstinent at the time of treatment initiation.[19] It is not known to be affected by most anesthetic drugs and can be continued perioperatively.[20 21]

Table 2 Organ system-based clinical concerns and considerations

Nervous	► Excessive alcohol intake can result in neurological complications, with many secondary to nutritional deficiencies. ► Chronic alcohol use can lead to alcoholic neuropathy and may result in sensory, motor and autonomic dysfunction.[75] ► Skeletal muscle weakness and atrophy is seen in patients with alcoholic myopathy and may lead to hyperkalemia, myoglobinuria and subsequent kidney dysfunction.[76 77]	► Document preexisting neurological or musculoskeletal abnormalities. ► Weigh risks and benefits of regional anesthesia in patients with peripheral neuropathy or if patient cooperation is a concern. ► Multimodal analgesia for pain. ► Consult acute pain service.
Circulatory	► Alcohol and its toxic metabolites, particularly acetaldehyde, can damage the cardiovascular system. It increases the risk of diseases such as coronary heart disease, stroke, hypertension and cardiomyopathy; the dose and pattern of use heavily influences these risks.[78]	► Assess hemodynamic stability in the context of neuraxial anesthesia as it pertains to volume status and cardiac function.
Hematology	► Alterations in coagulation are common in patients with AUD with a risk of both bleeding and thrombosis due to thrombocytopenia, platelet dysfunction, and alterations in procoagulant and anticoagulant factors.[79]	► Obtain complete blood count, coagulation studies, such as prothrombin and INR. ► Regional techniques may be contraindicated in patients with coagulopathy.
Immune	► The immune system, both innate and adaptive, is adversely affected by alcohol consumption, resulting in abnormal function of neutrophils and macrophages. An imbalance in proinflammatory and anti-inflammatory cytokines is thought to be a primary factor in the increased incidence of nosocomial infection and sepsis.[80]	► Strict adhere to anti-infective practice guidelines with invasive lines such as epidural and peripheral catheters.

AUD, alcohol use disorder; INR, international normalized ratio.

Table 3 Three Food and Drug Administration-approved medications for alcohol use disorder[19]

Medication	Mechanism	Perioperative management
Disulfiram	Inhibits aldehyde dehydrogenase causing buildup of acetaldehyde in presence of alcohol leading to uncomfortable symptoms and aversion to alcohol.[19]	Stop 1–2 weeks before surgery.
Acamprosate	NMDA glutamate receptor antagonist initiated in abstinent patients to restore balance of neurotransmitters, reduce alcohol cravings and intake.	Continue perioperatively.
Naltrexone	Non-selective competitive opioid receptor antagonist (highest affinity for mu receptor) attenuates alcohol's rewarding effects in the mesolimbic-dopaminergic pathway; lower doses used for chronic pain (see below).	Continue perioperatively if opioid-free anesthesia/analgesia reliable. If anticipating need for postoperative opioids, stop oral medication 72 hours before surgery and/or use last intramuscular dose 25 days before surgery.

NMDA, N-methyl-d-aspartate.

Naltrexone, a non-selective opioid antagonist at the mu, kappa and delta receptors, is widely considered to be the current treatment of choice for AUD pharmacotherapy. The dose range for naltrexone is typically 50–150 mg daily. Multiple studies and meta-analyses support its use for pursuing abstinence as well as reducing heavy drinking days and quantity of alcohol consumed at each episode of drinking.[22 23] One must be cautious when using naltrexone in the context of comorbid liver disease or concomitant use of opioids; initiation of naltrexone during opioid use may precipitate significant opioid withdrawal symptoms due to residual receptor blockade.[4]

Chronic pain physicians use LDN, dosed at 1.5–4.5 mg, in the management of chronic pain conditions such as arthritis and fibromyalgia.[24 25] LDN, at 1/10th the dose of naltrexone used for treating AUD, has exhibited effects that are not seen in larger doses including analgesic and anti-inflammatory properties. The exact mechanism of LDN remains unclear. However, it is thought to modulate opioid receptors, via transient blockade, resulting in a positive feedback response that increases endogenous opioids and opioid receptors. It also reduces inflammatory mediators via antagonism of toll-like receptor 4 in microglial cells and macrophages found in the peripheral and CNS.[24 25]

There is interest in using LDN for AUD symptoms, but most studies for AUD evaluate at least a 50-mg dose of naltrexone; thus, data are limited.

PREOPERATIVE EVALUATION

Obtaining the true amount of daily alcohol use at the surgical or anesthesia preoperative visit can potentially lend itself to engaging these patients in AUD services to reduce alcohol consumption and risk of complications. Some data demonstrate that drinking over 60 g daily (>4 standard U.S. drinks) is associated with a two-to-fourfold increase in postoperative complications.[10] At least one randomized controlled trial demonstrates that reduction of alcohol consumption at least 4 weeks prior to surgery led to a dramatic reduction in postoperative complications.[26] In addition, a remote history of risky drinking did not result in increased postoperative complications when compared with risky drinking in the few weeks leading up to surgery.[27] Tapering or discontinuing AUD medication treatments (eg, naltrexone) to facilitate postoperative analgesia may have a much different result in an individual with remote AUD and strong recovery history, as compared with another with a history of multiple relapses and poor psychosocial functioning. If history is unavailable or unclear or if there is concern for polysubstance use, a urine toxicology screening can be beneficial. Breath or serum testing for alcohol levels may be more practical than testing for alcohol metabolites in urine, which requires expensive, time-consuming chromatographic testing.[28] At least one device is validated for use in emergency departments for patients with differing levels of consciousness.[29]

The anesthesiologist taking care of a patient with AUD must be aware of the effects this disease has on the anesthetic plan. In an acutely intoxicated patient, informed consent presents a challenging conundrum as autonomy must be maintained if possible. While decision-making capacity is temporarily altered by acute alcohol use, it (depending on quantity) is not thought to result in a definite absence of capacity. If other contributors (eg, head trauma, polysubstance use) have been ruled out, it might be sufficient to document a capacity assessment. Every effort should be made to provide alternate care plans and discharge instructions. Documentation is important in the event of treatment refusal or patient-directed discharge (PDD). Individuals with SUDs and those in withdrawal have an increased incidence of PDD which is linked to an increased 30-day mortality rate.[30] This is critical in the context of an already increased morbidity/mortality risk on hospital discharge for patients with SUD in general.[31] One study following semistructured interviews of patients with SUD demonstrated four reasons for PDD: cravings or withdrawal symptoms, uncontrolled acute or chronic pain, stigmatization from staff, and lack of freedom of movement.[30] We are unaware of data specific to postoperative PDD; however, early identification and intervention of individuals with SUDs (including treatment of uncontrolled pain and withdrawal symptoms) may prevent PDD and could improve outcomes.

A non-judgmental approach during preoperative discussions may help avoid stigmatizing patients and empower them to be honest and forthcoming about their substance use. Avoid stigmatizing language such as 'addict', 'alcoholic', and similar phrasing, as this can worsen outcomes.[32] Considering the extent of a patient's SUD journey (often including relapses, degradation of personal and familial relationships, financial hardships, etc) and referring to AUD as a treatable disease can aid in normalizing patients' care.[32]

POSTOPERATIVE PAIN CONTROL

Implications of acute and chronic alcohol use on pain control

Alcohol use is known to have effects on pain perception, threshold, and intensity. Studies have shown an increase in pain threshold and a reduction in pain perception and intensity rating with alcohol administration. In patients without AUD or chronic use, the analgesic effect of alcohol reliably increases with escalating alcohol doses and blood alcohol concentration (BAC). The pain-dampening effects tend to decrease with time-induced reductions in BAC.

Chronic alcohol use has been shown to affect pain acutely, during periods of withdrawal and with chronic use.[33–35] Evidence suggests that those with chronic alcohol exposure, including those who are dependent but abstaining or experiencing acute withdrawal symptoms, may have components of hyperalgesia.[36] As such, they exhibit a greater response to a similar painful

stimulus than those without a history of chronic exposure. This may be related to glutamatergic effects (including central sensitization) but the true mechanism remains unknown.[34]

The relationship between chronic significant alcohol use and chronic pain is significant. Epidemiological studies estimate that 25%–28% of chronic pain patients self-medicate with alcohol and patients with back and neck pain may be twice as likely as the general population to develop symptoms of AUD.[37 38]

Challenges faced and uncontrolled pain

Patients in long-term recovery from AUD may fear opioids and may under-report pain to avoid receiving them; patients not in recovery may over-report pain to obtain more opioid-induced euphoria or reduce withdrawal symptoms.[39] The euphoria associated with several agents used for perioperative pain control (including opioids) is of concern, as is the potential need to taper medications used in the treatment of AUD. While some clinicians' first instinct might be to either withhold opioids or reduce potency and frequency of administration, one must recognize that a patient with AUD may have attenuated effects from opioids, and in fact, higher doses and greater frequency of administration may be needed for pain control.[40–43] There are no data to demonstrate that patients with AUD are more susceptible to the respiratory depressant effects of opioids. It has also been demonstrated that reducing physical pain is likely to reduce risk of relapse in alcohol-dependent individuals; thus, adequate pain control is important.[44]

Multidisciplinary care and multimodal treatment options

Several papers and consensus statements have discussed the importance of multidisciplinary care (including the anesthesia team, psychiatrist, social worker, addiction medicine provider, as well as inclusion of the patient and support system) coupled with multimodal analgesia for patients with SUD; those with AUD are no exception to this rule.[45] Clinically, the anesthesiologist and pain physician should consider the following in the patient with AUD[46]:

1. Local wound infiltration by surgical staff.
2. Peri/intraoperative infusions of ketamine, lidocaine and magnesium as adjuvants.
3. Multiple classes of analgesics, including acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs) if appropriate, antineuropathics, anticonvulsants, muscle relaxants and alpha-2-agonists.
4. Regional anesthetic techniques including neuraxial and peripheral nerve blocks and catheters (in the absence of contraindications, particularly coagulopathy).

AUD and regional anesthesia

There is no evidence that peripheral nerve blocks or neuraxial regional anesthesia techniques will worsen alcoholic neuropathy. There is also no clear evidence-based clinical guidance on the use of peripheral nerve blocks and neuraxial regional anesthesia techniques in this population. A thorough preoperative assessment should be conducted, including documentation of preexisting neurological deficits, as well as consideration of associated risks and benefits.

AUD and adjuvant medications

Special note should be made of gabapentin and topiramate, both of which are used by many SUD specialists to treat symptoms of AUD but are not currently FDA approved for this indication.[4] Although meta-analysis found that 1% of the general population misused gabapentin, medications like this and topiramate, may still be considered for multimodal analgesia in the AUD population.[4 47 48] A randomized controlled trial showed that the use of gabapentin up to 1200 mg/day demonstrated benefit in alcohol withdrawal and AUD symptoms versus placebo.[49] Favorable effects within doses of 150–450 mg/day have also been seen with pregabalin for relapse prevention and reduction in drinking.[50] In addition, studies have shown benefit from topiramate (75 mg up to 300 mg/day) in reducing relapse risk in patients with AUD.[51 52] If these medications are being used to treat either AUD, neuropathic pain, or both, they can be continued or potentially increased for postoperative analgesia. These patients should be monitored for sedation potentiation when used with other medications (benzodiazepines, barbiturates and muscle relaxants).

PERIOPERATIVE MANAGEMENT OF NALTREXONE

Naltrexone, a competitive mu-opioid receptor antagonist, is dosed orally from 25 to 150 mg daily or given as a once monthly 380 mg intramuscular suspension under the brand name Vivitrol.[41 53] Patients may be resistant to opioids in the presence of naltrexone but may become overly sensitive to opioids as its effect diminishes.[40 41] Patients planning to have surgery while taking this medication should consult their prescribing physician to determine the optimal perioperative drug schedule and discuss expectations.[41] Based on receptor pharmacology studies, the half-life of naltrexone's major active metabolite, 6-beta-naltrexol, is approximately 13–14 hours orally; thus, oral naltrexone should be stopped by the prescriber at least 72 hours prior to elective surgery (roughly five half-lives).[40 54] For intramuscular depot-naltrexone administration, the concentration declines 14 days after last dose. The last intramuscular dose is recommended no less than 25 days prior to elective surgery.[55] Oral naltrexone can be used as a replacement/bridge for the intramuscular formulation until 72 hours prior to surgery.[56]

While the pharmacology of naltrexone suggests that discontinuing naltrexone may be of immediate perioperative benefit, one must recognize that this cessation can also significantly increase risk of relapse, particularly in patients with higher severity AUD. Relapse risk must be weighed against the clinical risk of significant opioid antagonism resulting in uncontrolled postoperative pain. This clinical decision should be made on a case-by-case basis with the surgeon, the patient/family, and of course the primary SUD practitioner (if available). This will serve to both adjust patient expectations appropriately and establish a clear plan of postoperative care and coordination of follow-up.

While not explicitly addressed in literature, if the choice is made to discontinue naltrexone and if there is significant concern for relapse within 72 hours (for patients on either oral or extended-release naltrexone with temporary oral substitution), one should plan to bridge this gap using either disulfiram or acamprosate and/or maintaining close follow-up with the primary prescriber. The patient should be counseled extensively to avoid reinforcing locations, situations and triggers, and support from family or friends should be enlisted. In addition, 12-step programs and other previously useful behavioral interventions should be used more aggressively. If the concern for relapse is significant, presurgical admission should be considered. If cravings present during hospitalization and naltrexone initiation is unsafe at that time, using the above approaches (gabapentin, topiramate, counseling, etc) postoperatively is encouraged, as is using inpatient SUD consultants.[48 51]

While all surgeries are unique, in situations where opioid-free anesthesia and analgesia can reliably be accomplished using

multimodal methods, the clinician should continue full-dose naltrexone; if a painful surgery is anticipated and opioids will likely be needed for pain control, the clinician should recommend discontinuation at the time intervals noted above. In either case, discussion with the SUD practitioner is of the utmost importance to carefully coordinate dates of stoppage, encouragement of other SUD treatment modalities as already noted, and restarting at appropriate time intervals if the medication is stopped.

There are no data to specifically address reinitiation of naltrexone and each patient especially those deemed high risk should be managed on a case-by-case basis; naltrexone should not be reinitiated until at least 7–10 days after last opioid administration.[41] If there is desire to reinitiate naltrexone earlier than this or if there is concern about potentially precipitating withdrawal, one can initiate a naloxone challenge test (administration of 0.2–0.8 mg naloxone intravenous with monitoring for 30–60 min for opioid withdrawal symptoms) to determine likelihood of precipitating withdrawal.[57]

Patients with a history of naltrexone use that is continued perioperatively (such as for urgent, emergent or trauma cases) may require additional monitoring for respiratory depression and hemodynamic compromise if opioids are used for postoperative pain, given potential for receptor upregulation and increased sensitivity to opioids in the context of continued antagonism.[41 58] The duration of this effect has not been effectively studied to this point.[40] In all patients receiving naltrexone (but particularly in those receiving the extended-release injectable version), continuous pulse oximetry monitoring is invaluable because some patients who are repeatedly administered high-dose full agonists to overcome receptor blockade and provide postoperative analgesia may suddenly develop respiratory depression[59] (see online supplemental figures 2 and 3).

PERIOPERATIVE MANAGEMENT OF LDN

The coadministration of LDN and an opioid is unlikely to result in clinically significant withdrawal symptoms; however, it could affect analgesia in the postoperative period or in settings where full mu agonists are needed.[60 61] As discussed in the naltrexone section, continuation of LDN is acceptable if opioid-free anesthesia and analgesia are planned. If opioid agonist need is anticipated, discontinuation of LDN for 48 hours is recommended by the LDN Research Trust in order to ensure mu-opioid receptor liberation for treatment with full agonists.[62 63] If opioid need is anticipated and LDN has not been discontinued, short-acting full mu agonists should be administered. At such low doses of naltrexone, opioid dosages will easily overcome the antagonistic effect of LDN.[64–66]

Notably, however, exogenous opioids are thought to alter the analgesic effects of LDN via disruption of the endogenous opioid system; for this reason as well as potential for precipitated withdrawal, it is advised that exogenous opioids be weaned and discontinued prior to initiating or reinitiating LDN for the management of chronic pain conditions.[67–69] Specifically, the LDN Research Trust recommends at least 48 hours free from opioid agonists prior to reinitiation of LDN[62] (see online supplemental figures 2 and 3).

DISCHARGE CONSIDERATIONS

Postoperatively, the clinician should advise the patient with AUD of an increased susceptibility to relapse of both alcohol and other substances of abuse. This is a vulnerable time for patients with AUD and there is significant mortality within the first 30 days after hospital discharge for this patient population.[70] While it would certainly be ideal to avoid prescription opioids for discharge, weighing the risk of alcohol relapse due to uncontrolled pain versus use of full opioid agonists for pain control is important. Thus, reviewing the patient's AUD history with the patient and providing an explanation of treatment options and goals is essential. Consistent messaging from multiple perioperative clinicians will best demonstrate consensus.

If the patient was using acamprosate or disulfiram preoperatively, it is reasonable to continue them postoperatively; the discharging provider should ensure the patient has an adequate supply of their medication. Naltrexone presents a unique challenge because reinitiation of it usually requires a period of abstinence as previously indicated; it is ideal if this can be reinitiated while inpatient. Awaiting this prior to discharge may result in much longer hospital stays.

In patients with a known history of AUD or other SUDs with an outpatient provider managing this disorder, the inpatient clinician should confirm appropriate follow-up and complete a 'warm hand-off' to ensure no lapses in care. If the patient has a newly diagnosed AUD, local SUD specialty care resources should be made available and ideally an appointment scheduled by the time the patient leaves the hospital; doing so can reduce morbidity and mortality risks.[71]

Unfortunately, more than 50% of patients discharged after a hospitalization involving alcohol withdrawal are readmitted an average of 1.8 times for alcohol-related issues within a year of their initial hospitalization, with readmission rates highest among patients who direct their discharge or have comorbid psychiatric disorders.[72] Given the significant risk to patients with AUD within 30 days of discharge, one should ensure that patients with AUD are not experiencing withdrawal symptoms at the time of discharge.

DISCUSSION

The perioperative period represents a vulnerable time for all patients, but those with AUD require special attention because of unique factors related to changes in physiology, drug metabolism, and the potential for withdrawal syndromes. Routine, validated screening, as well as the use of non-stigmatizing language will facilitate receiving an accurate history. Toxicology (urine drug screen or a blood alcohol level if acute intoxication is suspected) screening can be helpful when clinical history is unavailable. The use of regional and multimodal analgesic techniques both intraoperatively and postoperatively will likely lessen reliance on postoperative opioids. However, opioids should be used if needed for pain control, as uncontrolled pain represents a major risk factor for relapse. When possible, maintaining previously successful AUD treatment strategies, whether behavioral and/or medical, is likely to assist with relapse prevention efforts. If changes to previous therapies are required, a collaborative approach and shared decision-making including the patient, available AUD treatment providers, the anesthesia and/or acute pain service and the surgical team is recommended. Lastly, communication with the patient's outpatient treatment provider will be beneficial in creating a comprehensive care plan after discharge.

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Contributors OL: authored introduction, along with sections central and peripheral nervous system, cardiovascular, respiratory, GI systems, perioperative considerations, pain perception, pain threshold, low dose naltrexone. VA: authored introduction, GI, cirrhosis and coagulopathy, seizures, and perioperative naltrexone management. AB: authored abstract along with sections on pharmacology of alcohol, pathophysiology

of withdrawal. SP: senior author, authored sections on preoperative evaluation, comorbid SUDs, FDA-approved treatments, pain control, and perioperative naltrexone management, pain perception, pain threshold.

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