## HOT THERAPEUTIC TOPICS FOR THE DENTAL TEAM: FROM WEED TO WEIGHT LOSS

- Understanding Substance Use Disorders & Risk Factors
- Cannabis Legalization & Implications for the Dental Team
- Dental Implications for SUDs and Medication-Assisted Therapies
- New Approaches to Managing Patients with High Blood Pressure Readings in the Dental Chair-How High is Too High?
- Weight Loss Wars: Adverse Effects & Risks for Dental Patients?

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**No relevant financial relationship(s) or nonfinancial relationship(s)**

- I have no relevant financial or nonfinancial relationships in the products or services described, reviewed, evaluated or compared in this presentation.




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## SUBSTANCE USE DISORDERS: IMPLICATIONS FOR DENTAL PRACTICE

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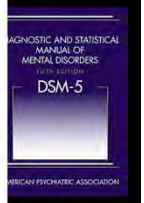
## SUD IS A CHRONIC DISEASE WITH VARYING SEVERITY

**Three Levels of Severity**

The DSM-5 includes guidelines for clinicians to determine how severe a substance use disorder is depending on the number of symptoms. Two or three symptoms indicate a mild substance use disorder; four or five symptoms indicate a moderate substance use disorder, and six or more symptoms indicate a severe substance use disorder. A severe SUD is also known as having an addiction.

Doctors determine the severity level of the substance use disorder to help develop the best treatment plan. The higher the severity, the more intensive the level of treatment needed.

Most patients are likely to need ongoing treatment and recovery support using a chronic care model for several years. A doctor should monitor progress and adjust the plan as needed.

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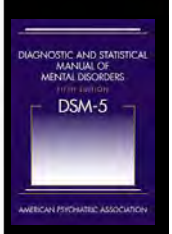
Like other illnesses, addiction gets worse over time. Similar to stages of cancer, there are levels of severity to describe a substance use disorder.

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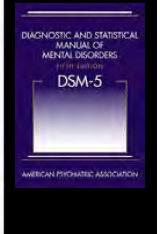
**Types of Substances**

| Alcohol | Marijuana | Opioids | Nicotine |
|---|---|---|---|
| Beer<br>Wine<br>Spirits | Marijuana<br>THC | Heroin<br>Fentanyl<br>Prescription Pain Killers | Nicotine,<br>cigarettes or<br>vapes |
| **Stimulants** | **Sedatives** | **Synthetics** | **Hallucinogens** |
| Cocaine<br>Methamphetamine | Benzodiazepines<br>GHB | Synthetic Cannabinoids<br>(K2/Spice)<br>Synthetic Cathinones<br>(Bath Salts)<br>Ketamine GHB | MDMA, Ecstasy/Molly<br>LSD<br>PCP (Phencyclidine)<br>Peyote (mescaline)<br>psilocybin |

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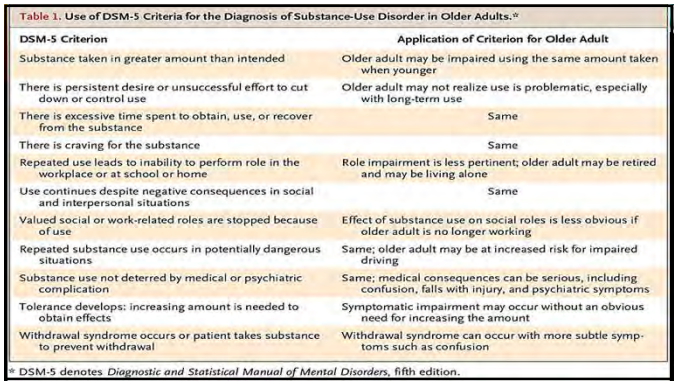

Table 1. Use of DSM-5 Criteria for the Diagnosis of Substance-Use Disorder in Older Adults.*

| DSM-5 Criterion | Application of Criterion for Older Adult |
|---|---|
| Substance taken in greater amount than intended | Older adult may be impaired using the same amount taken when younger |
| There is persistent desire or unsuccessful effort to cut down or control use | Older adult may not realize use is problematic, especially with long-term use |
| There is excessive time spent to obtain, use, or recover from the substance | Same |
| There is craving for the substance | Same |
| Repeated use leads to inability to perform role in the workplace or at school or home | Role impairment is less pertinent; older adult may be retired and may be living alone |
| Use continues despite negative consequences in social and interpersonal situations | Same |
| Valued social or work-related roles are stopped because of use | Effect of substance use on social roles is less obvious if older adult is no longer working |
| Repeated substance use occurs in potentially dangerous situations | Same; older adult may be at increased risk for impaired driving |
| Substance use not deterred by medical or psychiatric complication | Same; medical consequences can be serious, including confusion, falls with injury, and psychiatric symptoms |
| Tolerance develops: increasing amount is needed to obtain effects | Symptomatic impairment may occur without an obvious need for increasing the amount |
| Withdrawal syndrome occurs or patient takes substance to prevent withdrawal | Withdrawal syndrome can occur with more subtle symptoms such as confusion |

* DSM-5 denotes *Diagnostic and Statistical Manual of Mental Disorders*, fifth edition.

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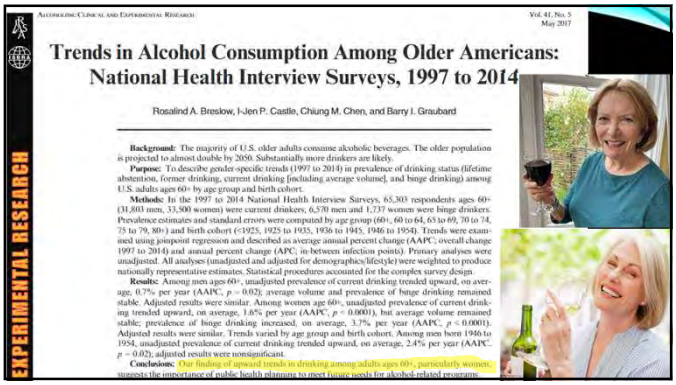


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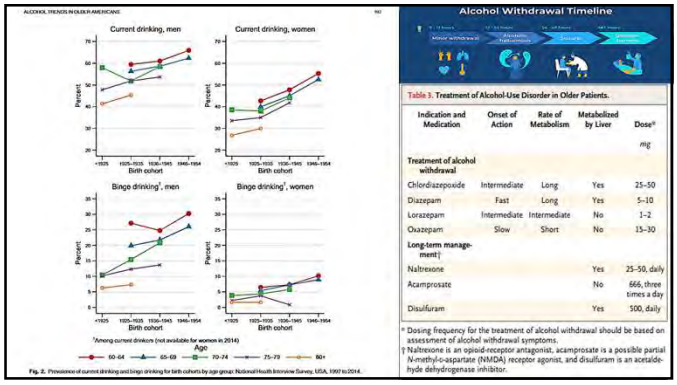


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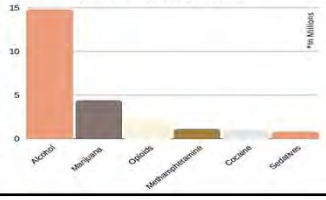
## Prevalence in the U.S.

In the United States, over 20 million people suffer from addiction – that's one in seven people.[2] Nearly 50 percent of people in the U.S. know someone who has suffered or is currently suffering from a substance use disorder.[3] And 23 million Americans are in recovery, proving that a person can be treated and recover from this illness.[4]

Alcohol use disorder is the most prevalent addiction in the U.S., followed by marijuana and opioid use disorder. The types of substance use disorder broken down from 2018 data shows:[2]

- 14.8 million people aged 12 or older had an alcohol use disorder;
- 4.4 million people aged 12 or older had a marijuana use disorder;
- 2 million people had an opioid use disorder;
- 1.1 million people had a methamphetamine use disorder;
- 997,000 people had a cocaine use disorder; and
- 751,000 people had a sedative use disorder.

Figure 1
**Prevalence of Substance Use Disorders**

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## Addiction Facts and Figures




People in the U.S. suffer from addiction

1 in 7

are expected to develop a substance use disorder at some point in their lives.




of people in the U.S. know someone who has suffered or is currently suffering from a substance use disorder

23 MILLION

Americans are in recovery, proving that a person can be treated and recover from this illness.

<18

90% of Americans with a substance use disorder began using substances before the age of 18.

Research suggests genetic factors account for about half of a person's likelihood of developing a SUD.

10%

Only about 10 percent of people with a substance use disorder receive any type of specialty treatment.

The DSM-5 has helped change how we think about addictions by not overly focusing on withdrawal.

The DSM-5 has eleven criteria for substance use disorders based on decades of research.

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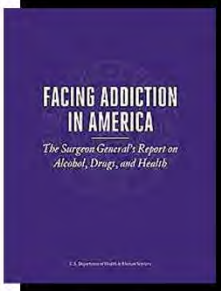
## CHAPTER 2.
## THE NEUROBIOLOGY OF SUBSTANCE USE, MISUSE, AND ADDICTION




### Chapter 2 Preview

A substantial body of research has accumulated over several decades and transformed our understanding of substance use and its effects on the brain. This knowledge has opened the door to new ways of thinking about prevention and treatment of substance use disorders.

This chapter describes the neurobiological framework underlying substance use and why some people transition from using or misusing alcohol or drugs to a substance use disorder—including its most severe form, addiction. The chapter explains how these substances produce changes in brain structure and function that promote and sustain addiction and contribute to relapse. The chapter also addresses similarities and differences in how the various classes of addictive substances affect the brain and behavior and provides a brief overview of key factors that influence risk for substance use disorders.

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## Neuropsychiatric Model of Addiction Simplified

Wilson M. Compton, MD, MPE*, Eric M. Wargo, PhD, Nora D. Volkow, MD

KEYWORDS
• Neurobiology • Addiction • Addiction cycle • Reinforcement

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0193-953X/22/Published by Elsevier Inc.

KEY POINTS

- Developmental neuroscience helps to explain the risk for onset of substance use and substance use disorders (SUDs).
- Severe SUDs involve changes in limbic and prefrontal brain areas after chronic drug exposure.
- The addiction cycles involves reinforced, learned associations between drugs and cues that trigger the anticipation of that reward (known as incentive salience), as well as heightened dysphoria during withdrawal, and weakened prefrontal cortical circuits needed for inhibiting habitual responses.

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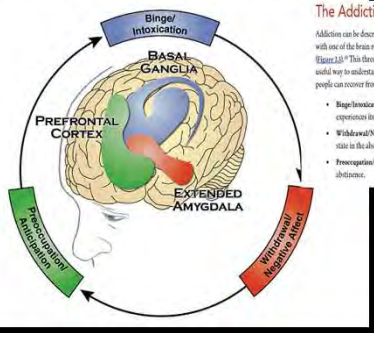
Figure 2.3: The Three Stages of the Addiction Cycle and the Brain Regions Associated with Them




### The Addiction Cycle

Addiction can be described as a repeating cycle with three stages. Each stage is particularly associated with one of the brain regions described above—basal ganglia, extended amygdala, and prefrontal cortex (Figure 2.3).* This three-stage model draws on decades of human and animal research and provides a useful way to understand the symptoms of addiction, how it can be prevented and treated, and how people can recover from it.** The three stages of addiction are:

- **Binge/Intoxication**, the stage at which an individual consumes an intoxicating substance and experiences its rewarding or pleasurable effects;
- **Withdrawal/Negative Affect**, the stage at which an individual experiences a negative emotional state in the absence of the substance; and
- **Preoccupation/Anticipation**, the stage at which one seeks substances again after a period of abstinence.

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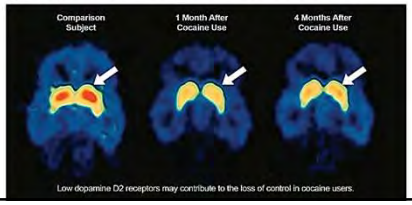
## In Summary: The Binge/Intoxication Stage and the Basal Ganglia

The "reward circuitry" of the basal ganglia (i.e., the nucleus accumbens), along with dopamine and naturally occurring opioids, play a key role in the rewarding effects of alcohol and other substances and the ability of stimuli, or cues, associated with that substance use to trigger craving, substance seeking, and use.

As alcohol or substance use progresses, repeated activation of the "habit circuitry" of the basal ganglia (i.e., the dorsal striatum) contributes to the compulsive substance seeking and taking that are associated with addiction.

The involvement of these reward and habit neurocircuits helps explain the intense desire for the substance (craving) and the compulsive substance seeking that occurs when actively or previously addicted individuals are exposed to alcohol and/or drug cues in their surroundings.

Figure 2.8: Time-Related Decrease in Dopamine Released in the Brain of a Cocaine User




Low dopamine D2 receptors may contribute to the loss of control in cocaine users.

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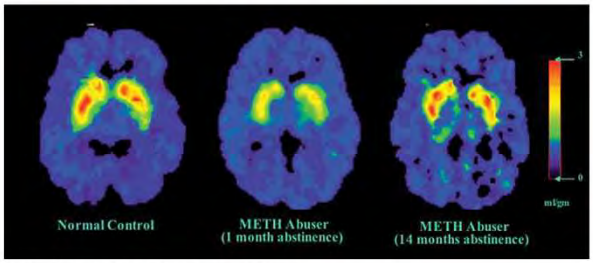
Figure 7
**Brain scan showing brain recovery with prolonged abstinence.**




*Source: NIDA. (2020) Drugs, Brains, and Behavior: The Science of Addiction.*

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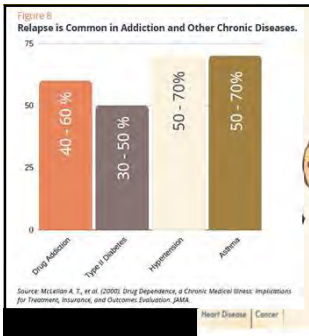
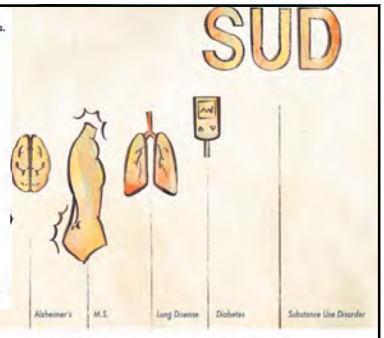
Figure 6
**Relapse is Common in Addiction and Other Chronic Diseases.**




*Source: McLellan A. T., et al. (2000). Drug Dependence, a Chronic Medical Illness: Implications for Treatment, Insurance, and Outcomes Evaluation. JAMA.*




**Addiction is a Chronic Disease**

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**Box 1**
**Reinforcement (dopamine signaling) mechanisms for major drug classes**

OPIOIDS

Opioids, including morphine heroin, fentanyl, and prescription analgesics such as oxycodone, increase dopamine signaling in the basal ganglia indirectly through their actions at specific opioid receptors, especially the mu opioid receptor. Preclinical research shows that the activation of mu-opioid receptors on gamma aminobutyric acid (GABA) cells in the VTA disinhibits dopamine neurons increasing their activity and enhancing dopamine release in the NAC.[49]

ALCOHOL

Alcohol's reinforcing effects have been associated with processes involving multiple molecular targets, including the enhancement of opioid signaling through mu-opioid receptors. Alcohol also enhances GABAergic neurotransmission via its direct effects on GABA-A receptors which are believed to contribute to reward and to its anxiolytic effects.[4]

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**Box 1**
**Reinforcement (dopamine signaling) mechanisms for major drug classes**

STIMULANTS (COCAINE AND AMPHETAMINE-LIKE SUBSTANCES)

The reinforcing effects of stimulants are mediated by their direct effects on dopamine neurons. Cocaine enhances dopamine levels primarily by inhibiting the dopamine transporter, thus reducing the reuptake of dopamine from the synapse. Amphetamine-like substances, however, both inhibit the transporter and directly increase vesicular dopamine release.[47] In either case, the net effect is to increase dopamine in the NAC. The effects of this class of drugs are also mediated by increases in the activation of the other monoamine systems, serotonin and norepinephrine.[47] The bias toward a particular monoamine system depends on the specific stimulant. For example, cathinones (bath salts) have a greater effect on serotonin than does amphetamine, which is biased toward dopamine and norepinephrine systems.[50]

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**Box 1**
**Reinforcement (dopamine signaling) mechanisms for major drug classes**

BENZODIAZEPINES

Benzodiazepines are allosteric modulators of GABA-A receptors, meaning that their binding shifts the way the receptor responds to its standard ligands. Although both GABA and dopamine neurons in the VTA express these receptors, benzodiazepines bind to those containing the alpha-1 subunit, which is only found on GABA neurons in the VTA and is lacking in VTA-dopamine neurons.[51–53] The resulting inhibition of VTA-GABA neurons enhances dopamine release. In human studies, benzodiazepines enhance the subjective effects of opioids, including "high" and "liking," indicating that these drugs' rewarding properties may be synergistic, accounting for their common couse.[54] Combining the 2 classes of drugs has also been implicated in increasing the risk for overdose, due to their shared effect of inhibiting respiration.[54–56]

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**Box 1**
**Reinforcement (dopamine signaling) mechanisms for major drug classes**

NICOTINE

The reinforcing effects of nicotine are mediated by multiple receptors in the VTA and NAC,[4] and its actions at nicotinic acetylcholine receptors (nAChR) alpha-4 beta-2 subtype seem to be integral to these effects.[57] In addition to increasing dopamine discharge rate, nicotine changes the pattern of discharge to favor a phasic or bursting mode.[58] Dopamine bursting promotes the formation of associations between stimuli and rewards, and this may be the basis for reinforcement-enhancing effects of nicotine in combination with other substances.[25,59] Analyzing data from 2 cohort studies, Kandel and Kandel found that cocaine dependence was highest in users who had first smoked cigarettes and that concurrent smoking around the time of cocaine initiation was associated with more persistent cocaine use and addiction—consistent with the priming effect they found in an animal model. Conversely, cocaine does not seem to prime the nicotine response.[22] Nicotine's linkages to later addiction to other classes of drugs such as opioids are not fully established.

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**Box 1**
**Reinforcement (dopamine signaling) mechanisms for major drug classes**

CANNABINOIDS

Cannabinoids activate type 1 cannabinoid receptors (CB1) in the VTA, but the mechanism by which this activation facilitates dopamine release is not well understood. Cannabis receptor pharmacology research is providing clues. For example, in light of the sometimes contradictory reinforcing and aversive effects of cannabis, Spiller and colleagues document the importance of the balance of both CB1 and CB2 receptor activation in cannabis effects.[60] Their work suggests that reinforcing and aversive effects may be mediated by differential CB1 and CB2 receptor expression.

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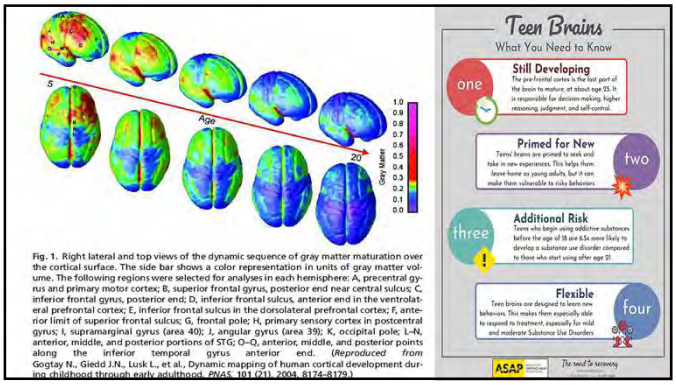


Fig. 1. Right lateral and top views of the dynamic sequence of gray matter maturation over the cortical surface. The side bar shows a color representation in units of gray matter volume. The following regions were selected for analyses in each hemisphere: A, precentral gyrus and primary motor cortex; B, superior frontal gyrus, posterior end near central sulcus; C, inferior frontal gyrus, posterior end; D, inferior frontal sulcus, anterior end in the ventrolateral prefrontal cortex; E, inferior frontal sulcus in the dorsolateral prefrontal cortex; F, anterior limit of superior frontal sulcus; G, frontal pole; H, primary sensory cortex in postcentral gyrus; I, supramarginal gyrus (area 40); J, angular gyrus (area 39); K, occipital pole; L–N, anterior, middle, and posterior portions of STG; O–Q, anterior, middle, and posterior points along the inferior temporal gyrus anterior end. (*Reproduced from* Gogtay N., Giedd J.N., Lusk L., et al., Dynamic mapping of human cortical development during childhood through early adulthood. *PNAS*. 101 (21). 2004. 8174–8179.)

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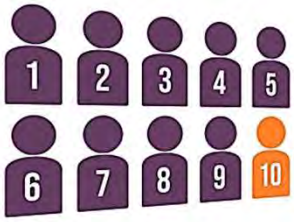
## Substance Use Disorders are Pediatric-Onset Diseases

- 9 out of 10 adults (90%) with substance use disorders initiated their use before age 18
- The earlier and heavier the use, the more likely a person will develop later problems
- All substance use puts adolescents at increased risk for a variety of adverse health outcomes




National Center on Addiction and Substance Abuse at Columbia University. (2011). Adolescent Substance Use: America's #1 Public Health Problem. New York, NY: Author.

www.OneChoicePrevention.org 4

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## Signs, Symptoms & Early Intervention

Because substance use disorder is a progressive disease, intervening in the early stages greatly improves outcomes. Families should take warning signs seriously.[10] Concerned significant others may report these signs and symptoms:

- Their loved one starts behaving differently for no apparent reason — such as acting withdrawn, frequently tired or depressed, or hostile
- Disinterest in activities that were previously enjoyable
- Loss of money, missing valuables, and borrowing
- Change in daily routine
- Loss of interest in overall health, hygiene, preventative and dental care
- Changes in mood
- Change in weight or appearance
- Change in sexual behavior
- Change in weight, eating or sleeping habits
- A decline in performance at work or school
- Change in peer group
- Secrecy regarding phone
- A tendency to disappear for hours at a time
- Deteriorating relationships
- Inability to be present when in conversation



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MENTAL HEALTH DISORDERS AND RISK OF SUD

**SAMHSA**

Substance Abuse and Mental Health Services Administration

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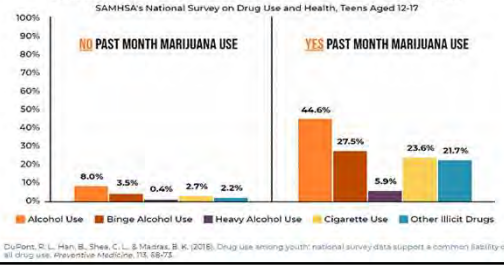
## FOR YOUTH, ALL SUBSTANCE USE IS RELATED

National data confirm that for teens aged 12-17, use of any one substance -- alcohol, marijuana/THC, or cigarettes/nicotine -- dramatically increase the use of using the other two substances, and other illicit drugs. Similarly, not using any one substance dramatically decreases the likelihood of using the others. This means that for many teens, substance use comes down to making One Choice.

### TEEN MARIJUANA USE IS ASSOCIATED WITH HIGHER USE OF OTHER DRUGS

SAMHSA's National Survey on Drug Use and Health, Teens Aged 12-17




DuPont, R. L., Han, B., Shea, C. L., & Madras, B. K. (2018). Drug use among youth: national survey data support a common liability of all drug use. *Preventive Medicine, 114*, 68-73.

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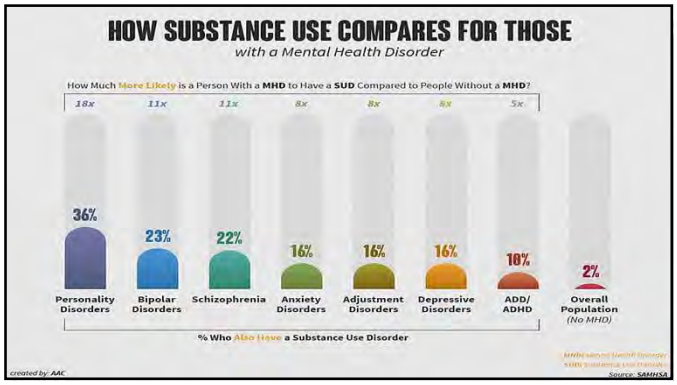


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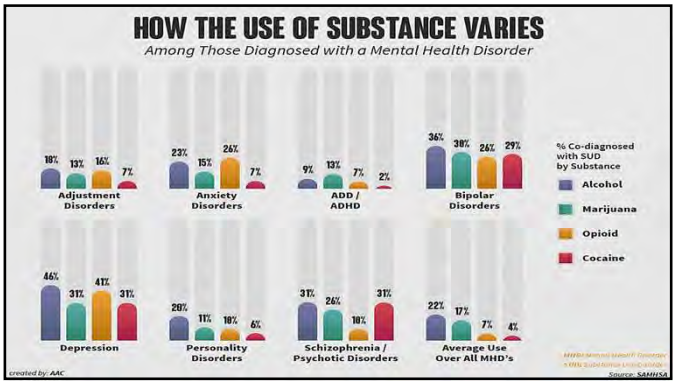


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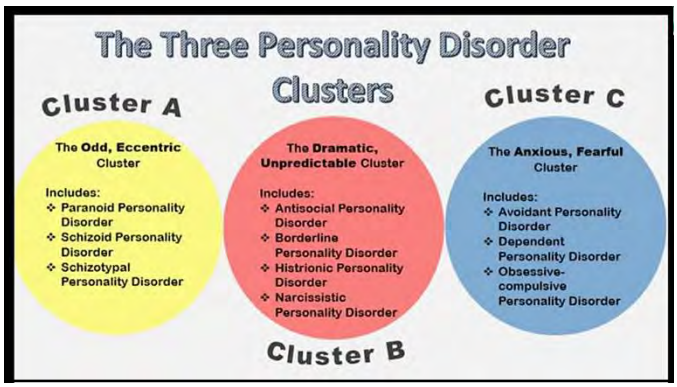


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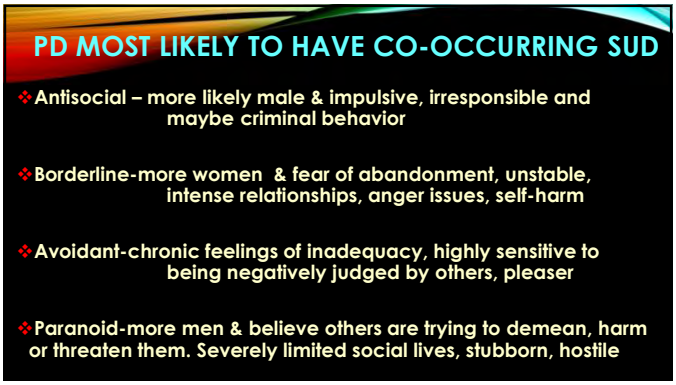


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# Cannabinoids: Overview [1-8,99]

A Crawley BSP, M LeBras Pharm D, L Regier BSP, A Wiebe, BSP © www.RxFiles.ca July 2026

## Clinical Pearls

- Routinely ask about cannabis use in primary care (just like tobacco/alcohol), & screen for cannabis use disorder (**1 in 5 may develop with ongoing daily use**).[76,77]
- Cannabinoids are not 1st or 2nd-line agents for any indication. Ensure adequate trial of evidence-based strategies (pharm & non-pharm), prior to trial.
- If non-response to trial of ≥3 other medications for neuropathic pain, a trial of prescription cannabinoids (rather than cannabis) may be reasonable.[2]
- When used, start cannabinoids at a low dose, and gradually titrate. Adverse effects are common; monitor & document; stop +/- taper if not tolerated.
- Inhaled cannabis (esp smoked) is not a recommended route due to difficulty dosing, risk of respiratory damage, & multi-component composition.
- The potential harms of cannabinoids may be underappreciated by patients. Informed consent and patient education are recommended. See the **RxFiles** *Cannabis Patient Booklet* (available online: colour, or B/W 💻, or print copy).

## Definitions and Background Information

**Cannabinoid receptors**: CB1 receptors (primarily in the central and peripheral nervous systems) and CB2 receptors (primarily in the immune system) are part of the human endocannabinoid system.[1]

**Cannabinoids**: compounds that activate cannabinoid receptors. Endogenous cannabinoids in humans include AEA & 2-AG.

**Phytocannabinoid**: cannabinoid derived from cannabis (e.g. THC, CBD, & MANY others). Two studied phytocannabinoids, although still not fully understood, are delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD).
THC: a partial CB1 & CB2 receptor agonist. CBD: uncertain mechanism of action, modulates ++receptors, ↓CB1 receptor activity.[88]

**Cannabis** (aka *marijuana)*: Contains 400+ compounds, including 140+ cannabinoids. Marketed based on concentration of THC & CBD, though it is uncertain if these are the only important compounds in cannabis (e.g. potential "entourage effect": see Misc. info below).

**Non-Medical Prevalence (2024)**: 26% of Canadians ≥16yr used cannabis in last 12mo, 6% used daily, 69% consumed by smoking.[85]

**Legal status in Canada**: Prescription cannabinoid medications are regulated as controlled drugs. Cannabis has been legal since Oct 2018; may be purchased from licensed retail stores for non-medical use. Cannabis for medical purposes is also available with HCP authorization through federally licensed producers. Legal products include dried cannabis, oils, vapes, beverages, topicals, & edibles (max 10 mg THC/pkg).

## Are Cannabinoids Helpful (For Therapeutic Use)?

Cannabinoids may help with (limited, generally low-quality evidence, compared to placebo):

- **chemotherapy-induced nausea/vomiting** (CINV)
  **NNT≈3** for control of CINV over ~1 day (mostly nabilone/dronabinol).[11]
- **spasticity of multiple sclerosis or spinal cord injury**
  **NNT≈6** for ≥30% ↓ spasticity over ~6-14wk (nabiximols).[21]
- **seizures in Lennox-Gastaut & Dravet Syndrome** with CBD (**EPIDIOLEX**)
  **NNT≈4-7** for ≥50% reduction in seizure frequency over ~14wk.[2]
- **cachexia** in HIV/AIDS, cancer,[12] palliative care: weak evidence.
- **chronic neuropathic pain**: severity ↓ ~0.5-1.6/10 points on numerical rating scale with nabiximols & nabilone (small effect with mod-large ↑in dizziness, sedation, & nausea), non-significant for ≥30% reduction over 4-15wk. Less benefit seen with other cannabinoids.[22]
  See below for more information about *Cannabinoids for Chronic Pain*.

Cannabinoids do not have evidence to support use for (yet are commonly used):[114]

- **anxiety disorders** – literature mixed (& many limitations), no consistent effectiveness for THC & potential for harm (associated with dose-related ↑anxiety); high-dose CBD (300-600mg/day) may help sx over 4-15wk (low certainty evidence).[68,91,92,124,125] See **RxFiles**: Cannabis in Anxiety Disorders: FAQs.
- **sleep disorders / insomnia** – literature mixed, many limitations, potential for harm (may contribute to next-day sedation, withdrawal after regular use can cause sleep disruptions).[93]

## Are Cannabinoids Safe? (Potential Downsides)

Patients frequently underappreciate or are unaware of the potential adverse events (AE) related to cannabinoids.

Cannabinoid AE are very common. Approximately 8-9 out of 10 patients will develop an adverse event with cannabinoid therapy and ~1 out of 10 patients will stop therapy because of an adverse event.[2]

- Notable AE include **feeling "high" NNH≈4**; **dizziness NNH≈5**; **sedation NNH≈5**; **speech disorders NNH≈5**; and **ataxia / muscle twitching NNH≈6**.[2] Additional concerns include driving impairment, addiction risk, euphoria, and psychosis.
- Caution needed if used in older adults: altered distribution & metabolism, polypharmacy risk, & more vulnerable to CNS effects.[75]
- **Risk of cannabis use disorder** (CUD); associated with self-harm & overdose death in youth.[74]
- Some cannabinoids may have fewer AE than others, yet this is not well studied (including specific THC/CBD ratios) & few head-to-head trials have been conducted.
- Likelihood of AE ↑with dose & duration (e.g. >24wk).[90]

## Challenges with the evidence[11,17,90]

Quality evidence (without mod-high bias risk) is lacking & difficult to obtain for many outcomes. Results in low confidence assessing benefits & harms. Noted due to:

- difficulty blinding patients due to psychoactive components (~90% can guess their allocation, may bias toward benefit),
- variability in product potency, forms, route of administration, & standardization of dose.
- enrolled patients tend to have prior cannabis exposure (contributing to selection bias),
- frequent exclusion of important populations (e.g. older adults) & patients with common comorbidities (e.g. mental health dx), and
- often small sample size, with short duration.
  - Trials with *longer duration* tend to show less benefit,[11] suggesting that if a beneficial effect exists, it may wear off over time.

## Cannabinoids for Chronic Pain[2,15,22,100,102-105,126]

Chronic pain is the most common reason patients seek cannabis for therapeutic reasons.[63]

- **Chronic pain guideline recommendations**: Conflicting. ❖NICE'21 & IASP'21 advise against use.[103,104] ❖PEER:'22 harm > benefits for OA & LBP (not recommended); might consider for neuropathic pain (unclear benefit) after other agents with stronger evidence considered.[102] ❖One guideline:BMJ '21 may trial **non-inhaled** medical cannabinoids (for any chronic pain) if standard care insufficient,[100] & another'24 suggests potential benefits > non-serious harms[105] {e.g. chronic pain esp neuropathic, HIV/MS related muscular/neuropathic pain; strongest evidence for oils, capsules; THC >CBD for benefit but also ↑AE}.[105]
- **Effectiveness**: A SR updated annually, notes no high-certainty evidence; most studies evaluate neuropathic pain (very few for OA/LBP – no benefit) for short duration (4-16wk) vs placebo in white adults (24-68yr, not studied in adolescents). Nabiximols (mean 8 sprays/day, up to 15wk) has moderate evidence & nabilone (THC-only, dose 0.25-2mg BID, 4-9wk) has low certainty evidence: suggest small ↓ in pain intensity (↓0.54 & 1.59/10points NRS), but no clinically significant response (≥30% improvement), no improvement in overall function, & with mod-large ↑in dizziness, sedation, & nausea (synthetic po THC: D/C due to AE **NNH≈14**/4-16wk). CBD-only products appear to have no effect on pain severity or function (fibromyalgia – no benefit in 1 RCT[119]). Insufficient evidence for: 1) whole-plant cannabis or topical CBD, 2) comparisons between cannabis-related products or with active treatments, & 3) impact on opioid use (i.e. not established whether cannabis is opioid-sparing).[22]
- **If considering a trial**: weigh potential benefits vs downsides (AE). Risk-benefit balance will differ from patient to patient. See Online Extras: *Prescribing/Authorizing Cannabinoids Safely*.
- **Product selection**: Nabiximols have the most evidence, yet costly (vs nabilone ↓cost, yet ↓supporting evidence). Not recommended to start with trial of whole-plant cannabis, especially inhaled route. If patient prefers to trial a non-prescribed product (may be due to cost), encourage preference for oral doses (can be measured, titrated), "start low, go slow" approach,[87] generally start with higher CBD / lower THC for tolerability despite the limited evidence for benefit, & close monitoring / follow-up for achievement of therapeutic goals & AE. Advise accessing from a licensed source, though also caution about potential inaccuracy for product labelling, even from regulated sources.[111]
- **Bottom line**: Balance of evidence for possible small ↓ in pain, however some ↑ harms → requires shared decision-making[78,79,100] Formulations with most evidence for benefit (e.g. nabiximols) come with AE & cost barriers; long-term benefits & AE unknown.

## Strategies for Safer Use[3]

To ↓ health harms from cannabis use:

- Ideally delay to after late adolescence (i.e. >25yr) due to ongoing brain & social development (+ younger use associated with CUD[107])
- Preferred route: edible / oral ingestion > vaping > smoking
- Avoid driving after cannabis use (inhalation: 6-8hr, edible: 8-12hr)
- Choose lower potency products; ↓THC (e.g. <10% inhaled, ≤5mg oral)
- Avoid daily use (for non-medical use)
- Avoid during pregnancy / lactation
- Avoid if personal / family history of psychosis

**Misc. info**: **Entourage effect**: an unproven hypothesis that efficacy of phytocannabinoids is increased (or AE ↓) when used in combination and/or in particular ratios and/or with flavonoids, terpenoids. **Topical cannabis** e.g. creams: a dosage form promoted as a local analgesic without systemic effect, but without trials to support (See RxFiles Q&A: Topical Cannabis). **Travelling with cannabis outside of Canada**: not legal. **Resources for: 1) Cannabis for Medical Purposes** Health Canada, **2) Adolescents** Counselling Adolescents & Parents About Cannabis Infographic (CPS) **, 3) Pregnancy** What Parents Need to Know About Maternal Cannabis Use During Pregnancy, **4) Perioperative Use** ASRA Pain Medicine Consensus Guidelines for the perioperative patient who uses cannabinoids.[86] **Synthetic unregulated cannabinoids**: e.g. K2, Spice – highly potent CB1/CB2 receptor agonists; case reports of severe acute toxicity (avoid).[52] **Concentrated Cannabis** e.g. hash, shatter, budder, wax, dabs: contains THC as high as 90%, often inhaled quickly. **CAUTION - very high potency** cannabis products are sometimes available which may pack THC several hundred times stronger than the federal standard, increasing harms! Newslink

A Crawley BSP, M LeBras Pharm D, L Regier BSP, B Jensen BSP, A Wiebe BSP © www.RxFiles.ca 

| Generic/TRADE | Indications & Comments | DOSING | $/30d | Adverse Events AE / Contraindications CI / Drug Interactions DI / Monitor M |
|---|---|---|---|---|
| **Prescription Cannabinoids** (pharmaceutical grade) | | | | |
| **Nabilone CESAMET**, g<br>synthetic THC analogue<br>0.5, 1mg cap ☎ ▼<br>0.25mg cap ✗ ▼ | Preferred over cannabis.[CFP'18]<br>✓ severe nausea/vomiting from cancer chemotherapy<br>off-label: AIDS-related anorexia ☎<br>palliative pain<br>neuropathic pain (see 2018 guideline: https://www.cfp.ca/content/cfp/64/2/111.full.pdf)<br>• Not detected in SK urine drug screen | **Initial**: 0.25-0.5mg po HS<br>**Usual**:<br>1-2mg po daily-BID for CINV<br>1mg po BID for neuropathic pain<br>**Usual max**: 6mg/day<br>{Onset 60-90min; duration 8-12hr} | **$62-72** g<br><br>$130-470 g<br>$252 g<br>**$690** g [$1450] | **AE: Some notes on adverse events:**<br>• percentages below are often "worst case scenarios" from systematic reviews, yet due to trial-design issues could also be underestimates.<br>• adverse events **dose-related** (↑dose =↑AE), & more common with THC products<br>• it is difficult to compare AE rates between agents, due to few head-to-head trials.<br>• **THC** appears the main psychotropic component responsible for causing a "high".[44] **CBD** appears safer than THC, yet some of its psychotropic effects may be underappreciated (e.g. vs placebo in pediatric trials: aggression/anger 3-5% vs <1%; irritability/agitation 5-9% vs 2%; somnolence 25% vs 8%).[31] |
| **Nabiximols SATIVEX** ✗ ⊗<br>extracted THC/CBD<br>2.7mg THC & 2.5mg CBD per spray (from whole plant)<br>(**peppermint flavour**; poor taste; contains alcohol)<br>❄ refrigerate prior to dispensing<br>Not available in USA. | Preferred over cannabis.[CFP'18]<br>✓ advanced cancer pain (adjunctive)<br>✓ multiple sclerosis neuropathic pain or spasticity (adjunctive)<br>• Spasticity may require lower doses than pain (e.g. 4-5 sprays vs >8 sprays per day).<br>• Detected in SK urine drug screen | • Spray under the tongue or into side cheek (may alternate sides).<br>• Shake gently. Device requires priming (3 sprays).<br>**Initial**: 1 spray sublingually HS<br>**Usual**: 1 spray sublingually q4h<br>**Usual max**: 12 sprays per day<br>{Onset 15-40min; duration 2-4hr} | 3 vial pack = $673<br>($2.50/spray)<br>(90 spray/vial)<br><br>$75<br>**$468**<br>**$917** | **AE noted across cannabinoids** (specific cannabinoid not reported, tend to be more common with THC products[90,107]): • **drowsiness or sedation** up to 50%.[2]<br>• **psychiatric disturbances** up to 17% e.g. depression, anxiety, bipolar, paranoia, hallucination, panic, suicidality, hyperactive delirium,[2,89] ↑bipolar disorder risk with onset of use ≤17yr.[123]<br>• **acute psychosis or dissociation** up to 5%.[2] **1st episode psychosis** daily cannabis ↑3x & THC ≥10% ↑5x vs never users.[120,121] **Schizophrenia unmasking:** cannabis may hasten first psychotic episode by 2-6yr.[8] ↑psychotic disorder risk with onset of use ≤19yr.[113,123]<br>• **dry mouth, nausea** • **speech disorders** up to 32%, & **ataxia** up to 30% (falls risk).[2]<br>• **impaired memory** up to 11%.[2] Also **impaired cognitive performance** (up to 28d after use).<br>• **cannabis hyperemesis syndrome** severe abdominal pain/vomiting;[32,110] counsel on cessation; may be relieved by hot bath/shower caution: burns; capsaicin to abdomen useful?;[129] ?IV haloperidol[130]<br>• **cannabis use disorder** risk ↑with duration & daily use[97] (see more info on next page 💻).<br>• **withdrawal** with abrupt discontinuation (see withdrawal symptoms on next page 💻).<br>• **CV:**[98, 117-18] ↑HR,[1] postural ↓BP,[1] ↑MACE, ? ↑MI esp 1hr after smoking[39] & use >4x/mo,[81] arrhythmia[101]<br>• **rare or uncertain:** ?sexual problems, ?cancer testicular, ?↓BMD, ?pancreatitis.<br>**AE with specific mention of THC** (most associated with AE causing withdrawal from therapy):[121]<br>• **dizziness** up to 32%.[2] • **euphoria** up to 15%, and **feeling "high"** up to 35%.[2]<br>• **driving impairment** risk of fatal car crash approximately doubles with THC.[28,55]<br>• **acute panic attack & anxiety disorder** • **red eyes** reported with non-medical use.<br>• **appetite changes** - increased appetite in up to 38% of patients on dronabinol.[18]<br>**AE with specific mention of CBD** (caution, non-prescription products may contain unlabeled THC):<br>• **GI issues** diarrhea up to 20%, vomiting up to 15%.[19,31] **SATIVEX**: mouth irritation.<br>• **irritability / agitation** up to 9%, & **anger / aggression** up to 5%.[31] • **pneumonia** up to 8%.[31]<br>• **drowsiness, somnolence** (which may impair driving ability, contribute to falls).<br>• **appetite changes** decreased appetite in up to 22% of patients on CBD.[31]<br>• **↑ transaminases** up to 16%;[31,116] ?related to concomitant valproate/clobazam in peds.<br>**Harms specific to smoked cannabis**:<br>• **respiratory:** cough 7%, ↑phlegm, dyspnea, development of COPD, pulmonary aspergillosis, ?lung cancer, vocal fold changes.[35]<br>• **other harms**: ↑**psychiatric disturbances** (up to 27% COMPASS), ?steatosis with hep C, ?gynecomastia, ?thrombophlebitis, ?contaminants in unregulated cannabis (e.g. lead, fentanyl, pesticides), ↑self-harm/suicidality, if at risk. |
| **Cannabidiol EPIDIOLEX** ☎ ✆<br>extracted CBD<br>100mg/mL solution [FDA'18, CDN'24]<br>(contains alcohol, sesame oil; strawberry flavour) | ✓ Adjunct for seizures: Lennox-Gastaut syndrome, Dravet syndrome, & tuberous sclerosis complex (TSC) [≥2yr]<br>• Not detected in SK urine drug screen | **Seizures** (Lennox-Gastaut or Dravet):<br>**≥2yr**: 2.5-10mg/kg/dose po BID<br>usually give before a meal<br>TSC dose: 2.5 to 12.5mg/kg/dose po BID<br>• Food (fat/caloric): ↑ absorption. | **$1475**/100mL | |
| **Dronabinol MARINOL**<br>synthetic THC ❄<br><br>**USA only**: 2.5, 5, 10mg cap (in sesame oil); 5mg/mL solution **SYNDROS** (contains alcohol) | ✓ severe nausea/vomiting from cancer chemotherapy<br>✓ AIDS-related anorexia<br>(↓nausea in up to 20% of pt with dronabinol.[18]) | **Initial**: 2.5mg po HS<br>**Usual**: 2.5-5mg po TID-QID for chemo nausea/vomiting (~5mg/m²)<br>2.5mg po BID ac lunch and supper for anorexia [AIDS 3]<br>**Max**: 20mg/day | **D/C from Canadian market** | |
| **Cannabis from Whole-Plant** (e.g. dried, oils) | | | | |
| **Oral Cannabis Oils** ✗ ⊗<br>THC/CBD in various ratios, e.g.:<br>25mg THC / 0mg CBD per mL<br>1mg THC / 20mg CBD per mL<br>3mg THC / 3mg CBD capsule<br>many other formulations (e.g. lozenges, gummies) & potencies available.<br>**Veteran's Affairs**: coverage available for some patients | No official indication. May be medically authorized in Canada for any indication (i.e. "off-label use").<br>• THC detected in urine drug screen up to 4 weeks after last dose (especially with chronic/heavy use)<br>• **Oral vs inhaled**: Oral has lower bioavailability (~10% vs ~25%),[1] slower onset (30-60min vs 5-10min),[4] longer duration (4-8hr vs 2-4hr),[1] & does not have respiratory risk.<br>• **Smoked vs vaped**: smoking has more respiratory risk (data limited), yet vaping has risk too (2,602 reports of vaping lung injury in US).[70,73] Vaping ~2x more potent (smoking destroys some drug via combustion).<br>• When used, advise selection of regulated products and devices from licensed sources. | **Initial**: CBD 2.5-5mg po daily-BID +/- THC 1-2.5mg po daily-BID (for pain)<br>**Usual**: Uncertain due to lack of randomized trials. Titrate slowly, e.g. CBD q2-3d, THC q2-7d.[87]<br>(Consider titrating CBD to 40mg/day first, then adding THC if needed, with THC then titrated to max 40mg/day)<br>• Food increases absorption.<br>• Consider 1st dose at 7 p.m. to leave time for assessing effect.<br>• Consider weekend trial start (or when impairment lower impact). | $7<br><br>e.g. 30mL bottle of oil containing ~700mg CBD ≈ $60<br><br>Use a calibrated dropper | **CI:pregnancy** ↓birth wt & ↑preterm,[83] ?stillbirth, ?negative neurodevelopment[ACOG'25]; <21-**25yr** (exception: CBD for tx-resistant seizure); psychosis/schizophrenia hx.[6] **Caution**: in older adults (↑AE),[82] **breastfeeding**,[ACOG'25] **SUD history**, **driving** (sometimes contraindicated) <4-5hr after inhalation/<6hr after ingestion / <8hr after euphoria (studies focused on THC component); hx of seizures, psychiatric disorders (e.g. bipolar, anxiety), CVD, or respiratory dx.[9] Caution: ped toxicity → edible ingestion (THC ≥1.7mg/kg[112]).<br>**Allergy**: Type 1 & 4 reactions possible (e.g. sneezing/runny nose, itchy eyes, wheezing →rare anaphylaxis).[106] |
| **Dried Cannabis** ✗ ⊗<br>THC/CBD in various ratios, often to smoke/vape, e.g.:<br>12.5% THC<br>4% THC / 10% CBD<br>1% THC / 13% CBD<br>many other potencies available.<br>❄ refrigerate for max stability<br><br>**Veteran's Affairs:** coverage available for some patients<br>**Trend** toward ↑ potency products[54] e.g. 4% THC in 1995 → 12% in 2014; some may now be in the ≥20% range<br>**Average joint**: ~0.3g dried cannabis.[69] | Guidelines recommend **avoiding** smoked cannabis.[2,7,100]<br><br>**"Cannabis Math"**<br>*note: estimate only – some uncertainty!*<br>What is the estimated THC dose if **1 joint**, containing 0.5 grams of 10% THC dried cannabis, is smoked?<br>**Answer**: 500mg cannabis x 10% THC x 50% loss to combustion ≈ **25mg THC**<br>Caution: Less well-regulated products may have THC component, even if labelled as CBD only. | **Initial**: 1-2 puffs inhaled HS<br>(Variation due to inhalation depth, puff size, THC potency, smoked vs vaped, joint size, etc.)<br><br>**Usual**: Uncertain due to low certainty evidence.<br>Titrate slowly.<br><br>2024 Canadian survey data indicates average daily use of cannabis = 1.1g of dried flower or 1.4 servings of edible products.[16] | One Canadian report noted the average retail price was $8/g, compared to ~$6/g in the unregulated market.[72] Licensed Producer price ~$10-15/g.<br><br>$12-24 for 1-2 puff HS<br><br>**$270** for 750mg/day<br><br>**$1080** for 3g/day | **DI: A note on drug interactions:**[127] Interactions not fully understood; many are theoretical / in vitro. Cannabis contains many compounds besides THC & CBD - these may also have unknown drug interactions. Watch closely for **pharmacodynamic** (additive) interactions.<br>**All cannabinoids**: additive CNS depressant effects (e.g. sedation, confusion) with EtOH, BZD, opioids, anticholinergics, anti-epileptics, & others. Avoid ≥ 3 CNS drugs.[BEERS'23]<br>Other additive effects (esp with THC): sympathomimetics & anticholinergics (↑HR +/- BP).<br>**Primarily CYP-mediated interactions:** THC (2C9, 3A4) & CBD (2C19, 3A4) are substrates – CYP ⊖ & ⊕ may alter effect & AE risk. CBD & THC are weak inhibitors of most CYP enzymes.<br>• **CBD**: moderate CYP2C19 inhibitor: e.g. ↑levels of es-/citalopram, **clobazam**, **warfarin**, DOAC, amitriptyline[122]; ↓levels of clopidogrel; ?additive hepatotoxicity risk with valproic acid or clobazam – mechanism unclear.[19,20]<br>• **Smoking cannabis**: may induce CYP1A2 e.g. ↓levels of antipsychotics, TCA, warfarin<br>**Nabilone**: while a THC-mimic, does not seem to have THC-like CYP drug interactions.<br>**M**: HR, BP, CNS adverse event, psych symptoms, tx agreement, CUD, LFT (with **EPIDIOLEX**) |

# Helping Dental Professionals Identify and Support Patients with Substance Use Disorders

Oral health is an essential part of overall health. Healthcare professionals who provide care to patients with possible Opioid Use Disorder (OUD) or Substance Use Disorders (SUD) need to be aware of the special considerations this population may experience. Use this resource to learn how dental professionals can identify patients who may be at high-risk for OUD and SUD, while seeking care in the dental setting.

## Objectives For This Discussion

- Identify patients who may be high risk for Opioid Use Disorders (OUD) or Substance Use Disorder (SUD), prescription misuse, and drug interactions.
- Recognize that patients with OUD/SUD may have additional oral health care and pain management needs.
- Identify potential oral complications with patients prescribed buprenorphine/naloxone products for OUD/SUD.

## Considerations for Intake Assessment

To assist dental professionals in identifying and supporting patients with substance use disorders, below are considerations for an intake assessment.

- Provide rationale for questions.
- Assess pain and prior pain management approaches.
- Assess current substance use, legal and illicit.
- Assess medical, psychiatric, and psychosocial risk factors.
- Current medications.
- Open-ended inquiry about non-medical opioid use.
- PDMP (Prescription Drug Monitoring Programs).
- Release of Information for other providers.

## ANXIETY MANAGEMENT/PRE-MEDICATION

- Discuss in advance of appointment: establishing trust can be a simple dental anxiety reliever
- Steps should be taken to manage anxiety without increasing the risk for SUDs
- Nitrous Oxide
- Valium/Halcion
- Music/ video glasses/noise cancellation

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# Helping Dental Professionals Identify and Support Patients with Substance Use Disorders

The Food and Drug Administration (FDA) warns about dental problems with buprenorphine medicines dissolved in the mouth to treat opioid use disorder and pain. Benefits for use outweigh these risks and professional oral care can help. The dental problems include tooth decay, cavities, oral infections, and tooth loss, can be serious and have been reported even in patients with no history of dental issues. Despite these risks, buprenorphine is an important treatment option for opioid use disorder (OUD) and pain, and the benefits of these medicines outweigh the risks.

The comprehensive approach of buprenorphine combined with counseling and other behavioral therapies is often one of the most effective ways to treat OUD. This approach, called medication-assisted treatment (MAT), is tailored to meet each patient's needs and can help sustain recovery and prevent or reduce opioid overdose.

## Buprenorphine-Suboxone-Methadone: "The Perfect Storm" for Dental Disease

1. Acidity –3.4% Strips or Tabs are placed sublingual or inside the cheek

- Strips/Tabs are sticky and leave a film

2. Dryness--Possible xerostomia from Medication Assisted Treatment (MAT)

- Increased bacteria in a dry, low pH environment = increased caries risk

3. Poor Oral Hygiene Habits

- Population tends to smoke or vape more
- Drinking sugary beverages
- Compromised self-care
- Limited access to affordable dental care

## Prevention of Oral Disease

- Prescribers of MAT should recommend visiting a dentist at time of Rx
- Instruct Patients to:
    - Rinse 30 min after use of strip/tab and swallow
    - Wait one hour then brush teeth
    - Good oral hygiene instructions
    - Drink more water to overcome xerostomia
    - Limit sugary beverages and decrease smoking/vaping
- If they have dental pain, do not discontinue use of MAT. See a dentist immediately.
- Consider prescription fluoride toothpaste or fluoride trays

## MAT/Dental Care Coordination

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- Clarify dental issue and procedure in advance
- Estimate pain requirement for non-MAT patients
- Consider MAT impact on dental pain management
    - Antagonist effect of naltrexone
    - Increased tolerance with buprenorphine/methadone
    - Buprenorphine receptor binding
- Examine OUD clinical stability and relapse risk
- Consider opioid vs. non-opioid approaches
- Determine follow-up plan: pain management, medical prescription (RX) disposal, monitoring, Narcan

## What Should Health Professionals do?

Physicians should ask patients about their oral health history prior to prescribing treatment with a transmucosal buprenorphine. Serious dental problems have been reported in patients with no history of dental issues, so it is important to refer them to a dentist as soon as possible after starting transmucosal buprenorphine.

Dentists treating someone taking a transmucosal buprenorphine product should perform a baseline dental evaluation and caries risk assessment, establish a dental caries preventive plan, and encourage regular dental checkups.

Dental professionals can play and important role in screening patients and team members for substance use and misuse and substance use disorders. The National Institute on Drug Abuse has resources for Screening for Substance Use in the Dental Setting.

## Patient Information

Patients using buprenorphine medicines dissolved in the mouth should take extra steps to help lessen the risk of serious dental problems. After the medicine is completely dissolved, take a large sip of water, swish it gently around your teeth and gums, and swallow. You should wait at least 1 hour before brushing your teeth to avoid damage to your teeth and give your mouth a chance to return to its natural state.

Inform your health care professional if you have a history of tooth problems, including cavities. Schedule a dentist visit soon after starting this medicine and inform your dentist that you are taking buprenorphine, and schedule regular dental checkups while taking this medicine.

Find-a-Dentist

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# Helping Dental Professionals Identify and Support Patients with Substance Use Disorders

Your dentist can customize a tooth decay prevention plan for you. Notify both your health care professional and your dentist immediately if you experience any problems with your teeth or gums. Health care professionals should be aware the benefits of buprenorphine clearly outweigh the risks and are an important tool to treat OUD. When combined with counseling and other behavioral therapies, this comprehensive MAT approach is often the most effective way for treating OUD and can help sustain recovery and prevent or reduce opioid overdose.
ADA Resources for Healthcare professionals

Please consider providing your patients with the following Opioid and Preventing Prescription Drug Misuse Resource sheet and print out with your after-visit instructions for the patients.

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SOCIETAL STATEMENT

# 2025 High Blood Pressure Guideline-at-a-Glance

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## INTRODUCTION

The 2025 AHA/ACC/AANP/AAPA/ABC/ACCP/ACPM/AGS/AMA/ASPC/NMA/PCNA/SGIM Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults (AHA/ACC/Multisociety HBP Guideline)[1] contextualizes the most recent clinical evidence in treating patients with one of the most modifiable cardiovascular disease (CVD) risk factors, high blood pressure (HBP). The discussion around HBP is quite expansive, and this guideline highlights the impact of HBP globally, provides guidance on multidisciplinary team-based care, and encourages the use of a new tool to calculate risk. The guideline contains updated, evidence-based recommendations that replaces those from the 2017 HBP guideline.[2] This Guideline-at-a-Glance highlights practice-changing recommendations from the guideline to accelerate adoption.

American College of Cardiology (ACC) guideline dissemination is an organization-wide effort facilitated by the Solution Set Oversight Committee to ensure the integration of guideline content throughout ACC's clinical policy, education, registry, membership, and advocacy efforts. For each guideline, an individual ACC Guideline Dissemination Workgroup is created to influence dissemination strategy and to develop tools to facilitate the implementation of key changes in practice. These tools include a **Central Illustration** to graphically convey key concepts, as well as tables highlighting updates in the AHA/ACC/Multisociety HBP Guideline and comparisons to the 2024 European Society of Cardiology (ESC) Guidelines for the Management of Elevated Blood Pressure and Hypertension.[3]

## TOP TAKE-HOME MESSAGES

The following Top Take-Home Messages are taken directly from the AHA/ACC/Multisociety HBP Guideline. Messages 1, 5, and 7 (in **bold** below) were selected as key themes for this Guideline-at-a-Glance because they outline the most impactful changes and address established gaps in clinical practice.

1. **HBP is the most prevalent and modifiable risk factor for the development of CVDs, including coronary artery disease, heart failure, atrial fibrillation, stroke, dementia, chronic kidney disease, and all-cause mortality. The overarching blood pressure treatment goal is <130/80 mm Hg for all adults, with additional considerations for those who require institutional care, have a limited predicted lifespan, or are pregnant.**
2. Clinicians should collaborate with community leaders, health systems, and practices to implement screening of all adults in their communities and implement guideline-based recommendations regarding prevention and management of HBP to improve rates of blood pressure control.
3. Multidisciplinary team-based care is effective in assessing and addressing patient access to medications and other structural barriers to support individual patient needs and thereby reduce barriers to achieving hypertension control. Team members may include physicians, pharmacists, nurse practitioners, nurses, physician assistants/associates, dieticians, community health workers, and other health care professionals.
4. Blood pressure is classified by the following framework: normal blood pressure is defined as <120 mm Hg systolic and <80 mm Hg diastolic;

*On behalf of the ACC Solution Set Oversight Committee.

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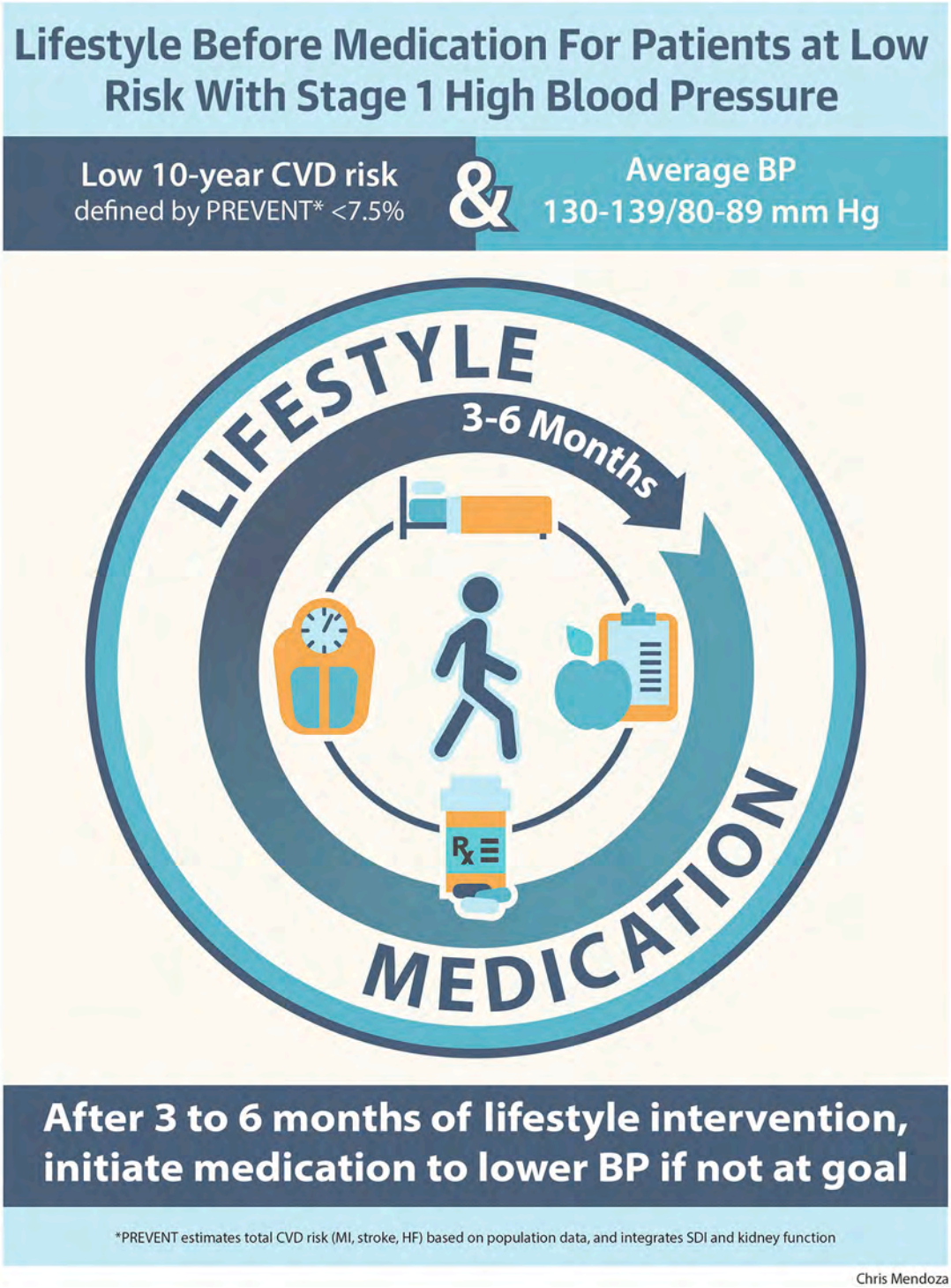
**CENTRAL ILLUSTRATION** **2025 High Blood Pressure Guideline-at-a-Glance**




**Gulati M, et al. JACC. 2025;86(18):1560–1566.**

BP = blood pressure; CVD = cardiovascular disease; HF = heart failure; MI = myocardial infarction; PREVENT = Predicting Risk of cardiovascular disease EVENTs; SDI = social deprivation index.

**TABLE 1 Select Differences Between 2017 and the 2025 AHA/ACC/Multisociety High Blood Pressure Guidelines**

| | 2017[2] | | 2025[1] | |
|---|---|---|---|---|
| | COR* | Old Recommendations | COR* | New Recommendations |
| Overarching BP treatment goal (Top Take-Home Message 1) | 1 | Use of BP-lowering medications is recommended for primary prevention of CVD in adults with no history of CVD and with an estimated 10-y ASCVD risk <10% and an SBP of 140 mm Hg or higher or a DBP of 90 mm Hg or higher. | 1 | In all adults with hypertension, initiation of medications to lower BP is recommended when average SBP is ≥140 mm Hg to reduce the risk of cardiovascular events and total mortality. |
| | | | 1 | In all adults with hypertension, initiation of medications to lower BP is recommended when average DBP is ≥90 mm Hg to reduce the risk of cardiovascular events and total mortality. |
| | 1 | Use of BP-lowering medications is recommended for secondary prevention of recurrent CVD events in patients with clinical CVD and an average SBP of 130 mm Hg or higher or an average DBP of 80 mm Hg or higher, and for primary prevention in adults with an estimated 10-y ASCVD risk of 10% or higher and an average SBP 130 mm Hg or higher or an average DBP 80 mm Hg or higher. | 1 | In adults with hypertension and clinical CVD, initiation of medications to lower BP is recommended when average SBP is ≥130 mm Hg to reduce the risk of cardiovascular events and total mortality. |
| | | | 1 | In adults with hypertension and clinical CVD, initiation of medications to lower BP is recommended when average DBP is ≥80 mm Hg to reduce the risk of cardiovascular events and total mortality. |
| | | | 1 | In adults with hypertension without clinical CVD but with diabetes or CKD or at increased short-term CVD risk (ie, estimated 10-y CVD risk ≥7.5% based on PREVENT†), initiation of medications to lower BP is recommended when average SBP is ≥130 mm Hg to reduce the risk of CVD events and total mortality. |
| | | | 1 | In adults with hypertension without clinical CVD but with diabetes or CKD or at increased 10-y CVD risk (ie, ≥7.5% based on PREVENT†), initiation of medications to lower BP is recommended when average DBP is ≥80 mm Hg to reduce the risk of CVD events and total mortality. |
| Lifestyle changes to prevent and treat elevated BP (Top Take-Home Message 5) | 1 | Weight loss is recommended to reduce BP in adults with elevated BP or hypertension who are overweight or obese. | 1 | In adults who have overweight or obesity, weight loss is recommended with a goal of at least 5% of body weight reduction to prevent or treat elevated BP and hypertension. |
| | 1 | A heart-healthy diet, such as the DASH diet, that facilitates achieving a desirable weight is recommended for adults with elevated BP or hypertension. | 1 | In adults with or without hypertension, a heart-healthy eating pattern, such as the DASH eating plan, is recommended to prevent or treat elevated BP and hypertension. |
| | 1 | Sodium reduction is recommended for adults with elevated BP or hypertension. | 1 | In adults with or without hypertension, reduction of dietary sodium intake‡ is recommended to <2,300 mg/d, moving toward an ideal limit of <1,500 mg/d. to prevent or treat elevated BP and hypertension. |
| | 1 | Potassium supplementation, preferably in dietary modification, is recommended for adults with elevated BP or hypertension, unless contraindicated by the presence of CKD or use of drugs that reduce potassium excretion. | 2a | In adults with or without hypertension, potassium-based salt substitutes§ can be useful to prevent or treat elevated BP and hypertension, particularly for patients in whom salt intake is related mostly to food preparation or flavoring at home, except in the presence of CKD or use of drugs that reduce potassium excretion where monitoring of serum potassium levels is indicated.‖ |
| | | | 1 | In adults with elevated BP or hypertension, moderate potassium supplementation¶, ideally from dietary sources, is recommended to prevent or treat elevated BP and hypertension, except in the presence of CKD or use of drugs that reduce potassium excretion where monitoring of serum potassium levels is indicated.‖ |
| | 1 | Adult men and women with elevated BP or hypertension who currently consume alcohol should be advised to drink no more than 2 and 1 standard drinks# per day, respectively. | 1 | Adults with or without hypertension who currently consume alcohol should be advised to pursue a recommended goal of abstinence, or at least to reduce alcohol intake to ≤1 drink/d for women and ≤2 drinks/d for men to prevent or treat elevated BP and hypertension.# |
| | 1 | Increased physical activity with a structured exercise program is recommended for adults with elevated BP or hypertension. | 1 | In adults with or without hypertension, increasing physical activity, through a structured exercise program that includes aerobic exercise and/or resistance training, is recommended to prevent or treat elevated BP and hypertension. |
| | | No corresponding recommendation | 2b | In adults with or without hypertension, stress reduction through transcendental meditation may be reasonable to prevent or treat elevated BP and hypertension, as an adjunct to lifestyle or medication interventions. |
| | | No corresponding recommendation | 2b | In adults with or without hypertension, other forms of stress management, such as breathing control techniques or yoga, may be reasonable to prevent or treat elevated BP and hypertension, as an adjunct to lifestyle or medication interventions. |

*Continued on the next page*

**TABLE 1 Continued**

| | 2017[2] | | 2025[1] | |
|---|---|---|---|---|
| | COR* | Old Recommendations | COR* | New Recommendations |
| Initial 3- to 6-mo trial of lifestyle modification before medication (Top Take-Home Message 7) | 1 | Adults with an elevated BP or stage 1 hypertension who have an estimated 10-y ASCVD risk less than 10% should be managed with nonpharmacological therapy and have a repeat BP evaluation within 3 to 6 mo. | 1 | In adults with hypertension without clinical CVD and with estimated 10-y CVD risk <7.5% based on PREVENT†, initiation of medications to lower BP is recommended if average SBP remains ≥130 mm Hg after a 3- to 6-mo trial of lifestyle intervention to prevent target organ damage and mitigate further rise in BP. |
| | | | 1 | In adults with hypertension without clinical CVD and with estimated 10-y CVD risk <7.5% based on PREVENT†, initiation of medications to lower BP is recommended if average DBP ≥80 mm Hg after a 3- to 6-mo trial of lifestyle intervention to prevent target organ damage and mitigate further rise in BP. |

*Colors in this table align with the classification system found in Table 3, "Applying American College of Cardiology/American Heart Association Class of Recommendation and Level of Evidence to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care," in the AHA/ACC/Multisociety HBP Guideline.[1]
†Increased short-term or 10-y risk is defined as a 10-y predicted risk for CVD events of ≥7.5% based on PREVENT (Predicting Risk of cardiovascular disease EVENTs).
‡Dietary sodium reduction may be contraindicated in patients with severe, symptomatic orthostatic hypotension.
§This recommendation refers to potassium-based salt substitutes, which typically contain 25% to 30% potassium chloride, 65% to 75% sodium chloride, and 0% to 10% flavoring agents. Products that refer to themselves as "salt substitutes" that do not contain potassium chloride as a substitute for sodium chloride have unknown effects on BP.
‖Drugs that reduce potassium excretion include: potassium-sparing diuretics (eg, amiloride, triamterene), mineralocorticoid receptor antagonists (eg, spironolactone, eplerenone, finerenone), angiotensin-converting enzyme inhibitors (eg, captopril, enalapril, lisinopril, benazepril, and others), angiotensin receptor blockers (eg, losartan, valsartan, candesartan, telmisartan, and others), and some immunosuppressive agents (eg, cyclosporine, tacrolimus).
¶Moderate potassium supplementation is <80 mmol/d (<80 mEq/d).
#One standard drink (12-14 g alcohol) is equivalent to 12 oz of beer (5% alcohol by volume), 5 oz of wine (12% alcohol by volume), or 1.5 oz of distilled spirits (40% alcohol by volume).
ACC = American College of Cardiology; AHA = American Heart Association; ASCVD = atherosclerotic cardiovascular disease; BP = blood pressure; CKD = chronic kidney disease; COR = Class of Recommendation; CVD = cardiovascular disease; DASH =Dietary Approaches to Stop Hypertension; DBP = diastolic blood pressure; PREVENT = Predicting Risk of Cardiovascular Disease EVENTs; SBP = systolic blood pressure.

elevated blood pressure as 120 to 129 mm Hg systolic and <80 mm Hg diastolic; stage 1 hypertension as 130 to 139 mm Hg systolic or 80 to 89 mm Hg diastolic; and stage 2 hypertension as ≥140 mm Hg systolic or ≥90 mm Hg diastolic.

5. **For all adults, lifestyle changes, including maintaining or achieving a healthy weight, following a heart-healthy eating pattern (such as DASH [Dietary Approaches to Stop Hypertension]), reducing sodium intake, increasing dietary potassium intake, adopting a moderate physical activity program, managing stress, and reducing or eliminating alcohol intake are strongly recommended to prevent or treat elevated blood pressure and hypertension.**
6. Initiation of medication therapy to lower blood pressure in addition to lifestyle interventions is recommended for all adults with average blood pressure ≥140/90 mm Hg and/or for selected adults with average blood pressure ≥130/80 mm Hg who have clinical CVD, previous stroke, diabetes, chronic kidney disease, or increased 10-year predicted cardiovascular risk of ≥7.5% defined by PREVENT™ (Predicting Risk of cardiovascular disease EVENTs).
7. **In adults with average blood pressure ≥130/80 mm Hg and at lower 10-year CVD risk defined by PREVENT of <7.5%, initiation of medication therapy to lower blood pressure is recommended if average blood pressure remains ≥130/80 mm Hg after an initial 3- to 6-month trial of lifestyle modification.**
8. For all adults with stage 2 hypertension, the initiation of antihypertensive drug therapy with 2 first-line agents of different classes in a single-pill, fixed-dose combination is preferred over 2 separate pills to improve adherence and reduce time to achieve blood pressure control.
9. Home blood pressure monitoring combined with frequent interactions with multidisciplinary team members using standardized measurement and treatment protocols and home measurement protocols is an important integrated tool to improve rates of blood pressure control. Reliance on cuffless devices, including smartwatches, for accurate blood pressure measurements should be avoided until these devices demonstrate greater precision and reliability.
10. Severe hypertension in nonpregnant individuals, defined as blood pressure >180/120 mm Hg, without evidence of acute target organ damage, should be evaluated and treated in the outpatient setting with initiation, reinstitution, or intensification of oral antihypertensive medications in a timely manner.

**TABLE 2 Select Comparison of 2025 AHA/ACC/Multisociety and 2024 ESC High Blood Pressure Guidelines**

| | ESC Guideline[3] | | AHA/ACC/Multisociety Guideline[1] | |
|---|---|---|---|---|
| | COR* | ESC Recommendations | COR* | AHA/ACC/Multisociety Recommendations |
| Overarching BP treatment goal (Top Take-Home Message 1) | 1 | It is recommended that in hypertensive patients with confirmed BP ≥140/90 mm Hg, irrespective of CVD risk, lifestyle measures and pharmacological BP-lowering treatment are initiated promptly to reduce CVD risk. | 1 | In all adults with hypertension, initiation of medications to lower BP is recommended when average SBP is ≥140 mm Hg to reduce the risk of cardiovascular events and total mortality. |
| | | | 1 | In all adults with hypertension, initiation of medications to lower BP is recommended when average DBP is ≥90 mm Hg to reduce the risk of cardiovascular events and total mortality. |
| | 1 | To reduce CVD risk, it is recommended that treated systolic BP values in most adults be targeted to 120-129 mm Hg, provided the treatment is well tolerated. | 1 | In adults with hypertension and clinical CVD, initiation of medications to lower BP is recommended when average SBP is ≥130 mm Hg to reduce the risk of cardiovascular events and total mortality. |
| | | No corresponding recommendation | 1 | In adults with hypertension and clinical CVD, initiation of medications to lower BP is recommended when average DBP is ≥80 mm Hg to reduce the risk of cardiovascular events and total mortality. |
| | 1 | BP-lowering drug treatment is recommended for people with pre-diabetes or obesity when confirmed office BP is ≥140/90 mm Hg or when office BP is 130-139/80-89 mm Hg and the patient is at predicted 10-y risk of CVD ≥10% or with high-risk conditions, despite a maximum of 3 mo of lifestyle therapy. | 1 | In adults with hypertension without clinical CVD but with diabetes or CKD or at increased short-term CVD risk (ie, estimated 10-y CVD risk ≥7.5% based on PREVENT†), initiation of medications to lower BP is recommended when average SBP is ≥130 mm Hg to reduce the risk of CVD events and total mortality. |
| | | | 1 | In adults with hypertension without clinical CVD but with diabetes or CKD or at increased 10-y CVD risk (ie, ≥7.5% based on PREVENT†), initiation of medications to lower BP is recommended when average DBP is ≥80 mm Hg to reduce the risk of CVD events and total mortality. |
| Lifestyle changes to prevent and treat elevated BP (Top Take-Home Message 5) | 1 | It is recommended to aim for stable and healthy BMI (eg, 20-25 kg/m$^2$) and waist circumference values (eg, <94 cm in men and <80 cm in women) to reduce BP and CVD risk. | 1 | In adults who have overweight or obesity, weight loss is recommended with a goal of at least 5% of body weight reduction to prevent or treat elevated BP and hypertension. |
| | 1 | Adopting a healthy and balanced diet, such as the Mediterranean or DASH diets, is recommended to help reduce BP and CVD risk. | 1 | In adults with or without hypertension, a heart-healthy eating pattern, such as the DASH eating plan, is recommended to prevent or treat elevated BP and hypertension. |
| | 1 | Restriction of sodium to approximately 2 g/d is recommended where possible in all adults with elevated BP and hypertension (this is equivalent to about 5 g of salt [sodium chloride] per day or about a teaspoon or less). | 1 | In adults with or without hypertension, reduction of dietary sodium intake‡ is recommended to <2,300 mg/d, moving toward an ideal limit of <1,500 mg/d to prevent or treat elevated BP and hypertension. |
| | 2a | In patients with hypertension without moderate to advanced CKD and with high daily sodium intake, an increase of potassium intake by 0.5-1.0 g/d—for example, through sodium substitution with potassium enriched salt (comprising 75% sodium chloride and 25% potassium chloride) or through diets rich in fruits and vegetables—should be considered. | 2a | In adults with or without hypertension, potassium-based salt substitutes§ can be useful to prevent or treat elevated BP and hypertension, particularly for patients in whom salt intake is related mostly to food preparation or flavoring at home, except in the presence of CKD or use of drugs that reduce potassium excretion where monitoring of serum potassium levels is indicated.‖ |
| | | | 1 | In adults with elevated BP or hypertension, moderate potassium supplementation¶, ideally from dietary sources, is recommended to prevent or treat elevated BP and hypertension, except in the presence of CKD or use of drugs that reduce potassium excretion where monitoring of serum potassium levels is indicated.‖ |
| | 1 | Men and women are recommended to drink less alcohol than the upper limit, which is about 100 g/wk of pure alcohol. How this translates into number of drinks depends on portion size (the standards of which differ per country), but most drinks contain 8-14 g of alcohol per drink. Preferably, it is recommended to avoid alcohol to achieve the best health outcomes. | 1 | Adults with or without hypertension who currently consume alcohol should be advised to pursue a recommended goal of abstinence, or at least to reduce alcohol intake to ≤1 drink/d for women and ≤2 drinks/d for men to prevent or treat elevated BP and hypertension.# |
| | 1 | Moderate intensity aerobic exercise of ≥150 min/wk (≥30 min, 5-7 d/wk) or alternatively 75 min of vigorous intensity aerobic exercise per wk over 3 d are recommended and should be complemented with low- or moderate-intensity dynamic or isometric resistance training (2-3 times/wk) to reduce BP and CVD risk. | 1 | In adults with or without hypertension, increasing physical activity, through a structured exercise program that includes aerobic exercise and/or resistance training, is recommended to prevent or treat elevated BP and hypertension. |
| | | No corresponding recommendation | 2b | In adults with or without hypertension, stress reduction through transcendental meditation may be reasonable to prevent or treat elevated BP and hypertension, as an adjunct to lifestyle or medication interventions. |
| | | No corresponding recommendation | 2b | In adults with or without hypertension, other forms of stress management, such as breathing control techniques or yoga, may be reasonable to prevent or treat elevated BP and hypertension, as an adjunct to lifestyle or medication interventions. |

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**TABLE 2 Continued**

| | ESC Guideline[3] | | AHA/ACC/Multisociety Guideline[1] | |
|---|---|---|---|---|
| | COR* | ESC Recommendations | COR* | AHA/ACC/Multisociety Recommendations |
| Initial 3- to 6-mo trial of lifestyle modification before medication (Top Take-Home Message 7) | 1 | In adults with elevated BP and sufficiently high CVD risk, after 3 mo of lifestyle intervention, BP lowering with pharmacological treatment is recommended for those with confirmed BP ≥130/ 80 mm Hg to reduce CVD risk. | 1 | In adults with hypertension without clinical CVD and with estimated 10-y CVD risk <7.5% based on PREVENT†, initiation of medications to lower BP is recommended if average SBP remains ≥130 mm Hg after a 3- to 6-mo trial of lifestyle intervention to prevent target organ damage and mitigate further rise in BP. |
| | | | 1 | In adults with hypertension without clinical CVD and with estimated 10-y CVD risk <7.5% based on PREVENT†, initiation of medications to lower BP is recommended if average DBP ≥80 mm Hg after a 3- to 6-mo trial of lifestyle intervention to prevent target organ damage and mitigate further rise in BP. |

*Colors in this table align with the classification system found in Table 3, "Applying American College of Cardiology/American Heart Association Class of Recommendation and Level of Evidence to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care," in the AHA/ACC/Multisociety HBP Guideline.[1]
†Increased short-term or 10-y risk is defined as a 10-y predicted risk for CVD events of ≥7.5% based on PREVENT (Predicting Risk of cardiovascular disease EVENTs).
‡Dietary sodium reduction may be contraindicated in patients with severe, symptomatic orthostatic hypotension.
§This recommendation refers to potassium-based salt substitutes, which typically contain 25% to 30% potassium chloride, 65% to 75% sodium chloride, and 0% to 10% flavoring agents. Products that refer to themselves as "salt substitutes" that do not contain potassium chloride as a substitute for sodium chloride have unknown effects on BP.
‖Drugs that reduce potassium excretion include: potassium-sparing diuretics (eg, amiloride, triamterene), mineralocorticoid receptor antagonists (eg, spironolactone, eplerenone, finerenone), angiotensin-converting enzyme inhibitors (eg, captopril, enalapril, lisinopril, benazepril, and others), angiotensin receptor blockers (eg, losartan, valsartan, candesartan, telmisartan, and others), and some immunosuppressive agents (eg, cyclosporine, tacrolimus).
¶Moderate potassium supplementation is <80 mmol/d (<80 mEq/d).
#One standard drink (12-14 g alcohol) is equivalent to 12 oz of beer (5% alcohol by volume), 5 oz of wine (12% alcohol by volume), or 1.5 oz of distilled spirits (40% alcohol by volume).

ACC = American College of Cardiology; AHA = American Heart Association; BMI = body mass index; BP = blood pressure; CKD = chronic kidney disease; COR = Class of Recommendation; CVD = cardiovascular disease; DASH = Dietary Approaches to Stop Hypertension; DBP = diastolic blood pressure; ESC = European Society of Cardiology; SBP = systolic blood pressure; PREVENT = Predicting Risk of Cardiovascular Disease EVENTs.

## *JACC* ILLUSTRATION

### Central Illustration: Lifestyle Before Medication For Patients at Low Risk With Stage 1 High Blood Pressure

The AHA/ACC/Multisociety HBP Guideline emphasizes the need for primary prevention, which plays an important role in managing early stages of hypertension. The 2025 HBP Guideline-at-a-Glance **Central Illustration** highlights the importance of implementing lifestyle modifications such as adopting a healthier diet and increasing physical activity to prevent progression and reduce long term CVD. In adults with an average blood pressure 130-139/80-89 mm Hg and low CVD risk, medication is recommended after 3 to 6 months of lifestyle modification if blood pressure is not at goal. The illustration focuses on Top Take-Home Message 7.

## COMPARISON OF PREVIOUS AHA/ACC GUIDELINES

The AHA/ACC/Multisociety HBP Guideline[1] updates content previously covered in the 2017 High Blood Pressure Guideline.[2] **Table 1** outlines recommendations on HBP treatment goals, lifestyle changes, and initial 3- to 6-month lifestyle modification before medication initiation between the 2017 and 2025 versions of the guideline. The comparison focuses on Top Take-Home Messages 1, 5, and 7.

For further details, refer to the corresponding sections of the AHA/ACC/Multisociety HBP Guideline[1]:

- Section 5.1. "Lifestyle and Psychosocial Approaches"
- Section 5.2.2. "BP Treatment Threshold and the Use of CVD Risk Estimation to Guide Drug Treatment of Hypertension"

## AHA/ACC/MULTISOCIETY HBP GUIDELINE COMPARISON TO ESC HBP GUIDELINE

In 2024, the ESC published a guideline on the diagnosis and management of elevated blood pressure and hypertension (2024 ESC HBP Guideline).[3] **Table 2** compares the recommendations related to HBP as a risk factor for CVD, lifestyle changes, and initial 3- to 6-month lifestyle modification before medication initiation between the 2025 AHA/ACC/Multisociety HBP Guideline and the 2024 ESC HBP Guideline. The comparison focuses on Top Take-Home Messages 1, 5, and 7.

For further details, refer to the corresponding sections of the 2024 ESC HBP Guideline[3]:

- Section 8.2.5. “Smoking”
- Section 8.4. “Selecting Patients for Pharmacological Blood Pressure-Lowering Treatment”
- Section 8.5.3. “Personalizing Treatment Strategies”
- Section 9.6.3. “Managing Blood Pressure in Diabetes”

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## REFERENCES

**1.** Jones DW, Ferdinand KC, Taler SJ, et al. 2025 AHA/ACC/AANP/AAPA/ABC/ACCP/ACPM/AGS/AMA/ASPC/NMA/PCNA/SGIM guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *J Am Coll Cardiol*. 2025;86(18):1567–1678.

**2.** Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol*. 2017;71:e127–e248.

**3.** McEvoy JW, McCarthy CP, Bruno RM, et al. 2024 ESC guidelines for the management of elevated blood pressure and hypertension. *Eur Heart J*. 2024;45:3912–4018.

**High Blood Pressure Clinical Guidelines**

Blood pressure (BP) is a common chronic cardiovascular condition in the United States and dentistry can play an important role in screening patients for hypertension and is an important vital sign to consider in providing dental treatment.

**Definitions**:

- Acute Hypertension: Can result from stimuli such as physical exertion, anxiety, or stress and generally normalizes once the stimuli is gone.
- Chronic Hypertension: Is blood pressure that remains consistently higher than normal.

Blood Pressure should be taken on patients with an upper arm BP monitor (provided in clinic – manual and/or automatic). Wrist BP monitors can be used if a upper arm BP monitor is not able to be used as determined by the faculty/provider. However, wrist BP monitors/cuffs are not as accurate as the Upper Arm BP monitors and should be limited in use.

- Always utilize the appropriate size cuff (e.g., small, medium, large) based on the patient's age and size to take the BP.
- A manual and/or automatic upper arm BP cuff should be used. If an automatic BP cuff is used and high BP readings are attained, a manual upper arm BP cuff may need to be used.
- If high BP readings are obtained that would preclude treatment, the BP measurement should be repeated after the patient has sat quietly for 5 minutes with their feet flat on the floor and their arm supported at the level of their heart. If the BP decreases to a recommended level allowing treatment to proceed (see section 6.22.4.1) should be in conjunction with clinical judgement.

**Recommendations for when to take BP**

- Patient on anti-hypertensive medications and/or previous history of cardiac event, such as, but not limited to, myocardial infarction or stroke;
- Comprehensive Oral Evaluation (D0150), Periodic Oral Evaluation (D0120), or Limited Oral Evaluation (D0140);
    - Pediatric/minor patients: provider should evaluate and determine if taking BP is appropriate given review of Health History.
- Before surgical procedures and those involving sedation (oral, IV or Nitrous Oxide); and/or,
    - Nitrous Oxide: Pediatric/minor patients: provider should evaluate and determine if taking BP is appropriate given review of Health History.
- Before vasoconstrictors in local anesthetics are used in patients, especially in patients with a cardiac event history and/or taking anti-hypertensive medication(s), or contributory health history.

References: https://www.ada.org/resources/research/science-and-research-institute/oral-health-topics/hypertension#.Y0A1K9dhE6E.link

**High Blood Pressure Treatment Guidelines**

The following BP treatment guidelines are recommendations and should be used in conjunction with a provider(s) clinical judgement taking into consideration, but not limited to, the multifactorial functional capacity and risk stratification tool, the clinical situation (including the need for emergent care), health history, dental history, prescription and non-prescription medications, Illicit substances, anxiety, risks to the patient, acute vs. chronic hypertension, written guidance from a physician, and/or individual patients' clinical situation. The provider, given this information, has the clinical autonomy to make treatment decisions in the best interest of the patient.

| Category | Systolic Blood Pressure (mm Hg) | | Diastolic Blood Pressure (mm Hg) | Dental Treatment recommendations | Referral to Physician |
|---|---|---|---|---|---|
| **Normal** | <120 | and | <80 | Elective care | No |
| **Elevated** | 120-129 | and | <80 | Elective care | No |
| **Hypertension** | | | | | |
| **Stage 1** | 130-139 | or | 80-89 | Elective care | No |
| **Stage 2** | 140-159 | or | 90-99 | Elective care | No |
| **Stage 2** | >160 | and/or | >100 | • Wait 5 minutes and reassess.<br>• If the BP decreases below 160/100 or within written guidance from a physician treatment may proceed in conjunction with clinical judgement.<br>• If dental symptoms, pain, and/or anxiety contribute to HTN, initiate emergency care with BP monitoring<br>• If BP does not decrease <160/100, utilize the Functional Capacity and Risk Stratification framework to determine if treatment can be safely completed | Yes |
| **Hypertensive Crisis** | >180 | and/or | >120 | • Utilize the Functional Capacity and Risk Stratification framework to determine if treatment can be safely completed<br>• If dental symptoms, pain, and/or anxiety contribute to HTN, provider may initiate emergency care in conjunction with clinical judgement with BP monitoring.<br>• Refer to physician as soon as possible or send for urgent medical evaluation, if symptomatic. This should be in conjunction with clinical judgement and using the Functional Capacity and Risk Stratification.<br>• Consider deferring elective care after risk stratification. | Yes |

- Dental Management of the Medically Compromised Patient, James W. Little et al, Seventh Edition., *and* <https://www.ada.org/en/member-center/oral-health-topics/hypertension> (July 20, 2021)
- https://www.ada.org/resources/research/science-and-research-institute/oral-health-topics/hypertension#.Y0A1K9dhE6E.link

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**Functional Capacity Determination and Risk Stratification**

Patients with an elevated blood pressure, less than 180/110, with no active cardiac conditions is not an indication to cancel a dental procedure without considering the potential risks and benefits of delaying the procedure. In conjunction with the risk/benefit analysis, It is recommended that the clinician utilize the multifactorial risk stratification based on the American College of Cardiology Foundation and American Heart Association taskforce on practice guidelines to determine if the dental procedure should be delayed.

Providers should use the following risk stratification: One (1) "yes" answer in Section 1 and in Section 2 one (1) "yes" answer for both category A and B.

| **Section 1: Determination of Metabolic Capacity** | |
|---|---|
| The patient should be "Yes" to at least one of the following | • Can you do light work around the house like dusting or washing dishes? |
| | • Can you climb a flight of stairs or walk up a hill? |
| | • Can you walk on level ground at 4 miles per hour? |
| | • Can you run a short distance? |
| | • Can you do heavy work around the house, like scrubbing floors, or lifting or moving heavy furniture? |
| | • Can you participate in golf, bowling, dancing, doubles tennis, or throwing a baseball or football? |

| **Section 2: Risk Stratification** | |
|---|---|
| **Category A** | • Is the patient taking antihypertensive medication and did they take it this day? |
| | • Does the patient have a health care provider managing their hypertension and have they been seen in the past 6 months? |
| | • Does the patient appear anxious, acknowledge anxiety about the procedure, or have a heart rate >100 beats per minute? |
| **Category B** | • Did the patient take public transportation or drive and walk in for the procedure? |
| | • Does the patient take care of their own house or apartment? |
| | • Does the patient state they can walk up a flight of stairs? |
| **There must be a one (1) "yes" answer to category A and B** | |

References:


- Yarows SA, Vornovitsky O, Eber RM, Bisognano JD, Basile J. Canceling dental procedures due to elevated blood pressure: Is it appropriate? J Am Dent Assoc 2020:S0002-8177(19)30906-7
- Fleischmann KE, Beckman JA, Buller CE, Calkins H, Fleisher LA, Freeman WK, Froehlich JB, Kasper EK, Kersten JR, Robb JF, Valentine RJ. 2009 ACCF/AHA focused update on perioperative beta blockade: a report of the American college of cardiology foundation/American heart association task force on practice guidelines. Circulation. 2009 Nov 24;120(21):2123-51. doi: 10.1161/CIRCULATIONAHA.109.192689. Epub 2009 Nov 2. PMID: 19884474.
- American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines; American Society of Echocardiography; American Society of Nuclear Cardiology; Heart Rhythm Society; Society of Cardiovascular Anesthesiologists; Society for Cardiovascular Angiography and Interventions; Society for Vascular Medicine; Society for Vascular Surgery, Fleisher LA, Beckman JA, Brown KA, Calkins H, Chaikof EL, Fleischmann KE, Freeman WK, Froehlich JB, Kasper EK, Kersten JR, Riegel B, Robb JF. 2009 ACCF/AHA focused update on perioperative beta blockade incorporated into the ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery. J Am Coll Cardiol. 2009 Nov 24;54(22):e13-e118. doi: 10.1016/j.jacc.2009.07.010. Erratum in: J Am Coll Cardiol. 2012 Jun 12;59(24):2306. PMID: 19926002



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# Implications of GLP-1 Agonists on Office-Based Sedation and General Anesthesia for Dentistry

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Incretin hormones, glucagon-like peptide-1 (GLP-1) and glucose-dependent insulinotropic polypeptide (GIP), are produced in the gut and play critical roles linking the processes of eating and digestion with the release of insulin from the pancreas and glucose homeostasis. GLP-1 receptor agonist and combination GLP-1/GIP receptor agonist medications are exogenous incretins that mimic their endogenous counterparts, but their significantly longer half-lives allow them to be clinically useful for managing diabetes mellitus type 2 (DMT2) and obesity. Recently, their use for weight loss has grown exponentially, increasing the potential that a provider of sedation or general anesthesia for dentistry will encounter a patient taking a GLP-1 or GLP-1/GIP combination receptor agonist. One of the clinical effects produced by these medications is decreased gastric emptying which increases satiety and decreases oral intake. While these medications are effective in the management of DMT2 and obesity, delayed gastric emptying can cause concerns for sedation and general anesthesia providers. Retained gastric contents can increase risks for emesis and subsequent pulmonary aspiration in the perioperative period. In 2024, a multisociety guidance document was published to provide recommendations for the management of these patients in the perioperative period. Recommendations emphasized risk stratification of individual patients and weighing the risks vs the benefits of holding or continuing GLP-1 and GLP-1/GIP combination receptor agonist medications. The recommendations also suggested shared decision making between the sedation or general anesthesia provider, the prescribing physician, and the patient should be used when developing a plan regarding the preoperative use of these medications.

**Key Words:** GLP-1 receptor agonist; GIP receptor agonist; Semaglutide; Tirzepatide; Diabetes mellitus type 2; Obesity.

Glucagon-like peptide-1 (GLP-1) and combination GLP-1/glucose-dependent insulinotropic polypeptide (GIP) receptor agonist medications (Table) mimic natural incretin hormones produced by the gut that have a critical role in digestion and glucose homeostasis. These classes of medications have promising roles in the treatment of diabetes mellitus type 2 (DMT2) and obesity. In fact, GLP-1 receptor agonists were the fastest growing class of diabetic medications in 2022. While new prescriptions of these medications for DMT2 increased 128%, it may be of more interest that new prescriptions for obesity grew 352% during this time.[1] With the rapid increases in prescriptions for DMT2 and weight loss management, a growing number of patients on these medications are presenting to dental offices for treatment under sedation or general anesthesia. It is important for all providers of sedation or general anesthesia for dentistry to understand the mechanisms of action and potential clinical ramifications of these novel medications. One of the clinical effects of GLP-1 receptor agonists is delayed gastric emptying which helps increase satiety and curb eating. However, delayed gastric emptying can be a major concern for sedation and general anesthesia providers as patients on these medications can present with substantial residual gastric content despite their compliance with routine preoperative fasting guidelines. This can put such patients at higher risk for emesis and pulmonary aspiration while sedated or generally anesthetized. The resulting effects of these medications on a patient's physiology may influence clinical management decisions when optimizing a patient for sedation or general anesthesia.

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## REVIEW OF INCRETINS AND GLUCOSE HOMEOSTASIS

Incretins are endogenous hormones produced by the gut that play critical roles linking the processes of eating and digestion

**Table.** Summary of GLP-1 and GLP-1/GIP Receptor Agonists.[2,6,9]

| *Medication* | *Class* | *Indication* | *Decrease in HBA1C* | *Half-life* | *Dosing schedule* |
|---|---|---|---|---|---|
| Dulaglutide (Trulicity) | GLP-1 RA | DMT2 | 1–1.5 | 4.5–4.7 d | SQ injection/wk |
| Exenatide IR (Byetta) | GLP-1 RA | DMT2, obesity | 1.0 | 2.4 h | SQ injection twice/d |
| Liraglutide, 3 mg (Saxenda) | GLP-1 RA | Obesity | N/A | 13 h | SQ injection/d |
| Liraglutide, 1.2 mg/1.8 mg (Victoza) | GLP-1 RA | DMT2 | 0.8–1.5 | 13 h | SQ injection/d |
| Lixisenatide (Adlyxin) | GLP-1 RA | DMT2 | 0.8–1.0 | 3 h | SQ injection/d |
| Semaglutide (Ozempic) | GLP-1 RA | DMT2 | 1.5–2.0 | 1 w | SQ injection/wk |
| Semaglutide (Wegovy) | GLP-1 RA | Obesity | N/A | 1 w | SQ injection/wk |
| Semaglutide (Rybelsus) | GLP-1 RA | DMT2 | 0.7–2 | 1 w | Oral pill/d |
| Tirzepatide (Mounjaro) | GLP-1/ GIP RA | DMT2 | 2–2.5 | 5 d | SQ injection/wk |

Abbreviations: DMT2, diabetes mellitus type 2; GIP, glucose-dependent insulinotropic polypeptide; GLP-1, glucagon-like peptide-1; IR, immediate release; RA, receptor agonist; SQ, subcutaneous.

with the release of insulin from the pancreas and glucose homeostasis. Two of the main incretins are GLP-1 and GIP which work along with insulin, glucagon, and somatostatin in helping to closely regulate blood glucose levels. With each meal, the ingestion of carbohydrates, proteins, and fats triggers the release of GLP-1 and GIP. Patients with DMT2 have an imbalance in the regulation of these incretin hormones.[2]

### Glucagon-like Peptide-1 (GLP-1)

GLP-1 is primarily produced in the enteroendocrine L cells in the small intestine and colon, although pancreatic alpha cells produce small quantities as well. Once released, GLP-1 acts to increase insulin secretion from beta cells in the pancreas which helps lower blood glucose levels. However, GLP-1 also has other important actions such as promoting somatostatin release from pancreatic delta cells, which in turn counteracts or inhibits the secretion of glucagon from alpha cells of the pancreas. GLP-1 also works to slow gastric motility, delaying emptying of the stomach and the absorption of carbohydrates from the gut. It also plays a role in helping to regulate fat deposition in adipose tissue.[3] Endogenous GLP-1 has a short half-life of approximately 2 minutes due to rapid degradation by dipeptidyl peptidase-4 (DPP-4) and neutral endopeptidase.[4]

### Glucose-dependent Insulinotropic Polypeptide (GIP)

GIP is produced primarily by enteroendocrine K-cells in the small intestine, specifically those within the duodenum and jejunum, and acts on specific receptors located in many of the same areas in which GLP-1 acts. These receptors are found in the pancreas, bone, adipose tissue, and heart. Like GLP-1, GIP stimulates insulin production from pancreatic beta cells, effectively reducing blood glucose, and helps regulate fat deposition. However, GIP on its own increases glucagon activity and has no effect on gastric emptying.[3]

### Dipeptidyl Peptidase-4 (DPP-4)

DPP-4 is an endogenous enzyme that is found in hepatocytes, intestinal membranes, kidneys, capillary endothelium, and blood plasma. As an exopeptidase, DPP-4 cleaves the peptide bonds of GLP-1 and other incretin hormones, releasing a single amino acid or dipeptide from the peptide chain.[4] DPP-4 is regulated at many levels including gene expression, interaction with proteins, and modulation of enzymatic activity. Changes in DPP-4 activity is associated with obesity and DMT2 as well as other neurologic and inflammatory diseases. Patients with DMT2 and obesity often have increased levels of DPP-4, increasing the cleavage and deactivation of incretin proteins (ie, GLP-1). This leads to an imbalance of incretin activity in these patients, resulting in impaired glycemic control due to a decrease of insulin and an increase in blood glucose. As part of the treatment of DMT2, patients may be taking a DPP-4 inhibitor, such as sitagliptin, with the goal to increase function of their endogenous incretin hormones.[2]

## GLP-1 AND GLP-1/GIP RECEPTOR AGONIST MEDICATIONS

Endogenous incretin hormones play a vital role in maintaining homeostasis with the regulation of insulin and glucose. GLP-1 and GLP-1/GIP receptor agonist medications are exogenous incretins that mimic the same effects of their endogenous counterparts. While these medications have the same physiologic effects as endogenous incretins, they have been engineered to have a significantly longer half-life (Table) compared with endogenous incretins, making these medications clinically useful in the management of DMT2 and obesity.

GLP-1 receptor agonist medications activate GLP-1 receptors on pancreatic beta cells, resulting in the release of insulin. The release of glucagon from the pancreas is also inhibited by GLP-1 receptor agonists. These medications also act on receptors in the hypothalamus, resulting in suppression of appetite. GLP-1 receptor agonist medications slow gastric emptying, which further contributes to a feeling of satiety and reduces

oral intake. All these changes lead to a decrease in plasma glucose levels which benefits the patient with DMT2. Numerous other health benefits of these medications include the cardiovascular benefits from decreased blood pressure, decreased low-density lipoprotein levels, and improved endothelial function and perfusion.[2,5]

The extent to which GIP receptor activation on its own is a viable treatment for DMT2 and obesity remains uncertain. GIP receptor agonists are thought to have limited potential as sole therapy for DMT2, although further investigation is ongoing. GLP-1 and GIP receptor agonists in combination have been found to have additive therapeutic effects. The addition of a GIP receptor agonist allows for a lower dose of a GLP-1 receptor agonist to be used when combined, resulting in fewer side effects when compared with medications targeting GLP-1 receptors alone.[2] Tirzepatide (Mounjaro, Eli Lilly) is a dual GLP-1 and GIP receptor agonist medication that depends heavily on GIP agonism. It has a long half-life, thus allowing it to be administered by injection once a week. Patients are often prescribed tirzepatide if they cannot tolerate a GLP-1 receptor agonist medication due to gastrointestinal (GI) symptoms.[2,6]

## PERIOPERATIVE COMPLICATIONS FROM GLP-1 AND GLP-1/GIP RECEPTOR AGONIST USE

The novelty of these medications has resulted in a rapid, exponential increase in new GLP-1 and GLP-1/GIP receptor agonist prescriptions in the United States.[7] The known mechanism of action and clinical effects of GLP-1 receptor agonists have suspected implications on standard preoperative fasting guidelines for elective procedures involving sedation or general anesthesia. Specifically, GLP-1 receptor agonist medications are designed to delay gastric emptying to increase satiety. With delayed gastric emptying, providers of sedation and general anesthesia should be concerned about patients having residual gastric content despite adherence to traditional preoperative fasting guidelines. This leads to concerns of perioperative emesis which could result in pulmonary aspiration of a critical volume of acidic stomach contents.

Early evidence is limited to case reports, resulting in the lack of definitive management guidelines for patients on GLP-1 or GLP-1/GIP receptor agonists.[5] The Anesthesia Patient Safety Foundation has described two case reports in detail. In one case, a patient taking semaglutide (Ozempic; Novo Nordisk) had a point-of-care gastric ultrasound prior to sedation for an imaging study. The ultrasound revealed the presence of solid gastric contents despite the patient fasting from solid foods for over 18 hours. The anesthesiologist made the decision to cancel the sedation due to concern for pulmonary aspiration. Another case describes a patient on tirzepatide (Mounjaro; Eli Lily) who fasted the night before surgery. This patient had significant emesis of complex gastric contents prior to extubation that was consistent with what she had eaten days before the procedure. However, the patient's airway was protected when the emesis occurred, so any pulmonary aspiration concerns were mitigated. She recovered in the postanesthesia care unit uneventfully following extubation. An additional case report describes a pulmonary aspiration event after the patient fasted preoperatively for 18 hours. Retrospective reviews of patients undergoing endoscopy have suggested retained solid gastric contents despite otherwise appropriate fasting times.[5]

Although the existing level of evidence with these new medications is limited in quality, the known mechanisms of action and current case reports indicate that patients taking GLP-1 or GLP-1/GIP receptor agonists are at a higher risk for retaining complex solid gastric contents despite following American Society of Anesthesiologists (ASA) preoperative fasting guidelines. This seemingly places such patients at higher risk for pulmonary aspiration and related perioperative complications.[5]

While pulmonary aspiration is a rare occurrence, it is a potentially avoidable adverse event that can have devastating consequences. From a liability perspective, pulmonary aspiration is one of the top 3 airway adverse events as described in an ASA closed claims project.[5] Knowledge of the mechanisms of action and clinical effects of these incretin-based medications is essential, and anesthesia providers must be aware that patients on these medications have an increased pulmonary aspiration risk.

## ANESTHETIC CONSIDERATIONS

Adjustments should be made in the anesthetic plan to optimize these patients. For patients at a higher risk of pulmonary aspiration, the ASA suggests considering GI stimulants such as metoclopramide which has been shown to reduce gastric volume and pH perioperatively.[8] Additionally, histamine-2 receptor antagonists (eg, famotidine) and proton pump inhibitors (eg, omeprazole) may be considered to potentially reduce gastric volume and acidity. Finally, preoperative nonparticulate antacids should also be considered, as they decrease gastric acidity.[8]

Considerations to reduce the risk of emesis for patients taking GLP-1 or GLP-1/GIP receptor agonist medications would include avoiding or limiting emetogenic agents. These include volatile anesthetics, nitrous oxide, ketamine, and opioids. Opioids should particularly be avoided in these patients due to their contribution to delayed gastric motility. Regarding antiemetics, the routine prophylactic use of ondansetron (a 5-HT3 receptor antagonist) and dexamethasone along with an additional antiemetic of another type, such as diphenhydramine (an H1 receptor antagonist) or aprepitant (an NK-1 receptor antagonist), could be considered to further reduce the risk of emesis. Depending on patient-specific factors and associated risks, anesthesia providers could consider treating these

patients as if they have a full stomach. Therefore, if intubation is considered, it could be accomplished with a rapid sequence induction, stomach decompression with an orogastric (OG) tube, and an awake extubation.[5]

GLP-1 receptor agonists have known associated risks for the adverse effects of nausea, vomiting, dyspepsia, abdominal distention, and delayed gastric emptying.[9] The use of GLP-1 receptor agonists is less common in pediatrics and has primarily been used for the management of DMT2 and obesity in patients 10 to 18 years of age. In literature published thus far, children on GLP-1 receptor agonists have similar GI adverse events at rates comparable to adults while under deep sedation or general anesthesia.[9] In August 2023, the ASA published the first set of guidelines for consideration in patients taking GLP-1 receptor agonists prior to a scheduled elective procedures[9]:

- For patients on daily, typically oral, dosed GLP-1 receptor agonists, consider holding their dose on the day of the procedure.
- For patients on weekly dosed GLP-1 receptor agonists, consider holding their dose a week prior to the procedure.
- If the GLP-1 receptor agonist is being utilized for DMT2 management and holding a dose would impact their dosing schedule, consult the patient's primary care physician or endocrinologist for bridging antidiabetic therapy to avoid hyperglycemia.

## Current Recommendations

In October 2024, the ASA issued an Affirmation of Value for a more recent multisociety guidance document on GLP-1 receptor agonists. This new guidance recognizes the inconsistencies in clinical care guidelines between associations leading to uncertainty on how to safely treat patients taking these medications. The objective of the multisociety guidance is to offer unified guidance for clinicians for managing patients taking GLP-1 medications, regardless of indication, which currently includes DMT2, weight management, and heart failure.[10]

- Recommendation 1: Shared decision making between procedural, anesthesia, and prescribing team should be used to determine the perioperative use of GLP-1 medications. Patient-specific factors should be considered when assessing the risks of these patients for delayed gastric emptying and pulmonary aspiration. Patients in the escalation phase, taking higher doses of these medications, or on weekly dosing are at higher risk for delayed gastric emptying and GI side effects. This is compared with patients in the maintenance phase, taking a lower dose, or on daily oral dosing who are at lower risk for delayed gastric emptying. Additionally, GI symptoms on the day of the procedure are suggestive of delayed gastric emptying. These symptoms include nausea and vomiting, abdominal pain or distension, constipation, or feeling full.[10] The GI side effects of GLP-1 receptor agonists are common, but these symptoms commonly decrease with continued use due to tachyphylaxis.[9] Finally, other medical conditions that impact gastric emptying, such as gastroparesis, bowel dysmotility, chronic opioid use, obesity, and Parkinson's disease, should also be considered as a confounding factor.[10]

In patients with lower risk, GLP-1 medications can be continued in the perioperative period without increased risk for delayed emptying and pulmonary aspiration. In higher risk patients, holding GLP-1 medications should balance risk vs benefit of surgical and medical risks and metabolic disease states. If the decision to hold GLP-1 medications is made, it is suggested to follow the original guidance of the ASA: hold daily formulations the day of surgery and weekly formulations a week prior to surgery.[9,10]

- Recommendation 2: Efforts should be made to minimize the pulmonary aspiration risk of delayed gastric emptying in the perioperative period. For higher risk patients, this could include perioperative diet modification of a liquid diet for 24 hours. When there is a concern for retained gastric contents on the day of the procedure, point-of-care gastric ultrasound can be used to assess volume of gastric contents and pulmonary aspiration risk. Finally, if there is a concern of retained gastric contents, shared decision making with the patient and care team should be used to determine risk vs benefit of delaying the procedure vs rapid sequence induction and tracheal intubation.[10]

In addition to case reports and guidance from various professional associations, there have been multiple retrospective reviews of patients taking GLP-1 receptor agonists undergoing endoscopy that suggest an increased risk of retained gastric contents in patients taking these medications.[5] Medications within this class have relatively long half-lives and stopping these medications for at least 5 half-lives before surgery to allow normalization of gastric function is often not practical. The potential cardiovascular benefits and negligible risk for hypoglycemia that these medications pose have contributed to the thought process of continuing this class of medications without perioperative interruption.[5]

With the limited published data, it is important to review current relevant literature and re-evaluate traditional fasting guidelines in patients taking GLP-1 and GLP-1/GIL receptor agonist medications. The recent popularity of these drugs will hopefully result in more data that may aid providers of sedation and general anesthesia in developing a more systematic approach to assessing risk in this patient population.

## Considerations for Office-Based Anesthesia for Dentistry

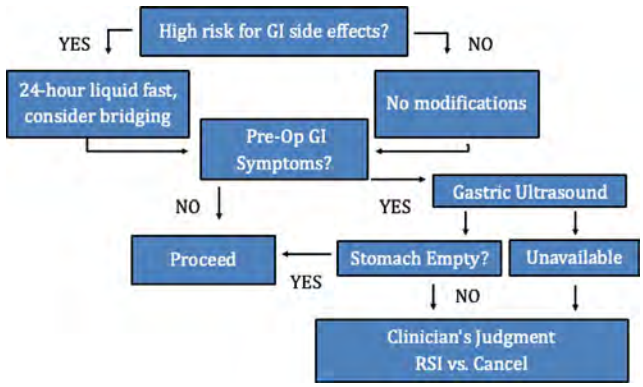
The clinical management of patients taking GLP-1 receptor agonists involves weighing the risks of delayed gastric emptying and pulmonary aspiration with the benefits of perioperative glucose control and improved cardiovascular health. In the preoperative period, the 2024 multisociety guidance document provides the most up-to-date recommendations for anesthesia providers.

If the patient is at high risk for GI side effects and delayed gastric emptying, a 24-hour fast should be considered as well as the use of shared decision making to decide if the GLP-1 medication should be held. If the patient is low risk, no preoperative modifications are likely needed.[10] On the day of the procedure, the anesthesia provider should complete a thorough interview to assess the patient for GI symptoms, including nausea, vomiting, retching, diarrhea, abdominal bloating, or abdominal pain. The presence of these symptoms is concerning for delayed gastric emptying. If the patient has no GI symptoms and is low risk, it is recommended to proceed with the procedure. However, if the patient is symptomatic and there is concern for retained gastric contents, a point-of-care gastric ultrasound can be used to assess pulmonary aspiration risk. If ultrasound is available and no gastric contents are appreciated, it is recommended to proceed with the procedure.[10]

While gastric ultrasound may be helpful, it is unlikely to be practical (ie, not available) in the outpatient dental setting. If an ultrasound of the stomach cannot be obtained and there are concerns about retained gastric contents and increased pulmonary aspiration risk, the ASA recommends to either delay the procedure or to proceed as if the patient has a "full stomach" and to manage accordingly.[9] ASA does recognize that no evidence supports an optimal duration of fasting for patients on GLP-1 receptor agonists.[5,9] Refer to the Figure for a summary of clinical decision making for patients on GLP-1 medications.

To reduce the risk of pulmonary aspiration preoperatively, the anesthesia provider could consider the use of gastric stimulants, histamine-2 receptor antagonists, proton pump inhibitors, and nonparticulate antacids. Antiemetics such as ondansetron, dexamethasone, aprepitant, and diphenhydramine should be considered. Emetogenic medications, such as nitrous oxide, volatile anesthetics, and ketamine should be minimized. Consideration for opioid-sparing strategies should also be made due to the known emetogenic effects of opioids and their further reduction of gastric motility. Intubation with a rapid sequence induction including stomach decompression with an OG tube is the preferred airway management strategy for patients with a full stomach. However, this may not be practical in all dental office settings. If rapid sequence induction is impractical given the practice environment, these patients should be seen under local anesthesia or possibly under light levels of sedation to help ensure their airway reflexes remain intact.

**Figure.** Summary of Clinical Decision Making for Patients on GLP-1 Medications




This flowchart is based on the 2024 multisociety guidance document for managing patients on GLP-1 medications10 and should be adapted as needed for patient care in the office-based environment.

## CONCLUSION

GLP-1 and GIP/GLP-1 receptor agonists mimic endogenous incretins and are used in the treatment of DMT2 and obesity. Dentists providing sedation and general anesthesia for these patients must remain vigilant as they may have retained gastric contents due to delayed gastric emptying. These medications may place patients at higher risk for perioperative emesis and pulmonary aspiration. A recent 2024 multisociety guidance document provides recommendations for patient optimization prior to a procedure utilizing sedation or general anesthesia. This new guidance emphasizes risk stratification based on patient-dependent factors and weighing the risks vs the benefits of holding or continuing these medications. Shared decision making should be used between the anesthesia provider, prescribing physician, and patient when developing a plan.

While these strategies help optimize patients for anesthesia-related care, they do not eliminate all risks for GLP-1 medication-related perioperative complications. The anesthesia provider should consider the risks vs benefits of holding these medications, the presence of GI symptoms on the day of the procedure, and the availability of resources in the individual practice environment. Providers of sedation and anesthesia for dentistry are likely to continue to encounter and treat more patients taking these medications. It is important to fully understand how GLP-1 and GLP-1/GIP receptor agonists impact anesthetic management to provide high quality office-based anesthesia care.

## REFERENCES


1. Pritchett J. 2022 Prescription Trends. PharmExec.com. https://www.pharmexec.com/view/2022-prescription-trends#
2. Dungan K, DeSantis A. Glucagon-like peptide 1-based therapies for the treatment of type 2 diabetes mellitus. December 2024. UpToDate. https://www.uptodate.com/contents/glucagon-like-peptide-1-based-therapies-for-the-treatment-of-type-2-diabetes-mellitus
3. Kim W, Egan JM. The role of incretins in glucose homeostasis and diabetes treatment. *Pharmacol Rev*. Dec 2008;60(4):470–512. doi:10.1124/pr.108.000604
4. Lee S, Lee DY. Glucagon-like peptide-1 and glucagon-like peptide-1 receptor agonists in the treatment of type 2 diabetes. *Ann Pediatr Endocrinol Metab*. 2017;22(1):15–26. doi:10.6065/apem.2017.22.1.15
5. Beam WB, Guevara LRH. Are serious anesthesia risks of semaglutide and other GLP-1 agonists under-recognized? Case reports of retained solid gastric contents in patients undergoing anesthesia. *APSF Newsletter*. 2023;38(3):67–71.
6. Min T, Bain SC. The role of tirzepatide, dual GIP and GLP-1 receptor agonist, in the management of type 2 diabetes: the SURPASS Clinical Trials. *Diabetes Ther*. 2021;12(1):143–157. doi:10.1007/s13300-020-00981-0
7. Shmerling R. What happens when a drug goes viral? Harvard Health Publishing. https://www.health.harvard.edu/blog/what-happens-when-a-drug-goes-viral-202302212892
8. Practice Guidelines for Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration: Application to Healthy Patients Undergoing Elective Procedures: An Updated Report by the American Society of Anesthesiologists Task Force on Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration. *Anesthesiology*. 2017;126(3):376–393. doi:10.1097/aln.0000000000001452
9. American Society of Anesthesiologists Consensus-Based Guidance on Preoperative Management of Patients (Adults and Children) on Glucagon-Like Peptide-1 (GLP-1) Receptor Agonists. American Society of Anesthesiologists; 2023.
10. Kindel TL, Wang AY, Wadhwa A, et al. Multisociety clinical practice guidance for the safe use of glucagon-like peptide-1 receptor agonists in the perioperative period. *Surgery Obesity Related Dis*. 2024;20(12):1183–1186.