

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	Vasodilatation, sympathetic blockade, inhibition of catecholamine release, decreased myocardial contractility, antiarrhythmic	Light-headedness, flushing or sensation of warmth if given in an awake pt	Bradycardia, low BP, poor peripheral and systemic perfusion due to vasodilation and low cardiac output	Check Mg ²⁺ levels, ECG, CO ₂ monitoring (noninvasive and invasive)
RESP	Respiratory depressant effect due to NMB Bronchodilator	Respiratory insufficiency Improvement in asthmatic pts	Hypoxia, hypoventilation, sedation, hypercapnia	Monitor levels, pulse oximetry, ABG, end-tidal CO ₂
CNS	Antiepileptic, NMDA receptor blockade, potentiation of NMB	Cessation of convulsions Analgesic adjuvant Muscle weakness	Postictal phase Decreased deep tendon reflexes Improvement in analgesia	Monitor levels
MS	Weakness, increased sensitivity to non-depolarizing relaxants	Respiratory depression Heightened response to muscle relaxants	Weakness, lethargy, absent or reduced DTRs	Monitor DTRs, twitch monitoring
OB	Tocolytic	Arrests labor	Decreased uterine tone	Uterine activity

Key References: Herroeder S, Schönherr ME, De Hert SG, et al.: Magnesium—essentials for anesthesiologists, *Anesthesiology* 114(4):971–993, 2011; Dubé L, Granry J: The therapeutic use of magnesium in anesthesiology, intensive care and emergency medicine: a review, *Can J Anesth* 50(7):723–746, 2003.

Perioperative Implications

Preoperative Concerns

- Assess baseline respiratory and CV, muscle strength, electrolytes including Mg²⁺, renal function, and ECG prior to any anesthetic.

Induction/Maintenance

- Dose of induction agent to be titrated as an exaggerated hemodynamic response and drop in BP can occur.
- Use of muscle relaxants to be avoided unless indicated. Consider decreasing the maintenance dose and monitoring TOF. Succinylcholine can be used safely.
- Volatile agents can compound the drop in SVR. MAC may be reduced by 20%.
- When central neuraxial blockade is used, careful titration of local anesthetics dose is needed.

- Vasopressors may be required to maintain adequate MAP and SVR if serum levels are high.

Adjuvants/Regional Anesthesia/Reversal

- Depresses the stress response to laryngoscopy, intraop BP control during surgery for pheochromocytoma, hypotensive anesthesia for surgeries requiring bloodless fields.
- Magnesium is a useful analgesic adjuvant (IV, RA) as a part of multimodal therapy.
- Calcium is used as an antidote to magnesium toxicity. However, it does not reverse the effects on the NM junction.

Postoperative Period

- Assess the reversal of NMB before extubation. Muscle weakness and respiratory insufficiency may warrant extended ventilatory support.
- Risk of pulm edema.

Anticipated Problems/Concerns

- Intensive monitoring required if magnesium infusion is continued postop.
- Postpartum hemorrhage due to tocolytic effect of magnesium (decreased uterine tone) if used in labor.
- Residual NMB and watch for respiratory failure.

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Marijuana

Luis R. Saucedo-Cerda | Jeffrey R. Kirsch

Uses

- Antiemetic
- Appetite stimulation
- Analgesia
- Recreational
- Epilepsy
- Glaucoma
- Mood disorders
- Spastic disorders

Perioperative Risks

- Cross-tolerance with barbiturates, opioids, benzodiazepines, and phenothiazines
- Tachycardia, vasodilation with hypotension, anxiety, dysphoria, hallucinations (acute use)
- Airway hyperreactivity from chronic smoking (carbon monoxide inhalation)
- Decreased efficacy of oral birth control medication
- Possible procoagulant effect in immunocompromised and certain other populations

Worry About

- Multiple drug consumption

Overview/Pharmacology

- Marijuana flower is commonly smoked, vaporized, or turned into edible products.
 - Absorption via inhalation is rapid and effects are felt within minutes.
 - Enteral administration is slower and effects are felt within 30–120 min.
- Sublingual and topical preparations of cannabinoids are also available.
- Over 60 different cannabinoids have been identified.
 - Primary psychoactive agent is δ -9 THC.
 - Cannabidiol has no hallucinogenic properties and is under investigation in the treatment of epilepsy, psychotic disorders, and other neuropsychiatric conditions.
- Endogenous cannabinoid system involved in analgesia, cognition, memory, locomotor activity, appetite, vomiting, and immune control.
 - Endogenous ligands include anandamide, 2-arachidonoylglycerol, palmitoylethanolamide.

Drug Class/Mechanism of Action/Usual Dose

- Cannabinoid.
 - Two G protein-coupled cannabinoid receptors (CB₁ and CB₂) have been identified.
 - CB₁ receptors found widely in central and peripheral nervous systems: Hippocampus, cortex, olfactory areas, basal ganglia, cerebellum, spinal cord.
 - CB₂ receptors found peripherally and linked to immunity (i.e., spleen, macrophages)
 - Leads to inhibition of adenylyl cyclase and decreased cAMP.
 - Neurons become hyperpolarized by activating Ca²⁺ and K⁺ channels
- Cannabidiol antagonizes and activates a variety of non-cannabinoid receptors; reduces psychoactivity of THC.
- Dosage varies depending on indication.

Assessment Points				
System	Effect	Assessment by Hx	PE	Test
CV	Hypotension Tachycardia (bradycardia with chronic use) Vasodilation Myocardial depression with higher doses Increased myocardial O ₂ demand Increased cerebral blood flow (decreased with chronic use)	Recent exposure Duration and amount of use Use of other recreational drugs Tobacco/alcohol use	Vital signs Injected conjunctiva Reduced oculomotor tracking	Urine toxicology screen
RESP	Coughing Decreased O ₂ -carrying capacity secondary to CO ₂ intake with inhalation Bronchial dilation Increased ventilation (decreased with larger doses) Bronchitis Decreased transport of secretions Squamous metaplasia Emphysema			
CNS	Euphoria/dysphoria Lethargy Impairment of coordination Changes in perception Decreased ability to perform complex thoughts or actions Decreased nausea Dizziness Hallucinations Panic reactions Ataxia/dysarthria Confusion Amnesia Anticonvulsant/proconvulsant Schizophreniform symptoms Poor judgment Increasing cognitive impairment with chronic use Depression			
OPHTH	Decreased IOP Possible rebound increase in IOP with cessation Poor oculomotor tracking			
IMMUNE	Decreased resistance to infection Impairment of macrophages			
GU	Urinary retention			
OB	Preterm labor IUGR VSD in fetus Delay in cognitive development			

Key References: Whiting PF, Wolff RF, Deshpande S, et al.: Cannabinoids for medical use—a systematic review and meta-analysis, *J Am Med Assoc* 313(24):2456–2473, 2015; Kumar RN, Chambers WA, Pertwee RG: Pharmacological actions and therapeutic uses of cannabis and cannabinoids. *Anaesthesia* 56(11):1059–1068, 2001.

Perioperative Implications

Preoperative Concerns

- Chronic use can lead to prolonged intoxication, lasting several days, secondary to storage in adipose tissue and reuptake of active metabolites in the gut.
- Pts may be sedated or have signs and symptoms of bronchitis and asthma.
- Marijuana may increase opioid effects on ventilation.

Induction/Maintenance

- May interact with medications that affect heart rate
- Reduces the MAC and may cause pronounced myocardial depression with potent inhaled anesthetics.
- Anesthesiologists should anticipate interactions with anticholinergics, barbiturates, and depressants.

Postoperative Period

- Increased postop agitation and confusion.
- Motor function and coordination may be reduced for a longer period than anticipated.
- Some pts may experience withdrawal. Signs include restlessness, irritation, agitation, nausea, and cramping.

Anticipated Problems/Concerns

- Increased risk of having respiratory complications during anesthesia.
- Periop agitation.
- Recent use may impair pt's ability to give consent. Chronic use may lead to difficulty following postop instructions.

- Interactions with the effects of chronotropic medications.
- Cannabinoids have prolonged action in older pts and those with liver disease.
- Anesthesiologists should encourage preop discontinuance of the drug for elective cases and consider delaying elective cases with recent use.

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Metformin (Glucophage)

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Uses

- Treatment of type 2 DM, particularly in overweight pts, when dietary management and exercise alone do not result in adequate glycemic control.
- A reduction of diabetic complications has been shown in overweight type 2 diabetic pts treated with metformin as first-line therapy after diet failure.

Side Effects

Very common: Nausea, vomiting, abdominal pain
Common: Taste disturbance
Very rare: Lactic acidosis

Perioperative Risks

- Hypoglycemia (rare)

- Metformin-associated lactic acidosis: The summary of product characteristics states that "Metformin hydrochloride should be discontinued 48 h before elective surgery under general, spinal or epidural anaesthesia. Therapy may be restarted no earlier than 48 h following surgery or resumption of oral nutrition and only if normal renal function has been established." This is