Medical Cannabis:

Therapeutic Review for Pain and Symptom Management

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Learning Objectives

At the completion of this activity, the pharmacist participant will be able to:

- Identify regulatory issues for use of cannabis in various states
- Describe the clinical pharmacology of medical cannabis and its active components
- Describe dosing strategies for the management of pain and other symptoms in advanced illness

Learning Objectives

At the completion of this activity, the pharmacy technician participant will be able to:

- Identify qualifying conditions for the New Mexico Medical Cannabis Program
- Discuss various formulations of medical cannabis including advantages and disadvantages of each
- Compare and contrast the safety profile of cannabis and opioids

Disclosure

- I have nothing to disclose.

Audience Question

In the past month, how many times on average have you been asked by a patient/colleague/friend/family member about the potential medical benefits of marijuana?

A. Once a month
B. Once a week
C. Daily
D. Not at all

Audience Question

If you have been asked about it, how confident are you in offering medical advice about marijuana?

A. Very confident
B. Somewhat confident
C. Not at all confident

Lori Paulson

Diagnosed with stage IV neuroendocrine cancer at the age of 33

Treated with 2 regimens containing highly emetogenic chemotherapy

Experienced significant side effects from benzodiazepines and opioids

Used medical cannabis as primary medication for n/v, anxiety, sleep and pain up until the last month of her life

Historical Timeline

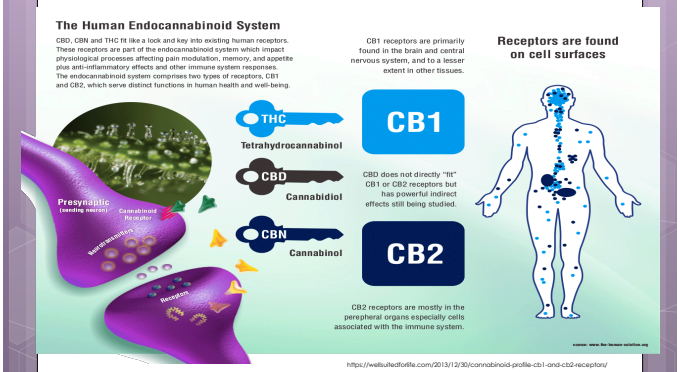
- One of the 50 "fundamental" herbs in traditional Chinese medicine
- Used in ancient Egypt for inflammation
- Domestic production of hemp encouraged 1600-1890s
- First use in the medical literature described by William O'Shaughnessy, an Irish physician, in 1839
- Listed in the US Pharmacopeia in 1851 with purported benefits that included analgesia, sedation and therapeutic benefits against inflammation, nausea, and spasms

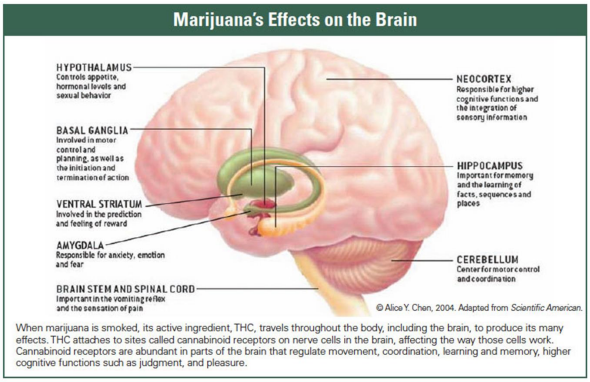
Historical Timeline

- Federal government passed the Marijuana Tax Act of 1937
- Legal use completely eliminated in 1942 when it was removed from the US Pharmacopeia
- 1970 – US Congress passed the Controlled Substances Act (CSA) placing cannabis into Schedule I category
- 1997 - White House Office of National Drug Control Policy asked IOM to review scientific evidence
  - IOM concluded marijuana has potential therapeutic value; IOM also recommended that research should focus on rapid onset, safe and reliable delivery systems

Endocannabinoid System

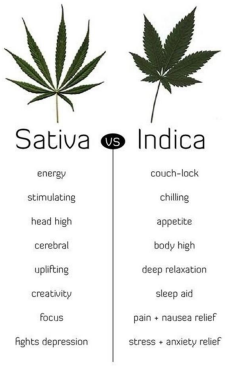
- Group of neuromodulatory lipids and their receptors in the brain that are involved in a variety of physiological processes including appetite, pain sensation, mood, and memory
- Cannabinoid binding sites throughout the central and peripheral nervous systems
  - Density of expression varies based on species – basal ganglia, cerebellum
  - Inhibitory and excitatory effects





Types of Cannabis

- *Cannabis sativa*
  - Provides more energetic, uplifting feeling
  - Can be effective for general well-being, increased focus and creativity, and for treating depression
- *Cannabis indica*
  - Provides deep relaxation
  - Can be effective for overall pain relief, muscle spasms, anxiety, and insomnia
- *Cannabis ruderalis*
- Hybrid



Pharmacology

- *Cannabis sativa* and *Cannabis indica* contain more than 60 naturally occurring cannabinoids
- Classical Cannabinoids
  - Δ^9 – tetrahydrocannabinol (Δ^9 THC)
    - *Major psychoactive* component
    - Appetite stimulant, anti-emetic, and anti-neuropathic pain properties
  - Cannabidiol (CBD)
    - Neuroprotective, analgesic, anti-emetic, anti-spasmodic and anti-inflammatory properties
  - Cannabinol (CBN)

Pharmacokinetics

- Highly lipophilic
- Varies by route of administration
  - Smoked/Vaporization
    - Onset of action within minutes
    - Estimated bioavailability 10-25%
    - Duration of action 2-4 hours
  - Oral
    - Bioavailability ranging from 5-20%
    - Peak concentrations in 1-3 hours
    - Duration of action 8-12 hours
  - Topical
    - Absorption varies
    - Local effects

Dosage Formulations

- Inhalation
  - Smoke
  - Vaporizer
- Oral
  - Chocolate or other edible
  - Capsule
  - Tincture
  - Teas, soda
- Topical
  - Salve
  - Balm

Commercial Cannabinoids

- Nabilone (Cesamet® US 2006; Canada 1985)
  - Synthetic analogue of THC
  - Suppression of chemotherapy-induced nausea/vomiting
  - Up to 6 mg daily in divided doses
- Dronabinol (Marinol® 1985)
  - Synthetic THC
  - Antiemetic/appetite stimulant for AIDS patients
  - 5-20 mg daily
- Nabiximols (Sativex® Canada, Europe, New Zealand, Israel)
  - Extracted THC:CBD (50:50) oral spray
  - Central neuropathic pain/spasticity in MS
  - Pain adjunct for adults with advanced cancer – phase 3 trials for FDA approval

Commercial Cannabinoids

- Dronabinol and nabilone
  - CIII
  - Low, variable bioavailability (5-20%)
  - Significant variability of response
  - Unpredictable and delayed onset of action
    - Onset 30-60 minutes; peak 2-3 hours
    - Makes difficult for patients to effectively titrate
  - First pass metabolism in liver results in psychoactive metabolite, 11-hydroxy-THC
  - Soft gelatin capsules – unable to be chewed or crushed

Dosing Strategies

- Must be individualized per patient
- Slow upward titration, promotes tolerance to psychoactive side effects
- Patients do not need to feel the "high" for symptom control
- Inhalation
  - Initiate 1 inhalation and wait 15 minutes
  - Ay increase by 1 inhalation every 15-30 minutes until desired symptoms has been achieved
- Recommend patients keep a cannabis journal

Dosing Examples

- Any symptom: Initial dose 2.5mg THC equivalent at bedtime
  - 1.25mg if young or elderly
- Epilepsy: 200-300mg CBD
- Appetite stimulation: 2.5mg THC ± 1mg CBD
- Glaucoma: 5mg THC
- Insomnia: 40-160mg CBD
- Pain management: 2.5-7.5mg THC ± 2.5mg-10mg CBD

Adverse Effects

- Tachycardia
- Sedation
- Dry mouth
- Dizziness or lightheadedness
- Red, irritated eyes
- Coughing with smoked/vaporized cannabis
- Cannabinoid hyperemesis syndrome
- Warnings/precautions
  - Schizophrenia, bipolar or severe depression
  - Heart disease, chest pain, HTN, irregular heartbeat
  - COPD
  - Immunosuppression
  - Pregnancy/breast feeding
  - Blood thinning effects

Patient Case

- JM is a 72 yo male with renal cell carcinoma, mets to the liver and cervical spine. He was admitted to home hospice care and shares with the nurse that he just started using marijuana daily for anxiety, sleep and pain. You review his medications and note that he is taking the following:
  - Lorazepam 0.5mg PO q4h PRN anxiety
  - Gabapentin 300mg PO TID
  - Lisinopril 10mg PO daily
  - Warfarin 2mg PO daily
  - Baclofen 10mg PO TID PRN pain

What medication might you be most concerned with as far as a potential drug interaction?

A. Lorazepam
B. Gabapentin
C. Warfarin
D. Baclofen

Drug Interactions

- THC and CBD are metabolized by CYP3A4 and CYP2C9
- CBD, but not THC, is metabolized by CYP2C19 THC is a CYP1A2 inducer
  - Theoretically, THC can decrease serum concentrations of clozapine, duloxetine, naproxen, cyclobenzaprine, olanzapine, haloperidol, and chlorpromazine
- CBD is a potent inhibitor of CYP3A4 and CYP2D6

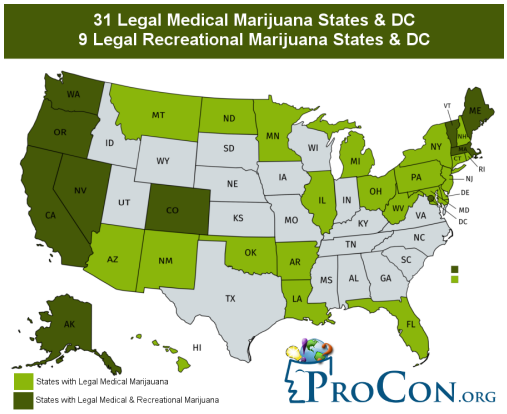
https://www.projectcbd.org/

Potentiation Effects

- Increased CNS depression – barbiturates, alcohol, benzodiazepines
- Systemic corticosteroids – increased immunosuppression
- Opioids?

Legalization Issues

- State decriminalization vs. federal law
  - In 2009, Department of Justice formally announced that it would not prosecute medical marijuana users who had complied with applicable state laws – focus on trafficking
- 81% of Americans support legalization for medical purposes (Harris Poll, 2015); majority support some form of legalization of cannabis use
  - From limited approval of high CBD products to legalization in CO, WA, OR, CA
- Compassionate Access, Research Expansion, and Respect States Act (CARERS Act), passed by the U.S. Senate in 2015
- 2016 – DEA announced it will keep marijuana listed as CI under CSA but will soften rules for research to make it easier to grow the plant for scientific study



NM Medical Cannabis Law

- PURPOSE: to provide relief from pain and suffering associated with debilitating medical conditions
- Signed into law in 2007 – Lynn and Erin Compassionate Use Act
- Allows providers to **recommend** medical cannabis for patients to be able to possess medical cannabis under state law
  - Provider certifies condition
  - Cannabis is not "prescribed" and is not filled at a pharmacy
- Currently 21 qualifying conditions
  - New conditions can be added by petitioning the Medical Advisory Board

NM Medical Cannabis law

The Lynn and Erin Compassionate Use Act (Act) does not offer protection for:

- (2) liability for damages or criminal prosecution arising out of the operation of a vehicle while under the influence of cannabis; or
- (3) criminal prosecution or civil penalty for possession or use of cannabis:
  - (a) in a school bus or public vehicle;
  - (b) on school grounds or property;
  - (c) in the workplace of the qualified patient's or primary caregiver's employment; or
  - (d) at a public park, recreation center, youth center or other public place.

NMSA 1978, § 26-2B-5.

Qualifying Conditions

- Severe chronic pain
- Painful peripheral neuropathy
- Intractable nausea/vomiting
- Severe anorexia/cachexia
- Hepatitis C infection, on antivirals
- Crohn's disease
- Ulcerative colitis
- PTSD
- ALS
- Glaucoma
- Inclusive body myositis
- Cancer
- Multiple sclerosis
- Epilepsy
- HIV/AIDS
- Inflammatory autoimmune-mediated arthritis
- Damage to the nervous tissue of the spinal cord with intractable spasticity
- Hospice care
- Huntington's Disease
- Parkinson's Disease
- Cervical dystonia

Application Process

- No enrollment fee
- Turn around time ~30 days
- Patient receives Medical Cannabis Program Registry ID card and is valid for 1 year
- Once approved, the list of licensed producers is sent with the program enrollment card
  - Program allows possession of 6 ounces of useable medical cannabis over the course of 3 months

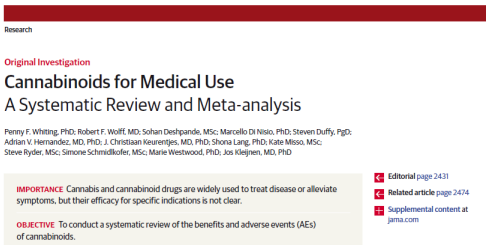
35 licensed non-profit producers

Personal Production License

- Can apply to have up to 12 seedlings and 4 mature plants
- Produce only at primary residence or property owned by the patient
- May legally obtain seeds or clones from licensed nonprofit producers
- Illegal to distribute in any way to anyone else – this includes selling to others!

Therapeutic Uses

2015 JAMA Meta-Analysis



Research

Original Investigation

Cannabinoids for Medical Use

A Systematic Review and Meta-analysis

Penny F. Whiting, PhD; Robert F. Wolff, MD; Sohan Deshpande, MSc; Marcello Di Nisio, PhD; Steven Duffy, PgD; Adrian V. Hernandez, MD, PhD; J. Christiaan Keurentjes, MD, PhD; Shona Lang, PhD; Kate Misso, MSc; Steve Ryder, MSc; Simone Schmidlkofer, MSc; Marie Westwood, PhD; Jos Kleijnen, MD, PhD

IMPORTANCE Cannabis and cannabinoid drugs are widely used to treat disease or alleviate symptoms, but their efficacy for specific indications is not clear.

OBJECTIVE To conduct a systematic review of the benefits and adverse events (AEs) of cannabinoids.

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Related article page 2474
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Neurologic Conditions

- Fibromyalgia
  - Small study in Israel – 26 patients
  - All reported significant improvement in questionnaire scores and 50% stopped taking other medications for fibromyalgia
- Multiple Sclerosis
  - Cannabis provides beneficial effects on spasticity, tremor, pain and anxiety
  - Also used to treat urge incontinence in MS patients
  - Most conclusive evidence of cannabis being effective in this patient population
  - Survey of 52 pts with pediatric-onset MS - 64% perceived negative effects on memory and focus

Habib G and Artul S. *J Clin Rheumatol* 2018;00:1-4
Brenton JN et al. *Journal of Neurology* 2018;265:417–423

Neurologic Conditions

- Neuropathy
  - 2018 Cochrane review, included 16 studies with 1750 patients
  - Cannabis-based medicines may increase the number of people achieving 50% or greater pain relief compared with placebo (21% versus17%; NNTB 20; 1001 participants, eight studies, low-quality evidence)
  - Cannabis-based medicines may increase nervous system adverse events compared with placebo; NNTH 3; (1304 participants, nine studies, low-quality evidence)
  - Psychiatric disorders occurred in 17% of participants using cannabis-based medicines and in 5% using placebo; (1314 participants, nine studies, low-quality evidence)

Mücke M, Phillips T, Radbruch L, Petzke F, Häuser W. Cannabis-based medicines for chronic neuropathic pain in adults. *Cochrane Database of Systematic Reviews* 2018, Issue 3. Art. No.: CD012182. DOI: 10.1002/14651858.CD012182.pub2.

Neurologic Conditions

- Seizure disorders
  - Plenty of media attention for childhood epilepsies – has been studied since mid-1970s
  - CBD as primary AED along with CBDV and THCV
  - GW Pharmaceuticals study in Dravet syndrome with 20mg/kg CBD dissolved in sesame oil showed 43% of CBD patients had a ≥50% reduction in convulsive seizures compared to 27% in placebo group
- Parkinson's Disease
  - https://www.youtube.com/watch?v=zNT8Zo_sfwo

Devinsky O, et al. Epilepsia 2014;55(6):791-802
Anderson LC, et al. *Journal of Pediatric Neurology* 2017

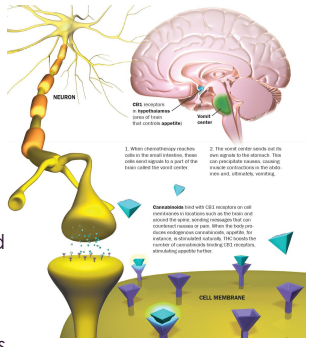
HIV/AIDS

- Improvement in cachexia
  - Improved appetite and caloric intake
- Improved mood
- HIV-related neuropathies
- Effective in tx of nausea/vomiting

Bonn-Miller MO, et al. *Journal of Behavioral Medicine* 2014;37(1):1-10
Badowski ME and Perez SE. *HIV/AIDS* 2016(8):37
Haney M, et al. Psychopharmacology 2007;181(1):170-178
Abrams DI, et al. Neurology 2007(68(7)515-521

Antiemetic

- Central regulation of emesis occurs at the dorsal vagal complex which is populated with CB1 receptors
- Potentially useful in combination with traditional therapy for refractory nausea and vomiting
- Minimal studies comparing cannabis to first line agents limits its clinical use



Chemotherapy Induced N/V

- Machado et al.
  - Synthetic THC in cancer patients
  - Dronabinol showed superior antiemetic activity compared to neuroleptics
- Lane et al.
  - Synergistic effect for dronabinol and prochlorperazine
- Meiri et al.
  - Blinded, placebo controlled comparison between dronabinol and 5-HT3 antagonist
  - Non-inferiority established
  - Greater activity in suppressing anticipatory nausea than 5-HT3 antagonist

GI Disorders

- Can be used for irritable bowel syndrome, Crohn's disease, and chronic diarrhea
  - CB_1 and CB_2 receptors located within the GI system
- In IBS, reduced frequency and severity of nausea episodes
- Improve appetite among Crohn's patients
  - Israeli study resulted in remission of symptoms in more than half of participants

Ligresti A, et al. *Gastroenterology* 2003;125(3):677-687
Naftali T, et al. *Digestive Diseases* 2014;32(4):468-474
Isfort RW and Gerich ME. *Am J Gastroenterol* 2016;111:159-160

Antitumor Effects

- Cannabinoids capable of decreasing tumor growth and metastasis by interfering with migration of cells
  - Promote cancer cell death, inhibit cell invasiveness by reducing the growth of new blood supply needed for tumor growth
  - Liver, prostate, glioblastoma cells
- Nabiximols + temozolomide being studied in glioma patients

Patient Case

- KP is a 79 yo male with RA, depression and chronic lower back pain. He presents to the pharmacy to pick up his monthly dose of oxycodone 10mg IR q4h PRN pain, #120 tabs. He tells you he has a friend who has recently started using medical marijuana for pain and it has helped him. He asks for your opinion in adding it to his current pain regimen. How do you respond?

A. It may allow him to decrease his oxycodone use
B. Mixing opioids and marijuana is too dangerous
C. It is not an approved condition under the NM Medical Cannabis Program
D. No way Jose

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Analgesia

- Analgesic effects may be mediated in part at the level of the spinal cord
  - CB1 receptors: Similar neuroanatomic, neurochemical and pharmacological characteristics to opioid receptors
- Beneficial in neuropathic pain and pain associated with MS and cancer that have not responded to traditional therapies
- Potential to use for acute pain associated with sickle cell disease

Cannabis and Opioid Use

- Approx 140 Americans die each day from opioid overdose
- Health and social costs > $55 billion
- States that had medical cannabis laws had an average of almost 25% fewer overdose deaths each year than states where cannabis remained illegal
  - Included prescription drugs and heroin overdoses
- Animal studies have shown cannabinoid compounds can work synergistically with opioids to mitigate pain

Chronic Pain and Opioid Use

- University of Michigan retrospective study of 185 patients
  - Patients reported cutting their opioid use by more than half in treating their chronic pain
- Israeli study
  - Followed 176 chronic pain patients over 7 months and found 44% stopped taking prescription opioids
- Recent *Journal of Pain* study looked at safety of medical marijuana as an opioid alternative
  - Followed 200 patients using cannabis for chronic pain over 12 months
  - Directly compared medical cannabis users with a control group of chronic pain patients who did not use the drug
  - Results showed some increased risk for non-serious adverse effects in the medical cannabis group but no difference in the risk of serious adverse events

Chronic Pain and Opioid Use

Table 1. Effect of MCP enrollment on opioid prescription patterns (Means comparison).

Variable (N = 66)	Comparison (N = 29)	MCP (N = 37)	P Value
Ceased opioid prescriptions {0,1}	3.4% (1)	40.5% (15)	<0.001
Reduced prescribed daily opioid dosage {0,1}	44.8% (13)	83.8% (31)	0.001
Average daily opioid dosage in the 1st 3 months (mg)	16.2 ± 14.8	24.4 ± 23.3	0.103
Average daily opioid dosage in the last 3 months (mg)	12.3 ± 12.4	12.4 ± 20.1	0.974
Change in prescribed daily opioid dosage (mg)	-3.9 ± 13.2	-12.0 ± 23.4	0.101
Percentage point change in prescribed daily opioid dosage	10.4 ± 114.9	-47.0 ± 63.1	0.013
Male	54.1% (20)	69.0% (20)	0.219
Age	59.7 ± 13.8	53.6 ± 9.5	0.036

Conclusions:
The clinically and statistically significant evidence of an association between MCP enrollment and opioid prescription cessation and reductions and improved quality of life warrants further investigations on cannabis as a potential alternative to prescription opioids for treating chronic pain.

Vigil JM et al. PLoS ONE 2017;12(11):e0187795

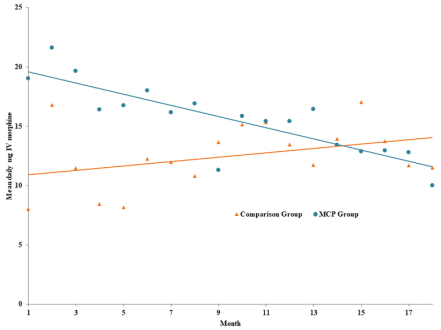


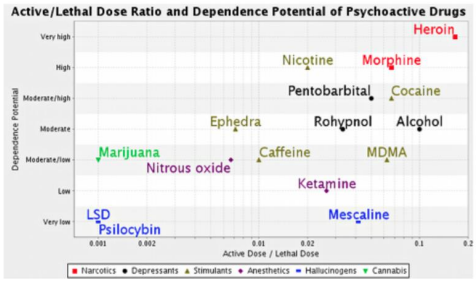
Fig 1. Mean prescribed daily opioid dosage by month. Notes: Month "1" represents the first month post-enrollment for the MCP patients (n = 37) and the fourth month of observation for the comparison group (n = 29). The time trends add a linear representation of the relative change in prescribed daily opioid dosage starting with the time of treatment (enrollment in the MCP).

https://doi.org/10.1371/journal.pone.0187795.g001

THC Tolerance

- Repeated exposure leads to tolerance
  - In animal models, this can include memory disruption, decreased locomotion and antinociception
  - Decreased receptor density and coupling can be more pronounced in some brain regions (hippocampus) than in others (basal ganglia)
  - Tolerance may actually allow for widening the therapeutic window when applied therapeutically
    - Tolerance develops less for some effects vs. others, and some therapeutic effects are less susceptible to tolerance development

Safety Profile



Safety Concerns

- Possible withdrawal symptoms
  - Irritability, insomnia, restlessness, hot flashes
- Difficult to correlate a single serum concentration to any physiologic effect or impairment
  - Impaired driving
  - DUID laws
- Pulmonary effects
- Carcinogens
- Liability
- Diversion
- Safe storage

Safety Concerns

- Early onset (16-18y) marijuana use associated with increased cognitive consequences – decreased attention, IQ & executive function (NIDA funded)
  - Regular use associated with reduced processing speed, attention, executive function and risky sexual behavior
- Brain appears vulnerable to marijuana exposure in adolescence
  - Continued maturation of pre-frontal cortex into early adulthood may be sensitive
    - Structural (decreased gray and increased white matter) and alterations in PFC and cortical thickness
  - Cumulative use over 8yr associated with poor attention functioning

What Do Doctors Think?

2009 AMA recommended review of Schedule I status

2013 NEJM physicians poll citing 76% of physicians believe benefits outweigh risks

2104 Medscape survey showed 56% in favor of legalizing medical cannabis nationally, with 82% support among responding oncologists

Role for Pharmacists?

- 3 states require medical cannabis to be dispensed by board-certified pharmacist – CT, MN, NY
- Review disease states, goals of therapy and then determine appropriate dosing and formulations
- Included in the prescription monitoring database for CT to include notes about the effects of cannabis on a patient's symptoms and conditions as well as how it may interact with other medications
- Conflicting state and federal laws

Future Directions

- Politics and therapeutics are complex and lack uniformity
- Evidence has begun to mount supporting medical cannabis efficacy and legalization
- Needs to be evaluated scientifically by the FDA
  - Sativex in several clinical trials for advanced cancer pain
  - Scheduling issue
- Physicians possess a constitutionally protected right to discuss medical cannabis with their patients
- Position statement needed from various national professional organizations

References

- Pertwee RG. Emerging strategies for exploiting cannabinoid receptor agonists as medicines. *Br J Pharmacol* 2009;156:397-411
- Pacher P, Batkai S, Kunos G. The endocannabinoid system as an emerging target of pharmacotherapy. *Pharmacol Rev* 2006;58(3):389-462
- Stout SM and Cimino NM. Exogenous cannabinoids as substrates, inhibitors, and inducers of human drug metabolizing enzymes: a systematic review *Drug Metabolism Reviews* 2014;46(1):86-95
- Manzanares J, Julian MD, Carrascosa A. Role of the cannabinoid system in pain control and therapeutic implications for the management of acute and chronic pain episodes. *Current Neuropharmacology* 2006;4:239-257
- Pletcher MJ, et al. Association between marijuana exposure and pulmonary function over 20 years. *JAMA* 2012;307(2):173-181
- http://www.cancer.gov/cancertopics/pdq/cam/cannabis/healthprofessional/page2; accessed 12/5/2014
- Grotenhermen F, Russo E, eds. Cannabis and Cannabinoids: Pharmacology, Toxicology, and Therapeutic Potential. Binghamton, NY: The Haworth Press, 2002
- Stockings E, Zagic D, Campbell G, et al. Evidence for cannabis and cannabinoids for epilepsy: a systematic review of controlled and observational studies. *J Neurol Neurosurg Psychiatry*;2018:1-13

References

- Borgelt LM, Franson KL, Nussbaum AM, Wang GS. The pharmacologic and clinical effects of medical cannabis. *Pharmacotherapy* 2013;33(2):195-209
- Khasabova IV, Gielissen J, Chandiramani A, et al. CB_1 and CB_2 receptor agonists promote analgesia through synergy in a murine model of tumor pain. *Behav Pharmacol* 2011;22(5-6):607-616
- Tramer MR, Carroll D, Campbell FA, et al. Cannabinoids for control of chemotherapy induced nausea and vomiting: quantitative systematic review. *BMJ* 2001;323(7303):16-21
- NM Department of Health https://nmhealth.org/about/mcp/svcs/, Accessed 3/22/18
- Noyes R Jr, Brunk SF, Avery DA, et al. Analgesic effect of delta-9-tetrahydrocannabinol and codeine. *Clin Pharmacol Ther* 1975;18(1):84-89
- Carter GT, Flanagan AM, Earleywine M, et al. Cannabis in palliative medicine: improving care and reducing opioid-related morbidity. *Am J Hosp Palliat Med* 2011;28(5):297-303
- Ware MA, Wang T, Shapiro S, Collet JP. Cannabis for the management of pain: Assessment of Safety Study (COMPASS). *Journal of Pain* 2015; 16(12):1233-42

Additional Resources

- Backes M. Cannabis Pharmacy: A Practical Guide to Medical Marijuana. New York: Black Dog and Leventhal Publishers, 2017
- Casarett D. Stoned: A Doctor's Case for Medical Marijuana. New York: Penguin Random House LLC, 2015
- American Association of Colleges of Pharmacy Medical Cannabis Toolkit, July 2016
- Medical Cannabis Institute
  - http://themedicalcannabisinstitute.org/
- Cannabis Training Institute
  - http://www.cannabistraininginstitute.com/
- American Cannabis Nurses Association
  - https://cannabisnurses.org/