Marijuana: Past, Present, and Future

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What is marijuana?

- Plant with 500 chemical compounds, and 100 cannabinoids
- THC & CBD
- THC binds to CB1 receptors
Concentrations of $CB_1$ receptors

- **Basal Ganglia**
  Movement
- **Cerebral Cortex**
  Higher cognitive function
- **Cerebellum**
  Movement
- **Hypothalamus**
  Appetite
- **Hippocampus**
  Learning, memory, stress
- **Medulla**
  Nausea/vomiting, chemoreceptor trigger zone (CTZ)
- **Spinal Cord**
  Peripheral sensation including pain

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- Most-used substance behind alcohol & tobacco
- Number of routes of administration

(CDC, 2017)
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- High variability of concentration

(CDC, 2017)
Figure 1. Increases over Time in the Potency of Tetrahydrocannabinol (THC) in Marijuana and the Number of Emergency Department Visits Involving Marijuana, Cocaine, or Heroin.

Panel A shows the increasing potency of marijuana (i.e., the percentage of THC) in samples seized by the Drug Enforcement Administration (DEA) between 1995 and 2012. Panel B provides estimates of the number of emergency department visits involving the use of selected illicit drugs (marijuana, cocaine, and heroin) either singly or in combination with other drugs between 2004 and 2011. Among these three drugs, only marijuana, used either in combination with other drugs or alone, was associated with significant increases in the number of visits during this period (a 62% increase when used in combination with other drugs and a 100% increase when used alone, P<0.05 for the two comparisons).
What is marijuana?

- Plant with 500 chemical compounds, and 100 cannabinoids
- THC & CBD
- THC binds to CB1 receptors
- Most-used substance behind alcohol & tobacco
- Number of routes of administration
- High variability of concentration
- Addictive substance
  - Up to 30% of active users have a SUD
  - 1:10 adults, 1:6 adolescents

(CDC, 2017)
What is “medical” marijuana?

- In Illinois since 2013
- Not approved by the FDA, nor prescribed/dispensed like medicine
  - **Medicine**: Marinol, Sativex, and Epidiolex
What is “medical” marijuana?

- In Illinois since 2013
- Not approved by the FDA, nor prescribed/dispensed like medicine
  - **Medicine**: Marinol, Sativex, and Epidiolex
  - **Not medicine**: Buying whatever you like from a dispensary, using it however and whenever you want
- Have you ever looked at what product is actually being sold?
  - **Local Example / Another Local Example**
What does research show it is good for?

**CONCLUSIONS FOR: THERAPEUTIC EFFECTS**

There is **conclusive or substantial evidence** that cannabis or cannabinoi**ds** are effective:
- For the treatment for chronic pain in adults (cannabis) (4-1)
- Antiemetics in the treatment of chemotherapy-induced nausea and vomiting (oral cannabinoids) (4-3)
- For improving patient-reported multiple sclerosis spasticity symptoms (oral cannabinoids) (4-7a)

There is **moderate evidence** that cannabis or cannabinoids are effective for:
- Improving short-term sleep outcomes in individuals with sleep disturbance associated with obstructive sleep apnea syndrome, fibromyalgia, chronic pain, and multiple sclerosis (cannabinoids, primarily nabiximols) (4-19)

In Illinois, it is approved (by the legislature) for **39** conditions...starting at age 18
- Agitation of Alzheimer’s disease
- HIV/AIDS
- Amyotrophic lateral sclerosis (ALS)
- Arnold-Chiari malformation
- Cancer
- Causalgia
- Chronic inflammatory demyelinating polyneuropathy
- Crohn’s disease
- CRPS (complex regional pain syndrome Type II)
- Dystonia
- Fibrous Dysplasia
- Glaucoma
- Hepatitis C
- Hydrocephalus
- Hydromyelia
- Interstitial cystitis
- Lupus
- Multiple Sclerosis
- Muscular Dystrophy
- Myasthenia Gravis
- Myoclonus
- Nail-patella syndrome
- Neurofibromatosis
- Parkinson’s disease
- Post-Concussion Syndrome
- Post-Traumatic Stress Disorder (PTSD)
- Reflex sympathetic dystrophy
- Residual limb pain
- Rheumatoid arthritis
- Seizures (including those characteristic of Epilepsy)
- Severe fibromyalgia
- Sjogren’s syndrome
- Spinal cord disease (including but not limited to arachnoiditis)
- Spinal cord injury is damage to the nervous tissue of the spinal cord with objective neurological indication of intractable spasticity
- Spinocerebellar ataxia
- Syringomyelia
- Tarlov cysts
- Tourette syndrome
- Traumatic brain injury
- Cachexia/wasting syndrome
“Medical” Marijuana

- Where is the medical evidence for this?
Narrative review of the safety and efficacy of marijuana for the treatment of commonly state-approved medical and psychiatric disorders

Katherine A Belendiuk¹, Lisa L Baldini² and Marcel O Bonn-Miller³,⁴,⁵*

Abstract

The present investigation aimed to provide an objective narrative review of the existing literature pertaining to the benefits and harms of marijuana use for the treatment of the most common medical and psychological conditions for which it has been allowed at the state level. Common medical conditions for which marijuana is allowed (i.e., those conditions shared by at least 80 percent of medical marijuana states) were identified as: Alzheimer's disease, amyotrophic lateral sclerosis, cachexia/wasting syndrome, cancer, Crohn's disease, epilepsy and seizures, glaucoma, hepatitis C virus, human immunodeficiency virus/acquired immunodeficiency syndrome, multiple sclerosis and muscle spasticity, severe and chronic pain, and severe nausea. Post-traumatic stress disorder was also included in the review, as it is the sole psychological disorder for which medical marijuana has been allowed. Studies for this narrative review were included based on a literature search in PsycINFO, MEDLINE, and Google Scholar. Findings indicate that, for the majority of these conditions, there is insufficient evidence to support the recommendation of medical marijuana at this time. A significant amount of rigorous research is needed to definitively ascertain the potential implications of marijuana for these conditions. It is important for such work to not only examine the effects of smoked marijuana preparations, but also to compare its safety, tolerability, and efficacy in relation to existing pharmacological treatments.

Keywords: Cannabis, Medical marijuana, Marijuana, Medicine, Treatment, Alzheimer's disease, ALS, Cachexia, Cancer, Crohn's disease, Epilepsy, Seizures, Glaucoma, Hepatitis C virus, HCV, HIV, AIDS, Multiple sclerosis, MS, Pain, Nausea, Vomiting, Post-traumatic stress disorder, PTSD
“Medical” Marijuana

There is no or insufficient evidence to support or refute the conclusion that cannabis or cannabinoids are an effective treatment for:

- Cancers, including glioma (cannabinoids) (4-2)
  - Cancer-associated anorexia cachexia syndrome and anorexia nervosa (cannabinoids) (4-4b)
  - Symptoms of irritable bowel syndrome (dronabinol) (4-5)
- Epilepsy (cannabinoids) (4-6)
- Spasticity in patients with paralysis due to spinal cord injury (cannabinoids) (4-7b)
- Symptoms associated with amyotrophic lateral sclerosis (cannabinoids) (4-9)
  - Chorea and certain neuropsychiatric symptoms associated with Huntington’s disease (oral cannabinoids) (4-10)
- Motor system symptoms associated with Parkinson’s disease or the levodopa-induced dyskinesia (cannabinoids) (4-11)
- Dystonia (nabilone and dronabinol) (4-12)
  - Achieving abstinence in the use of addictive substances (cannabinoids) (4-16)
  - Mental health outcomes in individuals with schizophrenia or schizophreniform psychosis (cannabidiol) (4-21)

- What about glaucoma?

Summary: Although marijuana can lower the intraocular pressure (IOP), its side effects and short duration of action, coupled with a lack of evidence that it use alters the course of glaucoma, preclude recommending this drug in any form for the treatment of glaucoma at the present time.

- PTSD

Linden Oaks BEHAVIORAL HEALTH Healthy Driven
“Medical” Marijuana

- Where is the medical evidence for this?
- Who created this list?
Adverse Impact

- What about negative health effects?
<table>
<thead>
<tr>
<th>Effects of short-term use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impaired short-term memory, making it difficult to learn and to retain information</td>
</tr>
<tr>
<td>Impaired motor coordination, interfering with driving skills and increasing the risk of injuries</td>
</tr>
<tr>
<td>Altered judgment, increasing the risk of sexual behaviors that facilitate the transmission of sexually transmitted diseases</td>
</tr>
<tr>
<td>In high doses, paranoia and psychosis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effects of long-term or heavy use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addiction (in about 9% of users overall, 17% of those who begin use in adolescence, and 25 to 50% of those who are daily users)*</td>
</tr>
<tr>
<td>Altered brain development*</td>
</tr>
<tr>
<td>Poor educational outcome, with increased likelihood of dropping out of school*</td>
</tr>
<tr>
<td>Cognitive impairment, with lower IQ among those who were frequent users during adolescence*</td>
</tr>
<tr>
<td>Diminished life satisfaction and achievement (determined on the basis of subjective and objective measures as compared with such ratings in the general population)*</td>
</tr>
<tr>
<td>Symptoms of chronic bronchitis</td>
</tr>
<tr>
<td>Increased risk of chronic psychosis disorders (including schizophrenia) in persons with a predisposition to such disorders</td>
</tr>
</tbody>
</table>

* The effect is strongly associated with initial marijuana use early in adolescence.

(Volkow et al., 2014)
Adverse Impact

▪ What about negative health effects?
▪ Do THC concentration levels matter?
▪ Why aren’t physicians asking for this?
  – Risk/benefit ratios, lack of evidence
▪ Drugged driving – how impaired are you, really?
Walk And Turn Clues & Observations

Clues

- Starts too Soon
- Loses Balance
- Stops
- Misses Heel-Toe
- Steps off Line
- Arms to Balance
- Incorrect # Steps
- Improper Turn
- Tremors

Observations

Percent of Cases (%)
Number of WAT Clues ≥2 considered “Impaired”

Median = 0

Median = 3

Cases

Controls

p < 0.001

p > 0.05, THC ≥5 vs. <5 μg/L
Number of Finger To Nose Misses

Median = 0

p < 0.0001

p > 0.05, THC ≥ 5 vs. < 5 μg/L

Median = 5
THC, 11-OH-THC & THCCOOH Plasma Concentrations After Smoking Cannabis

3.55% THC

THC detected 3 - 27 h
THCCOOH 2 – 7 days
LOQ 0.5 μg/L

Huestis et al
*J Anal Toxicol* 1992
Adverse Impact

- What about negative health effects?
- Do THC concentration levels matter?
- Why aren’t physicians asking for this?
  - Risk/benefit ratios, lack of evidence
- Drugged driving – how impaired are you, really?
  - How do edibles factor into this?
Mean Blood THC Concentrations in Occasional Smokers After 50.6 mg THC by 3 Administration Routes

- Smoking
- Vaporization
- Oral

N=9, LOQ=0.5
Adverse Impact

- What about negative health effects?
- Do THC concentration levels matter?
- Why aren’t physicians asking for this?
  - Risk/benefit ratios, lack of evidence
- Drugged driving – how impaired are you, really?
  - How do edibles factor into this?
- Does it have a real-world impact?
Increase in MVA Claims

Estimated effects of recreational marijuana sales in 3 states
Change in claim frequency for vehicles up to 33 years old, 2012-16

(HLDI, 2017)
THE OVERALL NUMBER OF TRAFFIC DEATHS RELATED TO MARIJUANA HAS ALSO RISEN SHARPLY IN CO

Nota: only 49% of operators involved in traffic deaths were tested for drug impairment in 2015, consistent with past practices.

Source: Fatality Analysis Reporting System and Colorado Department of Transportation (CDOT), as reported in Rocky Mountain HIDTA report #4 (September 2016)
Adverse Impact

- What about negative health effects?
- Do THC concentration levels matter?
- Why aren’t physicians asking for this?
  - Risk/benefit ratios, lack of evidence
- Drugged driving – how impaired are you, really?
  - How do edibles factor into this?
- Does it have a real-world impact?
- Is it a “gateway drug?”
Gateway Drug?

Past Month Prevalence of Cigarette, Alcohol and Other Illicit Use Among Youth Aged 12-17 by Past Month Marijuana Use, 2014

![Bar chart showing prevalence of marijuana use and related substance use among youth aged 12-17 in 2014.](chart.png)

SAMHSA's Center for Behavioral Health Statistics and Quality: NSDUH 2014

(DuPont, 2017)
Gateway Drug?

Prevalence Of Heroin Use Among Marijuana Users in the US

SAMHSA’s Center for Behavioral Health Statistics and Quality: NSDUH 2015

(DuPont, 2017)
Delivery System – Is this Medicine?

- How is medicine approved for the public?
  - Replicated science, multi-phase FDA trials

- How is medicine prescribed?
  - Dose, frequency, type, concentration

- How is medicine produced?
  - Uniform, standardized

- Do we smoke any medicine you’re aware of?
  - Or use bongs, dab kits, etc.

- How many of those 39 conditions do you have at age 18?

- What demographic do the products appear to be marketed at?
So what’s this all about then?

- To review…
  - Lack of evidence to support most medical claims
  - Dispensing system that is unspecific and promotes self-medication
  - Selling concentrates that have up to 93% THC
  - Low age for entry, products aimed to appeal to kids and young adults

- Do these ads look familiar?
Every doctor in private practice was asked:
— family physicians, surgeons, specialists...
doctors in every branch of medicine—
"What cigarette do you smoke?"

According to a recent Nationwide survey:

More Doctors Smoke Camels
than any other cigarette!

Not a guess, not just a trend... but an actual fact based on the statements of doctors themselves to nationally known independent research organizations.

Yes, your doctor was asked... along with thousands of other doctors from Maine to California. And they named their choice—the brand that most doctors named at their smoke in Camels. These nationally known independent research organizations found this to be a fact.

Nothing unusual about it. Doctors smoke for pleasure just like the rest of us. They appreciate, just as you, a milky taste that’s cool and easy on the throat. They enjoy a full, rich flavor of specially blended tobacco. And they named Camels... more than named Camel than any other brand. Next time you buy cigarettes, try Camels.
20,679 Physicians say "LUCKIES are less irritating"

"It's toasted" Your Throat Protection against irritation against cough
THE SHOCK OF FACING
what your figure may become

When Tempted
Reach for a LUCKY
instead
“It’s toasted”

Lucky Strike
Cigarettes

THE SPIRIT OF YOUTH
carry on — avoid that future shadow

Avoid that future shadow
by refraining from over-indulgence.

We do not represent that smoking Lucky Strike Cigarettes will cause the reduction of flesh. We do declare that when tempted to do yourself any harm, if you will “Reach for a Lucky,” instead, you will find, beyond over-indulgence in things that cause excess weight and, by avoiding ever indulgence, maintain a slim figure.

Your Throat Protection — against irritation — against cough.
How an addiction-profiteering industry is born

▪ **Phase 1**
  – Associate an addictive substance with broad medical benefit, despite lack of evidence
  – Promote public misinformation and confusion
  – Market to teenagers and young adults
    • What the kids are saying? Not an accident.
    • And who are these people, exactly?

▪ **Phase 2**
  – Commercialization
    • Bills to commercialize cannabis introduced in both house and senate

▪ Take a guess: in Illinois, who has exclusive cannabis sale rights for the first 12 months after commercialization?
Summary

- Actual science-based medical applications for cannabinoids are extremely limited
- Our current delivery system is not consistent with medicine and promotes self-medication and youth use
- Associating smoking marijuana (the plant) with medicine is a public health concern
- Big Cannabis is knocking at the door
Thank You!