Adolescent Marijuana Use

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Disclosure Statement

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• I do not intend to discuss unapproved/investigative use of commercial product(s)/device(s) in my presentation
Learning Objectives

• Describe marijuana use amongst adolescents
• Identify the harmful effects of marijuana use in adolescents
• Formulate an approach to evaluating and intervening when an adolescent is using marijuana

Legal Status of Marijuana
Prevalence of Adolescent MJ Use

• Most widely abused illicit drug in the US
• Most MJ use begins in adolescence
• Daily MJ use has remained steady over the past 5 years for 10th and 12th graders
• 8th graders have shown a decline in their MJ use over the past 5 years

Monitoring the Future 2018

Prevalence of MJ Use

DAILY MARIJUANA USE MOSTLY STEADY

<table>
<thead>
<tr>
<th></th>
<th>2008 – 2018</th>
<th>2018</th>
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</thead>
<tbody>
<tr>
<td>8th grade</td>
<td>0.7%</td>
<td>3.4%</td>
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<tr>
<td>10th grade</td>
<td>4.1%</td>
<td>5.8%</td>
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FIVE-YEAR TREND IN DAILY MARIJUANA USE REMAINS STEADY FOR 10TH AND 12TH GRADERS BUT SHOWS A DECLINE IN 8TH GRADERS

Drugabuse.gov
Prevalence of MJ Use

- Lowest levels of past-year use among 8th and 10th graders reached in 2016
- Perception of harm from MJ and disapproval of use are trending downward
- 26.7% of 12th graders report that regular MJ use poses a great risk
- 66.7% of 12th graders report that they disapprove of adults smoking MJ regularly

MTF 2018
Prevalence of Annual MJ Use

- 8th grade: 10.5%
- 10th grade: 27.5%
- 12th grade: 35.9%

MTF 2018

Daily Use of MJ

- 8th grade: 0.7%
- 10th grade: 3.4%
- 12th grade: 5.8%
1 in 16 12th graders use MJ daily

Ways to Use MJ
Prevalence of Vaping MJ Over the Past Year

<table>
<thead>
<tr>
<th>Grade</th>
<th>13.1%</th>
<th>12.4%</th>
<th>4.4%</th>
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<tbody>
<tr>
<td>8th</td>
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<td>10th</td>
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<tr>
<td>12th</td>
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MTF 2018

Prevalence of Vaping MJ Over the Past Month

<table>
<thead>
<tr>
<th>Grade</th>
<th>2.6%</th>
<th>7.5%</th>
<th>7.0%</th>
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<tbody>
<tr>
<td>8th</td>
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<td>10th</td>
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<tr>
<td>12th</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

MTF 2018
Do Adolescents Think MJ is Harmful?

75% of teens think that cannabis is not harmful

Hughes A et al State Estimates of adolescent marijuana use and perceptions of risk of harm from marijuana 2015

Every day, 3,287 Teens Use MJ for the 1st Time
Risk Factors for MJ Use

- Genetic factors
- Family history
- Minimal parental supervision
- Drug availability
- High risk peer group
- Need for thrill seeking activities

Impact of Medical Marijuana Laws

- Exposure to MJ advertising associated with both intention to use and use of MJ 1 year later
- Teens living in states that have passed MML are less likely to view MJ as harmful
- Rates of MJ use have not increased significantly in states that have passed MML
Colorado’s teen marijuana use dips after legalization

What is Marijuana?

- Cannabis indica
  - Relaxation
  - Lethargy
  - Sleep
- Cannabis sativa
  - Increased alertness
  - Increased energy
What Is Marijuana?

- Delta-9-THC: psychoactive
- THC: dried leaves, seeds, stems, oil, and flowers of the plant
- Euphoria lasts minutes to hours

Cannabinoids

- C sativa contains 60 cannabinoids, as well as 400 other chemicals
- Cannabinoids: cannabidiol (CBD), cannabigerol (CBG), and cannabinol (CBN)
  - Are not psychoactive (phytocannabinoids)
- CB1 receptors: CNS
- CB2 receptors: immune cells and throughout the body
Marijuana Potency

- **1960s-1970s**: MJ contained 1-2% THC
  - Hawaiian sensimilla: 3%
- **THC content has increased by 2-7 times**
- **Potency in the US increased to 20%**

Types of Marijuana

- **Hashish**: derived from dried exudate from the top and underside of C sativa leaves
  - Potency ranges from 10%-20%
- **Hashish oil**: concentrated hashish distillate
  - Potency ranges from 15%-30%
- **Sensimilla**: made from the seedless female flower of the cannabis plant
- **Blunt**: cigarette or cigar that is filled with marijuana
- **Sherms (or water or wet)**: a joint is dipped into PCP and dissolved in an organic solvent, such as formaldehyde
Marijuana Extracts

- Solvent-based and solvent-less MJ concentrates are much more potent than the flower alone
- Solvents used to extract the THC include CO2, butane, or alcohol
- Cannabis oils are used in vape pens and capsules

Marijuana Extracts

- Hash oil or honey oil-gooey liquid
- Shatter – hard, amber colored solid
- Shatter is easy to manipulate and less messy
Marijuana Extracts

• Pull and snap: honey colored with a taffy-like consistency
• Distillate: refined, or distilled, version of cannabis
  ▫ It is run through a purification process several times
  ▫ Looks like honey in color and consistency

Marijuana Extracts: Crystalline

• Solid extract
• Processes involving filters used to destroy the plant matter remaining in the extract, preserve the THC, and remove left over solvents
• Clear crystals
• 99% THC
THC Extracts: Wax

- Texture of candle wax
- Budder/badder: gooey, viscous wax
- Crumble: crumbled wax
- Honeycomb: wax with holes, resembles a honeycomb
- Potency ranges from 50%-90%

Dabbing

- Flash vaporization of cannabis extracts by applying to a hot surface and inhaling the vapor
Synthetic Cannabinoids

- John W. Huffman, professor of organic chemistry, developed synthetic marijuana to study the interaction between drugs and brain receptors.
- No cannabinoids listed in the ingredients
- Marketed as incense
- Contains HU-210, which is a synthetic cannabinoid that is 50-400 times more potent than THC and lasts longer

Synthetic MJ Adolescent Use

- 3.5% of 12th graders
- 2.9% of 10th graders
- 1.6% of 8th graders
- Lowest rates in 7 years

MTF 2018
Adverse Effects of Synthetic Cannabinoids

- Psychotic episodes
- Agitation & anxiety
- Tachycardia: 110-150 bpm
- Elevated blood pressure: 140-160/100-110 range
- Suicidal ideation and attempts
- Seizures
- Intense hallucinations
- MI and CVAs in young people

Is MJ Beneficial?
Benefits of Marijuana in Adults

- Management of neuropathic pain
- Management of hypertension
- Post-stroke neuroprotection
- Management of multiple sclerosis
- Cannabinoids inhibit cancer growth, angiogenesis, and metastasis
- Remedy for inflammation
- Remedy for diarrhea in Crohn’s Disease
- Treatment for dystonia,
- Treatment for rheumatoid arthritis
- Treatment for glaucoma
- Treatment for N/V (chemo)
- Treatment of epilepsy
- Treatment of wasting/cachexia
- Treatment for Huntington’s Chorea
- Block negative memories in PTSD
- Adjuvant treatment for prostate CA

Medical Marijuana: High Quality Evidence for Treatment of Health Conditions

- Chronic pain
- Neuropathic pain
- Spasticity due to multiple sclerosis
Medical Marijuana: Low-Quality Evidence to Treat Health Conditions

- Nausea and vomiting due to chemotherapy
- Weight gain in HIV infected patients
- Sleep disorders
- Tourette’s syndrome

Childhood Seizures

- Promising evidence that CBD oil is effective
Adolescent Use of Medical Marijuana

- ADD/ADHD
- Anxiety and depression
- Autism
- Anorexia
- Chronic pain
- N/V related to chemotherapy
- No evidence on efficacy/harms

What Are the Health Impacts of MJ Use?

Amerman S & Tau G Weeding Out the Truth: Adolescents and Cannabis 2016
Short-term Side Effects of MJ

- Dizziness
- Dry mouth
- Nausea
- Fatigue
- Somnolence/drowsiness
- Euphoria
- Vomiting
- Disorientation
- Confusion
- Loss of balance
- Hallucinations
- Short-term memory loss
- Anxiety/panic attacks
- Delayed reaction times

Wang et al 2008; Borgelt et al 2013

Marijuana and the Lungs
One joint = two to five cigarettes

MJ and the Lungs

- MJ smoke contains volatile chemicals and tar
- Large airway inflammation
- Increased airway resistance
- Lung hyperinflation
- Chronic bronchitis/increased cough
- Increased outpatient medical visits for respiratory problems
Is There Evidence That MJ Causes Lung Cancer?

YES

NO

MJ and Lung Cancer: Unclear

- MJ smoke contains carcinogenic combustion products
- 50% more benzoprene and 75% more benzathracene than cigarette smoke
- Higher amounts of ammonia, hydrogen cyanide, and polycyclic aromatic hydrocarbons than cigarette smoke
- MJ smoke is inhaled deeper and held for longer than cigarette smoke
  - Four times more tar deposition

Owen KP et al Marijuana: Respiratory Tract Effects 2013
MJ Smoking and Lung Cancer

- Well-designed population studies have failed to find an increased risk of lung cancer associated with marijuana use
- Comorbid use of MJ and tobacco
- Evidence for antineoplastic effects of MJ – can be protective against CA

Owen KP et al Marijuana: Respiratory tract effects 2013

Marijuana and Barotrauma

- Upper lobe bullous disease has been described in young MJ smokers
- Smoking MJ involves taking a deep breath and holding it
- Valsalva maneuver
- Pneumothorax (“bong lung”)
- Pneumomediastinum and pneumorachis (air in the spinal canal) have occurred
Aspergillus and MJ

- Aspergillus fumigatus can contaminate MJ
- Immunosuppressed patients (on chemotherapy, renal transplant, and AIDS) have developed chronic pulmonary aspergillosis
- Uncommon

Owen KP et al Marijuana: Respiratory tract effects 2013

Cardiac Effects of MJ

- THC targets CB1 receptors, which are found in the myocardium, vascular smooth muscle, and endothelium
- Bradycardia
- Vasodilation
- Hypotension
- Negative inotropic effects
- Synthetic cannabinoids (Spice, K2) have 100x the potency of delta-THC

Hill GED, et al Chronic MJ and synthetic cannabinoid-induced toxic myocarditis and end-stage cardiomyopathy: Management with mechanical circulatory support as a bridge-to-transplantation 2018
Cardiac Effects of MJ

- Acute or chronic MJ or synthetic cannabinoid abuse linked to major adverse cardiovascular events
- Myocardial infarction
- Arrhythmias
- Stroke
- Cardiomyopathy
- Sudden cardiac death

Cardiovascular Emergencies Associated With MJ Use

- Acute coronary syndrome
- Cardiac arrhythmias
- Ischemic stroke
- Stress cardiomyopathy
- Sudden death
- Acute myocardial infarction
- Vasculopathy
  - Cannabis arteritis
  - Migratory thrombophlebitis
  - Renal artery dissection

Singh et al Cardiovascular complications of marijuana and related substances: A review 2017
Cannabinoid Hyperemesis Syndrome

- Cyclic episodes of vomiting, nausea, and mild abdominal pain
- Marijuana precedes most cyclic vomiting attacks by years (some cases occur after only months of MJ use)
- Reduction and/or resolution of symptoms after cannabis cessation
- Abrupt attacks with accompanying abdominal pain and ER visits and hospitalizations
- Relief of symptoms with hot showers or baths

Cannabinoid Hyperemesis Syndrome: Treatment

- Disruption of the thermoregulatory systems of the hypothalamus is reduced by bathing in hot water
- Supportive therapy: IV fluids, anti-emetic medications
- Hot showers or baths work best
- Hyperemesis phase typically lasts 24-48 hours
- Haldol has shown to be effective anecdotally
- Cessation of cannabis use prevents recurrences
- Prevalence of CHS doubled after legalization of MJ in Colorado
Is MJ Addictive?

I can’t become addicted to MJ, right?

Cannabis Use Disorder: DSM V

- Problematic pattern of cannabis use leading to clinically significant impairment or distress
- Within a 12 month period, need at least 2 of the following:
  - Cannabis often taken at a larger dose or over a longer period of time than intended
  - There is a persistent desire or unsuccessful efforts to cut down or control use
  - A great deal of time is spent in obtaining cannabis, using cannabis, or recovering from its effects
  - Craving, or a strong desire or urge, to use cannabis
  - Recurrent use results in a failure to fulfill major role obligations at work, school, or home
Cannabis Use Disorder: DSM V

- Continued use despite having persistent or recurrent social or interpersonal problems caused by, or exacerbated by, the effects of cannabis
- Important social, occupational, or recreational activities are given up or reduced
- Recurrent cannabis use in situations where it is physically hazardous
- Continued use despite having a persistent physical or psychological problem caused by or exacerbated by use

Cannabis Withdrawal Syndrome

- Symptoms start within 48 hours of stopping use & can last up to 12 weeks
- Irritability, restlessness, anxiety, aggression, and sleep difficulties
- Worst symptoms during the 1st week of abstinence, decreases over 4 weeks
- CNR-1 (cannabis receptor) gene has been linked with cannabis withdrawal symptoms, as well as addiction and craving
MJ Use and Educational Outcomes

- Interferes with attention, motivation, memory, and learning
- Earn lower grades
- More likely to drop out of high school
- May result in an IQ drop up to 8 points
  - Evidence that genetics and family environment lead to both MJ use and lower IQ

What Can Clinicians Do?
Preventive MJ Messages

- Provide factual information
- Discuss the consequences of MJ use during adolescence
- Real stories
- Offer something better to do

How To Decrease MJ Use

- Educate about the potential negative health impacts of cannabis
- Target groups at high risk for substance abuse, including males and those with increased psychological stress
- Encourage youth to delay onset of use as long as possible after adolescence and young adulthood
### MI Tools: Quadrants

<table>
<thead>
<tr>
<th>Good things about using</th>
<th>Good things about quitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not so good things about using</td>
<td>Not so good things about quitting</td>
</tr>
</tbody>
</table>

### SBIRT

- **Screening**: ask if the teen is using MJ
- **Brief Intervention**: provide feedback to the teen, based on what they have told you
- **Referral**: if the teen is interested in receiving help to quit
- **Treatment**: outpatient or inpatient rehab
Problem vs Solution

- Teens do not see their drug use as a problem
- Drug use is a solution to a problem/problems
- Often a solution for mood disorders, abuse, isolation, and anxiety
- Provide support to treat any underlying mental health issues

Racial Disparity In The Criminalization of MJ

- Whites and Blacks use MJ at the same rates
- Blacks are 3.7 times more likely than Whites to be arrested for possession
- Blacks are >10 times likely to go to prison, as compared to Whites
Criminalization of MJ

- Most MJ arrests are treated as misdemeanors (fines, probation)
- Arrest ends up on the person’s record, whether or not it leads to prosecution or conviction
- This can influence the severity of punishment for future offenses
- In most States, MJ convictions lead to:
  - Revocation of a professional license
  - Suspension of a driver’s license
  - Inability to get insurance, mortgage, bank loans
  - Denial of access to public housing
  - Loss of student financial aid

Summary

- Marijuana is widely used by US adolescents
- Evidence that MJ negatively impacts cognition and learning
- Evidence that MJ increases respiratory complaints and some diseases
- Evidence for negative cardiac effects, including myocardial infarction and sudden death
- Black adolescents are criminalized at much higher rates for their marijuana use, compared to White youth