The Adverse Health Effects of Persistent Cannabis Use: Review & Recommendations for Change

Benjamin J. Tuyp, BA

*Vancouver Fraser Medical Program 2014, UBC Faculty of Medicine, Vancouver, BC

ABSTRACT

Cannabis is the world’s most widely used illicit drug. As consumption rates increase, societies are beginning to reconsider its legal status. In order to advise patients and policymakers, clinicians must remain informed of the adverse health effects of marijuana. Established risks include respiratory disease, cardiovascular disease, cognitive impairment, psychotic illness, and motor vehicle collisions. These damages are magnified in heavy users and in those initiating consumption at an early age. This paper focuses on the well-demonstrated harms of persistent marijuana use, providing clinicians with a foundation of knowledge and a series of lower-risk usage guidelines to augment discussions on drug policy and patient risk.

KEYWORDS: cannabis, harm reduction, substance-related disorders, cognition, mental illness

More than 10% of Canadians report cannabis use in the last year, a figure that increases to one-third in the young adult population.1 Public opinion on the drug’s legal status is changing: 66% of Canadians are now in favour of decriminalizing or legalizing marijuana, with 40% calling for taxable distribution.2 In order to participate in discussions with patients and policymakers, clinicians must remain abreast of marijuana’s adverse effects on health. Medically, cannabis has demonstrated efficacy in promoting weight gain, controlling nausea, palliating peripheral neuropathy, and reducing muscle spasticity.3 Recreational users describe benefits including increased relaxation, enhanced sociability, and heightened insight.5 On the other hand, serious and permanent harms can result from marijuana exposure, especially in young-onset and heavy users.

This brief review focuses on the well-demonstrated adverse health effects of marijuana: respiratory disease, cardiovascular disease, cognitive impairment, psychotic illness, and motor vehicle collisions. A set of risk-lowering cannabis use criteria is then introduced.1 At the end of this review, the reader will be able to discuss the risks of marijuana use be able to offer a harm-reducing set of usage guidelines to populations intolerant of abstinence.

Cannabis users ingest delta-9-tetrahydrocannabinol (Δ9-THC), marijuana’s active ingredient, by eating, smoking, or vaporizing the drug. Although smoking remains the most popular method of intoxication, this requires the inhalation of tar, carbon monoxide, and carcinogenic polycyclic aromatic hydrocarbons in addition to Δ9-THC.6 As a consequence, up to one-third of marijuana smokers experience cough, wheeze, and increased sputum production.7 Uncertainty remains as to whether obstructive changes in lung function—as seen in asthma, bronchitis, and emphysema—underlie this symptomatology.7 At the cellular

Correspondence
Benjamin Tuyp, bjtuyp@gmail.com

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level, daily cannabis users demonstrate pre-cancerous histological changes in tracheobronchial epithelium that are equivalent to smokers of 20-30 cigarettes a day. Although numerous case-control studies have investigated relationships between marijuana and lung cancer, many failed to quantify exposure or adjust for concomitant tobacco usage. Several recent, smaller, and more rigorous papers have reported relative lung cancer risks ranging 1.9-5.7 depending on “joint-years” (consuming one marijuana cigarette daily for a year) of use. A unique interpretation of marijuana’s carcinogenicity is presented in a retrospective case-control study of New Zealanders adjusted for age, sex, ethnicity, family cancer histories and tobacco usage. Researchers plotted cannabis and tobacco exposures as continuous variables and demonstrated 8% and 7% increases in lung cancer relative risk (RR) per marijuana “joint-year” and tobacco pack-year, respectively. Systematic reviews conclude that there exists a statistically significant, dose-dependent association between marijuana smoking and lung cancer. Larger well-designed studies are still required to clarify whether this is a causal relationship. For the meantime, users can minimize bronchitic symptoms and odds of developing lung cancer by avoiding cannabis smoking—especially when mixed with tobacco—and opting instead to eat or vaporize marijuana as a means of consumption.

The systemic effects of THC include generalized vasodilation, tachycardia, and mild hypertension. Although such alterations are demonstrably benign in healthy patients, these hemodynamic effects can provoke angina in those with cardiovascular disease. More importantly, the rate of myocardial infarction is increased 4.8 times in the first hour after cannabis use as compared to baseline. This risk is greater than that precipitated by sexual (RR=2.70) or physical (RR=3.45) activity.

The most commonly reported subjective effects of cannabis intoxication include increased relaxation (46%), heightened sensory perception (36%), deeper thought (31%), and increased laughter (29%). When smoked, these effects appear within ten minutes, plateau for approximately two hours, and resolve completely by four hours. Objective neuropsychological testing of users during acute intoxication demonstrates impaired motor coordination, planning and organization, problem solving, decision making, behavioural control, memory recall, and memory encoding. Although transient cognitive changes can lead to long-term sequelae depending upon the decisions made while intoxicated, temporary impairment is to be expected from any mild-altering substance. Keeping this in mind, we shift our focus to the residual and chronic effects of marijuana on brain function. Early studies on the long-term cognitive effects of marijuana did not adjust for abstinence periods or differences in baseline intelligence quotient (IQ). Recent analyses conclude that, in occasional users (<2 joints/week), cognitive impairment correlates with serum Δ9-THC levels. In these individuals, significant impairments in memory are unlikely to persist beyond the intoxication state, and even complex neuropsychological testing does not reveal measurable deficits at 24 hours post-ingestion.

In contrast, heavy users (>5 joints/week) manifest deprivations in verbal memory, working memory, and 2-7 IQ points that endure 7-28 days following cessation. Individuals beginning regular and persistent cannabis use before the age of eighteen demonstrate heightened deficits that are irreversible at one year of follow-up. The results above reinforce two hypotheses. One, that brain dysfunction persists beyond the acute intoxication state in individuals prescribing to heavy, daily or near-daily cannabis use. Two, that chronic marijuana abuse in adolescence has irreversible neurotoxic effects on the developing brain. Given that one in six individuals who initiate use before adulthood will become dependent on the drug, preventing teenage exposure is important in retaining public intellect.

A second reason to delay initiation of marijuana use is the observed association between exposure, impaired school performance, and fewer years of pursued education. Proponents of a causative link attribute this poor academic drive to a cannabis-induced “amotivational syndrome,” while others maintain that the same genetic and social factors predisposing individuals to cannabis use are to blame for less academic initiative. A November 2002 review concludes the truth lies somewhere in the middle, blaming the truncated education of adolescent cannabis users on a combination of cognitively-impairing acute intoxication effects, “affiliation with peers who reject school, and a desire to make an early transition to adulthood.”

In the brain, THC mediates most of its effects through interactions with the endocannabinoid system: a family of receptors that undergoes substantial development during the teenage years and has been implicated in schizophrenia. These observations prompted research that eventually demonstrated an association between adolescent (<18 years old) marijuana use and psychotic disease later in life. Reviews of the evidence conclude this is most likely a causative relationship, with adolescent users being about 5 times more likely to develop subsequent psychosis as compared to abstainers. This risk persists even after excluding transient substance-induced psychotic disorders, and is greatest for the youngest users and those genetically predisposed to schizophrenia.

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As mentioned above, cannabis intoxication increases impulsivity and disinhibition while impairing the planning and accuracy of decision-making—predispersing impaired individuals to engage in potentially injurious behaviour.24 Driving under the influence of cannabis (DUIC) is one dangerous and increasingly common example. The prevalence of DUIC now exceeds driving under the influence of alcohol in some populations; 15.1% and 11.7% of high-school students from one Eastern Canadian study reported committing these respective crimes within the past year.22 This trend is concerning, as topic reviews have concluded cannabis “causes impairment in every performance area that can reasonably be connected with safe driving of a vehicle.”23 Marijuana disrupts motor coordination, visual function, and the management of unexpected events. Although consumers often overestimate their impairment and attempt to compensate by reducing travel speed, current meta-analyses demonstrate that driving within four hours of using cannabis increases motor vehicle collision (MVC) risk 1.92 times.23,24 For comparison, the RR of MVC while impaired by alcohol is 1.38 at a blood alcohol level of 0.05% and 2.69 at 0.08%.25 Evidence of a causal link between cannabis use and MVCs is bolstered by culpability studies. These case-control analyses employ crash experts to determine which drivers are “at-fault” for a collision. Data from this subgroup of research reveal cannabis users are 1.65 times more likely than controls to be “at-fault” for a traffic accident, suggesting that marijuana increases once chances of causing—not simply being involved—in—an MVC.24

The studies cited above each contribute to a growing body of evidence that suggests the majority of cannabis-related harms occur in heavy and high-risk users.19 Exposed adolescents display a higher incidence of psychosis, cannabis dependence, and irreversible cognitive impairment. Heavy consumers are subject to elevations in lung cancer risk and prolonged intellectual dysfunction. Those predisposed to cardiovascular disease, psychotic disorders, or driving while intoxicated are in danger of cannabis-related complications. In spite of ongoing marijuana consumption, the damages associated with this drug can be greatly attenuated by adopting lower-risk patterns of use. A set of five harm-reducing recommendations, influenced by the 2011 Lower Risk Cannabis Use Guidelines for Canada, are presented below.1

First, individuals with cardiovascular disease or a personal or first-degree family history of psychosis must be informed they are particularly vulnerable to marijuana’s hazards. Second, all potential users should be advised that harms will increase proportional to the frequency, duration, and dose of cannabis consumed. Third, marijuana ingestion must be avoided at all costs in those below eighteen years of age. Fourth, users should avoid smoking, or co-ingesting tobacco with, marijuana—opting for vaporized or oral consumption instead.31 Finally, cannabis exposure should not exceed two joints per week, and should not occur within four hours of operating a motor vehicle.

More than one in ten Canadian adults used marijuana last year, making it our nation’s most popular illicit drug.121 Public criticism of cannabis prohibition is intensifying as municipal and federal political parties declare their support for its legalization and taxable distribution.2 In the midst of this changing social environment, it is imperative that medical professionals remain abreast of the harms of marijuana. With the exception of some chronically diseased patients, in whom the risk-benefit profile may be favourable, abstaining from cannabis is the preferred and most effective means of minimizing the individual and public health damages associated with its use. Despite this, clinicians must concede that social trends suggest cannabis will continue to exist as a popular drug of abuse. Hence, in order to minimize marijuana-associated damages, guardians of public health should adopt and provide evidence-based, harm-reducing cannabis use guidelines to those individuals and populations intolerant of abstinence.°

REFERENCES