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Colorado Cannabis Legalization and Its Effect on Emergency Care

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INTRODUCTION

Colorado legalized the use of medical marijuana in 2000, although it was not truly commercialized in the state until the US attorney general ceased the prosecution of marijuana users and suppliers in 2009. The result was striking: from January 2009 to January 2011, the number of registered medical marijuana licenses in Colorado increased from 5,051 to 118,895 (Figure 1).

In 2012, Colorado voted to legalize recreational marijuana beginning in 2014, making it the first state alongside Washington to permit recreational use. Several other states have recently legalized the use of medical or recreational marijuana, with other states considering similar measures (Figure 2).¹ Given this trend, emergency physicians in training will likely be confronted with increasing volumes of marijuana-related emergency department (ED) visits and may learn from Colorado's recent experience with increased availability of marijuana products.

THE EPIDEMIOLOGIC EFFECT OF LEGALIZATION

Although the significant increase in medical marijuana registrations does not prove its increased use, this inference is supported by various survey data. According to the National Survey on Drug Use and Health, the percentage of young Coloradan adults aged 18 to 25 years reporting marijuana use within the past year increased significantly after medical marijuana legalization (35% in 2007 to 2008 versus 43% in 2010 to 2011). Simultaneously, the percentage of adults aged 26 years or older perceiving “great risk” to marijuana use significantly decreased, from 45% to 31%.²

Interstate comparisons also show a higher prevalence of marijuana use in states in which it has been legalized versus those in which it has not. According to National Survey on Drug

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Use and Health responses from 2011 to 2013, the prevalence of Colorado adults endorsing marijuana use within the last month was 19% compared with a national prevalence of 12%.³ According to data from the National Epidemiologic Survey on Alcohol and Related Conditions, residents of states with medical marijuana legalization were twice as likely to endorse marijuana use compared with residents of states without legalized medical marijuana.⁴

THE EFFECT OF LEGALIZATION ON EMERGENCY CARE

Not surprisingly, increased marijuana use after legalization has been accompanied by an increase in the number of ED visits and hospitalizations related to acute marijuana intoxication. Retrospective data from the Colorado Hospital Association, a consortium of more than 100 hospitals in the state, has shown that the prevalence of hospitalizations for marijuana exposure in patients aged 9 years and older doubled after the legalization of medical marijuana (15 per 100,000 hospitalizations in 2001 to 2009 versus 28 per 100,000 hospitalizations from 2010 to 2013; $P < .001$) and that ED visits nearly doubled after the legalization of recreational marijuana (22 per 100,000 ED visits in 2010 to 2013 versus 38 per 100,000 ED visits from January to June of 2014; $P < .001$), although these findings may be limited because of stigma surrounding disclosure of marijuana use in the prelegalization era. However, this same trend is reflected in the number of civilian calls to the Colorado poison control center. In the years after both medical and recreational marijuana legalization, the call volume for marijuana exposure doubled compared with that during the year before legalization (medical marijuana legalization: 44 calls in 2010 versus 95 calls in 2011, $P < .001$; recreational marijuana legalization: 127 calls in 2013 versus 221 calls in 2014, $P < .001$).³

Acute Marijuana Intoxication

The marijuana plant, or *Cannabis* spp, contains more than 80 natural cannabinoid compounds that exert their clinical effects through their action on cannabinoid receptors located throughout the body.⁵ The most well-known cannabinoid is Δ^9 -tetrahydrocannabinol (THC) and is responsible for marijuana's psychotropic effects, which are mediated primarily through cannabinoid receptor 1 in the central nervous system. Marijuana products are predominantly smoked, vaporized, or ingested, with varying bioavailability and pharmacokinetics for each method.⁶

The management of acute marijuana intoxication consists primarily of supportive care. In our experience, neuropsychiatric symptoms such as agitation, psychosis, and anxiety are well managed by benzodiazepines, whereas gastrointestinal symptoms are responsive to traditional antiemetics such as ondansetron, metoclopramide, or butyrophenones when these first-line agents fail. Cardiovascular symptoms, such as tachycardia and hypertension, can be treated with benzodiazepines and intravenous fluid. We do not recommend routine urine toxicology screening when history and physical examination are consistent with marijuana use. Diagnostic confirmation adds little value in the management of acute intoxication, except in the case of unintentional pediatric ingestion, in which urine toxicology screening may provide important information to child protective service investigators.

The majority of adult patients with acute marijuana intoxication can be discharged from the ED after symptomatic improvement or sent home with a sober driver when symptoms are limited. Rarely, patients with severe intoxication may require admission for persistent neuropsychiatric symptoms in the form of either agitation or somnolence. Although there have been case reports of fatal cardiovascular events in the setting of marijuana use,^{7,8} to our knowledge there are no convincing data that demonstrate cardiac toxicity.

Marijuana products are most commonly smoked, although edible products are becoming increasingly common and commercialized. The THC content of edible products can be highly variable because of lack of federal regulation and at times can exceed that of inhaled products.^{9,10} Patients presenting with intoxication from edible marijuana may also exhibit a more pronounced toxidrome because of the delayed onset of action from oral absorption; peak plasma THC concentrations occur in 3 to 10 minutes with inhalation versus 2 to 4 hours with ingestion.¹¹ This delayed effect may provoke inexperienced marijuana users to redose edible products several times before experiencing the clinical effects of the first dose. In some instances, the effects of edible marijuana ingestion can be severe, with at least 1 reported suicide in Colorado linked to edible marijuana-induced psychosis.¹²

Emergency physicians in training may also encounter patients presenting with intoxication from synthetic cannabinoids, commonly referred to by their street names of “spice” or “K2.” Synthetic cannabinoid products are variable in their chemical content and toxicity. They are highly potent and produce profound neuropsychiatric and cardiovascular symptoms,^{13,14} with recent case reports of seizures, renal failure, and death resulting from their use.¹⁵ Although the overall symptomatology of patients presenting with synthetic cannabinoid intoxication is more pronounced, management remains supportive with benzodiazepines and intravenous fluid. Standard urine toxicology screening almost uniformly does not detect synthetic cannabinoids, and advanced confirmatory testing such as liquid chromatography–tandem mass spectrophotometry lags behind outbreaks of novel synthetic cannabinoids.¹⁶

Cannabinoid Hyperemesis Syndrome

Marijuana legalization may also eventually contribute to increased ED visits for the sequelae of chronic marijuana use, such as the recently described cannabinoid hyperemesis syndrome.¹⁷ Patients with cannabinoid hyperemesis present to the ED with periodic bouts of intractable vomiting that are unresponsive to traditional antiemetics such as ondansetron. On further interview, patients typically describe years of habitual marijuana use and stereotypical relief of symptoms with hot showers or bathing—in our experience, even to the point of inquiring about the availability of a hot shower in the ED. We observed a doubling in ED visits for cyclic vomiting after the legalization of medical marijuana in Colorado in 2009 (41 per 113,262 visits prelegalization versus 87 per 129,095 visits postlegalization), although the absolute number of visits remained modest.¹⁸

Evidence for best treatment of cannabinoid hyperemesis is lacking. Case reports point to the successful use of butyrophenones for recalcitrant vomiting,¹⁹ and we have found success with intravenous haloperidol at a dose of 2.5 mg, repeated at 5 mg if needed. In our experience, patients with intractable symptoms are good candidates for ED observation protocols in hospitals that have this capacity. For long-term relief, patients should be

counseled on the cessation of marijuana use as the primary means to achieve complete resolution of symptoms.

Pediatric Exposures

A particularly concerning trend in emergency care after marijuana legalization has been the increase in pediatric visits for unintentional marijuana exposure. In a retrospective chart review of ED visits at a tertiary children's hospital in Colorado, unintentional marijuana exposures in children younger than 12 years increased significantly after the legalization of medical marijuana in 2009 (0 of 790 total ingestions prelegalization versus 14 of 588 total ingestions postlegalization; $P < .001$).²⁰ This same trend was reflected in other states with legalized medical marijuana, according to National Poison Data System calls for pediatric marijuana exposure, with call rates in legalized states increasing by 30% after legalization.²¹

Edible marijuana products pose unique risk for pediatric exposure because of their brightly colored packaging and formulation into candies and other sweets.¹⁰ In contrast to adult patients, pediatric patients typically present with central nervous system depression,^{20,21} potentially causing airway compromise or risk of aspiration. We recommend that pediatric patients younger than 6 years and presenting with central nervous system depression be observed until symptoms resolve either in the ED or in an inpatient setting. In pediatric patients aged 6 years or older, disposition should be determined according to a provider assessment of symptom severity, patient comorbidities, and reliability of caregivers. Pediatric patients presenting without altered mental status may be discharged if they remain asymptomatic 4 hours after ingestion.

CONCLUSIONS

The Colorado experience with medical and recreational marijuana legalization suggests several trends that are likely to become increasingly prevalent in the future practice of current emergency medicine residents as more states pursue legalization. It is clear that marijuana availability and use in Colorado significantly increased after the commercialization of medical marijuana. Providers in states with impending legalization measures should become familiar with the symptoms and management of acute marijuana intoxication, as well as understand the effects on chronic diseases frequently observed in the ED. A systematic review of the public health implications of retail marijuana legalization performed by the Colorado Department of Public Health can be accessed online.³

Emergency physicians should be particularly aware of the unique characteristics of edible marijuana products, which can result in severe symptoms in novice users or children. Additionally, ED providers should be aware of an increasing number of motor vehicle drivers under the influence of marijuana.²² Although it is not clear that marijuana is responsible for increased rates of motor vehicle crashes, concomitant marijuana use can diminish clinical sobriety and cloud physical examination, particularly in regard to cervical spine clearance.

This review does not address the therapeutic benefits of medical marijuana, because doing so would recapitulate an abundance of existing literature. ED providers should be prepared,

however, to address an increasing frequency of questions from patients that are based on references from popular culture, such as the use of marijuana for seizure disorder,²³ chronic pain, and substitution for opioid therapy,^{24–26} as well as adverse health effects of long-term marijuana use.²⁷ Most important, emergency physicians in training should understand that a larger proportion of ED patients will be using marijuana products and engage their patients in open discussion of the risks and benefits of use. It is apparent that emergency physicians in training will thus need to achieve a broader knowledge of marijuana-related issues than previous generations of emergency physicians, and to this end, residency program directors should make an effort to integrate this topic into their residency curriculums.

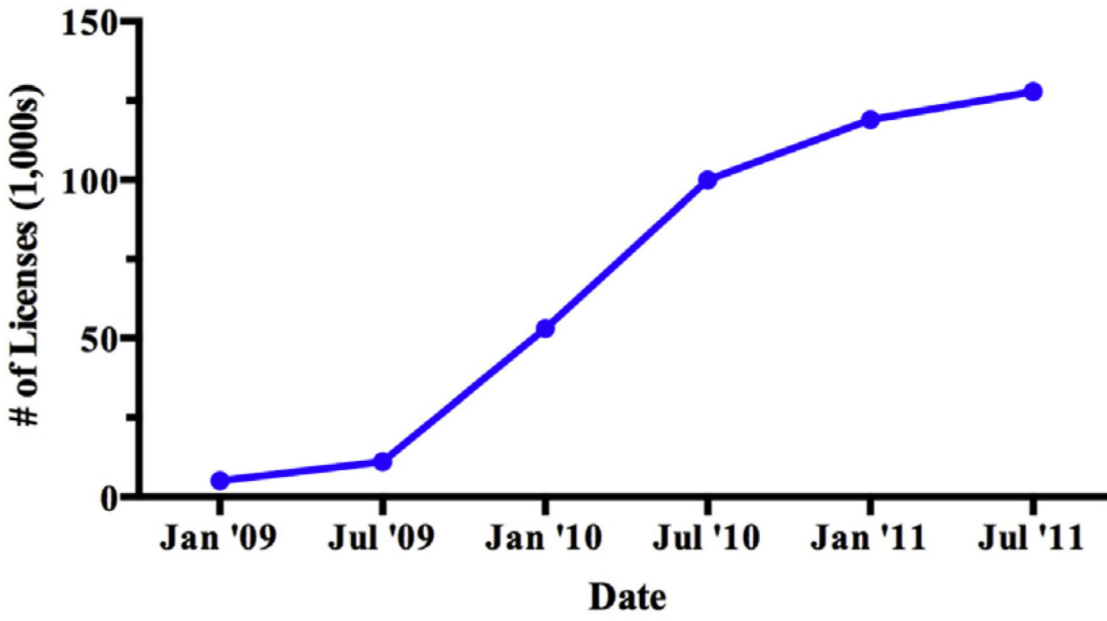
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Source: Unpublished data, Colorado Department of Public Health and Environment, January 2014.

Figure 1.
Number of active marijuana licenses in Colorado.

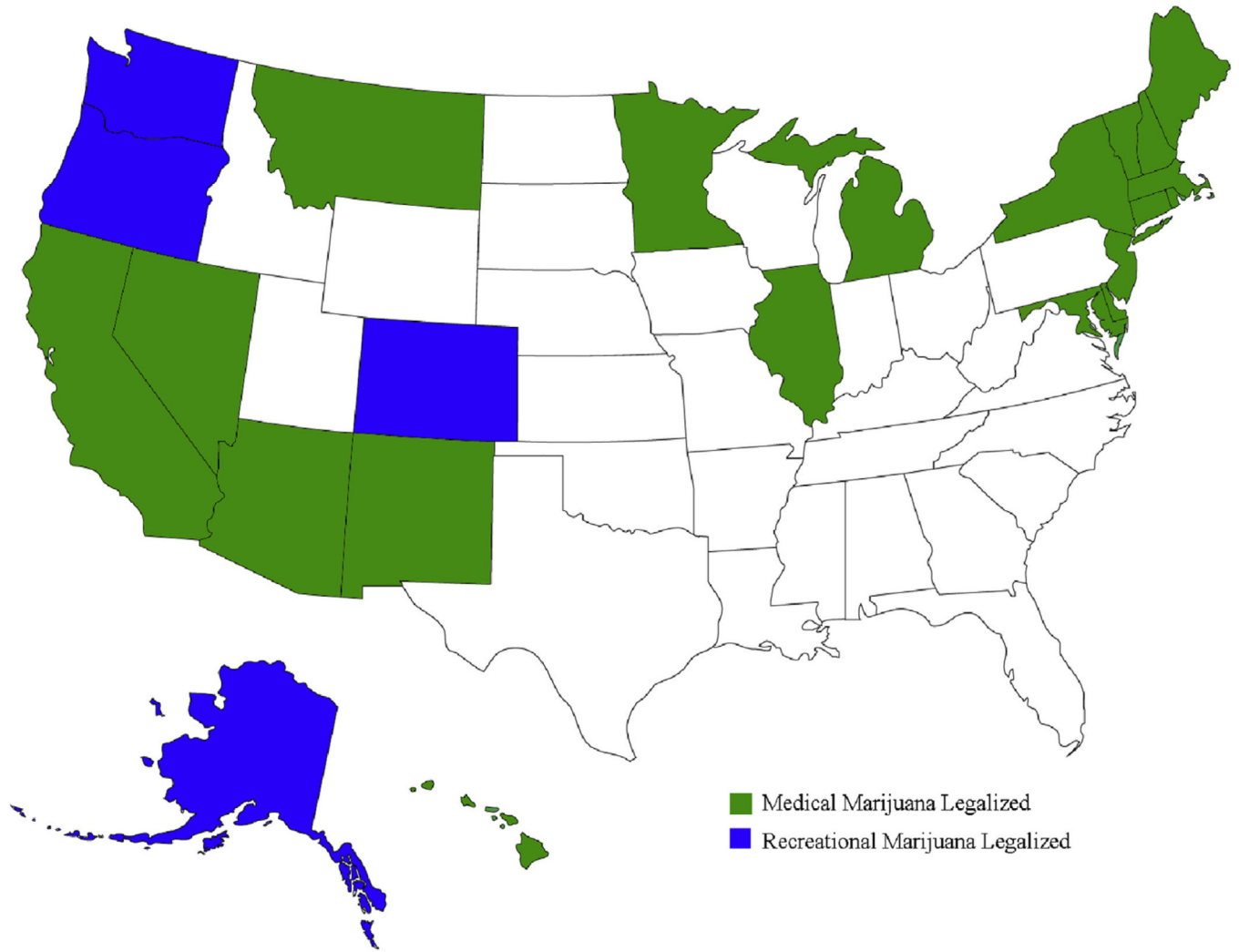


Figure 2. Marijuana legalization by state (as of May 2015).