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Original Research

A Chart Review of Emergency Department Visits Following Implementation of the Cannabis Act in Canada

Marisa O'Brien[1*], Peter Rogers[2], Eric Smith[3]

[1,2,3]Memorial University of Newfoundland and Labrador, Faculty of Medicine, Department of Emergency Medicine, Canada

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***Correspondence:**
mbob58@mun.ca

ABSTRACT

The legalization of cannabis for recreational use remains a controversial topic today. There are multiple known benefits of cannabis which include pain relief and treatment of epilepsy syndromes. However, there are also many associated risks. Shorter-term health consequences include cannabinoid hyperemesis syndrome and cannabis-induced psychosis. These conditions directly impact the influx of patients presenting to emergency departments (ED). This study aims to examine the impact of cannabis legalization on ED presentations. We performed a descriptive study via a retrospective chart review of cannabis-related ED visits in St. John's, Newfoundland (NL), ranging from six months prior to the date of legalization of cannabis for recreational use, to six months after. We searched the hospital ED visit records using keywords to identify patients who have symptoms relating to cannabis use. We manually reviewed all visit records that included one or more of these terms to distinguish true positives from false-positive cases unrelated to cannabis use. The number of cannabis-related visits increased from 2.56 per 1000 ED visits prior to legalization to 3.56 per 1000 ED visits post legalization ($p < 0.01$). There was no difference in the age of users between the two groups. Additionally, the most common presenting complaint due to cannabis use was nausea/vomiting (47.7%), followed by anxiety (12.2%). Following the implementation of the Cannabis Act in Canada, the EDs in St. John's, NL had a significant increase in the number of ED visits related to cannabis use. It is important to determine such consequences to ensure hospitals and public health are prepared to treat the influx of visits and are better equipped to manage the associated symptoms.

Introduction

The legalization of cannabis and its therapeutic value has been some of the more controversial topics in medicine throughout North America over the last two decades. Cannabidiol (CBD), a lipid substrate within cannabis, has been shown to have numerous therapeutic effects including alleviating chronic pain, treating epilepsy syndromes, and improving the appetite and body weight of both HIV/AIDS and chemotherapy patients [1, 2]. These medical benefits helped lead to its legalization for medical purposes in many jurisdictions across North America throughout the early 2000's. At this time, there were extensive criteria to determine who qualified for medical cannabis. In Canada, the Medical Marijuana Purposes Regulations were introduced in 2014, making cannabis more accessible to those suffering from less severe medical conditions but could have their symptoms improved or treated with cannabis [3]. This was shortly followed by the legalization of cannabis for recreational use on October 17th, 2018, with the passing of the Cannabis Act (C-45).

The legalization of cannabis is controversial because although it has numerous potential health benefits, there are also potential health risks. One of the concerns with legalized cannabis is the high Δ9-tetrahydrocannabinol (THC) concentrations. THC is the primary psychoactive cannabinoid component responsible for the adverse effects associated with cannabis use [1]. The cannabis being sold in stores today contain much higher amounts of THC, as potency has tripled since 1995 [4]. Consequently, this may contribute to an influx of cannabis-related emergency department visits, as THC has been shown to have a dose-dependent effects on psychotic symptoms [1, 5]. Inexperienced users who are not aware of the higher concentrations may take more than recommended leading to unwanted psychotic effects as well as hyperemesis. In addition to cannabis being an illicit psychoactive substance, numerous studies have shown adverse effects associated with cannabis. These effects can be acute or long-lasting. Some of the short-term health consequences include cannabis-induced psychosis and cannabinoid hyperemesis syndrome, a cyclic vomiting disorder resulting in intractable emesis, dehydration, and electrolyte abnormalities [1, 6]. In severe cases, cannabinoid hyperemesis syndrome can lead to complications such as acute renal injury, esophageal injury, pneumomediastinum, and cardiac arrhythmias [6]. These conditions likely influence patients presenting to emergency departments. Additionally, cannabis use before the age of 15 has been correlated with the development of schizophrenia in early adulthood [1,7]. With these risks and adverse effects considered, it could be argued there should be strict regulations and policies surrounding the legalization of recreational cannabis.

The novelty of cannabis legalization means there is little knowledge about the impacts it will have on the healthcare system and how it will affect Canada's public health. Therefore, it is important to determine such consequences to ensure hospitals and public health are prepared to treat the increase of emergency department visits and are better equipped to manage the associated symptoms. Several news articles have reported hospitals across Canada, including those in Calgary and Ottawa, have seen an increase in emergency department visits and hospitalizations following the legalization of non-medical cannabis; however, there have been limited studies published to confirm these reports [8, 9]. Therefore, it is critical that research is done to determine how cannabis use has been affecting our hospitals, as increases in both intentional and unintentional exposures are expected. It is also important to collect such data for the initiation of education and public awareness of cannabis use for both adolescents and

adults. Thus, this study aims to determine if there was a change in the number of cannabis-related Emergency Department (ED) visits after the implementation of the Cannabis Act in Canada. This article was previously accepted for a poster presentation at the Canadian Association of Emergency Physicians 2020 conference, and subsequently, the abstract was published in the Canadian Journal of Emergency Medicine.

Methodology

We performed a descriptive study via a retrospective chart review of cannabis-related ED visits in St. John's, NL, to compare the number of ED visits relating to cannabis use six months prior to the date of legalization of cannabis for recreational use, April 16th to October 16th, 2018, to six months after, October 17th, 2018, to April 17th, 2019. Data was collected from both the Health Science Centre and St. Clare's Mercy Hospital Emergency Departments, the only two adult tertiary care hospitals in the province's capital. These emergency departments serve a catchment area of 200,000 with a total number of 55,792 and 38,339 ED visits during the study time period at each hospital, respectively. As a result, this study was limited to individuals ≥ 18 years of age. We searched the emergency department visit records using keywords to identify patients who have symptoms relating to cannabis use. The 20 search terms identified were; cannabis, marijuana, hyperemesis, emesis, nausea, vomiting, gastro, gastroenteritis, psychosis, decreased level of consciousness (LOC), altered LOC, intoxication, confusion, edible, inhalation, synthetics, co-ingestion, ingestion, drug abuse, and substance abuse. We manually reviewed all visit records from the electronic health record system, Meditech, that included one or more of these terms to distinguish true positives from false-positive cases, visits unrelated to cannabis use, determined by the diagnosis and impression and plan section on the chart. This produced a total of 1485 charts in the before group and 1752 in the after group with 123 found to be true positives in the before group and 164 in the after group. The data collected from the charts included patient age, gender, date of visit, presenting complaint, cannabis use prior, or first time use if available, method of ingestion, co-morbidities, length of stay, outcome specifically if they were admitted, transferred, or discharged, and their diagnosis. The statistical software IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp and the Excel application for Windows (Microsoft, Mississauga, ON) were used to analyze the data. The rate of ED visits was analysed using a t-Test: Two-Sample Assuming Unequal Variances. Ethics approval for this study was approved by The Newfoundland and Labrador Health Research Ethics Board on April 5th, 2019. The reference number is 2019.053 and the research porter file number is 20192930.

Results

A total of 287 charts were included in the study; 123 of the 48, 050 ED visits six months prior to legalization of recreational cannabis use were related to cannabis use, and 164 of the 46, 081 ED visits six months after legalization were related to cannabis use. A significant increase in emergency department presentations related to cannabis use following the legalization of recreational cannabis was seen ($p < 0.01$). The overall rate of cannabis-related visits increased from 2.56 per 1000 emergency department visits prior to legalization to 3.56 per 1000 emergency department visits post-legalization of cannabis for recreational use. There was no difference in the age of users pre- and post-legalization of recreational cannabis use as the mean

age was 29 for both groups, and 57% of subjects were male (Table 1). Additionally, the number one presenting complaint, determined by the dominant complaint on the triage record, associated with cannabis-related visits was nausea/vomiting (47.7%), followed by anxiety (12.2%) and overdose (11.1%) (Table 2). Although most patients were discharged home, it is important to note 4% of patients were admitted to hospital while 11% were transferred to the Psychiatric Assessment Unit (Table 3).

While not every chart had recorded if the individual was a previous user, 2% of individuals reported it was their first-time use in the before group; this number did not increase after legalization as only 2% reported it was their first exposure to cannabis (Table 4). Furthermore, an important factor in emergency department preparedness for the increase in visits due to cannabis use is the amount of time an individual spent in the ED. The median length of stay in the before and after groups were 3.5 and 4 hours, respectively (Figure 1).

Table 1. Patient demographics.

	Before	*After*
Gender		
Female	54	70
Male	69	94
Age		
Under 20	16	23
20 – 29	62	93
30 – 39	21	23
40 – 49	6	12
50 – 59	13	11
60 – 69	2	2
70 – 79	3	0

Table 2. Frequency of presenting complaints commonly associated with cannabis-related emergency department visits within the study population.

Presenting Complaint		
Altered Level of Consciousness	7.0	2.4%
Anxiety	35.0	12.2%
Bizarre Behavior	9.0	3.1%
Chest Pain	1.0	0.3%
Confusion	3.0	1.0%
ETOH	21.0	7.3%
Hallucinations	5.0	1.7%
Ingestion	7.0	2.4%
Intoxication	4.0	1.4%
Medical Clearance	1.0	0.3%
Nausea/Vomiting	137.0	47.7%
Overdose	32.0	11.1%
Suicidal Ideations	14.0	4.9%
Substance Misuse	11.0	3.8%
Total	**287**	**100%**

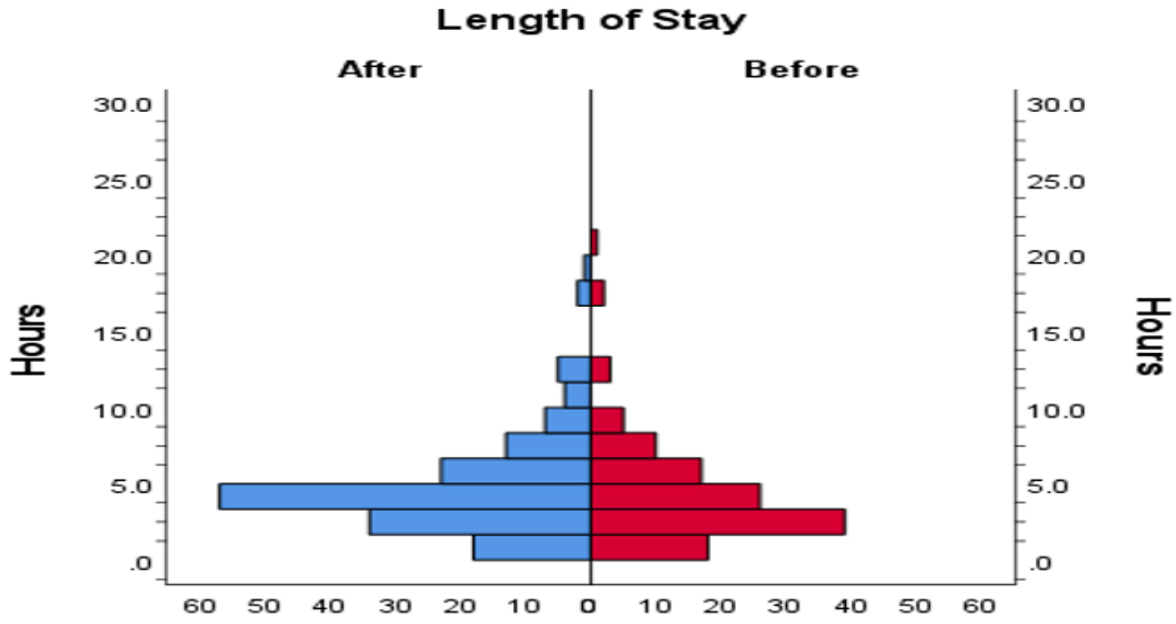
Table 3. Disposition from the emergency department

	Before	*After*	*Total*	*Percentage*
Admitted	2	9	11	4%
Discharged	92	122	214	75%
Psychiatric Assessment Unit	18	15	33	11%
Patient Left	8	18	26	9%
Not specified	3	0	3	1%
Total	123	164	287	100%

Table 4. Number of disclosed first-time cannabis users.

	Prior Cannabis Use	First Time User	Unknown	Total
Before	81	3	39	123
After	121	4	39	164

Figure 1. Comparison of the length of stay (Hours) in the emergency department per visit before and after legalization of recreational cannabis use.



Discussion

Following the implementation of the Cannabis Act in Canada in 2018, emergency departments in St. John's, NL had a significant increase in the number of visits related to cannabis use. The burden of cannabis use on hospital visits is important to ensure hospitals are prepared to treat the influx of visits and are better equipped to manage the acute cannabis-induced health conditions such as hyperemesis and psychiatric presentations. Anxiety was the second most common presenting complaint, followed by nausea/vomiting. 11% of cannabis-related visits required transfer to the Psychiatric Assessment Unit, suggesting a potential need for an increased number of mental health nurses in emergency departments. Additionally, the median length of stay in the ED was 3.5 and 4 hours for the before and after groups, respectively. This is slightly longer than the median length of stay per ED visit across Canada which was reported as 3.2 hours for the 2018-2019 fiscal year in the Canadian Institute for Health Information annual report [10]. The impact of non-medical cannabis use highlights the need for public awareness and education regarding the associated health concerns as well, as the 2019 Canadian Cannabis Survey stated 24% of respondents said they had not noticed any public health and safety messages or education campaigns following the implementation of the Cannabis Act. Additionally, only 36% of individuals said their knowledge of the harms associated with cannabis use had increased following the legalization of non-medical cannabis use [11].

There is limited research in the area of cannabis legalization burden currently, as recreational legalization only began in 2014. However, previous studies have also shown a significant impact on the emergency departments in those states for which cannabis is legal. Colorado was the first jurisdiction in North America to legalize recreational cannabis use [12]. A study

conducted in Colorado found that the hospitalization rates with marijuana-related billing codes increased from 274 per 100 000 hospitalizations prior to legalization, to 593 per 100 000, after the state legalization of recreational marijuana [13]. Similar trends were seen by the Regional Poison Centre (RPC) of Colorado. Following the legalization of cannabis for medical purposes, the number of calls the RPC received related to cannabis use was almost doubled compared to the number prior to legalization. Subsequently, following the legalization of cannabis for recreational use, the number of calls to the RPC increased by another 79.7% [13]. Additionally, ED visits for mental illnesses associated with marijuana-related billing codes were also increased by five-fold compared to the prevalence of mental illnesses with no association to marijuana use [13].

The consequences of cannabis legalization are not only seen in the adult population, but similar trends have been observed in adolescents. A study in Colorado found the annual rates of emergency department and urgent care visits in the age category of 13 to 21 years old increased from 1.8 per 1000 visits to 4.9 per 1000 visits from 2005 – 2015. The largest changes were noted in the years directly following the legalization of medical marijuana and recreational marijuana [14]. Additionally, Canadian news articles have commented on the increase of cannabis use among adolescents, which has now surpassed alcohol for hospitalizations due to harm caused by substance use among youth [15]. Legalization has also impacted pediatric emergency departments mostly due to accidental ingestion. Increased availability, unsecured edible products, and exposure to second-hand cannabis smoke are all consequences of legalization resulting in an increase in child cannabis toxicity [16]. A nation-wide study in the United States documented that children's exposure rates to cannabis have increased by 148% from 2006 to 2013. Additionally, in states that legalized cannabis for medical purposes, the rates increased by 610% [17].

There are many potential reasons for the increase in ED visits, including easier access to cannabis following the opening of cannabis retail stores. Additionally, the higher concentrations of THC sold in stores today may contribute to an increase in adverse effects associated with cannabis use [4]. As well, the increase in ED visits may be a result of the increase in non-medical cannabis use amongst Canadians in 2019 compared to previous years as seen in the 2019 Canadian Cannabis Survey. Another belief is the decrease in stigma surrounding cannabis use may have led to higher reporting rates as respondents to the 2019 Canadian Cannabis Survey voted cannabis use more socially acceptable, and 34% said they are more willing to disclose cannabis use now that it is legal [11]. Finally, another prediction from Emergency Medicine physicians in Colorado suggested that following the legalization of recreational cannabis use, there would be an increase in first-time users, and those inexperienced users would contribute to a large portion of ED visits following legalization; however, this was not demonstrated in our study as we did not see an increase in the number of first-time users in the after group [18]. Although we found legalization resulted in an increase in the number of cannabis-related emergency department visits, the use of cannabis for medical purposes may be relieving healthcare burdens in other areas including less opioid-related hospitalizations and overdoses. One study proved legalization of marijuana to be beneficial for opioid users. A significant reduction was observed in opioid-related hospital admissions, opioid pain relief overdoses, and overdose mortality rates [19]. Therefore, further studies are needed to compare the overall effect of the implementation of the Cannabis Act on Canada's healthcare system.

Limitations

There were several potential limitations to this study. The number of ED visits before and after legalization was compared using a two-way T-test; thus, there is an assumption that visits in the two groups are unrelated, and each chart was treated as an independent visit. Additionally, the diagnosis of cannabis use was concluded by history alone; therefore, there is an assumption that the primary complaint of the ED presentation was related to cannabis use alone. Consequently, some medical professionals may not ask specifically about cannabis use; therefore, the number of true visits related to cannabis use may differ. Medical marijuana was approved in Canada in 2001; therefore, both the before and after groups may contain patients who have medical prescriptions for cannabis. The patient charts did not specify if the cannabis used was for medical purposes; therefore, this is a limitation to include when assessing the use of cannabis before vs. after legalization of recreational cannabis use. Additional study limitations include the charts reviewed were restricted to adult urban emergency departments; therefore, dedicated pediatric and regional/rural centers are not represented. Lastly, the time frame of six months before and six months after the implementation of the cannabis act does not account for seasonal variation in the number of ED visits.

Conclusion

Our study supports the numerous news articles that have reported an increase in ED visits related to cannabis use following the legalization of recreational cannabis use and follows similar trends seen in the United States. The most frequent acute health conditions included nausea/vomiting and anxiety. The increase in ED visits could be related to several factors including increased potency of cannabis and increased access. Therefore, it may be important to increase public education on cannabis use, its acute health risks, and ensure hospitals are equipped to manage the influx of presentations and their specific needs. However, before revisiting the Cannabis Act, further studies need to be performed to assess the effects on cannabis use on a broader patient population as our study does not include pediatrics, as well as looking at the long-term effects of cannabis use we focused on the acute effects. Additionally, the benefits of cannabis legalization such as reduction in opioid use and related hospitalizations should be considered as well.

Declarations

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Disclosure Statement

No potential conflict of interest was reported by the authors.

Ethics Approval

Not applicable.

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