



Cannabis use in pediatric cancer patients: what are they reading? A review of the online literature

M. Yeung¹ · H. Wroot¹ · C. Charnock¹ · C. Forbes¹ · L. Lafay-Cousin^{1,2} · Fiona Schulte^{1,2} 

Received: 7 June 2019 / Accepted: 14 January 2020 / Published online: 20 January 2020
© Springer-Verlag GmbH Germany, part of Springer Nature 2020

Abstract

Background Recent changes to the legal status of marijuana in Canada warrant a review of the information that patients and families are accessing online regarding the role of cannabis in cancer. The aims of the current research were to identify the quality of literature available online as well as the themes, and opinion (i.e., pro-, neutral, or anti-cannabis) of online articles.

Methods Searches were conducted using three primary search engines: Google, Yahoo, and DuckDuckGo. Articles were assessed for quality based on a modified scale for evaluating online sources. Content of all unique articles was coded using a qualitative thematic methodology in a line-by-line fashion. Codes were clustered to determine themes within articles. Finally, opinions were determined by examining all articles in a line-by-line fashion. Each statement was coded as either pro-cannabis (positive) or anti-cannabis (negative).

Results We found most articles were authored by journalists (39.4%) and MDs (14.1%) and published as news (35.2%) or web articles (28.2%). The content of articles focused on four themes: the reasons for and against cannabis use; the opinions of health care providers; the restrictions placed by governing bodies and the need for additional research, education, and standardization. Article opinions were neutral-pro-cannabis.

Conclusions Health care providers should be aware that the overall quality of information found online is considered “satisfactory.” The majority of articles present a pro-cannabis opinion.

Keywords Cannabis · Pediatric · Oncology · Review

Introduction

Canada has now become the second nation in the world to legalize cannabis, both medically and non-medically. With these impending changes to cannabis law and how cannabis can be accessed, health care providers (HCPs) throughout Canada may expect increased interest from patients and families regarding the potential uses of cannabis in medical management. It is therefore critical HCPs familiarize themselves with the online information available to patients and families so that they are better equipped to respond to patient questions related to the potential uses of cannabis. The overarching goal

of the current study was to review current online literature available to parents and patients related to cannabis use in pediatric oncology.

The scientific evidence surrounding the potential risks and benefits of cannabis use across the lifespan are unknown. Among adult populations, cannabis has been shown to be associated with higher lung cancer rates, higher rates of chronic obstructive pulmonary disorder, and the abuse of other substances [1]. However, there is also evidence that cannabis may offer some analgesic effects, and can be used to combat nausea and pain associated with cancer [2]. In fact, a recent study suggests almost half of adult cancer patients report cannabis use [3]. Cannabis can also represent an alternative substance for individuals who have severe reactions to opioid treatments, or find these treatments addictive. Preclinical investigations also suggest cannabis may inhibit the growth of gliomas and can promote apoptosis in colorectal cancer cells [4–6]. Although these data may suggest some potential benefit of the drug, there are remaining questions related to dosage and potency. Moreover, the impact of cannabis on the developing brain is unknown.

✉ Fiona Schulte
Fiona.schulte@albertahealthservices.ca

¹ University of Calgary, Calgary, Alberta, Canada

² Department of Oncology, Division of Psychosocial Oncology, Cumming School of Medicine, Psychologist, Hematology, Oncology and Transplant Program, University of Calgary, Alberta Children’s Hospital, Calgary, Alberta, Canada

To date, few studies have attempted to review the online literature available to those interested in cannabis. Online literature is easily accessible to patients and families and therefore a likely primary source in providing information related to the role of cannabis in cancer. There is concern, however, about the type and quality of data available online and whether this is backed by scientific evidence. Thus, we thought it is critical to review the literature available online to get a sense of what patients and families may be reading. Moreover, as health care professionals, we aimed to better equip ourselves to respond to patients' queries regarding cannabis.

To the best of our knowledge, no studies have examined the literature that may specifically target cannabis use in pediatric cancer. Thus, given the changing legislation regarding cannabis legalization in both Canada and the United States (US), we thought it is timely to identify current, readily available online content. Specific aims were to identify (1) the quality of the online literature, (2) common themes in the available literature, and (3) whether online literature is generally of a pro- or anti-cannabis sentiment. We hypothesized article quality would be low and opinions would be pro-cannabis. Thematically, we expected results would focus on the reasons one should choose to use or not use cannabis, and to highlight the specific symptoms cannabis might alleviate.

Methods

Data sources and searches

Searches were conducted using three primary search engines: Google, Yahoo, and DuckDuckGo, using the respective "private browsing" modes for Google and Yahoo. Private browsing modes were used to avoid results being altered as a result of previous searches, ensuring results were as generalizable as possible. DuckDuckGo is a unique search engine which recognizes Boolean search operators and prevents result tracking, negating the need for a private browsing mode [7]. Searches were conducted using four strings of search terms in each search engine including Marijuana OR Pot OR Cannabis OR Weed AND Childhood OR Pediatric AND Cancer. The results from the first two pages of results were taken, scanned for eligibility based on inclusion/exclusion criteria, and recorded by link, date of the search, and search engine. The first two pages of results for each search were taken, as evidence suggests 97% of all traffic occurs within the first two pages of a Google search [8, 9]. Articles were further examined at this stage for whether they discussed both cannabis and pediatric cancer.

Article selection

Inclusion and exclusion criteria were determined prior to study selection. Eligible studies had information pertaining

to both marijuana and pediatric cancer, were published between 2007 and 2019, and were in the English language and relevant to Canadian and/or US law. Exclusion criteria comprised content that required a subscription due to the low likelihood of individuals viewing content that requiring subscription; online videos due to an inability to source and define online videos; and product reviews and promotions because of the irrelevance of product reviews to information informing the decision to use cannabis. Eligibility was determined by identifying the content discussed, and whether subject matter including cancer and cannabis were present, as well as a plausible connection to pediatrics, the date of publishing, length, and language.

Aim 1: quality assessment

Upon search completion, the quality of online content was evaluated based on a modified scale for evaluating online sources from the Milstein Undergraduate Library of Columbia University [10]. The selected quality rating scale included categories of authorship, publisher, accuracy, timeliness, footnotes and citations, and sponsorship. Authorship was evaluated based on the credentials of the author and the history of their articles. Publishers were evaluated based on their impartiality, reputation, and the quality of other articles published. Accuracy was determined based on the type of citations used in articles. Similarly, bibliographies were evaluated based on the type of citations, the number of citations, and whether they were in a recognized format. Timeliness was evaluated based on years since the initial search. Sponsorship was determined by impartiality of the author, the publisher, and whether any conflicts existed within the website, such as product advertising. Each subcategory was rated separately and subsequently subcategory ratings were used to provide an overall quality score of "very poor," "poor," "satisfactory," "good," and "excellent." These overall quality ratings were also combined to help evaluate quality by theme, explained below. Quality was rated by three individuals (MY, HW, CF) to ensure consistency of results. Disagreements were resolved through consensus between these two raters. Inter-rater reliability was calculated using an intraclass coefficient [11].

Aim 2: thematic assessment

After reviewing the quality of each article, the content of all unique articles was coded using a qualitative thematic methodology in a line-by-line fashion. Codes were clustered to determine themes within articles and ultimately the perspective of the content provided. Codes were double rated for consistency on a random selection of articles (~20%). All coding disagreements were clarified via consensus. Themes were determined based on consensus between three independent raters (MY, HW, CC).

Aim 3: opinion assessment

Opinions were determined by examining all articles in a line-by-line fashion. Each statement was coded as either pro-cannabis (positive) or anti-cannabis (negative). Statements were then tallied. Articles with a ratio of positive to total statements of greater than 0.6 were designated “positive,” while articles with a ratio of positive to total between 0.4 and 0.6 were designated “mixed.” Ratios below 0.4 were considered “negative.” Neutral statements, expressing either no opinion, or sentences which included both negative and positive opinions were not coded for. Opinion analysis was coded by three raters (MY, HW, CC). Disagreements were resolved between raters, and if they could not be resolved at this stage, then a third rater was introduced. Inter-rater reliability was calculated using Cohen’s Kappa where Kappa > 0.75 is considered excellent, 0.40–0.75 is considered fair to good, and < 0.40 as poor.

Data was analyzed using the NVivo Software (version 12) to complete the thematic analysis and opinion assessment.

Results

Data abstraction

In total, the search yielded 560 articles. Four hundred fifty-two articles were repeated within the search terms and across search

engines, providing 108 unique articles. Of these, 37 were excluded. Reasons for exclusion included not discussing pediatric cancer ($n = 24$), not discussing cannabis ($n = 4$), being published prior to 2007 ($n = 2$), for having a length (156 pages) determined to exceed what a patient or parent would be willing to read ($n = 1$), for containing only links to other webpages ($n = 2$), and fitting aforementioned exclusion criteria ($n = 4$). No articles were excluded for discussing non-US or Canadian laws. This left 71 articles eligible for review (see Fig. 1).

Post-review, three additional articles were excluded from thematic and opinion analysis as they replicated previous articles, but were from different sources. Because the information came from a source, it was included in the quality review. This left 68 articles eligible for thematic analysis.

Aim 1: quality assessment

Data regarding the quality assessment can be found in Table 1. Six subcategories comprised the quality assessment scale (i.e., authorship, publisher, accuracy, timeliness, footnotes and citations, and sponsorship). Overall, after review of 71 articles, the quality of 3 articles was rated as very poor (4%), 14 as poor (20%), 24 as satisfactory (34%), 17 as good (24%), and 13 as excellent (18%). Inter-rater reliability of the quality assessment using an intraclass correlation coefficient was 0.987, indicating a strong correlation between the total scores of the two raters [11]. The intraclass coefficients for individual

Fig. 1 PRISMA flowchart of review

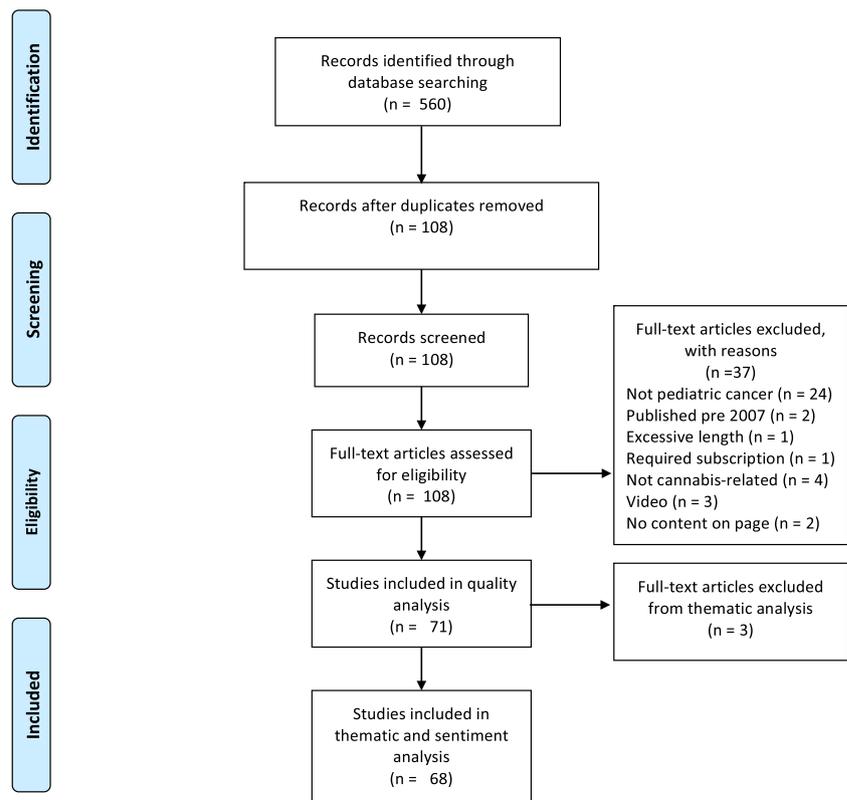


Table 1 Summary of article quality and opinion

Article type	Article title	Author type	Quality rating	Opinion	
Blog	Perspectives on the Use of Medicinal Marijuana in Children [12]	Medical doctor	Excellent	Neutral	
	Treating Pediatric Cancer with Cannabis Oil [13]	Unknown	Poor	Positive	
	Childhood Cancer Awareness Month Special: Treating Pediatric Cancer with Cannabis [14]	Unknown	Poor	Positive	
	The Cash Hyde Foundation: Information on Medical Marijuana and Pediatric Cancer [15]	Unknown	Poor	Positive	
	Most Doctors Would Allow Medical Marijuana for Children With Cancer, Study Finds [16]	Journalist	Satisfactory	Neutral	
	Sophie's Story [17]	Unknown	Poor	Positive	
	Sophie's Story [18]	Unknown	Poor	Positive	
	News	Cancer and Kids: Is Medical Marijuana the Answer? [19]	Journalist	Satisfactory	Positive
Medical marijuana for children with cancer? What providers think [20]		Unknown	Excellent	Neutral	
3-Year-old is focus of medical marijuana battle [21]		Journalist	Satisfactory	Neutral	
Is Cannabis Oil the Solution to Treating Cancer in Children? [22]		Journalist	Poor	Positive	
Medical marijuana for children with cancer? What providers think [23]		Unknown	Good	Neutral	
Pediatric Cancer Providers Give Medical Marijuana a Cautious Thumbs-up [24]		Hospital	Good	Neutral	
"Weediquette": Could Marijuana Help Kids With Cancer [25]		Journalist	Poor	Positive	
Majority of Doctors Support Using Medical Marijuana for Children [26]		Journalist	Satisfactory	Positive	
Cannabis for kids: Israel pioneers pediatric pot [27]		Journalist	Poor	Positive	
Marijuana Can Help Children with Seizures, Cancer Nausea [28]		Journalist	Good	Neutral	
Most Pediatric Oncologists Willing To Consider Medical Marijuana for Children With Cancer [29]		Unknown	Good	Anti	
Provider Perspectives Assessed on Medical Marijuana Use for Pediatric Cancer [30]		Unknown	Satisfactory	Neutral	
Medical marijuana for Children with Cancer? What providers Think [31]		Unknown	Satisfactory	Neutral	
Kids With Cancer May Benefit From Medical Marijuana; Pediatricians Group Calls for Rescheduling Drug to Allow Research [32]		Journalist	Satisfactory	Neutral	
Cannabis Use for Pediatric Cancers [33]		Medical doctor	Good	Positive	
Marijuana Drastically Shrinks Aggressive Form of Brain Cancer, New Study Finds [34]		Journalist	Satisfactory	Positive	
Overwhelming Majority Support Cannabis for Pediatric Cancer [35]		Journalist	Satisfactory	Positive	
Medical Marijuana for a child with leukemia [36]		Journalist	Satisfactory	Positive	
Parents of children with cancer want marijuana for their kids [37]		Journalist	Good	Neutral	
Cannabis Oil Pills Helped Child Go Into Remission, Mom Says [38]		Journalist	Satisfactory	Anti	
Pediatric cancer providers give medical marijuana a cautious thumbs up [39]		Hospital	Good	Neutral	
Weed the people Movie Looks at Children, Cancer, and Cannabis Medicine [40]		Journalist	Poor	Positive	
'Weed the People' Explores Cannabis as a Treatment for Pediatric Cancers [41]		Journalist	Good	Positive	
Review: Documentary 'Weed the People' looks at cannabis and pediatric cancer [42]		Journalist	Good	Positive	
Study looks at cannabis ingredients ability to help children's tumors [43]		Journalist	Satisfactory	Positive	
Magazine article		Medical Marijuana for Kids? [44]	Journalist	Satisfactory	Positive
		Medical Marijuana for Children With Cancer Broadly Supported By Doctors [45]	Journalist	Good	Neutral
	Is Medical Marijuana Safe for Children? [46]	Journalist	Satisfactory	Positive	
	Afraid Daughter, 3, Wouldn't Survive Chemo, Her parents Turn to Medical Marijuana [47]	Journalist	Satisfactory	Positive	

Table 1 (continued)

Article type	Article title	Author type	Quality rating	Opinion
Web article	‘Weed the People’ Explores Medical Marijuana for Kids With Cancer [48]	Journalist	Good	Positive
	Cannabis for Pediatric Cancer [49]	Medical doctor	Good	Positive
	Marijuana and cannabinoids for medical purposes [50]	Unknown	Good	Neutral
	Dr. William Courtney Calls Child “A Miracle Baby” [51]	Medical doctor	Satisfactory	Positive
	Pediatric Cancer and Cannabis Oil Five Case Reports [52]	Medical doctor	Poor	Positive
	Medical marijuana for children with cancer [53]	Journalist	Excellent	Neutral
	Medical Marijuana in Pediatric Medicine [54]	Researcher	Very poor	Positive
	Mom Says Cannabis Oil Treatments Are Helping Her Daughter Battle Pediatric Lymphoma [55]	Researcher	Poor	Positive
	Children and Medical Marijuana- Cannabis for Kids [56]	Unknown	Satisfactory	Positive
	Marijuana and Cancer [57]	Medical and editorial content team	Excellent	Anti
	Cancer, Children, and Cannabis [58]	Researcher	Very poor	Positive
	Medical Marijuana and Cancer [59]	Medical doctor	Good	Positive
	Canadian Cancer Society Perspective on Hemp and Cannabis Products [60]	Unknown	Satisfactory	Anti
	Cannabis Smoke and Cancer [61]	Unknown	Poor	Positive
	Cannabis Smoke and Cancer: Assessing the Risk [62]	Journalist	Satisfactory	Positive
	Children and medical marijuana info – CBD cannabis treatments for children [63]	Unknown	Poor	Positive
	Cannabis for pediatric patients [64]	Unknown	Satisfactory	Positive
	Cannabis Oil Testimonials [65]	Unknown	Very poor	Positive
	Despite Research Gap, Medical Marijuana Use Supported at End of Life in Pediatric Cancer [66]	Journalist	Excellent	Mixed
	Hospital article	“Weed the People” Doc Follows Kids Treating Cancer With Marijuana [67]	Journalist	Satisfactory
Cancer - Leukemia & Cannabis studies completed [68]		Unknown	Poor	Positive
Medical Marijuana and Cancer [69]		Hospital	Satisfactory	Positive
Medical Marijuana for Children with Cancer? What Providers Think [70].		Hospital	Good	Neutral
Government article	Marijuana at St. Jude [71]	Hospital	Satisfactory	Negative
	Cannabis and Cannabinoids (PDQ)-Patient Version [72]	Unknown	Good	Neutral
Academic article	Cannabis and Cannabinoids (PDQ) Health Professional version [73]	Medical and editorial content team	Excellent	Positive
	Marijuana as Medicine [74]	Government agency	Good	Positive
	Cannabinoids In Pediatrics [75]	Researcher	Excellent	Anti
	Provider perspectives on Use of Medical Marijuana in Children With Cancer [76]	Medical doctor	Excellent	Neutral
	Pot for Tots [77]	Researcher	Excellent	Positive
	Pediatric Oncology Providers and use of medical marijuana in children with cancer [78]	Medical doctor	Excellent	Positive
	Clinicians Support Medical Marijuana Use in Children With Cancer, but Lack Knowledge [79]	Journalist	Excellent	Neutral
	Medical Cannabis: Practical treatment of Pediatric Patients for Epilepsy, Autism, Cancer, and Psychiatric Disorders [80]	Medical doctor	Satisfactory	Positive
	Medical Cannabis Certification in a Large Pediatric Oncology Centre [81]	Medical doctor	Excellent	Positive
	The use of cannabis in supportive care and treatment of brain tumor [82]	Researcher	Excellent	Neutral

subcategories were authorship = 0.956, publisher = 0.927, accuracy = 0.822, timelines = 0.996, citations = 0.886, and sponsorship = 0.859.

With respect to the category of authorship, 28 articles (39%) were written by journalists while 16 articles (23%) were written by MDs, PhD, or other health care providers.

No authors were named in 19 (27%) of the articles. Eight articles (11%) stemmed from a variety of other authorship sources, including bloggers, hospitals, and governments. For the publisher, or source of the article, 21 articles (30%) were categorized as web articles with no news affiliation, 25 articles were from news websites (35%), 5 articles (7%) were from magazine websites, 3 articles (4%) were from government articles, 3 articles (4%) were from a hospital website, 7 articles (10%) from an academic journal and 7 articles (10%) from blogs. Ratings for the remaining six subcategories can be found in Table 2.

Aim 2: thematic analysis

Thematic analyses of coded content from 68 articles revealed four central themes: (1) reasons to use or not use cannabis in pediatric cancer patients, (2) the opinion of HCPs, (3) the restrictions placed by governing bodies, and (4) additional research, education, and standardization needed (see Table 3 for a breakdown of themes and codes). Inter-rater coding was similar overall, and disagreements were clarified via consensus.

Theme 1: Reason to use or not use cannabis in pediatric cancer patients In total, 27 of 68 articles (40%) cited reasons not to use cannabis, with focus primarily on the potential for abuse and developmental delays. Average quality of these articles was considered as “good” based on our quality assessment scale. Nineteen articles (28%) mentioned dangers surrounding the unknown interactions between cannabis and other cancer-related medications, such as chemotherapy. Average quality of these articles was considered “good.” Other reasons cited for the concerns of cannabis use included stigma discussed by 4 articles (6%), and an absence of benefits, discussed by 1 article (1%).

Seven articles (10%) discussed the documentary titled “Weed the People.” This film follows 5 American pediatric patients using medicinal cannabis to treat or cure life-limiting disease including cancer.

Forty-two articles (62%) spoke to the benefits of using cannabis. Among the most common, in 36 articles (53%) was the potential for cannabis to alleviate some effects of chemotherapy. Common reasons included alleviation of nausea in 30 articles (44%), pain in 24 articles (35%), and psychosocial concerns such as anxiety in 14 articles (21%). Average quality of these articles was “satisfactory.”

Thirty-three articles (49%) reported on the potential for cannabis to kill cancer either anecdotally in humans, or in animal studies. Of these, 31 (46%) stated that cannabis could kill cancer. The average quality of these 31 articles was rated as “good.” Two of these articles discussed preclinical trials completed in animals, while the remaining 29 (43%) discussed case reports of cannabis curing or greatly reducing

cancer in individual patients. Five articles (7%) reported cannabis could not kill cancer with an average quality rated as “satisfactory.”

Theme 2: The opinion of health care providers Forty-three articles (63%) discussed the opinion of HCPs. The average quality of these 43 articles was “good.” Common themes were families finding their physicians unhelpful, in 13 articles (19%), or that there had been conflict in opinions with their HCP because the provider was dissatisfied with the family choice to use medical cannabis, in 9 articles (13%). Average quality of these 9 articles was “satisfactory.” Nineteen studies (28%) discussed the findings of Ananth et al. on HCP willingness to provide cannabis to pediatric cancer patients in the US, highlighting the fact 92% of US HCPs were willing to help children with cancer access medical marijuana [76].

Theme 3. Restrictions placed by governing bodies Forty-one articles (60%) addressed the theme of “restrictions placed by governing bodies” with average quality rated as “satisfactory.” Often cited was the American Academy of Pediatrics (AAP) cannabis position, stating “the AAP opposes medical cannabis outside of the usual process by the Food and Drug Administration” but also that the AAP supported “option(s) for ‘compassionate use’ of cannabis for children with debilitating or life-limiting diseases” [83]. Individual articles also discussed local hospital rules preventing physicians from prescribing cannabis.

Thirty-six articles (53%) referred to the Schedule I status of the drug (in the US) implying cannabis is a drug with “no currently accepted medical use and a high potential for abuse” [84] and is in the same schedule as heroin and cocaine, therefore limiting the ability to both conduct research on cannabis and prescribe the medication to pediatric patients. The Schedule I status of the drug was cited by articles as one of the greatest barriers to the access and testing of cannabis. Seventeen articles (25%) discussed legal actions as a result of the prescription of cannabis, both real and predicted, from either the loss of licensure for HCPs or the loss of children for parents. Article quality of those discussing the Schedule I status of the drug and of those discussing legal actions due to the prescription of cannabis were “satisfactory.”

Theme 4. Need for research, education, and standardization Fifty articles (74%) highlighted a need for “further clinical research to determine efficacy and correct dosage for cannabinoids” as well as education and standardization [14]. The average for these reports was “satisfactory.” Reported in 20 articles (29%) was the urgent need for additional research to evaluate the efficacy of cannabis arguing that evidence-based research would subsequently allow for further education and standardization of its use. These articles highlighted

Table 2 Quality assessment ratings

Article type	Article title	Authorship	Publisher	Accuracy	Timeliness	Citations	Sponsorship
Blog	Perspectives on the Use of Medicinal Marijuana in Children [12]	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
	Treating Pediatric Cancer with Cannabis Oil [13]	Very poor	Poor	Very poor	Poor	Very poor	Satisfactory
	Childhood Cancer Awareness Month Special: Treating Pediatric Cancer with Cannabis [14]	Very poor	Poor	Satisfactory	Satisfactory	Poor	Satisfactory
News	The Cash Hyde Foundation: Information on Medical Marijuana and Pediatric Cancer [15]	Very poor	Poor	Poor	Very poor	Poor	Satisfactory
	Most Doctors Would Allow Medical Marijuana for Children With Cancer, Study Finds [16]	Poor	Poor	Good	Excellent	Satisfactory	Satisfactory
	Sophie's Story [17]	Very poor	Satisfactory	Satisfactory	Very poor	Very poor	Satisfactory
	Sophie's Story [18]	Very poor	Satisfactory	Satisfactory	Very poor	Poor	Satisfactory
	Cancer and Kids: Is Medical Marijuana the Answer? [19]	Poor	Good	Satisfactory	Excellent	Very poor	Good
	Medical marijuana for children with cancer? What providers think [20]	Very poor	Good	Satisfactory	Excellent	Very poor	Good
	3-Year-old is focus of medical marijuana battle [21]	Poor	Satisfactory	Satisfactory	Poor	Satisfactory	Good
	Is Cannabis Oil the Solution to Treating Cancer in Children? [22]	Poor	Very poor	Satisfactory	Satisfactory	Poor	Very poor
	Medical marijuana for children with cancer? What providers think [23]	Very poor	Satisfactory	Good	Excellent	Good	Excellent
	Pediatric Cancer Providers Give Medical Marijuana a Cautious Thumbs-up [24]	Poor	Satisfactory	Good	Excellent	Poor	Excellent
	“Weediquette”: Could Marijuana Help Kids With Cancer [25]	Poor	Poor	Poor	Good	Very poor	Good
	Majority of Doctors Support Using Medical Marijuana for Children [26]	Poor	Poor	Good	Excellent	Satisfactory	Poor
	Cannabis for kids: Israel pioneers pediatric pot [27]	Poor	Satisfactory	Poor	Poor	Very poor	Good
	Marijuana Can Help Children with Seizures, Cancer Nausea [28]	Poor	Satisfactory	Good	Excellent	Good	Excellent
	Most Pediatric Oncologists Willing To Consider Medical Marijuana for Children With Cancer [29]	Poor	Good	Good	Excellent	Good	Excellent
	Provider Perspectives Assessed on Medical Marijuana Use for Pediatric Cancer [30]	Very poor	Satisfactory	Satisfactory	Excellent	Poor	Excellent
	Medical marijuana for Children with Cancer? What providers Think [31]	Very poor	Poor	Good	Excellent	Poor	Satisfactory
	Kids With Cancer May Benefit From Medical Marijuana; Pediatricians Group Calls for Rescheduling Drug to Allow Research [32]	Very poor	Satisfactory	Good	Satisfactory	Poor	Excellent
	Cannabis Use for Pediatric Cancers [33]	Good	Poor	Good	Excellent	Excellent	Good
	Marijuana Drastically Shrinks Aggressive Form of Brain Cancer, New Study Finds [34]	Poor	Good	Good	Poor	Satisfactory	Excellent
Overwhelming Majority Support Cannabis for Pediatric Cancer [35]	Poor	Poor	Good	Good	Satisfactory	Poor	
Medical Marijuana for a child with leukemia [36]	Poor	Satisfactory	Satisfactory	Very poor	Satisfactory	Good	
Parents of children with cancer want marijuana for their kids [37]	Poor	Satisfactory	Good	Excellent	Satisfactory	Good	
Cannabis Oil Pills Helped Child Go Into Remission, Mom Says [38]	Poor	Satisfactory	Good	Very poor	Satisfactory	Good	
Pediatric cancer providers give medical marijuana a cautious thumbs up [39]	Very poor	Excellent	Satisfactory	Excellent	Satisfactory	Good	
Weed the people Movie Looks at Children, Cancer, and Cannabis Medicine [40]	Poor	Satisfactory	Poor	Good	Satisfactory	Good	
‘Weed the People’ Explores Cannabis as a Treatment for Pediatric Cancers [41]	Poor	Poor	Satisfactory	Excellent	Poor	Excellent	
Review: Documentary ‘Weed the People’ looks at cannabis and pediatric cancer [42]	Poor	Satisfactory	Satisfactory	Excellent	Poor	Good	
Study looks at cannabis ingredients ability to help children’s tumors [43]	Poor	Satisfactory	Good	Good	Poor	Good	
Magazine article	Medical Marijuana for Kids? [44]	Poor	Good	Good	Very poor	Poor	Excellent
	Medical Marijuana for Children With Cancer Broadly Supported By Doctors [45]	Poor	Good	Good	Excellent	Poor	Good
	Is Medical Marijuana Safe for Children? [46]	Satisfactory	Good	Good	Very poor	Satisfactory	Excellent
	Afraid Daughter, 3, Wouldn’t Survive Chemo, Her parents Turn to Medical Marijuana [47]	Poor	Satisfactory	Poor	Excellent	Satisfactory	Excellent
Web article	‘Weed the People’ Explores Medical Marijuana for Kids With Cancer [48]	Satisfactory	Satisfactory	Satisfactory	Excellent	Good	Good
	Cannabis for Pediatric Cancer [49]	Excellent	Poor	Good	Good	Excellent	Satisfactory

Table 2 (continued)

Article type	Article title	Authorship	Publisher	Accuracy	Timeliness	Citations	Sponsorship
	Marijuana and cannabinoids for medical purposes [50]	Very poor	Good	Good	Good	Good	Excellent
	Dr. William Courtney Calls Child “A Miracle Baby” [51]	Good	Very poor	Poor	Excellent	Very poor	Good
	Pediatric Cancer and Cannabis Oil Five Case Reports [52]	Good	Very poor	Very poor	Poor	Very poor	Good
	Medical marijuana for children with cancer [53]	Satisfactory	Good	Good	Excellent	Excellent	Excellent
	Medical Marijuana in Pediatric Medicine [54]	Poor	Very poor	Satisfactory	Very poor	Satisfactory	Very poor
	Mom Says Cannabis Oil Treatments Are Helping Her Daughter Battle Pediatric Lymphoma [55]	Poor	Poor	Poor	Satisfactory	Very poor	Satisfactory
	Children and Medical Marijuana- Cannabis for Kids [56]	Very poor	Very poor	Satisfactory	Excellent	Poor	Poor
	Marijuana and Cancer [57]	Good	Excellent	Excellent	Excellent	Excellent	Excellent
	Cancer, Children, and Cannabis [58]	Poor	Very poor	Very poor	Very poor	Poor	Very poor
	Medical Marijuana and Cancer [59]	Excellent	Satisfactory	Satisfactory	Excellent	Very poor	Good
	Canadian Cancer Society Perspective on Hemp and Cannabis Products [60]	Very poor	Good	Poor	Satisfactory	Poor	Good
	Cannabis Smoke and Cancer [61]	Very poor	Poor	Good	Very poor	Poor	Poor
	Cannabis Smoke and Cancer: Assessing the Risk [62]	Poor	Poor	Good	Very poor	Excellent	Poor
	Children and medical marijuana info – CBD cannabis treatments for children [63]	Very poor	Very poor	Satisfactory	Very poor	Poor	Satisfactory
	Cannabis for pediatric patients [64]	Very poor	Poor	Excellent	Very poor	Excellent	Poor
	Cannabis Oil Testimonials [65]	Poor	Very poor	Poor	Very poor	Poor	Very poor
	Despite Research Gap, Medical Marijuana Use Supported at End of Life in Pediatric Cancer [66]	Poor	Good	Excellent	Excellent	Excellent	Excellent
	“Weed the People” Doc Follows Kids Treating Cancer With Marijuana [67]	Poor	Satisfactory	Satisfactory	Excellent	Poor	Excellent
	Cancer - Leukemia & Cannabis studies completed [68]	Poor	Poor	Good	Poor	Excellent	Poor
Hospital article	Medical Marijuana and Cancer [69]	Very poor	Good	Satisfactory	Poor	Poor	Excellent
	Medical Marijuana for Children with Cancer? What Providers Think [70].	Poor	Excellent	Satisfactory	Excellent	Satisfactory	Good
	Marijuana at St. Jude [71]	Very poor	Excellent	Satisfactory	Excellent	Very poor	Excellent
Government article	Cannabis and Cannabinoids (PDQ)-Patient Version [72]	Very poor	Excellent	Excellent	Excellent	Poor	Satisfactory
	Cannabis and Cannabinoids (PDQ) Health Professional version [73]	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
	Marijuana as Medicine [74]	Very poor	Excellent	Excellent	Excellent	Excellent	Good
Academic article	Cannabinoids In Pediatrics [75]	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
	Provider perspectives on Use of Medical Marijuana in Children With Cancer [76]	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
	Pot for Tots [77]	Excellent	Excellent	Excellent	Poor	Excellent	Good
	Pediatric Oncology Providers and use of medical marijuana in children with cancer [78]	Excellent	Excellent	Excellent	Good	Excellent	Excellent
	Clinicians Support Medical Marijuana Use in Children With Cancer, but Lack Knowledge [79]	Satisfactory	Excellent	Excellent	Excellent	Excellent	Excellent
	Medical Cannabis: Practical treatment of Pediatric Patients for Epilepsy, Autism, Cancer, and Psychiatric Disorders [80]	Good	Satisfactory	Good	Satisfactory	Satisfactory	Very poor
	Medical Cannabis Certification in a Large Pediatric Oncology Centre [81]	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
	The use of cannabis in supportive care and treatment of brain tumor [82]	Excellent	Excellent	Excellent	Good	Excellent	Excellent

discussions with physicians who emphasized the current legislation and lack of evidence surrounding cannabis as a primary reason for not recommending its use at present. They suggested that physicians were open to the possibility cannabis might be a viable therapeutic option in the future, pending additional clinical trial.

Aim 3: opinion analysis

Forty-five articles (66%) were found to be pro-cannabis, 20 articles (29%) were of mixed or neutral opinion, and 6 articles (9%) were anti-cannabis. The opinion of articles, grouped by author and publisher can be found in Table 1.

Opinions were coded by two raters to ensure consistency. Kappa scores were calculated from the inter-rater review. For positive sentiment detection, $k = 0.718$. For negative sentiment detection, $k = 0.705$. Overall ratings matched, as all disagreements at this level were clarified.

Discussion

The objectives of the study were to determine the quality, themes, and opinions on the use of cannabis in pediatric cancer within the current online, web-based literature with an overall goal to enhance communication between health care providers

Table 3 Summary of code clusters

Research, education, and standardization (<i>N</i> = 38)	More research needed	<i>N</i> = 33
	More regulation/standardization needed	<i>N</i> = 20
Reasons for and against use (<i>N</i> = 42)	Concerns of cannabis use (<i>N</i> = 26)	
	Stigma	<i>N</i> = 4
	Developmental	<i>N</i> = 12
	Abuse potential	<i>N</i> = 13
	Other	<i>N</i> = 19
	No risk	<i>N</i> = 4
	Cannabis did not help	<i>N</i> = 1
	Does cannabis kill cancer? (<i>N</i> = 24)	
	Cannabis kills cancer	<i>N</i> = 22
	Cannabis does not kill cancer	<i>N</i> = 5
	Benefits/reasons for cannabis use (<i>N</i> = 34)	
	Chemotherapy not working	<i>N</i> = 13
	Chemotherapy side-effect medications not effective/giving additional side effects	<i>N</i> = 22
	Cannabis enhances conventional therapy	<i>N</i> = 8
	Specific cancer experience symptoms	
	Psychosocial issues	<i>N</i> = 12
	Pain	<i>N</i> = 17
	Neuropathy	<i>N</i> = 7
	Nausea	<i>N</i> = 25
	Vomiting	<i>N</i> = 19
	Appetite and weight concerns	<i>N</i> = 15
	Unclassified (frequency of less than 5)	<i>N</i> = 17
Governing restrictions (<i>N</i> = 39)	Legal action against patient or provider	<i>N</i> = 17
	Medical organization regulation	<i>N</i> = 22
	Schedule 1 restricts research and access	<i>N</i> = 27
	State-specific laws (US only)	<i>N</i> = 17
	Illegal in Canada	<i>N</i> = 1
	Other	<i>N</i> = 1
HCP opinion (<i>N</i> = 34)	Consult a physician	<i>N</i> = 4
	Conflict with HCP opinion	<i>N</i> = 9
	Ananth et al.'s findings	<i>N</i> = 17
	Physician unhelpful	<i>N</i> = 13

N articles with corresponding theme

and families. Overall, the quality of the literature reviewed varied widely, but the number of articles rated as “satisfactory,” “good,” or “excellent” was in the majority. In order to be classified as high-quality, articles required peer-review, full bibliographies and proper, consistent references. The most frequent authors in our online review were journalists; however, authorship was not listed for 25% of the articles reviewed (excluding government or hospital articles). In addition, articles were primarily published from news articles and the majority of these news articles were rated poor or satisfactory with respect to their overall quality. Nevertheless, the number of high-quality articles was surprising and somehow reassuring as patients and families interested in cannabis are able to access some high-quality literature through common search engines.

The content analysis of the articles revealed four primary themes: reasons for using or not using cannabis in pediatric cancer patients; the opinion of HCPs; the restrictions placed by governing bodies; and the need for additional research, education, and standardization. Across the four themes, articles highlighted the need for clinical literature and further investigation. Conclusive literature currently does not exist to support or refute the use of cannabis as a therapy in pediatric oncology. Although the status of the drug in the US was cited as a barrier to advancing the research in this field, changing legislation in some US states as well as federally in Canada will provide opportunities for dedicated clinical trials for adult cancer patients. Although upcoming trials conducted in adults may offer insight into the efficacy/toxicity profile of

cannabis, pediatric-specific trials will be necessary to understand the impact of cannabis on the developing brain, as well as the potential long-term effects of cannabis use. The current research on these impacts remain limited. [85]

Among the content reviewed, several articles also referenced studies suggesting cannabis had anti-cancer effects, particularly in leukemia [19, 86, 87]. Many of these articles included powerful parent and patient testimonials suggesting that cannabis is able to reduce the negative side effects of conventional therapies, and in some cases, may be used as a curative therapy. Importantly, the research in this area is in its infancy and thus has only explored a limited number of tumor types, and only in preclinical animal models [86]. Without a solid understanding of the clinical trial pathway, patients may be misled to believe cannabis is a viable and safe treatment to treat malignancy when most studies remain at a preclinical stage.

The pro-cannabis opinion was predominant in the web-based literature reviewed. Pro-cannabis articles were more likely to include anecdotal stories of success and were less likely to be backed up by research beyond the author. Pro-cannabis websites often provided further information about cannabis for non-malignant pediatric illness, and advocacy for cannabis access. On the other hand, the anti-cannabis articles tended to be of higher quality, written by governing bodies or by authors publishing to scientific journals and included peer-review, bibliographies, and extensive knowledge in the field. Thus, there appears to be an imbalanced quality of information available online with a limited guide for parents on how to critically assess the literature they may be accessing.

There were several limitations to the current study. First, data collection involving online search engines was complicated by tracking of previous searches, affecting output and reproducibility. Within the review, this was circumvented using private browsing modes, preventing search tracking. Unfortunately, because of this, none of our searches will reflect the personalized results of users of different backgrounds [88, 89]. However, we believe the private browsing mode led to a more conservative search. Families who have previously searched alternative therapies for their child's cancer would yield even greater pro-cannabis content in comparison to our results. Results are also filtered based on region and may not be most pertinent to users from geopolitical regions beyond the researchers' region [90]. However, because searches are intended to represent what Canadian and American caregivers are observing, we feel confident in our methodology, particularly because cannabis is not yet a widely accepted therapy in either region, and because the majority of literature identified was thematically consistent. Results of online search engines may also change day-to-day, depending on the popularity and release of new articles, affecting the reproducibility of the review.

In summary, this review has several important implications. First, the majority of articles were rated satisfactory, good, or

excellent quality, which indicates that families do have access to good quality articles online. However, there remain articles of poor or satisfactory quality. In this new age of technology, including the internet and social media, and the relative ease of access to opinions regarding medical care, it is difficult to control what information may be available to readers. Thus, it is becoming increasingly important for health care providers to help educate families on how to navigate and critically assess what they may read online. This has implications not only with respect to the use of cannabis in cancer care but for other medical discussions (e.g., vaccinations). While families have access to articles of varying quality, the personal patient and family stories suggesting symptoms of their disease were greatly improved by using cannabis were compelling. Patients and families may benefit from education related to the clinical trial pathway and the process that is required to derive evidence for new treatments. What remains clear is that there is a need for increased research on whether or not there may be a role for cannabis in cancer care in the future. As the legislation for cannabis changes, it will be important for HCPs to remain diligent about the emerging evidence and to provide patients with a clear understanding of the risks and benefits specifically as it may apply to children.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

References

1. Fergusson DM, Boden JM, Horwood LJ (2006) Cannabis use and other illicit drug use: testing the cannabis gateway hypothesis. *Addiction* 101(4):556–569
2. Lotsch J, Weyer-Menkoff I, Tegeder I (2018) Current evidence of cannabinoid-based analgesia obtained in preclinical and human experimental settings. *Eur J Pain* 22(3):471–484
3. Martell K, Fairchild A, LeGerrier B, Sinha R, Baker S, Liu H, Ghose A, Olivetto IA, Kerba M (2018) Rates of cannabis use in patients with cancer. *Curr Oncol* 25(3):219–225
4. Aguado T, Carracedo A, Julien B, Velasco G, Milman G, Mechoulam R, Alvarez L, Guzmán M, Galve-Roperh I (2007) Cannabinoids induce glioma stem-like cell differentiation and inhibit gliomagenesis. *J Biol Chem* 282(9):6854–6862
5. Cianchi F, Papucci L, Schiavone N, Lulli M, Magnelli L, Vinci MC, Messerini L, Manera C, Ronconi E, Romagnani P, Donnini M, Perigli G, Trallori G, Tanganelli E, Capaccioli S, Masini E (2008) Cannabinoid receptor activation induces apoptosis through tumor necrosis factor alpha-mediated ceramide de novo synthesis in colon cancer cells. *Clin Cancer Res* 14(23):7691–7700
6. Salazar M, Carracedo A, Salanueva IJ, Hernández-Tiedra S, Lorente M, Egia A, Vázquez P, Blázquez C, Torres S, García S, Nowak J, Fimia GM, Piacentini M, Cecconi F, Pandolfi PP, González-Feria L, Iovanna JL, Guzmán M, Boya P, Velasco G (2009) Cannabinoid action induces autophagy-mediated cell death through stimulation of ER stress in human glioma cells. *J Clin Invest* 119(5):1359–1372

7. Chitika Insights (2017) The value of Google result positioning. Chitika Website. <http://info.chitika.com/uploads/4/9/2/1/49215843/chitikainsights-valueofgoogleresultspositioning.pdf>. Accessed 14 Nov 2017
8. Netmarketshare.com (2017) Desktop search engine market share. <https://netmarketshare.com/search-engine-market-share.aspx?options>. Last updated November 1, 2017. Accessed 14 Nov 2017
9. Netmarketshare.com (2017) Mobile/Tablet Search Engine Market Share Website. <https://netmarketshare.com/search-engine-market-share.aspx?options>. Accessed 14 Nov 2017
10. Mills A (2018) Evaluating online sources. Columbia University Libraries Website. https://library.columbia.edu/locations/undergraduate/evaluating_web.html. Accessed 7 Mar 2018
11. Shrout PE, Fleiss JL (1979) Intraclass correlations: uses in assessing rater reliability. *Psychol Bull* 86:420–428
12. Spalding C (2017) Perspectives on the use of medicinal marijuana in children. AAP Gateway Blog Website. <http://www.aapublications.org/news/2017/12/13/Perspectives-On-The-Use-Of-Medicinal-Marijuana-In-Children-Pediatrics-12-13-17>. Accessed 7 Mar 2018
13. Unknown (2017) Treating pediatric cancer with cannabis oil. United Patients Group Website. <https://unitedpatientsgroup.com/blog/2014/10/17/hot-to-treat-pediatric-cancer-with-cannabis-oil>. Accessed 7 Mar 2018
14. Unknown (2015) Childhood cancer awareness month special: treating pediatric cancer with cannabis. United Parents Group. <https://unitedpatientsgroup.com/blog/2015/09/17/childhood-cancer-awareness-month-special-treating-pediatric-cancer-with-cannabis>. Accessed 21 Aug 2018
15. Unknown (2013) The cash Hyde Foundation: information on medical marijuana & pediatric cancer. United Patients Group Website. <https://unitedpatientsgroup.com/blog/2013/11/27/time-to-tell-the-truth-about-cannabis-for-kids-with-cancer-says-united-patients-group-and-cash-hyde-foundation>. Accessed 7 Mar 2018
16. Pascual O (2017) Most doctors would allow children with cancer, study finds. Smell The Truth. <https://blogs.sfgate.com/smellthetruth/2017/12/12>. Accessed 7 Mar 2018
17. Unknown (Unknown) Sophie's Story. CannaKids. <https://cannakids.org/sophies-story/>. Accessed 16 Dec 2019
18. Unknown (Unknown) Sophie's Story. SavingSophie.org. <https://savingsophie.org/sophies-story/>. Accessed 16 Dec 2019
19. Finger J (2017) Cancer and kids: is medical marijuana the answer? IBT Media. <https://www.newsweek.com/2017/07/28/medical-marijuana-pediatric-cancer-637676.html>. Accessed 18 Aug 2018
20. Children's Hospital of Chicago (2017) Medical marijuana for children with cancer? What providers think. Medical Xpress Website. <https://medicalxpress.com/news/2017-12-medical-marijuana-children-cancer.html>. Accessed 7 Mar 2018
21. Young S (2014) 3-year-old is focus of medical marijuana battle. CNN <https://www.cnn.com/2014/01/15/health/cannabis-landon-riddle/index.html>. Last updated January 15, 2014. Accessed 7 Mar 2018
22. Wilcox A (2018) Is cannabis oil the solution to treating cancer in children?. Herb Website. <https://herb.co/marijuana/news/is-cannabis-oil-the-solution-to-treating-cancer-in-children>. Accessed 7 Mar 2018
23. Unknown (2017) Medical marijuana for children with cancer? What Providers Think. Know MJ Website. <http://knowmj.org/medical-marijuana-children-cancer-providers-think/>. Accessed 7 Mar 2018
24. Gaudette R (2017) Pediatric cancer providers give medical marijuana a cautious thumbs-up. Newswise. <http://newswise.com/articles/pediatric-cancer-providers-give-medical-marijuana-a-cautious-thumbs-up>. Accessed 7 Mar 2018
25. Fallon K (2016) 'Weediquette': could marijuana help kids with cancer?. The Daily Beast Website. <https://www.thedailybeast.com/weediquette-could-marijuana-help-kids-with-cancer>. Accessed 7 Mar 2018
26. Hoffman R (2017) Majority of doctors support using medical marijuana for children. Herb Website. <https://herb.co/marijuana/news/medical-marijuana-for-children>. Accessed 7 Mar 2018
27. Gusovsky D (2014) Cannabis for kids: Israel pioneers pediatric pot. NBC News. <https://cnbc.com/2014/04/29/pediatric-medical-marijuana-its-big-business-in-israel/html>. Accessed 7 Mar 2018
28. Mammoser G (2017) Marijuana can help children with seizures, Cancer Nausea. Healthline Website. <https://healthline.com/health-news/marijuana-can-help-children-with-seizures-cancer-nausea>. Accessed 7 Mar 2018
29. Southall J (2018) Most pediatric oncologists willing to consider medical marijuana for children with cancer. Healio Website. <https://www.healio.com/hematology-oncology/pediatric-oncology/news/online/%7Bb8934f81-15c2-4e52-8547-25bb85f85954%7D/most-pediatric-oncologists-willing-to-consider-medical-marijuana-for-children-with-cancer>. Accessed 7 Mar 2018
30. Unknown (2017) Provider Perspectives Assessed on Medical Marijuana Use for Pediatric Cancer. MPR Website. <https://empr.com/news/medical-marijuana-use-mm-children-with-cancer/article/713660/>. Last updated December 17, 2017. Accessed 7 Mar 2018
31. Unknown (Unknown) Medical marijuana for children with cancer? What providers think. Medical Xpress Website. <https://www.sciencedaily.com/releases/2017/12/171212091039.htm> Accessed 7 Mar 2018
32. Rivas A (2015) Kids with cancer may benefit from medical marijuana pediatricians group calls for rescheduling drug to allow research. Medical Daily. <https://www.medicaldaily.com/kids-cancer-may-benefit-medical-marijuana-pediatricians-group-calls-rescheduling-drug-319622/>. Accessed 7 Mar 2018
33. Goldstein B (2017) Cannabis use for pediatric cancers. Marijuana.com Website. <https://www.marijuana.com/news/2017/01/cannabis-use-for-pediatric-cancers/>. Accessed 7 Mar 2018
34. Schwartz C (2017) Marijuana drastically shrinks aggressive form of brain cancer, New Study Finds. Huffington Post Website. https://www.huffingtonpost.ca/entry/marijuana-brain-cancer_n_6181060. Accessed 7 Mar 2018
35. Wilcox A (2016) Overwhelming majority support cannabis for pediatric cancer. Herb Website. <https://herb.co/marijuana/news/overwhelming-support-cannabis-pediatric-cancer>. Accessed 7 Mar 2018
36. Crombie L (2012) Medical marijuana for a child with leukemia. Oregon Live Website. https://oregonlive.com/health/index.ssf/2012/11/medical_marijuana_for_a_child.html. Accessed 7 Mar 2018
37. Sheridan K (2017) Parents of children with cancer want marijuana for their kids. Newsweek Website. <https://www.newsweek.com/parents-children-cancer-want-marijuana-their-kids-746162>. Accessed 7 Mar 2018
38. Lupkin S (2012) Cannabis oil pills helped child go into cancer remission, Mom Says. ABC News. <https://abcnews.go.com/Health/wireStory/25-nurses-cited-high-doses-patients-died-61686007>. Accessed 7 Mar 2018
39. Unknown (2017) Pediatric cancer providers give medical marijuana a cautious thumbs-up. Yale Cancer Centre. <https://yalecancercenter.org/news/article.aspx?id=16357>. Accessed 7 Mar 2018
40. Hall C (2017) Weed the people movie looks at children, Cancer and Cannabis Medicine. HuffPost. <https://www.huffpost.com/entry/weed-the-people-movie-look-at-children-cancer-and-cannabis-medicine>. Accessed 16 Dec 2019
41. Ellin S (2019) Weed the people explores cannabis as a treatment for pediatric cancers. JMore. <https://www.jmoreliving.com/2019/04/01/weed-the-people-explores-cannabis-as-a-treatment-for-pediatric-cancers/>. Accessed 16 Dec 2019

42. Myers K (2018) Review: documentary weed the people looks at cannabis and pediatric cancer. Los Angeles Times <https://www.latimes.com/entertainment/movies/la-et-mn-capsule-weed-the-people-review-20181101-story.html>. Accessed 16 Dec 2019
43. Marsh S (2017) Study looks at cannabis ingredient's ability to help children's tumors. The Guardian. <https://www.theguardian.com/society/2017/may/02/study-cannabis-cannabidiol-cbd-ability-to-help-children-brain-tumours>. Accessed 16 Dec 2019
44. Swartz A (2013) Medical marijuana for kids? The scientist magazine. <https://www.the-scientist.com/?articles.view/articleNo/36576/title/Medical-Marijuana-for-Kids-/>. Accessed 7 Mar 2018
45. Haelle T (2017) Medical marijuana for children with cancer broadly supported by doctors. Forbes Magazine. <https://www.forbes.com/sites/tarahaelle/2017/12/12/medical-marijuana-for-children-with-cancer-broadly-supported-by-doctors/#436cc28a795d>. Accessed 7 Mar 2018
46. Szalavitz M (2012) Is medical marijuana safe for children?. Time Magazine. <https://healthandtime.com/2012/11/28/is-medical-marijuana-safe-for-children/>. Accessed 7 Mar 2018
47. Dodd J (2018) Afraid daughter, 3, wouldn't survive chemo, her parents turn to medical Marijuana. People Magazine. <https://people.com/human-interest/parents-use-medical-marijuana-for-daughter-3-cancer/>. Accessed 16 Dec 2019
48. Ducharme J (2018) Weed the people explores medical marijuana for kids with cancer. Time Magazine. <https://time.com/5430844/medical-marijuana-cancer-treatment/>. Accessed Dec 16 2019
49. Goldstein B. (2017) Cannabis for pediatric cancer. Marijuana.com Website. <https://www.marijuana.com/news/2017/02/cannabis-for-pediatric-cancer/>. Accessed 7 Mar 2018
50. Unknown. (2015) Marijuana and cannabinoids for medical purposes. Canadian Cancer Society Website. <https://www.cancer.ca/en/cancer-information/diagnosis-and-treatment/complementary-therapies/medical-marijuana-and-cannabinoids/?region=bc>. Accessed 7 Mar 2018
51. Unknown (Unknown) Dr. William Courtney Calls Child "A Miracle Baby". Cure Your Own Cancer Website. <https://www.cureyourowncancer.org/dr-william-courtney-calls-child-a-miracle-baby.html>. Accessed 7 Mar 2018
52. Dach J (2014) pediatric cancer and cannabis oil five case reports. Jeffrey Dach MD Website. <https://jeffreydachmd.com/2014/09/pediatric-cancer-cannabis-oil-five-case-reports/>. Accessed 7 Mar 2018
53. Nierengarten MB (2018) Medical marijuana for children with cancer. Contemporary PEDIATRICS. <https://contemporarypediatrics.morderndicinecom/news/medical-marijuana-children-cancer>. Accessed 7 Mar 2018
54. Circus M (2010) Medical marijuana in pediatric medicine. DrSircus.com Website. <https://drsircus.com/cancer/medical-marijuana-in-pediatric-medicine-2/>. Accessed 7 Mar 2018
55. Kander J (2015) Mom says cannabis oil treatment are helping her daughter battle pediatric lymphoma. Medical Jane Website. <https://www.medicaljane.com/2015/02/28/hannah-ebertarts-journey-cannabis-extracts-for-pediatric-lymphoma>. Accessed 7 Mar 2018
56. Unknown (2017) Children and medical marijuana - cannabis for kids. Cannabiscure Website. <https://www.cannabiscure.info/children-medical-marijuana/>. Accessed 7 Mar 2018
57. Unknown (2017) Marijuana and cancer. American Cancer Society. <https://www.cancer.org/treatment/treatments-and-side-effects/complementary-and-alternative-medicine/marijuana-and-cancer.html>. Accessed 7 Mar 2018
58. Sircus M (2012) Cancer, children and cannabis. Drsircus.com Website. <https://drsircus.com/cancer/cancer-children-cannabis>. Accessed 7 Mar 2018
59. Kim A (2017) Medical marijuana and cancer. CancerCare Website. https://www.cancercare.org/publication/328-medical_marijuana_and_cancer. Accessed 7 Mar 2018
60. Unknown (2015) Canadian cancer society perspective on hemp and cannabis products to cure cancer. Canadian Cancer Society Website. <https://www.cancer.ca/en/about-us/news/national/2013/canadian-cancer-society-perspective-on-hemp-and-cannabis-products/?region=bc>. Accessed 7 Mar 2018
61. Unknown (Unknown) Cannabis Smoke and Cancer. Kind Green Buds Website. <https://www.kindgreenbuds.com/medical-marijuana/cannabis-smoke-and-cancer/>. Accessed 7 Mar 2018
62. Armentano P (Unknown) cannabis smoke and cancer: assessing the risk. NORML Foundation <https://norml.org/component/zoo/category/cannabis-smoke-and-cancer-assessing-the-risk>. Accessed 7 Mar 2018
63. Unknown (Unknown) Children and Medical Marijuana Info - CBD Cannabis Treatments For Children. CannabisCure. <https://cannabiscure.info/children-medical-marijuana/>. Accessed 16 Dec 2019
64. Unknown (Unknown) Cannabis For Pediatric Patients. <https://weedmaps.com/learn/cannabis-and-its-evolution/cannabis-for-children/>. Accessed 16 Dec 2019
65. Horsley L (2012) Cannabis oil testimonials. Cure Your Own Cancer. <https://www.cureyourowncancer.org/testimonials.html>. Accessed 16 Dec 2019
66. May B (2018) Despite research gap, medical marijuana use supported at end of life in pediatric Cancer. Medical Bag. <https://www.medicalbag.com/home/medicine/despite-research-gap-medical-marijuana-use-supported-at-end-of-life-in-pediatric-cancer/>. Accessed 16 Dec 2019
67. Le B (2018) Weed the people doc follows kids treating cancer with marijuana. The Fix. <https://www.thefix.com/weed-people-doc-follows-kids-treating-cancer-marijuana>. Accessed 16 Dec 2019
68. Unknown (Unknown) Cancer - leukemia and cannabis studies completed. Cannabis Research A - Z. <https://www.calgarycmmc.com/cancerleukemia.htm>. Accessed 16 Dec 2019
69. Unknown. (Unknown) Medical marijuana and cancer. Children's Hospital Colorado Website. <https://www.childrenscolorado.org/conditions-and-advice/marijuana-what-parents-need-to-know/medical-marijuana/medical-marijuana-and-cancer/>. Accessed 7 Mar 2018
70. Unknown (2017) Medical marijuana for children with cancer? What providers think. Ann & Robert H. Lurie Children's Hospital of Chicago Website. https://www.luriechildrens.org/en-us/news/Pages/medical_marijuana_for_children_with_cancer_518.aspx. Accessed 7 Mar 2018
71. Unknown (2019) Marijuana at St. Jude. St. Jude Children's Research Hospital. <https://www.stjude.org/treatment/patient-resources/caregiver-resources/patient-family-education-sheets/general-information/marijuana-at-st-jude.html>. Accessed 16 Dec 2019
72. Unknown (2017) Cannabis and cannabinoids (PDQ)-patient version. National Cancer Insitute. <https://www.cancer.gov/about-cancer/treatment/cam/patient/cannabis-pdq>. Accessed 7 Mar 2018
73. Abrams DI, Dou, J, Kumar NB, et al. (2017) Cannabis and cannabinoids (PDQ)-health professional version. National Cancer Institute. <https://www.cancer.gov/about-cancer/treatment/cam/hp/cannabis-pdq>. Accessed 7 Mar 2018
74. Unknown (2017) Marijuana as medicine. National Institute on Drug Abuse. <https://www.drugabuse.gov/publications/drugfacts/marijuana-medicine>. Accessed 7 Mar 2018
75. Campbell CT, Phillips MS, Manasco K (2017) Cannabinoids in pediatrics. J Pediatr Pharmacol Ther 22(3):176–185
76. Ananth P et al (2017) Provider perspectives on use of medical marijuana in children with cancer. Pediatrics. <https://doi.org/10.1542/peds.2017-0559>
77. Rollins JA (2014) Pot for tots: children and medical marijuana. Pediatr Nurs 40(2):59–60

78. Ananth PJ, Ma C, Al-Sayegh H et al (2016) Pediatric oncology providers and use of medical marijuana in children with cancer. *J Clin Oncol* 34(15_suppl):10581
79. Peachman RR (2018) Clinicians support medical marijuana use in children with cancer, but lack knowledge. *JAMA*. 319(9):852–853
80. Goldstein B (2016) Medical cannabis: practical treatment of pediatric patients for epilepsy, autism, cancer, and psychiatric disorders medical genomics <https://www.medicinalgenomics.com/wp-content/uploads/2016/05/Bonni-Goldstein-CannMed2016.pdf>. Accessed 16 Dec 2019
81. Skrypek M, Bostrom B, Bendel A (2019) Medical cannabis certification in a large pediatric oncology center. *Children (Basel)*. <https://doi.org/10.3390/children6060079>
82. Likar R, Nahler G (2017) The use of cannabis in supportive care and treatment of brain tumor. *Neuro Oncol Pract*. <https://doi.org/10.1093/nop/npw027>
83. American Academy of Pediatrics (2015) American Academy of Pediatrics reaffirms opposition to legalizing marijuana for recreational or medical use. AAP. <https://www.aap.org/en-us/about-the-aap/aap-press-room/Pages/American-Academy-of-Pediatrics-Reaffirms-Opposition-to-Legalizing-Marijuana-for-Recreational-or-Medical-Use.aspx>. Accessed 23 May 2018
84. Drug Enforcement Administration (2010) Pharmacist's manual. An informational outline of the controlled substances act. Drug Enforcement Administration, Office of Diversion Control. https://www.deadiversion.usdoj.gov/pubs/manuals/pharm2/pharm_manual.pdf. Accessed 23 May 2018
85. Mandelbaum DE, de la Monte SM (2017) Adverse structural and functional effects of marijuana on the brain: evidence reviewed. *Pediatr Neurol* 66:12–20
86. Fisher T, Golan H, Schiby G, PriChen S, Smoum R, Moshe I, Peshes-Yaloz N, Castiel A, Waldman D, Gallily R, Mechoulam R, Toren A (2016) In vitro and in vivo efficacy of non-psychoactive cannabidiol in neuroblastoma. *Curr Oncol* 23(2): S15–S22
87. Unknown (2018) Her treatment. Brave Mykayla: Pediatric Cancer Advocate Website. <http://www.bravemykayla.com/>. Accessed 21 July 2018
88. Fowler GE, Baker DM, Lee MJ, Brown SR (2017) A systematic review of online resources to support patient decision-making for full-thickness rectal prolapse surgery. *Tech Coloproctol* 21(11): 853–862
89. Mahood Q (2014) Searching for grey literature for systematic reviews: challenges and benefits. *Res Synth Methods* 5(3):221–234
90. Bilic P (2016) Search algorithms, hidden labour, and information control. *Big Data Soc*. <https://doi.org/10.1177/2053951716652159>

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.