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Medical Marijuana Legalization and Opioid- and Pain-Related Outcomes Among Patients Newly Diagnosed With Cancer Receiving Anticancer Treatment

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IMPORTANCE The past decade saw rapid declines in opioids dispensed to patients with active cancer, with a concurrent increase in marijuana use among cancer survivors possibly associated with state medical marijuana legalization.

OBJECTIVE To assess the associations between medical marijuana legalization and opioid-related and pain-related outcomes for adult patients receiving cancer treatment.

DESIGN, SETTING, AND PARTICIPANTS This cross-sectional study used 2012 to 2017 national commercial claims data and a difference-in-differences design to estimate the associations of interest for patients residing in 34 states without medical marijuana legalization by January 1, 2012. Secondary analysis differentiated between medical marijuana legalization with and without legal allowances for retail dispensaries. Data analysis was conducted between December 2021 and August 2022. Study samples included privately insured patients aged 18 to 64 years who received anticancer treatment during the 6 months after a new breast (in women), colorectal, or lung cancer diagnosis.

EXPOSURES State medical marijuana legalization that took effect between 2012 and 2017.

MAIN OUTCOMES AND MEASURES Having 1 or more days of opioids, 1 or more days of long-acting opioids, total morphine milligram equivalents of any opioid dispensed to patients with 1 or more opioid days, and 1 or more pain-related emergency department visits or hospitalizations (hereafter, hospital events) during the 6 months after a new cancer diagnosis. Interaction terms were included between each policy indicator and an indicator of recent opioids, defined as having 1 or more opioid prescriptions during the 12 months before the new cancer diagnosis. Logistic models were estimated for dichotomous outcomes, and generalized linear models were estimated for morphine milligram equivalents.

RESULTS The analysis included 38 189 patients newly diagnosed with breast cancer (38 189 women [100%]), 12 816 with colorectal cancer (7100 men [55.4%]), and 7190 with lung cancer (3674 women [51.1%]). Medical marijuana legalization was associated with a reduction in the rate of 1 or more opioid days from 90.1% to 84.4% (difference, 5.6 [95% CI, 2.2-9.0] percentage points; $P = .001$) among patients with breast cancer with recent opioids, from 89.4% to 84.4% (difference, 4.9 [95% CI, 0.5-9.4] percentage points; $P = .03$) among patients with colorectal cancer with recent opioids, and from 33.8% to 27.2% (difference, 6.5 [95% CI, 1.2-11.9] percentage points; $P = .02$) among patients with lung cancer without recent opioids. Medical marijuana legalization was associated with a reduction in the rate of 1 or more pain-related hospital events from 19.3% to 13.0% (difference, 6.3 [95% CI, 0.7-12.0] percentage points; $P = .03$) among patients with lung cancer with recent opioids.

CONCLUSIONS AND RELEVANCE Findings of this cross-sectional study suggest that medical marijuana legalization implemented from 2012 to 2017 was associated with a lower rate of opioid dispensing and pain-related hospital events among some adults receiving treatment for newly diagnosed cancer. The nature of these associations and their implications for patient safety and quality of life need to be further investigated.

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Supplemental content

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Pain is one of the most prevalent cancer-related symptoms.[1] Opioid therapy remains the mainstay approach to managing moderate to severe pain related to active cancer,[2-4] but undertreatment is prevalent[5] and may be increasing in the United States. Although patients with active cancer were exempted from recent opioid treatment guidelines intended for chronic noncancer pain,[6,7] the literature suggests a rapid decline (20%-40%) in opioids dispensed to patients with advanced cancer.[8-11] Clarifying the implications of alternative or adjuvant therapies to manage cancer-related pain is clinically important.

Medical marijuana may be used by patients with cancer to help manage pain.[12] A small number of clinical studies have supported the use of marijuana derivatives for cancer-related pain that is not responsive to opioids (ie, refractory cancer pain),[13,14] but overall, evidence on analgesic effectiveness and safety is limited.[15-17] Professional organizations, such as the American Society of Clinical Oncology[18] and the International Association for the Study of Pain,[19] do not currently recommend or endorse medical marijuana as first-line pain management.

Nevertheless, marijuana use among cancer survivors has increased rapidly during the past 2 decades. National surveys indicate that the rate of past 30-day use among cancer survivors more than doubled (from 5.6% to 12.2%) between 2005 and 2014.[20] This increase may be related to the recent wave of state legislation that legalizes marijuana use for qualified conditions. As of February 2022, medical marijuana legalization was in effect in 37 states and Washington, DC.[21]

Studies using data through the early 2010s found that medical marijuana legalization was associated with a reduction in opioids dispensed to general Medicare[22] and Medicaid[23] populations, but no such data exist for cancer survivors. These studies noted a reduction in opioid-related harm[24,25] and national age-adjusted opioid overdose death rates,[26,27] but implications of medical marijuana legalization for opioid-related and pain-related outcomes experienced by patients with cancer are unknown.

The aim of the study was to evaluate the association between recent medical marijuana legalization (2012-2017) and changes in opioid-related and pain-related outcomes for patients aged 18 to 64 years who were newly diagnosed with cancer and receiving cancer treatment. The prevalence of pain among this population was as high as 55% during anticancer treatment.[1] National studies have revealed important age differences in marijuana use among cancer survivors,[28-30] finding younger survivors more likely to report past or recent marijuana use, greater accessibility, and lower perceived risks associated with marijuana compared with their counterparts without cancer.[29] By focusing on adult patients younger than age 65 years receiving cancer treatment, we sought to shed light on the implications of medical marijuana legalization for a population that has elevated needs for cancer pain management but also is potentially more likely to use medical marijuana.

Key Points

Question Is medical marijuana legalization associated with opioid-related and pain-related outcomes for adult patients newly diagnosed with cancer and receiving anticancer treatment?

Findings This cross-sectional study of 38 189 patients with newly diagnosed breast cancer, 12 816 with colorectal cancer, and 7190 with lung cancer found that medical marijuana legalization implemented between 2012 and 2017 was associated with a 5.5% to 19.2% relative reduction in the rate of opioid dispensing.

Meaning Medical marijuana could be serving as a substitute for opioid therapies among some adult patients receiving cancer treatment; future studies need to elucidate the nature of the associations and implications for patient outcomes.

Methods

Data and Sample

The population in this cross-sectional study consisted of privately insured patients aged 18 to 64 years with a new diagnosis of breast (in women), colorectal, or lung cancer from January 1, 2012, to July 31, 2017, who received cancer treatment during the 6 months after diagnosis. These 3 types of cancer were selected because of the large number of new cases among those younger than 65 years[31] and the availability of anticancer treatment for these diagnoses. We used commercial insurance claims data from the Health Care Cost Institute,[32] containing about one-third of privately insured persons nationwide. No race or ethnicity information was available in the data. To ascertain new cancer diagnoses (eTable 1 in the Supplement), we required individuals to be continuously enrolled in employment-based or market exchange plans for at least 12 months before the month of the new cancer diagnosis. We further required continuous enrollment in the month of diagnosis and at least 5 months after, and at least 1 health care encounter indicating anticancer surgery, chemotherapy, or radiation (eTable 2 in the Supplement) during the 6 months. Patients were included in only 1 cancer group based on the first cancer diagnosis observed. This study was approved by the Weill Cornell Medicine Institutional Review Board, which waived the requirement for informed consent because only deidentified data were used. We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

Measures

The policy of interest was state medical marijuana legalization that grants legal protection to patients who possess marijuana for qualified medical purposes. Although medical marijuana legalization is heterogeneous across states, legal allowances for retail dispensaries (hereafter, dispensary allowances) have been identified as an important feature accounting for the bulk of reductions in opioid-related harm[27] and an increase in the use of marijuana in the general population.[33,34]

For state medical marijuana legalization status and effective dates of legislation, we used data vetted by the RAND-USC (University of Southern California) Schaeffer Opioid Policy Tools and Information Center[35] supplemented by data from the literature and our original legal research (eTable 3 in the Supplement). We did not consider recreational marijuana legalization because, among the 34 states without medical

marijuana legalization by January 1, 2012, only 1 state (Massachusetts) implemented recreational marijuana legalization before the end of 2017.

To control for concurrent policies that might affect opioid prescriptions, we extracted information on state prescription drug monitoring programs (PDMPs) that require all prescribers to consult the PDMPs before prescribing controlled substances. Although PDMPs assist prescribers with benefit-risk assessments when prescribing opioids,[36-40] strong mandates may unintentionally reduce appropriate opioid prescribing because of an increased burden and perceived liability to prescribers, as suggested in recent studies of patients treated by oncologists[41] and patients with bone metastasis after an emergency department visit.[42]

Three opioid-related outcomes were defined during the 6 months after new cancer diagnoses using data from the pharmacy claims: (1) 1 or more days during which the patient was in possession of prescription opioids (hereafter, 1 or more opioid days) regardless of short-acting or long-acting formulation, (2) 1 or more days during which the patient had long-acting opioids, and (3) total morphine milligram equivalents (MMEs) of opioids dispensed to patients with 1 or more opioid days. Opioids and their long-acting vs short-acting formulations were identified based on National Drug Codes and MMEs calculated using conversion factors provided by the US Centers for Disease Control and Prevention.[43] We excluded buprenorphines used for opioid use disorder when constructing these measures. We specifically examined long-acting opioids because of their role in managing persistent cancer-related pain.[2]

We defined a dichotomous outcome of having 1 or more pain-related emergency department visits or hospitalizations (hereafter, hospital events) based on the presence of pain diagnosis codes (eTable 4 in the Supplement) suggesting uncontrolled pain, as defined in quality measures by the US Centers for Medicare & Medicaid Services for patients receiving outpatient chemotherapy.[44] In the Health Care Cost Institute data, the maximum number of diagnostic codes increased from 3 under the *International Classification of Diseases, Ninth Revision* to 25 under the *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision*. We used the first 3 diagnoses throughout the study years when defining this outcome.

Statistical Analysis

Data analysis was conducted between December 2021 and August 2022. The main analysis included 34 states that did not have medical marijuana legalization before 2012, of which 14 implemented legalization before 2017. Eight of the 14 states had dispensary allowances by the end of 2017 (eTable 3 in the Supplement). For 7 of the 8 states, dispensary allowances did not take effect until after 2015, leaving limited exposure to reliably estimate associations pertaining to medical marijuana legalization with dispensary allowances. Thus, we did not differentiate between medical marijuana legalization with and without dispensary allowances in the main analysis but did so in a secondary analysis. We conducted a sensitivity analysis by restricting to 23 states with an operating PDMP by January 1, 2012, to isolate the associations with medical marijuana legalization and comprehensive PDMP mandates from those with launching a statewide PDMP.[45-47]

The analysis exploited staggered implementation of medical marijuana legalization in a difference-in-differences design. Unit of analysis was a patient half-year, defined as the month of the new cancer diagnosis and the 5 following months. A given patient half-year was categorized as exposed (coded as 1) to a policy—medical marijuana legalization or comprehensive PDMP mandate—if the policy took effect in the patient's residential state before the start of the patient half-year and as not exposed (coded as 0) otherwise. Changes in the outcome from before to after policy implementation in implementing states were compared with concurrent changes in states that had not yet implemented the policy. Association of medical marijuana legalization with an outcome may differ by the patient's previous exposure to opioids; thus, we included interaction terms between each policy indicator and an indicator of recent opioids, defined as having 1 or more opioid prescriptions during the 12 months before the new cancer diagnosis.

We estimated logistic models for dichotomous outcomes and generalized linear models for MMEs (conditional on having 1 or more opioid days), with a log-link function and distribution of error terms identified based on a modified Park test.[48] All models included dichotomous indicators of states to control for between-state differences that did not change over time and indicators of year-quarters to control for national secular changes in the outcome. Each model controlled for patient age and sex, non–cancer-related chronic pain conditions, and mental health and substance use disorders in the 12 months before the new cancer diagnosis. All models were estimated separately for patients with breast, colorectal, or lung cancer. We estimated outcomes conditional on exposure or no exposure to a policy and by recent opioid use or no recent opioid use. Differences in conditional estimates were derived, in absolute and relative (absolute difference divided by estimated outcome conditional on no exposure to policy) terms, and a 2-sided $P < .05$ indicated statistical significance. Statistical analyses were performed using Stata, version 17.0 (StataCorp LLC).

The difference-in-differences design relies on an important assumption that, in the time leading up to policy implementation, outcomes in states that ultimately implemented medical marijuana legalization followed a parallel trend vs outcomes in states that had not yet implemented medical marijuana legalization. We conducted event study analysis to formally assess this assumption.

Results

The groups for the main analysis included 38 189 patients with a new diagnosis of breast cancer (38 189 women [100%] and 0 men), 12 816 with colorectal cancer (5716 women [44.6%] and 7100 men [55.4%]), and 7190 with lung cancer (3674 women [51.1%] and 3516 men [48.9%]) (**Table 1**). Chemotherapy was the most common type of cancer treatment in all 3 groups; the proportion of patients receiving chemotherapy

Table 1. Characteristics of Patients in the Main Analysis Sample

Characteristic	Proportion of patients[a]		
	With breast cancer (n = 38 189)	With colorectal cancer (n = 12 816)	With lung cancer (n = 7190)
Sex			
Female	100	44.6	51.1
Male	0	55.4	48.9
Age group, y			
18-44	18.9	14.2	4.5
45-54	37.6	37.7	25.3
55-64	43.6	48.2	70.2
Pain and behavioral health diagnosis in the 12 mo before month of new cancer diagnosis			
Back pain	10.6	8.7	13.3
Neck pain	8.9	6.4	11.4
Arthritis and joint pain	35.2	26.9	39.4
Other pain[b]	21.6	22.0	25.6
Mental health or substance use disorder	17.7	14.0	19.7
Tobacco use	2.5	4.0	18.9
≥1 Opioid prescription	12.4	13.7	19.4
Cancer treatment in the first 6 mo after new cancer diagnosis			
Cancer resection surgery	12.5	57.1	23.6
Chemotherapy	64.8	71.4	81.9
Radiation	48.2	32.2	60.1

[a] Patients were included in the main analysis sample if they resided in 1 of 34 states that did not have medical marijuana legalization before January 1, 2012, at the time of their new cancer diagnosis.

[b] Other pain includes headaches, migraine, and other painful conditions.

Table 2. Opioid-Related and Pain-Related Outcomes by Cancer Type and Recent History of Opioid Prescriptions

Outcome	Groups, %[a]					
	With breast cancer		With colorectal cancer		With lung cancer	
	No recent opioids (n = 33 472)	Recent opioids (n = 4717)[b]	No recent opioids (n = 11 059)	Recent opioids (n = 1757)[b]	No recent opioids (n = 5793)	Recent opioids (n = 1397)[b]
Rate of ≥1 opioid days	37.7	89.1	37.9	88.3	32.9	89.6
Rate of ≥1 long-acting opioid days	0.5	5.6	2.7	12.9	7.0	30.2
Morphine milligram equivalents if ≥1 opioid days, mean (SD)	558.9 (1622.8)	2211.3 (6809.3)	1414.1 (4255.8)	3611.8 (10 195.7)	3475.8 (8422.8)	7870.9 (15 415.4)
Rate of ≥1 pain-related emergency department visits or hospitalizations	5.0	8.0	10.8	12.5	13.5	19.4

[a] Groups included patients newly diagnosed with breast, colorectal, or lung cancer from January 1, 2012, to July 30, 2017, receiving cancer treatment during the 6 months after the new cancer diagnosis and residing in 1 of 34 states without medical marijuana legalization before January 1, 2012.

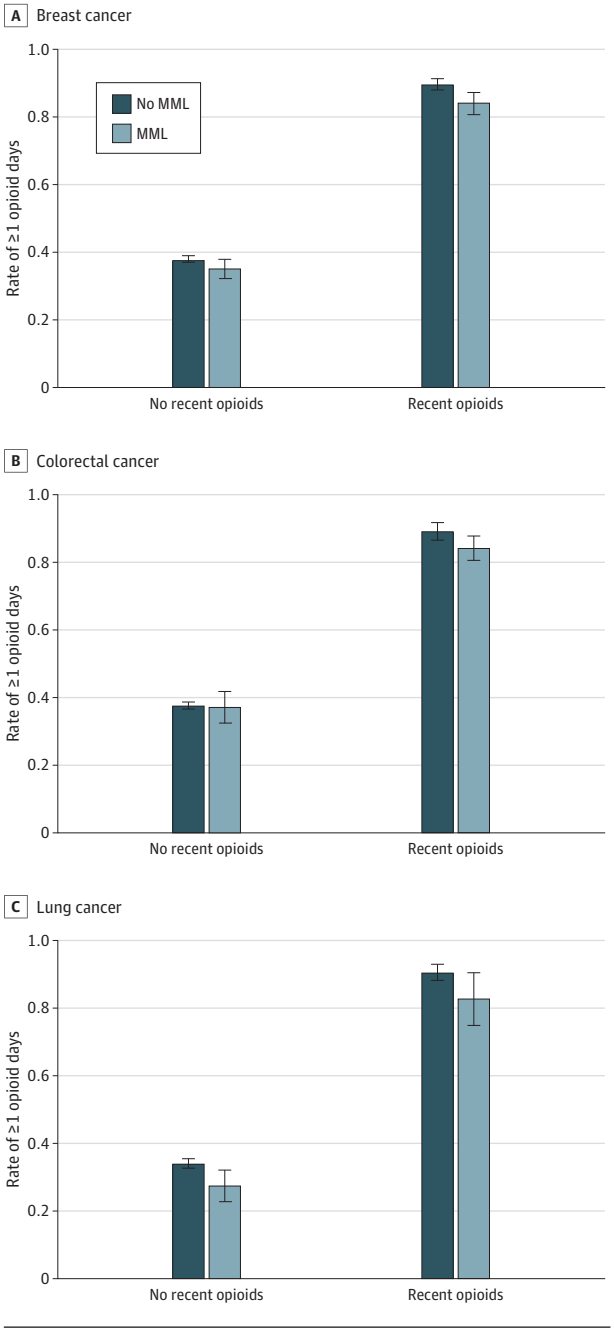
[b] Recent history of opioid prescriptions was defined as having 1 or more opioid prescriptions during the 12 months before the month of the new cancer diagnosis.

for breast cancer was 64.8%, 71.4% for colorectal cancer, and 81.9% for lung cancer. The rate of cancer resection surgeries was 12.5% for breast cancer, 57.1% for colorectal cancer, and 23.6% for lung cancer. All 3 groups had a high rate of chronic noncancer pain diagnoses, and the proportion of patients dispensed opioids in the 12 months before their cancer diagnosis was 12.4% for those with breast cancer, 13.7% for those with colorectal cancer, and 19.4% for those with lung cancer.

The rate of 1 or more opioid days did not differ substantively across the 3 cancer types. The rate of 1 or more long-acting opioid days, MMEs if 1 or more opioid days, and the rate of pain-related hospital events were higher among patients with colorectal or lung cancer than among patients with breast cancer (**Table 2**). Across cancer types, those with recent opioids had much higher rates of opioid dispensing and pain-related hospital events than those without recent opioids (eg, for patients with breast cancer, the rate of opioid dispensing was 89.1% among those with recent opioids vs 37.7% among those without recent opioids; the rate of pain-related hospital events was 8.0% vs 5.0%). Results of event study analysis supported the parallel trends assumption (eFigure 1 in the Supplement).

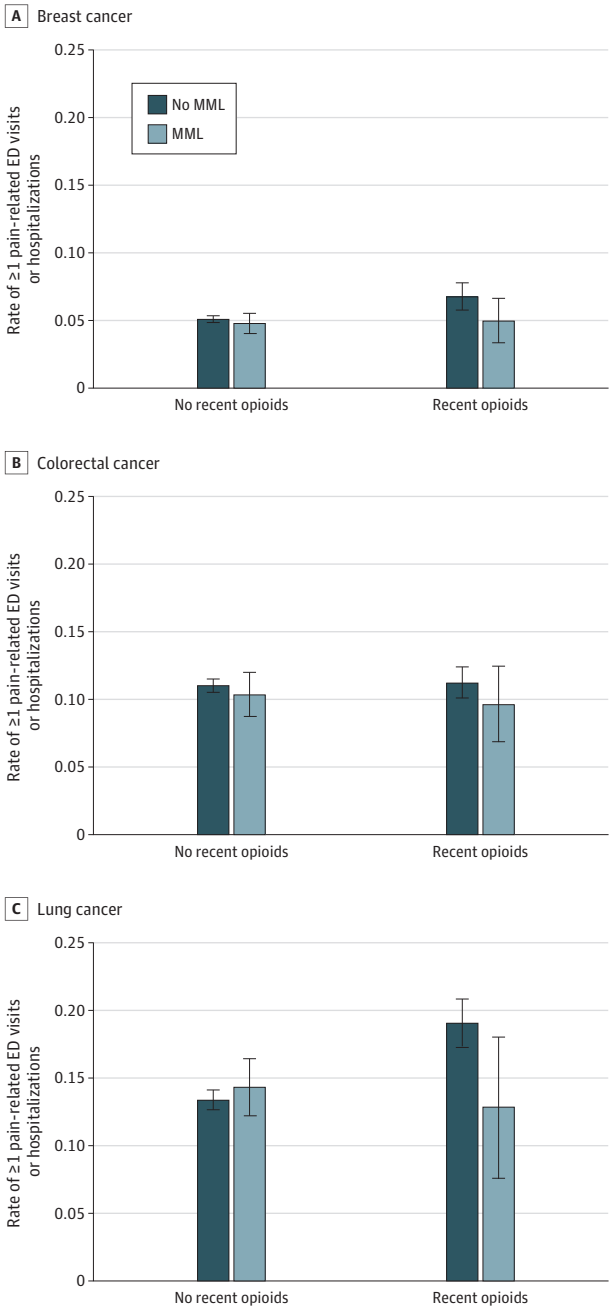
Figure 1 and **Figure 2** present conditional, model-based estimates for 2 outcomes with robust findings in the main analysis. Detailed results for all outcomes are shown in eTable 5 in the Supplement. Medical marijuana legalization was associated with a reduction in the rate of 1 or more opioid days from 90.1% to 84.4% (difference, 5.6 [95% CI, 2.2-9.0] percentage points [a 6.2% relative reduction]; $P = .001$) for patients with breast cancer with recent opioids and a reduction from 89.4% to 84.4% (difference, 4.9 [95% CI, 0.5-9.4] percentage points

Figure 1. Estimated Rate of 1 or More Opioid Days During the 6 Months After a New Cancer Diagnosis Conditional on Exposure to MML



Recent opioids is defined as having 1 or more opioid prescriptions during the 12 months before the month of the new cancer diagnosis. MML indicates medical marijuana legalization. Whiskers represent 95% CIs of estimated rates.

Figure 2. Estimated Rate of 1 or More Pain-Related ED Visits or Hospitalizations During the 6 Months After a New Cancer Diagnosis Conditional on Exposure to MML

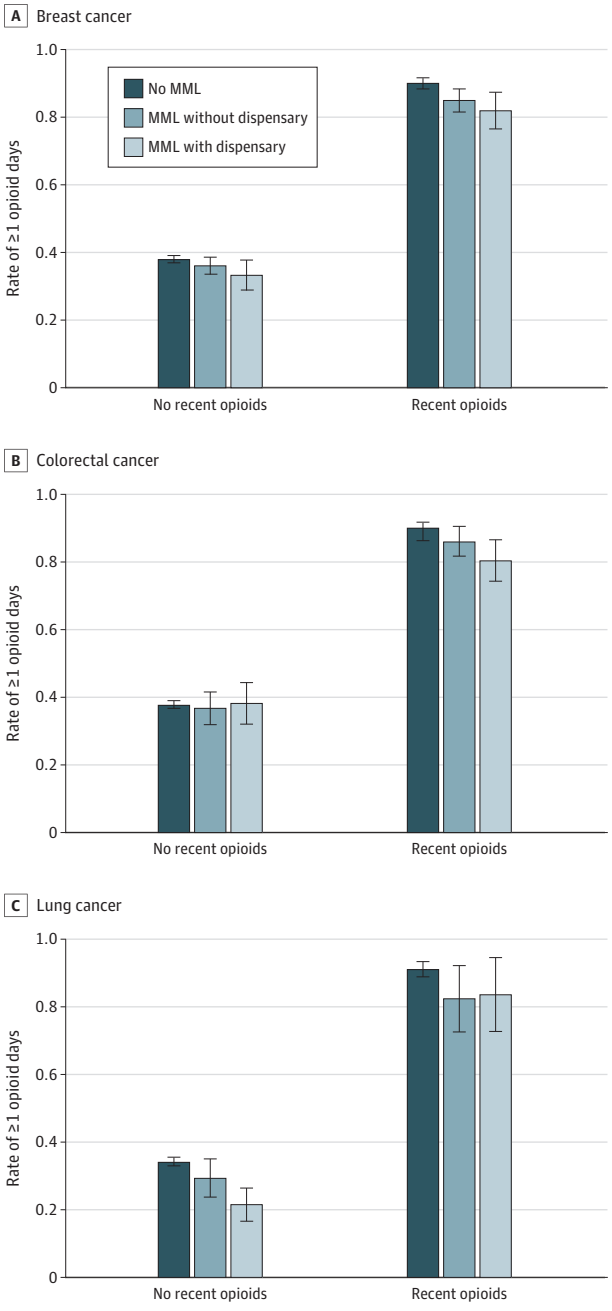


Recent opioids is defined as having 1 or more opioid prescriptions during the 12 months before the month of the new cancer diagnosis. MML indicates medical marijuana legalization. Whiskers represent 95% CIs of estimated rates.

[a 5.5% relative reduction]; $P = .03$) for patients with colorectal cancer with recent opioids. For patients with lung cancer without recent opioids, medical marijuana legalization was associated with a reduction from 33.8% to 27.2% (difference, 6.5 [95% CI, 1.2-11.9] percentage points [a 19.2% relative reduction]; $P = .02$) (Figure 1).

Medical marijuana legalization was associated with a reduction from 31.5% to 22.1% (difference, 9.4 [95% CI, 0.8-17.9] percentage points [a 29.8% relative reduction]; $P = .03$) in the rate of 1 or more long-acting opioid days among patients with lung cancer with recent opioids. Medical marijuana legalization was not associated with significant changes

Figure 3. Estimated Rate of 1 or More Opioid Days During the 6 Months After a New Cancer Diagnosis, Secondary Analysis Differentiating Between MML With and Without Legal Allowances for Retail Dispensaries



Recent opioids is defined as having 1 or more opioid prescriptions during the 12 months before the month of the new cancer diagnosis. MML indicates medical marijuana legalization. Whiskers represent 95% CIs of estimated rates.

in morphine milligram equivalents dispensed in any of the groups.

Medical marijuana legalization was associated with a reduction from 19.3% to 13.0% (difference, 6.3 [95% CI, 0.7-12.0] percentage points [a 32.6% relative reduction]; $P = .03$) in the rate of 1 or more pain-related hospital events among patients with lung cancer with recent opioids (Figure 2). For patients with breast cancer with recent opioids, the reduction was sizable (6.9% to 5.1%; difference, 1.8 [95% CI, -0.1 to 3.8] percentage points [a 26.1% relative reduction]) but did not achieve statistical significance ($P = .06$).

Comprehensive PDMP mandates were not associated with significant changes in any of the sample-outcome combinations except for a reduction in the rate of 1 or more long-acting opioid days among patients with breast cancer with recent opioids (5.0% to 2.8%; difference, 2.2 [95% CI, 0.4-4.0] percentage points; $P = .02$) and an increase in the rate of 1 or more opioid days among patients with lung cancer without recent opioids (31.9% to 38.1%; difference, 6.2 [95% CI, 0.3-12.0] percentage points; $P = .04$) (eTable 5 in the Supplement).

Results of the event study analysis suggest that medical marijuana legalization's association with 1 or more opioid days, if any, was not seen until the third or fourth year after policy implementation (eFigure 2 in the Supplement). Medical marijuana legalization's association with pain-related hospital events among patients with lung cancer, however, was seen as early as the second half of the first year after implementation.

Results of the secondary analysis (**Figure 3**; eTable 6 in the Supplement) indicate that, in general, medical marijuana legalization with dispensary allowances was associated with a larger reduction in the rate of 1 or more opioid days (eg, for patients with breast cancer and recent opioids, 90.1% to 82.1%; difference, 7.9 [95% CI, 2.7-13.2] percentage points; $P = .003$) compared with medical marijuana legalization without dispensary (90.1% to 85.1%; difference, 4.9 [95% CI, 1.5-8.4] percentage points; $P = .005$). For patients with breast cancer without recent opioids, medical marijuana legalization with dispensary allowances was associated with a reduction in the rate of 1 or more opioid days from 38.1% to 33.3% (difference, 4.8 [95% CI, 0.2-9.4] percentage points; $P = .04$). Sensitivity analysis restricted to 23 states with an operating PDMP by January 1, 2012, found qualitatively similar results pertaining to medical marijuana legalization (eTable 7 in the Supplement).

Discussion

We found medical marijuana legalization to be associated with a 5% to 20% relative reduction in the rate of opioid dispensing to adults younger than 65 years receiving cancer treatment after a new cancer diagnosis. Medical marijuana legalization with dispensary allowances was associated with a larger reduction in opioid dispensing compared with legalization without dispensary allowances.

The findings suggest that medical marijuana legalization may have been associated with lower use of opioids by some adult patients receiving cancer treatment. Several mechanisms are possible. Legal access to medical marijuana may have led oncologists and other practitioners to prescribe fewer opioids. Medical marijuana legalization may also have been associated with lower demand for opioids by patients who use marijuana when self-managing pain as well as by those who

were reluctant to complain about pain when perceiving marijuana as an alternative to opioids.[49] Without data on clinician practices or patient use of medical marijuana, the nature of the observed associations remains uncertain. Recent practitioner surveys found a high level of patient inquiries about medical marijuana but a low level of physician knowledge and a large variation in physician willingness to prescribe or recommend medical marijuana.[50] One survey of US medical oncologists[51] found that although 80% ever conducted discussions about medical marijuana with patients or families, only 46% ever recommended it clinically, and more than half of those who ever recommended it did not consider themselves to have sufficient knowledge. A survey of patients at a comprehensive cancer center[52] found that, despite a high level of active use and patient desire to receive information about medical marijuana, patients were largely not receiving such information from their treating physicians. Taken together, although medical marijuana legalization may be an important factor in opioid prescribing and patient behavior, the evolution of its use and implications for patient outcomes warrant continued investigation.

We found that medical marijuana legalization was associated with a reduction in pain-related hospital events (suggesting uncontrolled pain) among patients with lung cancer (and among patients with breast cancer to a lesser extent) with recent opioids, and such reductions were seen shortly after medical marijuana legalization took effect. Nevertheless, this outcome measure reflects extreme events, could reflect side effects of pain treatment, and does not shed light on quality of life or functioning or uncontrolled pain that is not followed by hospital events. Therefore, this finding underscores the importance of further studying medical marijuana legalization's implications for pain-related outcomes and marijuana-related harm (alone or interacting with opioids and other substances) among populations with cancer.

We did not find medical marijuana legalization to be associated with MMEs dispensed to patients who received some opioids. There is thus no evidence that medical marijuana legalization alters clinical decisions regarding the dose and duration of opioid therapies once a decision is made to prescribe opioids. Given that patients may be using marijuana concurrently with opioids (with or without clinicians' awareness or monitoring), the need to adjust opioid dosing and frequency for patients who use marijuana as an adjuvant therapy should be investigated in research and practice.

Future Research

Future studies are needed to replicate the findings of the present study in other populations of patients with cancer, investigate the nature of the associations to shed light on causal mechanisms, examine additional features of medical marijuana legalization (eg, continuing education requirements for clinicians), and assess implications for pain-related outcomes. All these research needs call for data on patient medical marijuana use and other pain management practices, clinician prescribing or recommendation of marijuana, and patient outcomes. As medical marijuana legalization expands, research will need to evaluate the safety, effectiveness, and therapeutic benefits of marijuana for patients with cancer with opioid or other substance use disorders. Findings of the present study also reinforce the importance for clinicians to ask patients what they are using to manage cancer-related pain, to discuss benefits and risks, and to address potential harm associated with drug interactions, polysubstance use, and use of products for which scientific evidence, clinical guidelines, and government regulations are lacking. Frontline medical marijuana dispensary staff likely play an important role in mitigating adverse outcomes. Understanding and improving the quality of their counseling and communication practices will be another area of critical importance.[53]

Limitations

This study has limitations. Our findings cannot be generalized to older patients receiving cancer treatment, for whom the implications of medical marijuana legalization may be different. The measure of pain-related hospital events focuses on extreme outcomes, and claims data did not allow us to investigate clinical outcomes. We were not able to assess actual medical marijuana use or whether marijuana was substituted for opioids at the patient level. We were not able to assess opioid-related or marijuana-related harm because many symptoms associated with these harms are not specific to either substance, and diagnostic codes in claims have poor sensitivity (approximately 25%) in capturing poisoning associated with opioids and other substances.[54] Although our analysis took into account 1 major type of state policies during the study years related to opioid prescribing (namely, comprehensive PDMP mandates), future studies will need to consider newer developments, such as state legislative limits on opioid prescriptions for acute pain.[55]

Conclusions

This cross-sectional study found that medical marijuana legalization between 2012 and 2017 was associated with reductions in the rate of opioid dispensing and pain-related hospital events in some privately insured patients aged 18 to 64 years receiving anticancer treatment. The findings suggest that medical marijuana could be serving as a substitute for opioids to some extent. Future studies need to elucidate the nature of the associations and their implications for patient outcomes.

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