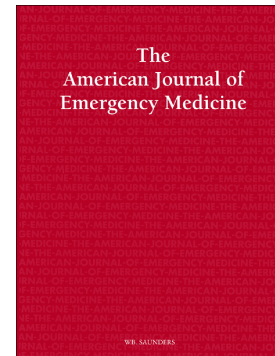# Journal Pre-proof

Chief complaint, drug testing, and neuroimaging for cannabis poisoning in the emergency department

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Chief Complaint, Drug Testing, and Neuroimaging for Cannabis Poisoning in the Emergency Department

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ABSTRACT

Background/Objectives: Cannabis ingestions in young children frequently lead to emergency department (ED) visits requiring substantial diagnostic evaluation, including advanced neuroimaging. We assessed the relationship between presenting chief complaint, timing of cannabis test results, and the use of advanced neuroimaging in these visits.

Methods: In this retrospective study using Epic's Cosmos database (January 2016 – June 2024), we included ED visits for children <6 years with a cannabis poisoning diagnosis and cannabis laboratory test. We described clinical characteristics and illustrated timing of drug testing results during these ED visits. We compared use of neuroimaging by chief complaint, using chi-squared tests and logistic regression.

Results: There were 3,653 encounters included. Median age was 29 (IQR 16-45) months and the cohort was 51% female, 41% White, 35% Black, and 15% Hispanic. The most common category of chief complaint was altered mental status (39%), followed by ingestion/exposure (35%), with seizures/abnormal movements present in 5%. The median times from ED arrival to cannabis test collection and result were 93 (IQR 40-208) and 152 (IQR 90-277) minutes respectively. Neuroimaging was performed in 35% of encounters, with significantly lower use in those with ingestion vs. neurologic chief complaints (8.8% vs. 56%; OR 0.08, 95% CI: 0.06-0.10).

Conclusions: For children with cannabis poisoning, drug screen results were frequently unavailable until late in ED visits, and presenting chief complaint strongly influenced the use of neuroimaging. These findings underscore the need for strategies to facilitate early caregiver disclosure of ingestion and expedite drug screening to optimize care.

1. INTRODUCTION

In the last decade, the frequency of cannabis ingestions in young children has risen dramatically in the United States.[1-3] These exposures often result in central nervous system depression due to the effects of delta-9-tetrahydrocannabinol (THC), frequently leading to altered mental status. [1, 4] The severity of intoxication in children who ingest edible cannabis products has been shown to correlate with the THC dose consumed.[5] Concentrations of THC in cannabis products have risen over time,[6] so small children often experience significant intoxication.

As pediatric cannabis exposures have increased, so too have emergency department (ED) visits for cannabis poisoning.[2, 7] These ED encounters have been shown to include considerable resource utilization, with nearly one-third of children treated in the ED undergoing advanced neuroimaging, presumably as part of a diagnostic workup for altered mental status.[8] However, cannabis exposure is primarily confirmed through urine drug screening,[9] and once cannabis intoxication is diagnosed, further testing may have limited utility.[10] Identifying factors that influence ED clinicians' decisions regarding diagnostic testing is crucial, as reducing unnecessary imaging and interventions could improve care and optimize resource use.

Prior studies examining ED management of pediatric cannabis poisoning have been limited by reliance on administrative databases lacking detailed clinical data and limited to tertiary pediatric centers,[2, 8] or by single-center designs with small sample sizes.[11-13] To address these gaps, we utilized Epic Cosmos, a large, nationally representative dataset to characterize ED care for children with cannabis poisoning. We hypothesized that (1) urine drug screen results would often be unavailable until late in the ED visit, and (2) the decision to obtain advanced neuroimaging would be influenced by the presenting chief complaint. Our objectives

were therefore to describe the clinical characteristics of children presenting to the ED with cannabis poisoning, assess the timing of urine drug screen results, and determine the association between presenting chief complaint and the use of diagnostic neuroimaging.

2. METHODS

2.1 Data Source

This was a retrospective cohort study using data from Epic Cosmos,[14] an expertly determined de-identified dataset created in collaboration with a community of Epic health systems representing more than 294 million patients from over 1,633 hospitals and 37 thousand clinics from all 50 states, D.C., Lebanon, and Saudi Arabia. As a de-identified dataset, our institution considered this study non-human subjects research.

2.2 Study Population

This study included ED visits from January 2016 through June 2024 for children under 6 years of age that included both a billing diagnosis indicating cannabis poisoning (International Classification of Diseases, Tenth Revision [ICD-10] codes T40.7 or F12) as well as a laboratory test for cannabis associated with the encounter. We limited the analysis to children under 6 years of age because this age group is commonly affected by unintentional exposures and to be consistent with prior literature.[1, 2, 5] We excluded encounters without a documented time stamp for collection or result of the cannabis testing.

2.3 Patient Characteristics

For each included encounter, we collected patient demographic variables including age, sex, race, ethnicity, whether patient was insured with Medicaid, rural-urban commuting area

(RUCA) codes (categorized as urban, suburban, large rural, rural), and whether the encounter occurred at a primarily pediatric (defined as median age < 18 for all encounters in that ED) or general ED. We collected ED visit details including arrival method (ambulance vs walk-in), emergency severity index (ESI) level, and chief complaint as categorized in Epic. Each encounter could have zero to multiple structured chief complaints recorded in Cosmos. For encounters with no recorded chief complaint, we categorized them as unspecified. We manually reviewed chief complaints for included encounters and classified them as altered mental status, ingestion/exposure, seizure/abnormal movements, trauma, general screening, alleged abuse, other, or unspecified (complaints within each category shown in **supplemental table 1**). Additionally, we obtained details pertaining to ED treatment including relevant time stamps (ED arrival, departure, cannabis test collection, cannabis test result instants), whether advanced neuroimaging (including CT or MRI) was done, and ED disposition.

2.4 Analysis

We described encounter-level characteristics using counts and proportions for categorical variables and medians with interquartile range (IQR) for numerical variables. To address our hypothesis that drug screen results would not be available until late in the ED visit, we constructed a time-to-event plot to illustrate the timing of cannabis test collection and result availability during ED visits. To assess the impact of chief complaint on the use of advanced neuroimaging, we compared the frequency of CT or MRI for children with a neurologic complaint (including categories of altered mental status and seizure or abnormal movements), an ingestion/exposure complaint, concerns for both ingestion and neurologic change, or neither. We used chi-squared tests to determine differences and used logistic regression to determine odds ratios for neuroimaging, excluding encounters with no specified chief complaint from this

analysis. All analyses were conducted using R (version 4.4.1), and a two-tailed $p < 0.05$ was

considered statistically significant.

3. RESULTS

3.1 Patient Characteristics

There were 7,330 ED visits for children < 6 years of age with an ICD-10 diagnosis for cannabis during the study period, of which 3,656 had a cannabis test associated with the ED encounter. After exclusion of 3 encounters with missing laboratory timing data, there were 3,653 encounters included in the analysis. Encounter level patient characteristics are shown in **Table 1**. The median age was 29 months (IQR 16-45 months), and the cohort was 51% female, 41% White, 35% Black, and 15% Hispanic. Medicaid was the primary insurance for 39% and children in the cohort primarily lived in zip codes with an urban (80%) RUCA category. These ED visits mostly occurred in general EDs (80%), with 20% occurring in pediatric centers. For disposition from the ED visit, 61% were discharged, 27% were admitted to the hospital, 11% were transferred to another medical facility, and 0.4% left against medical advice.

3.2 Clinical Presentation

Children treated for cannabis poisoning in this study were triaged as relatively high acuity, with 6% categorized as ESI level 1, 60% as ESI level 2, and 29% as ESI level 3 respectively; 34% arrived via ambulance, while 64% arrived via private transportation.

Frequency of chief complaints are shown in **Table 2**, with the individual chief complaints within each category shown in **supplemental table 1**. The most common category of chief complaint was altered mental status (39%), closely followed by ingestion/exposure (35%), with seizures/abnormal movements present in 5%. Other chief complaints such as trauma, screening, and alleged abuse were uncommon.

Of the 3258 encounters with at least one specified chief complaint, 1,203 (37%) had a complaint of ingestion/exposure without a neurologic complaint, 1,540 (47%) had a neurological complaint without an ingestion/exposure complaint, 55 (1.7%) had both, and 450 (14%) had neither.

3.3 Timing of Cannabis Test Collection and Results

We calculated the time in minutes between ED arrival and the first cannabis test collection and result, with the results of this time-to-event analysis shown in **Figure 1.** The median time to cannabis test collection was 93 minutes (IQR: 40-208 minutes) and the median time from ED arrival to first cannabis test result was 152 minutes (IQR: 90-277) minutes. Time to testing did not differ significantly between general and pediatric institutions. In 19% of encounters, the cannabis test resulted after the patient departed the ED. Of those encounters with the cannabis test resulting after ED disposition, 52% were discharged, 43% were admitted to the hospital, and 3.6% were transferred to another facility.

The time to collection and results were different based on presence of a neurologic vs ingestion/exposure chief complaint (**Table 3**). Median time between ED arrival and testing was longer for those with an ingestion complaint than those with a neurological complaint, for collection (127 vs 72 minutes; p <0.001) and results (188 vs 132 minutes; p <0.001).

3.4 Association between Chief Complaint and Neuroimaging

Advanced neuroimaging with CT or MRI occurred in 35% of encounters in the study, with no significant difference between general and pediatric EDs (35% vs 36%, p = 0.6), There were significant differences in imaging based on presenting chief complaint (**Table 3**). A considerably greater proportion of those with neurologic chief complaints were imaged

compared with those with a chief complaint indicating ingestion/exposure (56% vs. 8.8%), while those with both neurologic and ingestion complaints were imaged in 24% of encounters (p <0.001 for difference). In the logistic regression analysis, when compared to encounters with a neurologic chief complaint, there were significantly reduced odds of head imaging in those with exposure (OR 0.08, 95% CI: 0.06-0.10), both exposure and neurologic (OR 0.25, 95% CI: 0.13-0.45), and other (OR 0.51, 95% CI: 0.41-0.63) chief complaints.

4. DISCUSSION

The results from this large, multicenter, nationally representative database study add to the body of literature on pediatric cannabis ingestions in the ED. Children diagnosed with cannabis poisoning most often presented with chief complaints indicating neurologic symptoms or ingestion and were most often triaged as high acuity (ESI level 2). Cannabis test results were often not available until multiple hours into ED visits. Advanced neuroimaging was done in over half of encounters with neurologic chief complaints, but only a small percentage of those with chief complaint of ingestion or exposure.

Our results are generally consistent with the present literature on pediatric cannabis ingestions. Both a review of the National Poison Data System database and a systematic review of single center studies of cannabis ingestions have reported approximately 70% of these children experience lethargy or central nervous system depression.[1, 11] Though these symptoms are common, previous single center studies have reported that the majority of ED visits in their sites have a chief complaint of ingestion.[12, 13] In our study, neurologic chief complaints were more common than chief complaints of ingestion or exposure. Previous work limited to tertiary pediatric centers has demonstrated that greater than 30% of children receive head imaging during ED visits for cannabis poisoning.[2, 8, 10] Our results reinforce these findings in a nationally representative set of EDs, including both general and pediatric centers in similar proportion to the known patterns of ED visits for children nationally.[15] Importantly, we found no significant difference in imaging rates between pediatric and general EDs, supporting the broader applicability of prior observations.

This study provides important insight into the diagnostic workflow for children with cannabis ingestions. First, our results illustrate the importance of disclosure of ingestion on the

diagnostic workup. Though chief complaint does not tell the entire clinical picture of a child presenting to the ED, it is revealing that children with a chief complaint of ingestion had 92% reduced odds of head imaging compared to those with a neurologic chief complaint. Similar imaging rates for these chief complaints (5% vs. 56%) has previously been reported in a single center study.[12] This discrepancy suggests that the ED clinician's decision to obtain head imaging likely is impacted by both the severity of intoxication (and resultant mental status changes) as well as the disclosure of cannabis exposure. Because this imaging may be considered low-yield[10] and is associated with significant downsides such as cost and radiation exposure, efforts to avoid unnecessary imaging are needed. Our results suggest that strategies to encourage early disclosure of ingestion from caregivers of these children may be helpful to achieve this end. It may be the case that fear of repercussions from the legal system or child protective services may discourage full caregiver transparency – addressing this concern may be an important step. Previous work illustrated higher rates of imaging for cannabis ingestions in states where recreational cannabis was illegal.[2]

Beyond the clinical history, ED clinicians typically make the diagnosis of cannabis poisoning with urine drug screening.[9] Despite the relatively high acuity of the encounters included in this study (two-thirds were ESI 1 or 2), the median time to first cannabis test result was over two-and-a-half hours after ED arrival. It is therefore unsurprising that so many children with altered mental status received head imaging – the differential diagnosis for these symptoms includes conditions that require emergent intervention. It is not reasonable to delay ED workup for potentially life-threatening intracranial processes for multiple hours. Our time-to-result analysis further demonstrates that delays in these test results are due to both delays in collection and the time for the laboratory to run the test. This suggests two potential interventions to

improve time-to-diagnosis. First, it may be important to obtain the urine sample as quickly as possible, possibly necessitating catheterization in an altered patient. It should be noted that time to collection was much shorter in those with neurologic chief complaints (median 72 minutes), so many clinicians may already be prioritizing this. Second, availability of a rapid point-of-care cannabis test might reduce time-to-diagnosis by about 1 hour. While time-to-collection may be impacted by wait times and triage, this 1-hour time period is presumably after the initial clinical evaluation—a time when most additional diagnostic testing or imaging might occur. Thus, work towards development and implementation of reliable point-of-care testing seems warranted. Previous work has shown that point-of-care drug testing reduces ED length of stay[16] with a survey finding some of the highest utility in cases of altered mental status.[17] However, in cases of severely depressed mental status, even with a positive cannabis test, advanced imaging may still be warranted to rule out other intracranial causes. Future studies should examine how availability of rapid bedside test results impacts resource utilization and costs.

This study has several limitations. Though Cosmos contains robust electronic health record data, only common laboratory tests currently have results in the database. Therefore, we were unable to determine the cannabis test results. To account for this our inclusion criteria required both an ICD-10 diagnosis of cannabis ingestion and a cannabis test during the ED visit which may have resulted in selection bias as there may have been children diagnosed based on history alone and not tested. Chief complaint fields can be incomplete, and analysis of chief complaint should be interpreted with caution, as they do not represent the entire clinical history. Notably, 11% of encounters did not have a specified chief complaint, which could reflect variation in documentation practices across institutions, limitations of structured data capture in Cosmos, or complaints documented only in free text fields that are not yet fully incorporated into

the Cosmos dataset. We could not reliably distinguish initial ED visits from transfer visits, so it is possible that some children underwent diagnostic testing or received anchoring diagnoses at referring facilities. However, our requirement for cannabis testing during the index ED visit helps ensure that key diagnostic evaluation occurred at the treating site. Though timing of laboratory testing is present, Cosmos currently does not report time stamps for imaging results, so we were unable to determine if imaging occurred before or after the drug screening. Finally, billing diagnoses may not be sensitive for drug exposures,[18, 19] though we expect sensitivity to be higher in the pediatric population.[20]

5. CONCLUSIONS

In this large, nationally representative study of ED visits for cannabis poisoning in young children, we found that encounters were generally high acuity, with chief complaints primarily related to ingestion or neurologic symptoms. Drug screen results were frequently unavailable until late in ED visits, and presenting chief complaint strongly influenced the use of advanced neuroimaging. These findings underscore the need for strategies to promote early caregiver disclosure of ingestion, expedite drug screening results, and reduce low-yield imaging to optimize care and resource use for these children.

REFERENCES

[1]   Tweet MS, Nemanich A, Wahl M. Pediatric Edible Cannabis Exposures and Acute Toxicity: 2017–2021. Pediatrics. 2023;151(2)https://doi.org/10.1542/peds.2022-057761.

[2]   Walsh PS, Dupont AS, Lipshaw MJ, Visotcky A, Thomas DG. Cannabis Legalization and Resource Use for Ingestions by Young Children. Pediatrics. 2024;153(6)https://doi.org/10.1542/peds.2024-065881.

[3]   Cohen N, Galvis Blanco L, Davis A, Kahane A, Mathew M, Schuh S, et al. Pediatric cannabis intoxication trends in the pre and post-legalization era. Clin Toxicol (Phila). 2022;60(1):53-8. https://doi.org/10.1080/15563650.2021.1939881.

[4]   Richards JR, Smith NE, Moulin AK. Unintentional Cannabis Ingestion in Children: A Systematic Review. J Pediatr. 2017;190:142-52. https://doi.org/10.1016/j.jpeds.2017.07.005.

[5]   Pepin LC, Simon MW, Banerji S, Leonard J, Hoyte CO, Wang GS. Toxic Tetrahydrocannabinol (THC) Dose in Pediatric Cannabis Edible Ingestions. Pediatrics. 2023;152(3)https://doi.org/10.1542/peds.2023-061374.

[6]   Freeman TP, Craft S, Wilson J, Stylianou S, ElSohly M, Di Forti M, et al. Changes in delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD) concentrations in cannabis over time: systematic review and meta-analysis. Addiction. 2021;116(5):1000-10. https://doi.org/10.1111/add.15253.

[7]   Bennett CE, Venkataramani A, Henretig FM, Faerber J, Song L, Wood JN. Recent Trends in Marijuana-Related Hospital Encounters in Young Children. Acad Pediatr. 2022;22(4):592-7. https://doi.org/10.1016/j.acap.2021.07.018.

[8]   Toce MS, Dorney K, D'Ambrosi G, Monuteaux MC, Paydar-Darian N, Raghavan VR, et al. Resource utilization among children presenting with cannabis poisonings in the emergency department, a retrospective analysis. The American Journal of Emergency Medicine. 2023;73:171-5. https://doi.org/https://doi.org/10.1016/j.ajem.2023.09.002.

[9]   Van Oyen A, Barney N, Grabinski Z, Chang J, Oliff Z, Nogar J, et al. Urine Toxicology Test for Children With Altered Mental Status. Pediatrics. 2023;152(5)https://doi.org/10.1542/peds.2022-060861.

[10]   Dupont AS, Walsh PS. Do young children with known cannabis intoxication benefit from further neurological-based testing or imaging? Am J Emerg Med. 2023;75:119-21. https://doi.org/10.1016/j.ajem.2023.10.047.

[11]   Claudet I, Le Breton M, Bréhin C, Franchitto N. A 10-year review of cannabis exposure in children under 3-years of age: do we need a more global approach? Eur J Pediatr. 2017;176(4):553-6. https://doi.org/10.1007/s00431-017-2872-5.

[12]   Dubinin A, Bialostozky M, Richardson A, Laub N. Presentation, Management, and Child Protective Service Reporting of Children Who Test Positive for Cannabis in an Emergency Room Setting. Pediatr Emerg Care. 2024;40(6):443-8. https://doi.org/10.1097/pec.0000000000003145.

[13]   Kaczor EE, Mathews B, LaBarge K, Chapman BP, Carreiro S. Cannabis Product Ingestions in Pediatric Patients: Ranges of Exposure, Effects, and Outcomes. J Med Toxicol. 2021;17(4):386-96. https://doi.org/10.1007/s13181-021-00849-0.

[14]   Tarabichi Y, Frees A, Honeywell S, Huang C, Naidech AM, Moore JH, et al. The Cosmos Collaborative: A Vendor-Facilitated Electronic Health Record Data Aggregation Platform. ACI open. 2021;5(1):e36-e46. https://doi.org/10.1055/s-0041-1731004.

[15]   Michelson KA, Lyons TW, Hudgins JD, Levy JA, Monuteaux MC, Finkelstein JA, et al. Use of a National Database to Assess Pediatric Emergency Care Across United States Emergency Departments. Academic Emergency Medicine. 2018;25(12):1355-64. https://doi.org/https://doi.org/10.1111/acem.13489.

[16]   Lewandrowski K, Flood J, Finn C, Tannous B, Farris AB, Benzerx TI, et al. Implementation of Point-of-Care Rapid Urine Testing for Drugs of Abuse in the Emergency Department of an Academic Medical Center: Impact on Test Utilization and ED Length of Stay. American Journal of Clinical Pathology. 2008;129(5):796-801. https://doi.org/10.1309/59681r72jdtccd2b.

[17]   Lager PS, Attema-de Jonge ME, Gorzeman MP, Kerkvliet LE, Franssen EJF. Clinical value of drugs of abuse point of care testing in an emergency department setting. Toxicology Reports. 2018;5:12-7. https://doi.org/https://doi.org/10.1016/j.toxrep.2017.12.001.

[18]   Di Rico R, Nambiar D, Stoové M, Dietze P. Drug overdose in the ED: a record linkage study examining emergency department ICD-10 coding practices in a cohort of people who inject drugs. BMC Health Serv Res. 2018;18(1):945. https://doi.org/10.1186/s12913-018-3756-8.

[19]   Rowe C, Vittinghoff E, Santos GM, Behar E, Turner C, Coffin PO. Performance Measures of Diagnostic Codes for Detecting Opioid Overdose in the Emergency Department. Acad Emerg Med. 2017;24(4):475-83. https://doi.org/10.1111/acem.13121.

[20]   de Achaval S, Feudtner C, Palla S, Suarez-Almazor ME. Validation of ICD-9-CM codes for identification of acetaminophen-related emergency department visits in a large pediatric hospital. BMC Health Serv Res. 2013;13:72. https://doi.org/10.1186/1472-6963-13-72.

TABLES AND FIGURES

Table 1: Characteristics of ED visits for cannabis poisoning in young children.

Characteristic	N = 3,653[1]
Age, months	29 (16, 45)
Sex	
Female	1,854 (51%)
Male	1,796 (49%)
Race	
American Indian or Alaska Native	28 (0.8%)
Asian	34 (0.9%)
Black or African American	1,266 (35%)
Native Hawaiian or Other Pacific Islander	15 (0.4%)
White	1,515 (41%)
Multiple Races	466 (13%)
Other Race	228 (6.2%)
Unspecified	101 (2.8%)
Ethnicity	
Hispanic or Latino	537 (15%)
Not Hispanic or Latino	2,917 (80%)
Unspecified	199 (5.4%)
Medicaid Insurance	1,425 (39%)
Rural Urban Commuting Area	
Urban	2,919 (80%)
Suburban	306 (8.4%)
Large Town	228 (6.2%)
Small Town or Rural	171 (4.7%)
Unspecified	29 (0.8%)
Emergency Severity Index	
Level 1 - Immediate	226 (6.2%)
Level 2 - Emergent	2,175 (60%)
Level 3 - Urgent	1,045 (29%)
Level 4 - Less Urgent	160 (4.4%)
Level 5 - Non-Urgent	13 (0.4%)
Unspecified	34 (0.9%)
Arrival Type	
Ambulance	1,251 (34%)

Characteristic	N = 3,653[1]
Walk In	2,335 (64%)
Unspecified	67 (1.8%)
ED Disposition	
Discharged	2,237 (61%)
Hospital Admission	982 (27%)
Transferred to Another Facility	387 (11%)
Left Against Medical Advice	14 (0.4%)
Unspecified	33 (0.9%)
Emergency Department Type	
General	2,928 (80%)
Pediatric	725 (20%)

[1] Median (Q1, Q3); n (%)

Table 2: Chief complaints of children with ED visits for cannabis poisoning.

Chief Complaint Category	N = 3,653
Altered Mental Status	1,442 (39%)
Ingestion/Exposure	1,266 (35%)
Seizure/Abnormal Movements	189 (5.2%)
Trauma/Injury	72 (2.0%)
Screening	45 (1.2%)
Alleged Abuse	<11 (<0.3%)
Other	547 (15%)
Unspecified	405 (11%)

[1]Individual chief complaints included in each category are shown in the Supplemental Table. Each encounter could have multiple chief complaints.

Table 3: Comparisons of laboratory testing and neuroimaging by type of chief complaint

Chief Complaint Type	N	Time to Cannabis Test Collection[1]	Time to Cannabis Test Result[1]	Received Neuroimaging (N = 3,248)	Odds Ratio for Neuroimaging (95% CI)[3]
Neurologic	1,540	72 mins (IQR: 33-153)	132 mins (IQR: 82-221)	857 (56%)	Reference
Exposure	1,203	127 mins (IQR: 47-298)	188 mins (IQR: 102-390)	106 (8.8%)	0.08 (0.06, 0.10)
Both	55	47 mins (IQR:30-157)	120 mins (IQR: 76-252)	13 (24%)	0.25 (0.13, 0.45)
Other	450	100 mins (IQR: 49-191)	161 mins (IQR: 100-251)	175 (39%)	0.51 (0.41, 0.63)

[1]Median (IQR); p <0.001 for Kruskal-Wallis rank sum test.

[2]Abbreviations: IQR, interquartile range; CI, confidence interval; mins, minutes.

[3]Results of univariate logistic regression model with chief complaint type as predictor and neuroimaging as outcome variable.

Supplemental Table: Categorization of individual chief complaints

Category	Specific Chief Complaints Included
Altered Mental Status	altered mental status, fatigue, lethargy, weakness - generalized, fussy, loss of consciousness, syncope, acute neurological problem, dizziness, gait problem, crying, excessive daytime sleepiness, hallucinations
Ingestion/Exposure	ingestion, swallowed foreign body, drug overdose, poisoning, drug problem, chemical exposure, toxidrome, acute intoxication, abnormal lab, alcohol intoxication
Seizure/Abnormal Movements	seizures, shaking, febrile seizure, abnormal movement, tremors, spasms
Trauma/Injury	head injury, fall, trauma, motor vehicle crash, neck injury, ankle injury, gun shot wound, injury
Screening	screening, annual exam, drug / alcohol assessment, well child, medical clearance, wellness check, annual wellness
Alleged Abuse	assault victim, alleged child abuse, alleged sexual assault
Other	other, vomiting, fever, cough, abdominal pain, nasal congestion, illness, headache, shortness of breath, diarrhea, medical problem re-evaluation, allergic reaction, choking, earache, parental concerns

[1]Chief complaints within each category are listed from most frequent to least frequent within the cohort. For the "Other" category, the top 15 complaints are shown.

Figure 1 Legend: Survival curves for time between emergency department arrival and first cannabis test collection (red) and result (blue), in minutes.

Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐ The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:
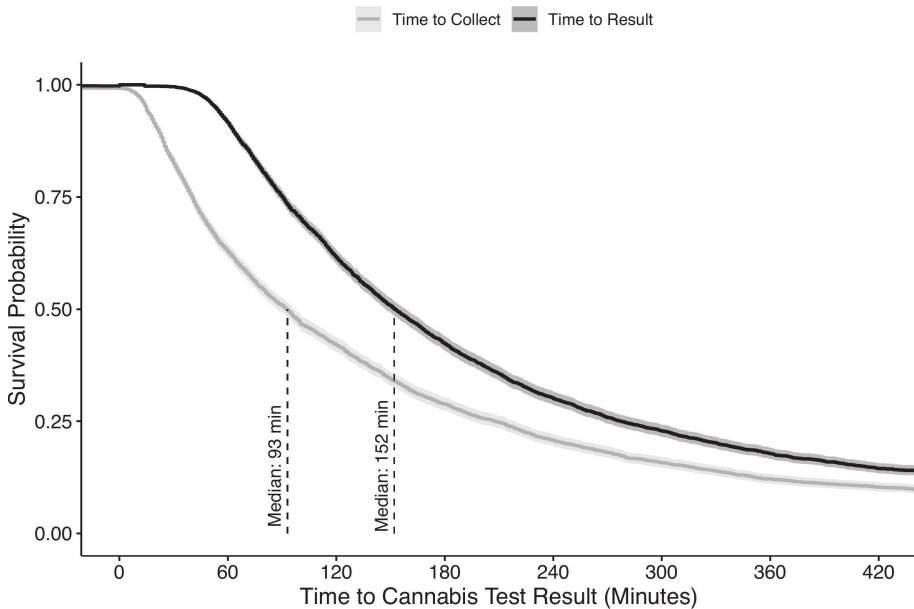
Time to First Cannabis Test Collection and Result

Figure 1