Examining the Current Assessment, Screening, and Documentation Practices of Anesthesia Providers Providing Care for Cannabis Users: A Process Improvement Study

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Abstract

With the rise of cannabis use in the United States, there is interest regarding potential effects cannabis consumption may have on patients undergoing anesthesia. In order to study these potential effects, documentation of cannabis use needs to be completed in the electronic medical record (EMR). This paper examines documentation practices of surgical patients' cannabis consumption at Oregon Health and Science University (OHSU). Prior to surgery at OHSU, patients have an anesthetic preoperative evaluation and note documented in the EMR. This evaluation is recorded using a standardized charting template (NoteWriter). The NoteWriter does not contain a section dedicated to documenting a patient's substance use. Substance use is documented in a separate section of the EMR, under the "Social History" tab. The "Social History" tab allows all healthcare professionals at OHSU to review and record a patient's history of tobacco, alcohol, and drug use. Documentation of cannabis use in the EMR at OHSU was found to have inconsistencies through data mining. A survey was developed and distributed to anesthesia providers at OHSU to assess their documentation practices and beliefs regarding their patients' cannabis use. The survey revealed that the majority of OHSU anesthesia providers reviewed a patient's substance use when preparing for a case; however, most do not chart their patients' substance use in the social history tab but defer documentation to other locations in NoteWriter. The authors advocate that cannabis screening be a standard part of the preoperative evaluation and documented in a consistent location in the EMR in order to improve current knowledge of cannabis use and anesthesia.

Keywords: Cannabis, electronic medical record (EMR), documentation, screening, provider beliefs

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Problem Description

The Oregon Health and Science University (OHSU) Department of Anesthesiology & Perioperative Medicine performs over 75,000 anesthetic procedures per year. Patients undergoing surgery have a preoperative anesthesia evaluation prior to their procedure. This evaluation is documented in the electronic medical record (EMR) using a standardized charting template (NoteWriter). Outside this NoteWriter, the 'Social History' tab in the EMR provides a central location for all healthcare providers to view and document their patient's substance use history. Cigarette smoking, vaping, and alcohol use are easily identified within this tab, as their effects on patients' health and outcomes are well documented. Within this social history tab, a patient's cannabis use is divided between the 'substance use' and 'e-cigarette/vaping' sections (see Appendix A). Furthermore, cannabis is listed as one of 30 substances within the 'illicit drug use' section; and may therefore be missed or not selected during preoperative interviews. The documentation of substance use is imprecise, not allowing for frequency or route consumed. At OHSU, cannabis use is not part of the preoperative NoteWriter, as such, anesthesia providers are not prompted to ask their patients about cannabis use and it may be

overlooked. Additionally, if providers wish to document their patient's cannabis use, they need to exit the preoperative NoteWriter and open the patient's social history tab to document in the correct location. Evolving evidence suggests that cannabis use impacts the pharmacodynamics of anesthetic drugs and should be regularly screened for as part of the preoperative evaluation (Teitel & Bozimowski, 2020). The inconsistencies identified among current documentation of cannabis use among surgical patients at OHSU demonstrates potential for quality improvement.

To gain insight about how frequently cannabis use is being screened for among surgical patients at OHSU, a gap analysis was performed via data mining in the EMR (see Appendix B). The data revealed that 77% of patient encounters had at least some part of the social history documentation section addressed. Of those with social history information recorded, 79% had 'illicit drug use' charted under the substance use section, and about 13.5% of illicit drug use patients had cannabis selected as a drug used. Of note, if providers document cannabis use within the preoperative NoteWriter, this data will not populate into the patient's 'social history' tab and would likely not be seen by other services or during future encounters.

The authors sought to gain awareness regarding anesthesia provider's screening and documentation practices and beliefs concerning their patient's cannabis use and anesthesia within a busy medical organization. The purpose of this process improvement project is to investigate potential documentation barriers in the EMR and gain insight to anesthesia provider's documentation practices and beliefs regarding their patient's cannabis use.

Specific Aims

1. Identify inconsistencies and/or barriers surrounding the documentation of cannabis use among surgical patients.
2. Gain insight regarding anesthesia provider's beliefs concerning the impact of cannabis use among surgical patients.

3. Develop recommendations for an implementation plan to improve documentation of patient's cannabis intake.

Available Knowledge

Cannabis use in medicine is estimated to date back to 2900 B.C. (Tapley & Kellett, 2019). Its multiple uses and forms have been well documented; many are familiar with the varied effects of cannabis through media exposure, popular culture, or personal experience. Cannabis is still federally considered a Schedule I illicit drug (Alexander & Joshi, 2019). However, 33 states have now legalized it for medical use, and 14 states have legalized it for recreational use (Suhre, O'Reilly-Shah, & Van Cleve, 2020). It is estimated that 22 million Americans partake in cannabis products, and its use has increased from 4.1% to 9.5% from 2015 to 2016 nationwide (Alexander & Joshi, 2019; Huson, Granados, & Rasko, 2018). Acute cannabis use not only alters one's functional capacity, but there is evidence to suggest that chronic use may significantly impact a person's response to anesthesia medications and their perioperative course (Wong & Irwin 2013).

Cannabis has many interactions with medications, immune function, and other physiologic mechanisms. Cannabis can potentially alter a patient's perioperative course through its interactions with anesthetic drugs (Horvath et al., 2019). For example, cannabis may alter medication requirements during induction of anesthesia, which adds potential considerations for anesthesia providers regarding their induction plan (Wong & Irwin, 2013). As cannabis use becomes increasingly popularized and destigmatized, anesthesia providers should consider including inquiries about cannabis use in its various forms when performing a preoperative evaluation of their patients.

The multiple nomenclatures that describe cannabis can be confusing and merit definition. "Cannabis" refers to all products derived from the plant *Cannabis Sativa*, from which the compound known as marijuana is produced (Huson, Granados, & Rasko, 2019). Marijuana specifically refers to compounds of the plant that contain tetrahydrocannabinol (THC), the psychoactive substance

responsible for the colloquial 'high' when smoked or ingested (Tapley & Kellett, 2019). Cannabis contains many active compounds known as cannabinoids, including delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD). THC is largely responsible for the psychoactive effects experienced with cannabis use while CBD and cannabinol have no psychoactive properties (Teitel & Bozimowski, 2020). THC and CBD interact with several receptors in the human body. CB1 receptors are located primarily in the central nervous system and have high affinity for THC (McLaren-Blades et al., 2019; Teitel & Bozimowski, 2020). CB2 receptors have a high affinity for CBD and are found in peripheral tissues and on immune cells (McLaren-Blades et al., 2019). They are activated in response to injury or inflammation (McLaren-Blades et al., 2019; Teitel & Bozimowski, 2020).

The pharmacodynamics and pharmacokinetics of cannabis vary widely depending on the route of administration, dose or concentration of the drug, liver function, and the amount of adipose tissue available for drug sequestration (Alexander & Joshi, 2019). Absorption of cannabis to peak onset is nearly instantaneously during inhalation of the drug but can be delayed by two hours or more following oral ingestion (Alexander & Joshi, 2019). A hyper-concentrated form of THC derived from the oils of the cannabis plant can be smoked or 'dabbed' to achieve a rapid, more intense effect than regular smoking due to the increased drug concentration available in the oils (Urits et al., 2020). Fat sequestration of cannabis can prolong the half-life of the drug by 30 days or more (Alexander & Joshi, 2019).

Both chronic use and acute ingestion or inhalation of cannabis can have significant effects on anesthetic drugs and have the potential to alter a patient's perioperative course (Horvath et al., 2019). One study determined that cannabis users require 14% more fentanyl, 19.6% more midazolam, and 220% more propofol during anesthetic induction than non-users (Davidson et al., 2020). Lynn & Galinkin (2020) determined that users required higher doses of opioids, although it is unclear if that requirement is due to a developed tolerance or a hyperalgesic effect secondary to chronic cannabis

use. Daily users reported higher-than-average postoperative pain scores and experienced more postoperative nausea and vomiting (PONV) than non-users (Davidson et al., 2020). Acutely intoxicated patients, defined as ingestion or inhalation of cannabis within four hours of surgery, were found to be at higher risk of experiencing cardiovascular or cerebrovascular events (Davidson et al., 2020). Patients may present with either tachycardia or bradycardia, orthostasis, airway edema and/or reactivity, abdominal pain, or hyperemesis (Horvath et al., 2020). Acute CNS effects range from euphoria to psychosis and the drug present at CNS receptors interacts synergistically with anesthetic induction agents (Horvath et al., 2020). Cannabis has been shown to cause a fourfold decrease in gastric emptying time, putting patients at higher risk for aspiration during airway instrumentation (Horvath et al., 2020). Chronic users may experience withdrawal starting at 1-2 days and lasting up to a week; symptoms include anxiety, irritability, fatigue, and poor appetite (Davidson et al., 2020; Ladha et al., 2021).

A thorough preoperative patient assessment record will allow anesthesia providers to more accurately tailor their anesthetic plans, leading to increased patient safety and potential avoidance of perioperative events such as uncontrolled pain, PONV, or negative cardiovascular, pulmonary, or neurologic sequelae.

Design

The Six-Sigma model was applied to this process improvement project as a guiding framework to structure the project. Six-Sigma is a quality management methodology used to help improve a current process by discovering and eliminating issues or barriers. Six-Sigma applies five tenets: (a) define, (b) measure, (c) analyze, (d) improve, and (e) control (Niñerola et al., 2020). These processes allow developers to make decisions, recommendations, and practice changes based on evidence gathered from moving through each process (Niñerola et al., 2020). The authors defined a potential problem of

inconsistent documentation of patient's cannabis use within the EMR, which was supported by a gap analysis of EPIC data pulled from de-identified patient social histories (see Appendix B).

Authors then applied the SWOT analysis method to further define the issue. This analysis method examines the strengths, weaknesses, opportunities, and threats within an organization that is planning to implement a given change. Applying the SWOT analysis, the authors determined that the strengths of current perioperative clinical practices at OHSU include the pre-procedure patient clinical evaluation performed prior to most elective surgical procedures. This evaluation is a comprehensive patient assessment performed by a qualified healthcare provider and often includes a social history evaluation. Perceived weaknesses include inconsistent assessment and documentation practices regarding cannabis use prior to surgery, divided locations within the EMR for documenting cannabis use within the social history tab, and lack of clarity regarding the frequency of use and route of ingestion. Opportunities include the ability to assess staff's charting habits and beliefs regarding patient's cannabis use and potentially identify barriers to consistent screening and documentation. Threats posed to completion of this project included the need to obtain buy-in from key stakeholders associated with the project and the potential for underpowering if survey participation is unacceptably low, or a lack of appreciable data collected during the data mining process. Following analysis, the decision was made to design a project to gain understanding of cannabis screening and documentation practices at OHSU. A thorough review by OHSU's Institutional Review Board determined that this project did not qualify as human research.

Methods

Context

This project took place in Portland Oregon's metropolitan area at OHSU's main hospital campus and nearby ambulatory surgical center, the Center for Health and Healing (CHH). OHSU utilizes 36 operating rooms, in four separate OR suites for the care of inpatient, outpatient, and obstetric surgical

patients (OHSU, 2021). Patient demographics are diverse, and OHSU provides care in a variety of surgical subspecialty areas. The OHSU Department of Anesthesiology & Perioperative Medicine employs approximately 60 anesthesiologists, 27 residents, and 20 certified registered nurse anesthetists (CRNA) and performs over 75,000 anesthetic procedures per year (OHSU, 2020). Whenever possible, patients undergo a thorough preoperative screening interview, often performed via phone or video chat, while more complex cases may require an in-person physical exam and appropriate testing. On the day of surgery, the anesthesiologist or CRNA performs a standardized preoperative review of systems and physical exam. This preoperative evaluation is completed in the EMR using a standardized charting template (NoteWriter) that uses checkboxes and drop-down lists under each designated category to produce a preoperative note. There is no substance-use category within the NoteWriter template that would prompt providers to ask about cannabis or other substance use. The EMR contains a separate social history section, as described earlier, which prompts providers to inquire about various substance usage. Data entered into the social history section of the EMR does not transcribe into the preoperative evaluation note. Likewise, data entered into the preoperative NoteWriter will not populate elsewhere in the chart.

Interventions

To identify issues or barriers of inconsistent patient screening and documentation of cannabis use by anesthesia providers, a survey was developed to examine providers' beliefs, understanding, and current practices surrounding cannabis screening and documentation. This survey assesses providers' awareness of the existing social history tab, assessing their practices regarding reviewing and documenting substance use, and assessing knowledge about how cannabis affects their patient's anesthetic (see Appendix C). After assessing the EMR, speaking with anesthesia providers, and data mining in EPIC, a nine-question survey was developed utilizing a 7-point Likert scale to assess key points of interest. The Likert scale method was chosen over 'yes/no' style answers because a wider range of

choices helps avoid the dilemma of respondents having to choose between two unequally desirable options, which can lower the reliability of a survey (Joshi et al., 2015; Kreitchmann et al., 2019). The 7-point Likert scale offers a wide spectrum of choices which is useful in evaluating the participants' strength or neutrality of opinion on a subject (Joshi et al., 2015). Prior to distribution, the survey was reviewed and approved by stakeholders. The survey was distributed by email to 173 anesthesia providers (MDs, CRNAs, and anesthesia residents) currently employed by the anesthesia and perioperative medicine (APOM) department at OHSU. The link was accompanied by an e-mail consent and disclosure statement (see Appendix C, Figure C2). Data from the survey was collected by the authors and further analyzed in the results and discussion sections of this paper.

Measures

The outcome measures for this project involves evaluating survey data for current provider trends regarding screening and documenting of cannabis use and assessing provider's beliefs regarding cannabis use among surgical patients at OHSU. The validity of survey responses is implied because data was gathered via a voluntary and anonymous survey. The process measure for this project includes the percentage of clinicians who respond to the survey during the four-week period the survey is available after dissemination. Balancing measures include continual SWOT analysis throughout the survey period and discussion regarding the effects that a change in documentation or clinical practice may have on a patient's perioperative course.

Results

The cannabis screening survey was completed by 52 of 173 (30%) eligible anesthesia personnel. The questionnaire was categorized into three subgroups. Questions one through four pertain to the social history tab and charting cannabis use. Question five and six examine anesthesia provider's habits when reviewing or evaluating their patient's cannabis use. Questions seven to nine describe an anesthesia provider's beliefs on the effects of cannabis on their patient's perioperative course. The

results were then divided into 'agreement' responses and 'disagreement' responses (see Appendix C, Table C1).

Anesthesia providers' habits regarding survey results concerning the social history tab indicated that 76% of anesthesia personnel know how to quickly find a patient's social history section in the patient's medical record. Despite this, 96% of respondents stated that they do not always chart their patient's substance use in the substance use section of the EMR, with 84% of responses indicating they will chart substance use in other areas such as free text boxes. Sixty-one percent of anesthesia providers responded with some level of agreement that they would be more likely to fill out substance use details if the social history tab was easier to access.

Substance use review by anesthesia providers revealed that 76% of respondents stated some degree of agreement that they always review a patient's substance use history prior to preparing for a case. Sixty-nine percent specified some level of agreement that screening patients regarding frequency, type, and route of cannabis use is an important part of their preoperative evaluation.

Anesthesia provider's' beliefs about the effects of cannabis revealed a 94% agreement that patients who use cannabis chronically or daily may require special considerations regarding their anesthetic induction plan. The majority (73%) of respondents agreed that chronic or daily use of cannabis may correlate with higher postoperative pain scores and opioid requirements. Fifty-eight percent of providers neither agree nor disagree with chronic or daily cannabis use being associated with increased risk for postoperative nausea and vomiting.

Discussion

Summary

The first specific aim of this paper, which was to identify inconsistencies and/or barriers surrounding the documentation of cannabis use among anesthesia patients, was achieved through dissemination and subsequent interpretation of the provider survey. Survey data revealed potential

areas for systems improvement and further education within the facility which may be applicable to other organizations. Strengths of the study relate to the nature of the study which solicits direct feedback from providers working within the system. Key findings relate to two domains: a) the EMR, and b) provider's knowledge and perception of how a patient's cannabis use may impact their anesthetic. The survey that was sent to anesthesia providers at OHSU yielded a 30% response rate, which is considered acceptable when assessing quality and validity of an intervention (Qualtrics, 2022). The proportionally large number of responses (52 of 173 surveyed) minimizes the risk for bias within the results (Qualtrics, 2022). Based on these results, the authors are confident that survey data offers a valid assessment and could be used to make recommendations for changes within the system.

Findings concerning the EMR relate to ease of navigation and charting continuity. The majority (96%) reported they do not consistently chart their patient's substance use within the social history tab in the EMR. This is problematic since substance use charted elsewhere is not readily accessible by other providers and is unlikely to carry over to future encounters. Subjects did agree they would be more likely to fill out substance use in the social history section if it was easier to navigate. These findings indicate potential learning opportunities in which providers may benefit from education specific to accessing and charting a patient's social history in the EMR. They may also lead administrators to examine the EMR for opportunities to streamline workflow and charting continuity.

The findings fulfill the questions posed in this study's second specific aim, which was to gain insight regarding anesthesia provider's beliefs concerning the impact of cannabis use among perioperative patients. Interestingly, about a third of respondents did not agree that preoperative screening for cannabis use was an important part of their anesthetic, despite 94% of responses agreeing that chronic cannabis users may require special considerations regarding their anesthetic induction plan. These two findings are somewhat incongruous and may demonstrate some ambiguity about the anesthetic implications of chronic daily cannabis use.

The third specific aim of this process improvement paper, which is to develop recommendations for an implementation plan to improve documentation of patients' cannabis use, are detailed in the following paragraphs. Findings from this project suggest that most anesthesia practitioners review their patient's substance use history when preparing for a case; however, the majority of providers do not chart their patient's substance use within the social history tab at OHSU. Most providers agreed that they would chart their patient's substance use if the social history tab was easier to access.

Limitations

A limitation of this process improvement project includes that the cannabis screening survey was sent to all anesthesia personnel at OHSU Hospital which consists of pediatric anesthesia practitioners at Doernbecher Children's Hospital. The survey was anonymous; therefore, there was no method to differentiate between adult and pediatric anesthesia practitioners. Many of the questions in the survey were not applicable to pediatric anesthesia practitioners which could impact the data obtained. Although pediatric anesthesia providers may not as frequently consider substance use among their patient population, they may likely still have beliefs on cannabis use and anesthetic implications.

Recommendations

Authors recommend educating providers on the importance of screening and charting within the social history tab to ensure cannabis use is captured for future reference. Additional recommendations include eliminating the nebulous cannabis charting as it currently exists in the EMR (see Appendix A) and replacing it with a simplified option akin to the alcohol or smoking sections (see Appendix A, figure A3) in order to facilitate more accurate data being captured within the EMR. Additionally, making the social history tab easier to access from the NoteWriter may improve the consistency of providers charting their patient's substance use. It is also recommended that a quick access link to the social history tab be added to the preoperative NoteWriter, or that the social history populates automatically into the preoperative chart. More evidence is needed regarding the absolute

implications of cannabis use and anesthesia. These changes promote continuity of patient care and could yield more accurate data mining for future studies examining cannabis use, its anesthetic implications, its influence on anesthesia providers' practice, and the information gathered may assist researchers in developing future practice guidelines regarding the safety and administration of anesthesia for cannabis users.

Conclusion

The results of the survey found that most providers agree that patients with chronic daily cannabis use may require special considerations. Nevertheless, many providers reported they do not routinely screen their patients for cannabis use during a preoperative evaluation. Providers who do screen their patients tend to chart findings outside of the patient's social history tab in the EMR, which is likely to cause this information to be missed by other services and future patient encounters. As cannabis use is becoming more prevalent in-patient populations, it is imperative to understand its impact on perioperative care. The authors advocate that screening for cannabis use be part of the standard preoperative evaluation and documented in the social history tab of the EMR.

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Appendix A

Cannabis charting formats in social history tab in the electronic medical record

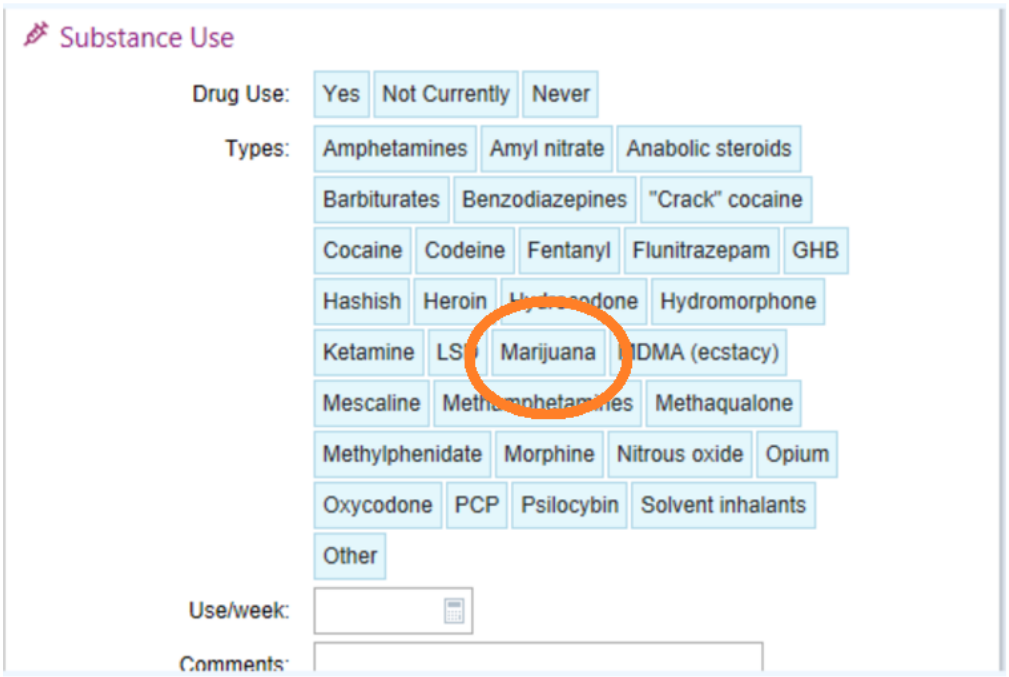


Figure A1. Screenshot of current EMR charting for substance use.

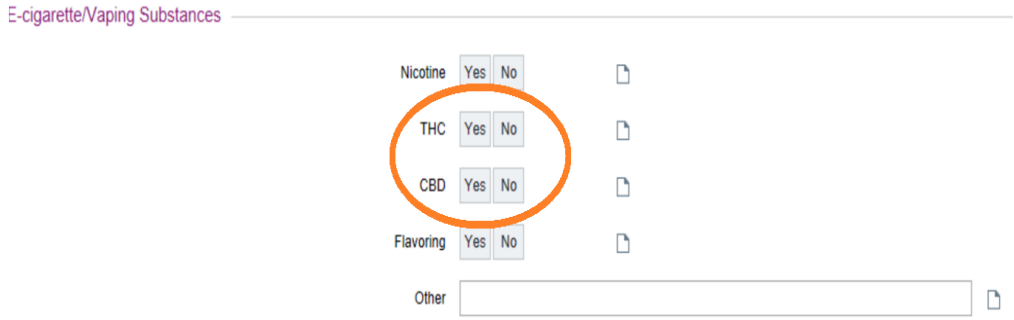


Figure A2. Screenshot of current EMR charting for vaporizer use.

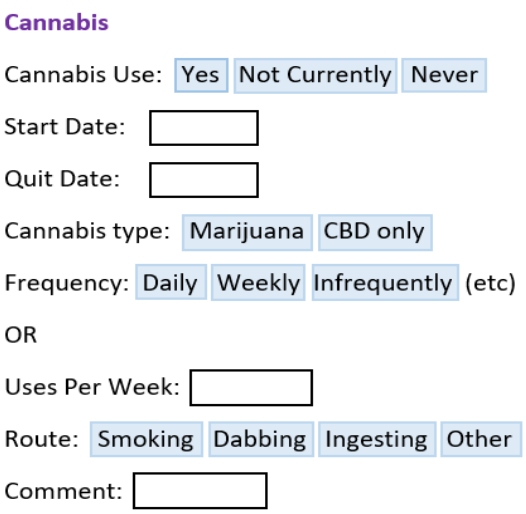
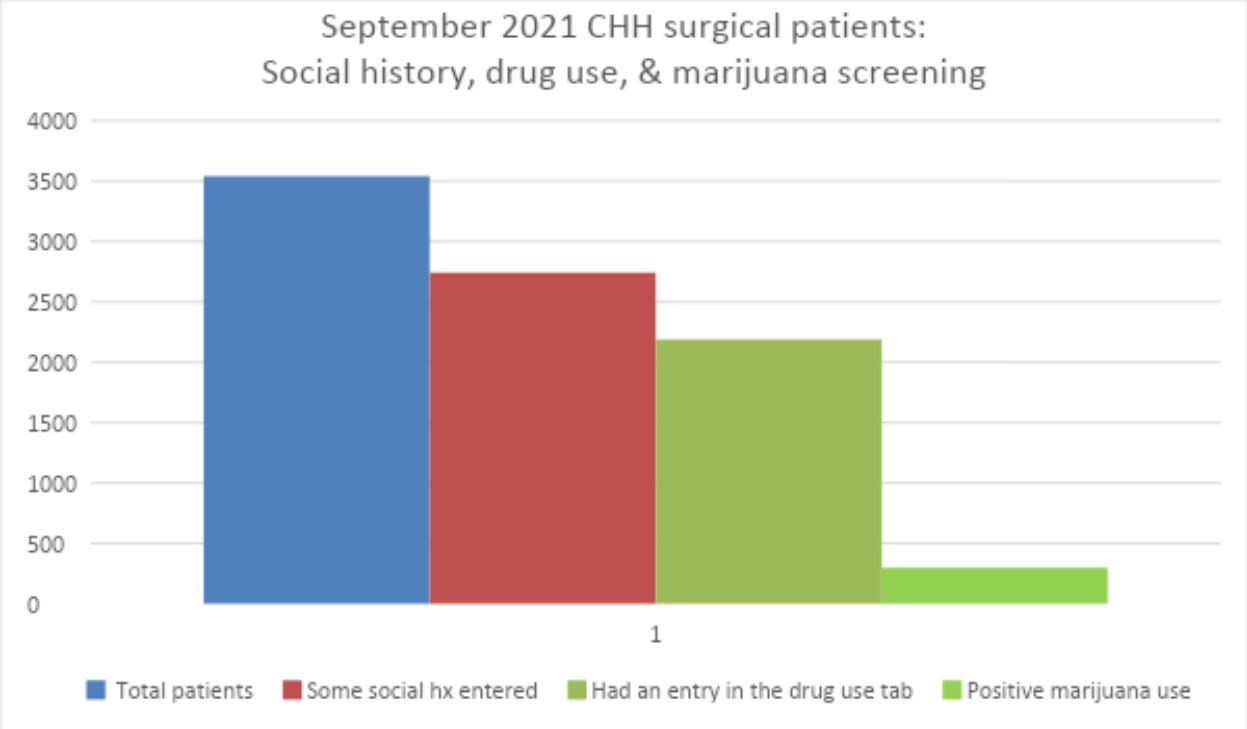


Figure A3. Proposed cannabis charting template.

Appendix B

Analysis of social history data on surgical patients at OHSU



A total of 3542 encounters were examined during the month of September 2021, of which 2,742 had a social history on file. Of the 2,742 with a social history on file, 2,192 had an “illicit drug use” entry and of these, 299 had a +cannabis entry.

Appendix C

Cannabis survey, disclosure & consent, and results

Provider Survey:

1. I know how to quickly find the social history section of my patient's medical record.
2. I would be more likely to fill out substance use details if the social history tab was easier to find
3. I always chart findings regarding my patient's substance use in the 'substance use' section under the social history tab in the EMR rather than in the pre-op note writer.
4. I chart findings regarding my patient's substance use in other areas of the patient's chart, such as the pre-op Notewriter, assessment, or free-text boxes.
5. I always review my patient's substance use history when preparing for a case.
6. Screening patients regarding frequency, type and route of cannabis use is an important part of my preop evaluation.
7. Patients with (chronic/ daily) use of cannabis may require special considerations regarding my anesthetic induction plan.
8. (Chronic/ daily) users of cannabis may be at increased risk for PONV.
9. (Chronic/ daily) users of cannabis may have higher postop pain scores and opioid requirements.

(a 7-point Likert scale was attached to all question: strongly agree, agree, somewhat agree, neutral, somewhat disagree, disagree, and strongly disagree)
Figure C1. Provider survey.

Survey disclosure and consent:

You are invited to participate in a brief anonymous survey titled "Cannabis Screening". This is being conducted by a group of graduate students in the nurse anesthesia program at Oregon Health & Science University as part of their doctoral research project. You were selected to participate because you are an anesthesia provider at OHSU.

The purpose of this survey is to assess provider's thoughts on cannabis and anesthesia, and how a patient's cannabis use is recorded and/or accessed in EPIC. Your participation in this project will help enhance our understanding surrounding these topics.

The survey will take less than 5 minutes to complete. Your participation is entirely optional, and you may close the survey at any point. Because this survey is anonymous, you will not be asked to disclose your identity and your individual response will not be linked to your name or email in any way. If you have questions, you may contact Gopi Patel at patelg@ohsu.edu.

By clicking the link below, you confirm that you are an anesthesia provider working at OHSU, that you have read and understood this consent form, and that you agree to participate.
Thank you for your kind attention. Your participation is greatly appreciated.
Figure C2. Survey disclosure and consent.

Survey results:

	Strongly agree	Agree	Somewhat agree	Neither agree/ disagree	Somewhat disagree	Disagree	Strongly disagree
Q.1	**14**	**14**	**12**	**1**	**5**	**6**	**0**
Q.2	**5**	**18**	**9**	**12**	**2**	**5**	**1**
Q.3	**1**	**1**	**0**	**3**	**4**	**22**	**21**
Q.4	**14**	**21**	**9**	**2**	**1**	**2**	**3**
Q.5	**10**	**24**	**6**	**0**	**7**	**4**	**1**
Q.6	**3**	**20**	**13**	**4**	**6**	**5**	**1**
Q.7	**13**	**21**	**15**	**2**	**0**	**1**	**0**
Q.8	**1**	**4**	**5**	**30**	**6**	**4**	**2**
Q.9	**6**	**17**	**15**	**12**	**2**	**0**	**0**

Table C1. Table of survey results. Fifty-two responses.

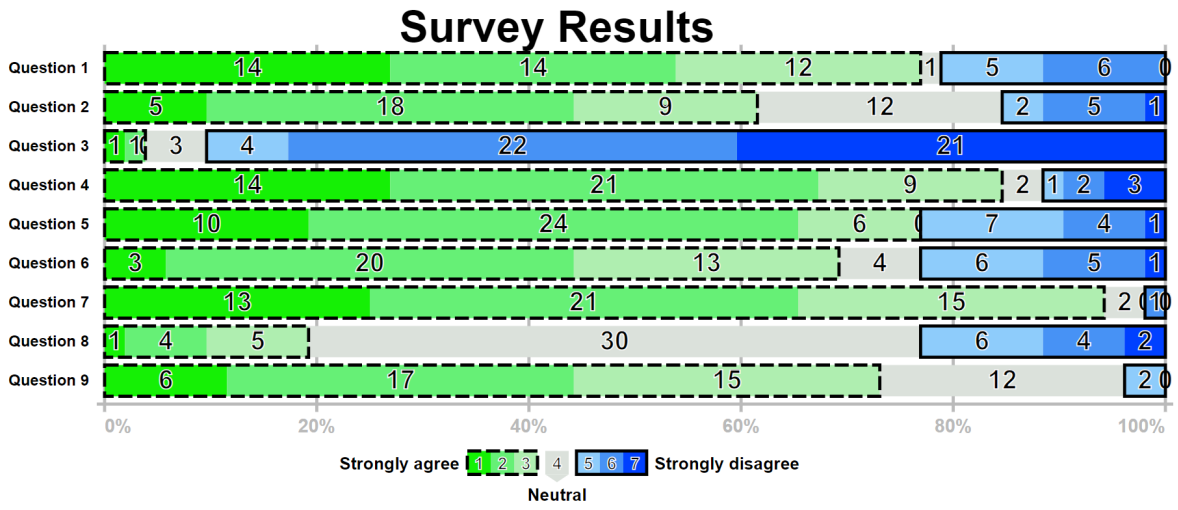


Figure C3. Colored graph of survey results.