

LEARNING IN THE MIDST OF A CRISIS: UNDERSTANDING INTERNAL MEDICINE  
RESIDENTS' KNOWLEDGE AND COMFORT IN CARING FOR PATIENTS WITH OPIOID  
USE DISORDERS

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**Learning in the midst of a crisis: understanding Internal Medicine residents' knowledge and comfort in caring for patients with opioid use disorders**

Abstract

**Introduction:** In the past five years, the Canadian health care system has faced a growing crisis of opioid overdoses (Government of Canada, 2018). This crisis has received attention not only from public health and government officials, but also from medical educators responsible for determining what and how trainees learn about opioid use disorders and their management (AFMC, 2018). Little is known about the needs of learners in terms of knowledge, attitudes, and skills in the diagnosis and management of opioid use disorders to guide curriculum innovation in this area.

**Objectives:** This study sought to evaluate the knowledge and comfort of Internal Medicine residents at the University of Toronto with respect to diagnosis and management of opioid use disorders using a mixed-methods design. The specific study aims were: 1) to describe any gaps in internal medicine resident knowledge and comfort with respect to recognition and management of opioid use disorders; 2) To better understand those factors that residents perceive to positively and negatively impact their knowledge and comfort in caring for this population; and 3) to generate data that will help guide educational interventions to improve both formal and informal curricula and enable trainees to better meet the needs of this population.

**Methods:** This study was designed as a mixed-methods study, using a sequential explanatory design in which the quantitative portion (a survey, described here) would precede and guide the qualitative portion (interviews with residents to be conducted as future work).

**Results:** A total of 14 residents completed the survey, with a response rate of 7%. The majority of Internal Medicine residents who participated in this survey study were able to correctly diagnose an opioid use disorder in a written clinical scenario, recognize the symptoms of acute opioid withdrawal, and offer appropriate medications for its management. Most were able to correctly name both first- and second-line options for opioid agonist treatment. Despite the high numbers of correct responses to knowledge-related questions, only half of respondents reported feeling comfortable making a diagnosis of an opioid use disorder, and a minority of respondents felt comfortable with the principles of prescribing either buprenorphine/naloxone or methadone. Similarly, only half of respondents were comfortable recognizing signs of acute opioid withdrawal, and less than half were comfortable with its management.

**Conclusions:** This study is limited by non-random sampling, a low survey response rate and small sample size. However, these results generate interesting questions about the extent to which knowledge alone may not predict comfort in caring for patients with opioid use disorders. Insofar as high levels of knowledge amongst respondents might reflect self-selection bias, we might also expect these respondents to feel more comfortable than their non-responding peers. Thus, the generally low comfort levels of this sample of residents leads one to question whether comfort levels among non-responders might be even lower – a possibility that would have important implications for curriculum development in this area. Another possibility is that the high levels of knowledge, and comparatively low levels of comfort are a reflection of the Dunning-Kruger effect. A larger sample size with linear regression modeling of the relationship between knowledge, self-rating of that knowledge, and comfort could help explore these theories further and generate data to guide curricular interventions.



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## **Chapter 1: Background**

### **1.1. The Opioid Crisis in Canada**

Between January and September 2017, the number of deaths from opioid overdose in Canada nearly doubled when compared to the same time period in 2016 (Government of Canada, 2018). Individuals living with opioid use disorders interact with the health care system with greater frequency than the general population (Gomes et al, 2017; CIHI, 2016). Between 2014 and 2015, there were 4,779 hospitalizations due to opioid overdose in Canada, representing a 30% increase since 2007-2008 (CIHI, 2016). Additionally, many patients admitted to hospital for other reasons have a comorbid opioid use disorder requiring attention during their stay. Fortunately, prior research has demonstrated that opioid-agonist therapy can be safely and effectively initiated during hospitalization for acute medical issues (Noska et al, 2015). When initiated in hospital, opioid-agonist therapy can decrease symptoms related to withdrawal, decrease the likelihood of an early discharge against medical advice, and help to facilitate linkage to addictions treatment programs, all of which improve patient care (Donroe, Holt & Tetrault, 2016; Wakeman, Metlay, Chang, Herman & Rigotti, 2017).

### **1.2. Gaps in Training**

Comprising a large proportion of medical house staff in urban Toronto hospitals, Internal Medicine residents frequently interact with individuals with opioid use disorders who are admitted to hospital. However, the three-year Internal Medicine residency program does not currently include formal training in recognition and management of opioid use disorders (Goguen J, personal communication, Jan 2018). Knowledge of opioid use disorders and comfort

with their management is not currently identified as a competency of Internal Medicine by the Royal College of Physicians and Surgeons of Canada and is not tested on formal licensing examinations (Royal College, 2011). Further, according to data available from the Association of Faculties of Medicine of Canada “review of opioid educational activities” across the country, formal curricula in recognition and management of opioid use disorders in Canadian postgraduate training programs is the exception, not the rule (AFMC, 2017).

### 1.3 Response from the Association of Faculties of Medicine of Canada (AFMC)

In the context of the current crisis, medical educators across the United States and Canada are paying increasing attention to how curricula can be reformed to help trainees grapple with a growing problem (AAMC, 2018; AFMC, 2017). In October 2017, the Association of Faculties of Medicine of Canada released a report on the response of Canadian Medical Schools to the opioid crisis. This report recommends that there be:

“core competencies identified in the diagnosis, treatment of pain, opioid prescribing and substance abuse disorders and that to be maximally effective, such experiences should also be reinforced throughout the continuum, from undergraduate education to residency training and in continuing education for practicing physicians...” (AFMC, 2017, p. 3)

Further, this report emphasized that Faculties of medicine should “evaluate their curriculum and assess learning outcomes in medical schools, residency programs and professional development offerings” (AFMC, 2017, p. 3). This study aims to support these recommendations by generating important data on resident knowledge and comfort that can help guide educational interventions and, ultimately, improve the care of this population.

## **Chapter 2: Data and Methods**

## 2.1 Introduction

This study sought to describe the level of knowledge of Internal Medicine residents at the University of Toronto with respect to diagnosis and management of opioid use disorders, and to determine whether a relationship exists between resident *knowledge* and *comfort* with management of opioid use disorders, controlling for postgraduate year. Further, we sought to understand what factors – both positive and negative – residents perceive to impact their knowledge and comfort in caring for these patients. Ultimately, we hoped to generate data to better guide educational interventions to improve both formal and informal training and enable training to better meet the needs of this population.

## 2.2 Ethics Approval

This study was conducted in the Internal Medicine residency program at the University of Toronto, and approved by both the Unity Health Toronto Research Ethics Board at St. Michael's Hospital, and the Longwood Medical Area Institutional Review Board at Harvard University.

## 2.3 Study Design

This study was designed as a mixed-methods study, using a sequential explanatory design in which the quantitative portion (a survey) would precede and guide the qualitative portion (interviews with residents). Due to unforeseen time constraints and sample size limitations addressed in later sections of this paper, only the quantitative portion was completed at the time of writing.

The survey was administered online using Qualtrics, and combined questions pertaining to knowledge, questions regarding residents' comfort, and questions regarding residents' perceptions of their training in this area. The survey template and scoring guide is available in Appendix 1.

The survey used in this study was designed de novo. As outlined previously, there is no existing benchmark specifying those components of addictions medicine that internal medicine residents ought to know, and no current standard mandating the incorporation of these topics into internal medicine residency programs. However, there are clear, evidence-based clinical practice guidelines for the care of patients with opioid use disorders (CRISM, 2018). Thus, the survey was designed in the following manner. Three case scenarios were written which were determined by the study authors to be common to the general internal medicine context. Next, evidence-based clinical practice guidelines were reviewed for content relevant to the case scenarios. Then, these scenarios were reviewed by Addictions experts for accuracy, and the scenarios were adjusted to accommodate any guideline-based practice points felt by the expert reviewers to be core knowledge. With respect to the evaluation of resident comfort, previously validated scales such as the Short Understanding of Substance Abuse Scale (SUSS) were reviewed for their applicability and relevance, but were not felt to be specific to the research questions of this study. Therefore, questions pertaining to comfort were designed de novo and similarly reviewed by Addictions medicine experts. Residents were asked to rate their knowledge, and report their comfort levels with various aspects of diagnosis and management, with response options on a Likert-scale.

In addition to the above information, the survey was designed to capture basic demographic information including age, post-graduate year, elective experience, and gender. Respondents had the option to select a gender identity from a drop-down menu of eight possible responses, including “prefer not to answer” and “other”.

The survey was then piloted among a small group of Chief Internal Medicine residents (PGY4) at the University of Toronto prior to administration to the general study population. All six Chief residents were invited to complete the pilot, and three completed the survey. Pilot survey data

was reviewed for such things as time taken to complete the survey and question logic as reflected by coherent responses.

Coding of survey responses was pre-determined. Responses were to be tallied and converted into a continuous variable for both knowledge and comfort respectively (See Appendix 1). The intention was then to analyze the data using descriptive statistics, as well as simple linear regression modeling. With respect to the latter, regression modeling was to be performed to examine whether a relationship existed between knowledge and comfort, controlling for post-graduate year. Additional control variables included amount of time spent on service at St. Michael's Hospital (the inpatient general medicine service with a high proportion of patients with substance use disorders), prior elective time in Addictions medicine, gender, and age. However, given the low response rate and small sample size, regression modeling was not feasible. Therefore, data was analyzed using descriptive statistics only.

#### 2.4 Rationale for mixed-methods design

We hypothesized that levels of knowledge and comfort were low, and that knowledge and exposure were important predictors of comfort. Prior research on the attitudes of health care providers towards patients with substance use disorders suggests that knowledge alone does not guarantee comfort and competence in this area of practice (DeFlavio, Rolin, Nordstrom & Kazal, 2015, VanBoekel, Brouwers, van Weeghel, & Garretsen, 2013). Thus, we also hypothesized that implicit bias, personal experience, role modeling, and burnout may be important factors impacting trainee comfort. Given the complex and nuanced nature of these phenomena, qualitative research methodology provided a useful framework to explore these factors with greater depth. Therefore, the study was initially designed to include follow-up interviews, in order to explore which factors

beyond formal curricula and clinical exposure residents perceived as impacting their knowledge and comfort. The specific questions of the interview guide were to be dictated by the results of the quantitative study, in keeping with a sequential explanatory design.

## 2.5 Study Participants

Residents in years one to three of the internal medicine residency program were invited to participate in the survey (n=209). Initially, our target sample was residents in years two and three of the program, as we anticipated recruiting during the early months of the academic year, at which point first-year residents would not have had sufficient time to experience and reflect upon residency training. We later amended our protocol to include first-year residents in an effort to increase our sample size, at which point they had completed more than six months of their first year.

Residents were asked to provide their email addresses, on an optional basis, in order to be contacted for follow-up interviews. Our aim was to recruit a smaller subset of respondents to participate in follow-up interviews, with a target sample of 10-12 residents or until we reached saturation. A purposive sampling strategy was chosen such that the sample would include residents across the range of possible survey responses – those who are knowledgeable and comfortable, those who are knowledgeable but not comfortable, those who are comfortable but lack knowledge, and those who are neither knowledgeable nor comfortable. Significant delays in ethics approval and low response rates limited the study team's ability to pursue this strategy, therefore at the time of writing no residents had been contacted to participate in follow-up interviews.

## Chapter 3: Results

### 3.1 Pilot survey results

As previously mentioned, three of the six Chief Internal Medicine residents completed the pilot survey using Qualtrics. The survey took between 12 and 17 minutes to complete – a time commitment we felt to be reasonable. No questions were answered incorrectly by all three chief residents. Question 4 “Does Louise meet criteria for an opioid use disorder?” was answered correctly by all three chief residents. Given the small number of respondents, little can be concluded about the quality of the question from this data. However, the fact that all three respondents answered it correctly did lead us to reflect upon the wording of the question and decide that increasing the number of response options to “Meets criteria for an opioid use disorder”, “Demonstrating signs of opioid tolerance, but does not meet criteria for an Opioid Use Disorder”, and “Dependent on opioids for pain control, but does not meet criteria for an Opioid Use Disorder” from the original binary “yes/no” response options would potentially increase the discriminatory potential of the question. Additionally, responses to Question 9 revealed an error in the original scoring template such that only “benzodiazepines” or “clonazepam” would be marked as a correct response, but one chief resident correctly identified “gabapentin” as another medication with the potential to cause respiratory depression. The scoring guide was revised to reflect this.

### 3.2 Survey results

#### 3.2.1 Respondents

A total of 14 residents completed the survey, amounting to a 7% response rate. Six respondents identified as “male” and eight identified as “female”. Respondents’ ages ranged from 25 to 33, with an average age of 29. Four (28.6%) respondents had completed electives in Addictions medicine. Respondents were asked to report the amount of time they had spent on the Clinical Teaching Unit at St. Michael’s Hospital in terms of one-month blocks. Time ranged from four residents who had completed zero blocks to one resident who had completed “more than 4 blocks”. The median amount of time spent on the Clinical Teaching Unit was 2.5 blocks. Due to the small number of participants, some data points such as age are omitted from the demographic data presented in Table 1 so as to protect participant privacy.

Table 1: Characteristics of respondents

	<i>N=14</i>	<i>%</i>
<u>Postgraduate year</u>		
PGY1	4	28.6%
PGY2	6	42.9%
PGY3	4	28.6%
<u>Gender</u>		
Male	6	42.9%
Female	8	57.1%
<u>Electives</u>		
Completed an elective in Addictions	4	28.6%
Did not complete an elective in Addictions	10	71.4%

Four residents were in their first year of training (PGY1) and were surveyed nine months into the academic year. Four residents were in their second year of training (PGY2), and six were in their third year of training (PGY3), with these two groups surveyed between six and nine months into their academic year. The slight discrepancy in timing of recruitment between the first-year residents and the rest was owing to the addition of the first-year cohort as an



amendment after initial approval of the study. The study was initially proposed to the Research Ethics Board shortly before the start of the academic year, and we anticipated recruitment commencing in July or August. As such it was initially felt that first-year residents would not have had sufficient time in the program and survey data at that time-point might not be a reflection of residency program training and experience so much as the knowledge and comfort they acquired prior to the start of postgraduate training. Ultimately, given that we did not receive ethics approval until halfway through the academic year, we opted to amend the protocol to include first-year residents.

### 3.2.2 Resident knowledge

In terms of knowledge, 12 (85.7%) respondents correctly diagnosed Louise (Case 1) as having an opioid use disorder, and 14 (100%) respondents correctly identified opioid withdrawal when presented with a clinical scenario and asked to identify acute concerns. Fewer – nine (64.2%) respondents – could name the COWS score as a clinical tool to assess the severity of opioid withdrawal, but all 14 (100%) could name appropriate medications to manage withdrawal symptoms.

In terms of opioid agonist treatment for opioid use disorders, 10 (71.4%) respondents correctly named buprenorphine/naloxone (or Suboxone) as first-line treatment, and 11 (78.6%) correctly named methadone as the second-line option. When asked directly “Is Louise a candidate for Suboxone (buprenorphine/naloxone)?”, all 14 (100%) answered correctly in the affirmative. A total of nine (64.3%) respondents could correctly identify and name the risk of precipitated withdrawal during buprenorphine/naloxone induction. In terms of important drug-drug interactions, eight residents (57.1%) correctly identified benzodiazepines as increasing

Louise's risk of respiratory depression when taken concurrently with opioids or methadone, and five (35.7%) correctly identified gabapentin as conferring this risk. Only one respondent listed both gabapentin and benzodiazepines. A total of 11 (78.6%) correctly named QT prolongation as an important side effect of methadone.

Two questions were included in Case 2 (Dan) of the survey which were felt by content experts to be common misconceptions in the inpatient setting regarding the management of opioid use disorders: the first pertaining to management of acute pain in those with an opioid use disorder, and the second pertaining to insertion of intravenous lines in those patients with a history of intravenous drug use. All 14 (100%) respondents correctly identified as "false" the statement "opioids should not be given for acute pain in those with a history of opioid use disorder". A total of 13 (92.9%) correctly answered 'yes', when asked if it was appropriate to start an intravenous line for Dan, a patient with known sickle cell disease and a history of opioid use disorder, experiencing an acute chest crisis.

Table 2: Resident knowledge

	<i>N=14</i>	<i>%</i>
Q1. Identified acute opioid withdrawal in problem list (free text)	14	100%
Q2. Identified COWS tool for assessment of opioid withdrawal (free text)	9	64.2%
Q3. Identified medications to manage acute opioid withdrawal (free text)	14	100%
Q4. Diagnosed Opioid Use Disorder (selected correct diagnosis from list)	12	85.7%
Q5. Identified buprenorphine/naloxone as first-line medication for OAT (free text)	10	71.4%
Q6. Identified methadone as second-line medication for OAT (free text)	11	78.6%
Q7. Identified Louise as candidate for Suboxone (binary response yes/no)	14	100%
Q8. Identified risk of precipitated withdrawal	9	64.3%
Q9. Identified medication(s) increasing risk of respiratory depression (free text)		
Gabapentin	5	35.7%
Clonazepam	8	57.1%
Listed both	1	7.1%
Q10. Agreed opioids can be given for acute pain in patients with history of OUD (true/false)	14	100%
Q11. Identified QT-prolonging effect of methadone (free text)	11	78.6%
Q12. Agreed IV lines could be started in patients with history of IVDU (true/false)	13	92.9%

### 3.2.3 Perceptions of training

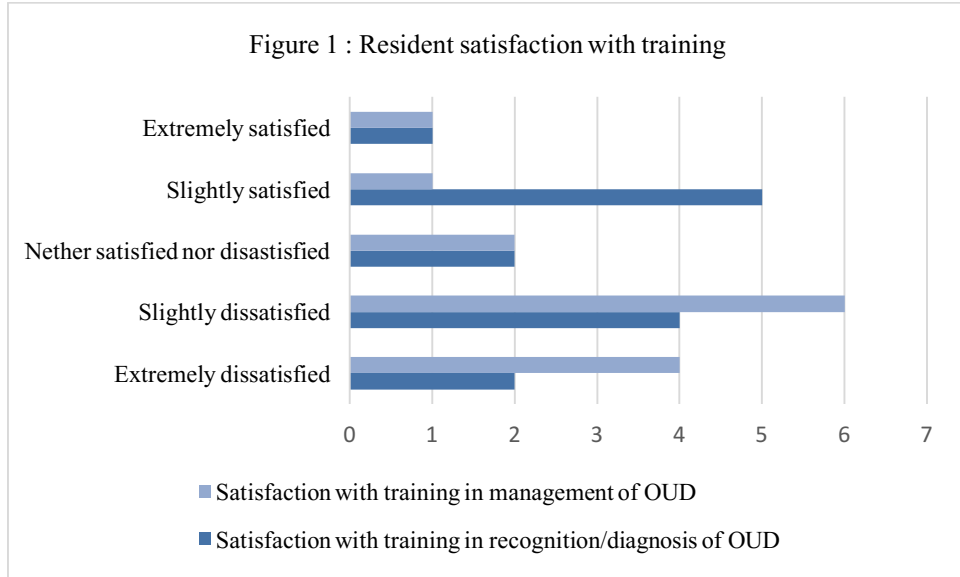
Residents were asked if their academic half day curriculum included formal teaching on opioid use disorders and eight (57.1%) respondents answered ‘no’, two (14.3%) answered ‘yes’, and four (28.6%) were ‘unsure’. Email communication with the Internal Medicine program

director confirmed that no academic half day sessions on diagnosis and management of opioid use disorders currently exist. Residents were also asked if they had ever attended teaching sessions on this content during their clinical rotations and seven (50%) answered that they had.

Table 3: Perceptions of training

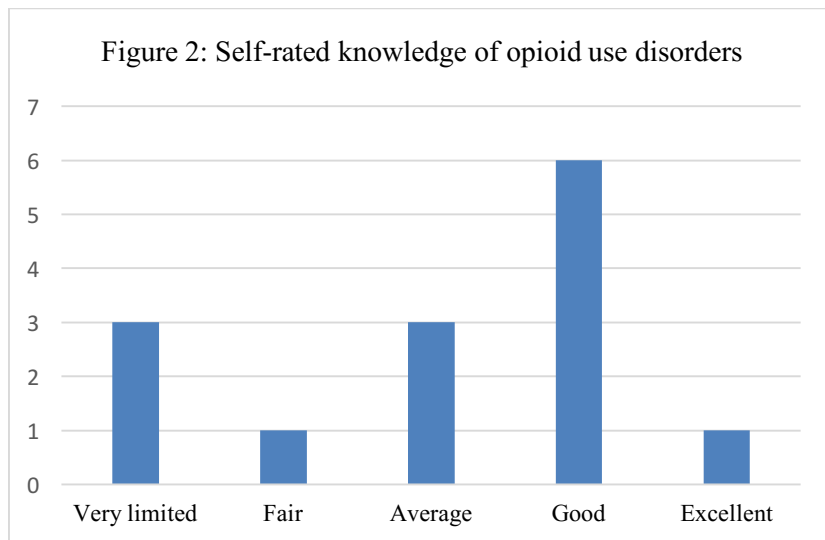
	<i>N=14</i>	<i>%</i>
<i>Believe AHD curriculum includes opioid use disorders</i>		
Yes		
No	2	14.3%
Unsure	8	57.1%
	4	28.6%
<i>Have attended clinical teaching sessions on OUD</i>		
Yes	7	50%
No	7	50%

Respondents were subsequently asked to respond to two questions describing their level of satisfaction with training in the diagnosis and management of opioid use disorders, with response options on a five-point Likert scale (1 = extremely dissatisfied and 5 = extremely satisfied). In terms of learning to *recognize and diagnose* opioid use disorders, the distribution of responses was relatively normal, with a mean satisfaction score of 2.9 and a median of 3.0. Responses ranged from 1.0 to 5.0, with a standard deviation of 1.3 as seen in the frequency distribution in Figure 1. With respect to learning to *manage* opioid use disorders, there was a mean satisfaction score of 2.2 and a median score of 2.0, such that despite a range of responses from 1.0 to 5.0, the majority of respondents were either extremely dissatisfied or slightly dissatisfied with their training.

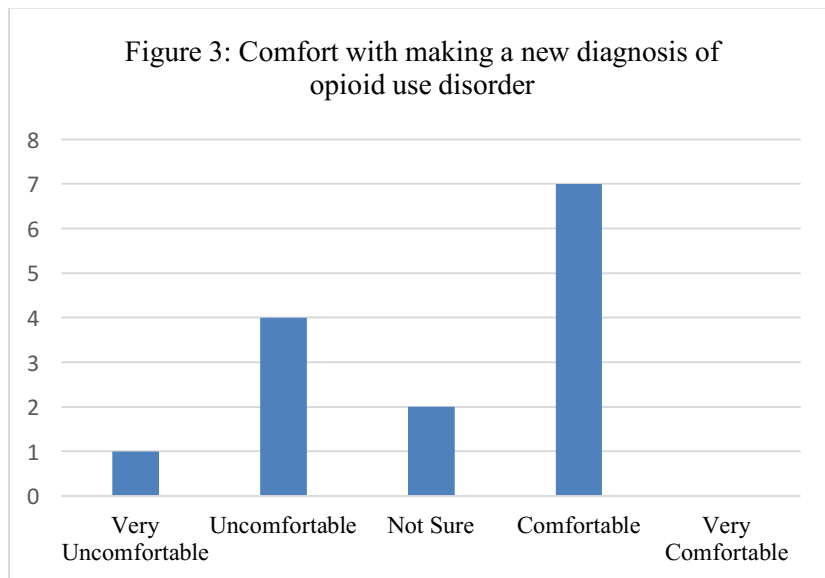


### 3.2.4 Resident Comfort

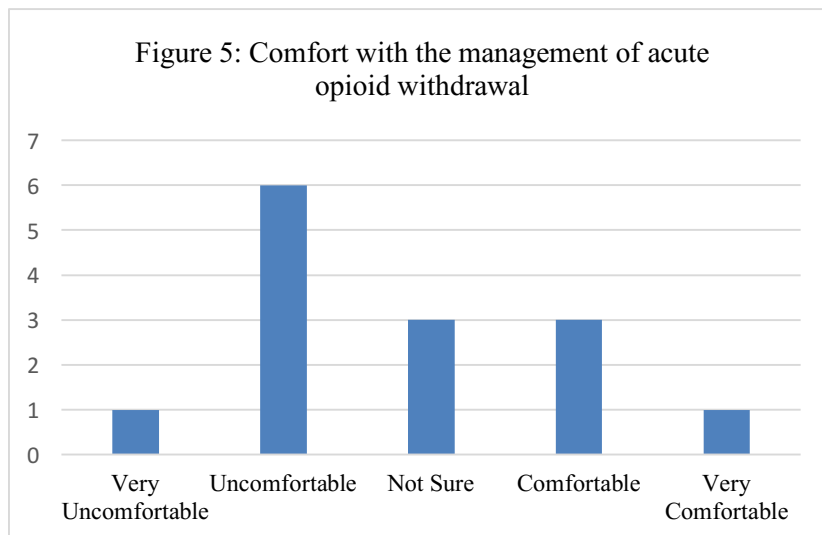
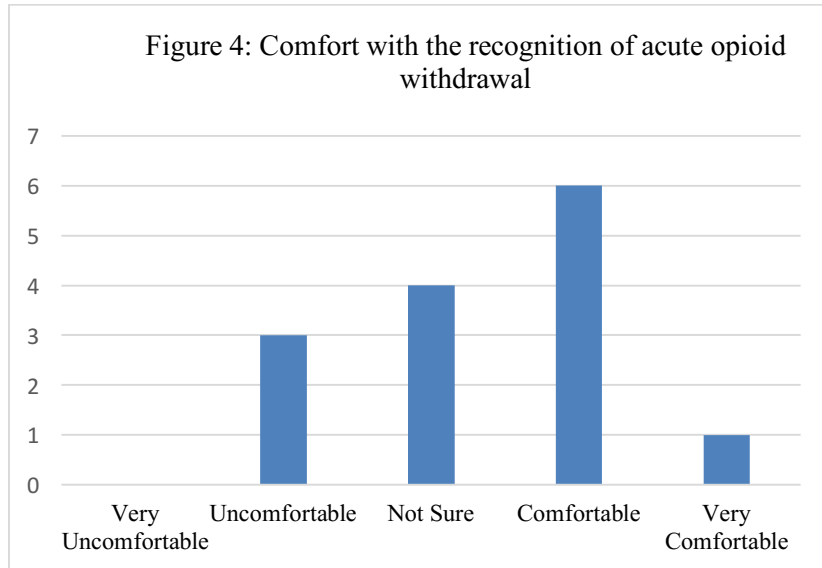
Residents were asked to rate their overall knowledge of opioid use disorders on a five-point scale. The distribution of respondents' answers was unimodal with a slight left-skew, a mean score of 3.071 and a median of 3.5. In terms of spread, the distribution of responses to this question had a standard deviation of 1.328 and a wide range from 1.0 to 5.0.



Residents were then asked a series of seven questions pertaining to their comfort with the diagnosis and management of opioid use disorders – with ‘comfort’ defined as *ease with the task at hand*. In terms of comfort with making a new diagnosis of an opioid use disorder, the distribution of responses was unimodal and slightly left-skewed, with a mean of 3.071 and a median of 3.5. The standard deviation was 1.072, with a range from 1.0 to 4.0.

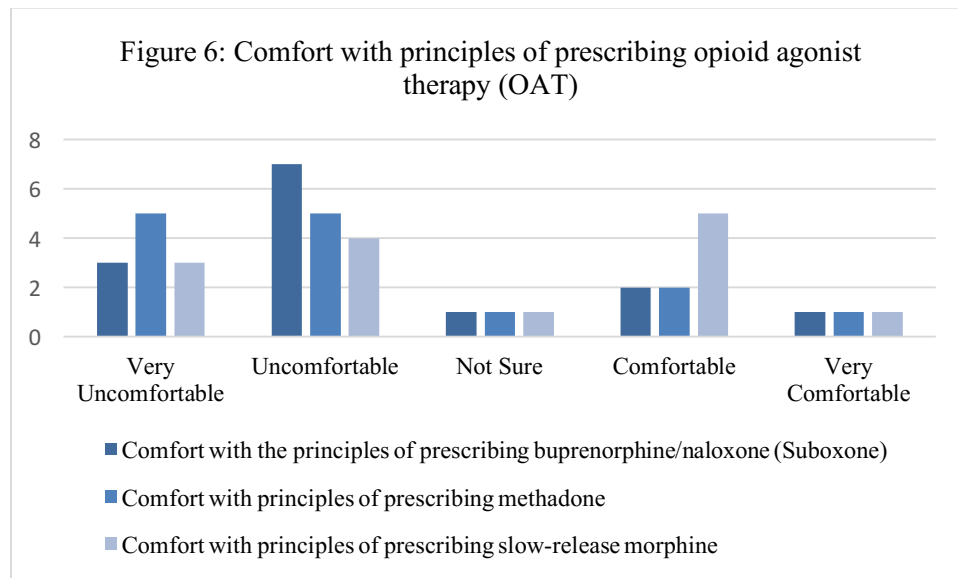


With respect to comfort with recognition of acute opioid withdrawal, the distribution of responses was approximately normal, with a mean of 3.357 and a median of 4. Responses ranged from a minimum of 2.0 to a maximum of 5.0, with a standard deviation of 0.929. Residents were, on average, less comfortable with management of acute opioid withdrawal than they were with its recognition, with a mean comfort score of 2.714 and a median of 2.5. The distribution of responses was unimodal and slightly right-skewed, with a range from 1.0 to 4.0 and a standard deviation of 0.994.



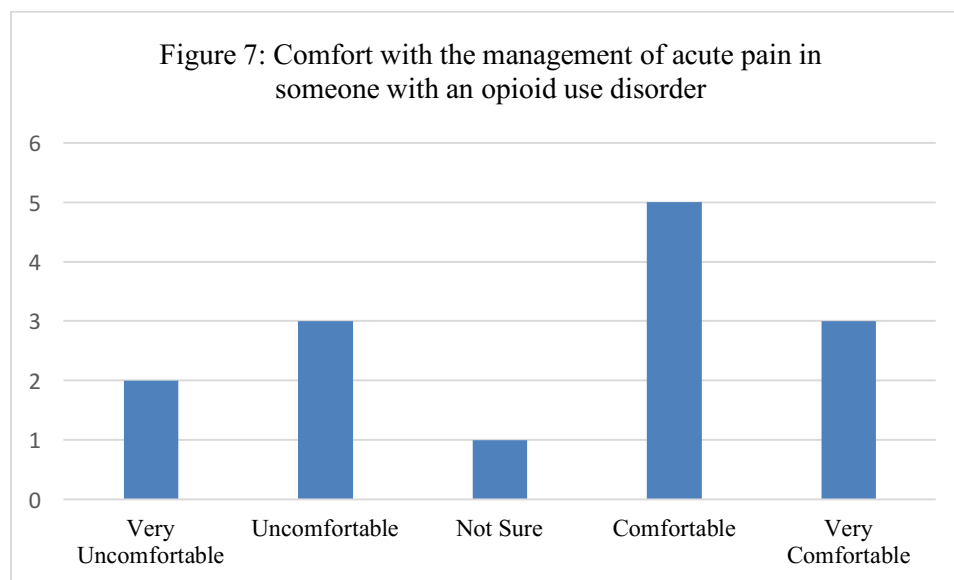
In terms of comfort with opioid agonist treatment, the majority of residents were “uncomfortable” or “very uncomfortable” with the principles of prescribing buprenorphine/naloxone (Suboxone), with a mean score of 2.357 and a median of 2.0. The distribution was unimodal with a right-skew due to the small number of residents with higher comfort levels, and responses ranged from 1.0 to 5.0 with a standard deviation of 1.216. Respondents’ comfort with the principles of prescribing methadone was similar, with slightly

more residents falling into the “very uncomfortable” category, with a mean score of with a mean score of 2.214 and a median score of 2.0. The distribution was similarly unimodal with a right-skew, and responses ranged from 1.0 to 5.0, with a standard deviation of 1.311. With respect to comfort with the principles of prescribing long-acting morphine in the management of an opioid use disorder, the distribution was relatively normal, with a mean comfort score of 2.786 and a median of 2.5. Responses ranged from 1.0 to 5.0 with a standard deviation of 1.369.



In terms of comfort with the management of acute pain in someone with a known opioid use disorder, residents were, on average, more comfortable than they were opioid agonist treatment, with mean score of 3.286 and a median of 4.0. The distribution appears to be bimodal due to the overall small sample size and the single resident who responded as “unsure”, but is otherwise approximately normal. The responses ranged from 1.0 to 5.0, with a standard deviation of 1.43





### 3.2.5 Relationship between knowledge and comfort

Due to a low survey response rate, the final sample size was not sufficient to enable linear regression modeling in order to explore the relationship between knowledge and comfort. However, direct comparison of the distribution of responses to “knowledge” and “comfort” questions respectively yielded some findings of interest.

All 14 (100%) correctly identified the signs of opioid withdrawal in Case 1, however when asked how comfortable they were with recognition of withdrawal, only half of respondents were “comfortable” or “very comfortable” – the remaining respondents were either “unsure” or “uncomfortable”. Similarly, only four residents (28.6%) reported being either “comfortable” or “very comfortable” with the management of opioid withdrawal, yet all 14 (100%) could name appropriate medications for withdrawal management and nine (64.2%) correctly identified the Clinical Opiate Withdrawal Scale (COWS) as a withdrawal assessment tool. That is – there were multiple respondents who correctly answered knowledge-based questions pertaining to opioid withdrawal, but reported discomfort with its recognition and management. Likewise, half of respondents were either uncomfortable, very uncomfortable or unsure of their comfort with

diagnosing an opioid use disorder, yet when asked to do so in Case 1, a total of 12 (85.7%) respondents correctly diagnosed Louise.

As mentioned previously, residents, on average, reported low levels of comfort with the principles of prescribing buprenorphine/naloxone and methadone. By contrast, knowledge-based questions pertaining to opioid agonist treatment were answered correctly by the majority of residents. For example, 71.4% of residents correctly named buprenorphine/naloxone (Suboxone) as first-line opioid agonist treatment, all 14 (100%) respondents recognized that Louise was a candidate for treatment, and 64.3% of residents were aware of the risk of precipitated withdrawal during buprenorphine/naloxone induction. However, it is not clear from the survey responses which components of prescribing residents were uncomfortable with, and knowledge-based questions pertaining to opioid agonist treatment did not cover the nuances of induction or maintenance therapy, but rather gauged more basic awareness of these medications, their indications, and a few clinically relevant facts regarding risks and side effects.

## **Chapter 4: Discussion and Limitations**

### **4.1 Discussion**

The majority of Internal Medicine residents who participated in this survey study were able to correctly diagnose an opioid use disorder in a written clinical scenario, recognize the symptoms of acute opioid withdrawal and offer appropriate medications for its management. Most were able to correctly name both first- and second-line options for opioid agonist treatment. Nearly all knew that individuals with opioid use disorders could still receive opioids for the management of acute pain and an intravenous line when necessary, in spite of prior

histories of injection drug use – two common misconceptions identified by experts. Despite the high numbers of correct responses to the above questions, only half of respondents reported feeling comfortable making a diagnosis of an opioid use disorder, and a minority of respondents felt comfortable with the principles of prescribing either buprenorphine/naloxone or methadone. Similarly, only half of respondents were comfortable recognizing signs of acute opioid withdrawal, and less than half were comfortable with its management.

The low response rate and small sample size limit the extent to which any conclusions can be drawn from this data. These limitations will be discussed in greater detail in the following section. However, these results do generate interesting questions about the extent to which knowledge alone may not predict comfort – questions which could have been explored in greater depth in follow-up interviews if sample size and time had permitted. Certainly, the quality of the data can be questioned on the basis of potentially significant differences between responders and non-responders. Namely, given the non-random recruitment methods and small numbers of respondents, those who responded may not be representative of all residents in the University of Toronto Internal Medicine program, let alone Internal Medicine residents more broadly across Canada.

One critique often leveled at survey studies is the propensity for self-selection bias, in that those residents who chose to participate in this survey might be motivated to do so by some connection to the content that their non-responding peers do not have – i.e a special interest in this area of practice, personal experience, or recent clinical exposure. Interestingly, one might expect this to mean that those who responded would be more interested in, knowledgeable about, and comfortable with opioid use disorders than their peers. Thus, the generally low comfort levels of this small sample of residents leads one to question whether comfort levels among non-

responders might be even lower – a possibility that would have important implications for curriculum development in this area.

Another possibility is that the high levels of knowledge, and comparatively low levels of comfort are a reflection of the Dunning-Kruger effect. This well-known theory of cognitive bias holds that those learners of lowest ability tend to overestimate their ability, and learners of highest ability tend to underestimate their ability (Dunning 2011). If we are to consider the potential for self-selection bias and the possibility that survey responders might have higher levels of knowledge than non-responders, those who responded to this survey might have a tendency towards underestimation of their knowledge and abilities. A larger sample size with linear regression modeling of the relationship between knowledge, self-rating of that knowledge, and comfort could help explore this further.

Understanding how comfortable or uncomfortable residents are with this area of practice and what factors might increase comfort levels is essential to the development of effective curricula in this area. If, for example, comfort levels are truly low across all levels of knowledge, there might be important hidden curricula in the learning and clinical environments such as stigma, role-modeling or work-flow challenges that limit the ability of residents to feel comfortable caring for these patients. If so, effective educational strategies would necessarily take into consideration these factors in addition to efforts to improve core knowledge. Likewise, if factors intrinsic to the learner are responsible for predicting comfort levels, such as the cognitive biases of the Dunning-Kruger effect, then educational strategies might instead include efforts to improve metacognition and awareness of cognitive bias among learners.

## 4.2 Limitations

This study is limited by non-random sampling, a low survey response rate and small sample size. Consequently, we were unable to perform linear regression modeling using control variables, as the overall sample size was too low to permit this kind of analysis. While the results of our survey may signal certain trends, they cannot be interpreted as representative of the entire cohort of Internal Medicine residents (n=209) at the University of Toronto, nor can they be generalized to broader populations of similar residents across the country. Thus, the results of this study in many ways generate more questions than answers, and point to the need for further research in this area.

An additional limitation relates to the survey design. As explained previously, the survey was designed de novo, due to the lack of existing validated tools and no established benchmark for Internal Medicine resident knowledge in this area of practice. Accordingly, the survey designed for this study has not been validated as a tool for measuring resident knowledge, and the high proportion of “knowledge” questions answered correctly by respondents may in fact reflect limitations of the tool itself. In other words, it is possible that “knowledge” questions were overly simplistic, and consequently over-estimated levels of knowledge. A larger pilot study could help address this limitation.

#### 4.3 Implications and future directions

Little is known about the needs of learners in terms of knowledge, attitudes, and skills in the diagnosis and management of opioid use disorders. The AFMC report included a review of current curricula in the undergraduate and postgraduate programs of all seventeen medical schools, and drew conclusions about best practices based on “expert consensus” (AFMC 2017). But no formal needs assessment was undertaken, and limited primary research exists to inform

their conclusions. This study sought to address some of those gaps in the literature in order to guide evidence-based approaches to curricular development in this important area of practice. More research, with larger sample sizes and the involvement of more residency programs across the country is needed to generate meaningful data regarding learners' needs. Further, a coordinated effort at the national level to define Internal Medicine competencies in the diagnosis and management of opioid use disorders would simultaneously help guide research efforts, and bolster support for dedicated curricular time through the establishment of a benchmark. Far from being an esoteric question of philosophical merit, how best to train future physicians to respond to the opioid crisis is a question with critical implications for the lives of thousands of Canadians.

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## Appendices

### Appendix 1: Survey and Scoring Template

#### *Part 1: Case scenarios*

##### *Case #1: Louise*

You are on call during your CTU rotation and receive a new consult from the ER. Louise is a 38 year old woman with a history of diabetes, hypothyroidism, depression, prior discectomy, chronic pain, and is being admitted for a left leg cellulitis. Her medications include Metformin 500mg po BID, Insulin glargine 18 units subcut QHS, Insulin lispro 6 units subcut TID with meals, Levothyroxine 88 mcg po daily, Hydromorphone controlled-release 24mg po BID, Oxycodone/Acetaminophen 1 tablet Q4h prn, Clonazepam 0.5mg po qhs and Gabapentin 300mg po TID. She presented to the ER six hours earlier with left leg pain, redness and subjective fever. When you arrive at her bedside, she is alert, oriented and cooperative but appears uncomfortable. In addition to ongoing leg pain, she now reports worsening nausea, abdominal cramping, sweating, anxiety, and chills over the past few hours.

1.	As you continue your assessment, you are starting to build a problem list in your head. List three acute concerns.	<i>Free text box: answer MUST include acute opioid withdrawal to be marked correct.</i>  <i>1 point for any answer that includes acute opioid withdrawal, withdrawal, opioid withdrawal</i>  <i>0 point if none of the above included</i>
2.	What clinical assessment scale can be used to assess the severity of opioid withdrawal?	<i>Free text box:</i> <i>COWS</i>  <i>1 point for COWS or Clinical Opiate Withdrawal Scale</i>

3.	What medications should you offer Louise to manage her opioid withdrawal?	<p><i>Free text box:</i></p> <p><i>Opioids</i></p> <p><i>or</i></p> <p><i>Opioid agonist treatment (suboxone or methadone)</i></p> <p><i>1 point (wrong if anything other than opioids, opioid agonist therapy, opioid replacement therapy, suboxone, methadone)</i></p>
4.	<p>The next day you have an opportunity to talk with Louise, as well as to her family physician and pharmacist. She was originally started on opioids in 2006 for low back pain secondary to disc herniation. She continued to work as a receptionist until five years ago, when she went on ODSP. Her Hydromorphone Contin dose has been escalating over the past three years as she seems to find only temporary relief each time the dose is increased. On multiple occasions over the past year, she has run out of her prescriptions early and admits she has bought morphine tablets off a friend in her building, but is adamant that she has never snorted or injected any medications. Her urine drug screens have been consistent with this information.</p> <p><b>Considering the above information, which of the following best describes Louise’s condition?</b></p>	<p><input checked="" type="checkbox"/> <i>Dependent on opioids for pain control, but does not meet criteria for an Opioid Use Disorder</i></p> <p><input type="checkbox"/> <i>Demonstrating signs of opioid tolerance, but does not meet criteria for an Opioid Use Disorder</i></p> <p><input type="checkbox"/> <i>Meets criteria for an Opioid Use Disorder</i></p>

**Case #2: Louise Part 2**

You are preparing to discharge Louise from hospital. She tells you that she’s feeling much better, her leg redness and swelling is almost gone, and she has been stepped down to oral antibiotics. You’re very pleased with her progress. As you discuss the discharge plan with Louise, she says, “I remember a few days ago you told me I was on some pretty high doses of those pain meds. My friend Janine told me that she had a problem with pills a few years ago and she’s been taking some medication, which helps a lot. Would that work for me? I wanna get off these pain pills.”

As a reminder: Louise is a 38 woman with a history of diabetes, hypothyroidism, depression, prior discectomy, chronic pain, and is being admitted for a left leg cellulitis. Her medications include Metformin 500mg po BID, Insulin glargine 18 units subcut QHS, Insulin lispro 6 units subcut TID with meals, Levothyroxine 88 mcg po daily, Hydromorphone controlled-release

24mg po BID, Oxycodone/Acetaminophen 1 tablet Q4h prn, Clonazepam 0.5mg po qhs and Gabapentin 300mg po TID.		
5.	Which medication is now considered first-line treatment for opioid use disorders? <b>**Note: a page break follows this question so as not to have Q8 prompt the answer to Q7**</b>	<i>Suboxone (bup/naloxone)</i> <i>1 point for suboxone</i> <i>0 for anything else</i>
6.	Which second-line medication can be considered if patients do not tolerate, or prefer not to take, Suboxone (bup/naloxone)?	<i>Methadone</i> <i>1 point for methadone</i> <i>0 for anything else</i>
7.	Is Louise a candidate for Suboxone?	<input checked="" type="checkbox"/> <i>yes</i> <input type="checkbox"/> <i>no</i> <i>1 point for yes</i> <i>0 points for no</i>
8.	If Louise had her regular dose of Hydromorphone controlled-release 1 hour ago, what is the risk of starting Suboxone immediately?	<i>Precipitated withdrawal</i> <i>1 point for precipitated withdrawal</i> <i>0 for anything else</i>
9.	Which of Louise's current medications increases the risk of respiratory depression when combined with opioids or methadone?	<i>Clonazepam</i> <i>1 point for clonazepam or benzodiazepine or gabapentin</i> <i>0 for anything else</i>

**Case #3: Dan**

*You are a PGY1 on call during your CTU rotation and have been asked to see Dan, a 26 year-old male with sickle cell disease. The senior medical resident has already seen Dan and tells you it's an interesting case of Acute Chest Syndrome in someone with a history of injection drug use (heroin) now on methadone. After taking a complete history, doing a focused physical exam, and reviewing the existing investigations, you agree that Dan meets criteria for Acute Chest Syndrome (He is febrile, dyspneic, complaining of significant chest pain, and has a new left lower lobe consolidation). The SMR helps you write out your admission orders, as this is*

*the first time you've seen a case of this. You discuss the main principles of management: supplemental oxygen, IV fluids, antibiotics, VTE prophylaxis, consideration of blood transfusion, and aggressive pain control.*

10.	True or False. Opioids should not be given for acute pain in those with a history of opioid use disorder.	<p><i>False</i></p> <p><i>1 point for false</i></p> <p><i>0 for true</i></p>
11.	The ER physician gave Dan Ceftriaxone 1g IV and Azithromycin 500 mg po. Given that Dan is on Methadone, which side-effect do you need to be particularly aware of?	<p><i>QT Prolongation</i></p> <p><i>1 point for QT prolongation</i></p> <p><i>0 for anything else</i></p>
12.	Patients with Acute Chest Syndrome typically require IV fluids and antibiotics. Given Dan's history of intravenous drug use, is it appropriate to insert an IV line in this case?	<p><input checked="" type="checkbox"/> <i>yes</i></p> <p><input type="checkbox"/> <i>no</i></p> <p><i>1 point for yes</i></p> <p><i>0 points for no</i></p>

***Part 2: Perceptions of training in opioid use disorders***

13.	Does your formal academic half day curriculum include teaching on opioid use disorders?	<p><input type="checkbox"/> <i>no – there is no teaching on this subject</i></p> <p><input type="checkbox"/> <i>yes – there is formal teaching on this subject</i></p> <p><input type="checkbox"/> <i>I'm not sure</i></p>
14.	Have you ever attended teaching sessions on opioid use disorders during your clinical rotations <b>as a resident</b> (i.e noon hour rounds, grand rounds, morning report, etc)	<p><input type="checkbox"/> <i>no</i></p> <p><input type="checkbox"/> <i>yes</i></p>
15.	In general, how satisfied are you with the training you have received with respect to <b>recognizing/diagnosing opioid use disorders?</b>	<p><input type="checkbox"/> <i>not at all satisfied</i></p> <p><input type="checkbox"/> <i>somewhat satisfied</i></p> <p><input type="checkbox"/> <i>neutral</i></p> <p><input type="checkbox"/> <i>satisfied</i></p> <p><input type="checkbox"/> <i>very satisfied</i></p>

16.	In general, how satisfied are you with the training you have received with respect to <b>management of opioid use disorders</b> ?	<input type="checkbox"/> <i>not at all satisfied</i> <input type="checkbox"/> <i>somewhat satisfied</i> <input type="checkbox"/> <i>neutral</i> <input type="checkbox"/> <i>satisfied</i> <input type="checkbox"/> <i>very satisfied</i>
<p><b><i>Part 3: Comfort with recognition and management of opioid use disorders</i></b></p> <p><i>Scored on 5 point likert scale</i></p> <p>For the purposes of the following questions, “comfortable” is defined as <b>feeling at ease with the task at hand.</b></p>		
19.	How would you rate your overall knowledge of opioid use disorders?	<input type="checkbox"/> <i>very limited</i> <input type="checkbox"/> <i>fair</i> <input type="checkbox"/> <i>average</i> <input type="checkbox"/> <i>good</i> <input type="checkbox"/> <i>excellent</i>
20.	How comfortable are you with <b>recognizing</b> acute opioid withdrawal?	<input type="checkbox"/> <i>very uncomfortable</i> <input type="checkbox"/> <i>uncomfortable</i> <input type="checkbox"/> <i>not sure</i> <input type="checkbox"/> <i>comfortable</i> <input type="checkbox"/> <i>very comfortable</i>
21.	How comfortable are you with <b>managing</b> acute opioid withdrawal?	<input type="checkbox"/> <i>very uncomfortable</i> <input type="checkbox"/> <i>uncomfortable</i> <input type="checkbox"/> <i>not sure</i>

		<input type="checkbox"/> <i>comfortable</i> <input type="checkbox"/> <i>very comfortable</i>
22.	How comfortable are you at making a new diagnosis of opioid use disorder?	<input type="checkbox"/> <i>very uncomfortable</i> <input type="checkbox"/> <i>uncomfortable</i> <input type="checkbox"/> <i>not sure</i> <input type="checkbox"/> <i>comfortable</i> <input type="checkbox"/> <i>very comfortable</i>
23.	How comfortable are you with the principles of prescribing methadone for opioid use disorder?	<input type="checkbox"/> <i>very uncomfortable</i> <input type="checkbox"/> <i>uncomfortable</i> <input type="checkbox"/> <i>not sure</i> <input type="checkbox"/> <i>comfortable</i> <input type="checkbox"/> <i>very comfortable</i>
24.	How comfortable are you with the principles of prescribing Suboxone for opioid use disorder?	<input type="checkbox"/> <i>very uncomfortable</i> <input type="checkbox"/> <i>uncomfortable</i> <input type="checkbox"/> <i>not sure</i> <input type="checkbox"/> <i>comfortable</i> <input type="checkbox"/> <i>very comfortable</i>
25.	How comfortable are you with the principles of prescribing slow-release morphine for opioid use disorder?	<input type="checkbox"/> <i>very uncomfortable</i> <input type="checkbox"/> <i>uncomfortable</i> <input type="checkbox"/> <i>not sure</i> <input type="checkbox"/> <i>comfortable</i> <input type="checkbox"/> <i>very comfortable</i>
26.	How comfortable are you with the management of acute pain in someone with a known opioid use disorder?	<input type="checkbox"/> <i>very uncomfortable</i> <input type="checkbox"/> <i>uncomfortable</i> <input type="checkbox"/> <i>not sure</i> <input type="checkbox"/> <i>comfortable</i> <input type="checkbox"/> <i>very comfortable</i>

**Part 4: Demographics**

27.	Postgraduate Year	<input type="checkbox"/> <i>PGY1</i> <input type="checkbox"/> <i>PGY2</i> <input type="checkbox"/> <i>PGY3</i>
28.	Age	<i>Drop down list</i>
29.	What is your present gender identity? Please check ONE only.	<input type="checkbox"/> <i>Woman</i> <input type="checkbox"/> <i>Trans Woman</i> <input type="checkbox"/> <i>Trans Man</i> <input type="checkbox"/> <i>Man</i> <input type="checkbox"/> <i>Gender Non-Conforming/Gender Fluid</i> <input type="checkbox"/> <i>Two-spirit</i> <input type="checkbox"/> <i>Prefer not to answer</i> <input type="checkbox"/> <i>Other</i>
30.	How many blocks (including the current one) have you spent on the Clinical Teaching Unit (CTU) at St Michael's Hospital?	<input type="checkbox"/> <i>none</i> <input type="checkbox"/> <i>1</i> <input type="checkbox"/> <i>2</i> <input type="checkbox"/> <i>3</i> <input type="checkbox"/> <i>4</i> <input type="checkbox"/> <i>&gt;4</i>
31.	Have any of your electives to date included dedicated time with an Addictions medicine specialist?	<input type="checkbox"/> <i>yes</i> <input type="checkbox"/> <i>no</i>



If you are willing to be contacted for an optional brief follow-up interview, please enter your email address here, otherwise please leave this section blank:

Thank you! Your participation is very much appreciated.