

Substance Use and Acute Inpatient Psychiatry:  
Identifying Factors Associated with Receipt of Addiction Care

by  
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## **Author's Declaration:**

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

## Abstract:

**Background:** Integrated care models are evidence-based approaches that advocate for identifying and simultaneously treating mental illness and problematic substance use. However, in psychiatric settings, current literature suggests that mental illnesses are often recognized and managed, whereas problematic substance and/or alcohol use may not always be addressed, often requiring care elsewhere. This pattern of care is concerning as individuals with concurrent conditions report higher rates of unmet care needs. Little research has examined the factors which allow for better detection and treatment of substance use for patients with concurrent mental illness and problematic substance and/or alcohol use.

**Objective:** This thesis aims to explore the receipt of addiction care for patients with identified substance use within inpatient psychiatry. In particular this thesis will (i) examine the proportion of patients with first time admission to inpatient psychiatry who used substance and/or alcohol, (ii) identify the characteristics of patients admitted for an addiction and, (iii) identify the factors associated with receipt addiction care within acute psychiatry.

**Methods:** This study utilized data from the Ontario Mental Health Reporting System (OMHRS) which is based on the Resident Assessment Instrument for Mental Health (RAI-MH). The analytic sample included 21946 inpatients with identified substance and/or alcohol use, admitted between 2006 and 2018. Prevalence and demographic characteristics of those with substance and/or alcohol use were established. The variables significantly associated with the addiction reason for admission were identified. Independent variables were separated into blocks and modelled independently by the dependent variable, receipt of addiction care. The variables from independent block models were used in multivariable logistic regression analyses that were developed to examine factors associated with addiction care receipt during an acute episode of care in inpatient psychiatry.

**Results:** Of the 21946 individuals with current problematic substance and/or alcohol use, 46.4% were admitted for addiction and 48.4% received addiction care during their acute stay. The majority of patients admitted for addiction were 25 to 44 years old, male, had completed greater than high school, were unemployed and, were never married. The multivariable logistic regression model identified several variables associated with receiving addiction care in acute psychiatry. Having a pre-existing substance use disorder, a CAGE score of 1+, addiction reason for admission and, displaying withdrawal symptoms increased the odds of addiction care receipt. Alternatively, patients that were involuntarily admitted to inpatient psychiatry or those at risk of self-harm (identified through SoS scale) had decreased odds of receiving addiction care.

**Conclusions:** While half of all of those admitted for the first time to inpatient psychiatry had problematic substance use, only a quarter received addiction care. Care providers should consider withdrawal symptoms and the CAGE questionnaire to identify patients with an addiction treatment need. Indicators of severe mental illness and self-harm reduced the odds of receiving addiction care. There is a need for integrated addiction care that can support patients who use substances and have severe conditions.

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## **List of Abbreviation:**

<b>SU</b>	Substance Use
<b>SUD</b>	Substance Use Disorder
<b>AUD</b>	Alcohol Use Disorder
<b>MI</b>	Mental Illness
<b>PI</b>	Physical Illness
<b>CD</b>	Concurrent Disorder
<b>CIHI</b>	Canadian Institute for Health Information
<b>OMHRS</b>	Ontario Mental Health Reporting System
<b>RAI-MH</b>	Resident Assessment Instrument – Mental Health
<b>NICE</b>	National Institute For Health And Care Excellence
<b>DSM-5</b>	Diagnostic and Statistical Manual of Mental Disorders 5th Edition
<b>WHO</b>	World Health Organization
<b>DSI</b>	Depression Severity Index
<b>PSS</b>	Positive Symptom Scale
<b>RHO</b>	Harm to Others Scale
<b>ABS</b>	Aggressive Behaviour Scale
<b>SCI</b>	Self-Care Index
<b>SoS</b>	Severity of Self-Harm
<b>CPS</b>	Cognitive Performance Scale
<b>CAP</b>	Clinical Assessment Protocol
<b>RFA</b>	Reason for Admission

## **Background:**

### **1.1 What is Mental Illness and Substance Use?**

Persons with mental illness (MI) experience a range of conditions that may cause significant behavioural or psychological dysfunction (1,2). Within Canada, approximately 1 in 5 persons live with some form of MI in their lifetime (1,2). Socially and economically, MI is a contributor to disability resulting in 1.5 to 7 times larger disease burden than cancer and infectious disease, respectively (3–5). The cost of disability and leave of absence from work associated with MI is double the cost of physical illness (PI) (4–7). The signs and symptoms of MI can vary dramatically, from feelings of sadness and hopelessness to hallucinations and delusions, resulting in a dynamic range of illnesses. Variety of factors influence the risk of MI incidence including social isolation, childhood trauma, genetic predispositions and substance and/or alcohol use (8,9).

Substance use (SU) is associated with impairments in life through reoccurring and problematic use of alcohol or drug(s) (licit or illicit) (3–5,10). Problematic use can be considered as reoccurring use, use of multiple types of substances, feelings of guilt, concerns brought up by others and, dependence (3,5,10). The impairments to persons that use substances and/or alcohol include physical health problems, social dysfunction and disability. Moreover, persons that use substances and/or alcohol find it challenging to initiate addictions services as a result of their impairments, social and legal repercussions of using drugs, non-readiness for change and/or availability of services (3–5,10,11). This lack of treatment seeking, trepidation of repercussions and, overall impairment can be reflected in the number of SU related deaths. The World Health Organization stated in 2016, that the death rate due to alcohol and various drugs were 160235 and 145565, respectively (4,5,12). In 2002, it was estimated that the cost of SU in Canada was

almost \$40 billion, an aggregate including direct health care and treatment, law enforcement, research, and indirect productivity loss (13).

## **1.2 Relationships between Mental Illness and Substance Use**

The concurrence of MI and SU is a complex condition as the occurrence of one often influences the incidence of the other (9,14–16). In 2016, it was estimated that globally 1 billion people would experience a MI and/or SU problem in their lifetime (17). The relationship can be described by the addiction vulnerability hypothesis, which states that the predispositions to SU is related to genetic, neurobiological and environmental factors (9,14–16). In the comorbidity of MI and SU, some of the aforementioned predisposing factors are combined and prime an individual towards the relationship between the two illnesses (9,10,14,16). Interestingly, MI can be considered a predisposition to using substances and/or alcohol as it increases potential for positive reinforcement due to the effects of substances and/or self-medication (9,10,14–16). For example, an individual with a cannabis addiction can possibly increase their susceptibility to mood disorders or psychosis based on the frequency of use and the neurological effects of cannabis on the brain (9,18). Alternatively, an individual might self-medicate their anxiety and depressive symptoms through the use of substances, particularly cannabis (9,10,19).

Individuals are five times more likely to have a mood disorder or SUD (substance use disorder) when the other disorder is present (10,19–21). Additionally, some estimate that 30% of individuals with MI use substances and/or alcohol; further, 53% of individuals who use drugs and 37% of individuals who abuse alcohol may also have a MI (22–24). A national Danish study of psychiatric patients found the lifetime prevalence of SU was: 37% for schizophrenia, 25% for both depression and anxiety (25). Furthermore, the symptom severity, disability and self-harm behaviors increase when experiencing a comorbid MI and SUD in comparison to a single

disorder (19,26,27). The occurrence of MI and SU also increases the likelihood of a physical illnesses (PI), usually as a chronic condition (28–30). In Canada, it was estimated that 29% of individuals with a comorbid MI and SUD had two or more chronic physical conditions (28).

### *1.2.1 Perceived Self-Medication*

Understanding perceived self-medication can assist in elucidating the reasons for the comorbid nature of MI and SU (10,31–33). Persons who use substances may experience compulsions to do so in order to modulate and stabilize psychological pain (19,31–33). Although, there is debate on the correctness of the self-medication hypothesis as not all use of substances is for self-medication. For instance, persons might choose to use a substance to seek a short-term reward (9,31). Instead, perceived self-medication can be one of many aspects to understanding an individual's use of substances and/or alcohol.

Perceived self-medication has a cyclical nature, meaning the use of substances amounts to worsened or prolonged psychological symptoms which result in the re-use of substances to cope (19,31–33). The purpose of understanding perceived self-medication is to support recognition of the motivators for reliance on substances to cope with psychological distress (31–33). It is important to note that the perceived self-medication is complementary to genetic perspectives of SU and are applied in conjunction when aiming to understand a persons' experiences with use of substances and/or alcohol. Moreover, by applying a perceived self-medication lens allows for a wider definition in capturing individuals who might not be diagnosed but are still relying on substances and/or alcohol to cope with their MI (31–33).

### *1.2.2 Concurrent Disorder and Concurrent Conditions*

The clinical term used to define the occurrence of both a diagnosed MI and SUD is concurrent disorder (CD). Based on a 2012 survey, the prevalence of CD within Canada was 1.2%; where CD included one diagnosed mood, anxiety or bipolar disorder occurring with a

diagnosed alcohol or cannabis use disorder (28). Likewise, the prevalence of CD for psychiatric inpatients between 2010-2011 was approximately 30% (including patients with mood/anxiety disorders or psychotic disorders and SUD) (34). Individuals are four times more likely to be admitted to inpatient psychiatry when they have CD than a MI alone (34). This increases to 20 times the likelihood for admission to inpatient psychiatry for persons having CD than SUD alone (34). However, this narrow criteria for CD likely underrepresents the overall prevalence as only select MI and SU diagnoses are included. The prevalence of CD within Canada may underestimate individuals who do not have a formal diagnosis of a MI or SUD but might display the clinical characteristics.

### *1.2.3 Specific Concurrent Relationships*

The patterns of CD may vary depending on the types of substances used and the nature of MI under investigation. Use of cannabis is commonly associated with mental health conditions such as strong associations with schizophrenia and other psychotic disorders (9,35,36). Lifetime use of cannabis was estimated to be 66% among individuals with psychosis (36). Some evidence infers a casual association between cannabis use and psychosis, suggesting that individuals who are predisposed to psychosis and consume cannabis are at an increased risk of developing the disorder with earlier incidence (9,36–38). However, some research has argued of a causal relationship regardless of any predisposition to psychosis (9,38). Furthermore, the psychoactive component of cannabis, THC, has a dose-response relationship to psychosis; in that regular users and heavy user are two and four times more to likely develop some form of psychosis, respectively (9,39). Concurrent conditions involving alcohol and depression are common, with estimates of about 80% of those with an alcohol use disorder (AUD: a specific type of SUD) also experiencing a mood disorder (40). Some research argues a casual association where alcohol increases the risk of depression, whereas other literature suggest that a depressive episode

predates the alcohol use following a self-medication hypothesis (20,40,41). Nevertheless, the concurrent relationships of both a MI and SU (one which feeds-off another in a casual or self-medicated manner) requires treatment of the coexisting conditions simultaneously.

### **1.3 Care Settings and Treatment**

The mental health care continuum has a variety of settings in which patients can receive care for MI and SU, such as a general hospital, in- and out-patient psychiatry or addictions facilities. The ability and type of care provided is dependent on the nature of the service utilized. For instance, most general hospitals can provide acute care for severe MI or SU overdose; generally only treating the primary concern (7,27,28,42,43). Not all care settings are equipped or designed to provide comprehensive care for all concerns (11,43). Mental health facilities may be unable to simultaneously meet the complex requirements of patients, services could be unavailable when patients require them and, services are fragmented in care or rely on other facilities to respond to the needs they are unable to meet (11,28,43). Upwards of 17% of patients with MI and SU report unmet needs from mental health services. Unmet needs in this population can result in poor health outcomes and increased rates of readmission (11,28,44). Although, it is unknown if the reported unmet needs are linked to issues due to mental health services (11,28). Additionally, the unmet needs could be associated to help-seeking behaviours – as population surveys suggest that 35-50% of individuals with MI and SU do not seek assistance from health services (11). Moreover, these unmet needs are service user perspectives rather than the measures of service itself. Instead, quality of care measures should be used to assess not just the efficacy of the care provided but the ability of said service to meet the needs of patients.

### *1.3.1 Determining Care Needs*

The need for care can be identified through various methods, in particular, from patient self-reports to clinical assessments using instruments or scales. Self-reports conducted by the patient are valuable in providing insight into their own case and demonstrates potential motivation for change (45,46). Specifically in addiction care, the patients' readiness for change is vital before care can be effective in achieving the treatment goals (such as abstinence, harm reduction etc.) (45,46). Readiness can also be viewed through the lens of Prochaska and DiClemente's stages of change (precontemplation, contemplation, preparation, action/maintenance, relapse prevention); depending on where the patients is can highlight how motivated they are to seek out and engage in treatment (47).

When identifying patients' substance use treatment need, assessment should encompass multiple dimensions such as: person's withdrawal symptoms (i.e. autonomic hyperactivity, hand tremors, illusions, anxiety etc.), degree of dependency and pattern of use (i.e. how often do they use, prior attempt to quit, biological factors for tolerance of substances and/or alcohol etc.), evaluate the patients' motivation for change and, their social, economic, psychological and medical context relating to substance use (45,46). The CAGE addiction scale is an example of an assessment which uses four items to identify if an individual has a potential problem with substance use. It uses items to assess the impact of substance use on a person's circumstance, such as feeling the urge to use substances upon waking, guilt about substance use and, being told to cut down by others. By sum, a score of 1 or greater identifies a need for addiction care (48,49).

Within the addiction literature, there is a gradient to substance use known as liability to addiction (see Figure 1 Addiction liability distribution), in which an individual has the propensity for addiction (i.e. from a person who uses substances to becoming dependent on the substances)



(50). Once the propensity reaches a certain threshold the substance use becomes a need requiring treatment (50). The level of severity can then be identified to determine the intensity and number of services required to effectively provide care (50). Various existing instruments are used to identify the level of severity but employ a diagnostic approach (which is ridged in what is and is not considered part of a diseased state and requiring care) (51,52). It is important to understand need for treatment along with the severity but when determining who requires care and at what level – a diagnostic lens should not be a main driving factor. Although, it is not known if in a clinical setting a diagnosis dictates receipt of care.

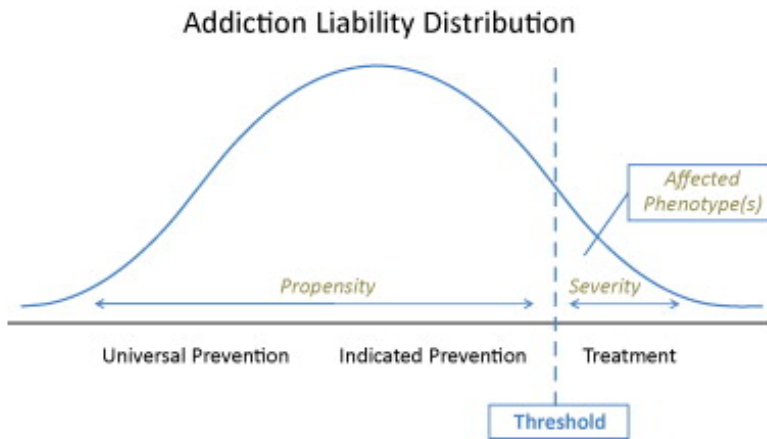


Figure 1 Addiction liability distribution (50)

### 1.3.2 Psychiatric and Substance Use Treatment

There are various treatment methods for individuals with MI and SU; many care settings apply a biological and/or therapeutic approach. Biological, also known as pharmacological, approaches are prescription medication-based – broadly including antipsychotic (for psychotic disorders), antidepressant (for mood disorders) and anxiolytic (for anxiety) medications (53). Therapeutic approaches, apply an evidence-based approach to have patients manually overcome, or reduce symptoms of their disorder(s) (53). Examples of therapeutic approaches include

cognitive-behaviour therapy and mindfulness-based cognitive-behaviour therapy (53). These therapies are considered short-term as consistent practice is required. Often, biological and therapeutic approaches are simultaneously applied as evidence suggest reduced rates of relapse when a combined effort is made (53). Biological therapeutic modalities are usually not the most effective method for individuals using substances and/or alcohol due to risk of increased addictive behaviours (53). Another important component of treatment is the overall readiness, need and preference of an individual; these factors should be taken into consideration when a care plan is made (53). This provides the individual with an environment where they are comfortable to complete treatment. Numerous interventions can be used specifically for substance use, including: providing referral to specialized counselling or programs (that are provided by addiction counsellors or concurrent disorder specialists), 12-step programs (which provide a structured approach to addiction recovery) and, harm reduction approach (applied to manage and educate safe use of drugs for those who are not ready for abstinence).

### *1.3.3 Addiction Care in Acute Psychiatry*

Within an acute psychiatric setting a patient's lengths of stay are typically up to 30-days, which is a short period of time to have the opportunity to address the goals of addiction care (i.e. reaching abstinence, education and/or harm reduction) (54–57). In an environment where time is strict, comprehensive assessment to identify need and severity along with making referrals to addiction/concurrent care settings are crucial in providing high-quality care (54–57). In acute scenarios, harm reduction and education are methods to be used prior to discharge as the patients can utilize these strategies before meeting with the referred program (58,59). Although the nature of acute care is short, patients should still be receiving some form of addiction care whether it is in the form of harm reduction, pharmacological, educational or therapeutic intervention. Ignoring

or underestimating the need in order to focus on just MI is not an effective method in improving MI and SU.

#### *1.3.4 Integrated Care Model and Current Best Practice Guidelines*

An integrated care model is a recognized method to improve patients with multifaceted requirements by simultaneously treating their MI and SU (60–64). An important component of integrated care is for the coexisting illnesses to be treated in the same environment and at the same time (60–66). Treatment occurring in the same location reduces opportunity for drop-out and “*falling through the cracks*” (when one service relies on another to provide the treatment but the patient is lost as a result of follow-up, not being ready or wanting to engage in the health care system) (67,68). The integrated care model allows for both concerns to concurrently improve without having one illness cause the other to worsen and reduces the likelihood of patients not receiving care (60–66,69).

The National Institute for Health and Care Excellence (NICE) based in the United Kingdom, has recently published best practice guidelines for treating patients with MI and SU (70). This guideline emphasizes identification of coexisting CD by applying thorough assessments and inquiring about SU activities of patients that present with MI (70). Although this document provides evidence for the need for identifying CD, it does not apply an integrated care approach. The guideline fails to address the need to treat CD in one location, focusing on improving MI and SU together. In a Canadian context, Health Quality Ontario has created best practice guidelines for specific disorders; including quality standards that recommend the identification and treatment of coexisting MI and SU. For instance, the document “*Unhealthy Alcohol Use and Alcohol Use Disorder*”, recommends that all concurrent health conditions occurring with AUD be recognized and the subsequent treatments not be delayed (71,72). The best practice guidelines for schizophrenia care in the community and hospital, go further to apply

an integrated approach, advising that clinicians offer treatment for coexisting MI and SU and, that health services provide resources for SU components of CD as soon as possible (73).

#### **1.4 Framing the Context in Ontario**

Ontario is the largest province by population in Canada, housing a socially diverse, heterogenous peoples with a multitude of factors that distinguish one MI and SU case from another. Individuals can receive treatment from mental health and addictions services that are publicly and privately funded, though care is largely supported by a universal health coverage system (34,74). The cost of public expenditure on mental health and addictions services for 2013-14 was approximately \$3.5 billion (representing \$3.1 billion from the Ministry of Health and Long-Term Care and \$440 million from the Ministry of Children and Youth Services) (75). Ontarians, 15 years and older, reported lifetime depression to be 5%, schizophrenia or bipolar disorder at 3% and SU concerns at 4%; although these values do not account for multimorbidity and CD (76). The prevalence of CD within Ontario has been estimated to be 18.5%; although this does not include undiagnosed conditions (24). Even though a large proportion of the population has MI and SU, when engaging with mental health services, Ontario residents report higher rates of poor accessibility and acceptability – with reports of unmet or partially met needs to be 46.1% higher than the national average (77). Finally, Ontario has interest in supporting performance measures for mental health and addiction services in order to monitor and, evaluate various sectors of services (78). This makes Ontario a compelling province in Canada to investigate addiction service provision.

## **Study Rationale and Objectives:**

### **2.1 Knowledge Gaps and Study Rationale**

The purpose of this study is to investigate factors associated with receipt of addiction care among those identified with problematic use of substance and/or alcohol within acute inpatient psychiatry. The rationale for this study is based off the following gaps found in the literature:

#### **1) The definition of CD, within a mental health context, is rigid:**

Studies have considered the relations between the coexisting conditions; however, due to the current diagnostic approach to classifying CD, the prevalence of those with a need are possibly underrepresented. This study will consider the symptomology of coexisting conditions within the data in an approach to be more inclusive of patients who clinically present with CD but have yet to be diagnosed. This method will allow for a more representative sample within acute psychiatry.

#### **2) Limited research examining the detection and addiction treatment of patients that use substances and/or alcohol and have MI:**

The extent to which the proportion of patients with MI and SU receive addiction care is unknown. Various best practice guidelines suggest applying an integrated approach to simultaneously treating SU and MI but, MI is often the focus of recognition and subsequent care receipt. It is important to identify the number of patients who engage with the mental health care system, are recognized with SU and receive addiction care.

#### **3) Factors that increase an individual's chance of receiving addictions related treatment are unclear:**

There is a paucity of research that examines factors associated with the likelihood of receiving addiction care. Understanding whether differences in clinical and demographic characteristics of patients with problematic use of substances and/or alcohol increase or reduce

the odds of receiving addiction care can provide new insight to understanding how to improve and maintain care moving forward.

**4) Limited research has been conducted on patients admitted for the first time to acute inpatient psychiatry, with MI and problematic use of substances and/or alcohol.**

The literature currently available represents persons with MI and SU within the population, long-stay psychiatric facilities and other clinical settings. Patients admitted to acute inpatient psychiatry for first episode admission is a novel setting to investigate level of patients' needs and receipt of addiction care. This environment provides a short-stay in which admission and discharge information, along with a multitude of demographic, clinical and treatment items can be utilized to investigate comprehensive assessment, identification and the start of high-quality treatment for patients with MI and SU. Moreover, acute psychiatry is the most common inpatient setting in Ontario and typically the patient's first point of contact with the mental health system.

## **2.2 Objectives**

Considering the complex requirements of patients with MI and SU and the identified research gaps, the current study aims to complete three research objectives:

**Objective One: What proportion of patients in acute psychiatry have problematic use of substances and/or alcohol?**

This objective will examine the proportion of patients admitted to acute inpatient psychiatry for the first time, between 2006 to 2018, who used substances and/or alcohol prior to admission – establishing the sample for this study. To identify problematic substance and/or alcohol use, the substance use clinical assessment protocol (SUBUSE CAP) embedded in the Resident Assessment Instrument-Mental Health (RAI-MH) will be utilized.

**Objective Two: What characteristics are associated with being admitted to acute psychiatry due to addiction?**

Objective 2 will identify the characteristics of patients whose reason for admission to acute inpatient psychiatry is addiction. By using a population of patients with problematic substance and/or alcohol use, this objective can identify demographic, clinical, diagnostic and other characteristics that relate to the recognition of addiction care need. In doing so, potential variables associated with receipt of addiction services can be identified.

**Objective Three:**

- a) What proportion of patients who use substances and/or alcohol receive addiction care?**
- b) Among patients who use substances and/or alcohol, what factors are associated with receiving addiction care?**

Objective 3 will utilize the significant factors found to be associated with admission due to addiction and examine whether they are also associated with receipt addiction care within acute psychiatry.

## **Methodology:**

### **3.1 Study Design & Data**

This study used a cross-sectional, retrospective analysis of the first episode of care for persons admitted to acute psychiatry between January 1<sup>st</sup> 2006 to December 31<sup>st</sup> 2018 in Ontario, Canada. This study used data from the Ontario Mental Health Reporting System (OMHRS) from the Canadian Institute for Health Information (CIHI), which is collected from assessments using the Resident Assessment Instrument for Mental Health (RAI-MH). The RAI-MH data are submitted to CIHI, who is responsible for assessing data quality, validity and consistency along with data anonymization, cleaning and, storage (79). The RAI-MH, is a clinically and psychometrically valid assessment completed on admission to, and at discharge from, inpatient psychiatric facilities in Ontario, Newfoundland, and sites in Manitoba and Quebec (61-63). This study used data from both admission to and discharge from Ontario hospitals.

Any member of the interdisciplinary team providing care to the patient completed the assessment. While not involved in the direct completion of RAI-MH, first-responders and patients' families are important key informants that provide information to the care team completing the comprehensive assessment. Items on the RAI-MH are organized into domains that include personal items, referral information, mental health service history, mental status, substance use and excessive behaviours, cognition, self-care, health conditions and possible medication side effects, stressors, service utilization and treatments and, resources for discharge (8,45,80,81). The items capture information that provides guidance for clinical care planning, resource allocation and, measuring the quality of care. Within the RAI-MH are clinical tools such as the Clinical Assessment Protocols (referred to as CAPs) and scales such as the Depression Severity Index or Positive Symptom Scale, which assist health care providers in the care planning with patients and measuring outcomes (45). For instance, the substance use



(SUBUSE) CAP is a collection of items within the interRAI instrument; when these items are endorsed, the CAP is triggered (45).

### *3.1.1 Substance Use Clinical Assessment Protocol*

The SUBUSE CAP can be triggered for two reasons: (i) the patient has current problematic use of substances or, (ii) the patient has prior history of substance use (45). Patients that trigger the SUBUSE CAP for current problematic substance use include the following: use of illicit substances (i.e. inhalants, crack/cocaine, opiates) in the last 90 days, consuming five or more alcoholic drinks in a single sitting within the last 14 days or, purposeful misuse of medication in the last 90 days (45). Patients that trigger the SUBUSE CAP for prior history of problematic substance use have not used substances within the last 90 days but have a potential for relapse (45). This group included the following: a history of illicit drug use but not in the last 90 days, history of injection drug use but not in the last 30 days, have a score of 1 or more on the CAGE addictions screen and, are in a social environment conducive to substance use (45). Although the first reason for CAP trigger is more urgent as the concern is currently present, the second trigger should be provided with treatment as potential relapse would negatively impact treatment moving forward (45,46).

## **3.2 Study Setting and Participants**

This study includes patients admitted to acute psychiatry in Ontario, who were identified in the data based on: (i) admission year between January 1<sup>st</sup> 2006 to December 31<sup>st</sup> 2018, (ii) no record of recent (within the last two years) psychiatric admission and, (iii) age of 18 years or older at time of admission. Patients who are designated as acute often require urgent care for their symptoms, including crisis assessment and stabilization, treatment of patient's MI and substance and/or alcohol needs and building their network of support within the community

before discharge (55,56). Patients within addictions units were excluded because receipt of addiction care is implicit in their program. Short-stay visits (less than 2 days) will be excluded from the study population, as a full assessment was not completed for this group.

### 3.3 Ethics

The Office of Research Ethics at the University of Waterloo provided the ethics clearance for this study on March 26th, 2020 under the ORE file number 41949.

### 3.4 Variables

The variables considered in this study are described below.

#### 3.4.1 Independent Variables

The independent variables can be found within Table 1, separated into block numbers and data operations. Below, each block grouping is described.

Table 1 List of independent block variables

<b>Block 1 Descriptive Variables</b>	<b>Block 2 Clinical Variables</b>
Age group	Length of Stay
Gender	Contact with Community Mental Health
Education	Insight Into Mental Health
Employment	Involuntary Admission
Unemployment Risk	Incapable of Consenting
Marital Status	Incompetent to disclose info related to clinical record
Homelessness	Has legal guardian/substitute decision-maker
Lived Alone	Addiction Reason for Admission (RFA)
Residential Stability	
<b>Block 3 Substance Use Variables</b>	<b>Block 4 Behaviour &amp; Risk Variables</b>
Alcohol Use	Risk of Harm to Others (RHO)
Tobacco Use	Aggressive Behaviour Scale (ABS)
Inhalant Use	Self-Care Index (SCI)
Hallucinogen Use	Severity of Self-harm (SoS)
Crack or Cocaine Use	Activities of Daily Living (ADL)
Stimulant Us	Instrumental Activities of Daily Living (IADL)
Opiate Use	

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Cannabis Use  
Gambling  
Intentional Misuse of Medication  
Withdrawal Symptoms  
CAGE  
Substance Use Scale

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**Block 5 Mental Status Variables**

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Depressive Severity Index (DSI)  
Cognitive Performance Scale (CPS)  
Mania Scale  
Anhedonia/Social Withdrawal  
Positive Symptom Scale  
Trauma CAP  
Anxiety Scale  
Substance Use Disorder Diagnosis

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**Block 1 Demographic Variables:**

1. *Age*: Categorical variable operationalized into four groups: 18 to 24, 25 to 44, 45 to 64 and, 65+.
2. *Gender*: Categorical variable for male, female and other. Operationalized into binary: male and female/other.
3. *Education*: Categorical variable, operationalized into less than high school or unknown, high school and, greater than high school.
4. *Employment*: Categorical variable, operationalized to binary: currently employed and unemployed.
5. *Unemployment risk*: A total of six binary variables (including increase in lateness and absenteeism over the last 6 months, poor productivity or disruptiveness at work/school, expresses intent to quit work/school, persistent unemployment or fluctuating work history over the last 2 years) are operationalized into a binary-sum variable for risk or no risk of unemployment.

6. *Marital Status*: Categorical variable with six levels, operationalized to three levels: never married, married/partner/significant other and, widowed/separated/divorced.
7. *Homelessness*: Categorical variable, operationalized to binary (yes/no).
8. *Lived Alone*: Categorical variable of who the patient lived with at admission which is operationalized to binary, lived alone or did not live alone.
9. *Residential Stability*: Binary variable (yes/no) reporting if prior to admission the patient's most recent residence was temporary (i.e. shelter).

### **Block 2 Clinical Variables:**

Clinical variables, are administrative and medical items that provide a comprehensive interpretation of the patient.

1. *Reasons for Admission (RFA) was Addiction*: Categorical variable used to identify patients' reasons for admission (including threat or danger to self, to others, Specific psychiatric symptoms, forensic). This is operationalized to binary: Yes patient has a RFA due to addiction and no patient do not have a RFA due to addiction. It is important to note that the "yes" group can include other types of reasons along with addiction.
2. *Length of Stay*: The length of stay was operationalized into five categories: 0 to 2 days, 3 to 7 days, 8 to 14 days, 15 to 30 days and 31+ days. The categories 0 to 2 days and 31+ days are used to remove any patients that have short/long stay acute visits from the sample. The other remaining three categories will be used in the analyses.
3. *Contact with Community Mental Health*: Categorical variable operationalized to binary: Yes contact in the last 31 days / 30 day or less and no contact with community mental health.

4. *Insight Into Mental Health*: The clinical staff rate the person's insight into their mental health condition as none, limited, or full. None or limited were recoded to be "No" insight" while full was coded as "Yes" for insight.
5. *Involuntary Admission*: Categorical variable for patient status at time of assessment with five categories for various patient status is operationalized to binary: Yes involuntary and no not involuntary.
6. *Incapable of Consenting*: Binary variable (yes/no)
7. *Incompetent to disclose info related to clinical record*: Binary variable (yes/no)
8. *Has legal guardian/substitute decision-marker*: Binary variable (yes/no)

### **Block 3 Substance Use Variables:**

Substance use status variables will be used to discern the frequency of specific substances, count of number of substances used in the last 90 days, withdrawal symptoms and CAGE addiction scale.

1. *Alcohol Use*: Categorical variable operationalized to binary: Yes, more than five drinks in a single sitting in a 14 day period and No, less than five drinks in a single sitting in a 14 day period.
2. *Tobacco Use*: Categorical variable operationalized to binary: Yes, chews/smokes tobacco daily or not in the last three days but is a daily smoker and no.
3. *Inhalant Use*: Categorical variable with five levels (0=Never or more than 1 year ago, 1=Within the last year, 2=Within the last 3 months, 3=Within the last month, 4=Within the last 7 days, 5=Within the last 3 days) which is operationalized to binary: Yes within the last 90 days and not in the last 90 days. Use of 90 day cut-off period is used as the SUBUSE CAP is created to trigger for patients within a 90 day window.
4. *Hallucinogen Use*: See number 3 above.

5. *Crack or Cocaine Use*: See number 3 above.
6. *Stimulant Use*: See number 3 above.
7. *Opiate Use*: See number 3 above.
8. *Cannabis Use*: See number 3 above.
9. *Gambling*: Binary (yes/no)
10. *Intentional Misuse of Medication*: Binary (yes/no)
11. *Withdrawal Symptoms*: Categorical variable with levels based on severity is operationalized to binary: Yes, withdrawal symptoms are present and no, withdrawal symptoms are not present.
12. *CAGE*: This is a composed of four binary variables used to indicate potential problems with substance addiction without a formal diagnosis. Variables included are: felt the need to cutdown on substance(s), angered by criticism from others, felt guilt for using substance(s), used substance(s) as an “eye-opener” in the morning (45,82). The sum of the four variables was calculated, ranging from 0 to 4 and, dichotomized as: 1= potential problem with substance addiction (cut-off= 1+) and 0= No potential problem with substance addiction (cut-off= 0).
13. *Substance Use Scale*: A variable that sums the number of substances used within the last 90 days (inhalants, hallucinogens, crack/cocaine, stimulants, opiates, cannabis), medication misuse, tobacco use and problematic use of alcohol. The categorical variable has three levels: 0= no substances used, 1= 1 to 2 substances used and, 3= 3 or more substances used.

#### **Block 4 Behaviour & Risk Variables:**

Behaviour and risk variables provide an understanding of the patients ability to take care of themselves and, their risk to harming themselves and others.

1. *Risk of Harm to Others (RHO)*: This variable reflects the patients' risk of harm to others, with a higher score indicating increased risk (45). Operationalized to binary: Yes (score of 1 or more) and No (score of zero).
2. *Aggressive Behaviour Scale (ABS)*: Is a measure of frequency and type of aggressive behaviour. Includes items for verbal abuse, physical abuse, socially inappropriate/disruptive, resists care (83). Operationalized to binary: Yes (score of 1 or more) and No (score of zero).
3. *Self-Care Index (SCI)*: Identifies patient's ability to care for themselves due to psychiatric symptoms (45). Operationalized to binary: Yes (score of 1 or more) and No (score of zero).
4. *Severity of Self-harm (SoS)*: Identifies patient's risk of harm to self and mental health symptoms through various items including: history of self-injury ideation, history of suicide attempt(s), mental health symptoms, cognitive performance, family concerns about the person and suicide plan (45). A higher scores indicating greater risk of self-harm (45). Operationalized to binary: Yes (score of 1 or more) and no (score of zero).
5. *Activities of Daily Living (ADL)*: A measure of the patient's ability to perform everyday activities. Operationalized to binary: Yes (score of 1 or more) and No (score of zero).
6. *Instrumental Activities of Daily Living (IADL)*: A measure that reflects the patients' ability to carry out instrumental ADLs such as meal preparations and finances. Operationalized to binary: Yes (score of 1 or more) and No (score of zero).

### **Block 5 Mental Status Variables:**

Mental status variables will be used within the multivariate logistic regression model, to assess significance of MI on the contact with addiction care.

1. *Depressive Severity Index (DSI)*: A measure of negative mood indicators including sad/pained facial expressions, negative statements, self-deprecation, guilt/shame and hopelessness (45). Operationalized to binary: Yes (score of 3 or more) and No (score of 2 or less).
2. *Cognitive Performance Scale (CPS)*: A measure describing the patients' cognitive status including daily decision making, short-term memory, ability to express oneself, and self-performance of eating (45). Operationalized to binary: Yes (score of 3 or more) and No (score of 2 or less).
3. *MANIA Scale*: A measure of mania symptoms which includes items for hyperarousal, irritability, increased sociability, inflated-self-worth, pressured speech, sleep problems due to hypomania and labile effect (45). Higher the score indicates higher levels of mania. Operationalized to binary: Yes (score of 3 or more) and No (score of 2 or less).
4. *Anhedonia*: Measure that reflects anhedonia symptoms. Operationalized to binary: Yes (score of 1 or more) and No (score of zero).
5. *Positive Symptom Scale*: A measure of positive symptoms including hallucinations, command hallucinations, delusions and abnormal thought processes (45). Operationalized to binary: Yes (score of 3 or more) and No (score of 2 or less).
6. *Trauma CAP*: Categorical: Type 1 = immediate safety concerns; Type 2 = Reduce impact of prior traumatic life events (45). Operationalized to binary: Yes (type 1 and type 2) and Not triggered.
7. *Anxiety Scale*: A measure of the patients' anxiety, including variables such as anxious complaints, fears/phobias, obsessive thoughts, compulsive behaviour, intrusive thoughts/flashbacks, and episodes of panic. Operationalized to binary: Yes (exhibited in the last 3 days) and No (not exhibited in the last 3 days).



8. *Substance Use Disorder Diagnosis*: Presence a DSM-5 substance related/addictive disorder diagnosis.

### 3.4.2 *Dependent Variables*

#### **Addiction Counsellor Variable:**

The variable receipt of formal care in the form of an addiction counsellor, is one of two variables used to create the dependent variable. Within the RAI-MH assessment, an addiction counsellor is designated as any health care provider with training related to treatment of substance use and addiction. Therefore, contact by an addiction counsellor provides an indicator that patient's needs for substance use care have been identified. The item is a categorical variable coded 0-7, representing the number of days where at least 15 minutes of care was provided (since the last 7 days or since admission). For this study, the item was re-coded to a binary variable; 0=No an addiction counsellor was not in contact and, 1=Yes an addiction counsellor was in contact (*Llg*: 1-7). This will be completed for both admission and discharge assessment and then combined together to form one addiction counsellor variable.

#### **Focus of Intervention Alcohol/Drug Related Variable:**

The focus of intervention variable is utilized alongside the addiction counsellor variable. This variable identified what the major focus of the intervention is; in this case, the item alcohol/drug treatment/smoking cessation (*L4e*). The variable will assist in ascertaining if patients are in contact with some form of addictions care/support through a health care provider not designated as an addiction counsellor. Focus of intervention for alcohol/drug treatment/smoking cessation is categorical with levels 0-3, representing: 0=no intervention of this type, 1=offered but refused, 2=received in the last 7 days and, 3=not received but scheduled to start within the next 7 days. Within this study, this variable is operationalized to binary to assess if focus of intervention is addictions related. Thus, the dichotomization is 0= focus not

addictions related (*L4e*: 0,1 and 3) and, 1= focus is addictions related (*L4e*: 2 only).

Operationalization is completed for both admission and discharge, then combined together, similar to the addiction counsellor variable.

### **Addiction Care Variable:**

This variable is a combination of the two new operationalized variables, formal care from an addiction counsellor and focus of intervention alcohol/drug treatment/smoking cessation.

Addiction care includes care given at admission and discharge. The variable is coded as binary;

Yes= addiction care was given or No= addiction care was not given. Addiction care will function as the dependent variable for objective 3b.

## **3.5 Analysis**

This study used Statistical Analysis Software (SAS) version 9.4.

### *3.5.1 Analysis Sample Size*

The study sample obtained from OHMRS 2019, assembled using the exclusion criteria, will include a total of 44516 patients within acute inpatient psychiatry.

### *3.5.2 Statistical Analysis*

#### **Objective One Analysis:**

To identify the proportion of patients who use substances and/or alcohol, recognized through triggering of the SUBUSE CAP, PROC FREQ function was used. Moreover, the frequency of patients admitted for addiction and the proportion that received addiction care were also identified. Patients that did not trigger the SUBUSE CAP were removed from the sample. Patients that triggered the SUBUSE CAP were identified with current or prior problematic substance use behaviours, thus this study can apply the assumption that all patients should be receiving addiction care. After the sample size is reduced, bivariate statistics through frequency

tables are completed between RFA by SUBUSE CAP and addiction care receipt to highlight the potential importance of RFA for addiction. Additionally, the relationship between SUBUSE CAP and addiction care was examined using a chi-square analysis. Finally, univariate population statistics for this reduced sample are identified using block 1 to 5.

### **Objective Two Analysis:**

The descriptive statistics and characteristic of the population are highlighted through cross-tabulation between all variables from block 1 to 5 and RFA for addiction variable. Frequency table function is utilized with chi-square procedure (PROC FREQ CHISQ) to determine any association between potential covariate. The variables with a p-value greater than or equal to alpha of 0.05 will be considered as covariates and will not be used further. The statistically significant variables will be applied to model creation in objective 3b.

### **Objective Three A Analysis:**

Bivariate statistics are calculated to determine the proportion of patients who use substances and/or alcohol that received addiction care are identified through cross-tabulation. This is completed to reveal the population in the study and their frequency of addiction care receipt.

### **Objective Three B Analysis:**

Preliminary multivariate logistic regression models were developed for identifying block variables associated with addiction care contact using the statistically significant variables found in objective two. Each block was separately modelled to ascertain significance between a smaller set of variables and the dependent variable. Within each model, variables that are not statistically significant were removed. Non-significance is identified through a p-value greater than 0.05.

Next, the statistically significant variables from the preliminary block models were entered into a full multivariable model 1. A manual backwards stepwise method is used to

remove the not statistically significant variables starting from block 5 variables and working towards block 1. Consideration for a final predictive model was stringent and removing variables are based on the following rules: (i) p-value of less than 0.01, (ii) OR greater than 1.0 with 95% CI not spanning 1.0, (iii) OR less than 1.0 with 95% CI not spanning 1.0 and, (iv) parsimony and lack of collinearity between variables. The C-statistic is used to identify goodness of fit, with a value of 0.70 as a minimum cut-off. Within the combined model the C-statistic will be the highest as all variables are included. As variables are removed, the C-statistic will decrease but the value will be monitored to understand that importance of that variable within the model. Age and gender are important variables that impact addiction care and carry potential bias when in psychiatry (84–86). Thus, irrespective of the statistical significance these important confounding variables will be retained in all models.

#### **Sensitivity Analysis:**

A sensitivity analysis was completed to account for the focus of intervention alcohol/drug treatment/smoking cessation variable. The focus of intervention variable cannot disentangle alcohol/drug treatment and smoking cessation. Thus, to control for the smoking cessation all patients that smoke or chew tobacco are removed from the sample. The final model is then applied to this new, tobacco free sample, under the assumption that no smoking cessation is required.

## Results:

### 4.1 Objective One: What proportion of patients in acute psychiatry have problematic use of substances and/or alcohol?

#### 4.1.1 Univariate Statistics for Acute Psychiatry

From 2006 to 2018, 44516 individuals, based on the inclusion criteria mentioned above, utilized acute psychiatric care within Ontario, Canada. Of the patients within acute psychiatry, 49.3% (n=21946) triggered the SUBUSE CAP. In particular, 44.8% (n=19928) triggered for current problematic use of substances and 4.5% (n=2018) triggered due to prior history of problematic substance use. The prevalence of RFA identified as problems with addiction was 24.6% (n=10944) while the overall prevalence of patients that received some form of addictions care during their acute stay was 27.6% (n=12298).

Table 2 Proportion of patients within acute psychiatry who triggered the substance use CAP, were admitted for addiction and those that received of addiction care

		<i>n</i>	%
<b>Total Population</b>		44516	
<b>Total Population that triggered SUBUSE CAP</b>		21946	49.3
<b>SUBUSE CAP</b>	None	22570	50.7
	Current Use	19928	44.8
	Prior Use	2018	4.5
<b>Reason for Admission</b>	Yes	10944	24.6
<b>Addiction</b>	No	33572	75.4
<b>Addiction Care</b>	Yes	12298	27.6
	No	32218	72.4

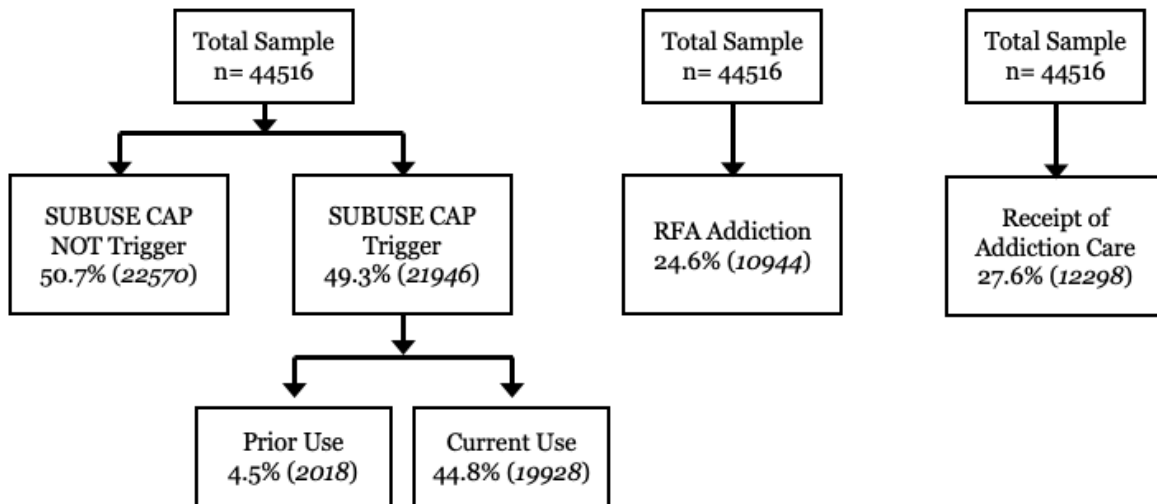


Figure 2 Visual categorization of patients within acute psychiatry who (i) trigger the SUBUSE CAP, (ii) were admitted for addiction and, (iii) received addiction care

#### 4.1.2 Descriptive statistics for patients that trigger the SUBUSE CAP

Amongst those who trigger the SUBUSE CAP (n=21946), 90.8% (n=19928) triggered the CAP for current problematic use of substances whereas 9.2% (n=2018) triggered the CAP due to prior history of problematic substance use. Of the patients that triggered the SUBUSE CAP for current problematic use of substances, 92.8% (n=9440) had a RFA related to addiction. Among patients that triggered the SUBUSE CAP for prior problematic substance use, 7.2% (n=731) had a RFA related to addiction. Overall, among those that trigger the SUBUSE CAP, 48.4% received addiction care; with 92.7% (n=9854) having current problematic substance and/or alcohol use and 7.3% (n=771) with prior problematic substance and/or alcohol use.

Among those who triggered the CAP, 40.5% of patients were 25 to 44 years old, 59.2% were male, 52.3% had completed greater than high school, 34.4% were employed, 29.4% had unemployment risk, 55.5% were never married, 28.4% lived alone and, 25.3% were homeless. Additionally, 58.7% of patients had a length of stay between 8 to 14 days, 87.9% had insight into their own mental health and, 17.7% were involuntarily admitted to inpatient psychiatry. Of patients within acute psychiatry, 66.4% used 1 to 2 types of substances in the last 90 days. In

terms of type of substances used: 33.1% consumed 5 or more alcoholic drinks in a single sitting in the last 14 days, 53.3% chewed or smoked tobacco daily/ not in the last three days but are a daily smoker. In the last 90 days, 15.3% of patients used crack/cocaine, 12.0% used opiates, 48.8% used cannabis and, 27.9% misused prescription/over-the-counter medication. Moreover, 47.4% of patients had potential problem with substance addiction based on the CAGE and 21.0% had withdrawal symptoms related to substances. Sixty percent of patients had depressive symptoms (based on a score equal to or greater than three on the Depressive Severity Index (DSI)), 33.5% had symptoms of mania, 33.0% had positive symptoms (based on the PSS) and, 47.5% had a substance use diagnosis.

Table 3 Proportion of patients with reason for admission due to addiction and receipt of addiction care by type of SUBUSE CAP trigger

		SUBUSE CAP		
		Current Use, % ( <i>n</i> )	Prior Use, % ( <i>n</i> )	Total
<b>Reason for Admission</b>	Yes	92.8 (9440)	7.2 (731)	46.4 (10171)
	No	89.1 (10488)	10.9 (1287)	53.6 (11775)
<b>Addiction Care</b>	Yes	92.7 (9854)	7.3 (771)	48.4 (10625)
	No	89.0 (10074)	11.0 (1247)	51.6 (11321)

Table 4 Demographic and clinical information regarding the patients that triggered the substance use CAP within acute psychiatry

Demographic and Clinical Variables		<i>n</i>	%
<b>Age group</b>	18-24	5524	25.2
	25-44	8877	40.4
	45-64	6355	29.0
	65+	1190	5.4
<b>Gender</b>	Male	12986	59.2
	Female/Other	8960	40.8
<b>Education</b>	Less than Highschool or Unknown	4369	59.2
	Highschool	6107	27.8
	Greater than Highschool	11470	52.3
<b>Employment</b>	Unemployed	14406	65.6
	Employed	7540	34.4
<b>Unemployment Risk</b>	No Risk	15464	70.5
	Risk	6482	29.5
<b>Marital Status</b>	Never Married	12181	55.5

<b>Demographic and Clinical Variables</b>		<b><i>n</i></b>	<b><i>%</i></b>
	Married or Partner/Significant Other	6196	28.2
	Widowed, Separated, Divorced	3569	16.3
<b>Homelessness</b>	No	16388	74.7
	Yes	5558	25.3
<b>Lived Alone</b>	No	15706	71.6
	Yes	6240	28.4
<b>Residential Stability</b>	No	15954	72.7
	Yes	5992	27.3
<b>Length of Stay</b>	3-7 days	89	0.4
	8-14 days	12881	58.7
	15-30 days	8976	40.9
<b>Contact with Community Mental Health</b>	No	15752	71.8
	Yes	6194	28.2
<b>Insight Into Mental Health</b>	No	2664	12.1
	Yes	19282	87.9
<b>Involuntary Admission</b>	No	18069	82.3
	Yes	3877	17.7
<b>Incapable of Consenting</b>	No	21285	97.0
	Yes	661	3.0
<b>Incompetent to disclose info related to clinical record</b>	No	21613	98.5
	Yes	333	1.5
<b>Has legal guardian/substitute decision-marker</b>	No	21310	97.1
	Yes	636	2.9
<b>Alcohol Use</b>	No	14683	66.9
	Yes	7263	33.1
<b>Tobacco Use</b>	No	10240	46.7
	Yes	11706	53.3
<b>Inhalant Use</b>	No	21716	99.0
	Yes	230	1.0
<b>Hallucinogen Use</b>	No	21159	96.4
	Yes	787	3.6
<b>Crack or Cocaine Use</b>	No	18597	84.7
	Yes	3349	15.3
<b>Stimulant Use</b>	No	20408	93.0
	Yes	1538	7.0
<b>Opiate Use</b>	No	19314	88.0



<b>Demographic and Clinical Variables</b>		<b><i>n</i></b>	<b><i>%</i></b>
<b>Cannabis Use</b>	Yes	2632	12.0
	No	11234	51.2
<b>Gambling</b>	Yes	10712	48.8
	No	21491	97.9
<b>Intentional Misuse of Medication</b>	Yes	455	2.1
	No	15830	72.1
<b>Withdrawal Symptoms</b>	Yes	6116	27.9
	No	17336	79.0
<b>CAGE</b>	Yes	4610	21.0
	No potential problem with substance addiction	11542	52.6
<b>Substance Use Scale</b>	Potential problem with substance addiction	10404	47.4
	1-2 Substances	14567	66.4
	3+ Substances	6230	28.4
<b>Risk of Harm to Other (RHO)</b>	None	1149	5.2
	No	13677	62.3
	Yes	8269	37.7
<b>Aggressive Behaviour Scale (ABS)</b>	No	18202	82.9
	Yes	3744	17.1
<b>Self-Care Index (SCI)</b>	No	8479	38.6
	Yes	13467	61.4
<b>Severity of Self-harm (SoS)</b>	No	4814	21.9
	Yes	17132	78.1
<b>Activities of Daily Living (ADL)</b>	No	20596	93.9
	Yes	1350	6.2
<b>Instrumental Activities of Daily Living (IADL)</b>	No	17204	78.4
	Yes	4742	21.6
<b>Depressive Severity Index (DSI)</b>	No	8594	39.2
	Yes	13352	60.8
<b>Cognitive Performance Scale (CPS)</b>	No	21201	96.6
	Yes	745	3.4
<b>MANIA Scale</b>	No	14604	65.6
	Yes	7342	33.4
<b>Anhedonia</b>	No	8790	40.0
	Yes	13156	60.0
<b>Positive Symptom Scale</b>	No	14701	67.0
	Yes	7245	33.0
<b>Trauma CAP</b>	No	17993	82.0

<b>Demographic and Clinical Variables</b>		<b><i>n</i></b>	<b><i>%</i></b>
<b>Substance Use Disorder Diagnosis</b>	Yes	3953	18.0
	No	11525	52.5
	Yes	10421	47.5

## **4.2 Objective Two: What characteristics are associated with being admitted to acute psychiatry due to addiction?**

The following section will highlight descriptive statistics from a cross-tabulation between variables from block 1 to 5 and addiction RFA. If a variable is not statistically significant (identified through chi-square or fisher's exact test), the p-value will be given instead of the percentage.

### *4.2.1 Bivariate Statistics related to Reason for Admission*

Among patients with a RFA for addiction, the prevalence for SUBUSE CAP triggers are as follows: 86.3% (n=9440) triggered for current use of substances, 6.7% (n=731) triggered due to prior history of substance use and, 7.1% (n=773) did not trigger the SUBUSE CAP. For the patients that did not have a RFA for addiction, the prevalence for SUBUSE CAP triggers are as follows: 31.2% (n=10488) triggered for current use of substances, 3.8% (n=1287) triggered due to prior history of substance use and, 64.9% (n=21797) did not trigger the SUBUSE CAP. The prevalence of patients with a RFA for addiction that received addictions care is 66.6% (n=7287) while those that did not receive addiction care is 33.4% (n=3657). Alternatively, the prevalence of patients without a RFA for addiction that did receive addictions care is 14.9% (n=5011).

Table 5 Proportion of patients who triggered the substance use CAP and received addiction care by reason for admission being addiction

		Reason for Admission Addiction	
		Yes, % (n)	No, % (n)
<b>SUBUSE CAP</b>	None	7.1 (773)	64.9 (21797)
	Current Use	86.3 (9440)	31.2 (10488)
	Prior Use	6.7 (731)	3.8 (1287)
<b>Addiction Care</b>	Yes	66.6 (7287)	14.9 (5011)
	No	33.4 (3657)	85.1 (28561)

#### 4.2.2 Block 1: Descriptive Variables

The greatest number of patients admitted for addiction are between 25 to 44 years of age (43.3%), followed by age groups 45 to 64 (30.1%), 18 to 24 (22.2%) and, 65 and over (4.40%). Males have a greater percentage of admission for addiction compared to females/other (64.9%). Approximately, half of the inpatient population admitted for addiction had completed education higher than high school (50.7%), just over a quarter completed high school (27.1%) and just under a quarter had less than high school or unknown (22.2%). The proportion of patients that were unemployed is higher than that of currently employed patients (67.7% and 32.3%, respectively). Of patients admitted for addiction, 31.0% were at risk of unemployment. Additionally, unemployment risk is similar for patients not admitted for addiction (28.4%).

Over half of the patients admitted for addiction were never married (57.3%), followed by those who are married or have a partner/significant other (26.6%) and, patients who are widowed, separated or divorced (16.1%). Within this population, the proportion of patients that are homeless (28.5%) is less than the proportion of patients who are not homeless (71.5%). A larger proportion of patients admitted for addiction did not live alone (70.0%) compared to those that did live alone (30.0%). A larger proportion of patients admitted for addiction did not experience residential stability (70.4%).

Table 6 Demographic characteristics of patients admitted for addiction

Block 1 Descriptive Variables		Reason for Admission Addiction		
		Yes, % (n)	No, % (n)	p-value
Age group	18-24	22.2 (2260)	27.7 (3264)	<.0001
	25-44	43.3 (4405)	38.0 (4472)	
	45-64	30.1 (3064)	28.0 (3291)	
	65+	4.4 (442)	6.3 (748)	
Gender	Male	64.9 (6602)	54.2 (6384)	<.0001
	Female/Other	35.1 (3569)	45.8 (5391)	
Education	Less than Highschool or Unknown	22.2 (2253)	18.0 (2116)	<.0001
	Highschool	27.1 (2758)	28.4 (3349)	
	Greater than Highschool	50.7 (5160)	53.6 (6310)	
Employment	Unemployed	67.7 (6887)	63.9 (7519)	<.0001
	Employed	32.3 (3284)	36.1 (4256)	
Unemployment Risk	No Risk	69.1 (7027)	71.7 (8437)	<.0001
	Risk	30.9 (3144)	28.4 (3338)	
Marital Status	Never Married	57.3 (5827)	54.0 (6254)	<.0001
	Married or Partner/Significant Other	26.6 (2703)	29.7 (3493)	
	Widowed, Separated, Divorced	16.1 (1641)	16.4 (1928)	
Homelessness	No	71.5 (7269)	77.4 (9119)	<.0001
	Yes	28.5 (2902)	22.6 (2656)	
Lived Alone	No	70.1 (7130)	72.8 (8676)	<.0001
	Yes	29.9 (3041)	27.2 (3199)	
Residential Stability	No	70.4 (7158)	74.7 (8796)	<.0001
	Yes	29.6 (3013)	25.3 (2976)	

#### 4.2.3 Block 2: Clinical Variables

The proportion of patients admitted for addiction with a length of stay of 8 to 14 days (56.9%) is similar to those with a length of stay of 15 to 30 days (42.6%). The majority of patients admitted for addiction have insight into their own mental health (88.6%), are competent to disclose information related to their clinical records (98.2%) and, entered care voluntarily (85.2%). Variables not statistically significant were contact with community mental health (p=0.06) and has legal guardian/substitute decision maker (p=0.89).

Table 7 Clinical characteristics of patients admitted for addiction

Block 2 Clinical Variables		Reason for Admission Addiction		p-value
		Yes, % (n)	No, % (n)	
Length of Stay	3-7 days	0.5 (51)	0.3 (38)	<.0001
	8-14 days	56.9 (5748)	60.3 (7097)	
	15-30 days	42.6 (4336)	39.4 (4640)	
Contact with Community Mental Health	No	71.2 (7238)	72.3 (8514)	0.06
	Yes	28.8 (2933)	27.7 (3261)	
Insight Into Mental Health	No	11.4 (1160)	12.8 (1504)	<.01
	Yes	88.6 (9011)	87.2 (10271)	
Involuntary Admission	No	85.2 (8669)	79.8 (9400)	<.0001
	Yes	14.8 (1502)	20.2 (2375)	
Incapable of Consenting	No	97.0 (9867)	97.0 (11418)	0.85
	Yes	3.0 (304)	3.0 (357)	
Incompetent to disclose info related to clinical record	No	98.2 (9991)	98.7 (11622)	<.01
	Yes	1.8 (180)	1.3 (153)	
Has legal guardian/substitute decision-marker	No	97.1 (9878)	97.1 (11432)	0.89
	Yes	2.9 (293)	2.9 (343)	

#### 4.2.4 Block 3: Substance Use Variables

Patients admitted for addiction used various types and numbers of substances within the last 90 days prior to admission, 55.5% used 1 to 2 substances, 41.0% used 3 or more substances and, 3.5% did not use any substances. The prevalence of patients with potential problem with substance addiction is 70.0% based on the CAGE, for patients admitted for addiction. Signs or symptoms that could be related to withdrawal of substances in the last 3 days (35.0%) is less prevalent than no signs or symptoms of withdrawal symptoms (65.0%) in patients admitted for addiction.

Among patients admitted to inpatient psychiatry for addiction, 64.5% chewed or smoked tobacco daily/not in the last three days but are a daily smoker. Additionally, 42.4% consumed 5 or more alcoholic drinks in any single sitting episode in the last 14 days. Between three days to 90 days before admission to acute psychiatry for addiction: 51.2% of patients used cannabis, 23.3% used cocaine and/or crack, 18.8% used opiates, 10.5% used stimulants and, 5.3% used hallucinogens. Alternatively, between three days and 90 days before admission, 98.8% did not

consume inhalants. Moreover, 24.1% of patients misused prescription and/or over-the-counter medication in the last three months. Finally, of the patients admitted for addiction, majority did not gamble excessively or uncontrollably in the last three months (97.4%).

Table 8 Substance use characteristics of patients admitted for addiction

<b>Block 3 Substance Use Variables</b>		<b>Reason for Admission Addiction</b>		
		<b>Yes, % (n)</b>	<b>No, % (n)</b>	<b>p-value</b>
Alcohol Use	No	57.6 (5862)	74.9 (8822)	<.0001
	Yes	42.4 (4310)	25.1 (2953)	
Tobacco Use	No	35.8 (3636)	56.1 (6604)	<.0001
	Yes	64.3 (6535)	43.9 (5171)	
Inhalant Use	No	98.8 (10048)	99.1 (11668)	0.03
	Yes	1.21 (123)	0.9 (107)	
Hallucinogen Use	No	95.7 (9636)	97.9 (11523)	<.0001
	Yes	5.3 (535)	2.1 (252)	
Crack or Cocaine Use	No	76.7 (7803)	91.7 (10794)	<.0001
	Yes	23.3 (2368)	8.3 (981)	
Stimulant Use	No	89.5 (9100)	96.0 (11308)	<.0001
	Yes	10.5 (1071)	4.0 (467)	
Opiate Use	No	81.2 (8261)	93.9 (11053)	<.0001
	Yes	18.8 (1910)	6.1 (722)	
Cannabis Use	No	48.8 (4966)	53.2 (6268)	<.0001
	Yes	51.2 (5205)	46.8 (5507)	
Gambling	No	97.4 (9907)	98.4 (11584)	<.0001
	Yes	2.6 (264)	1.6 (191)	
Intentional Misuse of Medication	No	75.9 (7721)	68.9 (8109)	<.0001
	Yes	24.1 (2450)	31.1 (3666)	
Withdrawal Symptoms	No	65.0 (6612)	91.1 (10724)	<.0001
	Yes	35.0 (3559)	8.9 (1051)	
CAGE	No potential problem with substance addiction	30.1 (3061)	72.0 (8481)	<.0001
	Potential problem with substance addiction	69.9 (7110)	28.0 (3294)	
Substance Use Scale	None	3.5 (355)	6.7 (794)	<.0001
	1-2 Substances	55.5 (5645)	75.8 (8922)	
	3+ Substances	41.0 (4171)	17.5 (2059)	

#### 4.2.5 Block 4 Behaviour & Risk Variables

Among patients admitted for addiction, 40.4% may be at risk of harm to others (a score of one or more based on Risk of Harm to Others (RHO) scale). Based on a score of one or more

on the Self-Care Index (SCI), 57.0% of patients admitted for addiction may be unable to care for themselves due to their psychiatric symptoms. The proportion of patients admitted for addiction with risk of self-harm is 71.0% (based on a score of one or more on Severity of Self-harm (SoS) measure). For patients admitted for addiction with a score greater than or equal to one, 5.7% had troubles with Activities of Daily Living and 19.3% has troubles with Instrumental Activities of Daily Living. The variable considered not statistically significant from the cross-tabulation with RFA related to addiction, and thus not reported is: aggressive behaviour scale (ABS; p=0.59).

Table 9 Behaviour and risk characteristics of patients admitted for addiction

<b>Block 4 Behaviour &amp; Risk Variables</b>		<b>Reason for Admission Addiction</b>		
		<b>Yes, % (n)</b>	<b>No, % (n)</b>	<b>p-value</b>
Risk of Harm to Others (RHO)	No	59.6 (6057)	64.7 (7620)	<.0001
	Yes	40.4 (4114)	35.3 (4155)	
Aggressive Behaviour Scale (ABS)	No	82.8 (8421)	83.1 (9781)	0.59
	Yes	17.2 (1750)	16.9 (1994)	
Self-Care Index (SCI)	No	43.0 (4374)	34.9 (4105)	<.0001
	Yes	57.0 (5797)	65.1 (7670)	
Severity of Self-harm (SoS)	No	29.1 (2962)	15.7 (1852)	<.0001
	Yes	70.9 (7209)	84.3 (9923)	
Activities of Daily Living (ADL)	No	94.3 (9592)	93.5 (11004)	<.01
	Yes	5.7 (579)	6.5 (771)	
Instrumental Activities of Daily Living (IADL)	No	80.7 (8209)	76.4 (8995)	<.0001
	Yes	19.3 (1962)	23.6 (2780)	

#### 4.2.6 Block 5 Mental Status Variables

The proportion of patients admitted for addiction with depressive symptoms (based on the DSI) is 56.4%. The prevalence of anhedonia symptoms (56.4%) is exactly the same as DSI for patients admitted for addiction. Patients admitted for addiction and have positive symptoms have a prevalence of 31.0%. The prevalence of patients that triggered the Traumatic Life Events CAP and are admitted for addiction is 18.8%. Among patients admitted for addiction, 70.4% have a current SUD. The variable considered not statistically significant from the cross-

tabulation with RFA related to addiction, and thus not reported are: Cognitive performance scale (CPS; p=0.87), MANIA scale (p=0.58) and, anxiety scale (p=0.27).

Table 10 Mental status characteristics of patients admitted for addiction

Block 5 Mental Status Variables		Reason for Admission Addiction		
		Yes, % (n)	No, % (n)	p-value
Depressive Severity Index (DSI)	No	43.6 (4436)	35.3 (4158)	<.0001
	Yes	56.4 (5735)	64.7 (7617)	
Cognitive Performance Scale (CPS)	No	96.6 (9828)	96.6 (11373)	0.87
	Yes	3.4 (343)	3.4 (402)	
MANIA Scale	No	66.4 (6749)	66.7 (7855)	0.58
	Yes	33.6 (3422)	33.3 (3920)	
Anhedonia	No	44.6 (4430)	37.0 (4360)	<.0001
	Yes	56.4 (5741)	63.0 (7415)	
Positive Symptom Scale	No	69.0 (7023)	65.2 (7678)	<.0001
	Yes	31.0 (3148)	34.8 (4097)	
Trauma CAP	No	81.2 (8263)	82.6 (9730)	<.01
	Yes	18.8 (1908)	17.4 (2045)	
Anxiety Scale	No	98.8 (10044)	98.9 (11647)	0.27
	Yes	1.2 (127)	1.1 (128)	
Substance Use Disorder Diagnosis	No	29.7 (3016)	72.3 (8509)	<.0001
	Yes	70.3 (7155)	27.7 (3266)	

### 4.3 Objective Three A: What proportion of patients who use substances and/or alcohol receive addiction care?

Among the inpatients that received addiction care, 49.4% triggered the SUBUSE CAP for current problematic substance use and 38.2% triggered SUBUSE CAP for prior history of problematic substance use. Of the patients within acute psychiatry that did not receive addiction care, 50.6% triggered the SUBUSE CAP for current problematic substance use and 61.8% triggered SUBUSE CAP for prior history of problematic substance use.

Table 11 Proportion of patients that received addiction care by the type of SUBUSE CAP trigger

SUBUSE CAP		Addiction Care	
		Yes % (n)	No % (n)
	None	n/a	n/a
	Current Use	49.4 (9854)	50.6 (10074)
	Prior Use	38.2 (771)	61.8 (1247)
	Total	48.4 (10625)	51.6 (11321)



### 4.3 Objective Three B: Among patients who use substances and/or alcohol, what factors are associated with receiving addiction care?

#### 4.3.1 Block Modeling

Preliminary multivariate logistic regression models were developed to examine the relationship between the receipt of addiction care (binary dependent variable) using the statistically significant variables found in objective two. Each block was separately modelled to ascertain significance between a smaller set of variables and the dependent variable. Within each model, variables that were not statistically significant were removed and the associated model was rerun. Non-significance is identified through a p-value greater than 0.05.

Table 12 Multivariate logistic regression block models examining the relationship between demographic, clinical, substance use, behaviour and risk and, mental status characteristics by receipt of addiction care

Variables		OR (95% CI)	p-value	C-statistic
<b>Block Model 1</b>				<b>0.59</b>
Age	25-44	1.57 (1.46-1.69)	<.0001	
	45-64	1.48 (1.35-1.61)	<.0001	
	65+	0.89 (0.77-1.03)	<.01	
Gender		0.68 (0.65-0.72)	<.0001	
Education	Highschool	0.88 (0.81-0.95)	<.01	
	> Highschool	0.81 (0.75-0.87)	<.0001	
Employed		0.88 (0.83-0.93)	<.0001	
Unemployment Risk		1.13 (1.07-1.20)	<.0001	
Marital Status	Married or Partner/Significant Other	0.88 (0.82-0.95)	<.01	
	Widowed, Separated, Divorced	1.01 (0.93-1.11)	0.73	
Homelessness		1.14 (1.07-1.21)	<.0001	
Lived Alone		1.06 (0.99-1.13)	0.09	
Residential Stability		1.05 (0.99-1.12)	0.10	
<b>Block Model 2</b>				<b>0.72</b>
Length of Stay	8-14 days	0.96 (0.61-1.52)	0.87	
	15-30 days	1.09 (0.69-1.72)	0.71	

Variables	OR (95% CI)	p-value	C-statistic
Insight into own Mental Health	1.43 (1.31-1.57)	<.0001	
Involuntary Admission	0.62 (0.50-0.82)	<.0001	
Incompetent to disclose information related to clinical records	0.64 (0.50-0.82)	<.01	
Reason for Admission Addiction	5.23 (4.93-5.54)	<.0001	
<b>Block Model 3a</b>			<b>0.78</b>
Alcohol Use	1.47 (1.38-1.59)	<.0001	
Tobacco Use	1.87 (1.77-1.99)	<.0001	
Inhalant Use	0.64 (0.47-0.87)	<.01	
Hallucinogen Use	0.84 (0.71-1.01)	0.06	
Crack/Cocaine Use	1.74 (1.59-1.91)	<.0001	
Stimulant Use	1.39 (1.22-1.58)	<.0001	
Opiate Use	2.12 (1.91-2.36)	<.0001	
Cannabis Use	1.06 (1.00-1.13)	0.07	
Gambling	0.89 (0.72-1.10)	0.26	
Medication Misuse	0.79 (0.73-0.85)	<.0001	
Withdrawal Symptoms	2.67 (2.46-2.91)	<.0001	
CAGE	3.09 (2.90-3.29)	<.0001	
<b>Block Model 3b</b>			<b>0.62</b>
Substance Use Scale	No Substances	0.65 (0.57-0.74)	<.0001
	3+ Substances	3.09 (2.90-3.29)	<.0001
<b>Block Model 4</b>			<b>0.59</b>
Harm to Others (RHO)	1.29 (1.22-1.36)	<.0001	
Self-Care Index (SCI)	0.75 (0.71-0.80)	<.0001	
Severity of Self-harm (SoS)	0.48 (0.45-0.51)	<.0001	
ADL Scale	1.02 (0.90-1.15)	0.78	
IADL Scale	0.82 (0.77-0.88)	<.0001	
<b>Block Model 5</b>			<b>0.73</b>
Depressive Symptom Index (DSI)	0.98 (0.92-1.04)	0.49	
Anhedonia	0.90 (0.85-0.96)	<.01	
Positive Symptom Scale (PSS)	0.85 (0.80-0.91)	<.0001	
Trauma CAP	1.18 (1.09-1.28)	<.0001	
Substance Use Disorder Diagnosis	6.41 (6.05-6.81)	<.0001	

### *4.3.2 Combined Modeling*

#### **Combined Model 1:**

Entering all variables into one model resulted in a C-statistic of 0.820. The goal was to maintain a strong C-statistic close to 0.800 while achieving a parsimonious model for receipt of addictions care. In evaluating combined model 1, only block 5 variables were assessed. Positive Symptom Scale ( $p=0.38$ ) and the Trauma CAP ( $p=0.07$ ) ceased to be significant and were removed from the model. Substance use disorder diagnosis ( $p<.0001$ ) remained significant and continued in the model going forward.

#### **Combined Model 2:**

After rerunning the model, the C-statistic remained 0.82 ( $df=29$ ). This model evaluated block 4, while reassessing block 5 for continued significance. Variables RHO ( $p=0.85$ ), IADL scale ( $p=0.03$ ) and SCI [OR= 0.87, 95% CI (0.81-0.93)] were not statistically significant and were removed, while SoS ( $p<.0001$ ) remained.

#### **Combined Model 3:**

The C-statistic was 0.819 ( $df=26$ ). This model evaluated block 3, while reassessing block 4 and 5. Substance type variables ( $df=7$ ; including use of alcohol, crack/cocaine, inhalants, stimulants, opiates, tobacco and, medication misuse) were significant. However, there was potential collinearity between these variables and the substance use scale variable. The substance use scale variable identified the number of substances a patients used within the last 90 days. Within the predictive model context, using one variable instead of six to predict odds of addiction care receipt will create a more parsimonious model. To check for collinearity: the substance type variables are removed and the substance use scale variable becomes significant [ $p<.0001$ ; 3+ substances used OR= 1.52, 95% CI (1.41-1.64) & zero substances used OR=

0.59, 95% CI (0.51-0.69)] – therefore this one variable will remain while the other seven are removed.

**Combined Model 4:**

The C-statistic decreased from 0.819 (df=26) to 0.814 (df=19) for this combined model. Block 2 was evaluated, while reassessing blocks 3 to 5. The variable for patients competence to disclose information related to clinical records [OR= 0.71, 95% CI (0.55-0.93)] was removed from the model.

**Combined Model 5:**

The C-statistic after rerunning was 0.814 (df=18). This model evaluated block 1, while reassessing the continued significance of blocks 2-5. Variables such as education (p=0.52 & 0.31), employment (p=0.18), unemployment risk (p=0.19) and, homelessness [OR= 0.89, 95% CI (0.82-0.95)] were not statistically significant and were removed. All variables included within each combined model during the model forming process can be found in Table 14. The OR/95% CI and p-values can be found in Appendix B.

Table 13 Block variables included in combined model building process

Variables		Model 1	Model 2	Model 3	Model 4	Model 5	Final Model
<b>Block 1</b>							
Age	25-44	X	X	X	X	X	X
	45-64	X	X	X	X	X	X
	65+	X	X	X	X	X	X
Gender		X	X	X	X	X	X
Education	Highschool	X	X	X	X	X	
	> Highschool	X	X	X	X	X	
Employment		X	X	X	X	X	
Unemployment Risk		X	X	X	X	X	
Homelessness		X	X	X	X	X	
<b>Block 2</b>							
Insight into own Mental Health		X	X	X	X	X	X
Involuntary Admission		X	X	X	X	X	X

<b>Variables</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>	<b>Final Model</b>
Incompetent to disclose information related to clinical records	X	X	X	X		
Reason for Admission Addiction	X	X	X	X	X	X
<b>Block 3</b>						
Alcohol Use	X	X	X			
Tobacco Use	X	X	X			
Inhalant Use	X	X	X			
Crack/Cocaine Use	X	X	X			
Stimulant Use	X	X	X			
Opiate Use	X	X	X			
Medication Misuse	X	X	X			
Withdrawal Symptoms	X	X	X	X	X	X
CAGE	X	X	X	X	X	X
Substance Use Scale						
No Substances	X	X	X	X	X	X
3+ Substances	X	X	X	X	X	X
<b>Block 4</b>						
Harm to Others (RHO)	X	X				
Self-Care Index (SCI)	X	X				
Severity of Self-harm (SoS)	X	X	X	X	X	X
IADL Scale	X	X				
<b>Block 5</b>						
Positive Symptom Scale (PSS)	X					
Trauma CAP	X					
Substance Use Disorder Diagnosis	X	X	X	X	X	X
<b>C-statistic</b>	<b>0.82</b>	<b>0.82</b>	<b>0.819</b>	<b>0.814</b>	<b>0.814</b>	<b>0.813</b>

\*X = Variable is included in the current model

\*\*Coloured cell = Variable is non-significant and will be removed from subsequent models

### 4.3.3 Final Model

The final logistic regression model for predicting the receipt of addiction care contains the following variables: age, gender, involuntary admission, addiction RFA, insight into own

mental health, withdrawal symptoms, CAGE screen, substance use scale and, substance use disorder diagnosis The model fit is considered good with a C-statistic of 0.813 (df=13).

In reference to patients 18 to 24 years old, the odds that a patient in acute psychiatry will receive addictions care is 21.3% greater for 25 to 44 years old, 11.3% greater for 45 to 64 years old and, 13.8% lower for 65 years and older. Females/other have a lower odds of receiving addiction care than males by 12.7%. Patients that are involuntarily within acute psychiatry have 34.1% lower odds of receiving addiction care compared to patients that are voluntarily using acute psychiatric services. Patients with insight into their own mental health have a 31.7% increase in their odds of receiving addiction care compared to patients that do not have insight into their own mental health. The odds of addiction care given to patients increases 2.12 times among those with a RFA for addiction, 2.00 times for patients with signs and symptoms of withdrawal of substances and 2.22 times for patients with a score of one or greater based on the CAGE addiction screen. The odds of receiving addiction care reduces by 31.4% for those with a SoS score of 1 or greater compared to those who have a score of zero. In reference to using 1 to 2 substances, patients using 3 or more substances within the last 90 days have a 52.8% increased odds of receiving addiction care. Moreover, patients that did not use substances within the last 90 days have a 41.3% decreased odds of receiving addiction care. Patients with substance use disorder are 2.97 times more likely to receive addiction care compared to those that do not have a substance use disorder. The logistic regression analysis can be found in Table 14 below.

#### *4.3.4 Sensitivity Analysis*

After removing patients that consumed tobacco (smoking and chewing), 9400 patients remained from the original SUBUSE CAP population. Within the sensitivity sample, 33.9% (n=3182) of patients received addictions care. Of the patients remaining, 88.4% (n=8309)

triggered the SUBUSE CAP for current problematic use of substances and, 11.6% (n=1091) triggered the SUBUSE CAP due to prior history of problematic substance use.

The final logistic regression model for predicting addiction care is applied to this sample, in which all variables remain statistically significant. Moreover, the C-statistic maintains a high degree of model-fit at 0.822 (df=13). The odds of addiction care, in reference to patients 18 to 24 years old, is 19.0% greater for patients 25 to 44 years old, 14.3% greater for patients 45 to 44 years old and, 14.9% lower for patients 65 and over. Females/other have a 19.8% lower odds of receiving addiction care compared to males. Patients that are involuntarily within acute psychiatry have 32.8% lower odds of receiving addiction care compared to patients voluntarily using acute psychiatric services. Those with insight into their own mental health have a 30.6% higher odds of addiction care compared to those without insight into their own mental health. The odds of addiction care given to patients increases 2.65 times for patients with a score of one or greater based on the CAGE addiction screen, 2.44 times for patients with signs and symptoms of withdrawal of substances and, 2.41 times among those with a RFA for addiction. Among patients with a with a SoS score of 1 or greater compared to those who have a score of zero, the odds of addiction care decreased by 30.9%. In reference to using 1 to 2 substances within the last 90 days, patients using 3 or more substances have a 20.9% greater odds of receiving addiction care. Additionally, patients that did not use any substances within the last 90 days, have a 30.6% decrease in their odds of receiving addiction care. Finally, patients with a diagnosed substance use disorder are 3.38 times more likely to receive addiction care compared to those without a formal substance use diagnosis. The predictive logistic regression analysis can be found in Table 14 below.

Table 14 Multivariable logistic regression model predicting addiction care for acute psychiatric inpatients in Ontario, Canada and for a tobacco-free sensitivity analysis sample

Variables	Final Model		Sensitivity Analysis		
	OR (95% CI)*	p-value	OR (95% CI)*	p-value	
<b>Block 1</b>					
Age	25-44	1.21 (1.12-1.31)	<.0001	1.19 (1.04-1.36)	0.01
	45-64	1.11 (1.02-1.21)	0.02	1.14 (0.99-1.31)	0.06
	65+	0.86 (0.74-1.01)	0.06	0.85 (0.69-1.05)	0.13
Gender		0.87 (0.82-0.93)	<.0001	0.80 (0.72-0.89)	<.0001
<b>Block 2</b>					
Insight into own Mental Health		1.32 (1.20-1.45)	<.0001	1.31 (1.11-1.53)	<.001
Involuntary Admission		0.66 (0.61-0.72)	<.0001	0.67 (0.59-0.77)	<.0001
Reason for Admission Addiction		2.12 (1.98-2.27)	<.0001	2.41 (2.15-2.69)	<.0001
<b>Block 3</b>					
Withdrawal Symptoms		1.94 (1.79-2.13)	<.0001	2.44 (2.08-2.85)	<.0001
CAGE		2.22 (2.07-2.38)	<.0001	2.65 (2.37-2.97)	<.0001
Substance Use Scale	No Substances	0.59 (0.51-0.68)	<.0001	0.69 (0.58-0.82)	<.0001
	3+ Substances	1.53 (1.42-1.65)	<.0001	1.21 (1.00-1.48)	0.07
<b>Block 4</b>					
Severity of Self-harm (SoS)		0.69 (0.63-0.74)	<.0001	0.69 (0.61-0.79)	<.0001
<b>Block 5</b>					
Substance Use Disorder Diagnosis		2.97 (2.77-3.18)	<.0001	3.38 (3.03-3.78)	<.0001
<b>C-statistic</b>		<b>0.813</b>		<b>0.822</b>	

\*OR (95% CI) is the adjusted odds ratio



## **Discussion:**

This study addresses several knowledge gaps surrounding mental health and addictions care within inpatient psychiatry. By utilizing the OMHRS data, a large comprehensive dataset, the results of this study find: (i) about half of patients have problematic substance and/or alcohol use at first admission to inpatient psychiatry, (ii) although those with an addiction RFA have similar characteristics to those with problematic substance and/or alcohol use, addiction RFA does not completely represent all persons with addiction need and, (iii) those with a SUD are more likely to receive addiction care and, those with severe mental health concerns are less likely to receive addiction care. This chapter begins with an in-depth discussion of the research findings, then the implications of the findings for future research and policy and, concluding with the study limitations.

### **5.1 Prevalence of Problematic Substance and/or Alcohol Use**

This was the first study to estimate the prevalence of problematic substance and/or alcohol use at first admission to acute psychiatric hospital stays in Ontario, Canada. Furthermore, this study was able to identify demographics and clinical variables associated with problematic substance and/or alcohol use. The care setting is an essential component of this study, in that acute psychiatry aims to stabilize and provide emergency care to patients with MI and SU (54,55,87). Prior literature has determined that substance and/or alcohol use is common among those with MI, and vice versa (9,14–16,18). An integrated care approach is a best-practice guideline when considering the optimal outcomes for people with MI and SU, which involves treating both illnesses simultaneously within the same environment (60–63,65,66). In an acute psychiatric setting, an integrated care approach would provide emergency care to MI and SU symptoms then discharge planning to addiction/concurrent treatment locations which provide

continuing care (60–63,65,66). In considering the study setting and how quality care can be provided, it is important to identify the proportion of people with addiction need.

This study found that the prevalence of patients within acute psychiatry that have identified problematic substance and/or alcohol use is almost half of the total inpatient population. This is a similar finding to a 2009 study conducted in Western Cape, South Africa in which 51% of psychiatric patients had SUD (88). The proportion found in our study is higher than the estimated 20% of people with MI and SU in the general population (2). The increase may be a result of: (i) an acute psychiatric setting cares for people with the highest severity of symptoms which results in the increased comorbidity of MI and SU and, (ii) the use of symptom indicators of problematic substance and/or alcohol use – rather than diagnostic. Previous studies, such as the psychiatric study from South Africa, have determined plethora of relationships between MI and SU based on a formal diagnosis (1,77,88). Ultimately, these studies do not include patients that have symptoms of SU and/or MI. The proportion of patients within this study may reflect a broader criteria than what has previously been reported.

Of the patients that have identified problematic substance and/or alcohol use from triggering the SUBUSE CAP, a little less than half received addiction care. The SUBUSE CAP is a useful tool for alerting the care team of potential addiction needs. However, given the treatment setting, it may be possible that addiction care is not provided as other concerns such as MI take precedent. For instance, we found that 78.1% of patients had indicators of self-harm behaviours and 61.4% were unable to care for themselves as a result of psychiatric symptoms. Although other concerns might take precedent, patients with problematic substance and/or alcohol use that do not receive treatment risk high rates of readmission as their substance and/or alcohol behaviour worsen and subsequently exacerbate their MI (11,28,44). Patients may also feel disconnected and unsupported by the healthcare system when their problematic need (whether

known or unknown) are not addressed (11,28). It is important to consider that not all hospitals have addiction counsellors or enough addiction support to meet the demands of their patients.

This study found that the demographic factors associated with MI and SU within the general population are similar to the acute psychiatric population (54,88,89). This is to be expected as a subset of those in the general population will access hospital services when under severe psychiatric and/or substance related emergencies. We found that those with problematic substance and/or alcohol use were generally male, between 25 to 44 years old, unemployed and, completed less than high school (87,90). We also found that a quarter of the population was homeless or lived alone and, that the majority were never married (87,90). An advantage of this study was the availability of scales or screeners in the OMHRS data to identify SU and MI, rather than defining them on the presence of diagnoses. With this broader definition, this study found that patients with identified problematic substance and/or alcohol use also experienced symptoms of depression (60.8%), mania (33.5%) and/or positive symptoms related to psychosis (33.0%). Additionally, among those patients that triggered the SUBUSE CAP half of them used cannabis in the last 90 days, used 1 to 2 substances in the last 90 days, smoked tobacco daily and more than a quarter had 4 or more drinks of alcohol in one sitting.

The link between depression and use of substances and/or alcohol is well documented, with the prevalence ranging from 30% to 54% (91,92). A study by Frank et. al. (2007) found that 59% of patients from Maintenance Therapies for Bipolar Disorder (MTBD) protocol had history of substance and/or alcohol use (93). Alcohol and cannabis were the most used substances, although they were not used to self-medicate the mania symptoms of bipolar disorder but rather the depressive symptoms (93). Various other studies have found that individuals with bipolar disorder engage with substance and/or alcohol more readily than the general population (94–96). A cross-sectional study in Oslo, Norway found that those with positive symptoms and those with

schizophrenia had a 40% increase in their likelihood of engaging with illicit substances in comparison to the general public (97). Other studies found a prevalence of 30% to 60% between schizophrenia and substance and/or alcohol use for patients (91,98,99). As this study focused on identifying MI through assessments and screens, statistical associations between formal mental health diagnoses were not explored further. Finally, this study found that a quarter of acute psychiatric patients were admitted for addiction reasons. Objective 2 will examine addiction reason for admission (RFA) in greater depth.

## **5.2 Characteristics Associated with Reason for Admission for Addiction**

To our knowledge, previous literature has not examined factors associated with being admitted to acute psychiatry for reasons of addiction. However, prior literature has looked at SU at admission in acute psychiatry but it did not examine receipt of addiction care (100).

Understanding the characteristics of those who were admitted for addiction is an important step in exploring factors that might also be related to receipt of addiction care.

This study found that of those admitted for addiction (N=10944), 90.0% had triggered the SUBUSE CAP. However, of those patients without an addiction RFA (N=33572), 35% had triggered the SUBUSE CAP. Furthermore, as would be expected, receipt of addictions care was more common among patients with an addiction RFA compared to other RFAs. With these findings in mind, RFA could have an impactful relationship on the trajectory of care in acute psychiatry. The RFA variable in the RAI-MH may provide insights into the clinical opinion of who might need addictions care. An addiction RFA represents the health care team recognizing patients as having an addiction need requiring support within the hospital. However, of the patients with an addiction RFA, 33.4% did not receive addiction care. This suggests that even if

the clinical team assigns an addiction RFA, there is a gap in care planning and identification of addiction treatment needs at admission into acute psychiatry.

Our study found that although the characteristics of those with an addiction RFA are similar to those that trigger the SUBUSE CAP, not everyone with identified substance and/or alcohol use have an addiction RFA. Thus, the clinical team's assessment at admission may not identify all persons with an addiction need (i.e. triggering the SUBUSE CAP). Within the initial assessment, the severity of substance and/or alcohol use may be missed or the MI becomes the focus of intervention even if SU is identified. When a thorough assessment is completed, the SUBUSE CAP should be triggered for patients with current or prior problematic substance and/or alcohol use.

Once identified, several aspects regarding the patient should be determined before activating care. These aspects include the patients readiness for change, their social, economic and, physical health related to substance and/or alcohol use and, their withdrawal symptoms (45). However, even when the SUBUSE CAP is triggered, it is possible that individuals are learning about having problematic substance and/or alcohol use for the first time (recall, this is their primary admission to acute psychiatry). Therefore, the patients' view on what they need is different than the care the clinical team suggest. Based on the addiction liability distribution, patients might have met the threshold for need through mental health care but based on their current stage of change, they are not ready to initiate addiction care (47,50,52). Activating addiction care through harm reduction, education and referrals can be a method to involve the patient in care and start progression towards change.

This study also found that addiction RFA is a driving factor of receiving addiction care: as 66.6% of those that had an addiction RFA received addiction care. This understanding can be used to begin assessing what characteristics may be associated with receiving addiction care.

Within block 1 demographic variables, we found that males between 25 to 44 years old, with less than high school education, who were unemployed, never married, had risk of homelessness, lived alone or had residential stability were significantly associated with an addiction RFA. This is to be expected as this finding is similar to the general population with problematic substance and/or alcohol use (87,90). Within block 2 clinical variables, most patients are self-admitted to inpatient care, have insight on their own concern and are capable of providing clinical information. For block 3 SU variables, it was expected that all variables would be significant and that those with addiction RFA would have similar proportion of type of substances used as those who triggered the SUBUSE CAP. Finally, in block 4 behaviour and risk variables, all were significant but the ABS. This was not expected as aggressive behaviour is often found in psychiatric patients with problematic substance and/or alcohol use (83,101–104). However, this can be explained as the ABS is embedded within the RHO, which was significant. The RHO accounts for the aggressive behaviour the ABS would identify.

The demonstrated characteristics for addiction RFA are similar to those we would expect to be identified with problematic substance and/or alcohol use. Therefore, addiction RFA is another viable way to consider need alongside triggering the SUBUSE CAP and symptom assessments.

Although it is important to consider how addiction RFA influences care trajectory, acknowledging that it might only act as a lighthouse in guiding care provision is important. Instead, an addiction RFA should be coupled with patient advocacy for their own needs and/or assessment which identifies a clear need for intervention. By demonstrating that those who have identified problematic substance and/or alcohol use and the addiction RFA tells us similar information – we can utilize the characteristics found significant with addiction RFA to examine predicting addiction care.

### **5.3 Factors Associated with Addiction Care**

A total of ten important factors were discovered to be predictive of receiving addiction care within acute psychiatry. Five factors were predictive for increasing the odds of addiction care, three factors were predictive for decreasing the odds of addiction care and two factors were predictive for increase or decrease based on their specific category. Interestingly, at least one factor was found significant from each block variable set identified in objective 2. The following sub-section will discuss these factors in length.

#### *5.3.1 Factors that Increase Odds of Addiction Care*

Patients with insight into their own mental health have a greater odds of receiving addiction support. The association between patients with this characteristic and addiction care receipt can be examined through two avenues. First, patients with insight into their own mental health have the ability to self-advocate and convey their symptoms to health care providers (105–107). Secondly, these individuals have an understanding of their problems and are able to seek help. Moreover, patients with insight are more ready for change which is important in creating SU behaviour changes.

Clinical recognition of the need for addictions care was also strongly related to receipt of addiction care. An addiction RFA demonstrates this recognition and may be indicative that the care team developed a plan of care to match this need. Although this method allows for a prompt transition from admission to treatment, we know that a large group of patients are missed, ignored or otherwise not recipients of addiction care. Approximately half of those that trigger the SUBUSE CAP do not receive an addiction RFA. Moreover, when examining specific variables, we see that about a quarter of those with substance problems identified from CAGE and those that use 3 or more substances did not have an addiction RFA. Healthcare teams should be aware of this bias moving forward in order to adequately delivery care to all that require it.

Moreover, addiction RFA should be coupled with symptom assessments to identify problematic substance and/or alcohol needs, especially those that occur concurrently with MI, in order to provide successful care.

Patients with a CAGE score of 1 or more have significant odds of receiving addiction care. The CAGE has been reviewed for reliability and validity in detecting alcohol abuse and dependence for patients (48,49,82). While created specifically for troubled alcohol use, the CAGE has been modified and applied in identifying substance abuse (48,108). The CAGE questionnaire validates to the clinical team that the patients have a need for addiction care or they require further investigation which is determined through troubling substance and/or alcohol use.

The presence of withdrawal symptoms for substances and/or alcohol increases the odds of receiving addiction. Depending on the substance, withdrawal symptoms can vary from anxiousness, trouble concentrating, irritability, shivering and headaches (109,110). These symptoms can appear once the effects of the substance(s) are diminishing and/or once the person stops using the substance(s) for a period of time where the body begins to crave the high (109,110). Withdrawal symptoms aid the healthcare team in identify an addiction concern and act as in indicator of severity allowing for the appropriate support to be activated. Both the CAGE questionnaire and withdrawal symptoms are visual and behavioural signs and symptoms that describe the current and prior substance use of patients. This information identify a problem with substances and/or alcohol and determine a need to activate addiction care.

Presence of a SUD was the factor that explained the greatest variation within the predictive model, specifically after controlling for all other factors the odds of receiving addiction care increase for those with a SUD compared to those without. Although a SUD is an important indicator for a disease, the symptoms for the disease can be present without a formal diagnosis and should be used to assess need (111–113). Moreover, based on the increase in odds,



a SUD may be related to bias of high severity and acts similar to an addiction RFA, in which a SUD is a direct indicator that the clinical team, and the physician, recognize the severity of the problem and the need for addiction care. For those patients without a SUD, health care teams should use the SUBUSE CAP to consider those who may benefit from addiction care. The overall bias in care limits, misses or delays treatment for patients without a diagnosis resulting in poorer SU and potential mental health outcomes. Simply, it would be more efficient to treat the problem rather than the label alone.

### *5.3.2 Factors that Decrease Odds of Addiction Care*

Females/other have decreased odds of receiving addiction care within acute psychiatry in comparison to male. This finding was expected as literature suggests that males are more likely to engage with substance and/or alcohol in a problematic way. However, within this population a little less than half are females with problematic use of substance and/or alcohol. In fact, the proportion of problematic SU has been found to be similar in both men and females (85,114,115) though women are more likely to combat barriers in obtaining treatment (84,85). Additionally, men experience more social support when initiating care, whereas females do not have enough support from social agencies in their treatment endeavours (116). Moreover, of the females that activate substance abuse treatment, fewer admission and overall completion of treatment is found (84,85). It is important to monitor and examine why addiction care is not activated for all patients regardless of gender.

Patients admitted to acute psychiatry involuntarily have a much lower odds of receiving addiction support. Of all patients with problematic substance and/or alcohol use, 17.7% were admitted involuntarily. Although a small number in comparison to those admitted on their own volition, it is important to note why such a population, although having a problem, do not receive care. Patients who are involuntarily admitted to acute psychiatry are not ready for change,

abstinence and, are not open to seeking care. Since this study assessed patients' first admission, those who were involuntarily admitted could be unaware that they have a problem requiring support – as they were brought into acute psychiatry by family/loved ones, police or first-responders. Furthermore, the problem could be acknowledged by the healthcare team but the effectiveness of treatment and the benefits it provides are obstructed by the individual choosing not to participate. With that as possibility, not giving the limited recourses to people who are unwilling to participate is be a valuable method in recourse conservation. Though, if problematic substance and/or alcohol use is identified, activating some form of addiction care such as harm reduction, education and follow-up/referral are important supports in starting the care process (58,59).

Patients with risk of self-harm, identified through the SoS scale, have a decrease in their odds of receiving addiction care. The SoS scale is scored based off of six items: history of ideation related to self-injury, history of suicide attempt(s), mental health symptoms, cognitive performance, family concerns about the patient and, suicide plans. The items used within the SoS scale are focused on MI and the consequences of severe symptoms leading to self-harm and suicide. This is of key importance to ensure the safety of the patient within psychiatry. While it is important to identify self-harm, upwards of 40% of those with substance and/or alcohol use have history of suicide (117–119) and suicidal behaviours are highly prevalent in those with cooccurring SU and MI (19,26,27,119). Over all, it is necessary to provide stabilization for patients with risk of self-harm and supporting their identified problematic substance and/or alcohol use. This thesis does not attempt to disentangle the connected nature of SU and its contribution to self-harm and suicide, concurrently treating the SU along with suicidal ideations can impact both behaviours down-stream and the symptoms currently present. Which is concerning that those most at risk for self-harm and problematic substance and/or alcohol are at a

decreased odds of receiving addiction care. Given the goal of stabilizing and importance of optimal care, future research should examine what barriers are in place from care delivery for these patients.

### *5.1.3 Factors that can Increase or Decrease Odds of Addiction Care*

Age is a factor associated with an increase or decrease in odds of addiction care based on the patients' age group. Patients between the age of 25 to 44 and 45 to 64 have a higher odds of receiving addiction care. This trend is to be expected as those with problematic substance and/or alcohol use are often between 24 to 44 and 45 to 64 (87,90,120). Additionally, the age breakdown found in prior literature is what our study found as well. However, our study found that patients 65 and over have a lower odds of receiving addiction care. As we know, this group has the smallest prevalence in psychiatry. Moreover, older adults are commonly not identified with problematic substance and/or alcohol use as their SU behaviours are not often assessed (86,87,90,120). From a treatment perspective, identifying problematic substance and/or alcohol use, regardless of age, is imperative in providing care to all patients.

The patients using three or more substances in the last 90 days have an increased odds of receiving addiction care. Further, those who did not use any substances in the last 90 days have a decreased odds of the same outcome. Patients using more than one substance, otherwise known as polysubstance use, are common in both the general population and within clinical psychiatry (121,122). Various adverse drug interactions are possible for those with polysubstance use, which can amplify the level of severity of MI (121,122). Future studies should look at the types of substances used in patients with polysubstance use and examine if receipt of addiction care changes accordingly. While the polysubstance use trend is intuitive in increasing the chances of addiction care, it is important to note the decrease based on no substances used. Although this group is not currently using substance and/or alcohol, they have triggered the SUBUSE CAP for

problematic use. Most likely, this SUBUSE CAP is triggered for prior problematic use of substance and/or alcohol within the last 90 days. Without intervention for those who trigger for prior use, there is increased odds for future relapse. Patients admitted to acute care are usually at their most vulnerable, with severe MI and SU symptoms. In this group, the potential for relapse is highest as individuals who have MI might revert to using substances and/or alcohol to self-medicate or experience worsening of psychiatric symptoms (26,42,43). As the cyclical nature of MI and SU is well established, it is incredibly important that an integrated care approach be utilized, even for those with prior problematic use especially when they have triggered the SUBUSE CAP. Those with severe MI should have their substance and/or alcohol use assessed in order to maintain abstinence and provide mental health care that is effective.

#### *5.1.4 Sensitivity analysis*

The sensitivity analysis provided a more stringent definition of addiction care by removing those who used tobacco and, possibly eliminating the delivery of smoking cessation. With this change addiction care included contact with an addiction counsellor and/or the focus of intervention involving alcohol/dependency treatment. The results show agreement between the final model and sensitivity analysis, with slight variation in the OR of variables. As tobacco use is identified in majority of patients in acute psychiatry, the removal of these patients will result in a reduced number of overall substances used and the relationship between dependent variables and use of substance and/or alcohol can be examined without tobacco use. These reasons could provide an explanation as to why variables that directly related to use of substances and/or alcohol (addiction RFA, withdrawal symptoms, CAGE and SUD) have an increase in their OR. Similarly, the use of 3 or more substance is statistically insignificant whereas no substances remains significant. Largely, the sensitivity analysis was able to disentangle the focus of intervention to include only alcohol/dependency without the smoking cessation component.

## 5.4 Future Research

Future studies leading from the findings of this thesis should consider creating a severity intensity scale which accurately examines the resources utilized by the patient to determine their level of severity. This scale can follow similar methodology to Stewart et., al (2019), in which the interRAI Child and Youth Mental Health (ChYMH) and Child and Youth Mental Health and Developmental Disability (ChYMH-DD) assessment instruments were used to create resource intensity scale. This scale would then be used to predict patients who have the most complex service needs. A version of this within RAI-MH would be extremely useful in clinical practice – especially when understanding who requires addiction support (123).

A key aspect of this study was to understand factors associated with addiction care receipt. It was briefly mentioned within the discussion that number of resources and receipt of care can differ depending on the geographic location of the facility within the province of Ontario. A small analysis was completed and found that the number of acute psychiatric facilities in Ontario that provide addiction care differ (see Appendix C). Thus, subsequent studies should use OHMRS data to examine the various facilities across the province of Ontario and their potential effect on the receipt of addiction care.

Future studies should consider the RFA variable, from the OHMRS data, to continue investigating addiction care trajectories. As found in this study, addiction RFA has an influence of receipt of addiction care. It would be interesting to examine how receipt of addiction care differ for those with an addiction RFA versus an addiction RFA combined with another of the seven RFA types. Finally, a gender based analysis should be conducted in future studies, as within acute inpatient psychiatry approximately 50% were female/other although, males have an increased odds of receiving addiction care.

## 5.5 Policy Implications

This research provides an in-depth examination of the problematic substance and/or alcohol use for patients in acute psychiatry. The overall characteristics of those with problematic substance and/or alcohol use and those that receive addiction care are established. As a result of these findings and previous literature identifying the importance of addiction care within a psychiatric population, future policy recommendations can be made.

Primarily, it was found that those that receive addiction care are patients who have an addiction RFA and/or have a SUD. Although it is crucial these patients receive care, the patients who have problematic substance and/or alcohol symptoms identified through the SUBUSE CAP are exempt. Expanding the definition of CD and coexisting SU and MI in identifying need can improve the receipt of addiction care. In literature, CD is strictly defined as those with diagnosed SU and MI but we find that those in acute psychiatry have similar characteristics and symptoms profiles yet do not always have a diagnosis. With an understanding that a diagnosis is a label in identifying one aspect of a patient, advocating for a more fluid definition of need can mitigate the bias. Instead, utilizing more symptom and clinical profiles for identifying need is a way to more broadly provide care. Using the SUBUSE CAP is a method in recognizing a need, allowing for further investigation to determine the level of severity and adequacy match to the correct support.

A seminal finding from this study was the lack of integrated care applied when SU and MI were present within psychiatric patients. Evidence suggests that targeting SU and MI simultaneously and, within the same environment is a key feature in providing high-quality care. By providing addiction care to those with both illnesses can mitigate relapse or reliance on substances and/or alcohol, reduce the severity of symptoms related to MI and, create a seamless care environment (60,61,81). It is crucial for best-practice guidelines and facilities to adopt an

integrated care approach and advance the discussion of collaborative SU and MI care within clinical practice, whether within inpatient or outpatient psychiatry.

In British Columbia, Canada, the ministry of health released a literature review and guide document, highlighting potential avenues for applying the integrated care model into SU and MI supports within the community (124). Three approaches to how this could be achieved are: (i) communication model, (ii) co-location and collaborative model and (iii) integrated team model (124,125). The communication model employs referral and information sharing methods across mental health and addiction providers in the province to improve sharing of information and enhance the movement from one location to another. Although this model would assist in creating referrals and improve the information sharing process, patients may not want to engage with multiple care providers in various location. Multiple locations and various days of different care delivery increase the chances of patients dropping out (60,124,125). The collaborative model suggests that the care providers work together in proximity to each other. In this version, health care providers are in the same facility (“one-stop shop” concept). Although, proximity does not always guarantee that care receipt will be provided without the appropriate assessment identifying a need for care (124,125). Interestingly, literature on this model suggests that it is only beneficial for low severity patients in the community. However, Kates et. al (2011) found the collaborative approach in a primary care setting within Hamilton, Ontario to be valuable in supporting their patients with onsite care for MI and SU, that led to positive outcomes (126). There is potential that a collaborative model is not as effective in a community setting as it within a primary care setting.

The final version is the integrated team model, which builds a collaborative SU and MI facility in areas where severity of illnesses are highest (i.e. targeting those most at risk - homeless population or where traditional services are unlikely to reach). This model would be

the most holistic approach which aims to address all social determinants of health by providing not only SU and MI care but food, shelter, clothing, occupational therapy, rehabilitation, employment and income support etc. The ultimate goal of an integrated team model is to target the most severe cases and provide care through one accountable organization overseeing the process (127).

In reviewing all versions of the integrated care approach - the collaborative model if applied to an acute psychiatric facility could be the most beneficial. A large concern with the collaborative model was that only those with low severity would approach this form of care within the community as they are capable of self-management and care activation. This concern would not be as relevant in acute psychiatry as those with the most severe cases have activated care to meet their multitude of complexities. If a collaborative approach to integrated care is used within acute psychiatry, the patients can be in one location where they receive both addiction and psychiatric support without needing to engage with various facilities in numerous locations. Moreover, once the severity of symptoms are reduced within acute psychiatry referrals can be made at discharge to collaborative community care, where support would continue with symptoms management and impulse control.

## **5.6 Limitation**

Although this thesis has many strengths which allow for meaningful findings, various limitations are identified. When applying an integrated care lens, this study only examined the receipt of formal addiction care and not care specifically for MI. However, it is understood through literature that MI is a priority focus of psychiatric care and where care is often activated. This study uses an acute care population which cannot be directly linked to the general population. Acute care is an important study sample as it often provides the worst case scenarios



or most severe symptoms allowing for examination of care during difficult times. Additionally, delivery of care in the community and other health settings are necessary in reducing the burden on the hospital settings. In situations where the hospital is unable to meet the patients' addiction needs due to staff or recourse restriction than referrals to other settings are an option. Reports of referrals to community addiction/concurrent disorder settings were not examined within this study. It would be meaningful to see who received referrals into the community (i.e. (i) those that received addiction care or those that did not and, (ii) what type of characteristics, factors etc. were associated with referrals).

We were unable to assess readmissions and follow-ups for patients in this study. It would have been useful to examine if patients are readmitted, how long after their first discharge and why they were readmitted (i.e. RFA) in creating a larger more comprehensive image of the healthcare process. Moreover, while the RAI-MH is a comprehensive assessment that gathers an immense amount of information, we are only assessing this information retrospectively. This study is unable to ask follow up or clarifying questions.

Moreover, some items within the assessment are subject to inherent inaccuracy. If a health care provider has addictions training and treats a patient – the assessor will code for that health care provider instead of an addiction counsellor. This section of code includes six other health care providers besides addiction counsellor which could provide addiction care. For example, if a patient is visited by a social worker who treats them for substance use concerns, the data will only recognize a social worker during that visit. This thesis used the focus of intervention alcohol/drug treatment/smoking cessation variable to assist in accounting for all addiction care, not just addiction counsellor visits. Unfortunately, the focus of intervention for alcohol/drug treatment/smoking cessation does not allow for disentanglement between the three components of care. In future editions of the RAI-MH, modifying focus of intervention into

alcohol/drug treatment and smoking cessation separately would be beneficial. To best deal with this issue, this study conducted a sensitivity analysis by removing patients that used tobacco to control for smoking cessation (under the assumption that those that do not smoke will not get smoking cessation measures).

The association between ethnicity and receipt of addiction care was not assessed as race or ethnicity is not routinely included in the OMHRS data. To measure racial and ethnic inequalities in future research, CIHI has created an interim race standard to ensure that high-quality data is collected and analyzed while maintaining cultural safety and ongoing dialogue with communities. Within this standard, race is described as the social construct to categorize people (i.e. skin color) and ethnicity is an association to a cultural group (i.e. religious affiliation, migration history, cultural traditions, nationality) (128). Moreover, First Nations, Inuit and Métis have ownership over collection and use of their own data under the OCAP standards (129). Therefore, Indigenous groups warrant consideration and are included in their own group independent from the racial group questions (128). This distinction is designed to allow Indigenous people to self-identify (128). Future research should consider the role of race and ethnicity on receipt of care as individuals in certain minority groups are less represented in treatment settings and have lower rates of treatment completion (130–132). Moving forward, research should investigate patterns of substance use among ethnic groups and, how ethnicity affects receipt of addiction care.

## **6.0 Conclusion**

The availability and use of standardized assessment data within Ontario creates the opportunity to capture the proportion of patients with potential problematic substance and/or

alcohol use at first admission to inpatient psychiatry in Ontario, Canada. In looking at this data, about half have an addiction need but only a quarter actually receive addiction care.

A substance use diagnosis was a strong factor associated with receipt of addiction care. Interestingly, the results also demonstrate a number of factors that can be used to identify need for addictions care, regardless of diagnosis, including withdrawal symptoms and the CAGE questionnaire. Utilizing a less diagnostic tool will assist in capturing a wider cohort of patients who will benefit from specific support. This study also found that the SUBUSE CAP is an adequate tool in identifying those with substance and/or alcohol need and should continue to be used in clinical practice.

Although it is well recognized that MI and SU occur simultaneously, this study demonstrates that within acute psychiatry self-harm and suicidal behaviours in patients reduces the odds receiving addiction support. This finding is somewhat concerning as it indicates those with severe mental health circumstances and who use substances may not be offered addictions care. Thus, this study provides some insight and evidence into acute psychiatric care and advocates for advancement in integrated care for those with concurrent MI and SU.

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## Appendices:

### Appendix A: Reference groups

Appendix A Table 1 Reference group used for logistic regression analyses

Variables	Reference Group
<b>Block 1</b>	
Age	18-24
Gender	Female
Education	Less than high school or unknown
Employment	Employed
Unemployment Risk	Risk
Marital Status	Never married
Homelessness	Yes
Lived Alone	Yes
Residential Stability	Yes
<b>Block 2</b>	
Length of Stay	3-7 days
Insight into own Mental Health	Yes
Involuntary Admission	Yes
Incompetent to disclose information related to clinical records	Yes
Reason for Admission Addiction	Yes
<b>Block 3</b>	
Alcohol Use	Yes
Tobacco Use	Yes
Inhalant Use	Yes
Hallucinogen Use	Yes
Crack/Cocaine Use	Yes
Stimulant Use	Yes
Opiate Use	Yes
Cannabis Use	Yes
Gambling	Yes
Medication Misuse	Yes
Withdrawal Symptoms	Yes
CAGE	Potential problem with substance addiction
Substance Use Scale	1-2 substance(s)
<b>Block 4</b>	
Harm to Others (RHO)	Score of 1 or more
Self-Care Index (SCI)	Score of 1 or more

<b>Variables</b>	<b>Reference Group</b>
Severity of Self-harm (SoS)	Score of 1 or more
ADL Scale	Yes
IADL Scale	Yes
<b>Block 5</b>	
Depressive Symptom Index (DSI)	Score of 3 or more
Anhedonia	Yes
Positive Symptom Scale (PSS)	Score of 3 or more
Trauma CAP	Triggered
Substance Use Disorder Diagnosis	Yes

## Appendix B: Combined Model Tables

Appendix B Table 1 Multivariate logistic regression combined model 1 examining the relationship between demographic, clinical, substance use, behaviour and risk and, mental status characteristics by receipt of addiction care

Variables		Combined Model 1	
		OR (95% CI)	p-value
<b>Block 1</b>			
Age	25-44	1.16 (1.07-1.26)	0.0005
	45-64	1.07 (0.98-1.17)	0.14
	65+	0.94 (0.79-1.10)	0.42
Gender		0.88 (0.82-0.94)	0.0002
Education	Highschool	1.05 (0.96-1.16)	0.27
	> Highschool	1.00 (0.92-1.09)	0.98
Employment		0.96 (0.89-1.03)	0.23
Unemployment Risk		1.06 (0.99-1.09)	0.12
Homelessness		0.86 (0.80-0.93)	<.0001
<b>Block 2</b>			
Insight into own Mental Health		1.20 (1.08-1.33)	0.0006
Involuntary Admission		0.68 (0.63-0.74)	<.0001
Incompetent to disclose information related to clinical records		0.74 (0.56-0.96)	0.03
Reason for Admission Addiction		2.05 (1.91-2.20)	<.0001
<b>Block 3</b>			
Alcohol Use		1.22 (1.12-1.32)	<.0001
Tobacco Use		1.59 (1.47-1.71)	<.0001
Inhalant Use		0.62 (0.45-0.85)	0.003
Crack/Cocaine Use		1.24 (1.12-1.38)	<.0001
Stimulant Use		1.11 (0.97-1.28)	0.13
Opiate Use		1.51 (1.34-1.70)	<.0001
Medication Misuse		0.88 (0.81-0.96)	0.003
Withdrawal Symptoms		1.87 (1.34-1.70)	<.0001
CAGE		2.08 (1.94-2.24)	<.0001
Substance Use Scale	No Substances	0.78 (0.66-0.91)	0.002
	3+ Substances	1.06 (0.96-1.18)	0.27
<b>Block 4</b>			
Harm to Others (RHO)		1.01 (0.94-1.08)	0.87
Self-Care Index (SCI)		0.88 (0.81-0.95)	0.001

Variables	Combined Model 1	
	OR (95% CI)	p-value
Severity of Self-harm (SoS)	0.73 (0.67-0.79)	<.0001
IADL Scale	0.92 (0.84-0.99)	0.03
<b>Block 5</b>		
Positive Symptom Scale (PSS)	0.96 (0.89-1.05)	0.38
Trauma CAP	1.08 (1.00-1.18)	0.07
Substance Use Disorder Diagnosis	2.81 (2.62-3.00)	<.0001
<b>C-statistic</b>		<b>0.820</b>

\*Coloured cell = Variable is non-significant and will be removed from subsequent models

Appendix B Table 2 Multivariate logistic regression combined model 2 examining the relationship between demographic, clinical, substance use, behaviour and risk and, mental status characteristics by receipt of addiction care

Variables		Combined Model 2	
		OR (95% CI)	p-value
<b>Block 1</b>			
Age	25-44	1.16 (1.07-1.26)	0.0004
	45-64	1.07 (0.98-1.18)	0.12
	65+	0.94 (0.79-1.10)	0.42
Gender		0.89 (0.83-0.95)	0.0005
Education	Highschool	1.05 (0.96-1.16)	0.3
	> Highschool	1.00 (0.92-1.09)	0.96
Employment		0.96 (0.89-1.03)	0.23
Unemployment Risk		1.06 (0.99-1.09)	0.1
Homelessness		0.86 (0.79-0.92)	<.0001
<b>Block 2</b>			
Insight into own Mental Health		1.22 (1.10-1.35)	0.0002
Involuntary Admission		0.68 (0.63-0.74)	<.0001
Incompetent to disclose information related to clinical records		0.74 (0.56-0.96)	0.03
Reason for Admission Addiction		2.05 (1.91-2.20)	<.0001
<b>Block 3</b>			
Alcohol Use		1.22 (1.12-1.32)	<.0001
Tobacco Use		1.59 (1.48-1.72)	<.0001
Inhalant Use		0.62 (0.45-0.85)	0.003
Crack/Cocaine Use		1.24 (1.12-1.38)	<.0001
Stimulant Use		1.11 (0.97-1.28)	0.14
Opiate Use		1.51 (1.34-1.70)	<.0001
Medication Misuse		0.88 (0.81-0.96)	0.004
Withdrawal Symptoms		1.87 (1.70-2.04)	<.0001
CAGE		2.08 (1.95-2.25)	<.0001
Substance Use Scale	No Substances	0.78 (0.66-0.92)	0.002
	3+ Substances	1.06 (0.96-1.18)	0.27
<b>Block 4</b>			
Harm to Others (RHO)		1.00 (0.94-1.08)	0.85
Self-Care Index (SCI)		0.87 (0.81-0.93)	0.001
Severity of Self-harm (SoS)		0.73 (0.67-0.79)	<.0001
IADL Scale		0.91 (0.84-0.99)	0.03
<b>Block 5</b>			
Substance Use Disorder Diagnosis		2.80 (2.62-3.00)	<.0001
<b>C-statistic</b>		<b>0.820</b>	

Appendix B Table 3 Multivariate logistic regression combined model 3 examining the relationship between demographic, clinical, substance use, behaviour and risk and, mental status characteristics by receipt of addiction care

Variables		Combined Model 3	
		OR (95% CI)	p-value
<b>Block 1</b>			
Age	25-44	1.16 (1.07-1.26)	0.0003
	45-64	1.07 (0.98-1.17)	0.13
	65+	0.91 (0.77-1.07)	0.24
Gender		0.90 (0.84-0.96)	0.001
Education	Highschool	1.05 (0.96-1.16)	0.29
	> Highschool	1.00 (0.92-1.09)	0.98
Employment		0.97 (0.90-1.04)	0.38
Unemployment Risk		1.06 (0.98-1.14)	0.14
Homelessness		0.86 (0.79-0.92)	<.0001
<b>Block 2</b>			
Insight into own Mental Health		1.32 (1.18-1.44)	<.0001
Involuntary Admission		0.67 (0.62-0.73)	<.0001
Incompetent to disclose information related to clinical records		0.73 (0.58-0.95)	0.02
Reason for Admission Addiction		2.06 (1.93-2.21)	<.0001
<b>Block 3</b>			
Alcohol Use		1.24 (1.14-1.34)	<.0001
Tobacco Use		1.59 (1.48-1.72)	<.0001
Inhalant Use		0.63 (0.45-0.87)	0.004
Crack/Cocaine Use		1.25 (1.12-1.39)	<.0001
Stimulant Use		1.10 (0.96-1.26)	0.17
Opiate Use		1.53 (1.34-1.72)	<.0001
Medication Misuse		0.89 (0.82-0.97)	0.008
Withdrawal Symptoms		1.86 (1.70-2.03)	<.0001
CAGE		2.09 (1.95-2.25)	<.0001
Substance Use Scale	No Substances	0.79 (0.67-0.93)	0.0035
	3+ Substances	1.06 (0.95-1.18)	0.3
<b>Block 4</b>			
Severity of Self-harm (SoS)		0.70 (0.65-0.76)	<.0001
<b>Block 5</b>			
Substance Use Disorder Diagnosis		2.81 (2.62-3.01)	<.0001
<b>C-statistic</b>		<b>0.819</b>	

\*Coloured cell = Variable is non-significant and will be removed from subsequent model



Appendix B Table 4 Multivariate logistic regression combined model 4 examining the relationship between demographic, clinical, substance use, behaviour and risk and, mental status characteristics by receipt of addiction care

Variables		Combined Model 4	
		OR (95% CI)	p-value
<b>Block 1</b>			
Age	25-44	1.24 (1.14-1.34)	<.0001
	45-64	1.13 (1.04-1.24)	0.006
	65+	0.88 (0.75-1.03)	0.11
Gender		0.88 (0.82-0.94)	<.0001
Education	Highschool	1.03 (0.94-1.13)	0.54
	> Highschool	0.96 (0.89-1.02)	0.3
Employment		0.95 (0.89-1.02)	0.18
Unemployment Risk		1.05 (0.98-1.13)	0.19
Homelessness		0.89 (0.82-0.94)	0.001
<b>Block 2</b>			
Insight into own Mental Health		1.32 (1.19-1.45)	<.0001
Involuntary Admission		0.67 (0.61-0.73)	<.0001
Incompetent to disclose information related to clinical records		0.71 (0.55-0.93)	0.01
Reason for Admission Addiction		2.13 (2.00-2.28)	<.0001
<b>Block 3</b>			
Withdrawal Symptoms		1.95 (1.79-2.13)	<.0001
CAGE		2.24 (2.09-2.40)	<.0001
Substance Use Scale	No Substances	0.59 (0.51-0.69)	<.0001
	3+ Substances	1.52 (1.41-1.64)	<.0001
<b>Block 4</b>			
Severity of Self-harm (SoS)		0.68 (0.63-0.74)	<.0001
<b>Block 5</b>			
Substance Use Disorder Diagnosis		2.97 (2.77-3.18)	<.0001
<b>C-statistic</b>		<b>0.814</b>	

\*Coloured cell = Variable is non-significant and will be removed from subsequent models

Appendix B Table 5 Multivariate logistic regression combined model 5 examining the relationship between demographic, clinical, substance use, behaviour and risk and, mental status characteristics by receipt of addiction care

Variables		Combined Model 5	
		OR (95% CI)	p-value
<b>Block 1</b>			
Age	25-44	1.24 (1.14-1.34)	<.0001
	45-64	1.13 (1.04-1.24)	0.006
	65+	0.87 (0.75-1.02)	0.09
Gender		0.88 (0.82-0.94)	<.0001
Education	Highschool	1.03 (0.94-1.13)	0.52
	> Highschool	0.96 (0.88-1.04)	0.31
Employment		0.95 (0.89-1.02)	0.18
Unemployment Risk		1.05 (0.98-1.13)	0.19
Homelessness		0.89 (0.92-0.95)	0.001
<b>Block 2</b>			
Insight into own Mental Health		1.23 (1.20-1.46)	<.0001
Involuntary Admission		0.66 (0.61-0.72)	<.0001
Incompetent to disclose information related to clinical records			
Reason for Admission Addiction		2.12 (1.98-2.27)	<.0001
<b>Block 3</b>			
Withdrawal Symptoms		1.95 (1.79-2.13)	<.0001
CAGE		2.24 (2.09-2.40)	<.0001
Substance Use Scale	No Substances	0.59 (0.51-0.69)	<.0001
	3+ Substances	1.52 (1.41-1.64)	<.0001
<b>Block 4</b>			
Severity of Self-harm (SoS)		0.68 (0.63-0.74)	<.0001
IADL Scale			
<b>Block 5</b>			
Substance Use Disorder Diagnosis		2.97 (2.78-3.18)	<.0001
<b>C-statistic</b>		<b>0.814</b>	

\*Coloured cell = Variable is non-significant and will be removed from subsequent models

## Appendix C: Addiction care provision based on facility health region

Appendix C Table 1 Number of addiction care visits from 2006 to 2018 by Ontario region

<b>Region</b>	<b>Number of Addiction Care Visits</b>
Erie St. Clair	1429
South West	2267
Waterloo Wellington	990
Hamilton Niagara Haldimand Brant	2039
Central West	894
Mississauga Halton	889
Toronto Central	3674
Central	1572
Central East	1860
South East	956
Champlain	1986
North Simcoe Muskoka	1202
North East	1593
North West	613