

Opioid misuse in Canada and critical appraisal of aberrant behavior screening tools

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Abstract

The incidence of prescription opioid misuse in Canada is increasing. Initiatives for safe prescribing practices for opioid medications include risk assessment for current and future opioid misuse. A clinical screening tool that can be universally applied to all patient populations is currently not available. Our objective was to provide a brief narrative review on opioid misuse from a Canadian perspective as well as a critical appraisal of the available clinical screening tools for detecting aberrant behaviors associated with opioid misuse. The Drug Abuse Screening Test, Addiction Behaviors Checklist, Diagnosis, Intractability, Risk and Efficacy Inventory, Pain Assessment and Documentation Tool, Prescription Drug Use Questionnaire, Prescription Opioid therapy Questionnaire, Screener and Opioid Assessment for Patients with Pain (SOAPP), Revised SOAPP, Pain Medication Questionnaire, Opioid Risk Tool and Current Opioid Misuse Measure were included in the following review. Overall, a wide variability in quality, sensitivity and specificity was observed between screening tools. There is an overall lack of applicability to diverse patient populations as the majority of screening tools have been validated in pain clinic populations only. To conclude, there is a great need for a validated and convenient aberrant behaviors risk assessment tool that can be applied to a diverse patient population in a clinical setting.

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Key words: Opioid analgesics; Opioid-related disorders; Prescription drug misuse; Risk assessment; Drug-seeking behavior; Canada

Core tip: With the increase in opioid prescribing in Canada, prescription opioid misuse is a growing concern from a health care, financial and safety standpoint. Definitions regarding opioid misuse and covariate risk factors predictive of opioid misuse are controversial. The currently available risk assessment tools used to predict or detect opioid misuse vary in terms of sensitivity, specificity, quality, reproducibility and have been validated in very limited patient populations. There is a clear need for the development of a generalizable risk assessment tool to assess for prescription opioid misuse.

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INTRODUCTION

The prevalence of prescription drug abuse in Canada is on the rise, with opioids leading as the most abused class of medications. Next to the United States, Canada has the second-highest level of prescription opioid use globally. Over a 10 year period (2000-2010), the total number of opioid medications consumed in Canada rose by greater than 200%^[1]. Of this increase in opioid consumption, an analysis by Fischer and colleagues determined a higher prescribing prevalence of "strong opioids" such as oxycodone, hydromorphone, fentanyl, meperidine, meth-

adone and morphine, whereas weak opioids such as codeine were prescribed less frequently over the 2005-2010 period^[2].

With increased opioid prescribing, misuse leading to addiction, overdose and death is a growing health issue. A population-based study in Ontario over a two-year period (2006-2008) showed 58% of drug-related deaths were attributed to opioid toxicity with oxycodone accounting for one-third of opioid-related deaths^[3]. From this same study, 7% of those who died used opioids prescribed for friends/family, 19% manipulated the dosage form (injections, inhalation, chewing), and 5% had been switched from another opioid near the time of death. Other behaviors such as diversion of opioids from health care facilities (0.6%), intentional double doctoring (2.1%) and purchasing opioids from street sources (2%) existed. From a national perspective, the 2009 Canadian Alcohol and Drug Use Monitoring Survey (CADUMS) showed a prevalence of nonmedical prescription opioid analgesic use of 4.8% and 0.4% for those trying to “get high”^[4]. Finally, a meta-analysis estimated that 3.3% of chronic non-cancer pain patients taking opioid medications were addicted and 11.5% displayed aberrant behaviors^[5].

Currently, there exists an initiative towards the promotion of safe prescribing practices in Canada, particularly concerning the prescribing and monitoring of opioid medications. In March 2013 a report published by the Canadian Centre on Substance Abuse^[6] acknowledged the increase in non-medical use of prescription drugs as well as the increase in criminal activity surrounding diversion. This document outlines strategies such as provincial monitoring programs, stricter legal implications for possession/diversion of prescription medications as well as risk-reducing strategies such as controlling/restricting prescribing practices. Several provinces have already implemented provincial drug monitoring programs in the form of provincial databases as a tool to assist healthcare professionals in identifying/discouraging double-doctoring, refuse early fills, avoid harmful drug interactions/overdose and identify patients who misuse prescription opioids^[7].

An intuitive strategy to promote safe prescribing practices for opioid medications would entail the identification of patients at highest risk for misuse coupled with appropriate intervention. Risk stratification would directly influence pain treatment considerations as well as intensity of patient monitoring required if considering initiation of opioid therapy. Several screening tools to identify aberrant behaviors have been proposed in the literature. However, the validity and generalizability of these tools are often questionable due to several factors, as will be discussed. It has been demonstrated that no one risk factor can predict drug abuse in a given individual, but particular combinations of risk factors are more predictive than others^[8]. There is a clear need for the development and validation of a robust clinical risk assessment tool that both identifies aberrant behaviors and weights them appropriately. There are very few well-designed clinical trials of adequate duration, ideally long-term studies,

which fulfil these requirements^[9].

The purpose of the following article is to provide a brief background on definitions and methods of opioid misuse, review covariate risk factors associated with opioid misuse as well as explore the available risk assessment tools for aberrant behaviors in terms of their practicality and generalizability to various practice settings.

DEFINITIONS, METHODS AND CONSEQUENCES OF OPIOID MISUSE

Prescription opioid misuse is considered a form of substance abuse. Table 1 provides an overview of definitions to differentiate clinical aspects of substance abuse^[8,10-13]. The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders^[14,15] has revised its criteria for substance abuse by merging “substance abuse” and “substance dependence” into one category entitled “substance use disorder”. The severity of the disorder is rated on a continuum from mild to severe depending on the number of symptoms present (see Table 1 for details). One of the main reasons for the revision was the diagnosis of drug dependence was often confused with addiction. Patients on long-term opioid medications are considered physically dependent and/or tolerant but may not be addicted to the medication. It has been argued that these two criteria should not be used when assessing for a substance use disorder in patients on opioids, but this practice has not been validated by clinical studies^[8].

The 2009 CADMUS estimated that approximately 19% of Canadians are using prescription opioid medications and 4.8% are using for non-medicinal purposes. In other words, approximately 1 in 20 patients prescribed opioid medications are not using them as prescribed^[4]. As this was a self-reported telephone survey, the prevalence of opioid misuse might be underreported. Some examples of opioid misuse include altering the dosage form (crushing, biting/chewing tablets, opening capsules, chewing fentanyl patches, crushing and injecting, cold water extractions/purifications of combination products), obtaining opioids in another manner (stealing/borrowing from friends/family members, purchasing off the street/internet, using another person's identity to obtain a prescription, obtaining black market opioid sample cards, “double doctoring”), taking more opioid than prescribed or taking opioid medications in conjunction with alcohol or other sedating medications^[6,8].

Opioid misuse has several serious consequences (Table 2). First and most concerning, is mortality related to impaired functioning/motor-vehicle collisions, accidental overdoses and suicide. From 2006-2008, 58% of 2330 drug-related deaths in Ontario were related to opioid use^[3]. The addition of long-acting oxycodone to the Ontario drug formulary was associated with a 5-fold increase in oxycodone-related mortality and a 41% increase in overall opioid-related mortality from 1991-2007^[16]. Second, burden of disease and overall harm of opioid medication misuse exceeds illicit drug use and is second to to-

Table 1 Definitions^[8,10-13]

Tolerance	A state of adaptation where fixed doses of opioids over time results in the need for increasing doses to maintain the same effect
Physical dependence	A state of adaptation manifested by a drug class-specific withdrawal syndrome that can be produced by abrupt cessation, rapid dose reduction, decreasing blood level of the drug, and/or administration of an antagonist
Dependence (DSM-V criteria) ^[14]	A substance use disorder as a maladaptive pattern leading to clinically significant impairment or distress for at least 12 mo and meet ≥ 2 of the following: Recurring opioid use leading to a failure to fulfill role obligations Societal and interpersonal problems Using opioids in situations that are physically hazardous Tolerance Withdrawal Taking opioid in larger amounts and for longer periods than intended Unsuccessful at cutting down Spending time to obtain or use the opioid Giving up activities due to opioid use Continuing use despite physical or psychological problems Craving or strong urge to use the opioid
Aberrant behavior	Behaviours that may cause suspicion about addiction in opioid-treated pain patients or a behavior outside the boundaries of the agreed-on treatment plan which is established as early as possible in the doctor-patient relationship
Misuse	Use of a medication for non-medical use or for reasons other than prescribed. Wilful or unintentional use of a substance in a manner not consistent with legal or medical guidelines such as altering dosage forms, sharing medications with the potential for harmful consequences.
Abuse	Misuse with consequences. The use of a substance to modify/control mood or state of mind (to obtain a "high") in a manner that is illegal or harmful to oneself or others. Examples of potential consequences include accident, injuries, blackouts, legal issues, and sexual behavior increasing the risk of sexually-transmitted diseases
Addiction	A primary, chronic, neurobiological disease with genetic, psychosocial and environmental factors influencing its development and manifestations. It is characterized by compulsive use, continued use despite harm and craving
Diversion	The unintentional transfer of a controlled substance from legitimate distribution and dispensing channels into illegal channels or obtaining a substance by an illegal method

DSM-V: The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders.

Table 2 Consequences of opioid misuse^[1,3,8,17,18,21]

Overdose-related death
Deteriorating social relationships
Reduced productivity/increased disability
Increased morbidity (opioid related side-effects/withdrawal symptoms, hyperalgesia)
Increased healthcare utilization/increased healthcare costs
Increased risk of blood-borne diseases (associated with injection drug use)
Malpractice claims
Increased drug diversion
Legal repercussions

bacco and alcohol^[1]. In 1999, projected health and social costs for each person addicted to opioids approximated \$44000/year^[17]. In 2002, a survey regarding the costs of substance abuse in Canada reported opiates as the second leading contributor to hospital admissions/hospital days and admission for psychiatric reasons^[18]. Unfortunately, the report did not specifically address the proportion of admissions due to prescription opioids. A study on emergency room visits demonstrated a 250% increase in number of visits related to narcotic withdrawal, overdose, intoxication, psychosis and harmful use between 2005-2011^[17]. In addition, the number of detoxification admissions related to controlled-release oxycodone to the Centre of Addiction and Mental Health in Toronto demonstrated an increase from 3.8% to 55.4% over a 5-year period^[19]. Information on job status/productivity losses

related to opioid misuse is currently unavailable from a Canadian perspective. Overall, there is a trend towards increased hospitalizations and increased enrollment into detoxification programs demonstrating an increase in health-care associated costs^[17]. Third, physicians have expressed concerns about prescribing opioid medications due to increased liability risks as well as increased potential for patient harm. It has been shown that family physicians prescribing opioid medications more frequently to their patients have resulted in increased contributions to opioid-related mortality. In one study, physicians in the uppermost quintile who prescribed opioids most frequently wrote the final prescription for 62.7% of patients whose death was related to opioids^[20]. Family physicians have voiced their concerns regarding the misuse/addiction potential of opioids, lack of specialized pain management knowledge as well as awareness of increasing government restrictions and investigations into opioid prescribing practices^[21]. Referral programs to specialized pain clinics have either long wait times (median of 6 mo for most pain clinics, 12 times longer than private multidisciplinary pain treatment facilities) or limited access with no specialist care available (*i.e.*, Prince Edward Island and the Territories)^[22]. As a result, over 95% of general practitioners have an active role in prescribing pain medications for their patients^[1,21]. Finally, the legal aspects of opioid misuse including diversion, robbery/theft and associated consequences such as increased crime rates and increased incarceration are a concerning aspect of

Table 3 Risk factors associated with opioid misuse^[8,23,24,26,27,37]

Non-modifiable risk factors	Age: Younger age (inverse risk relationship) Gender: Males (caucasian) Women misuse due to emotional issues versus men who misuse due to legal/behavioral issues Genetics: Family history of substance use disorder(s) Variations in <i>OPRM1</i> <i>PENK</i> gene polymorphisms
Reported pain severity/type of pain	Multiple pain complaints Chronic back pain Report greater degree of pain-related limitations
Comorbid psychological factors	History of substance use (cannabis, alcohol and other illicit drugs especially) Concomitant mood disorder, depression and/or anxiety Multiple psychosocial stressors Interpersonal problems with coworkers/family/friends History of risk-taking or thrill-seeking behavior Frequent contact with high-risk individuals or environments
Drug-related factors	Self-reported craving High daily doses (≥ 120 mg morphine equivalents per day) Use of short-acting opioids

OPRM1: μ -opioid receptor gene 1; PENK: Pre-proenkephalin.

opioid misuse. Data from Health Canada indicated that thefts/drug diversion from licenced dealers and Canadian pharmacies are a progressing issue. Oxycodone is of particular concern, with 340328 doses missing in 2010 from pharmacies, 168420 doses lost from licenced dealers, and over 300000 doses lost due to armed robbery or break-and-entry, representing a substantial increase since 2005^[1].

RISK FACTORS FOR OPIOID MISUSE

A comprehensive review of the literature on identification of covariate risk factors for opioid misuse has been established^[8,23-25]. A summary of risk factors can be found in Table 3. It has been suggested that solitary risk factors are poorly predictive of opioid misuse. Having a combination of one risk factor from each domain of (1) psychosocial issues; (2) drug-related factors; and (3) genetic factors most strongly predicts future likelihood of substance use^[8]. Rice and colleagues conducted a retrospective study with a primary objective of identifying patient characteristics and behaviors associated with a diagnosis of opioid abuse ($n = 6380$) versus those not diagnosed with opioid abuse ($n = 815536$)^[26]. The authors identified several “key characteristics” (defined as an OR of > 2) contributing to increased risk of opioid abuse which included; prior opioid prescriptions, a larger number of prior opioid prescriptions (1-5 prescriptions or 6 or more prescriptions), prior prescription of buprenorphine or methadone, past history of non-opioid drug abuse, comorbid mental illness, comorbid hepatitis and having a family history of opioid abuse. Other factors such as younger age (OR = 1.11) and male gender (OR =

1.35) also showed to increase risk, which is a consistent finding from other studies^[23,24]. Perhaps most concerning is the fact that adolescents are especially at risk of opioid misuse. An Ontario study conducted in 2010-2011 reported a non-medical prescription opioid use prevalence of nearly 1 in 5 (20%) secondary students (grades 9-12) compared with 5.9% in the adult population^[25]. Considering previous drug use is a very strong predictor of future substance use, a high prevalence of non-medical use of prescription opioids in young individuals will likely influence their drug use habits in their adult years.

The presence of comorbid psychiatric conditions is a strong predictor of opioid misuse. Coexisting depression and/or anxiety has been shown to increase risk^[8,27]. Chronic pain patients report a greater frequency of depression and anxiety than patients with other medical conditions. Some studies have reported a 50%-85% prevalence of concomitant psychiatric conditions in patients with chronic pain^[24]. One study demonstrated that patients with a high psychiatric morbidity defined as ≥ 2 positive responses on the Prescription Drug Use Questionnaire (PDUQ) were associated with younger age, longer duration on opioids, higher Screener and Opioid Assessment for Patients with Pain (SOAPP) and Current Medication Misuse Measure scores, greater incidence of abnormal urine drug screens and higher scores on the drug misuse index, indicating an overall increased risk for opioid misuse^[27]. To prevent future opioid misuse, treatment of the underlying mood disorder should be addressed prior to the initiation of opioid therapy.

Other predictors of future opioid misuse include drug related factors such as the use of immediate release opioid formulations, high daily doses of opioids and self-reported craving of opioid medication^[8]. Use of immediate release opioid medications (verses sustained release formulations) may increase risk of misuse due to the quick release of medication and capability of inducing a “high”. This theory is controversial as one prospective, comparative study found no difference in misuse between methadone and immediate release hydromorphone in 200 pain clinic patients^[28]. Wasan *et al*^[29] found that patients who reported craving opioids on the PDUQ were more likely to misuse their medication.

The overall purpose of risk factor identification is to stratify patients into “low” and “high” risk groups in order to formulate an individualistic follow-up plan. The categorization of the patient will determine the vigilance and intensity in which monitoring and follow-up should occur.

ABERRANT DRUG BEHAVIORS: PREDICTING MISUSE AND CRITICAL APPRAISAL OF AVAILABLE SCREENING TOOLS

As defined in Table 1, aberrant behaviors include “behaviours that may cause suspicion about addiction in opioid-treated pain patients or behaviors outside the boundaries

Table 4 Aberrant drug-behaviors^[5,9,38]

Indicator	Examples
Altering route of delivery ¹	Injecting, biting, crushing, separating oral formulations
Accessing opioids from other sources ¹	Obtaining the drug from friends/relatives Selling/purchasing from the "street" Double-doctoring Altering or creating fraudulent prescriptions Drug hoarding/trading Multiple emergency room visits
Unsanctioned use	Unauthorized dose escalations Binge use
Drug seeking behavior	Repeat prescription losses ¹ Aggressive requesting of higher doses Harassing staff for faxed prescriptions or "emergency" fit-in appointments Manipulation of the prescribing physician Claiming nothing else "works"/requesting specific opioid ¹
Repeated withdrawal symptoms	Dysphoria, myalgias ¹ , GI symptoms, cravings, nausea/vomiting etc.
Co-morbid conditions	Addicted to illicit drug, alcohol, cannabis and/or sedatives/hypnotics Underlying mood/anxiety disorders unresponsive to treatment
Social irregularity	Deteriorating/poor social function Concern expressed by family members
Views on opioid medication	Sometimes acknowledges being addicted Strong resistance to tapering or switching opioids Admits to mood-levelling effects Acknowledges distressing withdrawal symptoms

¹Associated with higher risk of addiction than others. GI: Gastrointestinal.

of the agreed-on treatment plan which is established as early as possible in the doctor-patient relationship". Table 4 contains a descriptive list of potential aberrant behaviors. The Canadian Guideline for Safe and Effective Use of Opioids for Chronic Non-Cancer Pain suggest that behaviors such as altering the route of delivery and/or obtaining opioids from other sources are highly indicative of addictive behavior, more so than other behaviors^[9].

To identify behaviors associated with opioid misuse, several screening tools have been developed. Table 5 provides an overview of commonly used screening tools for aberrant behaviors. A universally accepted or "gold standard" screening tool for detecting aberrant behaviors in primary care patients on long-term opioid therapy for non-cancer pain management currently does not exist for several reasons^[30]. Validation studies for predictive value and sensitivity/specificity of the questionnaires are limited. Sensitivity of the questionnaire evaluates the ability of the screening tool to identify patients who would later display aberrant behaviors whereas specificity measures the ability of the tool to identify patients who will not show aberrant behaviors. The development of aberrant behavior risk assessment tools stemmed from specialty clinics for pain management, where opioid prescribing is high. Validation studies often had very small sample sizes and/or were targeting very specific patient populations (*i.e.*, veterans). Banta-Green and colleagues investigated the applicability of the PDUQ to a general medical

population and found a very poor internal reliability compared with the index study involving pain centre patients (0.56 *vs* 0.81 respectively)^[31]. Therefore, the overall generalizability of the questionnaires to diverse patient populations is poor^[32]. Further, the limitations of written screening tools in patients who are not able to understand the assessment questions (*i.e.*, brain damage, illiterate, blindness, language barriers) create selection bias as these patients may not be evaluated correctly due to lack of response or incomplete understanding. One study reported that 15% of patients were unable to complete ≥ 1 of the risk assessment measures^[33]. The survey items and tested domains vary considerably from tool to tool. Some tools are specific to outpatient prescription opioid therapy whereas others are designed to screen for overall substance abuse risk. Standardization of screening tools is therefore not present. One of the largest criticisms of the validation studies for aberrant behavior risk assessment tools is the fact that baseline aberrant behaviors are often used to compare predictive validity. Aberrant behaviors documented at the index clinic visit are used as a baseline to compare future incidence of aberrant behaviors. Intuitively, patients with baseline aberrant behaviors are more likely to exhibit behaviors in the future, therefore biasing the predictive ability of the tool towards a more positive result (producing a false increase in predictive reliability). In an attempt to eliminate this criticism, the investigators of the SOAPP screening tool revised and retested their tool (SOAPP-R)^[34]. Finally, many of the validation studies for aberrant behaviors risk assessment tools did not incorporate pain monitoring tools such as the Brief Pain Inventory to monitor the control of patients' pain. Uncontrolled pain may be misinterpreted as drug-seeking behavior, therefore confounding the predictive ability of the screening tool.

A comparison of screening tools for aberrant behaviors has been conducted in an attempt to identify the most reliable tool. Moore and colleagues compared the predictive ability of a clinical interview, the Screener and Opioid Assessment for Patients with Pain (SOAPP), Opioid Risk Tool (ORT) and Diagnosis, Intractability, Risk and Efficacy Inventory (DIRE) screening tools in a group of 48 patients discharged from a pain management clinic to detect likelihood of aberrant behaviors^[35]. The authors found the sensitivity was highest for the clinical interview (0.77), followed by SOAPP (0.72), ORT (0.45) and DIRE (0.17). Combining the clinical interview with the SOAPP assessment tool increased sensitivity to 0.90. In another study, Jones *et al.*^[33] compared the ORT, Pain Medication Questionnaire (PMQ), the Revised SOAPP (SOAPP-R) and a detailed psychologist interview for sensitivity and specificity in chronic pain patients followed for 6 mo. The clinical psychologist had highest sensitivity, identifying 71% of the discharged patients for aberrant behavior. The 3 written measures had lower sensitivities; SOAPP-R (39%), PMQ (34%) and ORT (20%). For specificity, the ORT was most successful (88%), followed by PMQ (77%), SOAPP-R (69%) and clinical psychologist (60%). In 2009, the American Pain Society and American Acad-

Table 5 Overview of Aberrant drug-related behaviors risk assessment tools

Name of assessment tool and type of study	Description	Who administers and time to administer	Interpretation of results	Validated	Sensitivity/specificity	Limitations	Intended use	Quality score ^[36]
Substance abuse assessment tools								
Drug abuse screening test ^[39]	28-item yes/no questionnaire to assess drug dependence or abuse (shorter versions of 10 or 20 items also available)	Patient; 5-10 min	A score of 6 or more indicates a drug abuse or dependence problem	Yes	0.81-0.96/0.71-0.94	Test and retest were only a few weeks apart (psychometrics may be falsely better), susceptible to patient deception. Also hasn't been extensively tested in pain patients, therefore not specific to opioid use	For the initial assessment of drug abuse or dependence	N/A
Prospective multiple studies								
Risk assessment tools								
Opioid risk tool ^[40]	A 5-domain checklist (family history of substance abuse, personal history of substance abuse, age, history of sexual abuse and psychological disease) gender stratified and weighted	Patient; < 2 min	Low risk 0-3 points Moderate risk 4-7 points High risk ≥ 8 points	Yes	<i>c</i> statistic for male model = 0.82 and female = 0.85 (both excellent discrimination) Sensitivity to detect discontinuance of opioids due to ADRB = 0.45 ^[35]	Has only been validated in a pain clinic, therefore applicability outside this population is limited	To be used as a risk assessment tool for aberrant behaviors prior to initial opioid prescription	4/9
Prospective								
Diagnosis, intractability, risk and efficacy inventory ^[41]	7 item questionnaire-4 domains (diagnosis, intractability, risk and efficacy) with the domain of risk divided into 4 subcategories (psychological, chemical health, reliability and social support) to determine if a patient is suitable for maintenance opioid therapy	Physician; < 2 min	Each question is scored from 1 (least compelling/favorable) to 3 (most compelling/favorable) A score of ≤ 13 indicates an unsuitable candidate for maintenance opioid therapy A score of ≥ 14 indicates a good candidate with higher scores with a greater likelihood of successful prescription	Yes	Sensitivity to detect discontinuance of opioids due to ADRB = 0.45 ^[35] Sensitivity to detect discontinuance of opioids due to ADRB = 0.17 ^[35] To predict patient compliance = 0.94/0.87	Used primary care vignettes versus real-time patients, small sample size (<i>n</i> = 61), drew upon patient cases in a referral centre (may not be generalizable), prospective validation needed	A decision tool to assess reliability of patients prescribed high risk therapy (opioids) in a primary care setting	N/A
Retrospective								
Screener and opioid assessment for patients with pain ^[36,42,43]								
Prospective	14-item questionnaire with answers scored on a likert 5-point scale of 0 (never) to 4 (very often) regarding drug history and other aberrant behaviors	Patient; < 5 min	A score of ≥ 8 indicates "high risk" of future aberrant drug related behaviors	Yes	Original Validation study 0.86/0.73 Sensitivity to detect likelihood of discontinuance of opioids due to ADRB = 0.72 ^[35]	Predictive validity questionable as self-reported aberrant behaviors at baseline were compared to those at follow-up; also used PDUQ to identify/include higher-risk pain clinic participants (<i>n</i> = 175)	For the initial assessment of aberrant behaviors prior to initiating opioid therapy	5/9
Screener and opioid assessment for patients with pain- revised ^[34]								
Prospective	24-item questionnaire with answers scored on a likert 5-point scale of 0 (never) to 4 (very often) regarding drug history and other aberrant behaviors	Patient; 2-5 min	Scores range from 0-96 Low risk < 18 points High risk ≥ 18 points	Yes	Original validation study 0.81/0.68 Ability to predict discharge from opioid treatment 0.39/0.69 ^[33] Ability to predict presence of aberrant behaviors 0.41/0.71 ^[33]	Has only been validated in a pain management clinic setting, less sensitive and specific than original SOAPP tool	For the initial assessment of aberrant behaviors prior to initiating opioid therapy	6/9
Ongoing assessment tools (monitoring)								
Addition behaviors checklist ^[14]	20-item yes/no questionnaire evaluating aberrant behaviors since last clinic visit and within current clinic visit	Physician; 5-10 min	A score of ≥ 3 "yes" answers indicates possible inappropriate opioid use and should alert physician to investigate further	Yes	0.88/0.86	Validation study conducted in predominantly male veterans and some high risk patients were excluded	A tool to assess previous and current/ongoing aberrant behaviors of patients on opioids	4/9
Prospective cohort								

Current opioid misuse measure ^[16]	17-item questionnaire with answers scored on a Likert scale from 0 (never) to 4 (very often) assessing the frequency of aberrant behaviors in the previous 30 d	Patient; <10 min	A cut-off score of ≥ 10 weakly increases the risk for ADRB	Yes	0.74/0.73	Has only been validated in a pain management centre, small follow-up sample size ($n = 87$), cross-validation studies are pending, limited evidence	To be used as a monitoring tool for aberrant behaviors in chronic pain patients	5/9
Pain medication questionnaire ^[46,47]	26-item self-assessment questionnaire with answers scored on a Likert 5-point scale of 0 (disagree) to 4 (agree)	Patient; 5-10 min	Low risk 0-34 points High risk: 70-104 points High risk patients are associated with history of substance abuse, higher psychosocial distress and poorer functioning	Yes	None available	Has only been validated in a pain management clinic setting	An assessment tool for ongoing aberrant behaviors	6/9 4/9 (long-term)
Cross-sectional prospective cohort (long-term evaluation)	42-item yes/no questionnaire evaluating 6 domains: evaluation of pain condition, opioid use patterns, social/family factors, family history, history of substance abuse and psychiatric history	Physician; 15 min	Each "yes" answer counts as one point. A score of 15 or greater indicates a substance use disorder	Yes, but poor results	Cronbach's coefficient for reliability $\alpha = 0.81$ in original study with pain clinic patients but decreased to $\alpha = 0.56$ in a general medical setting	Evaluates risk at a single time point, very lengthy/time consuming. Pain behaviors to be used in conjunction with other clinical criteria administered by a mental health care practitioner. Performed poorly in a general medical population for the presence of addictive disease		6-7/9
Prescription drug use questionnaire ^[31,48]	Substance Abuse History Interview (3 questions) plus checklist of 6 aberrant behaviors	Physician; 2-5 min	Each item checked on substance abuse history equals one point 0-1 low risk 2-3 high risk	Yes	Sensitivity and specificity for each of the 6 aberrant behaviors determined ^[36] but some inconsistencies with original study	Limited to a pain clinic population, developed using retrospective chart review	A screening tool to identify substance abuse history and ongoing aberrant behaviors	7/9 ²
Documentation tools								
Patient assessment and documentation tool ^[50]	A 41-item clinician-directed interview chart note tool divided into 4 domains (4 A's): analgesia, activities of daily living, adverse events and aberrant drug-related behaviors	Physician; 10-15 min	A descriptive tool to aid in documentation (chart note)	Field-tested, but not validated	N/A	Descriptive tool; validation needed (no sensitivity or specificity data available)	A documentation tool to organize chart note information related to opioid use	N/A

¹Recommended for use in the Canadian Guideline for Safe and Effective Use of Opioids for Chronic Non-Cancer Pain Practice Toolkit^[6]; ²method of quality determination not consistent with original study design therefore questionable interpretation. ADRB: Aberrant drug-related behaviors; N: Sample size; N/A: Not assessed; PDUQ: Prescription drug use questionnaire; SOAPP: Screener and opioid assessment for patients with pain; DSM: Diagnostic and statistical manual of mental disorders.

emy of Pain Medicine published a clinical practice guideline attempting to evaluate the ability of available screening tools to predict future aberrant behaviors^[36]. The authors gave a quality score (maximum of nine points) to each of the assessment tools with one point awarded for a "yes" answer for the following domains: (1) Evaluates population other than the one used to derive the instrument; (2) Consecutive series of patients or a random subset; (3) Describes severity of symptoms, opioid dose/duration and underlying conditions; (4) Adequate description of screening instrument; (5) Appropriate criteria included in screening instrument; (6) Adequate description of method for identifying aberrant drug-related behaviors; (7) Appropriate criteria used to identify aberrant drug-related behaviors; (8) Aberrant drug-related behaviors assessed in all enrollees; and (9) Blinded assessment of aberrant drug-related behaviors.

Quality scores for the screening tools included in the analysis can be found in Table 5. The SOAPP-R assessment tool scored highest (6/9) amongst the initial screening tools with a prospective study design. Although the Prescription Opioid therapy Questionnaire scored highest amongst the retrospective or cross-sectional studies (7/9), the criteria used to evaluate the quality of the screening tool was unclear in comparison to the original study design and therefore may not reflect a true quality rating.

DISCUSSION AND CONCLUSION

The clinical/psychological interview remains the optimal strategy to identify opioid misuse, likely due to its in-depth nature. The SOAPP-R tool has decent overall quality, predictability of discontinuation of opioids due to aberrant drug behaviors as well as sensitivity and specificity. In addition, it has been cross-validated in over 600 patients and has been found to identify approximately 80%-90% of patients who will eventually misuse opioids^[24]. These are likely the tools of choice, especially for initial clinic visits when the decision to initiate or continue opioids is being considered. As stated above, combining risk assessment tools with a clinical interview strengthens predictive ability. However, both the limitations and intended patient population of each tool should be considered when choosing a risk assessment tool for a particular clinic. Overall, the available screening tools are preliminary at best.

Another major gap in clinical knowledge is the degree of impact these screening tools have on clinical outcomes^[36]. To date, there is a paucity of evidence to suggest that more frequent follow up and stricter prescribing practices diminish the incidence of opioid misuse for “high risk” patients on opioids.

An ideal opioid risk assessment tool to detect aberrant behaviors should be both sensitive and specific, maintain internal and external validity, have a robust population base (ideally for primary care or a general outpatient clinic setting) written in uncomplicated, patient-friendly language and be concise/efficient to administer. An ongoing clinical study at Health Sciences Centre Pain Clinic in Winnipeg, Manitoba, Canada is currently investigating a new aberrant behaviors checklist in chronic pain patients. The purpose of this study is to prospectively follow 150 patients on prescription opioid medications and trial an aberrant behaviors checklist for predictive validity and to assign weights to certain behaviors indicating greater or lesser predictability for opioid misuse. The results of this study could potentially add new data on specific aberrant behaviors that are most predictive of opioid misuse, leading to the development of a tool that could be subsequently validated for primary care use.

In conclusion, prescription opioid misuse in Canada is a serious public health issue that is increasing in prevalence and contributing significantly to patient morbidity and mortality. Chronic pain management goals include risk-assessment strategies to strive for optimal pain management while minimizing risk of opioid misuse. Identification of risk factors associated with opioid misuse can be a challenge due to variability between available risk assessment tools. A universal screening tool identifying aberrant behaviors would be the ideal standard of practice, similar to other chronic disease states that employ standard screening recommendations. Additional long-term validation studies in diverse patient populations are needed to improve and expand the current knowledge base. In addition, assessment of clinical relevance and impact of interventions for opioid misuse on patient

outcomes are required. Strategies to curb opioid misuse should be a top priority from a governmental, financial and public health standpoint.

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