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Screening for fetal alcohol spectrum disorder in forensic mental health settings

Kaitlyn McLachlan[a,b], Michael Amlung[b,c], Lana Vedelago[c] and Gary Chaimowitz[b,d]

[a]Department of Psychology, University of Guelph, Ontario, Canada; [b]Department of Psychiatry and Behavioural Neuroscience, McMaster University, Hamilton, Ontario, Canada; [c]Peter Boris Centre for Addictions Research, St. Joseph's Healthcare Hamilton, Hamilton, Ontario, Canada; [d]Forensic Psychiatry Program, St. Joseph's Healthcare Hamilton, Hamilton, Ontario, Canada

ABSTRACT

There is limited evidence to inform effective screening practices for identifying fetal alcohol spectrum disorder (FASD) in forensic mental health settings. This study sought to explore the potential use of four FASD screening tools in a Canadian forensic mental health program. In total, 151 patient charts were screened using the FASD Screening and Referral Tool for Youth Probation Officers and the FASD Risk Assessment Questions Asubset of current patients (n = 41) also completed screening interviews using the FASD Brief Screen Checklist and Life History Screen. Based on passive ascertainment via chart review, we found six cases of confirmed/suspected FASD (4%), evidence of PAE in 7% of the sample, and signs of maternal alcohol use during childhood in 17% of cases. Across the entire sample and four screening tools, the proportion of potentially 'positive' FASD screens based on exploratory evaluation ranged from 10% to 33%. Exploratory screening outcomes varied considerably between tools. Findings highlight the need for additional research to identify rates of FASD in forensic mental health settings, and to develop evidence-based screening and assessment approaches, and practice guidelines, for this setting.

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KEYWORDS Fetal alcohol spectrum disorder; prenatal alcohol exposure; screening; forensic psychiatry

Fetal alcohol spectrum disorder (FASD) is a common neurodevelopmental disability characterized by difficulties in cognitive functioning, socio-emotional and behaviour regulation, and adverse physical health impacts, resulting from prenatal exposure to alcohol (PAE) (Cook et al., 2016; Mattson et al., 2019). High rates of both physical and mental health comorbidity are often observed among individuals with FASD, along with disproportionately high rates of early life adversity and poor outcomes, such as child welfare system involvement, abuse, school disruption, and difficulty maintaining

CONTACT Kaitlyn McLachlan kmclac02@uoguelph.ca

independent living and employment (McLachlan et al., 2020; Pei et al., 2011; Popova et al., 2016; Streissguth et al., 2004; Weyrauch et al., 2017). Taken together, these factors place individuals with FASD at increased risk for criminal justice system involvement (Burd et al., 2010; Flannigan et al., 2018; Roach & Bailey, 2009).

Though empirical research is limited, a small number of studies of adolescents and adults seen for FASD assessment in clinical settings have shown high rates of criminal justice system contact (e.g. McLachlan et al., 2020; Streissguth et al., 2004). In addition, a growing number of studies show that youth and adults with FASD are overrepresented in correctional and forensic settings, with prevalence estimates ranging from 10% to 36% (Bower et al., 2018; Forrester et al., 2015; MacPherson et al., 2011; McLachlan et al., 2019). These rates are thought to be as high as 30 times greater than North American general population estimates (e.g. 2–5%), and conservative given the challenges inherent in identifying FASD in criminal justice contexts (Brown et al., 2018; May et al., 2014, 2018; Popova et al., 2018, 2019). Costs associated with FASD in the Canadian context are estimated to range from 1.8 to 9.7 billion across sectors, with costs attributable to criminal justice system involvement serving as among the highest economic drivers associated with the disability (Popova et al., 2015a, 2015b; Thanh & Jonsson, 2015).

In Canada, the forensic mental health system comprises a range of both inpatient and community-based services for individuals who have co-occurring legal and mental health difficulties (Livingston, 2006). The patient population typically includes individuals who have a mental disorder and are charged with criminal offences, primarily those adjudicated not criminally responsible on account of mental disorder (NCRMD) or unfit to stand trial (*Criminal Code*, s. 2 and 16; Crocker et al., 2015; Livingston, 2006). In line with international trends, the number of patients entering the Canadian forensic mental health system has grown, in part, as a result of deinstitutionalization and inadequate community-based mental health services (Crocker et al., 2017, 2015; Jansman-Hart et al., 2011; Seto et al., 2004). The same trend has been observed for individuals with other intellectual and developmental disabilities, who have disproportionately higher rates of admission to forensic mental health programs compared to the general population (e.g., Lin et al., 2017; Lindsay et al., 2011).

In Canada, individuals with FASD have been found unfit to stand trial owing to the substantial cognitive deficits experienced by defendants with the disability, and research supports deficits in their psycholegal abilities (R. v. Dewhurst, 2009; R. v. Sewap, 2008; McLachlan et al., 2014). While few cases have resulted in an NCRMD finding as a result of FASD-related deficits alone (e.g. R. v. Baril-Blouin, 2013; R. v. Charlie, 2016), several cases have resulted in an NCRMD finding for defendants presenting with both serious mental illness and FASD. Experts have also highlighted the relevance of FASD

in considerations of legal responsibility more broadly (R. v. Elias, 2010; R. v. Sam, 2010; Mela & Luther, 2013). Coupled with increased legal, policy, and clinical attention geared toward identifying individuals who may have FASD at various adjudicative stages, the intersection of both high mental health comorbidity and frequent criminal justice system contact suggests that individuals with FASD may also come into contact with the forensic mental health system at elevated rates (e.g. Binnie et al., 2014; Steering Committee on FASD and Access to Justice, 2016).

Though research in forensic contexts remains limited, Fast et al. (1999) found that 23% of Canadian youth admitted to a forensic assessment unit over an 18-month period met diagnostic criteria for Fetal Alcohol Syndrome (FAS) and Fetal Alcohol Effects.[1] Recently, Mela et al. (2020) evaluated the background, offence histories, and neurocognitive profiles of 45 adults with serious mental illness in a Canadian outpatient forensic mental health program, including a subset with FASD ($n = 12$). Both groups showed comparably high levels of lifetime adversity and varied offence histories, but rates of neurocognitive impairment were substantially higher among those with FASD. In the United States, Stinson and Robbins (2014) conducted a retrospective chart review and reported that 8% of patients detained in a secure forensic hospital and diagnosed with an intellectual disability also had FAS. Relative to those with other disabilities (e.g. traumatic brain injury, pervasive developmental disability) the subgroup with FAS presented with earlier onset of problem symptoms and behaviours, and higher treatment needs. They also had more variable employment history, higher rates of early life adversity (e.g. childhood abuse, victimization, parental substance abuse), and higher likelihood of arrest for substance use-related offences, highlighting the complexity of this population in forensic contexts.

Identifying individuals with FASD in forensic settings poses a challenge for many reasons, and they often go undetected in legal settings (e.g. Bower et al., 2018; Brown et al., 2018; McLachlan et al., 2019). Most individuals with FASD do not show overtly identifiable physical characteristics, and many present with masked yet substantial impairments in their cognitive and adaptive functioning, with a high degree of variability in presentation between individuals (Astley, 2010; J. Brown et al., 2018; Cook et al., 2016; Mattson et al., 2019; Mela et al., 2020). Confirming PAE can be particularly difficult for adults, and complex mental and physical health comorbidity may also substantially complicate the clinical picture (Brown et al., 2018; Chudley et al., 2007; McLachlan et al., 2019; Mela et al., 2019; Pei et al., 2011; Popova et al., 2016). Forensic clinicians have limited knowledge about FASD, and few assessment and intervention resources are available to identify and support patient needs in forensic settings (Binnie et al., 2014; Gagnier et al., 2011; McLachlan et al., under review; Reid et al., 2020). Evidence regarding the validity of potential FASD screening tools and approaches for correctional

and forensic contexts remains limited, further complicating detection and intervention efforts (Burd et al., 2010, 2003; Singal et al., 2018). Failure to identify individuals with FASD may be linked with poor treatment outcomes, increased recidivism, entrenched criminal justice system involvement, and ultimately poor health, social, and economic outcomes (Gagnier et al., 2011; McLachlan et al., 2018; Popova et al., 2015a; Reid et al., 2020; Roach & Bailey, 2009).

Screening tools present a potentially promising method for forensic clinicians to identify individuals at risk of having FASD. While several tools have been developed for correctional and mental health settings, empirical evaluation of their validity and/or implementation outcomes in forensic settings has yet to be undertaken. Currently, there is a Canadian national priority call to develop evidence-based approaches for identifying, evaluating, and supporting the needs of justice-involved individuals with FASD (Binnie et al., 2014; Canadian Bar Association, 2013; Steering Committee on FASD and Access to Justice, 2016). Thus, this study sought to explore the feasibility of using FASD screening tools in a forensic mental health setting and to provide a preliminary evaluation of their utility.

Method

Participants

The current study used a quasi-cohort, cross-sectional design wherein four FASD screening tools were completed using both chart review and interview approaches. The study was undertaken in a forensic mental health program that receives patients from an urban regional catchment who are admitted to secure treatment and assessment units, or as outpatients, with an annual census of ~190 individuals. Candidate charts and participants were considered eligible if they were admitted to the forensic program over a two-year period (2014–2016), including those with a Review Board disposition (an oversight tribunal) or those admitted for court-ordered assessment and/or treatment. Patients admitted over the two-year period, but discharged prior to a six-month data collection window, were identified with administrative staff assistance, and all candidate charts with available records were reviewed.

In total, 145 patients were admitted during the six-month data collection window and identified as eligible to participate in the interview arm of the study (Figure 1). Of these, 103 agreed to meet with the research team (71%), of whom 41 (40%) consented to participate in the interview and chart review, and 6 (6%) consented to chart review only. An additional 104 charts were identified as eligible for retrospective file review (e.g. discharged during the two-year review period). The final samples included 41 participants from both

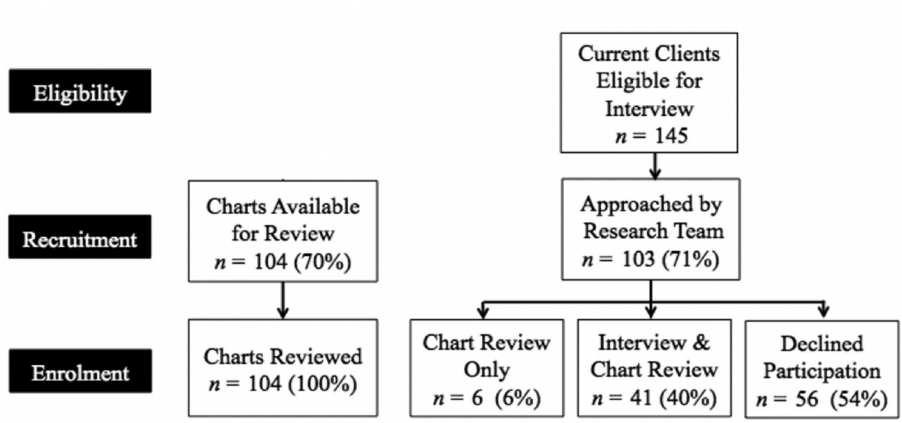

Figure 1. Study Eligibility, Recruitment, and Enrolment.

inpatient (n = 27) and outpatient units (n = 14) who completed both a screening interview and had their charts reviewed, and another 110 patient charts that were reviewed based on discharge from inpatient (n = 77) and outpatient (n = 33) units without corresponding interview.

Measures

FASD Brief Screen Checklist

The FASD Brief Screen Checklist (BSC; MacPherson et al., 2011) is an FASD screening tool developed for use with federally incarcerated adults. The self-report version of the BSC comprises Behavioural , Historical , and Maternal Indicators associated with FASD (Table 1). Indicators are rated dichotomously (e.g. yes/no), on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree) and by frequency (e.g. maternal drinking frequency during childhood ranges from 0 to 3). MacPherson et al. (2011) defined a 'positive' screen as having hits on the Behavioural Indicator (total score > 10); Historical Indicator (total score > 2), and Maternal Indicator (positive endorsement of a dichotomously rated composite indicator comprising items for both frequent and/or heavy maternal alcohol use in childhood). The Indicator capturing PAE was not evaluated given potential confounding with group classification. Preliminary evaluation in their development sample yielded good classification (78% sensitivity; 85% specificity; 41% positive predictive value; 97% negative predictive value; and 86% accuracy; MacPherson et al., 2011). Consistent with research identifying challenges obtaining clear information about PAE for adults, participants in the current study had difficulty providing detailed information about their biological mother's use of alcohol

Table 1. Participant Characteristics

	n (%)		*n* (%)
Gender (% male)	120 (80)	Age (*M*, SD)	39 (13)
Ethnicity[a]		Marital Status[b] (% single)	106 (70)
Caucasian/White	94 (62)	Primary Diagnosis	
Black/African-Canadian	28 (19)	Schizophrenia	58 (38)
Other/Unknown	29 (16)	Schizoaffective Disorder	24 (16)
Education[c]		Bipolar Disorder	16 (11)
≤ 8th Grade	9 (6)	Other	53 (35)
Grade 9 – 13/GED	111 (74)	Any evidence of previous FASD diagnosis	6 (4)
≥ Postsecondary	22 (15)	Confirmed	3 (2)
Current Status		Suspected	3 (2)
UST/ NCR	81 (54)	Evidence of PAE	10 (7)
Non-ORB	70 (46)	Evidence of problematic maternal alcohol use	26 (17)

Note. $N = 151$. [a]$n = 146$, due to missing data. [b]$n = 147$ due to missing data [c]$n = 142$ due to missing data. ORB = Ontario Review Board; UST = Unfit to Stand Trial; NCR = Not Criminally Responsible; FASD = Fetal alcohol spectrum disorder; PAE = Prenatal alcohol exposure

(Chudley et al., 2007; MacPherson et al., 2011). As such, we also explored 'positive' BSC screens relying on only the Behavioural and Historical Indicators. Also consistent with MacPherson et al., Likert responses were recoded dichotomously (1-3 = disagree; 4-5 = agree). Participants completed the BSC independently, though the research team provided reading support and answered questions as needed. Completion time ranged from 10 to 15 minutes.

Life History Screen

The Life History Screen (LHS; Grant et al., 2013) is a brief, structured interview protocol, designed as an unobtrusive screening tool that canvasses adverse life experiences commonly observed in individuals with FASD to guide follow-up assessments and treatment planning. The LHS comprises 27 items spanning: childhood history; maternal alcohol use; education; criminal history; substance use; employment and income; living situations; mental health; and day-to-day behaviours (Table 3). Eleven LHS items were drawn from the Addiction Severity Index (ASI; McLellan et al., 1980) and these have shown good classification accuracy in identifying FASD (both for diagnosed and suspected cases) in patients attending a substance treatment program (Grant et al., 2013). While the LHS has shown promise in mental health and addiction settings, additional published validation data remains limited. In the current study, we administered the 27-item LHS, also comprising the 11 LHS items previously evaluated by Grant et al. (2013) during interview sessions with participants. Two LHS items were ultimately excluded due to unclear scoring criteria ('In what grade did you start using alcohol or drugs?' and, 'If you did not finish school, why did you leave?'). Administration time was approximately 10 minutes.

FASD Screening and Referral Form for Youth Probation Officers

The FASD Screening and Referral Tool for Probation Officers (AST; Conry & Asante, 2010) was developed by the Asante Centre to support probation officers in determining when to refer clients for FASD assessment and services. The AST is a brief checklist that consists of five social factors (e.g. individual was adopted; previously in foster care) and five personal factors (e.g. developmental delay in early childhood; diagnosis of attention deficit hyperactivity disorder), each rated either present or absent, outlined in a more comprehensive screening and referrral guide (Table 3). Referral criteria include the presence of either: 1 social item *and* 2 or more personal items; or, 3 or more personal items. Though the AST has not been evaluated using a prospective design, both one-day snapshot and retrospective case–control studies have indicated promising sensitivity and specificity in justice-involved youth (Conry & Lane, 2009; McLachlan & Roesch, 2012). In the current study, the AST was completed by the research team based on chart review and supplemented by information from interviews where available, thus mirroring real-world application. There were no substantive differences in item endorsement or screening identifications for cases in the chart-review arm of the study, as compared to cases where interview data was also available. Completion time was approximately 10 to 15 minutes following comprehensive chart review and participant interviews.

FASD Risk Assessment Questions

The FASD Risk Assessment Questions (RAQ; Kellerman, 2005; Substance Abuse and Mental Health Services Administration, 2014) were drawn from the Substance Abuse and Mental Health Services Administration (SAMHSA) Treatment Improvement Protocol (TIP 58) for Addressing FASD. The nine RAQ questions are considered potentially useful indicators of FASD risk and can be completed based on chart review and/or client or caregiver interview. (Table 3). To our knowledge formal RAQ screening criteria have not been previously proposed, nor have the questions been evaluated from a psychometric perspective. For the current study, items were rated as present vs. absent, with a modification to two items (no jobs in the last two years vs. how many jobs in the last two years; no friendships, vs. older or younger friends), and we calculated a continuous total score by summing items endorsed to signify increased risk. The RAQ was completed by research assistants based on comprehensive chart review and required approximately five minutes to rate. Neither individual item frequencies nor total scores differed for cases completed relying on chart review compared to both interview and chart review.

The Asante Centre was previously known as the Asante Centre for Fetal Alcohol Syndrome.

Chart-review coding protocol

We developed a structured chart-review protocol canvassing a range of indicators relating to demographics, social/history factors, mental health, cognitive functioning, legal history, and history of PAE or an FASD diagnosis. Chart length varied considerably, and typically required between two and three hours to review.

Procedure

Study procedures were approved by the Hamilton Integrated Research Ethics Board (#1644). Eligible prospective participants were first contacted by a member of their treatment team and asked for consent to be contacted by the research team. They were then approached by the research team and invited to participate in the study following informed consent, with comprehension checks prior to enrolment. Participants next completed a semi-structured interview led by a member of the research team, comprising the BSC and LHS, and lasting between 30 and 45 minutes on average. Participants received an incentive at a value considered commensurate with the amount of time required to complete the study. None of the participants were provided an FASD diagnostic assessment during the study. Chart reviews were conducted using the procedure described, and the AST and RAQ were completed using all available information. Three research assistants with undergraduate or post-graduate level training in psychology conducted the interviews and chart reviews and received instrument and FASD-related training from the first author.

FASD risk classification

Cases were designated as being at possible high risk for having FASD if there was indication of *either* a prior diagnosis of FASD *or* evidence of PAE (e.g. indication that the patient's mother reported using alcohol during pregnancy). Given the passive nature of the surveillance we opted to include more liberal risk criteria (e.g. possible vs. confirmed FASD diagnosis; and possible or confirmed indication of PAE at any level vs. only confirmed PAE at above risk thresholds). We also documented evidence of potentially problematic maternal alcohol use during childhood as a relevant risk marker for PAE.

Data analysis

Descriptive characteristics and screening tool item endorsement are first characterized using frequency counts and percentages for categorical data, and means and standard deviations for continuous data. Exploratory differences between high- and low-risk groups on screening tools were compared using *t* tests for total scores and chi-square analyses for identification rates. We evaluated exploratory indicators for identification rates including sensitivity

(probability that a test result will be positive for cases designated at higher risk for possible FASD/PAE); specificity (probability that a test result will be negative for cases designated at lower risk for FASD/PAE); positive predictive value (PPV, probability that higher risk for FASD/PAE is thought to be present when the test is positive) and negative predictive value (NPV, probability that higher risk for FASD/PAE is thought to be absent when the test is negative). Statistical analyses were conducted using IBM SPSS version 25.0 for Mac.

Results

Participant characteristics

Analyses revealed no group differences on demographic characteristics between the interview (n = 41) and chart review only (n = 110) samples; thus, the groups are characterized together (Table 1, Table 4). Participants were predominantly male and approximately 40 years old. Nearly two-thirds were Caucasian and the majority were single. Roughly half were under a Review Board disposition (e.g. unfit to stand trial or NCRMD), and half were admitted for court-ordered assessment or treatment. Most individuals had a psychotic spectrum disorder as a primary diagnosis (e.g. Schizophrenia or Schizoaffective Disorder). Looking at all reported diagnoses, 11% (n = 16) of the sample was diagnosed with an intellectual disability. These characteristics are generally consistent with the overall population supervised under Canadian Review Boards (e.g. Crocker et al., 2015).

FASD, PAE, and problematic maternal alcohol use

Evidence suggesting a prior FASD diagnosis was found in six cases (4%) (Table 1). Of these, half were documented as diagnosed cases (n = 3, 2%) and half were documented as suspected or possible cases (n = 3, 2%). Little FASD-relevant information was recorded in patient charts (e.g. method/diagnostic approach, diagnostic/clinical features, etc.). Based on all available sources of information, evidence of PAE was documented for another four cases (3%), with no information provided with respect to FASD. In total, PAE was noted in 7% of cases in the overall sample, with little to no detail characterizing the timing, frequency, or other risk indicators of exposure. Evidence of potentially problematic maternal alcohol use in childhood was considered present for 26 individuals (17%), of which a subset also had diagnosed/possible FASD and/or PAE. However, little information characterizing patterns of use was available. Overall, very few charts contained information describing previous efforts to query or assess for FASD or potential PAE (or rule them out). These findings suggest that chart review, in the

absence of implementing routine identification and documentation practices, may not be a useful method for detecting FASD in similar settings.

FASD screening measures

FASD Brief Screen Checklist

Across the sample, BSC Behavioural Indicator endorsement ranged from 12% ('has temper tantrums') to 42% ('is restless'), and from 7% (foster care ≥ 3 times) to 100% ('history of mental health treatment') for the Historical Indicator, suggesting high rates of difficulties and experiences commonly associated with FASD in a forensic population. More than a third (37%) of participants indicated that their mother drank alcohol during childhood, though few confirmed overly frequent or heavy use, and only three (7%) endorsed maternal alcohol use in pregnancy. Using MacPherson et al.'s (2011) screening criteria, one of the four high-risk FASD/PAE cases was identified (25%), and none of the lower risk FASD/PAE cases were identified (Table 5). The relaxed screening criterion (i.e. without the Maternal Indicator) resulted in two higher risk FASD/PAE cases (50%) and three lower risk cases (8%) being identified. Exploratory evaluation suggested that the Behavioural Indicator best differentiated high risk from low-risk cases, with three of the four higher risk cases identifying problems with math, memory, reading, impulsivity, distractibility, forgetfulness, and attention, compared to rates ranging from 14% to 35% among the lower risk cases. Historical Indicator scores and identification rates did not differ significantly between groups, with the entire sample endorsing a history of previous mental health treatment, and high rates of early problems in school in the higher risk group (75%).

Life History Screen

Across the entire sample, rates of positively endorsed LHS Indicators ranged from 3% ('initiation of alcohol/drug use at an early age') to 95% ('ever arrested') (Table 3). Using a cut-off score of ≥10 for the LHS total score resulted in all cases flagged at higher risk for FASD/PAE being identified, as well as nearly half (n = 18, 49%) of the lower risk cases. Adjusting the LHS cut-off score to ≥12 resulted in a small reduction in exploratory sensitivity (75%) but improved specificity, with 35% of the lower risk cases identified. Total scores on both the 11- and 25-item versions of the LHS were significantly higher in those identified at higher risk for FASD/PAE compared to those at lower risk. Aside from items related to maternal alcohol use, several LHS items were endorsed at differential rates between the higher and lower risk groups, including a history of previous suicide attempt (100% vs. 27%), and difficulty concentrating/paying attention (100% vs. 27%).

FASD Screening and Referral Form for Youth Probation Officers

Item endorsement varied considerably across the AST, from a low of 1% ('sibling with documented FASD') to a high of 97% ('mental health diagnosis') (Table 2). Ten higher risk FASD/PAE cases (91%) and 40 lower risk cases (29%) were identified using the AST. These results yielded potentially promising exploratory sensitivity and specificity, though the overall number of cases positively identified as being at elevated risk for FASD (n = 50, 33%) may be impracticably high for everyday implementation in forensic settings without additional criteria for triage. All AST items differentiated the two groups from an exploratory perspective, with the exception of growth deficiency, school learning difficulties, and other mental health diagnosis.

FASD Risk Assessment Questions

Across the entire sample, rates of positively endorsed RAQ items ranged from 19% (special education classes, ADHD diagnosis) to 82% (no employment in last two years) (Table 3). Given a lack of previously defined RAQ scoring rules, we applied an exploratory cut-off of ≥5, resulting in seven higher risk FASD/PAE cases (64%) being identified, and nearly one-quarter lower risk cases identified (n = 32, 23%). Increasing the RAQ cut-off to ≥6 resulted in improved exploratory specificity (i.e. only 8% of low-risk cases were identified) but a large reduction in sensitivity (36%). The RAQ total score was significantly higher in the higher risk FASD/PAE group compared to those identified at lower risk (Table 5). Two RAQ questions differentiated the groups (aside from those focused on maternal alcohol use) including an ADHD diagnosis (46% vs. 17%), and problems managing money effectively (64% vs. 27%)

Discussion

While there is increasing recognition that individuals with FASD are over-represented in legal contexts, lack of clear methods for identifying those with FASD may hamper clinical and research efforts to identify effective practices in this context. This study evaluated four potentially useful FASD screening tools and approaches in a medium-sized urban Canadian forensic mental health program. Based on an exploratory passive surveillance approach we identified 4% of N. N. patients admitted to a forensic mental health program over a two-year period with a prior confirmed or suspected FASD diagnosis. While consistent with current general population estimates (e.g. 2–5%), this finding is likely best considered conservative given the lack of FASD screening and assessment procedures in place in the study setting. Higher rates of both PAE (7%) and problematic maternal alcohol use in childhbrown

ood (17%), coupled with 10–33% exploratory identifications using FASD screening tools, lend further weight to this possibility and would be

Table 2. Brief Screen Checklist Results (n = 41).

	High Risk (n = 4)	Low Risk (n = 37)		High Risk (n = 4)	Low Risk (n = 37)
Behavioural Indicators	*n* (%)	*n* (%)	**Behavioural Indicators Cont'd**	*n* (%)	*n* (%)
Acts impulsively	3 (75)	13 (35)	Is disorganized	2 (50)	7 (19)
Has trouble following direction	2 (50)	7 (19)	Has trouble staying on topic	2 (50)	7 (19)
Is restless	2 (50)	15 (41)	Has poor social skills	2 (50)	11 (30)
Has a problem with spelling	2 (50)	9 (24)	***Total Score (M, SD)***	13.5 (8.7)	5.7 (4.7)*
Shows poor judgment	2 (50)	7 (19)	***Positive Screens >10***	3 (75)	6 (16)**
Is easily distracted	3 (75)	11 (30)			
Has temper tantrums	2 (50)	3 (8)	**Historical Indicators**		
Has strong mood swings	2 (50)	7 (19)	Ever adopted	0 (0)	4 (11)
Is hyperactive	2 (50)	8 (22)	Ever in foster care	1 (25)	6 (16)
Has a problem with money	1 (25)	10 (27)	≥ 3 times	1 (25)	2 (5)
Unaware consequences of actions	1 (25)	4 (11)	Problems with school early	3 (75)	14 (38)
Has a problem with math	3 (75)	8 (22)*	Ever had mental health treatment	4 (100)	41 (100)
Interrupts a lot during conversation	1 (25)	13 (35)	≥3 times	4 (100)	23 (64)
Is agitated	2 (50)	7 (19)	***Total Score (M, SD)***	3.3 (1.3)	2.3 (1.0)
Is very forgetful of everyday things	3 (75)	10 (27)	***Positive Screens > 2***	3 (75)	14 (38)
Talks a lot but says little	2 (50)	5 (14)			
Has a poor memory	3 (75)	6 (16)	**Maternal Indicators**		
Has a problem with reading	3 (75)	6 (16)	Maternal alcohol use childhood	4 (100)	11 (32)
Is easily victimized	2 (50)	8 (22)	Drank >2x week	2 (50)	0 (0)
Has trouble completing tasks	0 (0)	9 (24)	≥4 drinks per occasion	2 (50)	3 (8)
Has a poor attention span	3 (75)	5 (14)	Maternal alcohol pregnancy	3 (75)	0 (0)
Has few friends	2 (50)	11 (30)	***Positive Screens***[a]	2 (50)	2 (50)
Is easily manipulated	2 (50)	7 (19)			

[a]Positive screen = presence of single Maternal Indicator combining frequent (≥ 2 weekly) or heavy (≥ 4 drinks on a drinking occasion) maternal alcohol use in childhood; * p <.05, ** p <.01, *** p <.001. High risk = possible risk of FASD/PAE; Low risk = lower risk of FASD/PAE; SSI = Social Security Income.

considered commensurate with estimated FASD prevalence in correctional and forensic settings (e.g. 10% to 36%). Alternatbrown

vely, it is also possible that individuals with FASD may present less frequently in some Canadian forensic mental health contexts given the strict

Table 3. Life History Screen Results (n = 41).

	High Risk	Low Risk		High Risk	Low Risk
	n (%)	*n* (%)		*n* (%)	*n* (%)
1. Raised by non-biological parents	2 (50)	11 (30)	17. Remembering things	2 (50)	10 (28)
2. More than two living situations	1 (25)	11 (31)	18. Following rules/instructions	2 (50)	16 (43)
3. Mother problem drinking alcohol	3 (75)	4 (11)	19. Getting along with others, arguing, fighting	1 (25)	30 (54)
4. Mother drank alcohol when young	3 (75)	13 (35)	20. Being on time	2 (50)	14 (38)
5. Mother drank alcohol pregnant	3 (75)	0 (0)	21. Keeping money to last month	2 (50)	17 (47)
6. Highest grade in school ≤ 10th grade	2 (50)	11 (30)	22. Doing things on spur of moment	3 (75)	24 (67)
7. History of special education	3 (75)	14 (40)	23. Getting really upset at little things	3 (75)	16 (43)
8. Ever arrested	3 (75)	36 (97)	24. Forgetting or missing appointments	2 (50)	14 (38)
9. Initiation of alcohol/drug use <12	0 (0)	1 (3)	25. Being surprised when you get into trouble	4 (100)	14 (38)
10. Longest time any job <1 year	0 (0)	9 (24)			
11. Income from SSI	3 (75)	32 (89)	*Total Score across All Items (M, SD)*	14.3 (3.9)	9.4 (4.1)
12. Never lived independently as adult	0 (0)	5 (14)	*Positive Screens ≥10*	4 (100)	18 (49)
13. ≥1 mental health disorder	2 (50)	16 (43)	*Positive Screens ≥11*	3 (75)	18 (49)
14. Previous suicide attempt	4 (100)	10 (27)	*Positive Screens ≥12*	3 (75)	13 (35)
Difficulties ….			*Positive Screens ≥13*	2 (50)	9 (24)
15. Concentrating/paying attention	4 (100)	17 (47)	**Total Score*	5.5 (1.7)	3.5 (1.5)
16. Understanding what adults tell you	3 (75)	11 (30)	**Positive Screens ≥5*	3 (75)	10 (27)

Items 1, 3, 4, 6, 8, 9, 10, 11, 13, 14, and 15 were reported in the original published validation study reported by Grant et al. (2013), where the complete LHS items are also outlined. *Denotes total scores and positive screens reported using these 11 items. High risk = possible risk of FASD/PAE; Low risk = lower risk of FASD/PAE. SSI = Social Security Income.

Table 4. Participant Characteristics.

	n (%)		*n* (%)
Gender (% male)	120 (80)	Age (*M*, SD)	39 (13)
Ethnicity[a]		Marital Status[b] (% single)	106 (70)
Caucasian/White	94 (62)	Primary Diagnosis	
Black/African-Canadian	28 (19)	Schizophrenia	58 (38)
Other/Unknown	29 (16)	Schizoaffective Disorder	24 (16)
Education[c]		Bipolar Disorder	16 (11)
≤ 8th Grade	9 (6)	Other	53 (35)
Grade 9–13/GED	111 (74)	Any evidence of previous FASD diagnosis	6 (4)
≥ Postsecondary	22 (15)	Confirmed	3 (2)
Current Status		Suspected	3 (2)
UST/NCRMD	81 (54)	Evidence of PAE	10 (7)
Non-ORB	70 (46)	Evidence of problematic maternal alcohol use	26 (17)

[c] N = 151. [a] n = 146, due to missing data. [b] n = 147 due to missing data. [c] n = 142 due to missing data. ORB = Ontario Review Board; UST = Unfit to Stand Trial; NCRMD = Not Criminally Responsible on Account of Mental Disorder; FASD = Fetal alcohol spectrum disorder; PAE = Prenatal alcohol exposure.

Table 5. Identification of high- and low-risk FASD/PAE cases across screening tools.

	High Risk	Low Risk				
Interview tools (*n* = 41)	*n* (%) *M* (SD)	*n* (%) *M* (SD)	Sensitivity % [95% CI]	Specificity % [95% CI]	PPV % [95% CI]	NPV % [95% CI]
Brief Screening Checklist[a]						
Behaviour total score	13.5 (8.7)	5.7 (4.7) **				
Positive Screens >10	3 (75)	6 (16)**	75 [19, 99]	85 [71, 94]	36 [18, 59]	97 [85, 99]
History total score	3.3 (1.3)	2.3 (1.0)				
Positive Screens > 2	3 (75)	14 (39)	75 [19, 99]	62 [45, 78]	18 [10, 13]	96 [80, 99]
Maternal total score	1.8 (1.5)	.08 (.3) ***				
Positive Screens[a]	2 (50)	3 (8)*	50 [7, 93]	92 [78, 98]	40 [14, 75]	94 [86, 98]
Final Positive Screens	1 (25)	0 (0)**	25 [1, 81]	100 [91, 100]	92 [87, 95]	93 [80, 98]
Modified Positive Screen	2 (50)	3 (8)*	50 [7, 93]	92 [78, 98]	41 [14, 75]	94 [86, 98]
Life History Screen[c]						
25-item Total Score	14.3 (3.9)	9.4 (4.1)*				
Positive Screens ≥10	4 (100)	18 (49)	100 [40, 100]	51 [34, 68]	18 [14, 24]	100% [-]
Positive Screens ≥12	3 (75)	13 (35)	75 [19, 99]	65 [48, 80]	19 [10, 32]	96 [81, 99]
11-item Total Score	5.5 (1.7)	3.5 (1.5)*				
Positive Screens ≥5	3 (75)	10 (27)	75 [19, 99]	73 [56, 86]	23 [12, 39]	96 [83, 99]
Chart-review tools (*n* = 151)						
Asante Screening Tool						
Positive Screen Criteria A	9 (82)	22 (16) ***				
Positive Screen Criteria B	5 (46)	26 (19)*				
Total Positive Screens	10 (91)	40 (29) ***	91 [59, 100]	71 [63, 79]	20 [15, 26]	99 [94, 100]
Risk Assessment Questions						
Total Score	4.9 (1.3)	3.3 (1.6) **				
Positive Screens (≥ 5)	7 (64)	32 (23)**	64 [31, 89]	77 [69, 84]	18 [11, 27]	96 [92, 98]
Positive Screens (≥ 6)	4 (36)	11 (8)**	36 [11, 69]	92 [86, 96]	27 [12, 49]	95 [92, 97]

Note: [a] Positive screen = presence of single Maternal Indicator for frequent (≥ 2 weekly) or heavy (≥ 4 drinks on a drinking occasion) maternal alcohol use in childhood; [b] Positive screen = >10 on the Behavioural Indicator, and > 2 on the Historical Indicator, and presence of the single Maternal Indicator; [c] FASD/PAE high risk for tools administered by interview, $n = 4$. [b] FASD/PAE high risk for tools completed by chart review, $n = 11$. High risk = possible risk of FASD/PAE; Low risk = lower risk of FASD/PAE. * $p < .05$, ** $p < .01$, *** $p < .001$.

legal criteria associated with management under a provincial or territorial Review Board and the lower frequency at which individuals with FASD may be found unfit to stand trial and/or NCRMD, as compared to more traditionally accepted clinical presentations (Criminal Code, 1985; Mela & Luther, 2013; Roach & Bailey, 2009). Regional and jurisdictional variations in the types of referrals made to forensic services may further impact these rates generally, as well as differences in FASD knowledge among legal and clinical professionals (e.g. Livingston, 2006).

An important aim of this research was to undertake a preliminary examination of several FASD screening tools and approaches to provide early guidance to the field. These tools were developed for use in a range of relevant populations and settings (e.g. youth on probation, adults attending tertiary mental health programs), and vary in terms of item content (e.g. behavioural descriptors, experiences of adversity), and administration format (e.g. patient-directed interviews, self-report questionnaire, clinician-rated checklists), thereby providing several potential options for practitioners considering the adoption of a screening approach in their setting. In terms of interview and self-report tools, we found that both the BSC and LHS were easy and efficient to administer in this population. Respondents provided clinically useful and informative details about their experiences, abilities, and histories, using these tools. We also found that many participants held limited knowledge about maternal health behaviours during pregnancy and early childhood, underscoring the challenges inherent in obtaining clear and reliable information about PAE, particularly among adults and in justice-involved populations (Chudley et al., 2007; McLachlan et al., 2019). On both the BSC and LHS, participant responses differentiated those designated at higher and lower risk for FASD/PAE reasonably well, suggesting potential future promise for forensic application. However, using pre-defined screening criteria, neither tool demonstrated an ideal balance of exploratory sensitivity and specificity, underscoring the need for additional research to refine and evaluate these tools prior to implementation in forensic contexts.

Our research team also found it relatively easy to complete the AST and RAQ primarily on the basis of data from chart review; however, we noted that clear documentation for relevant risk markers/items was often lacking and that chart review required a lengthy time investment. In practice, a forensic clinician completing these tools would likely need to collect additional information via interview(s) and record review, particularly with respect to pre and early postnatal history and development. Thus, both measures may be more appropriately implemented during intake and/or preliminary evaluation processes when extensive patient interviews and record review already form important components of forensic practice. While the AST yielded favourable exploratory identification of possible high-risk FASD/PAE cases, the tool also identified a potentially impracticably high number of cases , including many considered to be at lower risk for FASD/PAE. Similarly, while the total RAQ score differentiated the potentially higher and lower risk groups, exploratory indicators of sensitivity and specificity fell below commonly accepted thresholds. Prior to adopting either tool in practice, our findings suggest the need for additional research to validate appropriate referral criteria. At the same time, it may also be possible to use screening tools as aids for identifying potential markers commonly associated with FASD and inform more holistic

clinical judgments that incorporate a wide range of factors in determining the need for additional FASD-informed assessment or intervention services.

Limitations

This study aimed to inform the feasibility of administering FASD screening tools in a forensic mental health service where FASD knowledge, access to FASD-informed training, and FASD diagnostic resources are limited. As such, several limitations should be considered in evaluating the generalizability of the current findings. Without a gold standard clinical diagnostic process in place it was not possible to reliably estimate the rate of FASD, nor formally assess the validity of screening tools. As such, any consideration of the psychometric characteristics of these tools (e.g. sensitivity, specificity) should be viewed as exploratory in nature and with the intended action to spur additional research to inform evidence-based practice. Findings are also limited by the conservative sample size and require replication before firm conclusions can be drawn.

FASD screening tools were also completed by trained members of a research team rather than by active clinical team members engaged in everyday assessment or care provision. Additionally, we did not formally evaluate indicators such as ease of use, nor impact of training on raters. Prospective evaluation of the validity and implementation of FASD screening approaches is greatly needed and should evaluate implementation indicators (e.g. impact of FASD training on client care, shifts in care post identification, ease of use, etc.), psychometric properties in the context of everyday forensic practice, concurrent validity of self-report data relative to clinical assessment of cognitive functioning and other factors, and the perspective of individuals with lived experience. As well, response validity with regard to self-report should be assessed given the forensic context, and in particular, should be understood with consideration to elevated rates of cognitive impairment, suggestibility, and confabulation, often observed in individuals with FASD (Allely & Mukherjee, 2019; Brown et al., 2017; Mullally et al., 2020; Brown et al., 2011).

Practice guidance

Program level decisions to implement FASD screening or identification practices in forensic mental health settings requires careful consideration and planning, and may be supported through the use of FASD-informed implementation and evaluation guides, such as the Treatment Improvement Protocol (#58) for Addressing Fetal Alcohol Spectrum Disorder published by the Substance Abuse and Mental Health Services Administration (2014), Pei and colleagues' (2018) Best Practices for Serving Individuals with Complex Needs: Guide and Evaluation Toolkit, or the more comprehensive accompanying referral guide to the AST (Conry & Asante, 2010).

As a starting point, it is important to consider the primary goal of screening for FASD. While an important aim of screening may include identifying individuals who would benefit from more fulsome psychological, medical, or specialized FASD evaluation, the limited nature of FASD-specific resources across Canada suggests that these services may not be feasible for many, particularly outside of urban health centres (Clarren & Lutke, 2008). Thus, an additional aim may include determining how clinicians can adjust their practices to best support those identified at-risk. Ideally, screening tools or approaches would provide helpful 'here and now' clinical information to inform and guide adjustments to care. This may include recognizing that an individual requires additional support learning, understanding, and remembering new information, adjusting expectations and treatment goals to reflect underlying cognitive deficits or difficulties in self-regulation and adaptive functioning, and using trauma-informed approaches to care (Brown et al., 2018; Flannigan et al., 2018; Pei & Burke, 2018). Neuropsychological or psychological assessment may also provide important functional information in the absence of available FASD-specific resources. Thorough medical evaluation should also be considered given the wide range of physical health comorbidities identified in both children and adults with FASD, in addition to gaps in the evidence-base for psychopharmacological treatment in this population (Mela et al., 2018; Popova et al., 2016). FASD training should also be provided for clinicians administering screening tools, as well as those providing further assessment or milieu care to support best outcomes (McLachlan et al., under review). Developing a network of FASD-informed experts for consultation may provide additional guidance for forensic practitioners, particularly in resource-limited contexts.

With respect to selecting a specific FASD screening instrument or approach , it is important to consider practical needs and goals, client characteristics, item content, and psychometric properties. In the current study, we found that several tools included items that provided little helpful FASD-specific information given common difficulties observed in forensic contexts, such as a history of arrest or mental health diagnosis, and non-specific clinical symptoms, such as impulsivity. While these may be helpful FASD-specific risk indicators for other settings, unsurprisingly, these items yielded limited utility in identifying possible higher risk cases in the current study. Screening tool modifications may be required to achieve meaningful outcomes specific to forensic mental health settings and might include inquiring about frequent recidivism or administration of justice-related charges, the presence of multiple mental health comorbidities from an early age, or significant learning difficulties and educational supports coupled with early school failure (e.g. see Bower et al., 2018; Fast et al., 1999; Flannigan et al., 2018; McLachlan et al., 2018; Streissguth et al., 2004).

Implications and policy considerations

FASD screening in correctional and forensic settings has been highlighted as a pressing and critical need both in Canada and internationally (e.g. American Bar Association, 2012; Binnie et al., 2014; Canadian Bar Association, 2010, 2013; Freckelton, 2017; Steering Committee on FASD and Access to Justice, 2016). Despite these calls, evidence supporting effective screening practices and potentially useful tools remains limiteand. Given the high costs associated with FASD assessment, scarce specialized resources in correctional and forensic mental health settings, and limited knowledge and skill regarding FASD among many forensic clinicians, implementation of FASD screening approaches may contribute to more efficient use of clinical resources, a reduced risk of cases going unidentified, and ultimately improved outcomes (Binnie et al., 2014; Brown et al., 2018; Popova et al., 2013). Failure to identify individuals with FASD in forensic systems likely represents a barrier to recovery, particularly given their complex care needs, along with possible increased risk of recidivism, victimization, and harm, and ultimately, high costs to individuals, communities, and society (Flannigan et al., 2018; McLachlan et al., 2018; Popova et al., 2015a; Stinson & Robbins, 2014).

While further research is needed to further inform best practices for addressing FASD in forensic contexts, we offer several initial recommendations. Our findings complement a growing body of research highlighting the presence of individuals with FASD in forensic settings. Given the current gaps, important consideration should be made for the development and implementation of education and training for forensic clinicians. There is also a clear need for forensic clinicians to develop advanced forensic assessment and intervention skills with consideration of FASD across a range of legal contexts (McLachlan et al., under review; Reid et al., 2020). The recently proposed criteria for Neurobehavioral Disorder Associated with Prenatal Alcohol Exposure as a condition needing further study in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, American Psychiatric Association, 2013; see Doyle & Mattson, 2015; Kable & Mukherjee, 2017, for reviews), as well as DSM-5 consideration of FASD as a current exemplar for 'Other Specified Neurodevelopmental Disorder' (Code 315.8, p. 86), suggest further likelihood that forensic clinicians will require increased capacity to conduct effective differential evaluations that consider FASD in the broader context of mental and physical health needs. Lastly, there is a clear ongoing need for further research to identify relevant clinical and psycholegal characteristics and needs of individuals with FASD in forensic and legal contexts and to further develop the evidence-base for effective care to improve outcomes.

Notes

1. Fetal Alcohol Syndrome (FAS) and Fetal Alcohol Effects were diagnostic terms identifying individuals with prenatal alcohol exposure and neurodevelopmental deficits (see Sokol & Clarren, 1989).

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ORCID

Kaitlyn McLachlan http://orcid.org/0000-0003-4569-7529

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