Original Paper

Suicidal Ideation Endorsed on the Patient Health Questionnaire-9 at Intake and Treatment Outcomes in Gambling Disorder Care: Retrospective Cohort Study

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Abstract

Background: Gambling disorder (GD) carries a disproportionate burden of suicide risk. Clinicians frequently encounter patients with suicidal ideation (SI) at treatment entry, yet no published study has examined whether SI at intake predicts treatment engagement or symptom change in GD care.

Objective: This study aimed to determine (1) the prevalence of SI at treatment entry among adults seeking GD care, (2) how clinical and demographic characteristics differ by SI status, and whether SI at intake predicts differential (3) treatment engagement or (4) improvement in gambling symptom severity.

Methods: This retrospective cohort study used de-identified clinical data from Birches Health, a US-based virtual behavioral health provider. Eligible patients entered care for GD between June 2, 2024, and April 20, 2026; completed at least one session; and had baseline Patient Health Questionnaire-9 (PHQ-9) data (N=1518). SI was defined as a score of ≥1 on PHQ-9 item 9. Baseline characteristics were compared using t and $\chi 2$ tests. Engagement was defined as appointments attended within 90 days of the first session and modeled using negative binomial regression; initiation of care was compared by SI status among all patients who completed an intake PHQ-9. Gambling Symptom Assessment Scale (G-SAS) trajectories were modeled using linear mixed-effects models with natural spline terms for time and SI-by-time interactions, adjusting for depression severity (Patient Health Questionnaire-8 [PHQ-8]), age, and gender. Sensitivity analyses addressed engagement definitions, follow-up patterns, and alternative codings of item 9.

Results: SI was endorsed by 465 (30.6%) patients. Patients with SI had higher depression and gambling severity (PHQ-8 mean 15.2, SD 5.5; G-SAS mean 22.6, SD 11.4) than those without SI (PHQ-8 mean 8.7, SD 5.3; *P*<.001; d=1.20; G-SAS mean 19.1, SD 11.9; *P*<.001; d=0.30) but did not differ on age, gender, or most psychiatric comorbidities. Patients with SI were less likely to initiate care (465/2009, 23.1%) than those without SI (1053/3958, 26.6%; *P*=.004). Among patients who initiated care, SI was not associated with appointments attended in the first 90 days (incidence rate ratio 1.04, 95% CI 0.92-1.17; *P*=.54) or with retention. By day 90, model-based G-SAS scores declined from 20.8 to 12.2 among patients with SI and from 18.9 to 11.4 among those without SI. Patients with SI had higher adjusted baseline G-SAS scores (b=1.85, 95% CI 0.21-3.49; *P*=.03), but change over time did not differ significantly between groups. Findings were consistent across sensitivity analyses.

Conclusions: SI at intake is common among adults entering GD treatment and is associated with more severe depressive and gambling symptoms. Among patients who started treatment, gambling symptoms declined substantially in both groups, with no significant differences in engagement or symptom improvement by SI status. Patients with SI can experience meaningful improvement in gambling symptoms during outpatient treatment.

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KEYWORDS

gambling disorder; suicidal ideation; digital health; behavioral addiction; depression; treatment engagement

Introduction

Gambling disorder (GD) is a behavioral addiction characterized by persistent, uncontrolled gambling despite substantial adverse consequences across financial, relational, occupational, and psychological domains [1]. Among psychiatric conditions, GD carries a disproportionate burden of suicide risk. A meta-analysis of 39 studies reported a lifetime pooled prevalence of 31% for suicidal ideation (SI), 17% for suicide plans, and 16% for suicide attempts among individuals with GD [2]. In a nationally representative US sample, suicide attempts were 2.8 times more likely among individuals with GD compared to nongamblers [3]. Across epidemiological studies, GD has been associated with elevated odds of both suicide attempts and suicide mortality relative to the general population, with registry-based cohort data estimating suicide risk among individuals with GD to be approximately five times that of the general population [4,5]. These figures situate GD among the most suicide-relevant presentations in behavioral health, yet the condition remains underrepresented in clinical suicide research relative to mood and substance use disorders.

Among individuals entering treatment for GD, SI is associated with a clinically distinct intake profile. Patients presenting with SI are more likely to be female, be unemployed, and report greater financial stress than those without SI at treatment entry [6]. Clinically, SI at intake has been linked to greater emotion dysregulation and trait impulsivity, with both variables increasing suicide risk indirectly through their effects on psychiatric symptom severity and gambling disorder severity [7]. These findings indicate that SI at treatment entry is a marker of a more complex presentation, with direct relevance to intake assessment and clinical triage.

A critical and understudied clinical question is whether SI at treatment entry predicts how patients engage with and respond to GD treatment. Clinicians and payers routinely encounter patients with SI at intake and must make decisions about treatment planning, monitoring intensity, and care appropriateness with little empirical guidance. To the best of our knowledge, no published study has examined whether SI at treatment entry predicts differential engagement or symptom change in any structured GD treatment program. This gap has direct consequences for clinical triage, safety monitoring, and the allocation of treatment resources across care settings.

This study used de-identified intake and longitudinal outcome data from Birches Health, a national digital health platform delivering insurance-covered, structured care for gambling disorder in the United States. Birches Health uses a measurement-based care model in which validated clinical instruments, including the Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), and the Gambling Symptom Assessment Scale (G-SAS), are administered systematically at intake and across the treatment course, generating prospectively collected longitudinal data well suited to examining clinical predictors of treatment response. The purpose of this study was to determine (1) the prevalence of SI at treatment entry among adults seeking care for GD, (2) how clinical and demographic characteristics differ between patients with and without SI at intake, (3) whether SI at intake predicts differential treatment engagement, and (4) whether SI at intake predicts differential improvement in gambling-related symptom severity over the course of treatment. Findings have important implications for the identification and management of suicide risk in gambling disorder treatment.

Methods

Study Design and Participants

This study used a retrospective cohort design to evaluate SI in patients entering care for GD through Birches Health, a US-based behavioral health provider that treats behavioral and process addictions via virtually delivered care. Analyses were conducted using de-identified data collected as part of routine clinical care. Data covered patients whose first attended session occurred between June 2, 2024, and April 20, 2026, with appointment and assessment records through April 20, 2026. Patients were included if they specified gambling concerns as their primary reason for seeking treatment, were at least 18 years of age, completed at least one visit, and had baseline data recorded for the PHQ-9. This study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational cohort studies (see Multimedia Appendix 1) [8].

Ethical Considerations

This study protocol was reviewed and approved by the Biomedical Research Alliance of New York (BRANY) Institutional Review Board (study ID 26-113-1708). All patients initiating care at Birches Health provide informed consent during registration, which encompasses the scope of services, confidentiality protections, and applicable data use practices. The study relied exclusively on de-identified clinical data generated through routine care, with no direct patient contact or intervention by the research team. Given the retrospective, de-identified nature of the data, the study qualified for exemption from additional informed consent requirements under US federal human subjects regulations [9]. No participant compensation was provided. Data were de-identified by Birches Health before transfer to the research team, and no direct identifiers were shared. De-identified data were stored on a secure, encrypted cloud storage platform with access restricted to members of the study team using role-based permissions.

Birches Health Treatment

Birches Health is a privately held US-based platform founded in 2023 that provides behavioral health treatment to adults across all 50 states, with a primary focus on GD and related behavioral addictions. Care is delivered via secure video sessions by master's-level licensed mental health and addiction counselors, including licensed clinical social workers, licensed mental health counselors, licensed marriage and family therapists, and licensed

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addiction counselors, who hold specialized credentials in gambling disorder treatment through the International Problem Gambling and Gaming Certification Organization (IPGGC). Patients access care through multiple pathways, including direct referral, online search, health care provider partnerships, and other digital channels. There are no fixed eligibility requirements; clinical appropriateness is evaluated on an individual basis.

Prior to the first appointment, patients complete a routine clinical intake process including standardized symptom assessments. During the initial visit, providers complete a comprehensive biopsychosocial and psychiatric diagnostic assessment to establish diagnoses, assess symptom severity and co-occurring conditions, and collaborate with patients to develop individualized treatment plans. Treatment goals are tailored to each patient's objectives and may include abstinence from gambling, harm reduction, or broader improvements in functioning and well-being. Evidence-based approaches used in treatment include cognitive behavioral therapy, acceptance and commitment therapy, motivational interviewing, and relapse prevention strategies.

Care at Birches Health is multicomponent and individualized and may include individual psychotherapy, group therapy, family therapy, peer recovery support, and financial wellness services. Co-occurring conditions, such as depression, anxiety, trauma-related symptoms, and substance use disorders, are addressed within the treatment model when clinically indicated. Session frequency and overall treatment duration are guided by clinical need and patient preference. Standardized symptom measures, including but not limited to the G-SAS and PHQ-9, are embedded in the clinical workflow and administered at a routine cadence via the online survey platform throughout care to support ongoing progress monitoring and treatment decision-making.

Given the elevated rates of SI documented in individuals with gambling disorder, Birches Health providers are trained to assess and respond to suicide risk as part of routine clinical care. Patients who endorse SI on the PHQ-9 at intake or at any point during treatment are evaluated by their provider and reevaluated throughout treatment. Appropriate safety planning using the Stanley-Brown Safety Plan template or escalation to a higher level of care is implemented as clinically indicated.

Study Measures

Demographic information, including age and gender, was self-reported during intake. Gender was self-reported using the response options "female," "male," "transgender or genderqueer," and "other." Primary diagnoses and psychiatric comorbidities were documented by providers in the electronic health record (EHR). Patients completed standardized symptom assessments via the online platform throughout the course of care based on their care plan and subject to provider judgment. Appointment records, including each appointment's scheduled date and status (occurred, cancelled, late cancellation, no-show, or rescheduled), were extracted from the EHR.

Gambling symptom severity was measured using the G-SAS, a 12-item self-report instrument capturing urge intensity, cognitive preoccupation with gambling, behavioral engagement, emotional distress, and functional impairment over the preceding week. Each item is scored on a 5-point scale (0-4), yielding a total score between 0 and 48, where higher values indicate greater severity. Prior research has supported good internal consistency of the G-SAS (Cronbach $\alpha \approx .85$-$.89$) [10].

Depressive symptoms were measured using the PHQ-9, which asks respondents to rate how often they have experienced each symptom over the prior 2 weeks on a scale from 0 to 3. Total scores range from 0 to 27, with higher scores indicating a greater symptom burden. The measure has strong psychometric support in clinical populations (Cronbach $\alpha = .89$) [11]. For the analyses in this study, an alternate version, the PHQ-8, was used, to avoid confounding due to the overlap in the SI definition with the PHQ-9 total score. The PHQ-8 is identical to the PHQ-9 with item 9 omitted and the total score calculated as PHQ-9 total score – item 9 score; a meta-analysis suggests that the two are extremely highly correlated (r=0.996) in their clinical accuracy [12].

The prevalence of SI at intake was estimated as the proportion of patients endorsing any response greater than zero on PHQ-9 item 9, which asks about thoughts of death or self-harm over the past 2 weeks [13]. The full ordinal distribution of item 9 responses was reported to characterize the severity of SI across the sample. Response options range from 0 (not at all) to 3 (nearly every day). Although this item was not developed as a stand-alone suicide risk screener, several studies have found it to be a strong predictor of suicide risk in a range of outpatient populations [14,15], and it has been used as an indicator of SI in research [13,16,17], despite not distinguishing passive ideation from nonsuicidal self-injury, active SI, suicide intent, or suicide planning. For this study, SI was defined as a score of ≥1 on this item at the time of initial assessment, consistent with prior research [13]. This operationalization captures thoughts of death or self-harm and is not a clinical assessment of suicide risk.

Statistical Analyses

Sample Descriptives and Comparisons

Baseline demographic and clinical characteristics were summarized using descriptive statistics. Continuous variables were reported as means (SDs), and categorical variables were reported as frequencies and percentages.

Demographic and Clinical Characteristics by SI Status

Group differences between patients who endorsed and did not endorse SI were assessed using independent samples (Welch) *t* tests and Cohen d for continuous variables and χ^2 tests and odds ratios (ORs) for categorical variables.

Treatment Engagement by SI Status

Treatment engagement was examined using appointment-level records. Only appointments with a status of "occurred" were counted as attended, cancelled, late cancellation, no-show, or rescheduled; appointments without a recorded status were not counted. Engagement was examined in two stages. First, descriptive comparisons of total attended appointments and days in treatment (days from the first to the last attended

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appointment) were conducted by SI status. Given the expected positive skew in both variables, group differences were assessed using Wilcoxon rank-sum tests, and effect sizes were calculated using rank-biserial correlation. Second, negative binomial regression was used to examine whether SI status at intake predicted the number of appointments attended. To provide all patients with the same opportunity to accrue visits, the primary outcome was the number of attended appointments within 90 days of the first attended appointment among patients whose first attended appointment occurred at least 90 days before the end of the observation window (ie, April 20, 2026). Negative binomial regression was selected over Poisson regression because appointment counts were overdispersed, violating the assumption of equal mean and variance required by the Poisson model. The key predictor was SI status at intake, operationalized as a binary variable (endorsed with score 1-3 vs not endorsed with score 0). Models were fit sequentially: model 1, unadjusted; model 2, adjusted for baseline depression severity (Patient Health Questionnaire-8 [PHQ-8] total score) and gambling severity (G-SAS total score); and model 3 (primary), additionally adjusted for age and gender. Model 2 estimates whether SI adds prognostic information beyond concurrent depression and gambling severity; it is a conditional association, not a causal effect. Baseline gambling severity was included as a covariate because more severe gambling symptoms at intake may independently influence treatment use regardless of SI status. Collinearity was assessed using the correlation between SI and PHQ-8 scores and variance inflation factors. Sensitivity analyses and results are documented in Multimedia Appendices 2 and 3. The distribution of appointment statuses was described by SI status. Initiation of care was compared by SI status among patients referred for gambling concerns who completed an intake PHQ-9.

Gambling Symptom Trajectories

To examine whether SI status at intake was associated with differential gambling symptom severity trajectories over time, a linear mixed-effects model was fit. The outcome was the total G-SAS score, including the baseline assessment. Same-day duplicate G-SAS records with identical scores were retained once; when same-day records had conflicting scores, both were excluded because the correct value could not be verified. Time was operationalized as months since the first G-SAS assessment (days/30), so 0 corresponded to baseline.

The model included a random intercept and random slope for time per patient, allowing both initial symptom level and rate of change to vary across individuals. To evaluate whether a single linear slope was appropriate, we compared linear, piecewise linear (knot at 1 month), and natural cubic spline (3 *df*) specifications of time, each interacting with SI status, using maximum likelihood estimation and the Akaike information criterion (AIC); the specification with the lowest AIC was retained. The key predictor was the interaction between SI status and time, which tested whether the rate of G-SAS change over time differed between patients who did and did not endorse SI at intake. Because the retained specification includes multiple time terms, the SI×time terms were tested jointly using a likelihood ratio test. Adjusted between-group differences in the G-SAS (calculated as SI – no SI) with 95% CIs were estimated at prespecified time points (days 0, 30, 60, and 90) using estimated marginal means, with covariates held at their means and gender weighted by sample proportions. Covariates included baseline depression severity (PHQ-8 total score), age, and gender. Baseline G-SAS was not included as a covariate because it is part of the repeated outcome; the SI main effect therefore represents the adjusted difference in G-SAS at baseline. Models were fit sequentially: unadjusted (model 1), adjusted for PHQ-8 (model 2), and additionally adjusted for age and gender (model 3, primary). The PHQ-8 and age were standardized prior to model fitting. Given the complexity of the random effects structure, models were fit using the *bobyqa* optimizer, a derivative-free numerical optimization algorithm that is more robust to convergence failures than the default optimizer in lme4 when random effects structures are complex or data are unbalanced. The primary model used all available G-SAS observations. Sensitivity analyses and results are documented in Multimedia Appendices 2 and 3. All models were estimated using restricted maximum likelihood, allowing inclusion of all available observations under a missing at random assumption.

PHQ-9 Follow-up by SI Status

Because assessment timing and dropout may depend on symptom levels, follow-up availability was compared by SI status, patients with and without follow-up G-SAS data were compared on baseline characteristics, and a pattern-mixture model adding follow-up duration pattern (last G-SAS assessment at ≤30, 31 to 90, or >90 days) and its interaction with time was fit.

No imputation procedures were applied. Model assumptions were assessed using residual-versus-fitted plots, normal quantile plots of residuals and random effects, and checks for singular fits and convergence warnings. A two-sided alpha of $P<.05$ was used throughout. All analyses were conducted in R version 4.4.2 (R Foundation for Statistical Computing) using the *lme4*, *lmerTest*, *emmeans*, *effectsize*, *MuMIn*, *car*, and *MASS* packages.

Bias Mitigation

This study was conducted by the Fit Minded scientific team, which was contracted by Birches Health to provide scientific services (see the *Conflicts of Interest* section). To reduce the potential for sponsor influence, the following safeguards were applied. First, the research questions were developed by the scientific team based on scientific merit and were not prescribed by Birches Health. The research questions, primary outcomes (treatment engagement and G-SAS trajectories), and covariates were specified before data analysis began in June 2026. The 90-day engagement outcome, the spline specification of time, and all sensitivity analyses were added or revised in response to peer review; these changes are documented in Multimedia Appendix 4. Second, study findings were not contractual deliverables, and publication was not contingent on the direction of results. Third, Birches Health de-identified the data before transfer, and all data analysis was conducted by Fit Minded authors; Birches Health had no access to the analytic dataset or analysis outputs. Fourth, the Birches Health coauthor contributed to the description of the treatment program and critical revision of the manuscript. Birches Health did not have the right to approve, alter, or withhold the manuscript or its findings.

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Results

Sample Descriptives and Comparisons

Records were reviewed for Birches Health patients who entered care for GD and who completed at least one session between June 2, 2024, and April 20, 2026. Of the 15,461 patients screened for inclusion in the Birches Health gambling program, 5967 (38.6%) completed an intake PHQ-9 and 1542 (10.0%) attended at least one session. Of the 1542 patients who attended at least one session, 24 (1.6%) were excluded due to missing baseline PHQ-9 data, yielding a final analytic sample of 1518 (98.4%) patients. Of these, 1389 (91.5%) had a clinician-documented gambling disorder diagnosis recorded in the EHR; the remaining 129 (8.5%) were included on the basis of self-reported gambling concerns as the primary reason for seeking care, as diagnosis data were either not yet documented at the time of the data extract or were missing. Same-day duplicate G-SAS records were identified for 30 (2%) patients; 12 pairs had identical scores and were retained once, and 18 pairs had conflicting scores and were excluded, including 3 at baseline. For trajectory analyses, 504 (33.2%) patients were excluded due to missing or unusable baseline G-SAS data, limiting this analysis to 1014 (66.8%) patients. Of these, 15 (1.5%) were additionally missing baseline age (n=1, 6.7%) or gender (n=14, 93.3%), yielding 999 (98.5%) patients (n=8390 G-SAS observations) with complete covariate data for the linear mixed-effects trajectory models. The primary engagement model included 778 (77.9%) patients with complete covariate data whose first attended appointment occurred at least 90 days before the end of the observation window. Patients missing G-SAS data were slightly older than those with complete data (mean 44.3 vs 41.0 years; $t_{895.5}$=4.32; *P*<.001; d=0.25) but did not differ on SI prevalence, baseline depression severity, gender, or depressive disorder diagnosis (Multimedia Appendix 5).

SI at intake, defined as any nonzero score of PHQ-9 item 9, was present in nearly one-third of patients. Most patients who endorsed SI reported these thoughts on several days in the past 2 weeks, and a smaller proportion reported them on more than half the days or nearly every day (Table 1). Among all 5967 patients who completed an intake PHQ-9, including those who did not go on to attend a session, 2009 (33.7%) endorsed SI. These figures reflect endorsement of thoughts of death or self-harm on a single self-report item, which is not equivalent to clinically assessed suicidal risk.

Table 1. Distribution of PHQ-9[a] item 9 responses at intake.

Response	Participants (N=1518), n (%)
Not at all (score=0)	1053 (69.4)
Several days (score=1)	316 (20.8)
More than half the days (score=2)	75 (4.9)
Nearly every day (score=3)	74 (4.9)
Total endorsed (item 9 score≥1)	465 (30.6)
Total not endorsed (item 9 score=0)	1053 (69.4)

[a]PHQ-9: Patient Health Questionnaire-9.

Demographic and Clinical Characteristics by SI Status

The sample was predominantly male (958/1399, 68.5%; gender not recorded for 119/1399, 8.5%, patients), with no significant difference in gender distribution between patients who endorsed SI and those who did not (Table 2). Patients who endorsed SI at intake had substantially higher depression symptom severity (large effect) and higher gambling symptom severity (small effect) than those who did not, and a depressive disorder diagnosis was more common among patients with SI. Groups did not differ significantly on age; gender; or rates of anxiety disorder, trauma-related disorder, substance use disorder, or attention-deficit/hyperactivity disorder (ADHD).

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Table 2. Baseline characteristics by SI[a] endorsement.[b]

Characteristic	Not endorsed (n=1053)	SI endorsed (n=465)	Welch/chi-square test	*P* value	Effect size
Age (years), mean (SD)	41.9 (13.9)	42.7 (12.9)	$t_{955.5}$=1.06	.29	d=0.06
PHQ-8[c] total, mean (SD)	8.7 (5.3)	15.2 (5.5)	$t_{857.5}$=21.24	<.001	d=1.20
G-SAS[d] total, mean (SD)	19.1 (11.9)	22.6 (11.4)	$t_{621.7}$=4.55	<.001	d=0.30
Female, n/N (%)	304/977 (31.1)	135/422 (32.0)	χ^2_1=0.1	.79	OR[e] 1.04 (95% CI 0.81-1.33)
Anxiety disorder, n/N (%)	264/957 (27.6)	108/408 (26.5)	χ^2_1=0.1	.72	OR 0.95 (95% CI 0.73-1.23)
Depressive disorder, n/N (%)	198/957 (20.7)	117/408 (28.7)	χ^2_1=9.8	.002	OR 1.54 (95% CI 1.18-2.01)
Trauma-related disorder, n/N (%)	110/957 (11.5)	42/408 (10.3)	χ^2_1=0.3	.58	OR 0.88 (95% CI 0.61-1.29)
Substance use disorder, n/N (%)	68/957 (7.1)	38/408 (9.3)	χ^2_1=1.7	.20	OR 1.34 (95% CI 0.89-2.03)
ADHD[f], n/N (%)	49/957 (5.1)	17/408 (4.2)	χ^2_1=0.4	.54	OR 0.81 (95% CI 0.46-1.42)

[a]SI: suicidal ideation.

[b]Group differences were assessed using independent samples (Welch) *t* tests (effect size: Cohen d; *t* and d were computed as endorsed minus not endorsed) for continuous variables and χ^2 tests (effect size: odds ratio [OR], 95% CI, endorsed vs not endorsed) for categorical variables. Categorical values are reported as n/N (%), where N is the number of patients in that group with nonmissing data.

[c]PHQ-8: Patient Health Questionnaire-8.

[d]G-SAS: Gambling Symptom Assessment Scale.

[e]OR: odds ratio.

[f]ADHD: attention-deficit/hyperactivity disorder.

Treatment Engagement by SI Status

Of 5967 patients in the gambling program who completed an intake PHQ-9, 4449 (74.6%) did not attend a session. Patients who endorsed SI at intake were less likely to initiate care than those who did not (465/2009, 23.1%, vs 1053/3958, 26.6%; χ^2_1=8.2; *P*=.004; OR 0.83, 95% CI 0.73-0.94). Among the 1518 patients who initiated care, 14,469 (74.1%) of 19,514 appointments were attended; the remainder were cancelled (1664/19,514, 8.5%), late cancellations (463/19,514, 2.4%), no-shows (507/19,514, 2.6%), or rescheduled (891/19,514, 4.6%) or had no recorded status (1520/19,514, 7.8%). The proportion of appointments attended was similar for patients with (4772/6435, 74.2%) and without SI (9697/13,079, 74.1%) were cancelled. Patients who endorsed SI attended a mean of 10.3 (SD 10.3, median 6) appointments versus 9.2 (median 5) among those without SI (W=231,152.5; r=–0.06, 95% CI –0.12 to 0.01; *P*=.08) and remained in treatment for a mean of 89.1 (SD 87.9, median 56) versus 81.5 (median 49) days (W=231,359; r=–0.05, 95% CI –0.12 to 0.01; *P*=.09).

In model 1 (unadjusted), SI at intake was not associated with the number of appointments attended in the first 90 days (n=778, 77.9%; incidence rate ratio [IRR] 1.00, 95% CI 0.90-1.11; *P*=.97). Results were similar for model 2 (adjusted for clinical characteristics at baseline; IRR 1.03, 95% CI 0.92-1.16; *P*=.59). In model 3 (adjusted for demographic characteristics), SI was not associated with appointments attended (IRR 1.04, 95% CI 0.92-1.17; *P*=.54; Table 3), and the 95% CI was compatible with patients who endorsed SI attending between 8% fewer and 17% more appointments. Older age and male gender were associated with more appointments (Table 3). The correlation between SI endorsement and PHQ-8 scores was 0.53, and all variance inflation factors were ≤1.34. Results were consistent across sensitivity analyses (Multimedia Appendix 2).

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Table 3. Negative binomial regression: SI[a] endorsement and appointments attended in the first 90 days (n=778).

Predictor	IRR[b] (95% CI)	z	*P* value
SI endorsed (reference="not endorsed")	1.04 (0.92-1.17)	0.61	.54
Baseline PHQ-8[c]	1.00 (0.99-1.01)	–0.58	.56
Baseline G-SAS[d]	1.00 (0.99-1.00)	–1.36	.17
Age	1.01 (1.00-1.01)	2.70	.007
Gender: male (reference="female")	1.13 (1.01-1.27)	2.06	.04

[a]SI: suicidal ideation.

[b]IRR: incidence rate ratio (95% CI from profile likelihood). Outcome=appointments attended within 90 days of the first attended appointment among patients with at least 90 days between the first appointment and data extraction.

[c]Patient Health Questionnaire.

[d]G-SAS: Gambling Symptom Assessment Scale.

Gambling Symptom Trajectories

A natural cubic spline specification of time (3 *df*) fit the data better than linear or piecewise linear specifications (AIC 58,344 vs 58,672 and 58,358, respectively; likelihood ratio test vs linear: χ^2_4=335.5, *P*<.001) and was retained. Gambling symptom severity declined significantly over time across the full sample (Table 4), with model-based mean G-SAS scores declining from 18.9 at baseline to 11.4 at day 90 among patients without SI and from 20.8 to 12.2 among those with SI (Figure 1). The baseline difference in G-SAS scores between patients with and without SI was largest in model 1 (b=3.23, 95% CI 1.72-4.74; *P*<.001) and lessened in model 2 after accounting for baseline depression severity (b=1.79, 95% CI 0.12-3.47; *P*=.04). In model 3, higher baseline depression severity and female gender were associated with higher G-SAS scores, and patients who endorsed SI had higher G-SAS scores at baseline after adjustment for all covariates (b=1.85, 95% CI 0.21-3.49; *P*=.03; Table 4).

The SI×time terms were not jointly significant (Table 4), and the model-based difference between groups was no longer statistically significant from day 30 onward (Table 5). From day 30 to day 90, the 95% CIs for the adjusted difference ranged from −0.90 to 2.58 G-SAS points; differences of up to about 2.6 points higher among patients with SI, or about 0.2 SD of baseline G-SAS, cannot be excluded.

In the first 84 days, the SI×time terms were jointly significant (χ^2_3=8.3, *P*=.04): the baseline difference (2.08, 95% CI 0.39-3.77; *P*=.02) was no longer evident by day 30 (0.46, 95% CI –1.18 to 2.10; *P*=.58) and remained nonsignificant at day 60 (0.49, 95% CI –1.37 to 2.35; *P*=.60) and day 84 (–0.72, 95% CI –3.28 to 1.84; *P*=.58). When the baseline G-SAS score was held constant in the postbaseline model (n=836), the follow-up G-SAS score did not differ by SI status (b=–0.10, 95% CI –1.59 to 1.38; *P*=.89), with adjusted differences near zero at day 30 (–0.10, 95% CI –1.31 to 1.12), day 60 (–0.07, 95% CI –1.40 to 1.26), and day 90 (–0.01, 95% CI –1.44 to 1.42; all *P*≥.87). Trajectories were largely consistent in the sensitivity models (Multimedia Appendices 3 and 6).

Of the 999 patients included in trajectory analyses, 836 (83.7%) contributed at least one follow-up G-SAS observation beyond baseline. Follow-up availability did not differ by SI status (258/310, 83.2%, vs 578/689, 83.9%; χ^2_1=0.0; *P*=.86; OR 0.95, 95% CI 0.66-1.37), nor did the number of G-SAS assessments (median 5 in both groups; W=105,096; *P*=.69; r=−0.02, 95% CI −0.09 to 0.06) or follow-up duration (median 49 days in both groups; W=105,148; *P*=.70; r=−0.02, 95% CI −0.09 to 0.06). At day 90, 109 (35.2%) of 310 patients with SI and 236 (34.3%) of 689 patients without SI remained under observation (Multimedia Appendix 7). Patients without follow-up G-SAS data differed from those with follow-up only in age (mean 39.1 vs 41.4 years; $t_{223.8}$=2.06; *P*=.04; d=0.18; Multimedia Appendix 8).

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Table 4. Linear mixed-effects model of G-SAS[a] trajectories by SI[b] endorsement (n=999 patients, n=8390 observations).

Predictor	b (95% CI)	*t* (*df*)	*P* value
Time[c] (spline 1)	–7.53 (–9.91 to –5.15)	–6.20 (398.3)	<.001
Time[c] (spline 2)	–20.76 (–25.42 to –16.10)	–8.74 (362.7)	<.001
Time[c] (spline 3)	–16.39 (–24.12 to –8.67)	–4.16 (636.8)	<.001
SI endorsed	1.85 (0.21 to 3.49)	2.21 (1192.6)	.03
PHQ-8[d] (standardized per SD)	1.14 (0.44 to 1.85)	3.17 (977.3)	.002
Age[d] (standardized per SD)	0.43 (–0.26 to 1.11)	1.22 (973.6)	.22
Gender: male (reference="female")	–4.33 (–5.84 to –2.81)	–5.61 (969.9)	<.001
Gender: transgender or genderqueer (reference="female")	–0.36 (–14.35 to 13.64)	–0.05 (1003.1)	.96
Time[e] (spline 1)×SI endorsed	0.21 (–3.99 to 4.41)	0.10 (395.8)	.92
Time[e] (spline 2)×SI endorsed	3.09 (–4.97 to 11.15)	0.75 (342.0)	.45
Time[e] (spline 3)×SI endorsed	8.83 (–4.45 to 22.11)	1.30 (602.1)	.19
Marginal R^2	0.124 (—[f])	—	—
Conditional R^2	0.748 (—)	—	—

[a]G-SAS: Gambling Symptom Assessment Scale (total score, including the baseline assessment).

[b]SI: suicidal ideation.

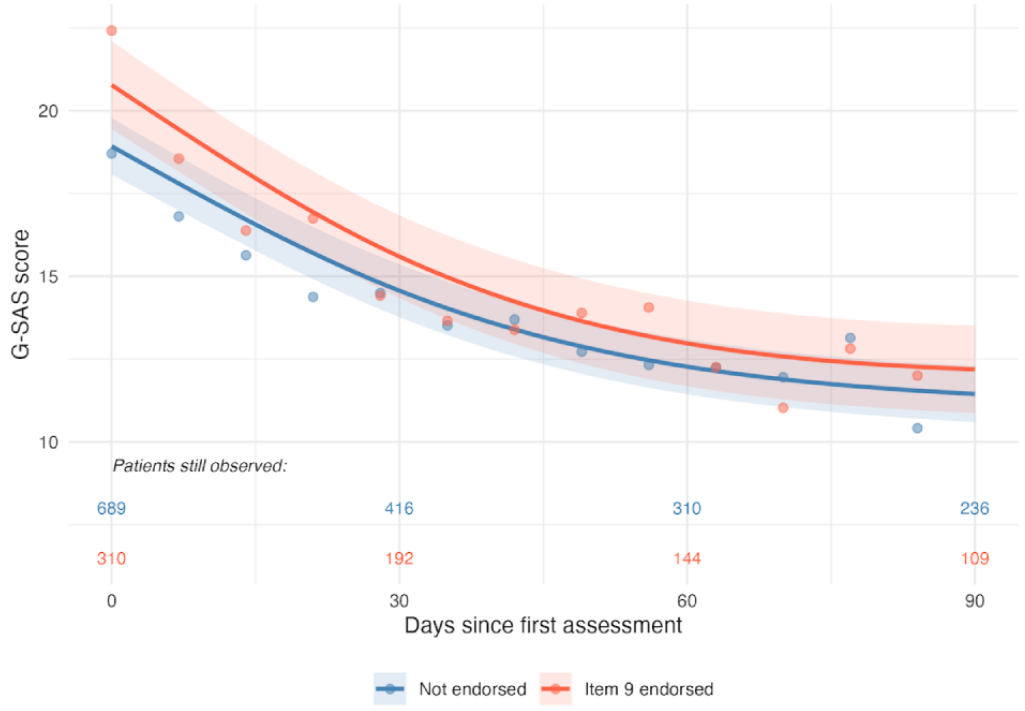
[c]Time: months since first assessment (days/30; 0=baseline). Time was modeled as a natural cubic spline with 3 *df*; spline and time coefficients were not interpretable individually (see Table 5 for group differences by day). Random intercept and random slope for time per patient; 95% CIs are Wald intervals.

[d]PHQ-8: Patient Health Questionnaire-8.

[e]Joint likelihood ratio test of SI×time terms: χ^2_3=6.9, *P*=.07. *t* Statistics used Satterthwaite *df*.

[f]Not applicable.

Figure 1. Model-based G-SAS trajectories by SI status. Lines and shaded bands are model-based mean G-SAS scores, with 95% CIs from the primary model. Points are raw mean G-SAS scores in 7-day bins. Numbers below the lines are patients with a G-SAS assessment on or after that day. G-SAS: Gambling Symptom Assessment Scale; SI: suicidal ideation.



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Table 5. Adjusted difference in G-SAS[a] (SI[b] endorsed – not endorsed) by day.[c]

Day	Difference (95% CI)	z	*P* value
0	1.85 (0.21 to 3.49)	2.21	.03
30	1.03 (–0.52 to 2.58)	1.31	.19
60	0.70 (–0.90 to 2.31)	0.86	.39
90	0.75 (–0.89 to 2.38)	0.89	.37

[a]G-SAS: Gambling Symptom Assessment Scale.

[b]SI: suicidal ideation.

[c]Model-based estimates from the primary model; covariates held at their means, gender weighted by sample proportions.

PHQ-9 Follow-up by SI Status

Follow-up PHQ-9 data were available for 67 (14.4%) of 465 patients who endorsed SI at intake and 153 (14.5%) of 1053 who did not. Among patients who endorsed SI at intake, 47 (70.1%) of 67 did not endorse SI at their last available assessment; among those who did not endorse SI at intake, 5 (3.3%) of 153 endorsed SI at their last assessment (Multimedia Appendix 9).

Discussion

Principal Findings

The purpose of this study was to determine the prevalence of SI at treatment entry among adults seeking care for GD, how clinical and demographic characteristics differ between patients with and without SI at intake, and whether SI at intake predicts differential treatment engagement or differential improvement in gambling-related symptom severity over the course of treatment. Nearly 1 in 3 patients entering GD treatment endorsed SI at intake. Patients presenting with SI were clinically distinguishable at intake, reporting substantially higher depressive symptom severity, greater gambling severity, and higher rates of depressive disorder diagnosis than those without SI, with a large difference in depressive symptom severity and small differences in gambling severity and depressive disorder diagnosis, although the groups did not differ by age, gender, or most psychiatric comorbidities. Among patients who initiated care, SI at intake was not associated with the number of appointments attended or with retention. Patients with SI began treatment with modestly higher gambling symptom severity, but both groups improved, and no statistically significant difference in gambling symptoms was detected from 1 month onward. Patients who endorsed SI on the intake questionnaire were, however, less likely to attend a first session. Taken together, these findings indicate that SI is common at treatment entry in GD and marks a more psychiatrically complex subgroup; once in care, patients with SI showed no evidence of poorer engagement or gambling symptom improvement, but they may face greater barriers to starting treatment.

SI was endorsed at intake by nearly 1 in 3 patients, a rate consistent with published estimates from treatment-seeking GD samples, although on the lower end of what has been reported in clinic-based cohorts [2,18]. Prevalence was somewhat higher among all patients who completed the intake questionnaire, including those who did not go on to attend a session, suggesting that estimates based only on patients who initiate care may modestly understate SI at first contact. That said, a significant subset of patients endorsed suicidal thoughts on more than half the days or nearly every day, indicating that frequent SI is present in a meaningful proportion of individuals entering care for GD. Although endorsement of PHQ-9 item 9 is not equivalent to clinically assessed suicide risk, the high prevalence observed in this sample suggests that a substantial proportion of patients entering treatment warrant additional clinical assessment and ongoing monitoring throughout care. Future research should further characterize the prevalence and presentation of SI across diverse gambling disorder treatment settings and populations.

Patients presenting with SI at intake were clinically more severe than those without SI. The most striking difference between groups was in depressive symptom severity. On average, the SI group had PHQ-8 scores nearly seven points higher than the non-SI group, a difference that crosses established clinical thresholds and places this subgroup firmly in the moderate to severe range [19]. Greater gambling severity and higher rates of depressive disorder diagnosis further characterized the SI group. These findings align with prior work documenting that the psychiatric symptom burden, particularly depression, is the primary clinical correlate of SI in treatment-seeking GD populations [7,18]. In contrast, neither age nor gender was associated with SI at treatment entry. Although female gender has been identified as a risk factor for SI in some GD studies [6] and in the general population [20,21], findings have been inconsistent across GD samples [22], and the predominantly male composition of the sample in this study may have limited our ability to detect gender differences. These findings suggest that SI at treatment entry primarily reflects the broader psychiatric symptom burden rather than demographic characteristics, underscoring the importance of comprehensive clinical assessment during intake.

Among patients who initiated care, SI at intake was not associated with treatment engagement. Patients with and without SI attended a similar number of appointments in the first 90 days, both before and after adjustment for baseline depression and gambling severity, and results were consistent for retention, total attended appointments, and exposure-adjusted counts. The proportion of scheduled appointments that were attended was also nearly identical in both groups. Because the CIs were compatible with modest differences in either direction, these findings indicate no detectable association rather than equivalent engagement. To the best of our knowledge, no published study

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has examined whether SI at intake predicts engagement in GD treatment, making direct comparisons difficult. A recent systematic review on suicidality and therapeutic engagement in adult mental health populations identified significant gaps in the literature, with limited understanding of the factors influencing treatment retention and dropout among individuals presenting with suicidality [23]. Patients who endorsed SI were, however, less likely to attend a first session after completing intake. This finding should be interpreted cautiously because the reasons for noninitiation were not available; some patients may have been referred to a higher level of care at intake, whereas others may not have been accepted into, or chose not to begin, outpatient treatment. If replicated, lower initiation among patients with SI would identify the transition from intake to the first session as a target for proactive outreach and care coordination [24]. Future research should identify the patient- and program-level factors associated with treatment retention and evaluate strategies to improve sustained engagement.

Patients with SI entered treatment with modestly higher gambling symptom severity, a difference of about two points on the 48-point G-SAS after accounting for depression severity. Both groups improved substantially; the between-group difference was no longer statistically significant by 1 month and remained small through 3 months. Differences in the shape of the trajectories over the full observation window were not statistically significant, whereas in the first 12 weeks, the groups converged because patients with SI improved more quickly early in treatment. When baseline gambling severity was held constant, follow-up scores were nearly identical, suggesting that the early convergence reflects higher initial severity, including regression toward the mean, rather than a distinct effect of SI. These findings were robust to follow-up duration patterns, restriction to patients with a documented GD diagnosis, and alternative codings of item 9. These findings are broadly consistent with evidence from other mental health settings demonstrating that patients presenting with SI can experience improvements in clinical symptoms comparable to those without SI. For example, a large study of collaborative care in a community mental health setting found that patients with SI at treatment entry showed significant improvement in depression and anxiety over the course of care, with trajectories broadly comparable to those without SI [25]. However, previous work in substance use disorder samples has yielded mixed results and has focused primarily on overdose risk and abstinence outcomes rather than symptom change [26,27], and to the best of our knowledge, no comparable work exists in GD specifically. Together, these findings suggest that among patients who initiate specialized outpatient GD care, SI at intake is not associated with poorer gambling symptom improvement. Because SI endorsement prompted provider evaluation and, when indicated, safety planning or escalation, and because these clinical responses were not measured, these results cannot show whether patients with SI require the same or different care; they describe gambling symptom trajectories under the care patients actually received.

Among the small subset of screened patients with a follow-up PHQ-9, most who endorsed SI at intake no longer endorsed it at their last assessment, and new endorsement among those who did not endorse it at intake was uncommon. Because follow-up PHQ-9 data were available for only about 1 in 7 patients, and patients with persistent SI may have been referred to other care, these descriptive findings should not be interpreted as evidence of SI resolution.

Future Research

Several directions follow from the findings. Most immediately, future studies should assess SI in GD treatment samples using validated multi-item instruments designed specifically for suicide risk assessment. Such data would allow researchers to distinguish thoughts of death or self-harm (which may reflect passive death wishes, active ideation, or nonsuicidal self-injury) from active suicidal risk and examine whether severity of ideation, rather than its mere presence, predicts differential clinical trajectories. The relationship among gender, SI, and GD warrants exploration in larger and more demographically diverse samples; although female gender has been identified as a correlate of SI in prior GD treatment studies [6], the sample in this study was predominantly male, which may have limited the power to detect gender differences. Longer follow-up windows are needed to evaluate the durability of gambling symptom improvement in patients who present with SI, as the observation window used here does not permit conclusions about sustained recovery or SI resolution over time. Future research should also examine SI as an outcome in its own right, tracking whether and at what rate SI remits over the course of GD treatment, rather than treating it solely as a baseline predictor. Studies should also document SI-related clinical responses, such as safety planning and escalation to higher levels of care, to determine whether patients with SI receive different care and whether that care modifies outcomes, and should examine reasons for noninitiation after intake by SI status. Finally, comparative effectiveness work across treatment modalities is needed to establish whether findings from this sample generalize to in-person and higher-acuity care settings and whether factors specific to virtually delivered care, such as accessibility and reduced stigma, contribute to the outcomes observed here.

Strengths and Limitations

Several strengths of this study should be noted. To the best of our knowledge, this is the first study to examine whether SI at treatment entry predicts treatment engagement and longitudinal symptom trajectories among adults receiving treatment for GD. The sample was large and drawn from a gambling treatment program, providing insight into treatment engagement and outcomes within a real-world model of specialized GD care. Data were collected prospectively as part of routine measurement-based care using validated instruments administered repeatedly throughout care, allowing longitudinal assessment of gambling symptom trajectories, while reducing the risk of retrospective recall bias. The use of routinely collected clinical data further enhances the clinical relevance of the findings by reflecting outcomes observed in everyday practice rather than under highly controlled research conditions. Engagement was measured using appointment-level records, and findings were robust across sensitivity analyses addressing

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outcome definitions, follow-up patterns, diagnostic status, and alternative codings of item 9.

The study also has limitations. The absence of a control group is an inherent constraint of the observational design; without a comparison condition, the observed symptom improvement cannot be attributed to treatment. The primary measure of SI, PHQ-9 item 9, was not designed as a stand-alone suicide risk screener. It captures the frequency of thoughts of death or self-harm over the prior 2 weeks and does not assess suicidal intent, plan, ideation intensity, or access to means. As a result, the prevalence estimate reported here reflects endorsement of thoughts of death or self-harm and may not correspond to clinical suicide risk as assessed by structured instruments. Dichotomizing item 9 also combines infrequent and near-daily thoughts; analyses using alternative codings yielded similar conclusions but were based on small groups. Although follow-up availability did not differ by SI status and results were robust to a pattern-mixture sensitivity analysis, only about one-third of patients remained under observation at 90 days, assessment timing was guided by provider judgment, and symptom-dependent dropout cannot be ruled out. The analytic sample was limited to patients who completed at least one session (approximately one-quarter of patients who completed intake) and patients who endorsed SI were less likely to initiate care. Findings therefore describe patients who entered outpatient care and may not generalize to individuals with GD who do not seek or initiate treatment, who are referred to higher-acuity settings, or who access treatment through in-person care. SI-related clinical responses, such as safety planning or escalation to a higher level of care, were not available, so we could not evaluate whether patients with SI received different care. Demographic characteristics were limited to age and gender; race and ethnicity, insurance status, and geographic location were not available, so we could not assess the sample's representativeness on these characteristics or examine them as potential confounders. Treatment episode status, such as planned completion, dropout, or ongoing care, was not available, so engagement measures could not distinguish completing treatment from disengaging, and some patients were still in care at the end of the observation window. Finally, psychiatric comorbidities were based on clinical diagnoses documented in the EHR and may therefore underestimate the prevalence of co-occurring conditions compared to studies using standardized research assessment protocols.

Conclusion

SI at intake is common in adults seeking treatment for GD and marks a clinically distinct subgroup with greater depressive and gambling symptom severity. Among patients who initiated outpatient care, SI was not associated with engagement, and patients with SI showed gambling symptom improvement that did not differ detectably from those without SI after starting from a modestly higher baseline. Patients with SI were, however, less likely to begin treatment after intake, highlighting the transition into care as a potential point of intervention. Prospective research using validated suicide risk instruments, documentation of SI-related clinical responses, longer follow-up windows, and SI resolution as a primary outcome is needed to build on these findings and inform the development of risk-stratified care protocols for this population.

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Data Availability

The dataset used for this retrospective cohort analysis is not publicly available, given Birches Health's privacy policy for patient data. However, analysis code and a data dictionary are available from the corresponding author upon reasonable request. Patient-level data cannot be shared under the data use agreement, but aggregated data are available on request.

Generative AI Use

The authors declare that generative AI (Claude) was used in a limited capacity during the preparation of this manuscript, for proofreading, editing, or language polishing and to confirm editorial changes and language revisions. Generative AI was not used to generate, draft, or substantively write any portion of the manuscript. The authors have written and approved all content and verified all outputs of the tool(s) used in manuscript preparation, and all authors take full responsibility for the integrity and accuracy of the final content presented.

Authors' Contributions

All authors contributed substantially to the manuscript. KM and EK contributed to conceptualization, formal analysis, and writing of the original draft. LH contributed to the formal analysis and rewriting of the revised manuscript. JH contributed to conceptualization and supervision. CG contributed to the description of the treatment program and critical revision. All authors have reviewed, edited, and approved the final manuscript.

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Conflicts of Interest

CG is employed by Birches Health, whose behavioral health services are the subject of this study. Fit Minded, Inc, served as the embedded scientific team for Birches Health and received compensation for those services. JH is the founder and chief executive officer of Fit Minded, Inc, and KM, EK, and LH are employees of Fit Minded, Inc. No author's employment status or compensation is contingent upon the direction or outcome of the findings. Birches Health had no right to approve, alter, or withhold the manuscript.

Multimedia Appendix 1

Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist.
[DOCX File , 12 KB-Multimedia Appendix 1]

Multimedia Appendix 2

Engagement sensitivity analysis.
[DOCX File , 9 KB-Multimedia Appendix 2]

Multimedia Appendix 3

Trajectory sensitivity analysis.
[DOCX File , 12 KB-Multimedia Appendix 3]

Multimedia Appendix 4

Record of analytic decisions.
[DOCX File , 13 KB-Multimedia Appendix 4]

Multimedia Appendix 5

Baseline characteristics by Gambling Symptom Assessment Scale (G-SAS) availability.
[DOCX File , 8 KB-Multimedia Appendix 5]

Multimedia Appendix 6

Model fit plots.
[DOCX File , 358 KB-Multimedia Appendix 6]

Multimedia Appendix 7

Gambling Symptom Assessment Scale (G-SAS) follow-up availability.
[DOCX File , 8 KB-Multimedia Appendix 7]

Multimedia Appendix 8

Baseline characteristics of patients with and without follow-up.
[DOCX File , 8 KB-Multimedia Appendix 8]

Multimedia Appendix 9

Patient Health Questionnaire-9 (PHQ-9) item 9 by intake suicidal ideation (SI) endorsement.
[DOCX File , 7 KB-Multimedia Appendix 9]

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Abbreviations

ADHD: attention-deficit/hyperactivity disorder
AIC: Akaike information criterion
EHR: electronic health record
GD: gambling disorder
G-SAS: Gambling Symptom Assessment Scale
IRR: incidence rate ratio
OR: odds ratio
PHQ-8: Patient Health Questionnaire-8
PHQ-9: Patient Health Questionnaire-9
SI: suicidal ideation
STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

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