Three-Year Outcomes After Brief Treatment of Substance Use and Mood Symptoms

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abstract

BACKGROUND: Screening, brief intervention, and referral to treatment (SBIRT) for adolescents exhibiting co-occurring substance use and mental health problems may improve outcomes and have long-lasting effects. This study examined the relationship between access to SBIRT and substance use, depression and medical diagnoses, and health services use at 1 and 3 years postscreening for such adolescents.

METHODS: The study draws from a cluster-randomized trial comparing SBIRT to usual care (UC) for adolescents endorsing past-year substance use and recent mood symptoms during visits to a general pediatrics clinic between November 1, 2011, and October 31, 2013, in a large, integrated health system (N = 1851); this sample examined the subset of adolescents endorsing both problems (n = 289). Outcomes included depression, substance use and medical diagnoses, and emergency department and outpatient visits 1 and 3 years later.

RESULTS: The SBIRT group had lower odds of depression diagnoses at 1 (odds ratio [OR] = 0.31; confidence interval [CI] = 0.11–0.87) and 3 years (OR = 0.51; CI = 0.28–0.94) compared with the UC group. At 3 years, the SBIRT group had lower odds of a substance use diagnosis (OR = 0.46; CI = 0.23–0.92), and fewer emergency department visits (rate ratio = 0.65; CI = 0.44–0.97) than UC group.

CONCLUSIONS: The findings suggest that SBIRT may prevent health complications and avert costly services use among adolescents with both mental health and substance use problems. As SBIRT is implemented widely in pediatric primary care, training pediatricians to discuss substance use and mental health problems can translate to positive outcomes for these vulnerable adolescents.

WHAT'S KNOWN ON THIS SUBJECT: Research suggests that screening, brief intervention, and referral to treatment (SBIRT) for adolescent substance use problems may improve patient outcomes. We examine SBIRT's benefits among adolescents in primary care with co-occurring substance use and mood symptoms.

WHAT THIS STUDY ADDS: Adolescents with access to SBIRT had improved substance use and depression outcomes and fewer emergency department visits at 3 years. Providing SBIRT in pediatric primary care may benefit adolescents with co-occurring substance use and mood symptoms.

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ARTICLE

Substance use and mental health problems co-occur frequently among adolescents and young adults[1,2] and are associated with an increased prevalence of health problems,[3,4] mortality, and morbidity.[5] Already associated individually with increased use of health care services,[6–9] when co-occurring, these problems exacerbate one another,[10] complicate treatments,[1] and generally yield poorer patient outcomes.[11] When onset of problems is in adolescence, individuals are more likely to develop severe substance use disorders with associated distress and impaired functioning in adulthood.[12–19] Unfortunately, relatively few adolescents seek or receive specialty behavioral health care for either problem.[20] Thus, effective early intervention strategies in a trusted, nonstigmatized, and accessible setting can have a long-lasting impact on their lives and is an important public health goal.

Screening, brief intervention, and referral to treatment (SBIRT) is a public health approach to prevention and early intervention for substance use problems. It includes systematic screening using evidence-based instruments, patient-centered brief interventions typically informed by motivational interviewing,[21] and a protocol for referring more severe patients to behavioral health treatment. Increasingly, research suggests that SBIRT for adolescent substance problems may decrease substance use and associated consequences,[22–24] depression symptoms,[25] and avoidable health services use.[26] A recent study compared adolescents screening positive for substance use who had access to SBIRT in pediatric primary care to adolescents without access using data from a cluster-randomized, pragmatic trial that examined the effectiveness of 2 modalities of delivering SBIRT (pediatrician delivered and behavioral clinician delivered) to usual care (UC). As

SBIRT for adolescents is implemented more widely, pediatric primary care practices are adopting a variety of clinical workflows, frequently employing SBIRT-trained physicians and nonphysicians, including behavioral health clinicians, on the care team.[27] We combined patients in the 2 SBIRT arms from the original trial and examined the relationship between access to SBIRT and depression, substance use, common medical diagnoses, and health services use at 1 and 3 years postscreening. We found the SBIRT group had a lower likelihood of psychiatric and medical conditions at 1 year postscreening and substance use problems at 3 years postscreening.[26] They used fewer psychiatry visits at 1 and 3 years and more specialty substance use treatment initiation at 3 years when needed.

Traditional randomized controlled trials often exclude patients with co-occurring problems despite their prevalence in pediatric primary care. In the current secondary analysis, we examine whether this more severe subpopulation, namely, adolescents in primary care reporting past-year substance use and recent mood symptoms at screening, see similar benefits in long-term substance use, psychiatric, and medical outcomes, and health services use. We address a critical gap in our understanding of the reach of SBIRT's benefits to these patients. We hypothesized that adolescents in the SBIRT arm would have lower rates of substance use and mental health diagnoses and lower rates of health services use at 1 and 3 years compared with those in the UC arm.

METHODS

Study Sample

The sample included adolescents aged 12 to 18 years with a visit to a general pediatrics clinic in a large, integrated health system in northern

California from November 1, 2011, to October 31, 2013 (Fig 1). The Teen Well-Check Questionnaire (TWCQ), a comprehensive screening instrument, was administered during regular adolescent well-check visits and included past-year alcohol, marijuana, and other drug use ("During the past year, did you [drink alcohol/use marijuana/use any other substance] to get high, calm down, or stay awake?" [yes or no]) and recent depression symptoms ("During the past few weeks, have you often felt sad, down or hopeless?" and "Have you seriously thought about killing yourself, made a plan, or tried to kill yourself?" [both yes or no]), which served as the initial substance use and mental health risk screening questions. Physicians were randomly assigned to 3 arms (assignment not blinded) which included (1) pediatricians trained in SBIRT; (2) a behavioral clinician arm in which pediatricians referred patients to a behavioral clinician for further assessment, brief intervention, and referral to treatment as needed; and (3) pediatricians who had access to the electronic health record (EHR) screening tools but no formal SBIRT training (UC). The 2 intervention arms are combined into an SBIRT arm. Additional study details are available elsewhere.[25,28] Patients who endorsed any of the alcohol, drug, or mood questions on the TWCQ or whose pediatrician determined them to be at risk on the basis of clinical assessment were considered positive and eligible for further assessment, brief interventions, and/or referral to treatment as needed ($N = 1871$). In this article, we focus on the subset of adolescents who screened positive for both mood and substance use symptoms on the TWCQ ($n = 289$).

Institutional review boards did not require pediatricians' consents, and the study was approved by the Institutional Review Boards of Kaiser Permanente Northern California
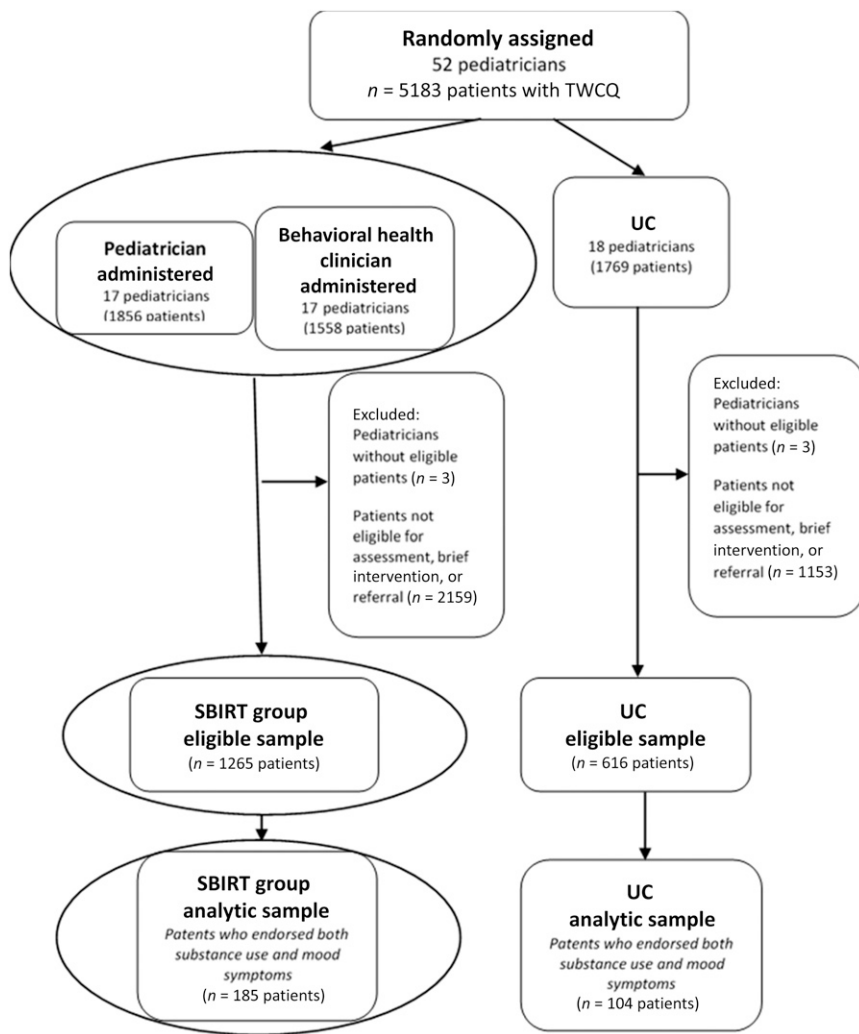
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FIGURE 1
Adolescents in primary care reporting both substance use and mood problems.

(KPNC) and the University of California, San Francisco.

Measures

A dichotomous indicator for the study group was created (1 = SBIRT group; 0 = UC). The EHR provided demographic data, including sex, age, race and ethnicity, and length of enrollment. The screening date was defined as the first date the adolescent screened positive for both past-year substance use and recent mood symptoms during the study period (November 1, 2011–October 31, 2013). To measure outcomes, *International Classification of Diseases, Ninth Revision* (ICD-9) and *International Classification of Diseases, 10th Revision* (ICD-10) diagnosis codes were used to create indicators for the presence of substance use (ICD-9: 291, 292, and 303–305; ICD-10: F10–F19), depression (ICD-9: 296.2, 296.3, 296.82, 298.0, 300.4, 301.12, 309.0, 309.1, 309.28, and 311; ICD-10: F32, F33, F34.1, F43.21, and F43.23), and common medical diagnoses during 1 and 3 years postscreening. Medical diagnoses included the 7 most common conditions in this age group[3,29,30]: asthma (ICD-9: 493; ICD-10: J45), arthritis (ICD-9: 710–719; ICD-10: M01, M02, M05–M08, and M11–M25), diabetes (ICD-9: 250; ICD-10: E08–E13), irritable bowel syndrome (ICD-9: 555, 560.89, and 564.1; ICD-10: K50, K58, and K566), migraine (ICD-9: 346; ICD-10: G43), rhinitis (ICD-9: 477; ICD-10: J30 and J31), and sinusitis (ICD-9: 461 and 473; ICD-10: J01 and J32).

Health services use data were categorized into inpatient and outpatient including emergency department (ED), primary care, substance use treatment, psychiatric treatment, and any outpatient use. Services use (eg, ED) outside of the health system was captured through automated claims data. Use was aggregated over the 1 and 3 years post the screening date. We examined dichotomous measures (1 if any use in that category; 0 otherwise) as well as visit counts during the 2 time periods for each type of use.

Statistical Analysis

We examined demographic differences between the study sample of patients who screened positive for both past-year substance use and recent mood symptoms ($n = 289$) and the larger cohort of eligible patients who did not ($n = 1582$). Subsequent analyses focused on the sample of patients who screened positive for both past-year substance use and recent mood symptoms and were conducted over 2 time periods: 1 and 3 years postscreening. We used χ^2 and t tests to examine differences in dichotomous and continuous covariates, respectively, between the SBIRT and UC groups. Separate multivariate logistic regression models were used to examine the presence of depression, medical, and substance use diagnoses over each time period, adjusting for corresponding previous diagnoses made in the year before the screening date. On the basis of preliminary analyses, we used negative binomial regression models to examine health care visit counts adjusting for previous use of corresponding services; the exponent of the coefficient gives the incidence rate ratio for the SBIRT group relative to

the UC group. Because of small numbers, we could not conduct multivariate analyses on inpatient events. All models adjusted for age, sex, race and ethnicity, and length of membership. Statistical significance was set at α = .05.

RESULTS

Demographics

Among the full sample, 14.7% of the SBIRT group (*n* = 185) and 16.9% of the UC group (*n* = 104; *P* = .23) screened positive for both past-year substance use and recent mood symptoms. These patients (Table 1) were more likely to be female (68.9% vs 53.2%; *P* ≤ .01) and older (16.1 [SE = 0.09] vs 15.8 [SD = 0.04]; *P* < .01) compared with patients not screening positive for both conditions. The race and ethnicity distribution was similar (*P* = .15). Patients who screened positive for both past-year substance use and recent mood symptoms reported significantly higher prevalence of depression diagnoses (18.3% vs 6.1%; *P* < .01) and were more likely to use ED (23.9% vs 16.2%; *P* < .01), psychiatry (23.9% vs 13.3%; *P* < .01), and primary care (71.3% vs 65.4%; *P* = .05) services in the year before the screening date. The brief intervention rate in the full sample was 14.9%, higher in the SBIRT arm than in the UC arm (21.3% vs 1.8%; *P* < .01).

Among adolescents screening positive for substance use and mood symptoms (*n* = 289), there was no difference in sex between the SBIRT and UC groups (72.4% vs 62.5%; *P* = .08; Table 2). The sample was mostly nonwhite (40.6% Black, 22.7% Hispanic, 11% Asian American patients); the race and ethnicity distribution was similar across the SBIRT and UC groups (*P* = .47). The mean age did not differ (*P* = .87) between the SBIRT (16.07 years; SE = 0.10 years) and UC groups (16.10 years; SE = 0.13 years). The brief

intervention rate was 19.4% and was higher in the SBIRT arm than in the UC arm (29.2% vs 1.9%; *P* < .01).

Comorbidity

The prevalence of depression diagnoses in the year before the screening date did not differ between the SBIRT and UC groups (16.2% vs 21.9%; *P* = .54; Table 3). Over 1 year postscreening, the SBIRT group had a significantly lower unadjusted prevalence of depression diagnoses than the UC group (3.8% vs 11.4%; *P* = .01). Over 3 years, the SBIRT group continued to have a lower prevalence of depression diagnoses (16.8% vs 27.6%; *P* = .03). Using multivariate

logistic regression analyses, we found that the SBIRT group had lower odds of depression diagnoses (odds ratio [OR] = 0.31; confidence interval [CI] = 0.11–0.87) than the UC group (Table 4) at 1 year postscreening after adjusting for patient characteristics. Similar results were observed at 3 years postscreening, with the odds of a depression diagnosis (OR = 0.51; CI = 0.28–0.94) being almost 50% lower in the SBIRT group than in the UC group.

Prevalence of unadjusted substance use diagnoses were similar at the 1-year pre- and postscreening and did not differ between the 2 groups (1

TABLE 1 Comparison Between Adolescents With Both Past-Year Substance Use and Recent Mood Symptoms and Those Without (*n* = 1871)

Full Sample	Adolescents With Past-Year Substance Use and Recent Mood Problems (*n* = 289)	Adolescents With Either Past-Year Substance Use or Recent Mood Problems (*n* = 1582)	*P*
Demographics, *n* (%)			
Women	199 (68.9)	842(53.2)	<.01
Race and ethnicity, *n* (%)			
White	65 (22.5)	461 (29.1)	.15
Black	111 (38.4)	525 (33.2)	—
Asian American	30 (10.4)	189 (11.9)	—
Hispanic	62 (21.5)	332 (21.0)	—
Other	5 (1.7)	20 (1.3)	—
Age, mean (SD)	16.1 (0.08)	15.8 (0.04)	<.01
Comorbidity in year before, *n* (%)			
Any depression diagnosis	53 (18.3)	96 (6.1)	<.01
Any substance use diagnosis	8 (2.8)	48 (3.0)	.91
At least 1 chronic condition[a]	52 (18.0)	284 (18.0)	.99

—, not applicable.

[a] Chronic conditions included asthma, arthritis, diabetes, irritable bowel syndrome, migraine, rhinitis, and sinusitis.

TABLE 2 Demographic Characteristics of Analytic Sample by SBIRT Group (*n* = 289)

Analytic Sample	SBIRT Group (*n* = 185)	UC (*n* = 104)	*P*
Demographics, *n* (%)			
Women	134 (72.4)	65 (62.5)	.08
Race ethnicity, *n* (%)			
White	37 (20)	28 (26.9)	.47
Black	72 (38.9)	39 (37.5)	—
Asian American	21 (11.4)	9 (8.7)	—
Hispanic	42 (22.7)	20 (19.2)	—
Other	2 (1)	3 (2.9)	—
Age, mean (SD)	16.1 (0.1)	16.1 (0.1)	.87

—, not applicable.

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TABLE 3 Unadjusted Prevalence of Depression, Substance Use and Medical Diagnoses, and Health Care Use Over Time

	1 y Prescreening			1 y Prescreening			1 y Prescreening		
	SBIRT Group (n = 185)	UC (n = 104)	P	SBIRT Group (n = 185)	UC (n = 104)	P	SBIRT Group (n = 185)	UC (n = 104)	P
Comorbidity, n (%)									
Any depression diagnosis	30 (16.2)	23 (21.9)	.21	7 (3.8)	12 (11.4)	.01	31 (16.8)	29 (27.6)	.03
Any substance use diagnosis	5 (2.7)	3 (2.9)	.93	4 (2.2)	3 (2.9)	.70	22 (11.9)	21 (20.0)	.06
Any chronic condition[a]	28 (15.1)	24 (22.9)	.09	11 (5.9)	14 (13.3)	.03	64 (34.6)	43 (41.0)	.25
Any use, n (%)									
Hospitalization	2 (1.1)	0 (0.0)	.29	0 (0.0)	1 (1.0)	.18	6 (3.2)	7 (6.7)	.17
Any outpatient	142 (76.8)	80 (76.2)	.97	52 (28.1)	38 (36.2)	.14	161 (87.0)	92 (87.6)	.72
ED	42 (22.7)	27 (25.7)	.53	11 (5.9)	11 (10.5)	.15	67 (36.2)	47 (44.8)	.13
Specialty substance use treatment	4 (2.2)	0 (0.0)	.13	1 (0.5)	0 (0.0)	.45	8 (4.3)	8 (7.6)	.23
Psychiatry	46 (24.9)	23 (21.9)	.60	12 (6.5)	10 (9.5)	.34	38 (20.5)	27 (25.7)	.29
Primary care	130 (70.3)	76 (72.4)	.61	46 (24.9)	33 (31.4)	.21	157 (84.9)	88 (83.8)	.95
No. visits, mean (SE)									
All outpatient	6.55 (0.81)	5.63 (0.01)	.50	1.51 (0.31)	2.01 (0.43)	.35	12.11 (1.76)	13.13 (1.73)	.68
ED	0.31 (0.05)	0.39 (0.08)	.35	0.08 (0.02)	0.17 (0.06)	.14	0.78 (0.11)	1.17 (0.22)	.12
Specialty substance use treatment	0.32 (0.22)	0.00 (0.00)	.15	0.14 (0.14)	0.00 (0.00)	.32	2.59 (1.18)	2.05 (1.22)	.75
Psychiatry	2.56 (0.53)	2.52 (0.87)	.97	0.36 (0.12)	0.61 (0.25)	.39	2.04 (0.46)	2.60 (0.82)	.55
Primary care	1.97 (0.17)	1.78 (0.20)	.49	0.68 (0.12)	0.86 (0.18)	.41	5.12 (0.44)	5.28 (0.51)	.82

[a] Any chronic condition included asthma, arthritis, diabetes, irritable bowel syndrome, migraine, rhinitis, and sinusitis.

year prescreening: 2.7% vs 2.9% for SBIRT and UC, respectively; P = .93; 1 year postscreening: 2.2% vs 2.9% for SBIRT and UC, respectively; P = .70). Prevalence of substance use diagnoses increased to 11.9% for SBIRT and 20% for UC by 3 years, but the difference was not statistically significant (P = .06). Multivariate analyses could not be performed for substance use diagnoses at 1 year postscreening because of quasi-separation of the data. At 3 years postscreening, the odds of a substance use diagnosis were significantly lower in the SBIRT group relative to the UC group (OR = 0.46; CI = 0.23–0.92).

Approximately 18% of the sample had at least 1 of the 7 most common pediatric medical conditions in the year before screening with no differences between the SBIRT and UC groups (15.1% vs 22.9%; P = .09). The proportion of patients with a medical condition decreased in both groups between 1 year pre- and 1 year postintake. The SBIRT group had a significantly lower rate of medical conditions at 1 year postscreening (5.9% vs 13.3%; P = .03). Over 3 years, 37% of the sample had a diagnosis for at least 1 of the abovementioned common pediatric conditions, with no differences between groups. Controlling for demographics and previous prevalence of medical conditions, the odds of medical conditions were similar between the 2 groups (Table 4) at 1 year (OR = 0.48; CI = 0.21–1.14) and 3 years, (OR = 0.85; CI = 0.49–1.46).

Service Use

The SBIRT and UC groups had similar rates of service use in the year before screening. More than one-fifth of the sample had an ED visit, but rates were similar across groups. ED use was lower in the 1-year postscreening but did not differ between the SBIRT and UC groups (5.9% vs 10.5% for SBIRT and UC, respectively; P = .15); multivariate analyses of ED use could not be performed because of low use rates and quasi separation of data. Analyses of the 3-year postscreening data revealed the SBIRT group had significantly fewer ED visits (rate ratio = 0.65; CI = 0.44–0.97) compared with the UC group (Table 5). The number of hospitalizations was too few to conduct multivariate analyses.

Rates of primary care visits were similar between the groups in the year before screening (70.3% vs 72.4% for SBIRT and UC, respectively; P = .61; Table 3) and in the postscreening periods: 24.9% vs 31.4% for SBIRT and UC, respectively, at 1 year (P = .21) and 84.9% vs 83.8% for SBIRT and UC, respectively, at 3 years (P = .95). Psychiatry department and substance use treatment visit rates revealed similar patterns across groups. Although there was an increase in overall services use by 3 years, the unadjusted rates and multivariate analyses of primary care, psychiatry department, and substance use treatment visits were similar between the SBIRT and UC groups.

DISCUSSION

In this secondary analysis study, we examined the relationship between access to SBIRT in pediatric primary care and subsequent substance use, depression, and medical diagnoses and services use over 1 and 3 years in a sample of adolescents self-reporting both past-year substance use and recent mood symptoms during a pediatric well-check visit. We found that the SBIRT group had lower rates

of subsequent substance use and depression diagnoses and ED use compared with those in the UC group.

Findings suggest that access to SBIRT services may be beneficial in reducing depression diagnoses over 3 years postscreening in adolescents with co-occurring symptoms. These adolescents also had half the likelihood of having a substance use diagnosis 3 years postscreening. The findings are encouraging because, if untreated, the complex population of adolescents with co-occurring substance use and mood symptoms with poor prognoses have a higher likelihood of developing other comorbidities.[31–33] Integrated behavioral health services like SBIRT may help prevent the escalation of substance disorders in later adolescence and young adulthood. That medical comorbidities did not differ across study arms over the course of the study supports the likelihood that reductions in substance and mental health diagnoses were related to access to SBIRT. Relatively few eligible patients received formal brief interventions (29.2% in the combined SBIRT arm), yet we found significant intervention effects, suggesting that higher intervention rates might have found greater population-level effects.

Early intervention in a trusted, nonstigmatized, and accessible setting may eliminate treatment barriers arising from patients and families having to navigate parallel, often nonintegrated mental health and substance use treatment systems.[34] The lower rates of substance use and depression diagnoses 3 years postscreening despite only a small proportion of eligible adolescents receiving a formal intervention suggest that implementing integrated behavioral health services in pediatric clinics may benefit patients beyond the intervention. Training pediatricians how to discuss substance use and mental health problems and/or embedding a behavioral health clinician in the clinic may increase provider awareness of problems and their confidence in engaging with patients about them.

TABLE 4 Multivariate Analyses of Depression, Substance Use, and Chronic Medical Diagnoses 1 and 3 Years Postscreening

	1-y Postscreening				3-y Postscreening			
	OR	95% Confidence Limits		P	OR	95% Confidence Limits		P
Depression diagnosis								
SBIRT group (reference = UC)	0.31	0.11	0.87	**	0.51	0.28	0.94	**
Female (reference = male)	2.64	0.68	10.28	—	2.27	1.07	4.81	**
Age	1.07	0.71	1.63	—	0.84	0.66	1.06	—
Race and ethnicity (reference = white)								
Asian American	0.21	0.02	2.09	—	0.30	0.07	1.22	—
Black	0.79	0.25	2.52	—	0.73	0.34	1.59	—
Hispanic	0.26	0.05	1.39	—	0.72	0.31	1.67	—
Unknown or missing	0.39	0.04	3.69	—	0.45	0.11	1.85	—
Previous depression diagnosis	6.65	2.38	18.54	**	3.13	1.57	6.26	**
Substance use diagnosis[a]								
SBIRT group (reference = UC)	N/A	N/A	N/A	—	0.46	0.23	0.92	**
Female (reference = male)	N/A	N/A	N/A	—	1.69	0.77	3.71	—
Age	N/A	N/A	N/A	—	1.24	0.95	1.64	—
Race and ethnicity (reference = white)	N/A	N/A	N/A					
Asian American	N/A	N/A	N/A	—	0.16	0.01	1.66	—
Black	N/A	N/A	N/A	—	1.09	0.42	2.85	—
Hispanic	N/A	N/A	N/A	—	1.89	0.70	5.07	—
Unknown or missing	N/A	N/A	N/A	—	1.79	0.45	7.06	—
Previous substance use diagnosis	N/A	N/A	N/A	—	13.08	2.63	65.07	**
Chronic medical diagnosis								
SBIRT group (reference = UC)	0.48	0.21	1.14	—	0.85	0.49	1.46	—
Female (reference = male)	0.89	0.36	2.16	—	1.40	0.78	2.49	—
Age	0.97	0.70	1.34	—	0.85	0.70	1.04	—
Race and ethnicity (reference = white)								
Asian American	0.27	0.03	2.33	—	0.56	0.19	1.63	—
Black	0.57	0.20	1.59	—	0.83	0.41	1.68	—
Hispanic	0.53	0.16	1.78	—	0.72	0.34	1.56	—
Unknown or missing	0.44	0.05	3.86	—	0.60	0.19	1.96	—
Previous medical condition	2.70	1.07	6.78	**	6.88	3.42	13.82	**

Any chronic condition included asthma, arthritis, diabetes, irritable bowel syndrome, migraine, rhinitis, and sinusitis. N/A, not applicable; —, not significant.

[a] One-year postscreening multivariate analyses could not be performed because of quasi separation of the data.

** $P < .05$.

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TABLE 5 Multivariate Analyses of Health Services Use Over 3 Years Postscreening

	Rate Ratio	95% CI		P
ED use				
SBIRT group (reference = UC)	0.65	0.44	0.97	**
Female (reference = male)	1.82	1.18	2.80	**
Age	1.18	1.02	1.36	**
Race and ethnicity				
Asian American	0.27	0.10	0.72	**
Black	1.30	0.77	2.21	—
Hispanic	1.29	0.73	2.27	—
Unknown or missing	1.12	0.49	2.54	—
Psychiatric treatment use				
SBIRT group (reference = UC)	1.00	0.55	1.85	—
Female (reference = male)	1.41	0.76	2.62	—
Age	0.70	0.57	0.87	**
Race and ethnicity (reference = white)				
Asian American	0.20	0.06	0.63	**
Black	0.32	0.14	0.70	**
Hispanic	0.43	0.18	1.04	*
Unknown or missing	0.93	0.27	3.17	—
Primary care use				
SBIRT group (reference = UC)	0.89	0.69	1.15	—
Female (reference = male)	1.64	1.26	2.14	**
Age	0.92	0.84	1.01	*
Race and ethnicity (reference = white)				
Asian American	0.85	0.53	1.37	—
Black	1.09	0.78	1.50	—
Hispanic	1.10	0.77	1.57	—
Unknown or missing	1.30	0.77	2.17	—
All outpatient use				
SBIRT group (reference = UC)	0.89	0.65	1.22	—
Female (reference = male)	1.22	0.89	1.69	—
Age	0.91	0.82	1.01	*
Race and ethnicity (reference = white)				
Asian American	0.46	0.25	0.83	**
Black	0.59	0.39	0.88	**
Hispanic	1.11	0.71	1.74	—
Unknown or missing	1.39	0.45	1.61	—

—, not significant.
* P < .10.
** P < .05.

Another important finding pertained to the use of ED visits. Research reveals that adults with co-occurring substance use and mental health problems are high users of costly and potentially avoidable health care services.[8] As with adults, adolescents screening positive for past-year substance use and recent mood symptoms were also higher users of ED and primary care services than their counterparts without symptoms before index screening. Previous research[35–37] reveals that <50% of adolescents visit a primary care provider (PCP) in a given 12-month period and even fewer visit for preventive care. However, because >70% of this group had visits to primary care in the prescreening period, an opportunity to identify substance use problems and intervene early was available. The PCP visit rates dropped significantly in the postscreening period, which is more in alignment with preventive care visit rates in this age group. Therefore, taken in context, the finding of a lower rate of ED use over 3 years postscreening associated with access to SBIRT services is valuable for developing policy. An investment in prevention and early intervention for adolescent substance use and mental health upstream in primary care may reduce the use of subsequent costly downstream services, even among patients more likely to use health services. In future studies, researchers should explore the specific cost offsets of providing SBIRT in pediatric primary care.

Post hoc analyses revealed that receiving a brief intervention was associated with significantly lower rates of ED services at 1 year, suggesting SBIRT may help avert problems leading to emergency medical care. A recent study of >100 Massachusetts pediatricians and >100 000 of their patients supports this notion.[38] In the study, authors found that implementation of a comprehensive model of integrated behavioral health, including provider training and on-site behavioral health resources, resulted in increased pediatrician behavioral health intervention self-efficacy and satisfaction and reductions in ED use. In future studies, researchers should further explore whether trainings on substance use screening and intervention methods such as SBIRT have ripple effects on the delivery of behavioral health services more broadly for pediatric PCPs and their practices.

This study has several limitations. It was conducted in an integrated health care system with an insured population (albeit with a significant market share representative of the region's sociodemographic composition) and may not be generalizable to uninsured populations. In this pragmatic trial, we did not recruit patients and administer standardized, research-caliber assessments but relied on EHR-based clinical information collected during regular clinical care. This strengthened the study by allowing us to examine the population base of adolescents with pediatric visits in the clinic,

increasing its generalizability to pediatric primary care populations. However, it limited our examination of problems and clinical outcomes to assessments and diagnoses documented during the study period. Using *International Classification of Diseases* codes for substance use disorder diagnoses in primary care has significant limitations because PCPs often do not recognize or diagnose substance use disorder, and if they do, they often do not document them. Possibly, provider SBIRT training enhanced PCP awareness of and attention to substance use disorder diagnoses. If so, findings may actually underestimate the impact of the intervention. Also, it is possible that a patient had no visit during this time period; thus, no opportunity for a documented diagnosis was available.

CONCLUSIONS

This study is among the first to examine the relationship between access to SBIRT and health outcomes and use in a sample of adolescents reporting both past-year substance use and recent mood symptoms. Adolescents in the SBIRT group had lower odds of depression and substance use diagnoses over 3 years and a decrease in ED use over 3 years. These findings point to SBIRT's potential as an early intervention strategy for preventing more serious substance use disorders with mental health complications and for averting costly use of services as adolescents enter adulthood.

ABBREVIATIONS

CI: confidence interval
ED: emergency department
EHR: electronic health record
ICD-9: *International Classification of Diseases, Ninth Revision*
ICD-10: *International Classification of Diseases, 10th Revision*
KPNC: Kaiser Permanente Northern California
OR: odds ratio
PCP: primary care provider
SBIRT: screening, brief intervention, and referral to treatment
TWCQ: Teen Well-Check Questionnaire
UC: usual care

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Three-Year Outcomes After Brief Treatment of Substance Use and Mood Symptoms

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