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Original Articles

Identifying Adolescents at Highly Elevated Risk for Suicidal Behavior in the Emergency Department

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Abstract

Objective: The feasibility and concurrent validity of adolescent suicide risk screening in medical emergency departments (EDs) has been documented. The objectives of this short-term prospective study of adolescents who screened positive for suicide risk in the ED were: 1) to examine adolescents' rate of suicidal behavior during the 2 months following their ED visits and compare it with reported rates for psychiatric samples; and 2) to identify possible predictors of acute risk for suicidal behavior in this at-risk sample.

Method: Participants were 81 adolescents, ages 14–19 years, seeking services for psychiatric and nonpsychiatric chief complaints, who screened positive for suicide risk because of recent suicidal ideation, a suicide attempt, and/or depression plus alcohol or substance misuse. A comprehensive assessment of suicidal behavior, using the Columbia-Suicide Severity Rating Scale, was conducted at baseline and 2 month follow-up.

Results: Six adolescents (7.4%) reported a suicide attempt and 15 (18.5%) engaged in some type of suicidal behavior (actual, aborted, or interrupted suicide attempt; preparatory behavior) during the 2 months following their ED visit. These rates suggest that this screen identified a high-risk sample. Furthermore, adolescents who screened positive for suicidal ideation and/or attempt *plus* depression and alcohol/substance misuse were most likely to engage in future suicidal behavior (38.9%).

Conclusions: In this study, use of a higher screen threshold (multiple suicide risk factors) showed promise for identifying highly elevated acute risk for suicidal behavior.

Introduction

Suicide is the second leading cause of death among adolescents between the ages of 12 and 17 years in the United States (Centers for Disease Control and Prevention [CDC] 2014). Moreover, nationally representative data indicate that, in the past year, 17.0% of high school students have had serious thoughts of attempting suicide and 8.0% have made a suicide attempt (Kann et al. 2014). Adolescents' suicidal thoughts and behaviors are associated with psychosocial impairment, personal and family suffering, psychiatric hospitalization, and elevated risk for subsquent suicidal behavior (Gould et al. 2003; Bridge et al. 2006; Nock et al. 2013) and suicide (Rao et al. 1993). A recent nationally representative study of suicidal ideation and behavior among 6483 adolescents between the ages of 13 and 18 years found that 33.9% of adolescents with suicidal ideation made a suicide attempt, and that 86.1% of these adolescents (i.e, 29.2% of ideators) attempted suicide within 12 months of the onset of ideation (Nock et al. 2013).

Suicide risk screening – the proactive identification of adolescents at risk for suicide – has substantial public health significance because, without screening, many adolescents at high risk go unrecognized and untreated (King et al. 2009b; Bridge et al. 2012; Olfson et al. 2012). Many adolescents who die by suicide have never received any mental health services (Brent et al. 1988; Marttunen et al. 1992; Shaffer et al. 1996). For ~50% of adolescent suicide deaths, the initial suicide attempts are fatal (Brent et al. 1988; Marttunen et al. 1992; Shaffer et al. 1996).

A strong argument can be made for suicide risk screening in the emergency department (ED) because the ED has become a primary triage site for the mental health system (Grupp-Phelan et al. 2007a,b). Approximately one third of all adolescents in the United States seek emergency services each year (Britto et al. 2001). Moreover, adolescents are the age group most likely to visit EDs, and the rate of self-harm-related visits for adolescents ages 15–19 years has quadrupled over the past two decades (Ting et al. 2012). In addition to psychiatric chief complaints, which are frequently associated with elevated suicide risk, several common reasons for seeking emergency services, such as interpersonal violence and alcohol poisoning or drug overdose, are associated with elevated suicide risk (King et al. 2013).

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Fortunately, research has documented the potential utility of youth suicide risk screening in the medical ED (King et al. 2009b; Horowitz et al. 2012). Screening for behavioral health issues (e.g., Fein et al. 2010) and, more specifically, screening for suicide risk, have been shown to be acceptable to families, feasible, and effective at identifying previously unidentified youth at risk (Olfson et al. 2005; King et al. 2009b; O'Mara et al. 2012). It is perhaps not surprising that a high proportion of adolescents who present for nonpsychiatric reasons and screen positive for suicide risk were previously unidentified and were not receiving mental health services (King et al. 2009b).

Despite the frequency with which adolescents present to EDs with suicide attempts, nonsuicidal self-injury (NSSI), suicidal thoughts, or other suicide risk factors, screening instruments that are designed to identify adolescents with high sensitivity, missing few at risk, generally struggle with the problem of low specificity (King et al. 2013). That is, they identify too many adolescents at risk, yielding false positives. One promising screening tool is a multicomponent screen that defines a positive screen as recent suicidal behavior, current suicidal ideation, or co-occurring depression and alcohol/substance abuse (King et al. 2009b). A second promising tool is the Ask Suicide-Screening Questions (ASQ), a brief screen that consists of four questions assessing current thoughts of being better off dead, wishing to die, suicidal ideation, and past suicide attempts (Horowitz et al. 2012). Each of these instruments has shown evidence of strong concurrent validity; however, neither has been evaluated longitudinally to determine its predictive validity for suicide attempts. Finally, a third screening tool is the Columbia-Suicide Severity Rating Scale (C-SSRS) (Posner et al. 2011), which was initially designed as a classification instrument for suicidal ideation, NSSI, and suicide-related behaviors. Recent studies of patients seeking emergency services for psychiatric chief complaints indicate that the ''duration'' of suicidal ideation predicts the likelihood of a return ED visit for a psychiatric chief complaint (Gipson et al. 2014) and that the suicidal ideation severity and intensity subscales predict future suicide attempts (Horwitz et al. 2014).

One of the challenges in the prediction and prevention of suicidal behavior is the long-standing reliance on patients' self-report of suicidal thoughts and intention. Some individuals may be motivated to deny or underreport suicidal thoughts for fear of being shamed or hospitalized. This may be particularly true for adolescent males, for whom suicidal ideation is not as strong a predictor of suicide attempts as it is for females (Lewinsohn et al. 2001; King et al. 2014b). The scope of this challenge is highlighted by the fact that $\sim$ 78% of hospitalized adult patients who die by suicide explicitly deny suicidal thoughts or intent in their last communication before dying (Busch et al. 2003). Moreover, one of the highest risk times for suicide death is the week immediately following hospital discharge (Qin and Nordentoft 2005), suggesting that many patients who convince clinicians that they are safe to leave the hospital are still at high risk. Given this challenge and the fact that $\sim$90% of adolescents who die by suicide have at least one psychiatric disorder (e.g., Brent et al. 1993; Shaffer et al. 1996), a strong argument can be made for the importance of considering multiple risk factors in a suicide risk screen. The presence of co-occurring conditions, such as multiple psychiatric disorders or a depressive disorder and substance abuse, are associated with particularly high risk for suicidal behavior (Brent et al. 1999).

This short-term prospective study used the multiple-component suicide risk screen described (suicide attempt, suicidal ideation, depression plus alcohol/substance abuse [King et al. 2009b]) to identify adolescents at elevated risk for suicidal behavior in the ED. Adolescents who screened positive for elevated risk were reassessed 2 months after their ED visit. This time period is consistent with our objective to detect acute or near-term risk of suicidal behavior, which is most pertinent to risk formulation and disposition in the ED. Study aims were: 1) to examine adolescents' rate of suicidal behavior during the 2 months following their ED visits and compare it with reported rates for high-risk psychiatric samples; and 2) to identify possible predictors of acute risk for suicidal behavior in this at-risk sample.

Methods

Participants

Participants were adolescents seeking services from a medical ED in an urban area, who were originally recruited for a National Institute of Mental Health-funded intervention study: Teen Options for Change (TOC) (King et al. 2014a). Adolescents (ages 14–19) were invited to participate in this original study if they screened positive for elevated suicide risk based on a 22 item screen assessing the following: 1) Recent suicidal ideation (suicidal thoughts within past 2 weeks), 2) a suicide attempt in the past month, or 3) elevated depressive symptoms in combination with either drug or alcohol misuse. Exclusion criteria were level one trauma and significant cognitive impairment.

The primary analyses for the present study were restricted to 81 adolescents who completed a baseline assessment and a follow-up assessment 2 months later. Of the 624 adolescents who consented to participate in the study, 99 (15.9%) screened positive for suicide risk. There were no significant differences in age or sex between those who consented and completed the suicide risk screen (79% of eligible adolescents) and those who refused participation. Among adolescents who screened positive, 90 (90.9%) completed the baseline assessment in the ED, and 81 (90%) of these adolescents completed the 2 month follow-up assessment. There were no significant differences in age, sex, or screening scale scores (e.g., depression, suicidal ideation, suicide attempt, drug/alcohol use) between the 18 youth who screened positive but did not complete all of the assessments and the 81 adolescents in this study sample.

The distribution of eligible participants at study entry and follow-up, with reasons for positive suicide risk screens, are provided in Figure 1. The positive screen types for these 81 adolescents were depression and alcohol/substance misuse (44.4%), recent suicidal ideation or attempt (33.3%), or both (depression, alcohol/substance misuse and suicidal ideation and/or attempt [22.2%]).

Forty-nine of the 81 participants in this sample were included in the TOC randomized controlled trial (King et al. 2014a), with 27 having been randomized to the TOC condition, which involved personalized feedback to adolescents regarding their screening responses, a 20–30 minute adapted motivational interview in the ED focused on developing a personal action plan consistent with goals and values, a handwritten follow-up note, and one telephone check-in.

Screen measures

Depressive Symptoms. The 10 item Reynolds Adolescent Depression Scale-2: Short Form (RADS-2:SF) (Reynolds 2008) was used to assess severity and frequency of depressive symptoms for the screen and follow-up assessments. Respondents are asked to rate ''How you usually feel'' on a four point Likert scale ranging

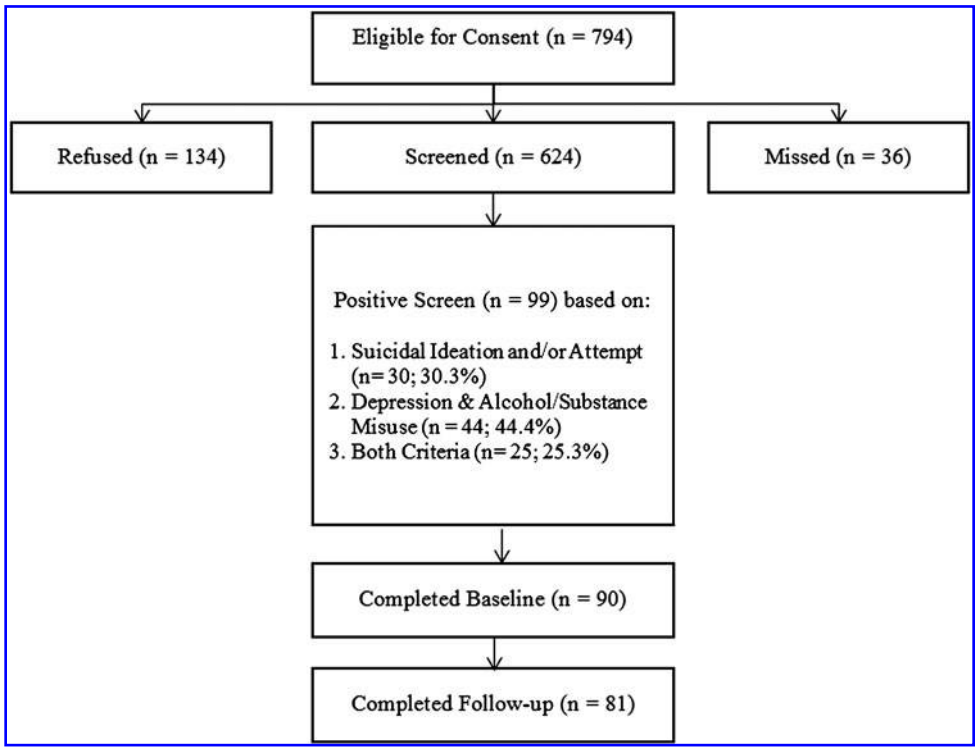

FIG. 1. Participant flow chart and reasons for positive suicide risk screen.

from ''Almost never'' to ''Most of the time.'' Sample items include ''I feel I am no good'' and ''I feel like nothing I do helps anymore.'' The RADS-2:SF has demonstrated acceptable reliability and validity in adolescents, and has similar psychometrics as the longer RADS-2 (Milfont et al. 2008). Elevated depressive symptoms were considered to be at a score ≥ 26.

Suicidal Thoughts and Behaviors. Three dichotomous yes/no questions were used to assess: 1) A wish to be dead during the past 2 weeks, 2) suicidal thoughts during the past 2 weeks, and 3) a suicide attempt in the past month. Affirmative responses to recent suicidal thoughts or suicide attempt (items 2 and 3) indicated a positive screen.

Alcohol Use. Alcohol Use Disorders Identification Test (AUDIT-10) (Saunders et al. 1993) assesses the current presence of at-risk drinking. The first three items (AUDIT-C) were used during the screen and the full 10 item AUDIT was used at baseline and follow-up assessments. The AUDIT has 10 items, each scored on a five point scale from 0 to 4 that assesses the frequency and intensity of alcohol consumption. It has been validated for use with adolescents in the ED (Chung et al. 2002) and has specificities and sensitivities comparable with or exceeding those of other alcohol screening measures (Reinert and Allen 2007). A positive alcohol screen was defined as an AUDIT-C score ≥ 3.

Drug Use. The six item CRAFFT was used to assess current drug and alcohol consequences in adolescents simultaneously (Knight et al. 2002). The CRAFFT was used during the screen, and questions were altered to only ask about drug use consequences, as alcohol was assessed independently. The CRAFFT has demonstrated strong sensitivity and specificity for identifying drug-related problems among adolescent medical patients (Knight et al. 2002). A positive drug use screen was defined as a score ≥ 2.

Additional baseline measures

Suicidal Thoughts and Behavior. The C-SSRS (Posner et al. 2011), a semistructured clinical interview, was used to assess suicidal ideation severity and suicidal behaviors at baseline and follow-up assessments. During the baseline assessment, we inquired about suicidal ideation in the past week and about suicidal behavior in the past week and over the patient's lifetime. During the follow-up assessment, we asked about suicidal behavior occurring since the baseline assessment, as well as the past week's suicidal ideation and behavior. The behavior subscale assesses the presence (yes/no) of actual (self-injurious act with at least some intent to die); aborted (behavior taken toward making attempt [e.g., pills in hand], but patient stops self); and interrupted (behavior taken toward making attempt, but outside person/source prevents attempt) attempts; in addition, it assesses preparatory behavior (e.g., collecting pills, writing suicide note) and NSSI (self-harm act with no intention to commit suicide).

The C-SSRS has been validated for use with clinical adolescent and adult populations and has demonstrated strong psychometric properties (Posner et al. 2011). It has also demonstrated predictive validity among adolescent and young adults seeking psychiatric emergency services (Gipson et al. 2014; Horwitz et al. 2014). Our primary suicidal behavior outcome was broadly defined to include preparatory behavior and actual, aborted, or interrupted suicide attempts (using dichotomous yes/no scores for each item). Analyses were comparable with and without the inclusion of preparatory behaviors, and are reported both ways. Elevated suicidal ideation was not included in any analyses as a form of suicidal behavior.

Suicidal Ideation. Suicidal Ideation Questionnaire-Junior (SIQ-JR) (Reynolds 1988) is a 15 item self-report questionnaire that measures frequency of a range of suicidal thoughts on a seven point scale ranging from ''I never had this thought'' to ''Almost every day.'' The SIQ-JR was used during baseline and follow-up assessments. Total scores can range from 0 to 90. Sample items include ''I thought about telling people I plan to kill myself'' and ''I wished I were dead.'' The SIQ-JR. has well-documented psychometric properties (Reynolds 1988) and has shown predictive validity for suicidal thoughts and attempts in adolescents following their psychiatric hospitalization (King et al. 1997), although a more recent study reported an absence of predictive validity for adolescent males following psychiatric hospitalization (King et al. 2014b).

Hopelessness. The Beck Hopelessness Scale (BHS) (Beck and Steer 1988), a 20 item true–false self-report questionnaire was used to assess negative attitudes about the future. The BHS was used during baseline and follow-up assessments. Sample items include ''My future seems dark to me'' and ''I can look forward to more good times than bad.'' The BHS has demonstrated strong reliability and validity in adolescent samples (Goldston et al. 2001).

Treatment History. The Child and Adolescent Services Assessment-Revised (CASA-R) (Ascher et al. 1996; Dulcan 2003) is a questionnaire that assesses use of mental health services by children and adolescents ages 8–18 years across a wide range of treatment settings. Its test–retest reliability varies with intensity of treatment, with the most intensive treatment having very high reliability, treatment of moderate intensity having moderate reliability, and services provided in the child's natural settings having fairly low reliability. Because of the relatively low rates of treatment in the study sample, we consolidated information from multiple items. History of inpatient psychiatric or substance use treatment was defined to include treatment on an inpatient unit in a psychiatric hospital, a psychiatric inpatient unit of a general hospital, a medical unit in a general hospital for mental health reasons, or an inpatient alcohol or drug treatment unit or detox unit. A psychiatric treatment log (Dulcan 2003) was also used to assess whether there was any ongoing psychotropic medication or outpatient therapy. All treatment indicators were coded dichotomously to indicate any level of treatment.

Procedures

Adolescents were recruited from a general ED in a midwestern region of the United States between November 2009 and October 2010. Data were collected during late afternoon and evening recruitment shifts after obtaining adolescent written informed assent and parent/guardian informed consent, when present. Parent/guardian consent was waived as a requirement for minors when parents/guardians were not present (institutional review board [IRB] approval). Adolescents were approached in the waiting room or in their assigned treatment rooms. Research staff would leave the room when medical staff were present to preserve patient privacy. Please see King et al. (2014a) for additional details about TOC study design. A follow-up assessment occurred $\sim$ 2 months after baseline. Participants were contacted using information they had provided at baseline or by contacting their family or friends, whose names and contact information had been previously provided by participants for this purpose.

Participants and parents/guardians were offered dollar store gift items as a token of appreciation for completing the screen. Participants were also remunerated $20 for completing baseline assessments and $30 for completing the 2 month follow-up, with an additional $20 incentive if the participant returned to the hospital for the assessment. For those participants unable to return to the hospital, assessments were conducted in the community or participants' homes. IRB approvals were obtained at both the participating university and hospital.

Study procedures included a detailed risk management protocol with clear action steps to be followed if a subject met specified high suicide risk criteria. These criteria included the following: 1) History of a serious suicide attempt (clear/definite intent to die that realistically could have led to death and necessitated intensive medical care; or method chosen was hanging, jumping, firearm, suffocation); 2) a score of 5 or 6 on the SIQ-JR (indicating suicidal thoughts had occurred at least a few times a week) or positive scores on two or more items suggesting active intent or planning; 3) an oral statement of suicidal intent or planning; 4) a suicide attempt as the reason for ED visit; or 5) clinical judgment that a combination of risk factors put the youth at high risk. The required action steps were documented and included: 1) Notifying the ED physician of the patient's high-risk status, 2) informing the adolescent of the need to notify the ED physician and contacting/consulting with the project director (or senior on-call study clinician) regarding next steps, and 3) documenting next steps, including contacts with adolescent's parent/guardian and recommendation/referral for psychiatric evaluation.

Results

Table 1 provides demographic, screening, and clinical characteristics of the 81 adolescent participants.

Predictors of suicidal behavior

Fifteen of 81 participants (18.5%) screening positive for suicide risk had engaged in suicidal behavior within 2 months of the ED visit, including 6 (7.4%) who had made actual suicide attempts (1 of whom reported two suicide attempts). Two thirds of adolescents engaging in postdischarge suicidal behavior had presented to the ED for a medical or an injury-related (nonpsychiatric) reason.

Eight participants reported one type of suicidal behavior, five reported two types, and two reported three types. The most prevalent suicidal behavior was an aborted attempt, which was the case with nine youth. Five participants reported interrupted attempts, with one participant reporting three interrupted attempts. Six participants made actual suicide attempts, one of whom reported two suicide attempts. Adolescents reporting actual suicide attempts did not differ from those reporting other types of suicidal behavior on any of the demographic, screening, or clinical characteristics assessed at baseline. Sensitivity and specificity of screening criteria were also assessed within the high-risk analytic sample (Table 2). Depression demonstrated the greatest sensitivity in detecting youth at high risk for suicide but had the poorest specificity. The combination of screen items demonstrated the poorest sensitivity but the greatest specificity in predicting future risk.

We compared participants who had engaged in postdischarge suicidal behavior with those who had not (Table 1). We also used SPSS 21(SPSS Inc. 2012) to estimate logistic regression models to assess bivariate associations between baseline characteristics and

Table 1. Demographic, Positive Screen, and Clinical Characteristics of Adolescents in the Sample

Characteristic	*Total sample* (n = *81*)	*No suicidal behavior during follow-up* (n = *66*)	*Suicidal behavior during follow-up* (n = *15*)	*Group difference statistic*
Demographics				
Age, M (SD)	17.54 (1.6)	17.42 (1.6)	17.95 (1.6)	F (2, 80) = 1.37
Sex, *n* (% Female)	59 (73%)	48 (73%)	11 (73%)	χ^2 (2, 81) = 0.00[c]
Race/ethnicity, *n* (%)				χ^2 (2, 81) = 4.80[c]
White	35 (43%)	30 (45%)	5 (33%)	
Black	33 (41%)	24 (36%)	9 (60%)	
Other	3 (4%)	2 (3%)	1 (7%)	
Multiracial	10 (12%)	10 (15%)	0 (0%)	
Suicide risk screening criteria				
Positive screen type				χ^2 (2, 81) = 7.79*[c]
Depression/substance use, *n* (%)	36 (44%)	32 (48%)	4 (27%)	
Suicide ideation/attempt, *n* (%)	27 (33%)	23 (35%)	4 (27%)	
Both, *n* (%)	18 (22%)	11 (17%)	7 (47%)	
RADS-2:SF, mean (SD)	29.22 (4.3)	29.95 (4.3)	30.45 (4.0)	F (2, 80) = 1.55
AUDIT-C, mean (SD)	3.05 (3.3)	2.98 (3.4)	3.33 (2.6)	F (2, 80) = 1.37
CRAFFT, mean (SD)	2.69 (1.9)	2.68 (1.9)	2.73 (1.5)	F (2, 80) = 0.01
Recent suicide ideation, *n* (% yes)[a]	41 (51%)	31 (47%)	10 (67%)	χ^2 (2, 81) = 1.89[c]
Recent suicide attempt, *n* (% yes)[a]	15 (19%)	11 (17%)	4 (27%)	χ^2 (2, 81) = 0.81[c]
Psychiatric chief complaint, *n* (% yes)	26 (32%)	21 (32%)	5 (33%)	χ^2 (2, 81) = 0.13[c]
Mental health treatment[b]				
Any ongoing pharmacotherapy, *n* (% Yes)	14 (17%)	9 (14%)	5 (33%)	χ^2 (2, 81) = 3.32
Any ongoing outpatient treatment, *n* (% Yes)	11 (14%)	8 (12%)	3 (20%)	χ^2 (2, 81) = 0.65[c]
History of inpatient treatment, *n* (% Yes)	23 (28%)	18 (27%)	5 (33%)	χ^2 (2, 81) = 0.22

[a]Assessed using items adapted from the Columbia-Suicide Severity Rating Scale.
[b]Assessed using items adapted from the Child and Adolescent Services Assessment-Revised.
[c]Cross-tab included one cell with an expected count < 5, and may be unreliable.
Statistical test p values: *$p < 0.05$.
RADS-2:SF, Reynolds Adolescent Depression Scale - 2nd Edition, Short Form; AUDIT-C, Alcohol Use Disorders Identification Test–Consumption.

postdischarge suicidal behavior, presented in Table 3.[1] These characteristics were chosen on the basis of empirical associations identified in univariate analyses as well as theoretical relevance. Variables considered included positive screen type, SIQ-Jr score, BHS score, history of NSSI, history of actual suicide attempts, history of suicidal behavior, and treatment status. Because of the small sample size, we did not include covariates in regression analyses.

Groups were similar in age, sex, race/ethnicity; suicide risk screening scores on the RADS, AUDIT, and CRAFFT; suicidal ideation and/or attempt (yes/no); psychiatric chief complaint; and baseline mental health treatment status. Only positive screen type distinguished adolescents with from those without suicidal behavior, (χ^2 [1] = 6.51, $p < 0.05$). The subgroup of adolescents screening positive for both depression and alcohol/substance abuse and the subgroup of adolescents screening positive for suicidal ideation and/or attempt engaged in suicidal behavior with the percentage rates of 12.5% and 14.8%, respectively. In contrast, 38.9% of the subgroup of adolescents screening positive for both criteria engaged in suicidal behavior. In a logistic regression, a positive screen for both criteria was associated with a substantially elevated likelihood of postdischarge suicidal behavior (odds ratio [OR] = 5.09 [95% CI: 1.25–20.78]). We considered conducting these analyses with more limited combinations of suicide risk screen types (e.g. suicidal ideation plus depression/alcohol) but were unable to do so because of the small numbers of participants in each combination (see Fig. 2).

Participant SIQ-Jr. scores were associated with postdischarge suicidal behavior (OR = 1.03 [95% CI: 1.01–1.06]). A 10 point increase on the SIQ-Jr. scale (range: 0–90) was associated with an ~ 30% increase in the odds of suicidal behavior within 2 months of discharge. A baseline history of suicide attempt behavior (actual, aborted, or interrupted attempts) was associated with postdischarge suicidal behavior (OR = 6.22 [95% CI: 1.32–29.34]). Baseline BHS score, history of suicidal behavior broadly (actual, aborted, or interrupted attempts, or preparatory behavior), history of NSSI, and history of actual suicide attempts were not associated with postdischarge suicidal behavior. There was no observed effect of participation in the TOC intervention on likelihood of postdischarge suicidal behavior (OR = 0.87 [95% CI: 0.27–2.82]).

Discussion

In this study, we screened 624 adolescents who presented to a medical ED with psychiatric and nonpsychiatric chief complaints,

[1]Ancillary bivariate analyses were conducted to consider alternatives to listwise deletion of partial cases. We used full-information maximum likelihood estimation (FIML), implemented in Mplus 6.12. FIML is a widely accepted means of handling missing data that can yield more robust parameter estimates than other methods, such as multiple imputation or listwise deletion. Because there were few partial cases at follow-up, results were largely identical to listwise deletion analyses, bolstering confidence in results. The BHS and nonsuicidal self-injury parameters were slightly different when estimated by FIML. Odds ratios and p values differed slightly by a factor of < 0.02, remaining at nonsignificant levels. The resulting output is available from the authors upon request.

Table 2. Sensitivity and Specificity of Positive Screen Type in Predicting Suicidal Behavior

	Preparatory behavior and actual, aborted, or interrupted attempts		*Actual, aborted, or interrupted attempts*	
	Sensitivity	*Specificity*	*Sensitivity*	*Specificity*
Suicide risk screen positive for:				
Depression	0.87 (13/15)	0.12 (8/66)	0.92 (11/12)	0.16 (11/69)
Substance use	0.87 (13/15)	0.26 (17/66)	0.92 (11/12)	0.28 (19/69)
Suicide ideation/attempt	0.73 (11/15)	0.48 (32/66)	0.67 (8/12)	0.48 (32/69)
All	0.47 (7/15)	0.83 (55/66)	0.50 (6/12)	0.83 (57/69)

Sensitivity and specificity, respectively, reflect the proportions of youth who did and did not engage in suicidal behavior screening during the follow-up period. Counts for each are provided in parentheses.

using a 21 item multicomponent suicide risk screen. We conducted outcomes assessments 2 months later with a subset of these adolescents ($n=81$) who screened positive for suicide risk (suicide attempt, suicidal ideation, or depression plus alcohol/substance abuse) to determine if the screen had identified a group at ''high risk'' for suicidal behavior, and to determine predictors of suicidal behavior within this ''high risk'' group. Within the 2 month period following their ED visit, 7.4% of these adolescents had made a suicide attempt, and 18.5% had engaged in some type of suicidal behavior (encompassing actual, aborted, and interrupted suicide attempts, as well as preparatory behavior). Given the short follow-up period, these rates are substantial.

In a study of psychiatric ED adolescent and young adult patients, 7.2% of the sample made a follow-up suicide attempt, but this was over an 18 month follow-up period (Horwitz et al. 2014). It is also notable that the suicide attempt rate in this study was higher than the 6% rate reported in an ED study involving adolescents screened for suicidal ideation or attempt, with a comparable follow-up period of 2 months (Asarnow et al. 2011). This provides initial validation of this multicomponent suicide risk screen as a tool for identification of adolescents at elevated risk. Moreover, results indicate that this screen can be used to identify a subgroup of adolescents who are at more highly elevated acute suicide risk than other adolescents who screen positive. To our knowledge, this is the first prospective study of outcomes associated with ED-based suicide risk screening.

It is also worth noting that adolescents who screened positive in our sample had rates of suicidal behavior at or above rates of those from studies utilizing psychiatric inpatient and high-risk clinical samples, providing additional evidence of the screen's utility in identifying high-risk adolescents. In the Treatment for Adolescents with Depression Study (TADS) of depressed adolescents seen in an outpatient setting, 4.6% made a suicide attempt or engaged in preparatory suicidal behavior during the follow-up period (Vitiello et al. 2009), which, of note, is reflective of behavior over a longer period (36 weeks), than in this study (8 weeks). In the Treatment of SSRI-resistant Depression in Adolescents (TORDIA) study, 5% of treatment-resistant depressed adolescents made a suicide attempt in the first 12 weeks (Brent et al. 2009), suggesting a slightly lower occurrence than in our current sample, given the lower rate and longer time frame. Among psychiatrically hospitalized adolescents in the Youth-Nominated Support Team – Version II (YST-II) study, 18.5% made a suicide attempt over a 1 year period (King et al. 2009a); however, only 7.4% had made a suicide attempt during the first 3 months of the study (Czyz et al. 2014). It should be noted, however, that the adolescents in these studies were generally in psychiatric treatment, which may have accounted for the lower prevalence rates of suicidal behavior.

Because of the limited specificity of many suicide risk screening tools, resulting in the identification of too many adolescents as being at risk (false positives) (King et al. 2013), and the often limited resources for follow-up and triage of mental health concerns in the ED (Grupp-Phelan et al. 2007a), it is important to develop screening strategies that identify more highly elevated levels of suicide risk. Our results indicate that adolescents who doubly screened positive (recent suicidal behavior/current ideation *plus* depression and alcohol/substance misuse) were significantly more likely to engage in suicidal behavior during the 2 month follow-up period than were adolescents who screened positive on one criterion, supporting the

Table 3. Bivariate Associations of Baseline Clinical Characteristics and Postdischarge Suicidal Behavior

	Suicidal behavior[a]		*Suicide attempt behavior*[b]	
Clinical characteristic	*Odds ratio (95% CI)*	p *value*	*Odds ratio (95% CI)*	p *value*
SIQ-Jr	1.04 (1.02–1.07)	0.002	1.03 (1.00–1.05)	0.021
BHS	1.04 (0.94–1.16)	0.422	1.02 (0.91–1.14)	0.745
Prior nonsuicidal self-injury	1.47 (.48–4.46)	0.500	1.61 (0.50–5.24)	0.428
Prior suicide attempts	2.27 (0.76–6.78)	0.143	2.48 (0.78–7.94)	0.125
Prior suicidal behavior[a]	4.49 (0.95–21.27)	0.059	3.74 (0.78–17.92)	0.098
Prior suicide attempt behavior[b]	6.22 (1.32–29.34)	0.021	5.16 (1.08–25.54)	0.039

Bivariate models include only one clinical characteristic as a predictor of suicidal behavior. No predictors are significant after controlling for gender.
[a]Defined as preparatory behavior and an actual, interrupted, or aborted suicide attempt.
[b]Defined as an actual, aborted, or interrupted suicide attempt.
SIQ-Jr, Suicide Ideation Questionnaire-Jr; BHS, Beck Hopelessness Scale.

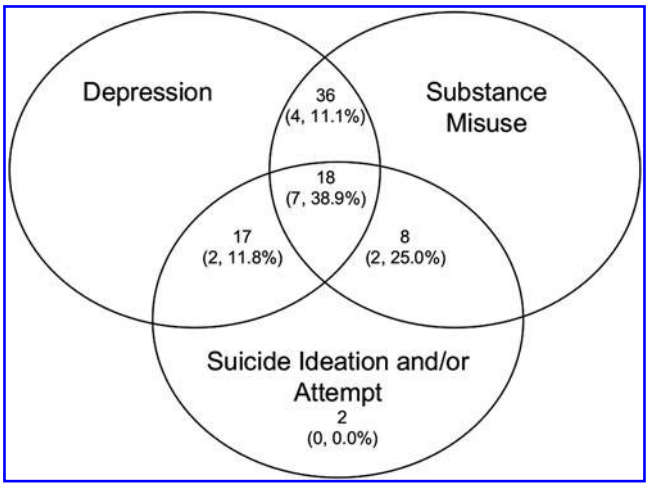

FIG. 2. Reasons for positive suicide risk screens with proportion of within-group incidence of postdischarge suicidal behavior given in parentheses as (*n, %*). Suicidal behavior included actual, aborted, and interrupted suicide attempts, as well as preparatory behavior.

potential use of this multicomponent suicide risk screen for identifying particularly high risk adolescents.

Research pertaining to youth suicide risk screening in general medical EDs with community-based outcome assessments must be attuned to risk management issues. In this study, research staff were trained to implement a risk management protocol that incorporated action steps to be followed immediately for all youth who met the study-defined criteria for highly elevated risk. This necessitated the on-call involvement of the project director or designated senior clinician. It is also notable that, in this study, we received an IRB-approved waiver of parental consent, which enabled us to obtain a more representative sample than would otherwise have been possible. Federal regulations enable IRBs to approve such waivers if considered appropriate to do so and not inconsistent with federal, state and local laws. The pertinent state laws and statutes are highly variable, however, and IRBs vary widely in their practices related to such waivers (King and Kramer 2008), even with studies such as this that are categorized as minimal/low risk studies. Nevertheless, if such screening is conducted as part of customary care rather than as part of a research study, it may be possible to screen youth who present without a parent or guardian in a larger number of EDs, as a result of mature minor rules that enable minors of a certain age and maturity to consent to their own healthcare (King and Kramer 2008).

Limitations

Findings of this study should be considered in light of limitations. One limitation is that, despite a clinically rich and diverse sample with a high rate of retention at 2 month follow-up, the sample size of 81 participants limits our ability to examine multiple covariates and potential interactions in our models because of power constraints. Furthermore, because this study did not include a 2 month follow-up of adolescents who screened negative, we cannot statistically test whether our positive screen sample was more likely to engage in suicidal behavior than those who screened negative. It is important to note, however, that our sample was composed of a representative sample of adolescents seeking medical emergency services from the study community, and one would not expect such a high rate of suicidal behavior within 2 months of their ED visits. Additionally, our outcome variable was a dichotomous grouping of suicidal behaviors that differed in severity (e.g., aborted attempt vs. actual attempt), as our sample size and incidence rate did not allow for a more nuanced assessment of different suicidal behaviors. The adolescents in this study were a part of a randomized effectiveness trial, and a subset of the participants received personalized feedback and an adapted motivational interview. Although intervention effects did not produce significant changes in suicidal ideation or behavior, it was associated with a reduction in depressive symptoms and may have contributed in other ways to study findings. Our sample was collected from an ED in an underserved, urban community. It is unclear how findings related to this sample would generalize to other samples of adolescents in other EDs.

Clinical Significance

Past studies have established the concurrent validity, acceptability, and feasibility of brief suicide risk screening in general ED settings for adolescents. However, limited information has been reported about the outcomes of screened adolescents. In this study, we screened adolescents in a general ED and then examined their suicidal behavior prospectively. Although our sample size is small, the results are promising, particularly given the urgent need for standardized protocols to identify youth at high risk. In this study, 11%–12% of adolescents who screened positive for depression in addition to suicidal thoughts, a recent suicide attempt, or substance misuse engaged in some form of suicidal behavior within the two months following their ED visit. Moreover, 25% of adolescents who screened positive for substance misuse in addition to suicidal thoughts or a recent suicide attempt engaged in some form of suicidal behavior during this time period. Finally, nearly 40% of the adolescents who screened positive on all three dimensions engaged in some form of suicidal behavior during follow-up.

It is noteworthy that two thirds of the adolescents engaging in post-discharge suicidal behavior presented to the ED for a non-psychiatric reason and would not have been identified as being at risk for suicidal behavior. This suggests the importance of ED-based suicide risk screening and is consistent with King et al.'s (2009b) finding that a significant proportion of those identified through such screening are not currently receiving mental health services.

Conclusions

There is a substantial need to develop brief screening tools to assess and predict risk for suicidal behaviors among adolescents. The volume of annual pediatric ED visits presents a unique opportunity to identify adolescents at risk and intervene accordingly. Our findings demonstrate the promise of the ED as a venue for identifying adolescents at particularly acute risk for engaging in suicidal behavior with a relatively small number of screening questions.

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Disclosures

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