School-Based Screening to Identify At-Risk Students Not Already Known to School Professionals: The Columbia Suicide Screen

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Voluntary universal screening is advocated as a practical approach to early identification of students at risk for suicide[1–3] based on the assumptions that adolescents do not reveal their suicidal thoughts or behaviors to others[4–6] and they are more likely to report stigmatizing information in a self-administered instrument than they are during a face-to-face evaluation.[7,8] It is not clear, however, the extent to which students identified as at risk during a school screening program overlap with those already of concern to school professionals. Many of the problems that bring a student to the attention of school staff—irritability, substance use, and school absences, for example—are associated with suicidal behavior.[9–12] The value of universal screening would be greatly reduced if school-based screening programs detected students already identified by school staff.

Both screening and the evaluations of school professionals are imperfect methods of identifying students with mental health problems. Given the multiple demands on school administrative and clinical professionals, it would be impossible for these individuals to identify all students with mental health needs. On the other hand, screening for uncommon conditions often lacks specificity; that is, a high proportion of the students identified through screening will eventually be shown not to have the condition of interest.[13]

We examined the overlap between students identified through systematic screening for suicide risk and those identified as at risk by school professionals. We expected that overlap would be greatest with respect to externalizing disorders such as substance abuse but that screening would identify students at elevated risk for suicide whose symptoms were less overt. In addition to assessing overlap, we examined the extent to which screening and school professionals' evaluations produced

Objectives. We sought to determine the degree of overlap between students identified through school-based suicide screening and those thought to be at risk by school administrative and clinical professionals.

Methods. Students from 7 high schools in the New York metropolitan area completed the Columbia Suicide Screen; 489 of the 1729 students screened had positive results. The clinical status of 641 students (73% of those who had screened positive and 23% of those who had screened negative) was assessed with modules from the Diagnostic Interview Schedule for Children. School professionals nominated by their principal and unaware of students' screening and diagnostic status were asked to indicate whether they were concerned about the emotional well-being of each participating student.

Results. Approximately 34% of students with significant mental health problems were identified only through screening, 13.0% were identified only by school professionals, 34.9% were identified both through screening and by school professionals, and 18.3% were identified neither through screening nor by school professionals. The corresponding percentages among students without mental health problems were 9.1%, 24.0%, 5.5%, and 61.3%.

Conclusions. School-based screening can identify suicidal and emotionally troubled students not recognized by school professionals. (*Am J Public Health.* 2009;99:334–339. doi:10.2105/AJPH.2007.127928)

false positives and whether screening led to improved identification of students with mental health problems.

METHODS

Sample and Data Collection

This study was part of a larger psychometric evaluation of school-based screening for suicide risk via the Columbia Suicide Screen (CSS). From 1991 to 1994, 2858 students in grades 9 through 12 who spoke English and attended mainstream classes were recruited from a convenience sample of 7 high schools in the New York, NY, metropolitan area. Schools were selected to be representative of the range of schools (e.g., private, public, parochial, vocational or technical, urban, suburban) in the area. Data on the number of schools approached for participation were not available; however, 1 school that agreed to participate in

the study subsequently dropped out when a parent protested to the school board (this school accounted for 9.6% [n=275] of the sample). A full description of the sampling procedure has been provided elsewhere.[13]

A passive consent procedure was used in which letters describing the project were mailed to students' homes as well as sent home with students; parents were requested to sign and return the form only if they did not want their child to participate in the suicide screening (if a return letter was not received, consent for participation was assumed). Letters and forms were sent home to parents in English, Spanish, or Mandarin. Students enrolled in special education classes and English-as-a-second-language classes were not included in the sample. Seven percent (n=182) of parents refused consent. In addition, consent was obtained from students before they participated in the screening. Approximately 13% (n=332) of

students whose parents had consented declined to participate; 340 (13.2%) students were absent during the screening.

Ultimately, 1729 students (67% participation rate) completed the CSS.[13] The screened sample was 57% female, with a mean age of 15.4 years (SD=1.4; range=11–19); 56% of the students were White, 18% were African American, 13% were Hispanic, and 13% were members of other racial/ethnic groups. Participants were approximately evenly divided among the 4 high school grades.

The CSS was administered during regular class time in English only. Research staff members were available to answer any questions students had during the screening. Students were classified as having screened positive when they reported any 1 of the following: (1) recent suicidal ideation (in the preceding 3 months), (2) history of a suicide attempt, (3) 3 or more emotion-related impairments (e.g., sadness, social withdrawal, anxiety, irritability, substance use) that they believed had been "bad" or "very bad" problems in the preceding 3 months, or (4) requests for help in any of the areas just listed.

Within 1 to 14 days of screening, 73% (n=356) of the students with positive screening results (participation was incomplete as a result of absenteeism and school time constraints) and 23% of those with negative results (n=285) completed the mood, anxiety, and substance use modules of the Diagnostic Interview Schedule for Children, version 2.3 (DISC 2.3).[14] The students with negative results were frequency matched to the students with positive results on the basis of gender, ethnicity, and grade.

Concurrent with the CSS screenings, principals (unaware of students' screening results) were asked to identify the clinical and administrative staff members within their schools most likely to be aware of students' emotional and behavioral problems. Principals had been in their positions for an average of 7.4 years (range=2–15 years), suggesting that they would have been aware of reasonably good informants. The clinical staff members identified included psychologists, social workers, guidance counselors, nurses, resource room or special education coordinators, and specialty counselors (e.g., mental health and alcohol and drug counselors); administrative staff

included deans, principals, and vice principals. Because our focus was on maintaining student confidentiality, teachers were not eligible for selection as informants.

Within 1 month of the screenings and diagnostic assessments, the school professionals identified by principals were mailed a letter and questionnaire that included the names of all students in their school who had completed the CSS; no information regarding students' screening or diagnostic status was made available to them. They were asked the following questions: (1) Are you currently concerned about this student's emotional status? (2) Do you have plans to see this student again? and (3) Have you referred or do you plan to refer this student to an outside agency? Possible responses for each question were "yes/definitely," "possibly/somewhat," and "no/definitely not." Both "yes/definitely" and "possibly/somewhat" were considered positive responses.

An average of 3.66 (SD=1.29; range=2–6) staff members per school served as informants. The student-to-informant ratio ranged from 110:1 in small public or private schools to 483:1 at the largest school included in the study. Although some schools had fewer overall informants than did others, each school had at least 1 administrative and 1 clinical informant, thus allowing for students to be identified by at least 2 different sources. Results (available on request) suggested that schools with fewer informants identified fewer students as a concern in terms of their emotional status than did schools with more informants; in addition, with the exception of students who had substance use problems, there was little overlap (less than 10%) between administrative and clinical school professionals in their identification of students with mental health problems.

Data on participation rates among informants were not collected. Also, informant demographic and employment details (e.g., gender, ethnicity, time in current position) were not collected so as to reduce the burden of the assessment, maintain informants' confidentiality, and eliminate the possibility of informants being criticized for failing to notice a student with mental health problems.

Measures

As mentioned, the CSS, an 11-item self-report questionnaire embedded within a health survey,

measures suicidal ideation in the preceding 3 months (yes or no), history of suicide attempts (yes or no), and problems associated with feeling unhappy or sad, irritable, anxious, or socially withdrawn and with using alcohol or drugs in the preceding 3 months (assessed on a Likert scale ranging from none to very bad). Four questions focusing on relationships (with family and friends) and familial depression and substance use are also measured on the CSS but were not included in our analyses. Follow-up questions (e.g., regarding the student's desire to speak to a mental health professional or his or her treatment history) were asked each time a student responded yes to an item or rated a Likert-scale item "bad" or "very bad."

The Flesch–Kincaid grade-level score (in which the comprehension difficulty of a reading passage is converted into academic English grade equivalents through a count of the number of syllables in each word and the number of words in each sentence of the passage) indicates that the CSS has a reading level of 3.4. Depending on the scoring algorithm chosen, the sensitivity of the CSS in predicting high levels of suicide risk among high school students ranges from 0.75 to 1.00, and its specificity ranges from 0.83 to 0.72 (M.A.S., H.C.W., Y. Huo, J.B.T., P. Fisher, and D.S., unpublished data, 2008)[13]; the corresponding sensitivity and specificity levels are 0.79 and 0.47 in predicting attempts among young adults.[15]

The DISC 2.3 Youth Informant version is a structured instrument administered by lay interviewers. It has satisfactory psychometric properties among children aged 6 to 17 years.[14,16,17] The DISC 2.3 was used to ascertain, according to criteria of the *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition* (*DSM-III-R*),[18] the presence of probable mood (major depression or dysthymia, including suicidal ideation and a suicide attempt in the preceding 6 months along with history of a suicide attempt), anxiety (including generalized anxiety disorder, panic disorder, agoraphobia, and social phobia), and substance use (including alcohol, marijuana, and other substances) disorders with impairment in the preceding 6 months.[18]

Statistical Analysis

We conducted 3 sets of analyses. In the first analysis, we used κ statistics to examine the

extent of overlap between students identified during school-based screening and students identified by at least 1 school professional.

In the second analysis, we compared students identified through the screening and by school professionals in terms of the presence of *DSM-III-R* DISC 2.3 diagnoses. The comparison was made with respect to 2 standards. The first was unnecessary burden (defined as 1 minus the positive predictive value)—that is, the proportion of students who were identified as at risk through screening or by school professionals but did not report recent suicidal ideation or a previous attempt and did not meet criteria for an emotional or substance use disorder.

The second standard was false positives (defined as 1 minus specificity), that is, the proportion of students who did not report ideation or a previous lifetime attempt or meet criteria for an emotional or substance use disorder but were identified as at risk via screening or by school professionals. The 2 proportions differed in their denominators; the denominator for unnecessary burden was the overall number of students identified through screening or by school professionals, and the denominator for false positives was the number of students who did not report suicidal ideation or a suicide attempt or did not have a DISC 2.3–assessed disorder.

In the third set of analyses, we examined the extent to which school professionals and screening complemented each other. We calculated and compared the proportions of students with *DSM-III-R* DISC 2.3 diagnoses (1) identified neither by school staff nor through screening, (2) identified both by school staff and through screening, (3) identified by school staff only, and (4) identified through screening only. Analyses that included DISC 2.3 diagnostic data were weighted to reflect the proportion of male and female students with positive screening results in each school in the original sample of 1729 screened students. Analyses that did not include diagnostic data (i.e., the analyses involving κ values) were not weighted. Analyses adjusting for school-level influences (including student-to-informant ratios) and demographic variables were conducted; these adjustments did not affect the results, and thus school and demographic variables were dropped from subsequent analyses.

RESULTS

Overlap Between Screening and School Professionals

Table 1 presents a cross tabulation of the screening results according to whether school personnel identified a student as potentially having a mental health problem. There was minimal overlap between school professionals and screening in identification of students as at risk for suicide (κ=0.206; SD=0.023; *P*<.001). Forty-one percent of students who screened positive for suicide risk were also identified by school professionals. Also, there was very little within-school overlap between administrative and clinical professionals. Most (23.9%) students were a concern to clinical staff only; 11.9% were identified by administrative staff only, and 5.3% were identified by both clinical and administrative staff (data not shown).

Screening Versus School Professionals

With respect to false positives, school professionals (26.6%; 7.5% identified by administrative staff members only, 16.0% identified by clinical staff members only, 3.1% identified by both administrative and clinical staff members) and the CSS (28.2%) identified similar percentages of students as at risk for suicide. However, 37.3% of the students who screened positive did not have a significant mental health problem (i.e., suicidal ideation, history of a suicide attempt, or *DSM-III-R* mood, anxiety, or substance use disorder), whereas 63.5% of students identified by school professionals had no such problem (15.5% identified by administrative staff only, 36.6% identified by clinical only, 11.4% identified by both). It follows that screening accurately identified 62.7% of students with a significant mental health problem, whereas school

professionals accurately identified 36.5% (10.9% identified by only administrative staff, 21.5% identified by only clinical staff, 4.1% identified by both).

Among students (n=471) who did not have a significant mental health problem, 9.1% were identified through screening only, 24.0% were identified by school professionals only, 5.5% were identified both by school staff and through screening, and 61.3% were identified neither by school staff nor through screening.

Our final research question focused on whether screening led to improved identification of students with mental health problems. Table 2 displays the rates at which students with DISC 2.3–assessed mental health problems were identified through the screening, by the school staff, or both, by diagnosis or type of mental health problem. Large proportions of students with serious mental health problems, as assessed by the DISC 2.3, were identified only through screening. Among students with recent suicidal ideation or a history of a suicide attempt, 83.1% were identified via screening, and 40.2% were identified only via screening (in contrast to 8.9% identified only by school staff). Similarly high percentages of students with mood and anxiety disorders were identified only through screening.

School professionals identified most of the students who we considered to be at the highest level of suicide risk. Two thirds of students with a suicide attempt in the preceding 6 months were of concern to someone at their school (administrative staff only, 8.3%; clinical staff only, 50.0%; both, 8.3%). Among the subgroup with both suicidal ideation or a history of a suicide attempt and a current mood, anxiety, or substance use disorder, 63% were identified by school professionals (administrative staff only, 17.4%; clinical staff

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TABLE 1—Cross Tabulation of Overlap Between School Professionals and School-Based Screening in Identification of Students at Risk for Suicide: New York Metropolitan Area

	Identified by School Professionals, No. (%)	Not Identified by School Professionals, No. (%)	Total, No. (%)
Identified by screening	201 (41.1)	288 (58.9)	489 (28.3)
Not identified by screening	259 (20.9)	981 (79.1)	1240 (71.7)
Total	460 (26.6)	1269 (73.4)	1729 (100.0)

TABLE 2—Students at Risk for Suicide Identified by School Professionals and Through Screening, by Diagnosis or Type of Mental Health Problem: New York Metropolitan Area

Diagnostic Status	Not Identified, No. (%)	Identified Both by School Professionals and Through Screening, No. (%)	Identified by School Professionals Only, No. (%)	Identified Through Screening Only, No. (%)
Any recent suicidal ideation (past 3 months) or history of suicide attempt (n=184)	5 (8.0)*	85 (42.9)*	5 (8.9)	89 (40.2)*
History of suicide attempt (n=79)	3 (6.1)	39 (46.9)*	2 (10.2)	35 (36.7)*
Attempt in past 6 mo[a] (n=19)	0 (0.0)	13 (66.7)	0 (0)	6 (33.3)
Suicidal ideation in past 6 mo without history of suicide attempt (n=105)	2 (9.5)	46 (39.1)*	3 (7.9)	54 (42.9)*
Mood disorder[b] (n=88)	5 (13.6)	48 (44.1)*	3 (13.6)	32 (28.8)*
Mood disorder only (n=34)	3 (28.0)	17 (36.0)	1 (12.0)	13 (28.0)
Anxiety disorder[b] (n=97)	11 (18.6)	41 (37.3)*	6 (8.5)	39 (35.6)*
Anxiety disorder only (n=44)	9 (34.5)	13 (20.7)	5 (13.8)	17 (31.0)
Mood or anxiety disorder[b] without substance disorder (n=116)	14 (22.7)	49 (36.0)*	7 (9.3)	46 (32.0)*
Substance use disorder[b] (n=38)	2 (18.5)	26 (48.1)*	2 (3.8)	8 (15.7)
Substance use disorder only[a] (n=16)	1 (0.0)	11 (71.4)	1 (0)	3 (14.3)
Any of above disorders[b] (n=155)	16 (21.6)	75 (38.2)*	9 (11.8)	55 (28.4)*
More than 1 disorder[b] (n=60)	2 (2.7)*	34 (51.4)	2 (13.5)	22 (32.4)
Suicidal ideation or history of suicide attempt in combination with current mood, anxiety, or substance use disorder[a,b] (n=85)	0 (0.0)	53 (63.0)	1 (0)	31 (37.0)
Suicidal ideation or history of suicide attempt or current mood, anxiety, or substance use disorder[b] (n=254)	21 (18.3)	107 (34.9)*	13 (13.0)	113 (34.3)*
None of the above (n=385)	184 (61.3)*	50 (5.5)*	67 (24.0)	84 (9.1)*

Note. All analyses involving the diagnostic interview were weighted to represent the original 1729 screened students. Statistical tests compared identification by school staff only with identification through screening only, identification both by school professionals and through screening, and identification neither by school professionals nor through screening. Unweighted frequencies are shown, with weighted percentages in parentheses.
[a]Not tested statistically because the reference group had zero cases.
[b]"Disorder" requires impairment.
*$P \leq .001$.

only, 37.0%; both, 8.7%). However, screening identified 100% of students in both of these high-risk subgroups. In the absence of screening, more than one third of high-risk students would have been missed.

Another way to assess overlap is to examine the sensitivity of the CSS conditional on absence of identification by a school professional. As noted, the CSS identified 100% of students at the highest risk for suicide. In the group of students with suicidal ideation or any history of suicidal behavior, the CSS identified 81.8% of those missed by school professionals. Almost 60% of students with internalizing disorders only who were missed by school professionals were identified through screening. Even in the case of problems identified by school professionals at comparatively high rates (e.g., substance use, at 44.4%), the CSS identified additional DISC 2.3–assessed students.

Students Identified by School Professionals Only and Students Missed

Thirteen (13.0%) students with a significant mental health problem were identified by school professionals only. Ten percent of these students were identified by clinical staff only, 2.4% were identified by administrative staff only, and 0.6% were identified by both.

Twenty-one (18.3%) students with a significant mental health problem were missed both by school staff and through the screening process. Twenty-eight percent of the students missed had a mood disorder only, and 34.5% had an anxiety disorder only.

DISCUSSION

The majority of students who screened positive on the CSS were not identified by school professionals. School-based screening improves

identification of students at the highest risk for suicide, and it also improves identification of students with lesser mental health problems (suicidal ideation, previous suicidal behavior, internalizing disorders). In fact, in the absence of screening, a large proportion of students with serious mental health problems would go undetected by school staff and mental health providers as well.

Most of the students at the highest risk for suicide (as assessed via the DISC 2.3) were identified by school professionals, as were the majority of those diagnosed with substance use disorders. In addition, 13% of students who had a significant mental health problem were identified as a mental health concern by school professionals but were not identified by the CSS. There was little overlap in the identification of students among administrative and clinical school professionals, which is not

surprising given that these professionals fulfill different functions in the school. Clinical staff identified about twice as many students as administrators, although administrators did identify some students with significant mental health problems who were otherwise not identified.

School professionals are likely to have the greatest level of awareness of the types of externalizing problems that disrupt classrooms.[12] These types of problems (e.g., aggression, disruptive conduct) are not assessed by the CSS, which may have been the reason that a small subset of disordered adolescents were identified only by school professionals.[19–22] We emphasize that screening should be viewed as but one component of suicide prevention and that it does not reduce the need for school professionals to be actively engaged in identifying and helping at-risk students.

Screening has been criticized for identifying a large number of students without significant mental health problems (i.e., false positives).[23,24] Screening and school professionals identified similar proportions of students as at risk; however, in comparison with school professionals, screening was associated with a lower false-positive rate and a higher positive predictive value in the identification of significant mental health problems. It should be noted that school professionals were asked to make a very broad assessment: their general concern with the emotional status of a particular student. By contrast, the CSS is specifically geared toward assessment of suicide risk. Furthermore, the false-positive rate among school professionals would probably have been lower if the criteria assessed had included conduct disorders or general social, familial, and academic problems.[12]

School professionals indicated that they planned to refer or had already referred 65% of students they were concerned about to an outside agency for services. However, few students completed the transition from identification to treatment. Only 40% of those identified by school staff as needing a referral reported having seen a mental health professional in the previous year and only 17% in the previous 3 months. Although there is a growing trend for schools to offer in-house mental health services,[12,25] most still lack the resources to do so. Screening could become a key element

in service coordination between schools, families, and community mental health service providers.

Finally, it must be acknowledged that almost 20% of students who reported a significant mental health problem were identified by neither school staff nor the CSS. There may be methodological reasons for this outcome. The DISC 2.3 asks about symptoms occurring in the preceding 6 months, whereas the CSS focuses on the preceding 3 months, and the question we posed to school professionals asked about whether they were currently concerned about students. These different time frames may have resulted in students reporting on a diagnosis that was transient and may have resolved itself by the time of the screening or completion of the school staff questionnaires.

In fact, given the possible 1-month time lag in administration and given that the questionnaire completed by school professionals focused on their immediate concerns with respect to students' mental health status, school professionals may have identified new incidents that were not present during the earlier screening and DISC 2.3 evaluation. Nevertheless, it is important to remember that screening is unlikely to identify all students who may need help and should be only 1 component of a school's mental health initiative.

Limitations

Not all of the schools selected agreed to participate in the study, nor did all of the students within the participating schools. As a result, the possibility of systematic differences between participants and nonparticipants could compromise the generalizability of our findings. Also, the sensitivity of school professionals' identification of students with mental health problems would have been underestimated to the extent that principals were inaccurate in their assessments of the staff members at their school most likely to be aware of such problems. As noted earlier, however, principals had been in their position for an average of 7.4 years and thus were likely to have named the appropriate staff members.

Finally, the numbers of students with certain mental health problems (e.g., suicide attempts in the preceding 6 months [n=12] and substance abuse disorder only [n=8]) were small, resulting in some instances in zero-frequency cells and low power to detect differences

between groups. However, despite low frequencies of some mental health problems, significant differences between groups were found, suggesting a large effect size.

Public Health Implications

This study underlines the importance of screening for suicide risk and its associated mental health problems. Our results demonstrate that school-based screening is an efficient method of identifying not only students who are likely to be suicidal but also students who are depressed, anxious, or abusing substances. Our findings also clearly demonstrate that screening does not overlap with the work currently being done by school professionals. ∎

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Contributors

M. A. Scott assisted in data collection, conducted the statistical analyses, led the interpretation of the data, wrote the first draft of the article, and edited the final version. H. C. Wilcox assisted in data collection, data interpretation, and the editing of the article. I.S. Schonfeld, M. Davies, and J.B. Turner consulted on the statistics and assisted in interpretation and editing of the article. R.C. Hicks assisted in data collection and in the editing of the article. D. Shaffer originated and supervised the study, assisted in guiding the analyses, and contributed to editing the final version of the article.

Human Participant Protection

This study was approved by the institutional review board of the New York State Psychiatric Institute as well as the review boards of the New York City Board of Education and the Archdiocese of New York. Informed passive consent was obtained from parents, and active consent was obtained from students.

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