The Predictive Validity of the Beck Depression Inventory Suicide Item

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ABSTRACT

Objective: The current study examines the predictive validity of the Beck Depression Inventory (BDI) suicide item for death by suicide and suicide attempts.

Method: The study included 2 samples: (1) 5,200 psychiatric outpatients who were evaluated between 1975 and 1995 and followed prospectively for up to 20 years (all psychiatric diagnoses based on *DSM-III* and *DSM-III-R*), and (2) 119 patients who, between 2000 and 2004, participated in a randomized controlled trial of outpatient Cognitive Therapy for Suicide Prevention after a suicide attempt and were followed for 18 months (all psychiatric diagnoses based on *DSM-IV-TR*). All patients completed structured diagnostic interviews, as well as the BDI and Scale for Suicide Ideation.

Results: Cox regression models demonstrated that the BDI suicide item significantly predicted both deaths by suicide (Wald $\chi^2_1 = 35.67$; $P < .001$ [N = 5,200]) and repeat suicide attempts (Wald $\chi^2_1 = 8.82$; $P < .01$ [N = 119]), with each successive rating on the item conferring greater risk. Using receiver operating characteristic (ROC) curves, optimal cutoff scores of 1 and above for suicide and 2 and above for suicide attempts were identified as providing the best balance between sensitivity and specificity.

Conclusions: The BDI suicide item is associated with both risk of repeat suicide attempts and death by suicide. The use of the item as a brief, efficient screen for suicide risk in routine clinical care is recommended. Clinicians would then conduct a comprehensive suicide risk assessment in response to a positive screen. Future research examining the item's performance in other at-risk groups (ie, older adults, adolescents, inpatients, etc) is encouraged.

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Suicide and suicide attempts are a pressing public health problem, with a yearly mortality in the United States of over 40,000 lives and 25 to 50 nonfatal suicide attempts made for every suicide.[1,2] The presence of suicidal ideation and intent predicts suicidal behavior, and past suicide attempts are a robust predictor of repeat attempts and death by suicide.[3–5] Thus, screening for suicide risk by assessing suicidal ideation and intent using instruments with predictive validity is an integral component of an effective suicide prevention strategy. To date, however, few instruments have demonstrated predictive validity for suicide or suicide attempts.

Two measures with predictive validity for death by suicide are the Scale for Suicide Ideation[6] (SSI) and the self-harm item (item 9) of the Patient Health Questionnaire[7] (PHQ-9).[3,8] Additionally, worst-point severity of suicide ideation on the Columbia Suicide Severity Rating Scale (C-SSRS)[9] and the Suicide Probability Scale[10] have been found to predict suicide attempts in adolescents.[9,11] Despite these promising findings, the use of these measures in clinical practice has limitations. Although the SSI and C-SSRS include screening questions that reduce administration time, semistructured assessments may be too time-consuming, especially during brief clinical encounters. Findings for the PHQ-9 suicide item are promising; however, because the item does not distinguish between suicidal ideation and thoughts of self-injury, it may capture false positives. Additionally, the item measures the frequency of thoughts, but not necessarily their severity.

The suicide item (item 9) from the Beck Depression Inventory (BDI) assesses the severity of suicidal thoughts and is routinely used in clinical practice.[12] Every version of the BDI is a 21-item self-report measure that includes the same item that assesses suicidal ideation and is rated on a 4-point scale, with higher scores indicating greater intent.[12,13] This item has demonstrated initial predictive validity for suicide among inpatients.[14] The present study sought to examine the predictive validity of the BDI suicide item for suicide and repeat suicide attempts. It was expected that the item would demonstrate adequate predictive validity for these outcomes. We also sought to examine the item's sensitivity and specificity and to identify optimal cutoff scores for use in clinical practice.

METHOD

Participants

The current study consists of 2 separate samples. The first sample[3] was 5,200 psychiatric outpatients who were evaluated between 1975 and 1995 and followed prospectively for up to a 20-year period for a study on risk factors for suicide. At follow-up, 43 participants (0.8%) had died by suicide and 97 (1.9%) had died of other causes. The second sample[15] included 119 psychiatric patients who were recruited between 2000 and 2004 to participate in a randomized controlled trial of outpatient Cognitive Therapy for Suicide Prevention following presentation to the emergency department after a suicide attempt. During the 18-month follow-up, 1 patient (0.8%) died by suicide and 36 (30.3%) made

Clinical Points

- Brief screens for suicide risk that are predictive of suicidal behavior are needed for use in clinical practice.
- A score of 1 or higher on the Beck Depression Inventory suicide item can be used to trigger suicide risk assessment and management, while a score of 2 or higher may indicate increased risk over the coming months.

repeat attempts. Table 1 presents demographic and clinical characteristics of both samples.

Procedure

Procedures were approved by the Institutional Review Board, and all patients provided written informed consent. Participants in the first sample completed an intake that included the Structured Clinical Interviews for *DSM-III* or *DSM-III-R* Axis I and II Disorders,[16] the BDI-1A[13] or BDI-II[12] and the SSI.[17] Deaths were ascertained prospectively using the National Death Index,[18] and death certificates were obtained to determine cause of death (see Brown et al[3] for further details). The median length of follow-up was 10 years (range, < 1 to 20 years), and the mean length of time from intake to suicide was 5.47 years (SD = 4.57; range, < 1 to 17 years).

Participants in the second sample completed a baseline assessment that included the Structured Clinical Interview for *DSM-IV-TR*,[19] the BDI-II,[12] and the SSI[17] and were subsequently randomized to a study condition and followed for 18 months. The date of repeat attempts was recorded during follow-up assessments (see Brown et al[15] for further details). The mean length of time from baseline to repeat attempt was 131.50 days (SD = 122.75; range, 11 to 464 days).

RESULTS

Single covariate Cox regression models indicated that the BDI suicide item significantly predicted suicide in sample 1, Wald $\chi^2_1 = 35.67$, $P < .001$ (N = 5,200). The hazard ratio (HR) for the item as an ordinal scale was 2.79; 95% confidence interval (CI), 2.00–3.91. The item remained significant after controlling for suicide attempt history in the subgroup of subjects for which these data were available, Wald $\chi^2_1 = 10.13$; $P = .001$ (n = 3,653). Table 2 presents HRs, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of each successive cutoff score. Each successive dichotomization significantly predicted suicide and remained significant after controlling for suicide attempt history. Results for the full sample are reported in Table 2. Evaluation of the receiver operating characteristic (ROC) curve identified a cutoff score of 1 as providing the best balance between sensitivity and specificity. The area under the curve (AUC) values for the BDI suicide item and the SSI were comparable: 0.72 and 0.71, respectively.

Single covariate Cox regression models indicated that the BDI suicide item also significantly predicted repeat suicide attempts in sample 2 (controlling for treatment condition), Wald $\chi^2_1 = 8.82$, $P < .01$ (N = 119). The HR for the item as an ordinal variable was 1.69; 95% CI, 1.19–2.38. Table 2 presents HRs, sensitivity, specificity, PPV, and NPV of each successive cutoff score. Scores of 2 and 3 significantly predicted repeat attempts. Evaluation of the ROC curve identified a cutoff score of 2 as providing best balance between sensitivity and specificity (Figure 1). ROC curve plots of the BDI suicide item and SSI revealed similar AUCs: 0.63 and 0.67, respectively.

DISCUSSION

Results indicated that the BDI suicide item significantly predicted both suicide and repeat attempts, with each successive cutoff score conferring greater risk. These results are expected, given the associations between suicidal ideation with and without intent and eventual suicidal behavior[3,5]; however, these findings establish the predictive validity of the item as a screening tool. For suicide, a score of 1 conferred a 4-fold risk and was identified as the optimal cutoff score. This is consistent with past research on the item, which also identified a score of 1 as optimal for predicting suicide.[14] Compared to the SSI cutoff score of 2,[5] the BDI suicide item cutoff of 1 had higher sensitivity (81% vs 53%), but lower specificity (54% vs 83%) for predicting suicide. Thus, it is superior to the SSI at identifying true positives, but performs less well at correctly identifying true negatives. The BDI suicide item also demonstrated a higher HR than found in past research[8] for the PHQ-9 suicide item (4.48 vs 2.64) in predicting suicide. For repeat attempts, a score of 2 conferred 2-fold risk and was identified as the optimal cutoff score. To our knowledge, our study is the first to demonstrate the predictive validity of the BDI suicide item for repeat attempts.

Results from sample 1 indicate that a cutoff score of 1 (ie, suicidal ideation without intent) may represent long-term vulnerability for eventual death by suicide. The findings from sample 2 may be more clinically useful than the findings for sample 1 because the item was also found to have predictive validity over a shorter time period (ie, months rather than years). Specifically, results found that patients scoring at or above 2 (ie, suicidal ideation with some intent) were at significantly higher risk for suicidal behavior than patients scoring 1 or below. Thus, it is recommended that when using the BDI suicide item in clinical practice, a cutoff score of 1 or above trigger a suicide risk assessment and corresponding risk management plan and that careful attention be given to patients endorsing at or above a 2 on the item (especially those with a history of suicide attempts), as this indicates they are at elevated risk for suicidal behavior in the coming months.

It is important to note that although results support the use of this item as an initial screen for suicide risk, it should not be relied upon as the sole determination of risk or to make risk management decisions (eg, hospitalization). Rather, the cutoff scores may be used to alert clinicians to the need for a more thorough evaluation of risk. Thus, this item is most appropriate for use by experienced clinicians

Table 1. Demographic Information[a]

Characteristic	Sample 1			Sample 2		
	Full Sample (N = 5,200)	Suicide	No Suicide	Full Sample (N = 119)	Attempt	No Attempt
Age, mean (SD), y	36 (12)	40 (14)	36 (12)	35 (10)	35 (8)	35 (11)
Female	56	44	56	61	56	64
White	81	88	81	35	42	33
Unemployed	19	49	19	47	56	43
Married	38	42	38	10	11	10
Past psychiatric hospitalization	16	72	16	100	100	100
Past suicide attempt	12	58	12	100	100	100
Major depressive disorder	43	67	42	77	67	82
Bipolar disorder	4	14	4	11	14	10
Substance use disorder	12	14	12	68	72	64
Personality disorder[b]	29	33	29	36	50	30

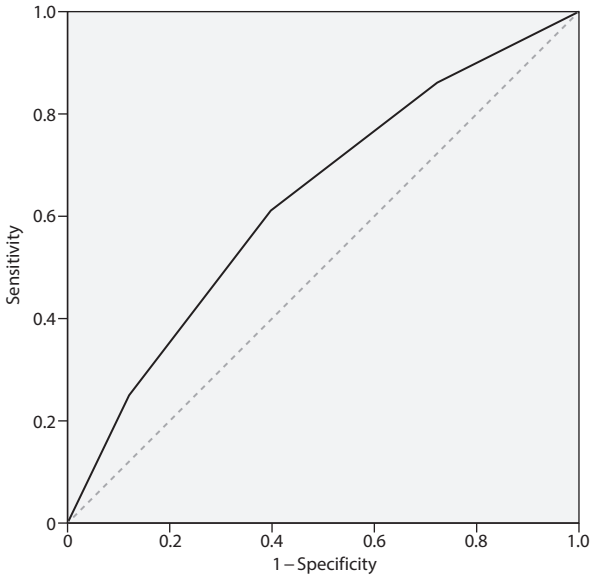
[a]All values are percentage (%) unless otherwise noted.
[b]In Sample 2, only borderline personality disorder was assessed; thus, percentages reflect that disorder only.

Table 2. Predictive Validity of the BDI Suicide Item for Death by Suicide and Repeat Suicide Attempts

BDI Suicide Item Cutoff Score	Hazard Ratio	95% CI	Wald χ^2_1	Sensitivity	Specificity	PPV	NPV
Sample 1							
= 0 vs > 0	4.48	2.08–9.67	14.60**	81%	54%	1%	100%
≤ 1 vs > 1	4.64	2.38–9.05	20.25**	28%	93%	3%	99%
≤ 2 vs 3	11.03	4.34–28.04	25.42**	12%	99%	8%	99%
Sample 2							
= 0 vs > 0	2.41	0.93–6.24	3.30	86%	28%	34%	82%
≤ 1 vs > 1	2.33	1.19–4.58	6.08*	61%	60%	40%	78%
≤ 2 vs 3	2.84	1.31–6.15	7.04*	25%	88%	47%	73%

*$P < .01$. **$P < .001$.
Abbreviations: BDI = Beck Depression Inventory, CI = confidence interval, NPV = negative predictive value, PPV = positive predictive value.

Figure 1. ROC Curve[a] of a BDI Suicide Item for Repeat Suicide Attempts



[a]Area under curve = 0.632.
Abbreviations: BDI = Beck Depression Inventory, ROC = receiver operating characteristic.

(or where there is an experienced clinician available) who can conduct risk assessments in response to a positive screen on the item.

The current study has several strengths, including the use of clinical populations and a prospective design. Limitations must also be noted. All participants in sample 2 had previously attempted suicide; thus, results regarding suicide attempts may not generalize to non-attempters and additional research in non-attempters is necessary. Additionally, the BDI suicide item was evaluated only in the context of the other BDI items. Further study is important for establishing the predictive validity of the item as an independent screen without also administering the other items. Future research examining the predictive validity in other settings (eg, inpatients, primary care) and populations (eg, adolescents, older adults) is encouraged to improve generalizability.

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