Journal of the Formosan Medical Association (2016) 115, 395–403

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.jfma-online.com

ORIGINAL ARTICLE

Predictive validity of a five-item symptom checklist to screen psychiatric morbidity and suicide ideation in general population and psychiatric settings

Chia-Yi Wu [a,b], Jia-In Lee [c], Ming-Been Lee [b,d,e,*], Shih-Cheng Liao [b,e], Chia-Ming Chang [b,f], Hsi-Chung Chen [e], For-Wey Lung [b,g]

[a] School of Nursing, National Taiwan University College of Medicine, Taipei, Taiwan
[b] Taiwan Suicide Prevention Center, Taipei, Taiwan
[c] Department of Psychiatry, Kaohsiung Medical University Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan
[d] Department of Psychiatry, National Taiwan University College of Medicine, Taipei, Taiwan
[e] Department of Psychiatry, National Taiwan University Hospital, Taipei, Taiwan
[f] Department of Psychiatry, Chang-Gung Memorial Hospital and Chang-Gung University, Taoyuan, Taiwan
[g] Division of General Psychiatry, Songde Branch, Taipei City Hospital, Taipei, Taiwan

Received 16 April 2015; received in revised form 8 May 2015; accepted 11 May 2015

KEYWORDS
psychological distress;
psychiatric morbidity;
self-rating scale;
suicide ideation;
suicide risk screening

Background/purpose: Suicide is a major concern in public health worldwide. Early identification of individuals at risk is critical for suicide prevention. The present study revised the 5-item Brief Symptom Rating Scale (BSRS-5) to a checklist format (BSRS-5R) and validated the BSRS-5R into a screening tool for psychiatric morbidity and suicide ideation in the general public.
Methods: The study participants consisted of two subsets of sample from community residents and psychiatric patients. The community subjects were recruited from stratified proportional randomization sampling in a nationwide community survey, while the psychiatric patients were from psychiatric outpatient service and psychiatric daycare unit in a teaching hospital in northern Taiwan. All participants responded to the questionnaire investigating the BSRS-5, personal experience with suicide, and demographic information.
Results: In total, 2147 community respondents and 700 respondents from psychiatric settings completed the survey questions. The BSRS-5R was highly correlated to BSRS-5 with good internal consistency in our study sample. For the community subjects, *receiver operating*

Conflicts of interest: The authors have no conflicts of interest relevant to this article.

* Corresponding author. Department of Psychiatry, National Taiwan University Hospital, Number 7, Chung Shan South Road, Taipei, Taiwan.
E-mail address: mingbeen@ntu.edu.tw (M.-B. Lee).

http://dx.doi.org/10.1016/j.jfma.2015.05.004

characteristic curve analysis revealed an optimal cutoff of 2/3 for BSRS-5R to discriminate psychiatric morbidity or suicide ideation. The BSRS-5R could also identify psychiatric morbidity in psychiatric outpatients and daycare patients. In addition, the cutoff of 4/5 for BSRS-5R to determine suicide ideation yielded moderately good predictive validity in psychiatric outpatients and in daycare patients.

Conclusion: The BSRS-5R was validated as an efficient checklist to screen for psychiatric morbidity and suicide ideation in the general public. The result is valuable in translating into general medical and community settings for early detection of suicide ideation.

Introduction

Suicide has been recognized as a major public health issue worldwide and is one of the first causes of potential loss of life.[1] It involves multiple determinants with a complex process from initiation of ideation, planning, attempting, and finally to completed behaviors.[2] Suicide risks can be formulated as an interaction between relatively stable risk factors or predisposing characteristics, protective factors, and acute precipitants.[3] Individuals should be screened and assessed for suicide risks along a timeline of imminent, near-term, and long-term risk.[4] Psychological autopsy studies have demonstrated that a majority of suicides occur on the individual's first attempt.[5,6] Thus, earlier identification of high-risk individuals with suicide ideation (SI) is crucial for early intervention prior to an attempt. Moreover, SI was reported to closely link to a suicide attempt and completed suicide, and have a long-term effect on the development of future mental health problems.[7] The reported prevalence rates of SI varied widely by various definitions, in different settings, and for diverse populations.[8] The estimated prevalence of SI in the general population ranges widely from 2.3% to 14.6% for 1-year SI and from 10% to 14% for lifetime SI.[5,9–12] Well-established risk factors for suicide included mental disorders and severe psychosocial stress, especially mood disorders, anxiety disorders, substance use disorders, and schizophrenia.[9,13–23] Mental disorders presenting with anxiety, depression, or suicide ideation are common in the community as well as in medical settings including primary care clinics and inpatient units.[24–27] However, only a minority of the high-risk individuals sought professional help and were correctly identified by nonpsychiatric physicians.[12,28–30]

A number of tools for screening or indepth assessment for suicide were designed to capture potential risk factors for further management.[4,31] Among all screening tools for suicide risk factors, relatively few were invented for universal application across different medical settings and populations.[4] This may be due to the fact that completed or attempted suicides are rare events, making prediction difficult simply based on screening results. Therefore, proactive detection of the aforementioned risk factors to uncover early-stage suicide ideation plays a key role in suicide prevention in the suicidal process. Previously our research team has proved that the 5-item Brief Symptom Rating Scale (BSRS-5) is a satisfactory instrument to screen for psychiatric morbidity or SI in a variety of settings with a wide application in Taiwan. It is adopted as a routine screening among medical inpatients at admission or individuals receiving general health examination.[32–37] In order to increase the feasibility of BSRS-5 as a more efficient and widely acceptable screening tool, the authors revised the 5-point ratings of BSRS-5 to a yes/no response format, the BSRS-5R, and examined its reliability and validity in both general population and psychiatric settings. It was expected that the revised format would be easier and shorter to use either by self-report or by interview in diverse situations.

Methods

Participants

The study sample comprised individuals recruited from the following two populations:

(1) *Community subjects*
The community sample was enrolled using a standardized computer-assisted telephone interview system. The telephone numbers were selected using a stratified proportional randomizing method from the telephone-number bank according to the distribution of population size in different geographic areas of Taiwan. All the respondents aged 15 years and older were invited to answer a series of surveyed questions. In total, 2147 respondents (43.5% males) who completed all the surveyed questions were included as study participants.

(2) *Psychiatric patients*
The psychiatric patients came from two sources in the study hospital: (1) patients who received the outpatient service provided by the corresponding author (Lee MB); and (2) patients who attended the 60-bedded daycare psychiatric rehabilitation program. The candidates were invited to complete the aforementioned survey questions. Within the 8-month study period, 636 outpatients and 64 daycare patients completed the surveyed questions, resulting in a total of 700 psychiatric patients (65.9% females) collected in the study.

Surveyed questions and procedure

All the participants were asked to complete the questions of BSRS-5, which is a 5-item Likert scale (scores of 0 to 4) by self-report or by interview for measurement of the severity

of psychological distress. A higher score indicates poorer mental health.[32] The full scale contained the following five items of psychopathology: (1) feeling tense or keyed up (anxiety); (2) feeling low in mood (depression); (3) feeling easily annoyed or irritated (hostility); (4) feeling inferior to others (interpersonal hypersensitivity: inferiority); and (5) having trouble falling asleep (insomnia). An additional question, "Do you have any suicide ideation?" was added at the end of the questionnaire. A brief and consistent instruction before the description of symptoms was given to respondents to ensure validity and to guide them in rating the degree to which they felt discomfort from each item during the past week, including the current day. The participants were asked to rate symptoms on a 5-point scale: 0, not at all; 1, a little bit; 2, moderately; 3, quite a bit; and 4, extremely, and a total score was calculated for each participant. The BSRS-5 has been reported to have satisfactory psychometric properties as a measure to detect psychiatric morbidity in medical settings or the community.[32,34] In addition to BSRS-5 questions, the participants were also inquired about demographic data and personal experience about suicide (i.e., suicide ideation or attempt over the past 1 year or lifetime). We converted the original item rating(s) into 0, meaning no distress at all (original score of 0), or 1, meaning significant distress (original scores of 1 to 4) for the symptoms listed in the BSRS-5, resulting in a total score of 5 in the revised scale of BSRS-5R. It was designed as a more efficiently and effectively administered screening tool for symptom checking for both clinical and community subjects. In this study, the presence of psychiatric morbidity was defined by BSRS-5 with a score of 6 or higher.

Statistical analysis

Other than descriptive statistics of demographic variables, we used the following tests for data analysis: Pearson's correlation to test the correlation between BSRS-5 and BSRS-5R; Cronbach α to estimate the internal consistency of BSRS-5R; Chi-square test with estimation of odds ratios (ORs) in a 95% confidence interval to examine the association of SI with psychological distress defined by BSRS-5R; receiver operating characteristic (ROC) curve analysis with area under the curve (AUC) to establish the optimal cutoff point for BSRS-5R to predict SI and psychiatric morbidity; Spearman's rho correlation to examine the association between SI and individual items of BSRS-5R. Furthermore, stepwise logistic regression analysis was performed to examine which of the five symptom items had discriminative validity for SI. Statistical significance was set at a level of $p < 0.05$. The SPSS 18.0 software package (SPSS Inc., Chicago, IL, USA) was used for analyses in this study.

Results

Demographics and clinical characteristics of the study participants

As shown in Table 1, the daycare patients ($n = 64$), who were referred for psychiatric rehabilitation from unstable outpatients or acute inpatients receiving hospitalized psychiatric care, had a higher ratio in females and older age patients than psychiatric outpatients ($n = 636$) and community subjects ($n = 2147$). The rate of suicide ideation in the past week was increased from 2.1% in the community subjects, about 15-fold (27.4%) for psychiatric outpatients, and to approximately 30-fold (57.8%) for day care patients. According to the scores of BSRS-5, the daycare patients presented a significantly higher rate of psychiatric morbidity than psychiatric outpatients and community subjects. Accordingly, based on the mean scores of BSRS-5, the daycare patients presented more severe psychological distress (BSRS-5 $= 9.97 \pm 5.08$) than outpatient participants (6.92 ± 5.29) and community sample (1.49 ± 2.45). In a word, the daycare patients manifested with most severe psychopathology, followed by the outpatients, and then the community subjects.

With respect to psychiatric diagnosis, all the psychiatric patients received at least one diagnosis of formal psychiatric disorder. Among the outpatient population, 16.3% of them had two psychiatric diagnosis; the most prevalent diagnoses were depressive disorders ($n = 297$, 46.7%) and anxiety disorders ($n = 276$, 43.6%). The former disorders included major depressive disorder ($n = 98$,15.4%) and dysthymic disorder ($n = 199$, 31.2%); the latter included generalized anxiety disorder ($n = 168$, 26.4%), panic disorder ($n = 31$, 4.9%), obsessive compulsive disorder ($n = 31$, 4.9%), phobia ($n = 7$, 1.1%), followed by other disorders such as adjustment disorders ($n = 44$, 6.9%), insomnia ($n = 27$, 4.2%), schizophrenia ($n = 5$, 2.4%), and delusional disorders ($n = 24$, 3.8%). Among the 64 daycare patients, the most prevalent diagnoses were major depressive disorders ($n = 25$, 39.1%) and bipolar disorders ($n = 20$, 31.2%), followed by schizophrenia ($n = 11$, 17.6%), organic mental disorders ($n = 2$, 3.1%) and obsessive compulsive disorder ($n = 2$, 3.1%). It is clear that the majority of psychiatric disorders among the outpatients were depressive disorders (46.7%) and anxiety disorders (43.6%); whereas, among daycare patients, the main psychiatric disorders were mood disorders (70.3%) including major depression and bipolar disorders.

Reliability and validity of BSRS-5R to determine psychiatric morbidity

The correlations between BSRS-5R and the parent form BSRS-5 were 0.87 ($p < 0.01$) for community subjects and 0.80 ($p < 0.001$) for psychiatric patients. The internal consistency of BSRS-5R was satisfactory according to Cronbach's alpha, 0.865 for community subjects and 0.79 for psychiatric patients. In the current study, when choosing 5/6 of the BSRS-5 score as a cutoff (referred as golden standard) to determine psychiatric morbidity (PM), the prevalence of PM was 6.2% in community subjects, 50.5% for the outpatients, and 76.6% for daycare patients (Table 1). As shown in Table 2, ROC curve analysis revealed that 2/3 was the optimal cutoff point for the BSRS-5R to discriminate psychiatric morbidity of community subjects (sensitivity = 0.96; specificity = 0.88) with AUC of 0.96. In addition, other optimal cutoff thresholds to identify psychiatric morbidity were 3/4 for psychiatric outpatients

Table 1 The demographics and mental health status of the study participants.

	Community subjects *n* (%)	Psychiatric outpatients *n* (%)	Daycare patients *n* (%)	χ^2	*p*
Gender					
Male	935 (43.5)	228 (35.8)	11 (17.2)	27.63	< 0.0001
Female	1212 (56.5)	408 (64.2)	53 (82.8)		
Age (y)					
15–24	324 (15.1)	30 (4.7)	0 (0)	68.26	< 0.0001
25–44	558 (26.0)	167 (26.3)	15 (23.4)		
45–64	908 (42.3)	287 (45.1)	35 (54.7)		
≥ 65	357 (16.6)	152 (23.9)	14 (21.9)		
BSRS-5 score					
< 6	1994 (93.8)	315 (49.5)	15 (23.4)	826.53	< 0.0001
≥ 6	129 (6.2)	321 (50.5)	49 (76.6)		
BSRS-5R score					
< 3	1768 (83.3)	187 (29.4)	7 (10.9)	776.09	< 0.0001
≥ 3	355 (16.7)	449 (70.6)	57 (89.1)		
Suicide ideation over the past week					
Absence	2100 (97.9)	462 (72.6)	37 (42.2)	486.32	< 0.0001
Presence	46 (2.1)	174 (27.4)	27 (57.8)		

BSRS-5 = 5-item Brief Symptom Rating Scale; BSRS-5R = Revised 5-item Brief Symptom Rating Scale of a checklist format.

(sensitivity = 0.96; specificity = 0.83), as well as 4/5 for daycare patients (sensitivity = 0.92; specificity = 0.93).

Associations between psychopathology and suicide ideation

For community subjects, the BSRS-5R score and its individual item were all significantly correlated with SI. The BSRS-5R score had the highest correlation coefficient (0.47), followed by anxiety (0.25), depression (0.24), hostility (0.20), inferiority (0.18), and insomnia (0.16). Regarding individual items of BSRS-5R, there were significant positive interitem correlations. As shown in Table 3, the two highest interitem correlation coefficients were 0.49 for depression and anxiety and 0.47 for depression and hostility. As displayed in Table 4, the participants with BSRS-5R defined psychiatric morbidity presented a significantly higher rate of SI when compared with those not so defined for both community sample (11.0% vs. 0.3%; OR = 43.52) and psychiatric patients (38.5% vs. 3.1%; OR = 19.65). Concerning the association of SI with each item of BSRS-5R, the patients with positive responses to any item were significantly more likely to have SI for both community subjects and psychiatric patients; the OR for each response to predict SI were displayed in Table 4. The top two items were depression (OR = 28.33) and anxiety (OR = 22.04) for community subjects; depression (OR = 47.57) and hostility (OR = 12.92) for psychiatric patients. Stepwise logistic regression analysis on BSRS-5R items to predict SI revealed that significant independent predictors contained anxiety, depression, inferiority, and insomnia for community subjects as well as depression, inferiority, and hostility for psychiatric patients (Table 5).

Table 2 Parameter summary in BSRS-5R validation using ROC curve analysis to predict recent psychiatric morbidity and suicide ideation.

Statistical measures	Community subjects (*n* = 2147)		Psychiatric outpatients (*n* = 636)		Daycare patients (*n* = 64)	
	PM	SI	PM	SI	PM	SI
Optimal cutoff	2/3	2/3	3/4	4/5	4/5	4/5
Sensitivity	0.96	0.89	0.96	0.76	0.92	0.89
Specificity	0.88	0.85	0.83	0.76	0.93	0.41
Accurate classification	0.89	0.85	0.89	0.76	0.92	0.61
False positive	0.12	0.15	0.17	0.24	0.07	0.60
False negative	0.04	0.11	0.04	0.24	0.08	0.11
Negative predictive value	0.99	0.99	0.95	0.89	0.78	0.83
Positive predictive value	0.35	0.11	0.85	0.54	0.98	0.52
Area under the curve	0.96	0.90	0.92	0.81	0.92	0.66

PM = psychiatric morbidity; ROC = receiver operating characteristic; SI = suicide ideation.

Table 3 Correlations among suicide ideation and each BSRS-5R item using Spearman's correlation coefficient in the study participants.

	Suicide ideation		Insomnia		Anxiety		Hostility		Depression		Inferiority	
	A*	B*	A	B	A	B	A	B	A	B	A	B
Insomnia	0.16**	0.19**										
Anxiety	0.25**	0.28**	0.29**	0.39**								
Hostility	0.20**	0.32**	0.27**	0.32**	0.43**	0.56**						
Depression	0.24**	0.40**	0.33**	0.34**	0.49**	0.56**	0.47**	0.58**				
Inferiority	0.18**	0.44**	0.17**	0.23**	0.32**	0.41**	0.33**	0.43**	0.35**	0.54**		
BSRS-5R	0.29**	0.48**	0.62**	0.60**	0.72**	0.77**	0.73**	0.78**	0.76**	0.82**	0.60**	0.73**

*Group A = community subjects; Group B = psychiatric patients.
**$p < 0.001$.

Validity of BSRS-5R in screening for suicide ideation and other suicide risks

Considering BSRS-5R as a screening measure for SI, the optimal cutoff values to identify the presence of SI were 2/3 for community subjects and 4/5 for psychiatric patients. As Table 2 shows, using these cutoff points, among community subjects, the accurate classification rate for SI was 85.88% [with sensitivity = 0.89, specificity = 0.85, negative predictive value (NPV) = 0.99, positive predictive value (PPV) = 0.110, and AUC = 0.90]. The NPV of 0.99 implied that when the respondent scored < 3, there was a 99.7% probability that he or she would not have SI. Based on the cutoff of 4/5, the accurate classification rate for SI was 0.76 with a sensitivity of 0.76; specificity, 0.76; and NPV, 0.90 for psychiatric outpatients. With respect to the validity profile to determine SI using 4/5 as a cutoff for psychiatric daycare patients, the results showed a sensitivity of 0.889 and a negative predictive value of 0.83, but a weak performance with levels of specificity (0.41) and accuracy of classification (0.61) below 0.70 (Table 2).

Concerning the convergent validity, we examined the relationship between BSRS-5R and personal experience of suicide. As shown in Table 6, the community subjects who had suicide behaviors in the past 1 year, presented a highest rate (75.0%) of positive suicide ideation screening by BSRS-5R, followed by those with suicide ideation over the past 1 year (69.0%), suicide behavior in lifetime (46.7%), and suicide ideation cross lifetime (38.5%). The same characteristics of findings were noted for psychiatric patients; the patients who stated future suicide intent presented the highest rate (79.9%) of screening positive, followed by that (74.4%) of individuals ever receiving medical treatment for suicide behaviors, and 64.7% of those with past suicide attempt without medical treatment. Concerning the sum-score of BSRS-5R, as shown in Table 6,

Table 4 The presence and prediction of suicide ideation by BSRS-5R items in different study populations.

Variables	Suicide ideation, *n* (%)				Unadjusted odds ratios (95% confidence intervals)	
	Community subjects		Psychiatric patients		Community subjects	Psychiatric patients
	Absence	Presence	Absence	Presence		
BSRS-5R score						
< 3	1736 (99.7)	5 (0.3)	188 (96.9)	6 (3.1)	1	1
≥ 3	316 (89.0)	39 (11.0)	311 (61.5)	195 (38.5)	43.52 (17.02—111.26)*	19.65 (8.55—45.16)*
Depression						
No	1704 (99.6)	6 (0.4)	209 (98.6)	3 (1.4)	1	1
Yes	391 (90.9)	39 (9.1)	290 (59.4)	198 (40.6)	28.33 (11.91—67.38)*	47.57 (15.00—150.81)*
Inferiority						
No	1796 (99.0)	18 (1.0)	314 (91.8)	28 (8.2)	1	1
Yes	296 (91.6)	27 (8.4)	185 (51.7)	173 (48.3)	9.10 (4.95—16.73)*	10.49 (6.76—16.26)*
Hostility						
No	1597 (99.5)	8 (0.5)	174 (95.6)	8 (4.4)	1	1
Yes	496 (92.9)	38 (7.1)	325 (62.7)	193 (37.3)	15.29 (7.09—32.99)*	12.92 (6.22—26.82)*
Anxiety						
No	1769 (99.5)	9 (0.5)	148 (95.5)	7 (4.5)	1	1
Yes	330 (89.9)	37 (10.1)	351 (64.4)	194 (35.6)	22.04 (10.54—46.09)*	11.69 (5.37—25.45)*
Insomnia						
No	1523 (99.3)	11 (0.7)	149 (86.9)	22 (13.1)	1	1
Yes	571 (94.2)	35 (5.8)	353 (66.4)	179 (33.6)	8.50 (4.29—16.85)*	3.37 (2.08—5.46)*

*$p < 0.001$.

Table 5 Stepwise logistic regression model[a] for predicting suicide ideation in different study populations.

Covariates	B	Sig	Exp (B)	95% CI	χ^2
Community subjects ($n = 2147$)					
(1) Depression	1.83	< 0.001	6.26	2.31–16.98	92.66
(2) Anxiety	1.73	< 0.001	5.63	2.34–13.59	28.02
(3) Insomnia	0.91	0.02	2.47	1.18–5.19	6.29
(4) Inferiority	0.79	0.02	2.20	1.12–4.32	5.38
Psychiatric patients ($n = 700$)					
(1) Inferiority	1.51	<0.001	4.51	2.81–7.24	149.72
(2) Depression	2.63	<0.001	13.83	4.09–46.84	54.64
(3) Hostility	0.89	0.04	2.43	1.06–5.57	4.89

[a] Model contained scale items selected in stepwise regression analysis.

the patients with experience of any type of suicide (i.e., ideation or attempt) presented significantly higher scores than those without that experience. The findings clearly demonstrated that BSRS-5R was valid to differentiate the degree of severity of various suicide experiences (1-year experience > lifetime experience; suicide behavior > ideation) as well as efficiently to classify the suicide with different levels of severity (stated future suicide intent > past medically treated suicide behaviors > nonmedically treated suicide behaviors).

Discussion

Previously, the BSRS-5 was validated as an effective screening instrument to identify psychiatric morbidities and suicide ideation,[32,37] yet first-line workers reported its inconvenience in the 5-point ratings on itemized severity of psychological distress while screened for individuals with severe medical conditions or the elderly population. In balancing the feasibility, effectiveness, and dissemination of a scale for wider applications, current findings demonstrated the BSRS-5R as having a good performance with satisfactory validity to identify psychiatric morbidity or SI in community subjects and psychiatric patients. The checklist of BSRS-5R was highly correlated with the original BSRS-5 and had a satisfactory reliability (Cronbach α 0.79 and Cronbach α 0.80 for community subjects and psychiatric patients, respectively). In accordance with the well-established finding that mental disorders were one of the most important risk factors for suicide,[7,13,38] in this study, there were higher rates of SI among the patients who were classified as having psychiatric morbidity by BSRS-5R: 11.0% (OR = 43.52) for community subjects and 38.5%

Table 6 Convergent validity of the BSRS-5R in screening for suicide ideation and other suicide-related risk factors.[a]

BSRS-5R	BSRS-5R	BSRS-5R screening for SI		
	Means (SD)	Negitive *n* (%)	Positive *n* (%)	Total *n* (%)
Community subjects				
Lifetime suicide ideation				
Yes	1.99 (1.64)*	174 (61.5)	109 (38.5)	283 (100)**
No	0.91 (1.29)	1592 (86.6)	246 (13.4)	1838 (100)
Suicide ideation in the past year				
Yes	3.00 (1.67)*	13 (31.0)	29 (69.9)	42 (100)**
No	1.01 (1.35)	1753 (84.3)	326 (15.7)	2079 (100)
Lifetime suicide attempt				
Yes	2.42 (1.63)*	24 (53.3)	21 (46.7)	45 (100)**
No	1.02 (1.37)	1744 (83.9)	334 (16.1)	2078 (100)
Suicide attempt in the past year				
Yes	3.75 (1.50)*	1 (25.0)	3 (75.0)	4 (100)**
No	1.05 (1.38)	1767 (83.4)	352 (16.6)	2119 (100)
Psychiatric patients				
Lifetime suicide attempt without medical treatment				
Yes	4.17 (1.37)*	54 (35.3)	99 (64.7)	153 (100)**
No	3.30 (1.68)	356 (65.1)	191 (34.9)	547 (100)
Lifetime suicide attempt treated at medical facility				
Yes	4.45 (1.10)*	21 (25.6)	61 (74.4)	82 (100)**
No	3.36 (1.68)	389 (62.9)	229 (37.1)	618 (100)
Stated future suicide intent				
Yes	4.58 (1.06)*	24 (20.3)	94 (79.9)	118 (100)**
No	3.26 (1.67)	386 (66.3)	196 (33.7)	582 (100)

* $p < 0.001$ using independent t test.
** $p < 0.001$ using χ^2 test.
SD = standard deviation; SI = suicide ideation.
[a] The cutoff points of the BSRS-5R for screening suicide ideation were 2/3 for the community subjects and 4/5 for the psychiatric patients.

(OR = 19.65) for psychiatric patients. Among the patients with SI, a high proportion was defined as having psychiatric morbidity by BSRS-5R: 84.8% (39/46) for community subjects and 97.01% (195/201) for psychiatric patients.

Furthermore, the symptoms in each item of the BSRS-5R were significant independent predictors for SI according to the parameters of correlation coefficients, OR, and multivariate analysis. In particular, among community subjects, depression (r = 0.24, OR = 28.33) and anxiety (r = 0.25, OR = 22.04) were two most important predictors. These findings are consistent with those reported by Kessler et al.[38,39] They found that the majority of patients with SI (80–82%) met the criteria for one or more of the 12-month DSM disorders. Major depressive disorder was the most common single disorder (38.9–41.9%), whereas anxiety disorders were the most common class of disorders (60.6–62.8%). Anxiety or anxiety disorders closely linked to SI and were important predictors of suicide.[10,16,38–41] Sareen et al[16] conducted a population-based longitudinal study on adults and found that a preexisting anxiety disorder is an independent risk factor for subsequent onset of SI. They also reported that a comorbid anxiety disorder could amplify the risk of suicide attempts in persons with mood disorders. In addition to anxiety, inferiority, and hostility also played important roles in predicting SI based on the ORs or correlation coefficients to SI either in community subjects or in psychiatric patients. For instance, among psychiatric patients, compared with those with negative responses to items of inferiority or hostility, the patients with positive responses were about 10 times more likely to have suicide ideation for inferiority (OR = 10.49) or hostility (OR = 12.92; Table 4). Inferiority was a kind of interpersonal hypersensitivity expressed in the interaction between the individual and society. It may lead to hostility and destructive consequences. When inferiority feeling turns inward, it may be manifest as depression or suicide. With regard to hostility, it could be a reaction to frustration resulting from stress or, as our study showed, be closely associated with anxiety (r = 0.43 for community subjects; 0.56 for psychiatric patients) or depression (r = 0.47 for community subjects; 0.58 for psychiatric patients). Altogether, unresolved anxiety, inferiority, or hostility may lead to a final outcome of depression or suicide ideation. In terms of insomnia, the remaining predictor with a weak but significant correlation with SI and the other four items of symptoms, it might cause severe anxiety or lead to hopelessness and helplessness.[41]

Based on the univariate model and multivariate analysis, all five symptoms could predict SI with the 5-item total score or any single item rating. Using stepwise logistic regression analysis, all five except for hostility could predict SI among community subjects; whereas in psychiatric patients, only depression, inferiority, and hostility could significantly predict SI. In a word, the contributing factors of suicide varied in different settings and diverse populations. This study showed that severer psychological distress would lead to higher presence of SI. Most of psychiatric patients presented overt and chronic psychiatric conditions. As such, multiple symptom domains would work together and finally result in hopelessness, helplessness, and suicide ideation. Regarding predictive validity of BSRS-5R for community subjects, the optimal cutoff (2/3) derived from ROC curve to predict SI performed good with the sensitivity of 0.89, specificity of 0.85, and accurate classification rate of 84.9%. The high specificity and negative predictive value (NPV) (0.99) for our patients implied that those scoring < 3 were highly unlikely to have SI. The NPV of 99.7% means that when the participant scored <3, there was a 99.7% probability that he or she would not have SI. In addition, the AUC was 0.90 (SE = 0.03). It indicates that this instrument has good ability to discriminate between cases (with SI) and noncases (without SI). However, the positive predictive value (PPV) of 11.0% was low and reflected the low rate of SI (2.1%) in our patients. For psychiatric patients, the BSRS-5R also showed equally good quality to discriminate psychiatric morbidity or suicide ideation. However, the cutoff thresholds were different and higher in psychiatric patients than the community subjects. To summarize, the cutoff values to determine psychiatric morbidity were 3/4 for psychiatric outpatients and 4/5 for the daycare patients. Further, the optimal cutoff point to determine the presence of suicide ideation was 4/5 for all psychiatric patients, outpatients, or daycare patients.

To infer, suicide ideation occurred with a close relationship to the severity of psychopathology defined by BSRS-5R. The BSRS-5R had a good predictive validity on psychiatric morbidity and suicide ideation for the community sample, thus it will be suitable for use in the general public. However, using BSRS-5R as a screening measure in psychiatric daycare patients with smaller sample size, more severe psychopathology, and more prevalent SI, the results showed a satisfactory sensitivity (0.89) and negative predictive value (0.83), but a weak performance with lower specificity (0.41). Besides, the BSRS-5R only contained five items with two ratings (yes or no), the range of the sum-score was too narrow (0–5) to predict wider-range severity of psychological distress of psychiatric daycare patients. Therefore, it was suggested to apply the BSRS-5R in the psychiatric settings as an initial screener to determine if the level of psychological distress or suicide risk returns to the normal condition as well as to provide a global impression about what symptom domain needs further evaluation. Thus, it can serve as a quick reference of suicide risk judgment for mental and nonmental health workers in their busy clinical services.

Suicide is a process presenting with complicated, multifaceted, and interactive determinants. Multiple suicide risk assessment scales have been proposed, but different scales need to be designed for various settings, time points of suicide development, different populations, and purposes. Anyone with significant psychological distress all needs professional attention, independent of the levels of suicide risk. Basic indication of the BSRS-5R was suitable for use as a screening measure for early identification of individuals at risk for psychiatric morbidity or SI in the community or at the nonpsychiatric medical settings. After the individuals are screened positive, they need further assessment and formulation on suicide risks using more comprehensive patient-centered methods and receive relevant and timely clinical interventions.[41,42] Compared with other screening tools, the BSRS-5R not only presents with optimal values to predict both psychiatric morbidity and suicide ideation, it also provides a simple profile of five domains of common psychopathology. Meanwhile, it can be used in combination with other relevant assessment tools

directly measuring the risks of suicide intent, acts, or repetition to provide more comprehensive and valid prediction toward suicidal behavior at different situations and time points.[43]

Limitations and strengths of the study

The study was a cross-sectional design focusing on the predictability of suicide ideation and psychiatric morbidity. Thus generalization needs to be careful. We need further study to apply the new format of BSRS-5R in different situations to test if BSRS-5R would be feasible for people with more severe suicidal behaviors, such as prior suicide attempt. In addition, extended applications will be needed to examine the validity in other groups of individuals at risk such as cancer patients, elderly people with multiple morbidities or physical disabilities, and nonpsychiatric primary care settings.

The findings demonstrated that individuals with a past history of suicide ideation, suicide attempts, and currently stating future suicide intent presented with significantly higher scores on BSRS-5R and higher rates of positive screening for SI defined by BSRS-5R. This indicated that BSRS-5R could well differentiate people with a history of suicide behaviors and current suicide intent. The inference could be made that the BSRS-5R screening might be feasible to identify individuals with a past suicide attempt, which has been considered as the most important predictor for future completed suicide. Moreover, BSRS-5R items contain no item about somatic or psychosomatic symptoms and thus can avoid the confounding effects of physical symptoms on the severity of psychopathology measurement. It is therefore suitable for use in SI-associated risk groups of physically ill individuals. In addition to self-rating, BSRS-5R can also be administered by interview, so it could be used to screen SI in the elderly or in people who cannot read, or people with severe physical impairments. Future research and clinical applications are suggested to test its appropriateness and feasibility in general medical settings. Further development of a more comprehensive scale may be considered for accurate detection of suicide risk that reflects risks of different populations and settings across the timeline.

Acknowledgments

The authors wish to acknowledge Professor Wen-Chung Lee for his comments on statistics and the colleagues at the Taiwan Suicide Prevention Center for their administrative assistance and devoted help. We are also grateful for financial support provided by the Department of Health and Welfare, Executive Yuen, Taiwan (reference number: DOH 94-3084).

References

1. World Health Organization. *Revised Global Burden of Disease (GBD) 2002 Estimate*. Geneva, Switzerland: World Health Organization; 2002. Available at: http://www.who.int/healthinfo/bodgbd2002revised/en/index.html/ [Accessed 28 February 2008].
2. Mann JJ, Apter A, Bertolote J, Currier D, Haas A, Hegerl U, et al. Suicide prevention strategies. *JAMA* 2005;**294**:2064—74.
3. Scocco P, De Leo D. One-year prevalence of death thoughts, suicide ideation and behaviors in an elderly population. *Int J Geriatr Psychiatry* 2002;**17**:842—6.
4. Boudreaux ED, Horowitz LM. Suicide risk screening and assessment: designing instruments with dissemination in mind. *Am J Prev Med* 2014;**47**:S163—9.
5. Suominen K, Isometa E, Suokas J, Haukka J, Achte K, Lonnqvist J. Completed suicide after a suicide attempt: a 37-year follow-up study. *Am J Psychiatry* 2004;**161**:562—3.
6. Cavanagh JT, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a systematic review. *Psycol Med* 2003;**33**:395—405.
7. Reinherz HZ, Tanner JL, Berger SR, Beardslee WR, Fitzmaurice GM. Adolescent suicidal ideation as predictive of psychopathology, suicidal behavior, and compromising functioning at age 30. *Am J Psychiatry* 2006;**163**:1226—32.
8. Burless C, De Leo D. Methodological issues in community surveys of suicide ideators and attempters. *Crisis* 2001;**22**:109—24.
9. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Arch Gen Psychiatry* 1999;**56**:617—26.
10. Neeleman J, DeGraaf R, Vollebergh W. The suicide process: prospective comparison between early and later stages. *J Affect Disord* 2004;**82**:43—52.
11. Casey PR, Dunn G, Kelly BD, Birkbeck G, Dalgaro OS, Lehtinen V, et al. Factors associated with suicidal ideation in the general population: five-centre analysis from the ODIN study. *Br J Psychiatry* 2006;**189**:410—5.
12. De Leo D, Cerin E, Spathonis K, Burgis S. Lifetime risk of suicide ideation and attempts in an Australian community: prevalence, suicidal process, and help-seeking behaviour. *J Affect Disord* 2005;**86**:215—24.
13. Baxter D, Appleby L. Case register study of suicide risk in mental disorders. *Br J Psychiatry* 1999;**175**:322—6.
14. Henriksson MM, Aro HM, Marttunen MJ, Heikkinen ME, Isometsa ET, Kuoppasalmi KI, et al. Mental disorders and comorbidity in suicide. *Am J Psychiatry* 1993;**150**:935—6.
15. Hawton K, Comabella CC, Haw C, Saunders K. Risk factors for suicide in individuals with depression: a systematic review. *J Affect Disord* 2013;**147**:17—28.
16. Sareen J, Houlahan T, Cox BJ, Asmundson JG. Anxiety disorders associated with suicidal ideation and suicide attempts in the national comorbidity survey. *J Nerv Ment Dis* 2005;**193**:450—4.
17. Verona E, Sachs-Ericsson N, Joiner Jr TE. Suicide attempts associated with externalizing psychopathology in an epidemiological sample. *Am J Psychiatry* 2004;**161**:444—51.
18. Phillips MR, Yang G, Li S, Li Y. Suicide and the unique prevalence pattern of schizophrenia in mainland China: a retrospective observational study. *Lancet* 2004;**364**:1062—8.
19. Black DW, Warrack G, Winokur G. The Iowa record-linkage study. I. Suicides and accidental deaths among psychiatric patients. *Arch Gen Psychiatry* 1985;**42**:71—5.
20. Druss B, Pincus H. Suicidal ideation and suicide attempts in general medical illnesses. *Arch Intern Med* 2000;**160**:1522—6.
21. Chang HJ, Yang CY, Lin CR, Ku YL, Lee MB. Determinants of suicidal ideation in Taiwanese urban adolescents. *J Formos Med Assoc* 2008;**107**:156—64.
22. Lewinsohn PM, Rohde P, Seeley JR. Adolescent suicidal ideation and attempts: prevalence, risk factors, and clinical implications. *Clin Psychol* 1996;**3**:25—46.
23. Bartle-Haring S, Rosen KH, Stith SM. Emotional reactivity and psychological distress. *J Adolesc Res* 2002;**17**:568—85.
24. Cheng TA. A community study of minor psychiatric morbidity in Taiwan. *Psychol Med* 1988;**18**:953—68.
25. Hwu HG, Yen EK, Chang LY. Prevalence of psychiatric disorders in Taiwan defined by the Chinese diagnostic interview schedule. *Acta Psychiatr Scand* 1989;**79**:136—47.

26. Lue BH, Lee MB, Liang KC. Clinical evaluation of psychiatric disorders among first visit patients to a primary care unit. *J Formosan Med Assoc* 1990;**89**:156—61.
27. Liu SI, Prince M, Blizard B, Mann A. The prevalence of psychiatric morbidity and its associated factors in general health care in Taiwan. *Psychol Med* 2002;**32**:629—37.
28. McDermut W, Mattia J, Zimmerman M. Comorbidity burden and its impact on psychosocial morbidity in depressed outpatients. *J Affect Disord* 2001;**65**:289—95.
29. Lipkin M. Primary care and psychiatry. In: Sadock BJ, Sadock VA, editors. *Comprehensive textbook of psychiatry*. Philadelphia: Lippincott Williams & Wilkins; 2000. p. 1923—35.
30. Ballard ED, Cwik M, Storr CL, Goldstein M, Eaton WW, Wilcox HC. Recent medical service utilization and health conditions associated with a history of suicide attempts. *Gen Hosp Psychiatry* 2014;**36**:437—41.
31. Fowler JC. Suicide risk assessment in clinical practice: pragmatic guideline for imperfect assessments. *Psychotherapy* 2012;**49**:81—90.
32. Lee MB, Liao SC, Lee YJ, Wu CH, Tseng MC, Gau SF, et al. Development and verification of validity and reliability of a short screening instrument to identify psychiatric morbidity. *J Formos Med Assoc* 2003;**102**:687—94.
33. Chen HC, Wu CH, Lee YJ, Liao SC, Lee MB. Validity of the five-item brief symptom rating scale among subjects admitted for general health screening. *J Formos Med Assoc* 2005;**104**: 824—9.
34. Lung FW, Lee MB. The five-item Brief-Symptom Rating Scale as a suicide ideation screening instrument for psychiatric inpatients and community residents. *BMC Psychiatry* 2008;**8**: 53—60.
35. Chen WJ, Chen CC, Ho CK, Lee MB, Chung YT, Wang YC, et al. The suitability of the BSRS-5 for assessing elderly who have attempted suicide and need to be referred for professional mental health consultation in a metropolitan city, Taiwan. *Internat J Geriatr Psychiatry* 2009;**24**:1151—7.
36. Hung GCL, Kwok CL, Yip PSF, Gunnell D, Chen YY. Predicting suicide in older adults — a community-based cohort study in Taipei City, Taiwan. *J Affect Disord* 2015;**172**:165—70.
37. Lee JI, Lee MB, Liao SC, Chang CM, Sung SC, Chiang HC, et al. Prevalence of suicidal ideation and associated risk factors in the general population. *J Formos Med Assoc* 2010;**109**:138—47.
38. Kessler RC, Berglund P, Borges G. Nock Matthew, Wang PS. Trends in suicide ideation, plans, gestures, and attempts in the United States, 1990-1992 to 2001-2003. *JAMA* 2005;**293**: 2487—95.
39. Baca-Garcia E, Perez-Rodriguez MM, Keyes KM, Oquendo MA, Hasin DS, Grant BF, et al. Suicidal ideation and suicide attempts in the United States: 1991—1992 and 2001—2002. *Mol Psychiatry* 2010;**15**:250—9.
40. Haatainen KM, Tanskanen A, Kylma J, Honkalampi K, Koivumaa-Honkanen H, Hintikka J, et al. Stable hopelessness and its predictors in general population: a 2-year follow-up study. *Suicide Life Threat Behav* 2003;**33**:373—80.
41. Thompson EA, Mazza JJ, Herting JR, Randell BP, Eggert LL. The mediating roles of anxiety, depression, and hopelessness on adolescent suicidal behaviors. *Suicide Life Threat Behav* 2005; **35**:14—34.
42. Berman AL, Silverman MM. Suicide risk assessment and risk formulation. Part II: suicide risk formulation and the determination of levels of risk. *Suicide Life Threat Behav* 2014;**44**: 432—43.
43. Wu CY, Lin YY, Huang HC, Wu SI, Sun FL, Huang CR, et al. Validation of the Chinese SAD PERSONS scale to predict repeated self-harm in emergency attendees in Taiwan. *BMC Psychiatry* 2014;**14**:44.