# Adaptation and validation of the Columbia-Suicide Severity Rating Scale (C-SSRS) – screen version

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**Summary**

**Aim.** To perform an adaptation and psychometric validation of the Polish version of the Columbia-Suicide Severity Rating Scale (C-SSRS) screen version in a clinical sample of patients admitted to the psychiatric hospital.

**Methods.** This was a single-center, observational and cross-sectional study. A total of 318 consecutive patients completed a set of questionnaires upon their admission to acute psychiatric units. The set comprised C-SSRS screener and the reference measures: the Suicidal Behaviors Questionnaire – Revised (SBQ-R), the Suicidal Ideation Attributes Scale (SIDAS), the Center of Epidemiological Studies Depression Scale – Revised (CESD-R), the Scale of Psychache, the Purpose in Life scale (PIL), and alcohol misuse screen test (CAGE).

**Results.** Cronbach's α of the C-SSRS was 0.89. Two latent components were identified in the factor analysis: (1) suicidal thoughts, intentions and plans, and (2) history of suicidal attempts. There were differences in the mean scores of all the utilized questionnaires (SBQ-R, the Psychache scale, CAGE, SIDAS, PIL and CESD-R) between the C-SSRS risk groups ($p = 0.01$). The C-SSRS risk group was associated with the category of the primary psychiatric diagnosis ($p < 0.001$).

**Conclusions.** The Polish version of the Columbia-Suicide Severity Rating Scale screener is a questionnaire with good psychometric features to assess the suicidal risk among psychiatric in-patients. It can be used for the purposes of a routine assessment of suicidal risk among hospitalized patients.

**Key words:** screening, mental health, psychometry

## Introduction

About 793,000 people worldwide commit suicide each year, with the male suicide rate being more than double that of women. More than half (58%) of all suicide deaths occur before the age of 50. It is a significant challenge for public health as well as all medical disciplines [1].

People diagnosed with mental disorders are at a particularly high risk of a suicide or a suicide attempt [2, 3]. Among people who committed suicide, the most prevalent diagnoses were mood disorders (30.2%) followed by disorders related to substance use (17.6%), schizophrenia (14.1%) and personality disorders (13.0%) [4]. The leading predictors of suicide attempts in the developed countries were mood disorders, while in the developing countries – impulse control, substance use and post-traumatic stress disorder [5].

In many cases, rationale for an admission to a psychiatric inpatient ward is patients' safety in terms of suicide prevention. It is assumed that it will prevent suicide or suicide attempt also at post discharge time [6, 7]. However, practice and research show that patients commit suicide during hospitalization as well [8–13]. The suicidal risk remains high shortly after and up to three months after discharge from a psychiatric hospital [10, 12, 13]. Moreover, suicide rates in the first week after admission and after discharge from hospital are similar and attributed to 6% and 13% of all suicides in men and women, respectively [13].

The assessment of the suicidal risk remains challenging given the heterogenous and comprehensive characteristics of suicide as a clinical and social phenomenon [11, 14]. In this context, in addition to medical assessment, the use of risk evaluation tools may help the clinician to apply preventive procedures and adequate treatment [15].

In recent years, one of the most widely used instruments assessing the risk of suicide is the Columbia-Suicide Severity Rating Scale (C-SSRS). The scale has been found to have good psychometric properties and a cross-cultural validity [16–22]. Subsequently, a screening version of the C-SSRS was developed to aid the suicidal risk assessment in the emergency setting, which has also been found to show predictive value [23–26].

The aim of the present study is the adaptation and psychometric validation of the Polish version of the C-SSRS screener [27] in a clinical sample of patients admitted to the psychiatric hospital.

## Materials and methods

The study was conducted among the consecutive patients admitted to two acute psychiatric units of the First Department of Psychiatry, Institute of Psychiatry and Neurology, Warsaw, Poland between 1st September 2020 and 15th September 2021, i.e., during the COVID-19 pandemic. Data collection was conducted by two psychiatrists and one researcher with an expertise in qualitative social studies. The respondents were recruited within the first seven days of their hospitalizations.

The inclusion criteria were age of at least 18 years old, informed consent to participate in the study, a diagnosis of a psychiatric disorder in accordance with the tenth edition of the International Classification of Diseases (ICD-10).

Exclusion criteria comprised the following: lack of a consent for participation, a discharge (e.g., against medical advice or due to a somatic state exacerbation) before examination by the researcher, agitation posing threat to the researcher, quarantine or isolation due to SARS-CoV-2 infection, dementia or intellectual disability, amnestic syndrome or any other neurodegenerative or neurodevelopmental impairment hampering the comprehension of the questionnaires, disturbed consciousness, serious difficulties in establishing a logic contact with a patient due to severe psychopathological symptoms, non-Polish native speaker.

During the study, 742 patients were admitted to the two in-patient wards. 424 people were excluded (188 patients based on the adopted criteria, 138 who had already participated in the study, 98 who refused to participate in it without giving a reason). Ultimately, 318 patients were included in the study sample.

The study was divided into two phases. In the pilot phase, ten cognitive interviews were conducted to verify the comprehensibility and logic of the C-SSRS screener (i.e. validated scale). Apart from separation of feminine and masculine version, as well as using courtesy forms Mrs. and Mr. no changes were made to the Polish text. Next, the sets of the questionnaires were distributed among the respondents.

## Research tools

The Columbia-Suicide Severity Rating Scale (C-SSRS) comprises six questions about the consecutive phases of the suicidal process, i.e., wishing to die, suicidal thoughts, method deliberation, intentions, plan, any preparations or attempt. Item one, two and six are asked always, while items three, four and five are asked only when the answer to item two (about the presence of suicidal thoughts within the past month) is positive. Items one to five consider last month, while item six is about last three months. The score of the C-SSRS screener is evaluated based on the pattern of responses as follows:

- high suicidal risk (red color) – items 4, 5 or 6a marked as "yes,"
- intermediate risk (orange color) – items 3 or 6 marked as "yes," with 4, 5 and 6a marked as "no,"
- low risk (yellow color) – items 1 and 2 are marked as "yes," with the remaining items marked as "no,"
- no risk – all items answered with a "no."

The following battery of self-reported questionnaires were applied to validate the C-SSRS. All the utilized tests are recognized psychometric tools and offer satisfactory validity and reliability for the purposes of scientific research and clinical practice. The selected questionnaires belong to two categories:

(1) reference measures, i.e., the Suicide Behaviors Questionnaire – Revised, the Suicidal Ideation Attributes Scale;

(2) measures previously correlated with suicidal risk, namely: the Scale of Psycha-che, the Purpose in Life questionnaire, the Center for Epidemiologic Studies Depression Scale-Revised, the CAGE questionnaire.

The Global Assessment of Functioning scale (administered by the researcher) was utilized for a general characterization of the study group.

The Suicide Behaviors Questionnaire – Revised (SBQ-R) was developed by Osman et al. [28] and adapted to Polish by Chodkiewicz and Gruszczyńska [29]. It consists of four items that assess past suicidal behaviors, including both ideations and attempts, and the self-reported likelihood of suicidal behaviors in the future. The score ranges from 3 to 18, with 9 being a cutoff for the high-risk suicidal group in the Polish population. The Cronbach's α score was 0.82 in the validation study [29].

The Suicidal Ideation Attributes Scale (SIDAS) is a measure assessing the severity of suicidal ideations and tendencies and the self-reported ability to control them. It was developed by van Spijker et al. [30] and consists of five questions scored from 0 to 10. A rise in the total score indicates a greater severity of suicidal ideations. Cronbach's α of the scale was found to be 0.91. The Polish-language version was prepared in accordance with the standard procedure (back-translation, panel of experts) at the Institute of Psychiatry and Neurology in Warsaw.

The Scale of Psychache by Holden et al. [31] was adapted to Polish by Chodkiewicz et al. [32]. It comprises thirteen items considering different aspects of psychological pain. The score ranges from 13 to 65, with an increase indicating higher severity of psychache. Cronbach's α for the Polish version reached 0.90 to 0.96, depending on the study group.

The Purpose in Life (PIL) was developed by Crumbaugh and Maholick [33]. The Polish adaptation by Życińska and Januszek [34] comprises of six items from the original scale. The questions cover existential aspects: purpose, sense and affirmation of life. The range of the score is 7 to 42 and its rise means higher sense of life's purpose. Cronbach's α of the Polish version reached 0.85.

The Center for Epidemiologic Studies Depression Scale – Revised (CESD-R) is a scale that assesses the severity of depressive symptoms based on the major depression criteria from the 5th edition of the Diagnostic and Statistical Manual (DSM-5). It was created by Eaton et al. [35] and adapted to Polish by Świtaj et al. [36]. The questionnaire comprises twenty questions with answers on a 4-point Likert scale, which cover the frequency of the depressive symptoms within past two weeks. A rise in the score suggests a greater severity of the symptoms. Cronbach's α of the Polish version was 0.93.

The CAGE questionnaire is a tool screening for alcohol use disorder. It was developed by Mayfield et al. [37] and validated in Polish by Morawski and Świątkiewicz [38]. Its name is an acronym of four items comprising the scale (thoughts about **C**utting down on drinking, being **A**nnoyed with others' comments about drinking, feeling **G**uilty in the morning after drinking, and drinking after waking up, i.e., as an **E**ye-opener). The score ranges from 0 to 4, with score of two being a cutoff warranting further diagnosis towards alcohol dependence. Cronbach's α of the CAGE questionnaire reached 0.82 in the current study.

The Global Assessment of Functioning (GAF) is a measure taken from the fourth edition of the Diagnostic and Statistical Manual [39]. It is utilized to assess functioning of a patient in the light of the presence and severity of psychopathological symptoms. The score ranges from 1to 100. The researcher assesses the functioning at the moment of the evaluation and the best functioning over the past year.

The following information was collected in the sociodemographic and clinical questionnaire: sex, age, education, marital status, place of residence, cohabitation, housing situation, professional activity, opinion of the financial situation, opinion of the health status, year of becoming ill/noticing the first symptoms, year of first psychiatric treatment, number of in-patient psychiatric hospitalizations (apart from the current one).

In the set of questionnaires provided to the respondent, the titles of the tools were omitted to avoid suggesting choices.

## Statistical analysis

The data was analyzed in SPSS Statistics, version 23 (IBM, the United States). The categorical variables were characterized as number of observations ($N$) and percentages (%). The normality of distribution of continuous variables was verified with the Shapiro-Wilk $W$ test and by analysis of histograms, skewness and kurtosis. The number of the respondents was sufficient for the purposes of the factor analysis since there is a low number of items in the C-SSRS screener [40]. The Kaiser-Meyer--Olkin measure and Bartlett's test were used to assess whether the data were fit to detect a structure. Exploratory factor analysis, with principal component analysis as an extraction method, was performed in two steps: first, an unrotated factor matrix (to elucidate the number of components by means of the Kaiser rule), followed by a second analysis on a rotated factor matrix. A non-orthogonal Oblimin rotation method was utilized because it was assumed that the components might be intercorrelated. The assumed maximal number of iterations for each model to reach convergence was set at 250. Indices with a common variance of at least 0.5 were considered significant association. Internal consistency of the scale was assessed with Cronbach's α for the whole scale, Cronbach's α coefficients if item deleted and discriminative power (by means of item's correlation with total score).

The heterogeneity of variance between the subgroups was checked with the Levene's test. Intergroup comparisons were conducted using the chi-squared test (for qualitative variables, due to the expected count of at least 5 in each cell of the 2 x 2 contingency table, using the Bonferonni correction) and analysis of variance (for continuous variables with a distribution close to normal; using the Welch's test if the condition of homogeneity of variance between groups was not met).

In case of statistically significant intergroup differences, Tukey's or Dunnett's T3 *post hoc* tests was applied, respectively for $F$ test and Welch's test.

The effect sizes were assessed in two manners: eta-squared test in analysis of variance and lambda in chi-squared test. Those quotients may be interpreted in terms of Cohen's thresholds for small (0.1), medium (0.3) and strong correlation (0.5). Bootstrapping, with sampling set at $N = 1000$, was performed to empower the results

and account for possible non-parametric distribution. The confidence intervals were computed using the bias-corrected percentile method. Statistical significance was defined as $p < 0.05$ or a confidence interval not encompassing 0.

## Ethical considerations

The study was approved (number 22/2020) by the Bioethics Committee at the Institute of Psychiatry and Neurology, Warsaw, Poland (Decision no. 22/2020). Each respondent received detailed information about the study. Participation was voluntary, respondents did not receive any gratification. At the recruitment stage they were informed about the right of refusing to participate in the study, as well as resigning from it at any stage and that their decision would not affect their treatment. The questionnaires were coded to make personal identification impossible. The respondents were assured that all research materials would be kept in a place inaccessible to third parties, and the persons conducting the research were informed that the information collected during the research was confidential. All the responders signed an informed consent form.

## Results

### Sample characteristics

The study sample comprised in 53% of women ($N = 169$) and the mean age was $39.7 \pm 16.8$. An average time of psychiatric treatment was $9.3 \pm 11.1$ years and the number of hospitalizations was $4 \pm 7$. The most frequent primary diagnoses on admission were either mood disorders (28%, $N = 88$) or psychotic and related disorders (29%, $N = 91$). A detailed characteristics of the sample can be found in Table 1.

Table1. **Characteristics of the studied group of patients admitted to the psychiatric hospital**

| Age, M ± SD (Min-Max) | 39.69 ± 16.84 (18–87) |
|---|---|
| Sex, N (%) | |
| Male | 149 (47%) |
| Female | 169 (53%) |
| Education level, N (%) | |
| No education | 2 (1%) |
| Elementary | 35 (11%) |
| Vocational | 65 (20%) |
| Secondary | 113 (36%) |
| Higher | 103 (32%) |
| Marital status, N (%) | |
| Single | 173 (54%) |
| Married | 68 (21%) |

| | |
|---|---|
| Informal relationship | 24 (8%) |
| Divorced | 32 (10%) |
| Widowed | 19 (6%) |
| Place of residence, N(%) | |
| Rural area | 22 (7%) |
| City with less than 50k inhabitants | 23 (7%) |
| City with 50–100k inhabitants | 14 (4%) |
| City with 100–500k inhabitants | 9 (3%) |
| City with more than 500k inhabitants | 249 (78%) |
| Accommodation, N (%) | |
| Alone | 100 (31%) |
| With parents | 95 (30%) |
| With children | 3 (1%) |
| With partner | 38 (12%) |
| With partner and children | 43 (14%) |
| With friends | 23 (7%) |
| Other | 15 (5%) |
| Employment status, N (%) | |
| Full-time employment | 109 (34%) |
| Student | 47 (15%) |
| Pension | 62 (20%) |
| Retirement | 38 (12%) |
| Unemployed | 62 (20%) |
| Other | 35 (11%) |
| Self-reported financial situation, N(%) | |
| Very poor | 41 (13%) |
| Poor | 49 (15%) |
| Neither poor, nor good | 100 (31%) |
| Good | 94 (30%) |
| Very good | 34 (11%) |
| Self-reported health status, N(%) | |
| Very poor | 28 (9%) |
| Poor | 102 (32%) |
| Neither poor, nor good | 97 (31%) |

| | |
|---|---|
| Good | 65 (20%) |
| Very good | 24 (8%) |
| Years of psychiatric treatment, M ± SD (Min-Max) | 9.25 ± 11.11 (0–53) |
| Number of hospitalizations, M ± SD (Min-Max) | 4.32 ± 7.78 (0–64) |
| General Assessment of Functioning currently, M ± SD (Min-Max) | 35.42 ± 11.76 (11–71) |
| SBQ-R total score, M ± SD (Min-Max) | 9.93 ± 5.31 (3–20) |
| The Scale of Psychache, M ± SD (Min-Max) | 32.05 ± 13.6 (12–65) |
| PIL total score, M ± SD (Min-Max) | 26.15 ± 10.41 (0–42) |
| CESD-R total score, M ± SD (Min-Max) | 39.24 ± 21.52 (0–80) |
| SIDAS total score, M ± SD (Min-Max) | 12.45 ± 12.46 (0–40) |
| CAGE total score, M ± SD (Min-Max) | 1.25 ± 1.48 (0–4) |
| Main diagnosis category on admission, N(%) | |
| F00–09. Organic, including symptomatic, mental disorders | 26 (8%) |
| F10–19. Mental and behavioral disorders due to psychoactive substance use | 48 (15%) |
| F20–29. Schizophrenia, schizotypal and delusional disorders | 91 (29%) |
| F30–39. Mood disorders | 88 (28%) |
| F40–49. Neurotic, stress-related and somatoform disorders | 40 (13%) |
| F60–69. Disorders of adult personality and behavior | 20 (6%) |
| F70–79. Mental retardation | 3 (1%) |
| F80–89. Disorders of psychological development | 2 (1%) |

N – number of observations; M – mean value; SD – standard deviation; SBQ-R – the Suicide Behaviors Questionnaire-Revised; PIL – the Purpose in Life scale; CESD-R – the Center for Epidemiologic Studies Depression Scale – Revised; SIDAS –the Suicidal Ideation Attributes Scale; CAGE – alcohol use disorder screening test

Note. Some percentages do not sum up to 100% – this indicates missing data, which did not exceed N = 2 in each case.

## Factor analysis and internal consistency of the C-SSRS

The employed data seemed to be adequate for detection of the structure, as indicated by both the Kaiser-Meyer-Olkin measure (0.847) and Bartlett's test ($\chi^2$ = 1494.964; $df$ =21; $p$ <0.001).

Initial factor analysis, in an unrotated matrix, indicated two latent components that cumulatively accounted for 76% of the explained variance of the variables (Table 2).

Table 2. **Eigenvalues and percentages of the explained variance of the detected latent components (described in the text) elucidated by factor analysis of the Columbia-Suicide Severity Rating Scale screener items in the studied sample of hospitalized psychiatric patients**

| | Initial Eigenvalues | | | Extraction sums of squared loadings | | |
|---|---|---|---|---|---|---|
| Component | Total | % of variance | Cumulative (%) | Total | % of variance | Cumulative (%) |
| 1 | 4.281 | 61.163 | 61.163 | 4.281 | 61.163 | 61.163 |
| 2 | 1.016 | 14.509 | 75.672 | 1.016 | 14.509 | 75.672 |
| 3 | 0.597 | 8.530 | 84.202 | | | |
| 4 | 0.447 | 6.382 | 90.584 | | | |
| 5 | 0.332 | 4.738 | 95.321 | | | |
| 6 | 0.243 | 3.471 | 98.792 | | | |
| 7 | 0.085 | 1.208 | 100.000 | | | |

The Oblimin rotation reached convergence in five iterations, thus verifying the factor structure. Differences can be seen within the semi-standardized coefficients of the model when comparing the component matrix to the pattern matrix (Table 3). Based on pattern matrix, two components can be identified: (1) suicidal thoughts, ideations and tendencies (C-SSRS items one to five) and (2) past suicidal attempts (items 6 and 6a). The detected factor structure is graphically summarized in Figure.

The two latent factors appeared to be correlated ($r = 0.46$), in accordance with initial predictions.

Table 3. **Factor loadings of latent components obtained in the factor analysis of the Columbia-Suicide Severity Rating Scale (C-SSRS) screener in the studied sample of hospitalized psychiatric patients**

| | Component | |
|---|---|---|
| Initial unrotated component matrix | 1 | 2 |
| C-SSRS 1. Wish to be dead | 0.732 | -0.381 |
| C-SSRS 2. Thoughts about killing yourself | 0.884 | -0.304 |
| C-SSRS 3. Thoughts about ways to kill yourself | 0.902 | -0.266 |
| C-SSRS 4. Intentions of acting on suicidal thoughts | 0.866 | -0.005 |
| C-SSRS 5. Working out details of killing yourself | 0.815 | 0.105 |
| C-SSRS 6. Suicidal attempt or preparation ever | 0.626 | 0.506 |
| C-SSRS 6a. Suicidal attempt or preparation in last three months | 0.587 | 0.664 |
| Rotated structure matrix | 1 | 2 |

| | | |
|---|---|---|
| C-SSRS 1. Wish to be dead | 0.814 | 0.254 |
| C-SSRS 2. Thoughts about killing yourself | 0.935 | 0.416 |
| C-SSRS 3. Thoughts about ways to kill yourself | 0.940 | 0.456 |
| C-SSRS 4. Intentions of acting on suicidal thoughts | 0.825 | 0.613 |
| C-SSRS 5. Working out details of killing yourself | 0.742 | 0.654 |
| C-SSRS 6. Suicidal attempt or preparation ever | 0.439 | 0.801 |
| C-SSRS 6a. Suicidal attempt or preparation in last three months | 0.353 | 0.884 |
| Rotated pattern matrix | 1 | 2 |
| C-SSRS 1. Wish to be dead | 0.884 | -0.152 |
| C-SSRS 2. Thoughts about killing yourself | 0.942 | -0.017 |
| C-SSRS 3. Thoughts about ways to kill yourself | 0.927 | 0.029 |
| C-SSRS 4. Intentions of acting on suicidal thoughts | 0.689 | 0.296 |
| C-SSRS 5. Working out details of killing yourself | 0.559 | 0.397 |
| C-SSRS 6. Suicidal attempt or preparation ever | 0.089 | 0.760 |
| C-SSRS 6a. Suicidal attempt or preparation in last three months | -0.068 | 0.916 |

The scale presented high internal consistency, since Cronbach's α was 0.89. Discriminative power and Cronbach's α if item deleted were also satisfactory, indicating that no item was redundant in statistical terms (Table 4).

Table 4. **Measures of internal consistency of the Polish version of the Columbia-Suicide Severity Rating Scale (C-SSRS) screener in a sample of hospitalized psychiatric patients**

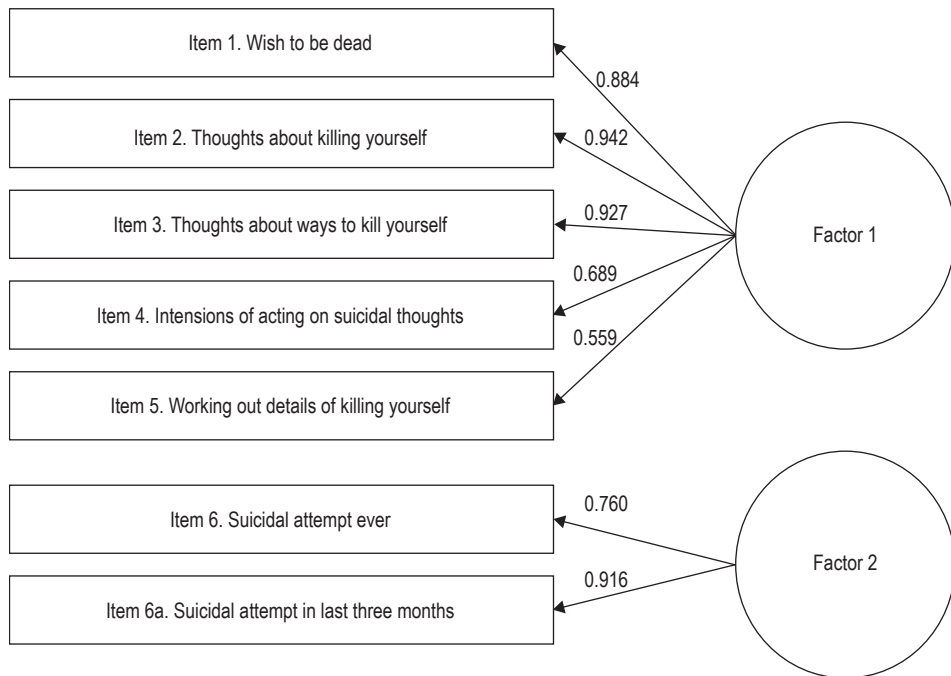| | Corrected item-total correlation | Squared multiple correlation | Cronbach's α if item deleted |
|---|---|---|---|
| C-SSRS 1. | 0.628 | 0.496 | 0.882 |
| C-SSRS 2. | 0.813 | 0.842 | 0.858 |
| C-SSRS 3. | 0.835 | 0.857 | 0.855 |
| C-SSRS 4. | 0.791 | 0.686 | 0.862 |
| C-SSRS 5. | 0.726 | 0.599 | 0.870 |
| C-SSRS 6. | 0.527 | 0.353 | 0.894 |
| C-SSRS 6a. | 0.494 | 0.360 | 0.895 |

Figure. **Graphic summary of the factor loadings of the latent components in the factor analysis of the Columbia-Suicide Severity Rating Scale (C-SSRS) screener in the studied sample of hospitalized psychiatric patients. The factor loading from the rotated pattern matrix are presented**

## Relevance analysis

There were statistically significant differences in the mean scores of all the utilized questionnaires (namely SBQ-R, SIDAS, the Psychache scale, CAGE, PIL, and CESD-R) between C-SSRS suicide risk groups. This means there was a significant difference in the severity of the suicidal ideation (SBQ-R and SIDAS), depressive symptoms (CESD-R), alcohol misuse (CAGE), psychache, and the sense of meaning in life (PIL). *Post-hoc* analyses confirmed in detail large differences between the no-risk and high-risk C-SSRS groups. Additionally, high-risk group scores were significantly higher than low – and intermediate-risk groups in the SBQ-R, SIDAS, PIL, and the Psychache scale. The CESD-R score differentiated the high-risk and low-risk groups as well. The strongest effect sizes were seen in the case of the SBQ-R and SIDAS. Detailed results of the C-SSRS intergroup comparisons are in Table 5.

Table 5. **Comparison of scores of the selected questionnaires between risk groups based on the Polish version of the Columbia-Suicide Severity Rating Scale screener. Presented as mean values (M) with 95% bias-corrected and accelerated confidence intervals (BCa 95% CI).**

| | No risk (N = 88) | Low risk (N = 37) | Intermediate risk (N = 66) | High risk (N = 122) | | | |
|---|---|---|---|---|---|---|---|
| | M (BCa 95% CI) | M (BCa 95% CI) | M (BCa 95% CI) | M (BCa 95% CI) | F | p | $\eta^2$ |
| SBQ–R | 4.57 (4.15–5.05) | 7.22 (6.25–8.17)[a] | 10.68 (9.68–11.67)[a,b] | 14.22 (13.5314.94)[a,b,c] | 185.652* | <0.001 | 0.578 |
| The Scale Psychache | 21.49 (19.7–23.27) | 30.3 (26.14–34.6)[a] | 32.52 (29.34–35.75)[a] | 39.95 (37.99–42)[a,b,c] | 58.512* | <0.001 | 0.304 |
| PIL | 32.77 (30.78–34.5) | 25.43 (22.18–28.66) | 26.7 (24.35–28.98) | 21.3 (19.4622.96)[a,b,c] | 25.778 | <0.001 | 0.200 |
| CESD–R | 23.69 (20.17–27.16) | 33.32 (27.52–39.04)[a] | 42.58 (38.03–47.17)[a,b] | 50.43 (47.59–53.36)[a,b] | 37.545 | <0.001 | 0.267 |
| CAGE | 0.99 (0.71–1.28) | 0.86 (0.51–1.27) | 1.23 (0.83–1.58) | 1.57 (1.31–1.86)[a] | 130.776* | 0.01 | 0.036 |
| SIDAS | 0.98 (0.38–1.8) | 6.65 (4.13–9.43)[a] | 9.64 (7.45–11.95)[a] | 24.02 (22.37–25.5)[a,b,c] | 109.619* | <0.001 | 0.613 |

N – number of observations; F –Snedecor's F test; p – probability in the test; $\eta^2$ – effect size; SBQ-R – the Suicide Behaviors Questionnaire-Revised; PIL – the Purpose in Life scale; CESD-R – the Center for Epidemiologic Studies Depression Scale – Revised; SIDAS – the Suicidal Ideation Attributes Scale; CAGE – alcohol use disorder screening test

* Welch's test with post hoc Dunnett's T3 test (instead of F test with post hoc Tukey's test) was utilized due to lack of homogeneity of variance between the groups

[a] p <0.05 vs. no risk group in post hoc test

[b] p <0.05 vs. low risk group in post hoc test

[c] p <0.05 vs. intermediate risk group in post hoc test

There was a statistically significant association between risk group and category of the primary psychiatric diagnosis (Likelihood Ratio $\chi^2 = 71.222$; $df=15$; $p <0.001$). In the no-risk group, over 50% of the respondents had the F20–29 category diagnosis. The high-risk group comprised mostly of patients with mood disorders (26%; $N = 32$), neurotic, stress-related and somatoform disorders (21%; $N = 26$) and disorders related to substance use (21%; $N = 25$), as seen in Table 6 in detail.

Table 6. **Comparison of number of observations and frequencies of patients from different diagnostic categories between risk groups based on the Polish version of the Columbia-Suicide Severity Rating Scale screener in the studied sample of hospitalized psychiatric patients**

| | No risk (N = 88) | Low risk (N = 37) | Intermediate risk (N = 66) | High risk (N = 122) | | | | |
|---|---|---|---|---|---|---|---|---|
| ICD–10: | N | % | N | % | N | % | N | % |
| F00–09 | 12 | 13.6% | 5 | 13.5% | 3 | 4.5% | 6 | 4.9% |

| F10–19 | 9[b]   | 10.2% | 5  | 13.5% | 9  | 13.6% | 25[a]      | 20.5% |
|--------|--------|-------|----|-------|----|-------|------------|-------|
| F20–29 | 45     | 51.1% | 13 | 35.1% | 15 | 22.7% | 18         | 14.8% |
| F30–39 | 19[b]  | 21.6% | 9  | 24.3% | 28 | 42.4% | 32         | 26.2% |
| F40–49 | 2[a,b] | 2.3%  | 3  | 8.1%  | 9  | 13.6% | 26[a,b,c]  | 21.3% |
| F60–69 | 1[a,b] | 1.1%  | 2  | 5.4%  | 2  | 3.0%  | 15[a,b,c]  | 12.3% |

N – number of observations; ICD-10 – the International Classification of Diseases, tenth edition; F00–09 – Organic, including symptomatic, mental disorders; F10–19 – Mental and behavioral disorders due to psychoactive substance use; F20–29 – Schizophrenia, schizotypal and delusional disorders; F30–39 – Mood disorders; F40–49 – Neurotic, stress-related and somatoform disorders; F60–69 – Disorders of adult personality and behavior; F70–79 – Mental retardation; F80–89 – Disorders of psychological development.

[a] p <0.05 vs. F00–09 group in post hoc test

[b] p <0.05 vs. F20–29 group in post hoc test

[c] p <0.05 vs. F30–39 group in post hoc test

## Discussion

This is the first validation of the Polish version of the Columbia-Suicide Severity Rating Scale (C-SSRS) in its screener version. The questionnaire has been repeatedly found to be a reliable, easy-to-use and quick tool assessing the suicidal risk [23–26]. In this study, results from a factor analysis and the associations of the C-SSRS score with the reference measures are shown to provide evidence for the validity of the Polish version.

The Polish-language C-SSRS screener has been found to have a high internal consistency as the Cronbach's α reached the value of 0.891. Two factors of C-SSRS screener were detected, namely (1) "suicidal thoughts, intentions and plans," and (2) "history of suicidal attempts." For comparison, only one factor was elucidated in the Lebanese version of the screener, yet it should be noted that the study sample was different, i.e., nonclinical and of particular age [24]. In this study, both factors were strongly correlated with one another, but it should be noted that they represent separate, yet subsequent aspects of the suicidal process, as previously noted in the literature [41, 42]. It has also been raised that the previous suicidal attempt is one of the most crucial risk factors for a completed suicide [42, 43]. Thus, despite partial overlap with the C-SSRS risk groups, the distinction between the two factors represents an important clinical issue.

The C-SSRS screener score was linked to results of the suicidal ideation reference scales. The high-risk C-SSRS group reached overtly the highest SBQ-R and SIDAS scores, indicating the greatest intensity of the experienced suicidal ideations in this group. Although no similar study, employing identical measures, was published so far, reliability and validity of both SBQ-R and SIDAS was already underlined [29, 30]. Also, the SBQ-R and C-SSRS appeared to have similar clinical feasibility in the setting of a military outpatient clinic [44].

The C-SSRS high-risk group was linked with the greatest severity of depressive symptoms, i.e., CESD-R score. Also, the category of mood disorders as the primary diagnosis was also highly represented in the high-risk group in the present study. Those results confirm the validity of the C-SSRS screener based on depression being a major risk factor for suicidal behaviors [45]. This also stands in line with previous research indicating that mood disorders are highly prevalent among suicide attempters, particularly in the developed countries [4, 5].

The C-SSRS high-risk group also scored the highest on the psychache scale. According to the Scheidmann's model, experience of immense mental pain explains suicidal behaviors. Psychache has been confirmed to predict both suicidal ideation and attempts, independently of hopelessness and depressive symptoms. Thus, the observed association between psychache and suicide risk group further confirms the validity of the Polish version of the C-SSRS screener [46, 47].

Similarly, the C-SSRS high-risk group has been found to score the lowest on the Purpose in Life scale, which was also an expected result in the light of the previous research. Low meaning (or purpose) in life was associated with poor mental health outcome, which includes suicidality [48].

The high-risk group patients scored averagely higher on the CAGE test, comparing to the no-risk group. This result stands in line with the previous findings. The whole spectrum of alcohol use disorders (particularly abuse and addiction) has been found to be associated with suicidal risk, particularly in case of comorbid depression [49]. Interestingly, suicidal risk may rise with the number of drinks consumed weekly [50].

Despite a series of results confirming validity of the C-SSRS screener in a Polish sample in this study, several shortcomings should be delineated. This was a single-center and observational study in a highly specific population, which limits the generalizability of the results. Although the study group consisted of people diagnosed with the entire spectrum of mental disorders, the number of patients ($N = 318$) was relatively low. On the other hand, the study group represented a naturalistic sample of consecutive patients admitted to a psychiatric hospital to an acute ward. In the case of such patients, it is a normal procedure to assess the suicidal risk. Thus, the conditions of the research reflect a real-life clinical situation.

Due to the above-mentioned limitations, the statistical analyses employed Bootstrap sampling, which empowers the results and allows to adjust them to possible non-normal distribution of the continuous variables.

To recommend widespread use of the Columbia-Suicide Severity Rating Scale (C-SSRS) screener, it is advisable to conduct a multicenter, prospective study to evaluate the predictive value of the tool in various forms of psychiatric health care as well as in primary care settings.

## Conclusions

The Polish version of the Columbia-Suicide Severity Rating Scale screener is a questionnaire with good psychometric properties. It can be used for the purposes of a routine assessment of suicidal risk among hospitalized patients.

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