RESEARCH



Preliminary validation of the Suicide Management Competency Scale in a Chinese nurse population: a cross-sectional study



Yuxiu Liu¹, Wei Wu², Shuzhen Li², Xin Wang³ and Lan Zhang^{1*}

Abstract

Background Suicide represents a significant public health concern at the global level and is a major area of concern for mental health professionals. Nurses are positioned to identify and manage individuals at risk of suicide or suicidal ideation. It is widely acknowledged that ensuring nurses are adequately trained to assess and manage suicidal patients is of paramount importance in the prevention of suicide. The objective of this study was to examine the reliability and structural validity of the Suicide Management Competency Scale (SMCS) in clinical nurses population.

Methods A total of 452 clinical nurses in a third-class hospital in Liaoning Province were selected using convenience sampling. The survey was conducted using the general demographic questionnaire and the Suicide Management Competency Scale (SMCS). The reliability and acceptability of the scale were assessed by checking the consistency of the scale part, the split-half reliability coefficient, and the correlation between each item and the score of the total scale. Confirmatory factor analysis, convergent validity and discriminant validity were used to determine the dimensional structure and validity of the scale.

Results The internal consistency of the scale, as indicated by the Cronbach's α coefficient, was 0.902. The split-half reliability coefficient was 0.771. The results of the confirmatory factor analysis were as follows: CMIN/DF = 2.609, RMSEA = 0.060, RMR = 0.040, CFI = 0.957, GFI = 0.930, NFI = 0.933, TLI = 0.949, IFI = 0.958. All of the model fitting indexes were within the acceptable range. The average variance extracted (AVE) of the three subscales ranged from 0.500 to 0.583. The combined reliability values (CR) range from 0.848 to 0.888, indicating that the SMCS scale exhibits good convergence validity. The analysis of the correlation coefficient between the subscale and the total scale revealed that the AVE square root value of each subscale is between 0.707 and 0.763, which is greater than the correlation coefficient between the two indicators. This indicates that there are significant differences between the subscales of the SMCS, that the internal structure of the questionnaire is highly differentiated, and that the discrimination validity is good.

Conclusion To the best of our knowledge, this is the inaugural study to report the utilisation of the Suicide Management Competency Scale (SMCS) in the context of clinical nursing. The findings offer preliminary support for the utilisation of the SMCS in clinical nurses. In the future, nursing managers will be able to effectively evaluate clinical

*Correspondence: Lan Zhang zhang800519@126.com

Full list of author information is available at the end of the article



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by-nc-nd/4.0/.

nurses' ability to manage and prevent suicide, as well as train nurses in this area, with the ultimate goal of saving as many lives as possible.

Keywords Suicide, Competence, Nursing, Reliability, Validity

Background

Suicide can be defined as an act with the intention of ending one's own life [1]. It is estimated that approximately 800,000 individuals die by suicide on a global scale each year [2]. Suicide represents a significant public health concern at the global level and is a major area of concern for mental health professionals [3]. The reduction of suicide mortality rates is one of the United Nations' Sustainable Development Goals for 2030 [4]. Despite a notable decline in the overall suicide rate in China between 2004 and 2014 [5], as evidenced by a study on suicide rates in China, suicide continues to represent a significant public health concern among young people in China [6]. Timely recognition of suicidal signs and early prevention of suicide are crucial. As most patients at risk of suicide or dying by suicide have had previous contact with nurses [7], nurses, as health professionals providing 24-hour care to patients, are at the forefront of identifying and managing people at risk of suicide or suicidal ideation and are more likely to recognise warning signs of suicide or plan interventions to prevent suicide [8].

Nevertheless, the accurate response rate to suiciderelated literacy among caregivers is less than 50% [9]. A paucity of suicide-related literacy among clinical nurses has been identified as a contributing factor to the stigmatisation of patients who have attempted suicide. These patients are not only treated with negative attitudes, but also experience significant barriers to seeking help from healthcare professionals [10, 11]. Furthermore, nurses who lack information about suicide have an adverse impact on the assessment of patients at risk of suicide and their nursing skills [8]. They frequently fail to provide accurate care at critical moments in the prevention of patient suicide. Furthermore, it reiterates the pivotal role that nurses play in the assessment, management, and reduction of suicide risk. The American Psychiatric Nurses Association (APNA) (2022) has identified suicide management competence as one of the core competencies for nursing professionals. It encompasses an understanding of suicide, the management of personal reactions, attitudes and beliefs, the establishment and maintenance of cooperative therapeutic relationships with patients, the development of risk assessment plans, the creation of a continuing care plan and the provision of care based on ongoing assessment [12].

With regard to the tools utilized to assess the capacity of nurses to manage suicidal behaviors, the team led by Chueh-Fen Lu has developed a scale to evaluate the suicide management abilities of nursing students in Taiwan. This scale, entitled the Suicide Management Competency Scale (SMCS), has been validated through empirical investigation [13]. Based on the concept of suicide theory and the support of evidence-based nursing theory, a semi-structured focus group was conducted with 32 nursing students. The scale was constructed using students' views on suicide, including both their professional and personal perspectives on working with patients at risk of suicide and managing related issues. Secondly, the scale was employed to conduct psychometric tests among nursing students at two universities, and the results demonstrated that the scale exhibited satisfactory reliability and validity. However, the SMCS has not been validated in a clinical nurses population. Accordingly, the present study employed confirmatory factor analysis (CFA) to substantiate the psychometric properties of the Suicide Management Competency Scale (SMCS) in clinical nurses and to assess its factor structure. It was hypothesised that the original three-factor model (i.e. Factor 1: Emotional challenges in suicide risk assessment; Factor 2: Delivering suicide intervention; Factor 3: Suicide risk nursing competence and confidence) would be appropriate for the nurse population under investigation. Evidence for the convergent and discriminant validity of the scale is presented herewith. Furthermore, the internal consistency and acceptability of the scale were evaluated based on the correlation between the scale score and the scores of each item.

Methods

Study design and participants

The study subjects were selected from a convenience sample of clinical nurses in a tertiary hospital in Liaoning Province, China, between August to September 2024. In order to be included in the study, participants had to be nurses who were on duty and had a licence to practise nursing, as well as having volunteered to take part. To ensure the reliability of the analysis results, the sample size required for a validated factor analysis was at least 200 cases, in accordance with the principle that the sample size should be 5–10 times the scale entries [14]. In consideration of the 20% sample attrition rate [15], the final sample size was calculated to be between 96 and 200. A total of 470 questionnaires were distributed, and 452 were returned, representing a valid recovery rate of 96.17%.

Instruments

General demographic characteristics questionnaire

A general demographic questionnaire was designed by the researcher and used in the study. The questionnaire included questions on a range of demographic variables, including gender, age, marital status, education, and years of working experience.

Suicide Management Competency Scale (SMCS)

The scale was developed by Chueh-Fen Lu's team based on the theoretical concept of suicide and the application of evidence-based nursing [16, 17], comprising a total of 16 items and three dimensions. These are as follows: emotional challenges in suicide risk assessment (1-6), the delivery of suicide interventions (7-12), and nursing competence and confidence in managing suicide risk (13–16). The scale employs a Likert 5-point scale, with responses ranging from 1 to 5. A score of 1 indicates a negative response, while a score of 5 represents a positive response. In order to ensure the integrity of the data, entries 1-6 must be reverse scored. The scale ranges from 16 to 80 points, with higher scores indicating greater clinical nurse ability to manage suicide. Cronbach's alpha was found to be 0.854 for the total score and 0.748 to 0.847 for the subscales [13].

Procedures

Data collection procedure

The data were collected via the online platform "Questionnaire Star". Prior to the investigation, the hospital nursing department and the individual responsible for each department were consulted and the principle of anonymous collection and voluntary participation was adopted. Before the formal investigation, 20 nurses who met the inclusion and exclusion criteria were randomly selected for a pilot survey. Prior to distribution, they were informed of the purpose, significance of the study, and precautions for completing the questionnaire. The questionnaire could only be submitted after all items were completed. Based on the pilot survey results, the clarity of the scale items was checked, and the presentation of the questionnaire, response time, and other aspects were reasonably modified to ensure the smooth progress of the formal investigation. For this pilot survey, 20 questionnaires were distributed and all were recovered, resulting in an effective recovery rate of 100%. The formal investigation adopted a convenience sampling method, where questionnaires were distributed to nurses who met the inclusion criteria. A total of 470 clinical nurses completed the survey questionnaire. Following the collation of the data, questionnaires that were ineffective, such as those that included repeated selection of only one option for all questions, a time period of less than 30 s, or obvious logic confusion, were eliminated. Ultimately, 452 valid questionnaires were obtained, representing an effective recovery rate of 96.17%.

Data analysis

The data were entered and analysed using SPSS 25.0 and AMOS 23.0, respectively. Descriptive statistics were employed to analyse the demographic data and the principal variables under investigation. For data that exhibited a normal distribution, the mean values $(M) \pm$ standard deviation (SD) was employed as the statistical measure. Frequency and composition ratio were utilised for counting data. The reliability of the scale was evaluated in accordance with the criteria set forth by Cronbach's α coefficient and split-half reliability. The correlation between the total number of SMCS and the scores of each item is examined. Additionally, the Cronbach's α coefficient of the scale is calculated after the removal of any item to assess the acceptability of the scale. The AMOS 23.0 software was employed for the construction of the model and the evaluation of the factor structure through the utilisation of confirmatory factor analysis(CFA). The objective is to ascertain whether the model is acceptable, based on the following fitting metrics. It is commonly accepted that a CMIN/ DF < 3.000, RMSEA < 0.080 an RMR value of less than 0.050, and CFI、GFI、NFI、TLI、IFI>0.900 are indicative of an appropriate model fit [18]. The evaluation of the scale's validity was conducted through the assessment of its convergent and discriminant validity. P < 0.05 was deemed to be statistically significant.

Results

Participants

A total of 452 clinical nurses completed the survey. The respondents were drawn from the clinical setting (77.7%), the emergency department (12.8%), and the intensive care unit (9.5%). The majority of participants were female (96.7%) and fell within the 20–39 age range (85.2%). A total of 368 nurses (81.4%) had obtained a Bachelor's degree. A mere 11 nurses had experience of working in psychiatry. A total of 31.6% of the nurses surveyed had experience caring for patients at risk of suicide. For further details, please refer to Table 1.

Reliability analysis

The Cronbach's α coefficient for the SMCS was 0.902, while the Cronbach's α coefficient for the three subscales were 0.856, 0.888, and 0.806, respectively. The split-half reliability coefficient was found to be 0.771. Secondly, the total score of the scale and the score of each item were subjected to statistical description, and the correlation between the score of each item and the total item was verified (Table 2). Following the removal of items, the Cronbach's α coefficient of the scale ranged from 0.890

Table 1 Frequency distribution of demographic characteristics (N=452)

| GenderFemale43796.7Male153.3Ages20~2913329.430~3925255.840~495512.2≥ 50122.7Marital statusSingle13630.1Married31669.9Education levelSecondary10.2College337.3Undergraduate36881.4postgraduate5011.1Technical titlenurse6113.5Nurse Practitioner26458.4vice professor of nursing153.3Unit workedClinic3517.7Emergency5812.8Nork experience≤ 5years11224.8>20years36.88.1411-20years1623.3Work in the psychiatric clinicYes112.4Kon4419.6Experience with patientsYes14331.6at risk of suicideYes14331.6 | Demographic variables | Categories | Ν | % |
|---|--------------------------------|---------------------------|-----|------|
| AgesMale153.3Ages20~2913329.430~3925255.840~495512.2≥ 50122.7Marital statusSingle13669.9Education levelSecondary10.2College337.37.3Undergraduate36881.4postgraduate5011.1nurse6113.5Nurse Practitioner26458.4nurse-in-charge11.224.8vice professor of nursing153.3Unit workedClinic3517.7Emergency5812.8Nurse Practitioner439.5Work experience≤5years11224.86-10years14231.411-20years16235.4Work in the psychiatric clinicYes112.4Ko4419.6Experience with patientsYes14331.6Arisk of suicideYes14331.6 | Gender | Female | 437 | 96.7 |
| Ages20~2913329.430~3925255.840~495512.2≥ 50122.7Marital statusSingle13669.9Education levelSecondary10.2College337.37.3Undergraduate36881.4postgraduate5011.1Technical titlenurse6113.5Nurse Practitioner26458.4nurse-in-charge11.224.8vice professor of nursing153.3Unit workedClinic3517.7Emergency5812.8Intensive care439.5Work experience≤ 5years11224.8>20years16231.4No4119.76Experience with patientsYes14.331.6Arrisk of suicideYes14.331.6No30968.4 | | Male | 15 | 3.3 |
| 30~3925255.840~495512.2≥ 50122.7Marital statusSingle13630.1Married31669.9Education levelSecondary10.2College337.3Undergraduate36881.4postgraduate5011.1Technical titlenurse6113.5Nurse Practitioner26458.4nurse-in-charge11224.8vice professor of nursing153.3Unit workedClinic3517.7Emergency5812.8Intensive care439.5Work experience≤ 5years11224.86-10years14231.411-20years16235.8Work in the psychiatric clinicYes112.4Experience with patientsYes14331.6Arisk of suicideYes14331.6 | Ages | 20~29 | 133 | 29.4 |
| 40~495512.2Marital status≥ 50122.7Marital statusSingle13630.1Married31669.9Education levelSecondary10.2College337.3Undergraduate36881.4postgraduate5011.1Technical titlenurse6113.5Nurse Practitioner26458.4nurse-in-charge11224.8vice professor of nursing153.3Unit workedClinic3517.7Emergency5812.8Intensive care439.5Work experience≤ 5years11224.86-10years14231.411-20years16235.8>20years368Kon4419.7Experience with patientsYes14331.6Arisk of suicideYes14331.6 | | 30~39 | 252 | 55.8 |
| ≥ 50122.7Marital statusSingle13630.1Married31669.9Education levelSecondary10.2College337.3Undergraduate36881.4postgraduate5011.1Technical titlenurse6113.5Nurse Practitioner26458.4nurse-in-charge11224.8vice professor of nursing153.3Unit workedClinic35177.7Emergency5812.8Intensive care439.5Work experience≤ 5years11224.86-10years14231.411-20years16235.8>20years112.4Kon4419.7Experience with patientsYes14331.6Arisk of suicideYes14331.6 | | 40~49 | 55 | 12.2 |
| Marital statusSingle13630.1Married31669.9Education levelSecondary10.2College337.3Undergraduate36881.4postgraduate5011.1nurse6113.5Nurse Practitioner26458.4nurse-in-charge11224.8vice professor of nursing153.3Unit workedClinic35177.7Emergency5812.8Intensive care439.5Work experience<5years | | ≥ 50 | 12 | 2.7 |
| Married31669.9Education levelSecondary10.2College337.3Undergraduate36881.4postgraduate5011.1nurse6113.5Nurse Practitioner26458.4nurse-in-charge11224.8vice professor of nursing153.3Unit workedClinic35177.7Emergency5812.8Intensive care439.5Work experience≤ 5years11224.86-10years14231.411-20years16235.8>20years368Work in the psychiatric clinicYes112.4Kaperience with patientsYes14331.6Arisk of suicideYes14331.6No30968.430968.4 | Marital status | Single | 136 | 30.1 |
| Education levelSecondary10.2College337.3Undergraduate36881.4postgraduate5011.1nurse6113.5Nurse Practitioner26458.4nurse-in-charge11224.8vice professor of nursing153.3Unit workedClinic35177.7Emergency5812.8Intensive care439.5Work experience≤ 5years11224.86-10years14231.411-20years16235.8>20years368Work in the psychiatric clinicYes112.4Ko44197.6Experience with patientsYes14331.6at risk of suicideNo30968.4 | | Married | 316 | 69.9 |
| College337.3Undergraduate36881.4postgraduate5011.1nurse6113.5Nurse Practitioner26458.4nurse-in-charge11224.8vice professor of nursing153.3Unit workedClinic3517.7Emergency5812.8Intensive care439.5Work experience≤5years11224.86-10years14231.411-20years16235.8>20years368Work in the psychiatric clinicYes112.4Kaperience with patientsYes14331.6At risk of suicideYes14331.6 | Education level | Secondary | 1 | 0.2 |
| Undergraduate36881.4postgraduate5011.1nurse6113.5Nurse Practitioner26458.4nurse-in-charge11224.8vice professor of nursing153.3Unit workedClinic3517.7Emergency5812.8Intensive care439.5Work experience≤5years11224.86-10years14231.411-20years16235.8>20years368Work in the psychiatric clinicYes112.4Experience with patientsYes14331.6at risk of suicideNo30968.4 | | College | 33 | 7.3 |
| postgraduate5011.1Technical titlenurse6113.5Nurse Practitioner26458.4nurse-in-charge11224.8vice professor of nursing153.3Unit workedClinic35177.7Emergency5812.8Intensive care439.5Work experience<5years | | Undergraduate | 368 | 81.4 |
| Technical title nurse 61 13.5 Nurse Practitioner 264 58.4 nurse-in-charge 112 24.8 vice professor of nursing 15 3.3 Unit worked Clinic 351 77.7 Emergency 58 12.8 Intensive care 43 9.5 Work experience \leq 5years 112 24.8 6-10years 142 31.4 11-20years 162 35.8 Work in the psychiatric clinic Yes 11 2.4 No 441 97.6 Experience with patients Yes 143 31.6 No 309 68.4 | | postgraduate | 50 | 11.1 |
| Nurse Practitioner 264 58.4 nurse-in-charge 112 24.8 vice professor of nursing 15 3.3 Unit worked Clinic 351 77.7 Emergency 58 12.8 Intensive care 43 9.5 Work experience \leq 5years 112 24.8 6-10years 142 31.4 11-20years 162 35.8 >20years 36 8 Work in the psychiatric clinic Yes 11 2.4 No 411 9.7 Experience with patients Yes 143 31.6 At risk of suicide No 309 68.4 | Technical title | nurse | 61 | 13.5 |
| $\begin{tabular}{ c c c } & nurse-in-charge & 112 & 24.8 \\ & vice professor of nursing & 15 & 3.3 \\ & Vice professor of nursing & 15 & 3.4 \\ & Clinic & 351 & 77.7 \\ & Emergency & 58 & 12.8 \\ & Intensive care & 43 & 9.5 \\ & Vork experience & $\leq 5years & 112 & 24.8 \\ & 6-10years & 142 & 31.4 \\ & 11-20years & 162 & 35.8 \\ & >20years & 36 & 8 \\ & Vork in the psychiatric clinic & Yes & 11 & 2.4 \\ & No & 441 & 97.6 \\ & Experience with patients & Yes & 143 & 31.6 \\ & no & 309 & 68.4 \\ \hline \end{tabular}$ | | Nurse Practitioner | 264 | 58.4 |
| vice professor of nursing 15 3.3 Unit worked Clinic 351 77.7 Emergency 58 12.8 Intensive care 43 9.5 Work experience ≤ 5years 112 24.8 6-10years 142 31.4 11-20years 162 35.8 >20years 36 8 Work in the psychiatric clinic Yes 11 2.4 No 441 97.6 Experience with patients Yes 143 31.6 No 309 68.4 | | nurse-in-charge | 112 | 24.8 |
| Unit worked Clinic 351 77.7 Emergency 58 12.8 Intensive care 43 9.5 Work experience ≤ 5years 112 24.8 6-10years 142 31.4 11-20years 162 35.8 >20years 36 8 Work in the psychiatric clinic Yes 11 2.4 No 441 97.6 Experience with patients Yes 143 31.6 at risk of suicide No 309 68.4 | | vice professor of nursing | 15 | 3.3 |
| Emergency 58 12.8 Intensive care 43 9.5 Work experience ≤ 5years 112 24.8 6-10years 142 31.4 11-20years 162 35.8 >20years 36 8 Work in the psychiatric clinic Yes 11 2.4 No 441 97.6 Experience with patients Yes 143 31.6 at risk of suicide No 309 68.4 | Unit worked | Clinic | 351 | 77.7 |
| Intensive care 43 9.5 Work experience ≤ 5years 112 24.8 6-10years 142 31.4 11-20years 162 35.8 >20years 36 8 Work in the psychiatric clinic Yes 11 2.4 No 441 97.6 Experience with patients Yes 143 31.6 at risk of suicide No 309 68.4 | | Emergency | 58 | 12.8 |
| Work experience ≤ 5years 112 24.8 6-10years 142 31.4 11-20years 162 35.8 >20years 36 8 Work in the psychiatric clinic Yes 11 2.4 No 441 97.6 Experience with patients Yes 143 31.6 at risk of suicide No 309 68.4 | | Intensive care | 43 | 9.5 |
| 6-10years 142 31.4 11-20years 162 35.8 >20years 36 8 Work in the psychiatric clinic Yes 11 2.4 No 441 97.6 Experience with patients Yes 143 31.6 at risk of suicide No 309 68.4 | Work experience | ≤ 5years | 112 | 24.8 |
| 11-20years 162 35.8 >20years 36 8 Work in the psychiatric clinic Yes 11 2.4 No 441 97.6 Experience with patients Yes 143 31.6 at risk of suicide No 309 68.4 | | 6-10years | 142 | 31.4 |
| >20years 36 8 Work in the psychiatric clinic Yes 11 2.4 No 441 97.6 Experience with patients Yes 143 31.6 at risk of suicide No 309 68.4 | | 11-20years | 162 | 35.8 |
| Work in the psychiatric clinicYes112.4No44197.6Experience with patientsYes14331.6at risk of suicideNo30968.4 | | >20years | 36 | 8 |
| No44197.6Experience with patientsYes14331.6at risk of suicideNo30968.4 | Work in the psychiatric clinic | Yes | 11 | 2.4 |
| Experience with patientsYes14331.6at risk of suicideNo30968.4 | | No | 441 | 97.6 |
| at risk of suicide No 309 68.4 | Experience with patients | Yes | 143 | 31.6 |
| | at risk of suicide | No | 309 | 68.4 |

 Table 2
 Descriptive statistics, acceptability and reliability parameters of the SMCS

| Item/total score | Mean | SD | ltem-total Correlation | Cronbach's alpha if item deleted |
|------------------|-------|-------|---------------------------|-------------------------------------|
| T1 | 2.94 | 0.97 | 0.596** | 0.898 |
| T2 | 2.83 | 1.03 | 0.592** | 0.897 |
| Т3 | 2.75 | 1.04 | 0.620** | 0.896 |
| T4 | 2.99 | 1.05 | 0.678** | 0.894 |
| Т5 | 2.67 | 1.03 | 0.599** | 0.897 |
| Т6 | 2.88 | 0.96 | 0.539** | 0.899 |
| T7 | 2.93 | 1.00 | 0.602** | 0.898 |
| Т8 | 2.83 | 0.93 | 0.687** | 0.894 |
| Т9 | 3.03 | 0.97 | 0.744** | 0.892 |
| T10 | 3.00 | 0.91 | 0.699** | 0.894 |
| T11 | 2.93 | 0.91 | 0.715** | 0.894 |
| T12 | 3.02 | 0.96 | 0.789** | 0.890 |
| T13 | 2.96 | 0.85 | 0.533** | 0.897 |
| T14 | 2.97 | 0.89 | 0.516** | 0.897 |
| T15 | 3.04 | 0.88 | 0.548** | 0.896 |
| T16 | 2.92 | 0.84 | 0.523** | 0.897 |
| SMCS total | 46 38 | 10342 | | |

Note. All correlations are significant at P < 0.05. SD: standard deviation

to 0.899, which remained below the overall Cronbach's α coefficient of the scale [15]. In conclusion, the SMCS has been demonstrated to possess both reliability and acceptability.

Validity analysis

Factor structure

In this study, Amos 23.0 software was employed to construct a model, and confirmatory factor analysis(CFA) was conducted on the survey data in order to obtain a structural equation model. The CFA demonstrates the original three-factor structure (i.e. Factor 1: Emotional challenges in suicide risk assessment; Factor 2: Delivering suicide intervention; Factor 3: Suicide risk nursing competence and confidence) and the data were fully fitted (CMIN/DF=2.609, RMSEA=0.060, RMR=0.06, CFI=0.957; Fig. 1 for the model). All standardized factor loads exceed the recommended critical value of 0.40 [19] (range=0.59~0.81), indicating an excellent fit between the model and the data. (Please refer to Table 3 for details.) All fitting indices demonstrate a good fit of the model used in this study with the data utilized.

Convergent validity

The mean variance extraction values (AVE) of the three subscales exhibited a range of 0.500 to 0.583, while the combined reliability values (CR) demonstrated a range of 0.848 to 0.888 (AVE > 0.5; CR > 0.8) [20]. In conclusion, the SMCS scale has been demonstrated to exhibit good convergence validity.

Discriminant validity

The correlation coefficient between the subscale and the total scale was analysed, and it was found that the AVE square root value of each subscale was between 0.707 and 0.763, which is greater than the correlation coefficient between the two indicators [21]. This indicates that there are significant differences between the subscales of the SMCS in this study, and that the internal structure of the questionnaire is highly differentiated, which can be easily distinguished and has good discriminative validity. Please refer to Table 4 for details.

Discussion

As reported by the World Health Organization (WHO) in 2021, a person dies by suicide every 40 s on average, with a significant number of attempted suicides occurring in the same period. Suicide occurs in all regions of the world and at all stages of the life cycle. Furthermore, it is emphasised that the topic of suicide prevention should be a fundamental aspect of healthcare, underscoring the significance of prompt diagnosis and addressing the needs of individuals at risk of suicide [22]. In order to facilitate early identification of suicide risk, it is essential



Fig. 1 Standardized three-factor structural model of the SMCS (N=452)

| T-1-1- 2 | The transfer and | - 6 + 1 | CNACC | (11 453) |
|----------|------------------|---------|--------|-----------|
| lable 5 | rit maices | orthe | SIVICS | (N = 452) |

| Fit indices | CMIN/DF | RMSEA | RMR | CFI | GFI | NFI | TLI | IFI |
|-----------------|---------|--------|--------|--------|--------|--------|--------|--------|
| Reference value | <3.000 | <0.080 | <0.050 | >0.900 | >0.900 | >0.900 | >0.900 | >0.900 |
| Model | 2.609 | 0.060 | 0.040 | 0.957 | 0.930 | 0.933 | 0.949 | 0.958 |

 Table 4
 Convergent and discriminant validity of the SMCS

| Factor/total | Correlation b | between factors | Convergent | Construct reliability | | | |
|--------------|-----------------------|-----------------|------------|-----------------------|----------|-------|--|
| | Discriminant validity | | | | Validity | | |
| | F1 | F2 | F3 | $\sqrt{\text{AVE}}$ | AVE | CR | |
| F1 | 1 | | | 0.707 | 0.500 | 0.856 | |
| F2 | 0.242** | 1 | | 0.756 | 0.571 | 0.888 | |
| F3 | 0.270** | 0.409** | 1 | 0.763 | 0.583 | 0.848 | |

Note. R: Spearman's rho correlation coefficient; LOSS: The Literacy of Suicide Scale **. *Pc*0.01

to gain an understanding of the risk factors, causes and signs of suicide, as this will inform the intervention and help-seeking processes. Nurses bear significant responsibility for the prevention of suicide and the management of care for patients who have attempted suicide [23]. It is therefore imperative that clinical nurses receive training in suicide risk evaluation and management.

The objective of this study was to develop an objective tool for the first time to assess the reported ability of clinical nurse populations to manage suicide. The assessment of perceived capacity for suicide management and the search for ways to plan early intervention, especially in clinical nurses, a special group of patients who are frequently exposed to suicide risk or attempted suicide, not only provides initial support for the use of SMCS in clinical nurses. In the future, nursing managers will be able to evaluate clinical nurses' ability to manage and prevent suicide, as well as train nurses in effective suicide management and prevention techniques, with the ultimate goal of saving as many lives as possible.

The results of this study showed that the SMCS demonstrated good internal consistency, acceptability and validity in the clinical nurse population. This tool is an effective and clinically useful instrument for rapidly and scientifically evaluating the suicide management capacity of clinical caregivers. It assesses their ability to manage the emotional challenges associated with suicide risk assessment, the provision of suicide intervention, and their nursing capacity and confidence in managing suicide risk.

The following evidence is presented in order to assess the reliability of the SMCS. Firstly, the Cronbach's α coefficient of the test scale was 0.902, with the Cronbach's α coefficient of each dimension subscale ranging from 0.806 to 0.888. These results are slightly higher than those obtained during the initial verification phase [13]. A Cronbach's α coefficient of greater than 0.8 is indicative of superior internal consistency, while a coefficient between 0.6 and 0.8 is indicative of good internal consistency, and a coefficient of less than 0.6 is indicative of poor internal consistency [24]. These findings suggest that the scale has better internal consistency among clinical nurses. Previous researchers have utilized this method to validate the reliability of pain scales, including the Visual Analog Scale (VAS), Numeric Rating Scale (NRS), and Verbal Rating Scale (VRS) among literate and illiterate patients with rheumatoid arthritis (RA). The results indicated that the VAS scale, with a high Cronbach's α coefficient, demonstrated better internal consistency [25]. This suggests that this method possesses sufficient evidence-based advantages for verifying the reliability of new scales. Furthermore, the SMCS total and subscale scores were examined in relation to their correlation with one another. Furthermore, the Cronbach's α coefficients remain below the Cronbach's α of the total volume table following the deletion, which substantiates the acceptability of SMCS.

The core purpose of confirmatory factor analysis (CFA) is to verify whether the factor structure of a scale aligns with theoretical hypotheses. In a factorial analysis study of the Toronto Alexithymia Scale-20 (TAS-20) among obese women, a five-factor solution was found to significantly outperform other tested models, thereby establishing the scientific validity of the scale with five factors [26]. This study employed the same method to examine the factor structure of the SMCS scale. The results indicated that all standardized factor loadings exceeded the threshold of 0.40, suggesting a strong correlation between the measurement items and their corresponding factors. Additionally, various fit indices of the model, such as the chi-square to degrees of freedom ratio and the goodnessof-fit index, fell within acceptable ranges [27], robustly demonstrating the overall good fit of the model. This also confirmed that our three-factor model (i.e. Factor 1: Emotional challenges in suicide risk assessment; Factor 2: Delivering suicide intervention; Factor 3: Suicide risk nursing competence and confidence) is suitable for our population of clinical nurses.

Convergent validity assesses the situation where items measuring the same underlying trait should cluster together within the same factor [28]. The results of this study showed that the Composite Reliability (CR) values were all above 0.8 and the Average Variance Extracted (AVE) values were all above 0.5, indicating that the structural validity of the three factors exhibited convergence. This suggests that the scale demonstrates high consistency in measurement and that its internal structure is stable and reliable, consistent with theoretical expectations. Furthermore, discriminant validity tests the situation where items measuring different underlying traits should not cluster together within the same factor [29]. The study results revealed that the square root of the AVE was greater than the correlation coefficient for specific factors of the scale, indicating good discriminant validity among the three dimensions. This suggests that the scale possesses relative independence, which can reduce measurement error and enhance measurement reliability. These two indicators not only indicate that the scale has good structural validity but also demonstrates its high quality.

Limitations

It must be acknowledged that this study is not without shortcomings. Firstly, it should be noted that all participants were from the same hospital. This limitation affects the universality and representativeness of the survey results, which in turn impedes the comprehensive use of the scale. It would be beneficial to conduct a multi-centre, large-sample study in more provinces and hospitals in the future, with the aim of comprehensively evaluating the suicide management abilities of clinical nurses. Secondly, as this is a cross-sectional study, it is not possible to determine cause-and-effect relationships between variables.

Conclusions

Suicide represents a significant global health concern. Clinical caregivers are in a pivotal role in providing care for patients who are at risk of suicide or who have attempted suicide. Thus, ensuring that caregivers are adequately prepared is an effective strategy for reducing suicide rates. It is therefore incumbent upon clinical managers to have at their disposal an objective instrument with which to assess the ability of nurses to manage suicide. The SMCS scale has been demonstrated to possess both reliability and validity, and has been shown to identify three key factors that contribute to the ability to manage suicide. The scale offers clinical managers a scientific tool and a theoretical basis for the subsequent development of suicide-related training programmes.

Acknowledgements

We would like to thank Professor Chueh-Fen Lu for providing us with the Suicide Management Competency Scale (SMCS). We would also like to thank the participants in this study who gave their valuable time to complete this study. We thank the reviewers of earlier versions of this manuscript for their insightful feedback.

Author contributions

YXL and LZ completed the study design. YXL and WW contributed to data collection. YXL, WW and SZL conducted data analysis, result interpretation and discussion. The manuscript was drafted by YXL, XW and edited and approved by LZ, WW. All authors have read and approved the manuscript.

Funding

No funding was obtained for this study.

Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

All procedures were performed with the 1964 Helsinki declaration, and the study protocol was approved by the Ethics Committee of the Jinzhou Medical University (JZMULL2023037) Prior to the investigation, permission to utilise the scale was obtained from Professor Chueh-Fen Lu via email. Participants were informed of the purpose and significance of this study and signed informed consent. All data were protected throughout the study.

Consent for publication

Not applicable.

Clinical trial number

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Department of Nursing, First Affiliated Hospital of Jinzhou Medical University, Liaoning, Jinzhou, China ²Heze Home Economics College, Heze, China ³Department of Nursing, Huaian Hospital of Huaian City, Huaian, Jiangsu 223200, China

Received: 1 September 2024 / Accepted: 16 April 2025 Published online: 22 April 2025

References

- Turecki G, Brent DA. Suicide and suicidal behaviour. Lancet. 2016;387(10024):1227–39. https://doi.org/10.1016/S0140-6736(15)00234-2.
- World Health Organization. World health statistics2018: monitoring health for the SDGs, sustainable development goals [EB/OL]. (2018-05-17). https://www .who.int/publications/i/i-tem/9789241565585. Commun,2019,10(1):207.
- Roush JF, Brown SL, Jahn DR, et al. Mental health professionals' suicide risk assessment and management practices. Crisis. 2018;39(1):55–64. https://doi.o rg/10.1027/0227-5910/a000478.
- McFarland DC, Walsh L, Napolitano S, Morita J, Jaiswal R. Suicide in patients with cancer: identifying the risk factors. Oncol (Williston Park). 2019;33(6):221–6.
- Sha F, Chang Q, Law YW, Hong Q, Yip PSF. Suicide rates in China, 2004–2014: comparing data from two sample-based mortality surveillance systems. BMC Public Health. 2018;18(1):239. Published 2018 Feb 13. https://doi.org/10.1186 /s12889-018-5161-y
- Li ZZ, Li YM, Lei XY, et al. Prevalence of suicidal ideation in Chinese college students: a meta-analysis. PLoS ONE. 2014;9(10):e104368. https://doi.org/10.1 371/journal.pone.0104368. Published 2014 Oct 6.

- Kammer J, Rahman M, Finnerty M, et al. Most individuals are seen in outpatient medical settings prior to intentional Self-Harm and suicide attempts treated in a hospital setting. J Behav Health Serv Res. 2021;48(2):306–19. http s://doi.org/10.1007/s11414-020-09717-1.
- Burnette C, Ramchand R, Ayer L. Gatekeeper training for suicide prevention: A theoretical model and review of the empirical literature. Rand Health Q. 2015;5(1):16. Published 2015 Jul 15.
- Karakaya D, Özparlak A, Önder M. Suicide literacy in nurses: A cross-sectional study. J Clin Nurs. 2023;32(1–2):115–25. https://doi.org/10.1111/jocn.16205.
- Aldalaykeh M, Al-Hammouri MM, Rababah J, Al-Shannaq Y, Al-Dwaikat T. Knowledge of Jordanian nurses and attitudes toward patients with suicidal attempt. Arch Psychiatr Nurs. 2021;35(6):664–8. https://doi.org/10.1016/j.apn u.2021.10.004.
- Boukouvalas E, El-Den S, Murphy AL, Salvador-Carulla L, O'Reilly CL. Exploring health care professionals' knowledge of, attitudes towards, and confidence in caring for people at risk of suicide: a systematic review. Arch Suicide Res. 2020;24(sup2):S1–31. https://doi.org/10.1080/13811118.2019.1586608.
- American Psychiatric Nurses Association. (2022) Competencies for nurse: Assessment and management of inpatient suicide risk. https://www.apna.o rg/news/ apna-position-statement-competenciesfor-nurse-assessmentandmanagement-ofinpatientsuiciderisk/
- Lu CF, Beckstead JW, Ye JY, Yang CY. Psychometric evaluation of suicide management competency scale for nursing students: A cross-sectional study. Int J Ment Health Nurs Published Online May. 2024;15. https://doi.org/10.1111/in m.13348.
- Liu Y, Zhang L, Yan X, Wang X, Huang Y. Psychometric evaluation of the Chinese version of the febrile convulsion knowledge scale for parents/caregivers: translation and validation study. BMC Nurs. 2024;23(1):40217. https://d oi.org/10.1186/s12912-024-02073-x.
- Liu Y, Zhang L, Li S, Li H, Huang Y. Psychometric properties of the Chinese version of the oncology nurses health behaviors determinants scale: a crosssectional study. Front Public Health. 2024;12:1349514. https://doi.org/10.3389 /fpubh.2024.1349514.
- Mäkinen IH. (2009) Social theories of suicide. In: Wasserman, D. & Wasserman, C, editors Oxford textbook of suicidology and suicide prevention, 1st edition. Oxford, UK: Oxford University Press, pp.139–148.
- Hawton K, Lascelles K, Pitman A, Gilbert S, Silverman M. Assessment of suicide risk in mental health practice: shifting from prediction to therapeutic assessment, formulation, and risk management. Lancet Psychiatry. 2022;9(11):922–8. https://doi.org/10.1016/S2215-0366(22)00232-2.
- 18. Lt H, Bentler PM. Cutoff criteria for fit indexes incovariance structure analysis: conventional criteria versus new alternatives. Struct Equ Model. 1999;6:1–55.
- Guo Z, Liu K, Liang C, et al. Validation of the Chinese version of the smartphone distraction scale. Heliyon. 2024;10(11):e31807. https://doi.org/10.1016 /j.heliyon.2024.e31807. Published 2024 May 23.

- Luo W, Cai Q, Chen R, et al. The Chinese version of the child food neophobia scale and its reliability and validity in preschool children. J Pediatr Nurs. 2023;69:1–5. https://doi.org/10.1016/j.pedn.2022.12.009. (收敛).
- Aazh H, Kartsonaki C, Moore BCJ. Psychometric evaluation of the 4 C tinnitus management questionnaire for patients with tinnitus alone or tinnitus combined with hyperacusis. Int J Audiol. 2024;63(1):21–9. https://doi.org/10.1080/ 14992027.2022.2143430.
- World Health Organization. (2021). Crude suicide rates. Retrieved from:https:/ /www.who.int/data/gho/data/indicators/indicatordetails/GHO/crudesuicider ates(per100000population).
- Pisani AR, Murrie DC, Silverman MM. Reformulating suicide risk formulation: from prediction to prevention. Acad Psychiatry. 2016;40(4):623–9. https://doi. org/10.1007/s40596-015-0434-6.
- Winter T, Riordan BC, Pakpour AH, et al. Evaluation of the english version of the fear of COVID-19 scale and its relationship with behavior change and political beliefs. Int J Ment Health Addict. 2023;21(1):372–82. https://doi.org/1 0.1007/s11469-020-00342-9.
- Ferraz MB, Quaresma MR, Aquino LR, Atra E, Tugwell P, Goldsmith CH. Reliability of pain scales in the assessment of literate and illiterate patients with rheumatoid arthritis. J Rheumatol. 1990;17(8):1022–4.
- 26. Pinaquy S, Chabrol H, Barbe P, Alexithymie. Scale (TAS 20) chez les femmes obèses [Factorial analysis and internal consistency of the French version of the Toronto Alexithymia Scale (TAS 20), in obese women]. Encephale. 2002;28(4):277–82. et obésité: étude de la structure factorielle et de la consistance interne de la version française de la Toronto Alexithymia.
- Schiltz HK, Magnus BE, McVey AJ, et al. A psychometric analysis of the social anxiety scale for adolescents among youth with autism spectrum disorder: Caregiver-Adolescent agreement, factor structure, and validity. Assessment. 2021;28(1):100–15. https://doi.org/10.1177/1073191119851563.
- Lifshitz R, Ifrah K, Markovitz N, Bluvstein I, Shmotkin D. Inventory of complicated grief: factor structure among middle-aged and older bereaved parents. Death Stud. 2022;46(1):200–7. https://doi.org/10.1080/07481187.2020.17259 31.
- Haiyan Bai. Cross-validating a bidimensional mathematics anxiety scale. Assessment. 2011;18(1):115–22. https://doi.org/10.1177/1073191110364312.

Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.