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Measuring readiness for nurse-led shared decision making in clinical practice: development and first testing of the RSDM-N scale

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Abstract

Object To develop a scale to measure the organizational readiness for change (ORC) in nurse-led shared decision-making (SDM) in clinical practice of China, test its reliability and validity, and conduct an analysis of the current status of nurse-led SDM readiness.

Methods This study follows the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) methodology guidance and has two phases. The first phase, based on ORC theory, an item pool was formed through literature review, qualitative interviews and group discussions. Two rounds of Delphi consultations were conducted to optimize items, developed an initial scale. Cognitive interviews were then conducted to understand the target population's comprehension of each item, addressing differences during the development process, resulting in the first scale version. In the second phase, the scale underwent reliability and validity testing, and the results were analyzed to assess the current status of nurse-led SDM readiness.

Results The final scale consists of 55 items across five dimensions.The overall Cronbach's α coefficient is 0.987, with a split-half reliability of 0.911, a test-retest reliability of 0.904, and an average content validity index of 0.989, indicating good reliability and validity. A field test was conducted among 496 nurses, revealing that the total score of nurses' SDM readiness ranged from 118 to 270, with an average of 209.79 ± 35.82.

Conclusion The RSDM-N scale exhibits sufficient measurement qualities for assessing nurse-led SDM readiness in China, guiding the implementation of nurse-led SDM.

Keywords Decision making, shared, Organizational innovation, Nurses, Scale development, Validity, Reliability, Methodological study

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Introduction

In recent decades, with the widely recognized and accepted concept of "patient-centered care" internationally, shared decision-making (SDM) with higher patient participation, as a gradually developing new medical decision-making model, has increasingly gained favor from both doctors and patients [1–3]. SDM is a collaborative decision-making approach involving healthcare professionals and patients. It refers to a process in which healthcare providers and patients engage in comprehensive discussions about available decision options, considering patients' values, needs, and decision-making preferences. The process includes providing sufficient evidence-based support and clarifying the benefits and risks of each option, ultimately reaching a mutually agreed-upon decision that aligns with the patient's expectations [2, 4, 5]. The fundamental characteristics of SDM include [6]: (1) At least two participants, including both healthcare professionals and patients; (2) Mutual information exchange between both parties; (3) Discussion of decision-making preferences by both parties; (4) Reaching a consensus-based decision. Studies have shown [7, 8] that SDM effectively promotes patient engagement in decision-making, enhances disease understanding, alleviates fear and depressive symptoms, improves treatment adherence and satisfaction, facilitates doctor-patient communication, strengthens the doctor-patient relationship, and helps patients clarify which aspects of care are most important to them, ultimately supporting optimal clinical decision-making.

Initial SDM research primarily focused on the dyadic relationship between patients and doctors. However, doctor-led SDM faced multiple challenges due to inherent limitations in their professional roles and working patterns [9–11]. For instance, doctors often face heavy workloads, which can limit the time available for in-depth SDM discussions with patients. Their authoritative position may also influence patients' willingness to fully express their preferences. As research progresses, it became evident that relying solely on doctors in SDM was insufficient. Researchers have gradually recognized the necessity of leveraging the role functions of other team members, particularly nurses [12].

Nurses, as medical professionals with the most extensive with patients, have a unique vantage point. They provide direct care, which gives them a deeper understanding of patients' symptom monitoring data and psychological conditions [13]. Their frequent interactions with patients and families, enable them to comprehend patients' decision-making preferences and values more comprehensively than other medical staff [14, 15]. In SDM-related studies across the United States, Canada, Japan, Germany and Taiwan, nurses have emerged as key promoters of the SDM process [13], with the role of decision coach being particularly prominent [16]. Decision coaches, as defined by Professor Stacey's team at the University of Ottawa in their decision-assistance research, are trained individuals who can offer positive and neutral guidance to patients in their decision-making process [16]. In clinical settings, an increasing number of nurses are taking on this role [16], signifying the growing recognition of their importance in SDM.

While nurses' involvement is a crucial step forward, it has not been sufficient to overcome the complex web of obstacles that impede the widespread and effective implementation of SDM in clinical practice. In recent years, research on the factors influencing SDM implementation has burgeoned. These studies have explored influencing factors at different levels, which serves as a vital theoretical foundation for our research. Chinese scholar Xia W [17] analyzed the factors affecting the clinical effectiveness of SDM from both the patient and healthcare provider perspectives. Patient-related factors, such as physical, psychological, and social aspects, not only impact disease development but also directly influence the effectiveness of SDM. For example, a patient's psychological stress can affect their ability to participate in decision-making. Provider-related factors, including time constraints, professional authority, communication skills, and the use of decision aids, also play a significant role. Scholl et al. [18] conducted a scoping review on organizational and system-level factors that may impact SDM implementation. They identified six organizational-level factors, like organizational leadership and culture, and four system-level factors, such as healthcare delivery culture and policies. These factors all interact and affect the successful implementation of SDM.

In the international context, SDM has achieved relatively mature development in countries like those in Europe and the United States. However, in China, SDM is still in the stage of theoretical reference and application exploration. Nurse-led SDM represents a novel and innovative approach in China's clinical context. To embed it into nursing processes and promote clinical nursing transformation [19, 20], it is necessary to assess its organizational readiness for change (ORC) prior to implementation [21]. ORC refers to the extent to which organizations and their members are psychologically and behaviorally prepared for organizational change [22]. By evaluating ORC, we can identify the enablers and barriers to integrating nurse-led SDM into clinical settings at organizational and system levels, and allows us to develop targeted intervention strategies based on these factors, ensuring the successful implementation of nurse-led SDM in China.

To assist researchers in gaining a comprehensive understanding and assessment of change readiness, Holt and Weiner et al. [23] proposed a corresponding

conceptual framework. This framework guides researchers and practitioners to consider ORC from three broad dimensions when planning and selecting appropriate assessment methods: psychological factors (characteristics of individuals who are required to implement the change), structural factors (the environment in which the change occurs), and level of analysis (individual and organizational levels). These form four key ORC dimensions: individual psychological (assessing members' beliefs, attitudes, and/or perceptions of the change), individual structural (evaluating the knowledge, skills, and/or abilities of members to cope with the change), organizational psychological (assessing the commitment and efficacy of organizational members regarding the change), and organizational structural (evaluating the support for change from human resources, and material resources, as well as communication channels and formal policies). At the individual level, nurses' knowledge, attitudes, and competencies significantly influence the implementation of SDM. Research [24] indicates that many nurses face barriers in practice due to a lack of relevant professional knowledge, suggesting that specialized knowledge and skills are central to nurses' SDM competency [25]. Also, physicians' recognition of nurses' roles and contributions fosters nurses' active participation in decision-making [24]. At the organizational and system levels, Waddell et al. [26] found that organizational leadership support for SDM directly impacts healthcare professionals' willingness to adopt SDM practices. When leadership advocates for SDM, healthcare professionals are more inclined to use it [26]. Additionally, organizational culture, particularly team collaboration and shared goals, plays a role in facilitating SDM implementation [26]. Furthermore, the application of SDM is constrained by existing healthcare policies and guidelines [26].

As research on ORC has advanced, a variety of evaluation tools have come into existence [27, 28]. These tools have been designed to measure various aspects of an organization's preparedness for change. Nevertheless, the majority of them are general-purpose scales that do not specifically target the implementation of SDM. This lack of specificity means they lack the essential relevance and are unable to fully satisfy the demands of accurately assessing the organizational readiness for SDM. Simultaneously, existing SDM-related measurement tools do not pay enough attention to nurses.

Currently, there are only a few scales developed for nurse groups related to SDM ORC, mainly three. These include the Role Competency Scale on Shared Decision-Making Nurses (SDM-N) developed by foreign scholars Tariman et al. in 2018 [29], which aims to measure the role competency of oncology nurses in the SDM process to assess the need for SDM education and training for oncology nurses; the Nursing Shared Decision-Making Attitude Scale (NSDMA) developed by Taiwan scholars in 2021 [30], which aims to measure nurses' attitudes towards SDM in Taiwan; and Chinese mainland scholar Guo's questionnaire on knowledge, attitude and practice of shared decision-making of oncology nurses developed in 2021 [31], aiming to explore the current situation and influencing factors of knowledge, attitude and practice of shared decision-making of oncology nurses in China, but the items lack the guidance of SDM related theories and have certain limitations. None of the aforementioned questionnaires account for the influence of organizational-level factors. Each questionnaire exhibits varying degrees of deficiencies, thereby limiting a comprehensive assessment of nurses' readiness to implement SDM. This is in line with the findings of relevant systematic reviews [18, 26, 32–34] that existing studies pay more attention to the promotion and obstacle factors at the individual level, and pay less attention to the organizational and system level factors.

Therefore, this study aims to develop a Readiness to Shared Decision Making-perceived Nurse scale (RSDM-N) tailored to China's medical context. This scale will comprehensively and effectively assess the psychological, behavioral, and structural readiness of the entire organization, its personnel, and the environment for the implementation of nurse-led SDM from both individual and organizational levels. Additionally, the study will test the reliability and validity of the RSDM-N. Meanwhile, based on the survey results, it will initially analyze the current status of the readiness for nurse-led SDM in China.

Method

Research design

This study falls within the scope of methodological research and aims to develop and validate a RSDM-N scale tailored to the Chinese healthcare context. The study is based on the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) (see Appendix A) [35], which provides methodological guidance for evaluating the psychometric properties of measurement tools, assessing their methodological rigor, and ensuring their validity and reliability. The COSMIN framework aids researchers in selecting the most appropriate health measurement tools or supports developers in constructing scientifically rigorous instruments.

The dimensions of the scale are established by integrating the ORC theory and conceptual framework proposed by Weiner et al. [23, 36] with the attributes and influencing factors of SDM derived from an in-depth literature analysis. The schematic diagram of the theoretical framework is presented in Fig. 1.

As shown in Fig. 2, the research of this study consists of two main stages. The first stage is the construction of

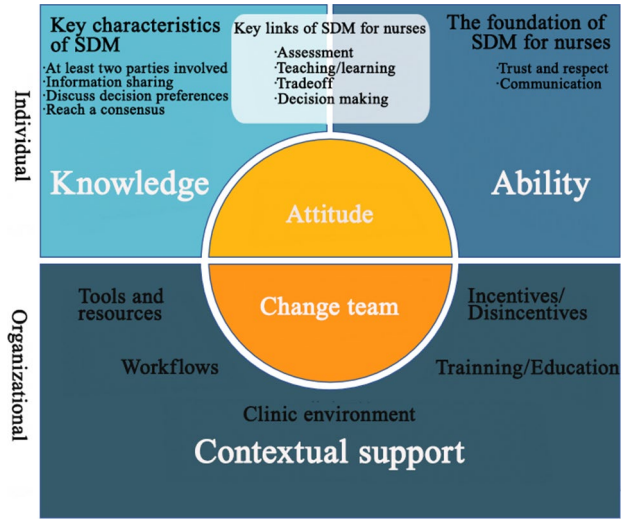

Fig. 1 The theoretical framework of this study. Note: Psychological factors (Attitude, Change team) are indicated by inner circles; structural factors (Knowledge, Ability, Contextual support) by outer squares

the initial version of the scale, which includes building an item pool via literature review, qualitative interviews, and group discussions, and then forming the initial scale through two rounds of the Delphi method and cognitive interviews. The second stage focuses on the reliability and validity test of the scale and the analysis of survey results, covering item screening and optimization, scale validation in aspects of content validity, construct validity, and reliability, as well as descriptive statistical analysis of the survey data. We will briefly describe each stage in the following chapters.

Construction of the initial version of the scale

The initial version of the RSDM-N scale was formed through the following two steps:

Step 1: Construction of the Item Pool.

The item pool was constructed through literature review, qualitative interviews, and group discussions.

Step 2: Formation of the Initial Scale.

a. Using the Delphi expert consultation method, a quantitative assessment of the relevance and importance of each dimension and item of the scale was conducted, along with specific revision suggestions. The Coefficient of Variation (CV) was used to evaluate the consistency of expert opinions, determining whether there was significant disagreement in the assessment of each indicator.

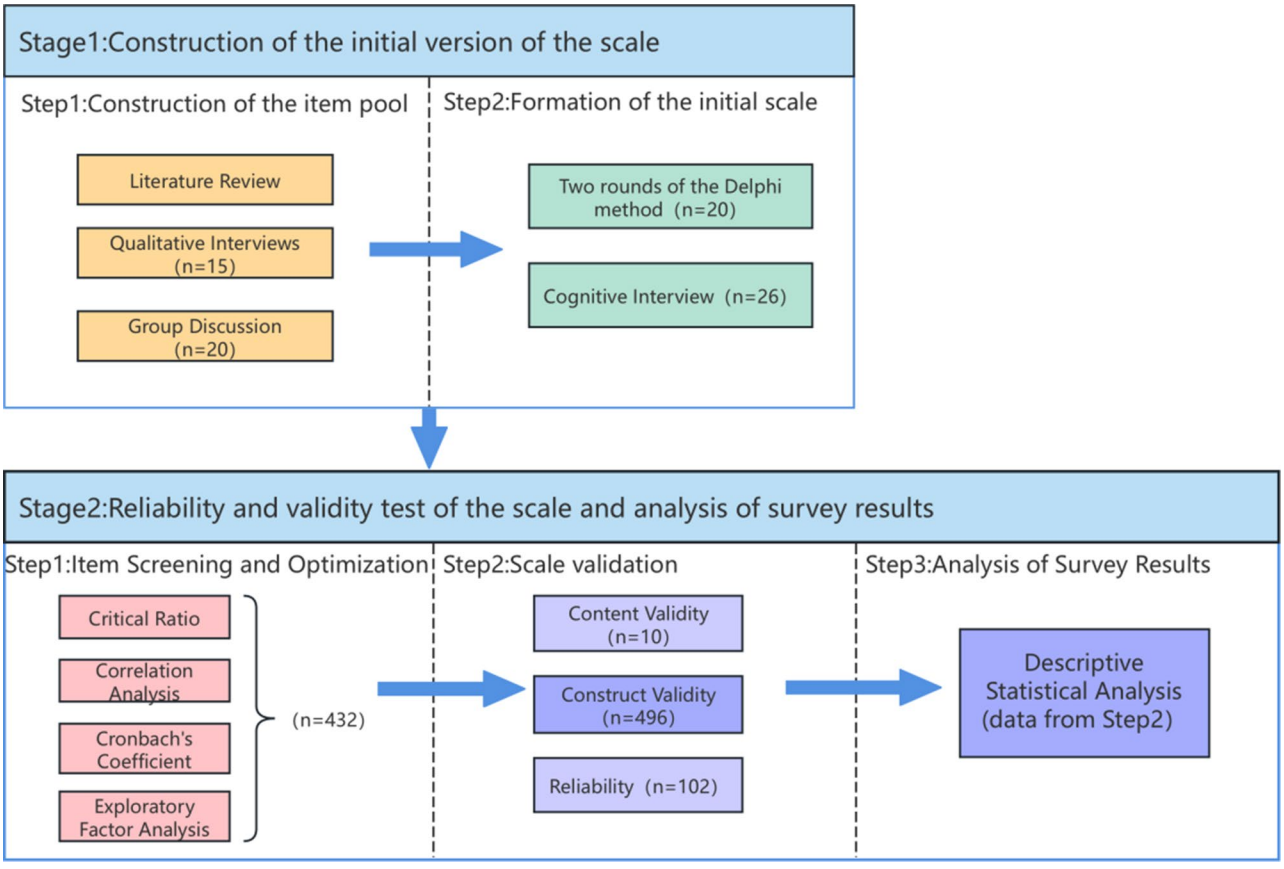

Fig. 2 The flow chart of research design

A CV > 0.25 was considered indicative of poor consistency in expert ratings [37]. The criteria for item retention were as follows: mean importance score ≥ 3.00, full score rate ≥ 70%, and CV ≤ 0.25 [37, 38]. Items that did not meet these criteria were reviewed by the research team, considering expert opinions and clinical applicability, to decide whether to remove them. For new or revised items proposed by experts, modifications were made based on expert recommendations and through group discussions while respecting expert suggestions. The final draft of the RSDM-N scale was developed accordingly.

b. Cognitive interviews were conducted to understand the target population's understanding of each item in the initial draft of the RSDM-N scale, aiming to address comprehension differences and measurement errors during the scale development process. This resulted in the formation of the initial version of the RSDM-N scale. The Question Appraisal System (QAS-99) was used to code and analyze the qualitative data [39].

Reliability and validity test of the scale and analysis of survey results

The reliability and validity test of the scale and the analysis of survey results were conducted through the following three st*eps:*

Step 1: Item Screening and Optimization.

A cross-sectional survey was conducted using convenience sampling to select nurses from 10 tertiary public hospitals in Beijing, with at least 40 nurses from each hospital. For inclusion, participants had to be currently employed registered nurses with at least one year of continuous clinical nursing experience, able to provide written informed consent, and willing to voluntarily participate. Excluded were non-hospital-employed nurses (e.g., visiting nurses, nursing interns) and those on temporary leave for study, external training, maternity, or medical reasons during recruitment. According to the methodological requirements of COSMIN's bias risk assessment checklist for structural validity [35], the final sample size was calculated to be at least 451 cases, based on seven times the number of questionnaire items and considering a 15% invalid response rate. Quantitative analysis and screening of the scale items were performed using critical ratio method, correlation analysis, Cronbach's alpha method, and exploratory factor analysis to determine the final version of the RSDM-N scale. As the scale items had changed, the 10 experts who participated in the initial development of the scale were invited again to evaluate the relevance of each dimension and item in the final version using the Delphi method and a consultation questionnaire.

Step 2: Scale Validation.

A large-sample cross-sectional survey was conducted using convenience sampling to select nurses from 18 tertiary general hospitals in Beijing, Tianjin, and other regions to complete the final version of the RSDM-N scale. The sample size calculation was similar to the previous stage, resulting in a minimum of 424 cases. Of the measurement sample, 20% were selected for retesting two weeks later, considering a 20% invalid response rate, resulting in a minimum of 102 nurses being retested. Content validity, confirmatory factor analysis were used for validity testing, while Cronbach's α coefficient, split-half reliability, and test-retest reliability were used for reliability testing. The reliability and validity of the scale were verified, and the final RSDM-N scale was constructed.

Step 3: Analysis of Survey Results.

IBM SPSS 27.0 software was used to perform descriptive statistics on the data collected in step 2, thereby examining the current status of nurses' readiness to implement SDM.

The statistical analysis methods used in this section, along with their corresponding evaluation criteria, are detailed in the Appendix B.

Results

Construction of the initial version of the scale

Step 1: Construction of the Item Pool.

Through the literature review, 118 candidate items were initially selected from relevant scales, of which 69 additional items were complemented through qualitative interviews with 15 nurses. The members of the research team met to merge, modify, and supplement the scale dimensions and item pool, ultimately forming a final RSDM-N scale item pool with 73 items.

Step 2: Formation of the Initial Scale.

(a) Two rounds of Delphi expert consultation were completed, with 20 experts participating in each round (Basic information of the experts is shown in the Appendix C), including 10 from hospitals and 10 from nursing colleges. Based on comprehensive expert opinions and group discussions, 25 items were revised, 13 items were deleted, 5 items were merged, and 1 item was added, resulting in a draft of the RSDM-N scale with 56 items.

(b) A total of 3 rounds of cognitive interviews were conducted (Participants' basic information is shown in the Appendix D). The first round involved 15 nurses, resulting in 61 doubts accumulated. The results showed that most issues (75.41%) with the items focused on "Clarification", with a small portion falling into "Instructions" (11.48%). Other categories were "Knowledge/Memory" (4.92%), "Sensitivity" (4.92%), and "Assumptions" (3.28%). Based on

participant feedback, the expert team discussed and revised 16 items, 2 instructions, and 1 overall scale design that raised doubts in the first round of cognitive interviews.
After modifying the items, the second round of cognitive interviews was conducted, including 6 nurses. All participants had an accurate understanding of most items. Based on the results of the second round, the expert team discussed and revised 1 item of the scale. The detailed coding and revision results from both rounds of cognitive interviews can be found in Appendix D.
After further modifications, the third round of cognitive interviews was conducted with 5 participants. All 5 respondents completed the scale easily in 6 min or less, indicating they could understand all items and select the best options based on their own and their department's actual situations. No new revision suggestions were raised.

The initial version of the RSDM-N scale formed through three rounds of cognitive interviews with 26 clinical nurses is shown in Appendix E. The initial version of the scale comprises 56 items under five dimensions: knowledge, attitude, ability, organizational environment, and facilitating factors.

Reliability and validity test of the scale and analysis of survey results

Screening and optimization of scale items

A total of 455 questionnaires were collected, and 15 questionnaires with completion time less than 200 s were excluded. Additionally, 8 samples with no difference in index answers were manually screened out, leaving 432 valid data samples. Basic information of the tested population is shown in Appendix F.

Based on the results of the critical ratio method, correlation analysis method, and Cronbach's alpha coefficient method, all items showed good performance and were retained. The first exploratory factor analysis extracted five common factors, with a cumulative variance contribution rate of 85.796%. All factor loadings were greater than 0.4. Items with factor loadings less than 0.4 or with similar loadings on two or more factors without specificity were deleted. According to these item screening criteria and discussions among the research team, item B10, "I believe I have the ability to conduct SDM", was deleted, while items E1 and E2, which were specific to the role of change promoters within the assessment team, were retained.

At the same time, the research team re-examined the content of the items under the organizational environment and facilitating factor dimensions, analyzed them based on the theoretical framework, and moved items E1 and E2, which were originally under the facilitating factor dimension but were more aligned with the assessment focus of the original organizational environment dimension (such as leadership and teamwork), to the organizational environment dimension. It was found that the original organizational environment dimension could be more appropriately mapped to internal organizational team support in terms of human resources, while the original facilitating factor dimension corresponded more appropriately to external organizational team support in terms of material resources (information technology, equipment, funding, etc.) and formal policies. The dimensions with changed items were renamed, with the organizational environment dimension redefined as the change team dimension and the facilitating factor dimension redefined as the contextual support dimension.

A second factor analysis was performed on the remaining 55 items, extracting five common factors that were consistent with the number of dimensions set when constructing the scale. The cumulative variance contribution rate was 86.053%. The five factors were renamed as knowledge, attitude, ability, change team, and contextual support dimensions.

The formal version of the RSDM-N scale, constructed after item screening through a large-sample cross-sectional survey, comprises 55 items across 5 dimensions (see Table 1). It adopts a Likert 5-point scoring method, with each item scoring from 1 to 5 points. The total score ranges from 55 to 275 points, and a higher score indicates a better readiness of nurses to implement shared decision-making.

Reliability and validity testing of the scale

Content Validity: Ten experts were invited to evaluate the content validity of the scale. The results showed that the I-CVI ranged from 0.9 to 1.0, and the S-CVI/Ave was 0.989, both reaching the recommended standards, indicating that the scale has good content validity.

Confirmatory Factor Analysis: A total of 542 questionnaires were distributed, and 496 valid questionnaires were recovered, with an effective recovery rate of 91.5%. Basic information of participants shows in Appendix C. The confirmatory factor analysis revealed that the preset model fitting indices were not ideal. Therefore, the model was revised based on the modification indices (MI) from the model test. After revision, the standardized factor loadings of each item ranged from 0.725 to 0.927. The fitting indices were $\chi 2/df = 2.273$, GFI = 0.829, AGFI = 0.804, NFI = 0.916, RFI = 0.909, IFI = 0.951, TLI = 0.947, CFI = 0.951, and RMSEA = 0.049, all meeting acceptable statistical standards. The AVE values of each dimension ranged from 0.725 to 0.790, and the CR values ranged from 0.961 to 0.980. The correlation coefficients between dimensions were all less than the square root of

Table 1 The formal version of the RSDM-N scale

Dimension		Item
1	Knowledge	q1. When patients face situations where there is no best or unique treatment/care plan and available options have pros and cons, SDM is the ideal medical decision-making model.
		q2. Both SDM and evidence-based medicine emphasize patient involvement and respect for patients' values and preferences.
		q3. The goal of SDM is to explicitly reach a consensus on health decisions between clinicians and/or nurses and patients and/or family members.
		q4. Before implementing SDM, it is necessary to assess whether the patient has the willingness and ability to participate in decision-making.
		q5. During the SDM process, high-quality information about different options should be provided to patients based on the best evidence from evidence-based practice.
		q6. During the SDM process, I should be objectively and neutrally assisted in fully weighing the pros and cons of different options.
		q7. During the SDM process, patients' understanding of the information should be explored by having them repeat the specific content of the relevant information.
		q8. During the SDM process, patients should be encouraged to provide their own thoughts and feelings about the disease and decision-making to healthcare professionals.
		q9. Decision aids are evidence-based tools that can assist in the implementation of SDM by providing information about choices and corresponding outcomes related to the patient's health condition, helping patients make informed choices.
		q10. The construction of decision aids should follow the International Patient Decision Aid Standards (IPDAS) or other recognized methods.
2	Attitude	q11. I believe that patient or family involvement in SDM is beneficial to themselves.
		q12. I believe that SDM helps improve the doctor-patient relationship and reduce doctor-patient conflicts.
		q13. I believe that SDM will enrich my professional knowledge and promote my professional development.
		q14. I believe that patients' values and decision-making preferences should be an important part of the decision-making process.
		q15. I believe that SDM has broad application prospects in our country.
		q16. I am willing to actively participate in the SDM process.
		q17. I am willing to actively consult relevant books, literature, etc., to understand the latest progress of SDM.
		q18. I am willing to actively participate in SDM-related training courses.
		q19. I believe that I will play a key role as a bridge and link between doctors and patients in the SDM process in various roles.
3	Ability	q20. I can explain to patients the importance of their participation in the decision-making process.
		q21. Before implementing SDM, I can determine whether the patient is suitable for SDM and in what way SDM should be implemented.
		q22. Before implementing SDM, I can accurately understand the patient's willingness to participate in decision-making.
		q23. I can provide patients with scientific and reliable information about different options based on the best evidence from evidence-based practice.
		q24. I can help patients fully weigh the pros and cons of different options in a neutral and objective manner.
		q25. I can explore patients' understanding of the information by having them repeat the specific content of the relevant information.
		q26. I can encourage patients to express their true thoughts and feelings about the disease and decision-making, such as expectations and concerns.
		q27. I can guide patients to consider their own values and preferences, helping them balance the pros and cons accordingly.
		q28. I can choose the way to provide information according to the situation to help patients understand and make decisions (for example, using cards, manuals, websites, videos, and other decision aids).
		q29. I can provide clear opportunities for patients to ask questions during the decision-making process.
		q30. I can actively assist and guide patients to discuss their condition and make decisions together with them step by step.
		q31. I can help patients understand information in a way that is easy to understand.
		q32. I can share important patient information with multidisciplinary team members.
		q33. I can guide and coordinate the ideas and expectations of both doctors and patients.
		q34. I can respect and understand patients' values and preferences.

Table 1 (continued)

Dimension		Item
4	Change team	q35. Leaders are good at actively exploring and improving clinical work.
		q36. Leaders have good influence, and we are willing to follow her/his suggestions or orders
		q37. Leaders can reasonably allocate human resources according to clinical work.
		q38. Leaders have good communication and coordination skills.
		q39. Leaders can widely listen to our opinions and views.
		q40. I have good execution ability for tasks assigned by superiors.
		q41. My ward has a cultural atmosphere and workflow of multidisciplinary collaboration.
		q42. Doctors and other members of the multidisciplinary team can fully recognize the role that nurses can play in SDM.
		q43. Team members can cooperate with each other and work together to achieve specific goals.
		q44. The team has practice change facilitators with rich professional knowledge and clinical experience.
		q45. The team has practice change facilitators who can develop feasible evidence-based practice plans.
5	Contextual support	q46. Senior leadership (hospital/nursing department) supports the development of evidence-based practice changes.
		q47. There are incentive policies that encourage participation in evidence-based practice (such as job prospects, learning opportunities, collective honors, rewards, etc.).
		q48. There are various forms of training courses related to SDM (such as lectures, video lessons, seminars, simulation exercises).
		q49. Evidence related to SDM has been transformed into forms that are easy to disseminate and conducive to understanding and application, such as forming a complete SDM workflow, SDM practice manual, SDM program promotion posters, etc.
		q50. There are decision aids available to provide decision support to patients (such as online decision support websites, video and audio materials that provide decision-related information).
		q51. There is a feedback system that can optimize practice plans based on feedback from clinical nursing staff and patients.
		q52. There is sufficient time to participate in SDM.
		q53. There are information technology resources required for evidence-based practice (medical data, software development technology, technical staff support, etc.).
		q54. There is a harmonious doctor-patient relationship based on mutual trust.
		q55. There is active and appropriate SDM-related hospital publicity or media guidance to make SDM a social norm.

Table 2 Total score and dimensional scores of nurses' SDM readiness ($n=496$)

Dimensional/ Total score	Number of items	Min	Max	Mean score of dimensions ($\bar{X}\pm s$)	Mean score of items ($\bar{X}\pm s$)	Percentage of nurses at each score level (%)		
						Excellent grade	Medium grade	Inferior grade
Knowledge	10	10	50	33.77 ± 9.54	3.38 ± 0.95	24.8	44.8	30.4
Attitude	9	9	45	35.80 ± 6.19	3.98 ± 0.69	36.1	60.7	3.2
Ability	15	30	75	57.86 ± 10.07	3.86 ± 0.67	30.2	65.8	4.0
Change team	11	29	55	45.11 ± 7.04	4.10 ± 0.64	44.0	54.8	1.2
Contextual support	10	13	50	37.25 ± 8.90	3.72 ± 0.89	33.3	45.1	21.6
Total score	55	118	270	209.79 ± 35.82	3.81 ± 0.65	30.6	56.3	13.1

the corresponding AVE. The revised test results showed that the model had good convergent validity and internal quality (see Appendix G).

Internal Consistency and Split-Half Reliability: Cronbach's alpha analysis and split-half reliability analysis were performed on the overall scale and its five dimensions. The results showed that the total Cronbach's α of the scale was 0.987, and the split-half reliability was 0.911. The Cronbach's α coefficients for the knowledge, attitude, ability, change team, and contextual support dimensions were 0.980, 0.981, 0.988, 0.980, and 0.974, all exceeding the recommended standard of 0.70, indicating good internal consistency reliability of the scale.

Test-Retest Reliability: After a 2-week interval, 102 nurses who were conveniently contacted were retested. The correlation between the measurement results of each dimension and the total scale from the two tests was calculated. The effective recovery rate was 93.14% (95/102). The results showed that the total Cronbach's α coefficient of the scale was 0.894, and the Cronbach's α coefficients of each dimension were all >0.80, indicating good stability of the scale. All values were statistically significant with $P<0.05$.

Analysis of survey results

The total score of nurses' SDM readiness ranged from 118 to 270, with an average of (209.79 ± 35.82). A higher score indicates a higher level of nurses' SDM readiness. The total score and scores of each dimension are shown in Table 2. Among them, the change team dimension

scored the highest, followed by the attitude dimension, and the knowledge dimension scored the lowest.

Discussion

This study aimed to develop a scale for measuring nurses' readiness for nurse-led shared decision-making, test its reliability and validity, and analyze the current situation. Under the guidance of COSMIN and ORC, the RSDM-N scale was developed and validated. The study provides an effective measurement tool for nursing administrators to assess nurses' readiness to implement SDM. Additionally, we initially analyze the current status and influencing factors of nurses' SDM readiness, offering evidence for evaluating the feasibility of nurse-led SDM in clinical practice.

RSDM-N scale developed under COSMIN guidelines shows strong reliability and validity

Guided by COSMIN [35], this study has improved the scientific rigor of the development and validation process of the measurement tool. During the questionnaire development phase, qualitative interviews and quantitative surveys were conducted in detail against the COSMIN bias risk assessment checklist during the initial formation of the scale. In the questionnaire validation phase, confirmatory factor analysis and exploratory factor analysis were conducted to measure the structural validity of the scale against the COSMIN measurement property quality criteria, and Cronbach's α, split-half reliability, and test-retest reliability were calculated.

After screening and optimizing items through exploratory factor analysis, the dimensions of the scale were reclassified and redefined. The new dimensions correspond more clearly to the theoretical framework and basically cover all aspects of nurses' SDM readiness at both the individual and organizational levels, making the scale structure more reasonable.

To verify the rationality of the scale construction based on the exploratory factor analysis, confirmatory factor analysis was conducted. The initial results indicated that the model needed to be revised. The model fit after revisions was better than before. Except that GFI and AGFI were slightly lower than the reference values, all other model indicators were within the reference range. Overall, the theoretical structural model and measurement model data of the RSDM-N factor fit well. The 55 items of the scale can well measure the five factors they belong to, namely "knowledge", "attitude", "ability", "change team", and "contextual support". These five factors can reasonably reflect the theoretical construct of the total scale, namely "practical readiness for implementing SDM", indicating that the RSDM-N has good structural validity.

Internal consistency measures the consistency level among items within the total scale and each dimension. The Cronbach's α coefficients of the five dimensions of this scale range from 0.974 to 0.988, and the split-half reliability coefficients range from 0.952 to 0.970. The Cronbach's α coefficient of the total scale is 0.987, and the split-half reliability coefficient is 0.911. Both of these values are greater than the COSMIN-recommended standard of 0.70 [35], indicating good internal consistency of the measurement tool. The test-retest reliability examines the cross-time stability and consistency of the scale. The ICC values of each dimension of this scale range from 0.896 to 0.912, and the ICC value of the total scale is 0.904, all of which are greater than the COSMIN-recommended reference standard of 0.70 [35], indicating good test-retest reliability of the measurement tool.

Although COSMIN was originally developed for a patient-reported outcome measurement tool, its developers Prinsen et al. [35] stated that COSMIN could be adapted for other types of outcome measures, such as clinician reported outcome measures (ClinROM), performance-based outcome measures (PerFOMs), etc. Current studies have applied it to the development of self-reported outcome measurement tools other than nurses, medical students and other patients [40], Chinese [41] or systematic review [42–45], and have achieved good verification. Therefore, the RSDM-N scale developed under the guidance of COSMIN methodology and the measurement attribute validation carried out in this study are more rigorous and standardized, which makes the development of measurement tools have higher quality.

Cognitive interviews address comprehension and measurement Bias

In terms of the quality of scale design, COSMIN recommends the use of cognitive interviews to inquire whether the respondents can correctly understand the items, instructions, and options of the scale. This study confirms the value of cognitive interviews in scale development and, based on the feedback from cognitive interviews, reflects on and summarizes the issues encountered in the process of scale development. The results of the first round of cognitive interviews show that the problems of scale items mainly focus on the category of "clarification", including problems such as "ambiguity", "wording", and "professional terminology", manifested as unclear interpretations, awkward expressions, and difficulty in understanding professional terms. Some items involving leader evaluation are likely to make respondents have concerns. Some dimensions are presented only by name but lack instructions, which easily leads to misunderstandings of the assessment purpose. In addition, since the concept of SDM has not been widely popularized, there are problems in the aspect of "knowledge/memory". The root cause lies in the differences in knowledge background

and perspective between scale designers and survey respondents. In view of this, cognitive interviews should be used to find cognitive biases, and then items should be modified and the scale structure should be improved in a targeted manner. This is of great significance for effectively solving understanding biases and measurement biases and improving the scientific nature of the scale, especially in the design of cutting-edge and highly professional scales, which should be fully utilized.

In cognitive interviews, the Question Appraisal System (QAS) is recommended to identify item issues and encode interview data [39]. The QAS is particularly suitable as a framework for probe development. For example, in this study, researchers first considered the potential sources of error for each item in the context of QAS before the interviews. They reviewed each item according to QAS to formulate hypotheses about potential errors and then designed probe questions targeting specific items to test for the occurrence of such errors. Additionally, the application of this evaluation system helped the study discover "sensitivity/bias" issues that are often difficult to detect.

However, there is currently a low level of awareness about cognitive interviews in China. Many scales use pilot surveys as a substitute for cognitive interviews, and only a few studies have employed cognitive interviews to revise items from the perspective of the target population for the scale measurement [46–50]. Moreover, these applications are mostly found in the cultural adaptation of scales, significantly affecting the accuracy, validity, and reliability of the scales. Therefore, it is necessary to actively promote the use of cognitive interviews in the development of scales or questionnaires in China to further enhance the scientific rigor and reliability of the assessment tools.

Nurse-led SDM readiness in China needs improvement

The results of this study show that the total score for nurses' SDM readiness is at a moderately low level. This suggests that the current readiness of nurses to implement SDM in clinical practice is not ideal, and the conditions for nurse-led SDM models are not yet conducive. The possible reasons for this are that SDM in China started relatively late, and although it has made some progress in recent years, its research and application are still in the stage of theoretical reference and local exploration [51]. It has not yet been widely disseminated and promoted in various hospitals. Moreover, current research has mostly focused on patients or doctor [52–58], and research focusing on nurses as the main participants in SDM has only just begun sporadically [31, 59–61]. Therefore, the conditions for implementing nurse-led SDM in the current clinical environment are not yet mature, and there is significant room for improvement at both the individual and organizational.

Nurses' positive attitude toward SDM but need improved knowledge

Among the three dimensions of knowledge, attitude, and ability at the individual level, the attitude dimension scored the highest, while the knowledge dimension scored the lowest, which is consistent with the results of cognitive interviews, revealing that nurses' cognitive level of SDM is not high. This result is slightly higher than the research results of Guo LX et al. [62], which may be because with the popularity of the patient-centered concept, patients' awareness of decision-making and decision-making status are increasingly valued, and the medical mode has gradually changed from the traditional physician-led paternalistic decision-making mode to the mode of patient empowerment. In addition, driven by the emerging wave of SDM in recent years, the medical mode has become more and more important. Both patients and medical staff are affected in a subtle way, so the recognition of SDM is gradually increasing, and the trend of promoting SDM is developing, but it is not mature and stable, and it still needs to be further improved.

The score of the knowledge dimension of this scale directly reflects nurses' understanding of SDM's essence, key features, implementation path, patient decision aids, and its relationship with evidence-based medicine, which is closely related to the promotion of SDM. The results show that nurses have a relatively good understanding of SDM's objectives and the steps to weigh the pros and cons, but have a shallow understanding of SDM's ideal scope of application, its relationship with evidence-based medicine, and the importance of patients' values and preferences. They are most unfamiliar with the relevant knowledge of decision-making support tools, indicating that nurses' current understanding of SDM mostly stays on the surface, and their understanding of its key features is not yet comprehensive. Nurses do not know much about the specific implementation methods of SDM, especially the use of patient decision aids to assist in implementing SDM. If nurses have a one-sided or even incorrect understanding of SDM, it will affect their attitude and behavior towards implementing SDM, hindering the development of SDM. A survey on attitudes and preferences of 200 Chinese doctors before and after learning PDAs about statin choice showed that after reading decision aids and watching videos of SDM process, the number of doctors willing to participate in SDM increased from 59 to 69% [63]. Cognition is the foundation of behavior, and improving nurses' understanding of SDM is the primary prerequisite for promoting its application in clinical practice [51, 64, 65]. Therefore, it is necessary to strengthen the relevant training of nurses on

SDM, help them clarify the essence and implementation process of SDM, conduct multi-channel and diversified training methods, and deepen nurses' understanding and experience of SDM through scenario simulation, role-playing, and other methods. This will help change their inherent conceptions about the value of patient decision-making and promote the true implementation of nurse-led SDM in clinical practice.

Nursing team supports SDM implementation but lacks contextual support

The dimensions of change team and contextual support in this scale assess the readiness for change at the organizational level mentioned above. The results show that the leadership style and organizational culture are well prepared to accept evidence-based practices such as nurse-led SDM, but there are many deficiencies in contextual support. In this study, the change team dimension scored the highest, close to an excellent level. Additionally, the items assessing the leader's various change abilities scored highly, indicating that in the current clinical environment, the leader's leadership style, influence, and communication and coordination abilities are good. They are able to actively explore improving clinical work, extensively listen to the opinions of organizational members, and play an important role in promoting change implementation and team collaboration [66]. The study of Santhidran et al. [67] also supports this conclusion. They found that effective leadership helps organization members to accept and understand change and gradually change their views on change, which is an important influencing factor for change preparation. Therefore, before preparing to implement SDM, it is necessary to ensure that leaders themselves are adequately prepared, with attitudes, leadership styles, knowledge reserves, communication, and other abilities that meet the requirements for implementing SDM.

On the other hand, organizational change culture, learning atmosphere, organizational identity, and organizational commitment can help improve the level of organizational members' readiness for change [68]. The results of the item scoring order in this study show that the item with the highest score is "I have good execution ability for tasks assigned by my superiors", followed by "Team members can cooperate and work together to achieve specific goals". The lowest-scoring item is "Other members of the multidisciplinary team, such as doctors, fully recognize the role nurses can play in SDM", and there is often a lack of practical change promoters with sufficient ability and experience in the team. This indicates that in the current practice environment, nursing staff can cooperate well with leaders to complete tasks, and there is a harmonious relationship and good collaboration atmosphere among members of the nursing team, which is conducive to the smooth implementation of practice changes. However, there is a lack of innovative power in the organization, and the collaborative relationship between other professional groups and nurses in the multidisciplinary team is not yet harmonious. Therefore, in the context of the existing organizational culture, it is also necessary to pay attention to the cultivation of practical change promoters, vigorously promote an innovative, daring, and SDM-oriented organizational culture atmosphere [36], and provide a more supportive organizational culture for the implementation of SDM in clinical practice.

The context support dimension is used to assess enablers from the individual, team, and management levels. In this study, the score of this dimension is low, only higher than that of knowledge dimension, which is in the lower middle level. The items with the lowest scores indicate that the practice of SDM in the current environment is still facing multiple resistance from organizations, society and other external environments, especially the relevant preparation for evidence transformation such as PDAs and SDM workflow is not perfect, which is related to the relative lack of PDAs and SDM evidence transformation and application in China because relevant research is still in its infancy. The results are similar to those of relevant domestic studies [60, 69]. In addition to exploring the theoretical system and model related to SDM, evidence transformation and application of SDM are also closely related to external support such as the implementation of hospital management model [60]. At present, there is no standardized theoretical system and specific operational process of SDM in China, and there is no corresponding management evaluation system to control the quality of decision-making participation. The promotion and application of SDM in clinical nursing situations are also weak, which limits the practice of SDM to a certain extent. Therefore, while actively developing high-quality PDAs suitable for China's medical cultural background, it is necessary to extensively mobilize various internal and external positive forces of the department to accelerate the creation of a supportive environment for SDM. It is suggested to actively construct a sound SDM theoretical system and a concrete and operational SDM workflow and management evaluation system and promote its application. Carry out PDAs related training courses, establish a training system to train specialized talents, optimize the allocation of human resources, improve the practice environment of nurses, and mobilize their internal enthusiasm in learning SDM and subjective initiative in implementing SDM; Provide policy support and guidance to SDM, formulate administrative policies to promote the transformation of SDM related evidence, and provide special fund support; Give full play to the media and other forces, popularize

the basic medical knowledge and SDM concept to the public in the form of network short videos, so that SDM can form a general social cognition and mode, and provide a certain foundation and guarantee for the realization of SDM.

Conclusion

Guided by COSMIN [24], this research developed and validated the RSDM-N scale. The scale demonstrated excellent reliability and validity, with a Cronbach's α of 0.987, split-half reliability of 0.911, test-retest reliability of 0.904, and an S-CVI of 0.989. These results indicate that the RSDM-N scale is a reliable and valid tool for assessing nurses' readiness for SDM in China, supporting the implementation of nurse-led SDM.

The study also confirmed the effectiveness of cognitive interviews in addressing comprehension and measurement biases during scale development, improving scale quality and survey reliability. This highlights the importance of adopting cognitive interviews in the design and introduction of survey questionnaires, promoting their application in China to enhance the scientific rigor of evaluation tools.

Currently, the overall level of nurses' readiness for SDM in China is relatively low, with obstacles at both individual and organizational levels. Individually, nurses have a positive attitude towards SDM but limited understanding and moderate ability to implement SDM. Organizationally, while nursing teams and leadership and organizational culture are supportive of SDM, there are significant deficiencies in contextual support, particularly in preparing for evidence transformation related to patient decision aids and SDM workflow.

To effectively implement nurse-led SDM, it is essential to analyze the RSDM-N scale survey results, mobilize favorable factors within individuals and organizations, create a supportive environment, and improve nurses' SDM readiness, laying the foundation for integrating SDM into clinical nursing practice in China.

Limitations

Despite the promising findings, this study has several limitations that should be acknowledged. Firstly, the sample size used for the validation of the RSDM-N scale might not be sufficiently large or diverse, limiting the generalizability of the results across different nursing populations and settings. Future research should aim to include a broader and more representative sample to enhance the external validity of the findings.

Secondly, the study relied on self-reported data, which are susceptible to social desirability bias and inaccuracies in self-assessment. To mitigate these issues, future studies should incorporate objective measures and external evaluations to provide a more robust and comprehensive assessment of nurses' readiness for SDM.

Addressing these limitations in future research will be crucial for further validating the RSDM-N scale and ensuring its applicability across various contexts and populations.

Supplementary Information

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Supplementary Material 1

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Author contributions

Meiqi Meng and Sihan Chen wrote the main manuscript text. Dan Yang and Xiaoyan Zhang provided valuable advice to the design of the study and helped with the data collection for the study. Yajuan Yang, Ziyan Wang and Jingyuan Zhang helped collect and analyze the data. Xuejing Li and Yufang Hao reviewed the first draft of the article, put forward valuable suggestions for revision, and grasped the implementation progress of the whole study. All authors reviewed the manuscript.

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Data availability

All data and materials for this study are available from author Meiqi Meng.

Declarations

Ethical approval and consent to participate

This study complies with ethical principles outlined in the Declaration of Helsinki, does not involve unethical behavior or human clinical trials, and will not have any adverse effects on the physical or mental health of the participants. Ethical approval for this study has been obtained from the Medical Ethics Committee of Beijing University of Chinese Medicine, with approval number 2021BZYLL0307. Clinical trial number is not applicable. Informed consent was obtained from all study participants.

Consent for publication

Not applicable: This article does not involve the public publication of any personal information (Including demographic data; personal medical information such as description of symptoms and conditions, medical procedures/treatments and recovery; genetic pedigrees and other personal genetic information; photographs; images; videos; voice and other recordings; or any other personal representation).

Competing interests

The authors declare no competing interests.

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