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REVIEW

Systematic Review of Assessment Tools for Factors Influencing Missed Nursing Care Among Nurses Based on COSMIN Guidelines

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Background: Due to various reasons, the phenomenon of missed nursing care is widespread, which directly leads to the occurrence of adverse nursing events. At present, a variety of measurement tools have been developed worldwide to assess the influencing factors of clinical nurses' missed nursing care. However, there is no comprehensive standard evaluation of the performance of such measurement tools and the methodological quality of the research.

Aim: A systematic review of the methodological quality and measurement properties of the scale for influencing factors of missed nursing care was conducted to provide evidence-based guidance for nursing managers in selecting high-quality assessment tools.

Methods: To systematically retrieve literature on assessment tools for clinical nurses' missed nursing care from Pubmed, Embase, Web of Science, CINAHL, CNKI, Wanfang Data Knowledge Service Platform, VIP Database, and China Biology Medicine (CBM) from inception to July 1, 2024. Two researchers independently screened and extracted the data. The assessment tools were evaluated in terms of measurement properties and methodological quality based on the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN), ultimately leading to the formulation of recommendations.

Results: A total of 12 studies included 12 assessment tools for evaluating factors influencing missed nursing care among clinical nurses. Since the content validity was "indeterminate" for all, there were no A-grade recommended tools. Nine assessment tools were recommended as B-grade, and three as C-grade.

Conclusion: The methodological and measurement properties of assessment tools for missed nursing care need to be further improved. In comparison, the missed intensive nursing care scale (MINCS) has a relatively comprehensive report on measurement properties, with high-quality evidence demonstrating that its measurement properties of structural validity, internal consistency, and stability are "adequate". It can be temporarily recommended as an assessment tool for influencing factors of missed nursing care in the intensive care unit. However, the reporting of its measurement properties still needs further refinement.

Keywords: clinical nurses, missed nursing care, assessment tools, COSMIN, measurement properties, systematic review

Introduction

Nursing quality and patient safety are persistent priorities in healthcare, and providing high-quality nursing services is the core objective of nursing management. The concept of missed nursing care (MNC), first introduced by Dr. Kalisch in 2006, refers to the partial, complete omission, or significant delay in executing nursing interventions required by patients due to factors such as inadequate nursing human resources, excessive non-nursing work, and irrational patient allocation.[1] Studies in multiple countries have shown that MNC is a widespread phenomenon, with nearly 98% of nurses reporting at least one missed or delayed nursing intervention during their previous shift.[2–6] For instance, a survey conducted in a 52-bed level 4 neonatal intensive care unit at an academic medical center in the Midwestern United States revealed that 136 nurses reported the lack of care for 418 neonatal patients during 332 shifts.[7] Because such omission behaviors are not easy to be detected, they may cause more serious security problems.[8] Nelson et al found that missed nursing care was correlated with urinary tract infections in patients in nursing homes.[9] Wendy Chaboyer's systematic review suggested that MNC not only directly

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contributes to adverse nursing events, prolongs patients' hospital stays, and increases the risk of readmission but also diminishes nurses' job satisfaction and escalates turnover rates.[10] Therefore, analyzing the influencing factors of the absence of nursing activities and taking preventive measures accordingly are of great significance for improving the quality of nursing and the prognosis of patients.

Currently, various measurement instruments have been developed globally to assess the factors influencing MNC among clinical nurses, yet a comprehensive and standardized evaluation of their performance and methodological quality remains lacking. Consensus-based Standards for the selection of health Measurement Instruments (COSMIN) supports the evaluation of the reliability, accuracy and scientificity of assessment tools from both measurement properties and methodological quality aspects to determine the recommended grade of assessment tools. This study, adhering to the COSMIN guidelines, conducts a systematic review of assessment tools for factors influencing MNC among clinical nurses, aiming to provide evidence-based support for effectively evaluating the influencing factors of MNC.

Study Method

We adopted the COSMIN systematic review guidelines and had two researchers independently evaluate the methodological quality and measurement properties of the included literature.[11] Based on the comprehensive evaluation results of the two researchers, If there are any differences or inconsistencies, consult a third-party professional for a decision. This research has been registered on the PROSPERO website with the registration number CRD42024560718.

Literature Search Strategy

A comprehensive literature search was conducted using computer-based tools to retrieve articles related to the assessment tools for missed nursing care among clinical nurses from Pubmed, Embase, Web of Science, CINAHL, China National Knowledge Infrastructure (CNKI), Wanfang Data Knowledge Service Platform, VIP Database, and China Biomedical Literature Database. The search period covered the establishment date of these databases up to July 1, 2024. The researchers' native language is Chinese, so we included Chinese databases in our search. We adopted a combined approach of using subject headings and free-text words, with primary search terms including "missed nursing care/scale/tool/reliability/validation" among others. Taking PubMed as an example, the specific search strategy is outlined in Table 1.

Inclusion and Exclusion Criteria

Inclusion Criteria

(1) The study participants are clinical registered nurses; (2) the research content involves the measurement properties of assessment tools related to factors influencing missed nursing care among clinical nurses; (3) the study type encompasses the development, validation, and cross-cultural adaptation of assessment tools; (4) the full text of the literature, in either English or Chinese, is accessible.

Table 1 Literature Search Strategy

Search Steps	Search Formula
#1	"missed care[MeSH Terms]" OR "missed nursing care[Title/Abstract]" OR "omitted care[Title/Abstract]" OR "delayed nursing care[Title/Abstract]" OR "unfinished care[Title/Abstract]"
#2	"scale[MeSH Terms]" OR "tool[Title/Abstract]" OR "questionnaire[Title/Abstract]" OR "instrument[Title/Abstract]" OR "measure[Title/Abstract]"
#3	"reliability[MeSH Terms]" OR "validation[Title/Abstract]" OR "psychometric[Title/Abstract]"
#4	#1 AND #2 AND #3

Exclusion Criteria

(1) Assessment tools that can only measure a certain dimension of the influencing factors of missed nursing care (such as the human factors dimension); (2) assessment tools used exclusively for measuring outcome indicators; (3) literature types such as meeting, reviews, and commentaries; (4) duplicate publications.

Literature Screening and Data Extraction

The process of literature screening and data extraction was independently carried out by two researchers. In the initial stage, NoteExpress 4.0 software was utilized to efficiently remove duplicate literature. Subsequently, the researchers conducted a preliminary screening based on the titles and abstracts of the literature, followed by a secondary screening through reading the full texts to determine whether to include the literature. The extracted data included the scale name, first author, publication year, research region, sample size, scale dimensions, number of scale items, scale scoring method, and scale retest time.

Literature Quality Evaluation

COSMIN Risk of Bias Checklist

The methodological quality of the included literature was systematically evaluated using the COSMIN Risk of Bias Checklist.[12] This checklist is subdivided into 116 items, grouped into three main sections: internal structure, content validity, and other measurement properties. It covers 10 modules in total, including assessment tool development, content validity, structural validity, internal consistency, cross-cultural validity, stability, measurement error, criterion validity, hypothesis testing, and responsiveness. A 4-point rating scale was applied to each item, ranging from "very good (V)" to "adequate (A)", "doubtful (D)", and "inadequate (I)" in descending order. If an item was not applicable to a specific study, it was marked as "not applicable (N)" and was not included in the final scoring. Ultimately, the principle of the lowest score was followed, whereby the final bias risk score for each module was determined by the lowest score among all items within that module.

COSMIN Quality Criteria

The measurement properties of the included literature were evaluated using the COSMIN quality criteria,[13] which encompass three aspects: reliability, validity, and responsiveness, and involves nine modules such as content validity, structural validity, and internal consistency. The evaluation results were represented as "sufficient(+)", "insufficient(-)" and "indeterminate(?)".

Modified GRADE System

The modified Grading of Recommendations, Assessment, Development and Evaluation (GRADE) system was adopted to evaluate the quality of evidence and form the final recommendations.[14] Initially, the measurement properties of each assessment tool were considered as "high-quality", followed by grading based on evaluations of risk of bias, inconsistency, imprecision, and indirectness, resulting in four hierarchical levels: "high", "moderate", "low", and "very low". Recommendations were made according to the evaluation outcomes of measurement properties and evidence levels: if any level of evidence demonstrated "sufficient" content validity, accompanied by at least low-quality evidence confirming "sufficient" internal consistency, the recommendation would be graded as A (strongly recommended); if further research was required to evaluate its quality, it would be graded as B; and if not recommended for use, it would be graded as C.

Results

Literature Search Results

An initial search yielded 7862 articles. After screening them layer by layer based on the inclusion and exclusion criteria, 12 articles were finally included, consisting of 6 Chinese articles and 6 English articles, respectively. The flowchart of literature screening is shown in Figure 1.

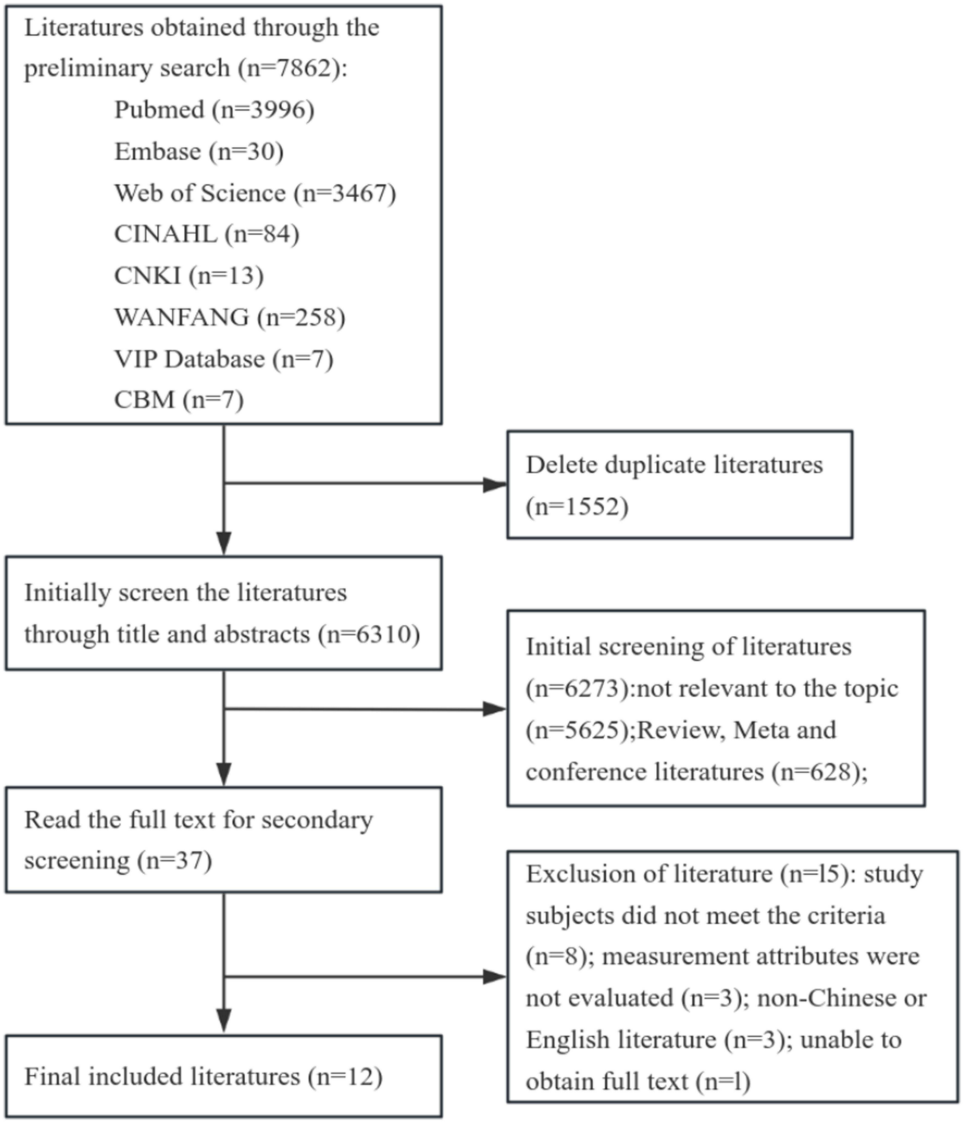

Figure 1 Flowchart of literature screening.

Basic Characteristics

Among the 12 included articles, 10 were related to the development and validation of missed nursing care assessment tools,[15–24] and 2 were about the Chinese adaptation and validation of foreign missed nursing care assessment tools,[25,26] all of which were multidimensional assessment tools. It is particularly noteworthy that each assessment tool included in this study comprises two independent subscales: a missed nursing care item survey and a missed nursing care influencing factor survey. This study only conducted a systematic review on the missed nursing care influencing factor survey. The basic characteristics of the included assessment tools are shown in Table 2.

Quality Assessment

None of the 12 articles included in this study reported on the cross-cultural validity, criterion-related validity, measurement error, and responsiveness of the assessment tools. The specific results of the methodological quality and measurement property quality evaluation are presented in Table 3.

Table 2 Study Characteristics

Scale Name(Abbreviation)	Author(Year)	Country/ Region	Sample Size	Dimensions/ Number of Items	Scoring Method	Retest Time
General Intensive Care Unit-Missed Nursing Care(GICU)[20]	Wang(2023)	China	237	5/22	4	2 Weeks
Oncology Missed Nursing Care Feedback Scale (OMNCFS)[21]	Gao(2018)	China	388	3/20	4	2 Weeks
MISSCARE Survey - Pediatric Version (MCS-Ped)[17]	Bagnasco(2018)	Italy	48	3/17	4	NR
MISSCARE Survey-Operating Room (MCS-OR)[15]	Kalisch(2021)	American	1693	4/17	4	NR
Neonatal Missed Nursing Care Scale (NMNCS)[22]	Gao(2023)	China	382	4/28	4	2 Weeks
Missed Catheterization Nursing Skills Scale (MCNSS)[23]	Jiang(2022)	China	297	3/21	4	2 Weeks
Missed Nursing Care-Intensive Care Unit (MNC-ICU)[24]	Liu(2024)	China	219	5/25	4	2 Weeks
Missed Nursing Care in Infection Prevention and Control Survey(MNCIPCS)[26]	Lv(2023)	China	450	4/20	4	2 Weeks
Missed Nursing Care(MNC)[18]	Kalisch(2009)	American	1098	3/16	4	2 Weeks
Missed Intensive Nursing Care Scale(MINCS)[16]	Li(2024)	China	950	4/25	4	2 Weeks
Unfinished Nursing Care Survey(UNCS)[19]	Bassi(2020)	Italy	1400	6/18	4	NR
Perinatal Missed Care Survey(PMCS)[25]	Ding(2024)	China	491	3/15	4	NR

Abbreviation: NR, not report.

Table 3 Evaluation results of methodological quality and measurement property quality

Scale Name	Content Validity	Structural Validity	Internal consistency	Reliability	Hypothesis Testing
	MQ/MP	MQ/MP	MQ/MP	MQ/MP	MQ/MP
GICU[20]	D/?	D/?	V/?	D/?	NR/NR
OMNCFS[21]	D/?	A/?	V/?	D/?	NR/NR
MCS-Ped[17]	D/?	I/?	V/?	NR/NR	NR/NR
MCS-OR[15]	D/?	V/+	V/+	NR/NR	NR/NR
NMNCS[22]	D/?	A/?	V/?	D/?	NR/NR
MCNSS[23]	D/?	V/-	I/?	D/?	NR/NR
MNC-ICU[24]	I/?	V/-	V/?	D/?	NR/NR
MNCIPCS[26]	D/?	A/?	V/?	D/?	NR/NR
MNC[18]	D/?	V/+	V/-	A/+	V/+
MINCS[16]	D/?	V/+	V/+	A/+	NR/NR
UNCS[19]	D/?	V/+	I/?	NR/NR	V/+
PMCS[25]	D/?	V/+	V/+	NR/NR	NR/NR

Abbreviations: MQ, methodological quality; MP, measurement property; methodological quality :V, very good ; A, adequate; D, doubtful; I, inadequate; N, not applicable; measurement property: "+", sufficient; "-", insufficient; "?", indeterminate; "±", inconsistent.

Content Validity

Content validity should evaluate the comprehensiveness, understandability, and relevance of assessment tools after finalizing their item versions.[27] Ten studies conducted item development and adjustment of the assessment tool through semi-structured interviews, expert consultations, and pilot surveys. However, the reporting of experts' or research subjects' opinions on the comprehensiveness, comprehensibility, and relevance of the assessment tool was not standardized. Furthermore, it was

unclear whether the items were tested in their final form after adjustment. Therefore, the methodological quality of these studies was rated as "doubtful", and the measurement properties were labeled as "indeterminate".[15–17,19–23,25,26] One study did not conduct a pilot survey, resulting in a "inadequate" methodological quality rating and "indeterminate" measurement properties.[24] The remaining study lacked detailed descriptions of its assessment tool development process and provided incomplete reports, leading to a "doubtful" methodological quality rating and "indeterminate" measurement properties.[18]

Structural Validity

COSMIN recommends the use of factor analysis to assess structural validity, with Confirmatory Factor Analysis (CFA) being preferred over Exploratory Factor Analysis (EFA). In terms of methodological quality, 5 studies conducted only EFA.[17,20–22,26] Among them, GICU did not describe the rotation method,[20] hence rated as "doubtful"; MCS-Ped reported a sample size less than five times the number of items, thus rated as "inadequate",[17] while the remaining three studies were rated as adequate.[21,22,26] Seven studies conducted CFA with adequate sample sizes and no other significant methodological flaws, earning them a rating of very good.[15,16,18,19,23–25] Regarding measurement properties, 5 studies that did not conduct CFA were rated as "indeterminate".[17,20–22,26] Among the 7 studies that did CFA,[15,16,18,19,23–25] 2 studies had fit indices <0.95 and Root Mean Square Error of Approximation (RMSEA) >0.06,[23,24] thus rated as "insufficient" for structural validity. The structural validity of the remaining 5 studies was deemed "sufficient".[15,16,18,19,25]

Internal Consistency

The evaluation of internal consistency typically employs the Cronbach's alpha coefficient, which indicates the degree of interrelatedness among the items within an assessment tool. All 12 included studies reported on internal consistency. Among them, 10 studies calculated internal consistency separately for each unidimensional scale without other methodological flaws, earning them a methodological quality rating of very good.[15–18,20–22,24–26] Two studies only reported the overall scale's internal consistency without calculating it for individual unidimensional scales, resulting in a methodological quality rating of inadequate.[19,23] Regarding measurement properties, COSMIN's criteria for evaluating internal consistency as "sufficient" include at least low-level evidence of sufficient structural validity and a Cronbach's α value ≥0.70 for each unidimensional scale or subscale. Two researchers integrated the results of structural validity evaluations and internal consistency scores for each assessment tool. The findings revealed that 3 studies had at least low-level evidence of sufficient structural validity and Cronbach's α values ≥0.70 for all unidimensional scales, leading to a measurement property rating of sufficient.[15,16,25] Two studies met the criterion of at least low-level evidence of sufficient structural validity but either failed to report Cronbach's α values for unidimensional scales or had Cronbach's α values <0.70, resulting in a rating of "indeterminate" for the former and "insufficient" for the latter.[18,19]

Reliability

Reliability refers to the degree of consistency of the results obtained when the same method is used to repeatedly measure the same subject.[28] Four studies failed to report on reliability,[15,17,19,25] 6 studies used test–retest reliability to evaluate reliability,[20–24,26] but failed to describe whether the patients were stable in the measured structure during the interval between measurements, and whether the methods and environments of the two measurements were similar. Therefore, the methodological quality was rated as "doubtful" and the measurement property was "indeterminate". Only 2 studies calculated the Intraclass Correlation Coefficient (ICC) to evaluate the reliability of the assessment tool, with both ICC values exceeding 0.70.[16,18] Nevertheless, the ICC model or formula was not reported, so the methodological quality was rated as "adequate" and the measurement property was considered "sufficient".

Hypothesis Testing

Hypothesis testing for construct validity refers to the extent to which the measured results reflect the theoretical constructs and traits that are actually intended to be measured. Two studies conducted hypothesis testing using discriminant validity,[18,19] fully described the characteristics of subgroups, and the results were consistent with the hypotheses without any other methodological flaws. Therefore, the methodological quality was rated as "very good", and the measurement property was "sufficient". The remaining studies did not conduct hypothesis testing.

Criterion Validity

Criterion validity refers to the degree to which the results obtained by an evaluation tool in measuring a certain construct fully reflect the "gold standard".[28] Since the study by Kalisch was the first domestic and international development of a missed nursing care assessment tool,[18] there were no comparable tools available, so this attribute was not applicable to it. None of the other studies reported on criterion validity.

Evidence Synthesis

The evidence quality of the evaluation tools was graded using the modified GRADE system,[14] and final recommendations were formed. In terms of risk of bias, the content validity of the MNC-ICU was rated as "inadequate",[24] resulting in a downgrade of 2 levels to low quality. The methodological quality of content validity for the remaining studies was rated as "doubtful", leading to a downgrade of 1 level to moderate quality. For the MCS-Ped, the methodological quality of structural validity was rated as "inadequate",[17] while the GICU was rated as "doubtful".[20] All other studies were rated as "very good" or "adequate". Consequently, the evidence level for structural validity of the MCS-Ped was downgraded 2 levels to low quality,[17] and the GICU was downgraded 1 level to moderate quality.[20] No downgrades were applied to the other studies. Due to the inadequate methodological quality of internal consistency in the UNCS, the evidence level was downgraded 2 levels.[19] The methodological quality of internal consistency in the MCNSS was rated as doubtful,[23] resulting in a downgrade of 1 level. No downgrades were applied to the other studies. Four studies did not report the methodological quality of reliability,[15,17,19,25] and 2 studies were rated as "adequate" in reliability,[16,18] with no downgrade applied. The remaining studies were rated as "doubtful", leading to a downgrade of 1 level. Both the MNC and UNCS reported hypothesis testing for structural validity with "very good" methodological quality,[18,19] resulting in a high-quality evidence rating. None of the evaluation tools were downgraded due to inconsistency, imprecision, or indirectness.

After integrating the results, it is found that all 12 evaluation tools included in this study have a indeterminate content validity, therefore, none of them meet the grade A recommendation criteria. Since there is high-quality evidence indicating that the measurement properties of MCNSS, MNC-ICU, and MNC are "insufficient",[18,23,24] they are recommended as grade C. Among the remaining B-level assessment tools, MINCS is tentatively recommended as an assessment tool for factors influencing missed nursing care in intensive care units.[16] This tool was developed through semi-structured interviews, expert consultations, and the Delphi method, encompassing 25 items across four domains: human resources (6 items), material resources (4 items), communication factors (4 items), and management factors (11 items). The items are clearly stated and easy to understand, effectively reflecting the actual situation of the surveyed subjects. However, it lacks reports on measurement error and criterion validity, indicating that further refinement is necessary, see Table 4 for details.

Table 4 Evidence Quality Grading and Recommendation

Scale Name	Content Validity	Structural Validity	Internal Consistency	Reliability	Hypothesis Testing	Recommendation
GICU[20]	M	M	H	M	NR	B
OMNCFS[21]	M	H	H	M	NR	B
MCS-Ped[17]	M	L	H	NR	NR	B
MCS-OR[15]	M	H	H	NR	NR	B
NMNCS[22]	M	H	H	M	NR	B
MCNSS[23]	M	H	M	M	NR	C
MNC-ICU[24]	L	H	H	M	NR	C
MNCIPCS[26]	M	H	H	M	NR	B
MNC[18]	M	H	H	H	H	C
MINCS[16]	M	H	H	H	NR	B
UNCS[19]	M	H	L	NR	H	B
PMCS[25]	M	H	H	NR	NR	B

Notes: H, High; M, Moderate; L, Low.

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Discussion

The methodology and measurement properties included in the assessment tools need to be further improved

According to the COSMIN guidelines, content validity is the most critical measurement property. An excellent assessment tool should comprehensively cover the concept to be measured. The basic information, qualifications and inquiry process of the participating experts ensure the effectiveness of its evaluation process. If there is high-quality evidence indicating a severe risk of bias in the content validity of the evaluation tool, the study can be disregarded. It is recommended that in the future, when developing or cross-culturally adapting assessment tools, a combination of qualitative interviews and quantitative research should be adopted, and provide detailed descriptions of the item development and adjustment processes. Expert inquiries should include multi-disciplinary healthcare workers such as researchers, psychology experts, and clinicians as much as possible. For the assessment of structural validity, most of the included studies only conducted EFA, and there were also flaws in the sample size and rotation methods. It is suggested that in future studies, if there is no solid theoretical foundation, EFA should be first employed to observe the internal structure of variables, followed by CFA for verification to enhance the rationality and scientificity of the construct validity of assessment tools. The COSMIN guidelines suggest that the time interval for retest reliability verification is generally about two weeks. If it is too long or too short, there may be bias. Moreover, the methods, environments and guidelines for the two measurements should be similar to minimize the influence of external conditions on the stability measurement results.

Notably, none of the assessment tools included in this article reported on cross-cultural validity, measurement error, criterion validity, or responsiveness. Future research should conduct reasonable and scientific validations of these attributes to enhance the quality of assessment tools.

Implications for Nursing Managers: Rationally Allocate Human Resources and Improve the Quality of Nursing

In numerous qualitative research themed around missed nursing care conducted among nursing staff, several nurses reported: “There are too few nurses for too many patients and treatments—our workload is overwhelming, and sometimes we are genuinely unable to keep up”. “Some equipment in our department, like infusion pumps and nebulizer pumps, have been in use for years. They frequently malfunction, and when they break down, we have to replace or borrow them, which delays treatment”. “Communication with managers is crucial. I believe issues like daily shift scheduling and patient assignment directly impact missed nursing care”. This indicates that the missed nursing care in clinical practice is mainly influenced by factors such as the working environment, personnel structure, communication and exchange, and workload. Among them, the insufficient allocation of nursing staff is the primary cause of missed nursing care. Studies show that for every one less patient cared for by a nurse, the reported adverse nursing events decreased by 1.04 times.[29] However, by the end of 2023, calculated based on the ideal doctor–nurse ratio of 1:2, there was still a shortage of 4 million nurses in China. The same situation exists in Western countries. According to the European Commission’s estimation, by the end of 2020, the shortage of nursing staff in Europe reached 590,000.[30] This has led to a series of negative impacts, including increased workload and stress for nurses, patients not receiving adequate care, and poor disease prognosis.

It is suggested that medical managers adopt flexible shift systems based on the number of patients and the complexity of their conditions, set up positions at different levels, ensure the completeness of equipment and facilities, reduce non-nursing tasks for clinical nurses, and provide psychological and physical support for nurses, such as setting up “nurse stress relief rooms”, implementing fatigue detection, providing biofeedback devices, massage chairs, and psychological counseling. It is believed that through these measures, the transformation from “passive remediation” to “active prevention” of missed nursing care can be achieved.

Conclusion and Limitations

This study systematically evaluates the assessment tools for influencing factors of missed nursing care among clinical nurses based on the COSMIN guidelines. The evaluation results are mixed. It is suggested that before developing or cross-culturally adapting assessment tools in the future, researchers should systematically learn the guideline standards for evaluating the quality of assessment tools to ensure the validity, reliability, and scientificity of the development and reporting process of assessment tools. This study only included Chinese and English literatures. Some of the evaluation processes were highly subjective, and there might be problems of incomplete literature retrieval, which could lead to bias. Future studies can further standardize and improve them.

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Disclosure

The authors report no potential conflicts of interest in this article.

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