Postprint: A Systematic Review of Assessment Tools for Medical Team Collaboration at Home and Abroad

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Abstract

Background In recent years, the promotion of the "health-centered" concept and the continuously increasing healthcare demands of patients have placed higher requirements on healthcare providers. Forming efficient medical teamwork is considered an important means to improve healthcare service quality, and selecting objective and effective teamwork assessment tools is particularly crucial for evaluating cooperation among team members and for team building.

Objective To systematically review medical teamwork assessment tools from both domestic and international sources, providing a reference for the rational selection of appropriate tools according to different contexts.

Methods In April 2022, literature related to medical teamwork assessment tools published from January 2016 to April 2022 was searched in PubMed, CNKI, Wanfang Data Knowledge Service Platform, and VIP Database. Two researchers independently conducted literature screening and information extraction, with cross-checking. The Chinese version of the COSMIN study design checklist was applied to evaluate the quality of the assessment tools.

Results A total of 30 articles were included, involving 32 medical teamwork assessment tools. For tools with localized versions, their original versions were also included, resulting in a final total of 49 medical teamwork assessment tools. Overall design and methodological quality evaluation was conducted on the 32 medical teamwork assessment tools involved in the 30 included articles. The results showed: in terms of overall scale design, 20 scales were rated as "very good", 2 as "good", and 10 as "unclear"; for content validity, the methodological quality of 1 scale was "very good", 12 were "good", and 19 were "unclear"; for structural validity, 19 scales had "very good" methodological quality, 10 were "good", and 3 were "poor"; for internal consistency, 29 scales had "very good" methodological quality, 1 was "good", and 2 were "unclear"; for stability, 6

scales had "very good" methodological quality, 8 were "good" , 1 was "unclear" , and other scales did not report relevant information. According to the different professional backgrounds of team members, they could be divided into interprofessional teamwork assessment tools (43) and intraprofessional teamwork assessment tools (6). Interprofessional teamwork assessment tools were further divided into physician-nurse team assessment tools (20) and "multi-role" team assessment tools for physicians, nurses, pharmacists, therapists, dietitians, etc. (23).

Conclusion Research on medical teamwork assessment tools has increasingly attracted the attention of scholars both domestically and internationally, with relatively rich content in the assessment tools. However, there is still a need to further develop and construct teamwork assessment tools specifically suitable for primary healthcare institutions.

Full Text

A Systematic Review of Domestic and International Assessment Tools for Medical Teamwork

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Abstract

Background In recent years, the promotion of the "health-centered" concept and increasing patient healthcare demands have placed greater expectations on healthcare providers. Establishing effective healthcare teams is regarded as an important approach to improving service quality. The selection of objective and valid teamwork assessment tools is particularly important for evaluating cooperation among team members and for team building.

Objective To systematically review domestic and international assessment tools for medical teamwork in order to provide a reference for the rational selection of tools according to different contexts.

Methods PubMed, CNKI, Wanfang Data, and VIP databases were searched in April 2022 for literature related to medical teamwork assessment tools published between January 2016 and April 2022. Two investigators independently conducted literature screening and information extraction, with cross-checking. The Chinese version of the COSMIN study design checklist was used to evaluate the quality of the assessment tools.

Results A total of 30 articles were included, involving 32 medical teamwork

assessment tools. Localized versions of tools were also included along with their original versions, resulting in 49 tools total (19 original versions and 30 revised/localized versions). Quality evaluation of the overall design and methodological quality of the 32 tools covered by the 30 included articles showed that: in terms of overall design, 20 tools were rated "very good," 2 "good," and 10 "vague" ; for content validity, 1 tool was "very good," 12 "good," and 19 "vague" ; for construct validity, 19 were "very good," 10 "good," and 3 "poor" ; for internal consistency, 29 were "very good," 1 "good," and 2 "vague" ; for stability, 6 were "very good," 8 "good," 1 "vague," with other tools not reporting relevant information. Based on team members' professional backgrounds, tools were divided into interprofessional teamwork assessment tools (n=43) and intraprofessional teamwork assessment tools (n=6). Interprofessional tools were further divided into physician-nurse team assessment tools (n=20) and "integration of multiple roles" team assessment tools (n=23) that include physicians, nurses, pharmacists, therapists, dietitians, and others.

Conclusion Research on medical teamwork assessment tools has received increasing attention from scholars at home and abroad, with relatively rich content. However, further development is needed to construct teamwork assessment tools specifically applicable to primary healthcare teams.

Keywords Crew resource management, healthcare; Teamwork; Interprofessional collaboration; Integrated service; Assessment tool; Systematic review

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Introduction

With social development and the promotion of the "health-centered" concept, the traditional physician-centered medical model is rapidly transitioning to a modern team-based medical model. Primary healthcare institutions are also shifting from services provided solely by general practitioners to services delivered by family doctor contract service teams (referred to as family doctor teams). As the interprofessional collaboration model demonstrates clear benefits in conserving medical resources, improving patient outcomes, and enhancing service quality, it has received widespread attention.

Although there is no unified definition of interprofessional collaboration (IPC), most scholars agree that it involves healthcare professionals from two or more disciplines working together to provide better patient care. Compared with terms like "multidisciplinary cooperation" or "multidisciplinary collaboration," IPC emphasizes professionals from across the healthcare sector rather than other industries, making the research population more specific. Previous systematic reviews of IPC have focused on its processes, outcomes for healthcare organizations and providers, and facilitators and barriers to implementation. However, few studies have systematically examined medical teamwork assessment tools for different team types and contexts.

Given that team members have diverse knowledge, identities, professional ranks, and backgrounds, suboptimal communication, cooperation awareness, and inclusiveness can affect efficient team coordination. Therefore, using appropriate assessment tools to evaluate teamwork and identify weak links in the collaboration process is crucial. This study summarizes medical teamwork assessment tools from the past five years, covering both interprofessional and intraprofessional teamwork tools, to provide guidance for selecting appropriate tools in different contexts.

Methods

Literature Search We searched PubMed, CNKI, Wanfang Data, and VIP databases in April 2022 for literature on medical teamwork assessment tools published from January 2016 to April 2022. Reference lists and similar articles from included studies were also searched. Using PubMed as an example, the search strategy was:

- #1 "teamwork" [Mesh]
- #2 "team" [Title/Abstract] OR "collaboration" [Title/Abstract] OR "interprofessional collaboration" [Title/Abstract] OR "integrated delivery" [Title/Abstract] OR "collaborative practice" [Title/Abstract] OR "interdisciplinary teamwork" [Title/Abstract]
- #3 "scale" [Title/Abstract] OR "questionnaire" [Title/Abstract] OR "survey" [Title/Abstract] OR "instrument" [Title/Abstract] OR "evaluation" [Title/Abstract] OR "evaluate" [Title/Abstract] OR "evaluating" [Title/Abstract] OR "assess"*[Title/Abstract] OR "measur"*[Title/Abstract]
- #4 #1 OR #2
- #5 #3 AND #4

Inclusion and Exclusion Criteria **Inclusion criteria:** (1) Original research; (2) Studies developing, revising, or localizing medical teamwork assessment tools; (3) Published in Chinese or English.

Exclusion criteria: (1) Duplicate publications; (2) Application studies of teamwork assessment tools; (3) Full text unavailable; (4) Not related to medical teams.

Literature Screening and Data Extraction Two researchers independently screened literature and extracted information, including first author, language version, tool description, theoretical framework, dimensions, and number of items. Disagreements were resolved through discussion within the research team.

Quality Assessment We used the Chinese version of the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN) study design checklist to evaluate study quality. This tool, adapted from the

original COSMIN checklist and the 2018 COSMIN risk of bias checklist, assesses the methodological quality of scale development studies and has been used to evaluate healthcare team-related scales. The COSMIN checklist contains 10 modules with specific items rated as "very good (V)," "adequate (A)," "doubtful (D),""inadequate (I),"or "not reported (N/R)."The overall rating for each module is determined by the lowest rating among its items, without requiring an overall quality score. We selected 8 commonly used modules for evaluation, implemented independently by two researchers with disagreements resolved through discussion.

Statistical Analysis Descriptive analysis was used to summarize basic information and methodological quality of the assessment tools.

Results

Literature Screening Results The search retrieved 6,666 articles: 6,093 from PubMed, 278 from CNKI, 212 from Wanfang, and 83 from VIP. After removing duplicates (n=671) and applying inclusion/exclusion criteria, 30 articles were included [Figure 1: see original paper]. These 30 articles involved 32 medical teamwork assessment tools. Including original versions of localized tools, 49 tools were analyzed (19 original versions and 30 revised/localized versions).

Quality Evaluation Results

Overall Design and Methodological Quality of Assessment Tools Using the COSMIN checklist' s "worst score counts" principle (where a module' s rating is determined by its lowest-rated item), we evaluated overall tool design. The Collaboration Practice Scale (CPS) (German version), ICU Nurse-Physician Questionnaire (ICU N-P-Q) (Swedish and Chinese versions), Collaboration and Satisfaction About Care Decisions (CSACD) (Korean and Norwegian versions), COPAN-5/3/2, TeamSTEPPS-Teamwork Attitudes Questionnaire (T-TAQ) (Norwegian and Chinese versions), Collaborative Practice Assessment Tool (CPAT) (Chinese version), Chiba Interprofessional Competency Scale (CICS29) (Italian version), Assessment of Interprofessional Team Collaboration Scale (AITCS) (revised, student, and two Chinese versions), multidisciplinary team information transfer and communication scale, Nursing Teamwork Survey (NTS) (Turkish version), TeamSTEPPS-Teamwork Perceptions Questionnaire (T-TPQ) (Iranian version), and Nurse-to-Nurse Collaboration Between Sectors (NN-CoBS) all clearly described research objectives, construct sources, measurement structure, and application context, with representative samples, earning "very good" overall design ratings. The original CICS29 and its Indonesian version had unclear sample representativeness, receiving "good" ratings. The Jefferson Scale of Attitudes Toward Physician-Nurse Collaboration (JSAPNC) (Greek version), ICU N-P-Q (Japanese version), Mayo High Performance Teamwork Scale (MHPTS) (Spanish version), Team Emergency Assessment Measure

(TEAM) (Swedish version), Perinatal Emergency Team Response Assessment scale (PETRA), Attitudes toward Health Care Teams Scale (ATHCTS) (simplified and Chinese versions), Interprofessional Attitudes Scale (IPAS) (German version), CPAT (revised version), and KidSIM Team Performance Scale (Spanish version) did not specify a recognized theoretical framework, receiving "vague" ratings .

Methodological Quality of Assessment Tools None of the included tools evaluated cross-cultural validity. For measurement error, only CPAT (revised version) received a "very good"rating; others did not report this information. For criterion validity, MHPTS (Spanish version), multidisciplinary team information transfer and communication scale, and NN-CoBS received "very good" ratings; others did not report this information.

Content validity: IPAS (German version) was "very good" ; CSACD (Korean and Norwegian versions), MHPTS (Spanish version), COPAN-5/3/2, T-TAQ (Chinese version), CPAT (Chinese version), AITCS (two Chinese versions), T-TPQ (Iranian version), and NN-CoBS were "good" ; all others were "vague."

Construct validity: JSAPNC (Greek version), ICU N-P-Q (Japanese version), CSACD (Norwegian version), MHPTS (Spanish version), IPAS (German version), CPAT (revised version), AITCS (two Chinese versions), multidisciplinary team information transfer and communication scale, and NN-CoBS were "good" ; TEAM (Swedish version), PETRA (original version), and CICS29 (Italian version) were "poor" ; all others were "very good."

Internal consistency: T-TPQ (Iranian version) was "good" ; JSAPNC (Greek version) and CSACD (Norwegian version) were "vague" ; all others were "very good."

Stability: TEAM (Swedish version), PETRA (original version), CPAT (revised version), CICS29 (original version), KidSIM (Spanish version), and NTS (Turkish version) were "very good" ; JSAPNC (Greek version), ICU N-P-Q (Chinese version), T-TAQ (Chinese version), CPAT (Chinese version), CICS29 (Italian version), AITCS (two Chinese versions), and multidisciplinary team information transfer and communication scale were "good" ; T-TAQ (Norwegian version) was "vague" ; others did not report stability information .

Classification of Assessment Tools Based on team members' professional backgrounds, the 49 tools were divided into interprofessional teamwork assessment tools (n=43) and intraprofessional teamwork assessment tools (n=6). Interprofessional tools were further divided into physician-nurse team tools (n=20) and "integration of multiple roles"team tools (n=23) including physicians, nurses, pharmacists, therapists, dietitians, and others.

Interprofessional Teamwork Assessment Tools Physician-Nurse Team Assessment Tools

These include general tools for all clinical settings and specialty-specific tools.

General tools (5 tools): JSAPNC (3 versions) assesses physician-nurse collaboration attitudes. CPS (2 versions) includes separate 10-item physician and 9-item nurse versions to evaluate overall collaboration; Liu et al. (2010) localized and expanded the nurse version.

Specialty-specific tools: - **For critical care (11 tools):** ICU N-P-Q (4 versions) assesses team communication; Li et al. (2020) localized only the "communication" dimension for pediatric use. CSACD (3 versions) evaluates collaboration levels and decision-making satisfaction. MHPTS (2 versions) assesses teamwork skills in simulation scenarios. TEAM (2 versions) evaluates emergency team skills from an observer perspective. - **For obstetrics:** PETRA assesses teamwork and team dynamics during obstetric crisis management. - **For primary care (3 tools):** COPAN-5/3/2 are the only tools specifically for assessing collaboration between general practitioners and nurses in primary healthcare. COPAN-3 focuses on team goal orientation, organizational context, and competence, while COPAN-2 focuses on internal and external team factors .

"Integration of Multiple Roles" Team Assessment Tools

- **Attitude assessment (9 tools):** ATHCTS (4 versions), T-TAQ (3 versions), and IPAS (2 versions). ATHCTS and T-TAQ have Chinese versions.
- **Collaboration quality assessment (3 tools):** CPAT (3 versions, including Chinese). The Chinese CPAT maintains original items, reflects actual collaboration levels, and can be completed in 10-15 minutes with good operability.
- **Practice competence assessment (3 tools):** CICS29 (3 versions).
- **Performance assessment (7 tools):** AITCS (5 versions) and KidSIM (2 versions). AITCS has Chinese versions.
- **Communication assessment:** Multidisciplinary team information transfer and communication scale .

Intraprofessional Teamwork Assessment Tools Nurses have the closest patient contact, and good nurse-nurse teamwork can improve efficiency and reduce adverse events. However, tool development for nurse teamwork has been limited recently.

NTS, based on Salas et al.' s "big five" teamwork model, assesses nurse team cooperation and internal performance, with Icelandic and Chinese versions. Recent localization has only occurred in Turkey. T-TPQ, validated in Iranian, assesses individual perceptions of teamwork behaviors and applies to both interprofessional and nurse teams. NN-CoBS, developed in 2021, assesses nurse-nurse collaboration during older adult transitions between hospital and primary care, but requires further validation .

Discussion

Quality Assessment Results The included tools showed incomplete overall research design and inadequate measurement property testing. Future studies should reference the COSMIN checklist to improve trial design, combining qualitative interviews and quantitative surveys to determine item comprehensiveness, relevance, and understandability from patient and expert perspectives, with standardized reporting formats. Measurement standard error, smallest detectable change, and limits of agreement should be calculated to enhance scientific rigor.

Cross-cultural validity testing requires at least two different cultural groups to evaluate whether items function similarly across cultures, which is complex and requires large samples. Therefore, such testing may be challenging. For criterion validity assessment, appropriate criteria must be identified; for newly developed short versions, the original scale can serve as the "gold standard."

Tool Characteristics and Applications This study included both original and culturally adapted tools to understand their cross-cultural development. Adapted tools not only conform to local language habits but also modify content based on clinical contexts. For example, Li et al. localized only the "communication" dimension of ICU N-P-Q to focus on pediatric nurse-physician communication, while the Norwegian CSACD added patient-centered decision-making items.

Tools were classified based on descriptions in included literature. Most physician-nurse collaboration tools lack theoretical model guidance and are based on literature reviews or other tools. Common dimensions include "shared decision-making," "communication," and "cooperation awareness," reflecting that good collaboration requires equal status, open communication, goal orientation, and joint clinical decision-making. JSAPNC is a mature tool for assessing attitudes toward physician-nurse collaboration, with multiple language versions and validated psychometric properties.

In contrast, "integration of multiple roles" tools often employ appropriate theoretical frameworks with richer dimensions, emphasizing "patient-centeredness," "team member roles," and "cohesion/coordination." T-TAQ and T-TPQ, based on the TeamSTEPPS model, are highly recognized for assessing teamwork attitudes and perceptions, often used together. T-TPQ has been translated into Chinese but requires further application and promotion. AITCS uniquely includes patients and families in team decision-making and has been introduced to China. CICS29 and IPAS also adhere to patient-centered collaboration but have not incorporated patients as team members; CICS29 is more comprehensive than IPAS but awaits Chinese localization and application.

Among nurse team tools, NNCS and NNCBS are well-established but have seen limited recent research. LEMETTI et al. developed NN-CoBS in 2021 to assess nurse-nurse collaboration during older adult transitions, but its applicability and

measurement properties require further validation. Nurses play crucial roles in patient care, and the nursing workforce is becoming younger. Studies show nurses, especially junior nurses, have moderate-to-low teamwork cognition and insufficient recognition of teamwork importance, which may explain the slow development of nurse teamwork assessment tools.

Limitations This study has several limitations. First, two articles could not be accessed due to copyright restrictions. Second, the COSMIN checklist has some subjective evaluation criteria. Third, while we included both original and adapted tools, the classification was based on literature descriptions and may not capture all nuances.

Conclusion

Foreign research on medical teamwork assessment tools is relatively rich, while domestic research started later and primarily uses translated tools. Most tools assess the team as a whole rather than individual members' collaborative competencies and emotional relationships. Assessment purposes focus on attitudes and performance, with few including patients and families as team members, despite their crucial role in long-term treatment execution.

Healthcare provider collaboration is essential for patient safety and effective resource utilization. The 2022 guidance on high-quality family doctor contract services emphasizes strengthening collaboration between general and specialist physicians, encouraging secondary and tertiary hospital physicians to join family doctor teams for "one-stop" integrated services. However, few tools are suitable for primary care settings. As family doctor teams expand and diversify, developing specialized assessment tools for primary healthcare teams is critical.

Among existing tools, COPAN is one of the few scales for assessing physician-nurse collaboration in primary care, with relatively high design and methodological quality ratings, but it has not been studied or translated in China. Our research team has previously developed a family doctor team effectiveness assessment tool based on the IMOI model (Input-Mediator-Output-Input), evaluating cross-professional collaboration capacity and work efficiency to guide quality improvement. Future work should adapt these tools to primary care contexts.

This study provides a reference for improving assessment indicators and selecting appropriate medical teamwork assessment tools for different situations.

**** Medical Teamwork Assessment Tools: Design and Methodological Quality Evaluation

**** Interprofessional Teamwork Assessment Tools (Nurse-Physician Team)

**** Interprofessional Teamwork Assessment Tools ("Integration of Multiple Roles" Team)

**** Intraprofessional Teamwork Assessment Tools (Nurse Team)

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Note: Figure translations are in progress. See original paper for figures.