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Quality assessment of clinical practice guidelines for adult obstructive sleep apnea: A systematic review

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ABSTRACT

Objective: Clinical Practice Guidelines (CPGs) are crucial in standardizing the management of obstructive sleep apnea (OSA) in adults. However, there has been insufficient evaluation of the overall quality of CPGs for adult OSA. This review aimed to comprehensively assess the overall quality of CPGs in the field of adult OSA.

Methods: A systematic search was conducted on various literature databases, guideline-related databases, and academic websites from January 2013 to December 2023 to select CPGs relevant to adult OSA. The methodological and reporting quality of the eligible CPGs were thoroughly appraised by three reviewers using the AGREE II instrument and RIGHT checklist, respectively.

Results: This review included 44 CPGs, consisting of 42 CPGs in English and 2 CPGs in Chinese. The assessment of methodological quality revealed that four domains attained an average standardized score above 60%. Among the domains, "clarity of presentation" received the highest standardized score of 85.10%, while the lowest standardized score was observed in the "rigor of development" domain with the value of 56.77%. The evaluation of reporting quality indicated an overall reporting rate of 51.30% for the eligible CPGs, with only three domains achieving an average reporting rate higher than 50%. The domain with the highest reporting rate was "basic information" at 60.61%, while the domain with the lowest reporting rate was "review and quality assurance" at 15.91%. Furthermore, a significantly positive correlation was found between the AGREE II standardized scores and the RIGHT reporting rates ($r = 0.808$, $P < 0.001$).

Conclusions: The overall quality of the currently available guidelines for adult OSA demonstrated considerable variability. Researchers should prioritize the utilization of evidence-based methods and adhere to the items listed in the RIGHT checklist when developing CPGs to enhance efficient clinical decision-making and promote the translation of evidence into practice.

1. Introduction

Obstructive sleep apnea (OSA) is a chronic sleep respiratory disorder characterized by intermittent partial or complete collapse of the upper airway in during sleep resulting in hypercapnia and intermittent hypoxia [1,2]. The primary signs and symptoms of OSA encompass snoring, nocturnal sleep disruption, and excessive daytime sleepiness [3,4]. OSA constitutes a widely prevalent condition among adults, with prevalence

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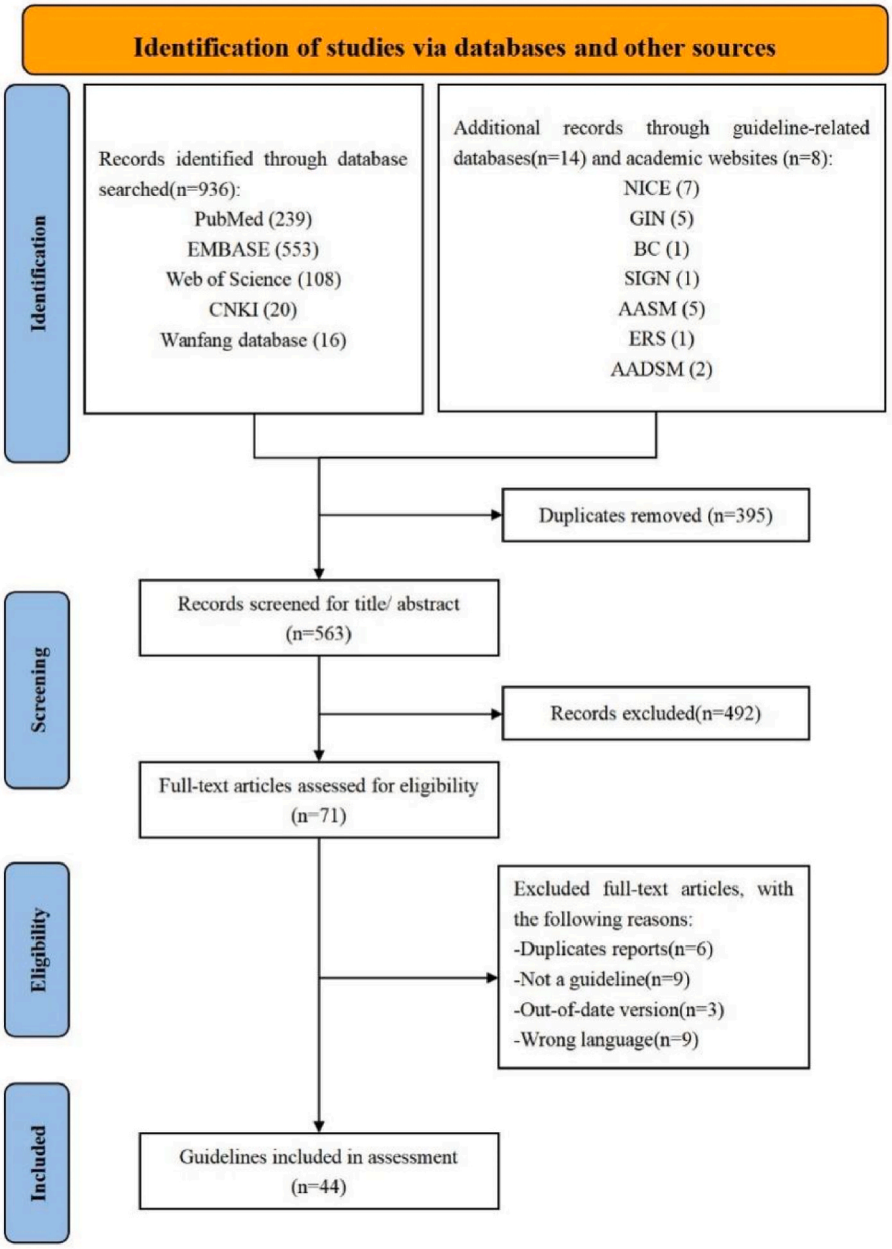

Fig. 1. Flow chart of selection process (PRISMA diagram).

rates ranging from 9% to 38% [5]. This disorder induces numerous negative consequences, such as impaired cognitive function [6], an increased risk of traffic and occupational accidents [7,8], diminished quality of life [9], and heightened cardiovascular morbidity [10]. Given the substantial prevalence of OSA and its consequential negative health outcomes, the public health system bears a heavy burden [2,11].

Clinical practice guidelines (CPGs) serve as valuable guidance documents for healthcare professionals, aiding in informed clinical decision-making through systematic review of medical evidence and careful consideration of treatment benefits and drawbacks [12]. These guidelines provide critical guidance on optimizing the allocation of medical resources, improving the quality of healthcare services, ensuring equitable access to health services, and facilitating the effective translation of scientific research into clinical practice [13]. However, it is essential to note that the overall quality of CPGs varies, and low-quality CPGs can lead to the widespread use of ineffective treatments, adversely impacting patient outcomes [14]. Hence, it is imperative to uphold high standards of guideline quality. Two internationally recognized instruments used for appraising the quality of CPGs are the Appraisal of Guidelines for Research and Evaluation II (AGREE II) instrument [15] and the Reporting Items for Practice Guidelines in Healthcare (RIGHT) checklist [16]. The AGREE II instrument provides a theoretical framework for appraising the methodological quality of CPGs, while the RIGHT checklist, endorsed by the World Health Organization (WHO), focuses on appraising the quality of guideline reporting.

In light of the fast-paced advancements in diagnostic and therapeutic technologies, many CPGs have emerged worldwide to establish standardized approaches for managing adult OSA over the past decade. However, a comprehensive evaluation of the overall quality of these previously published CPGs for adult OSA has yet been undertaken. To address this gap, we employed both the AGREE II instrument and RIGHT checklist to systematically appraise the overall quality of CPGs pertaining to adult OSA.

2. Methods

A comprehensive assessment of the overall quality of CPGs for adult OSA was conducted through a systematic review utilizing the AGREE II instrument [15] and RIGHT checklist [16]. This review protocol has been registered on PROSPERO (CRD42022352998).

2.1. Search strategy

To ensure comprehensive search results, we systematically searched key Chinese and English literature databases, as well as repositories of major guideline development organizations and the websites of relevant professional societies. The English databases we utilized included Embase, PubMed, and Web of Science, while the Chinese databases included the China National Knowledge Infrastructure (CNKI) and Wanfang databases. The key terms used for the literature search were "Obstructive sleep apnea", "Sleep apnea syndrome", "Sleep disordered breathing", "OSA", "Guideline", "recommendation", and "guidance", along with their corresponding English and Chinese synonyms. Additionally, we conducted manual searches in the repositories of major guideline development organizations such as the National Institute for Health and Care Excellence (NICE), the New Zealand Guidelines Group (NZGG), the Scottish Intercollegiate Guidelines Network (SIGN), the Guidelines International Network (GIN), the Registered Nurses Association of Ontario (RNAO), the National Health and Medical Research Council (NHMRC), and the British Columbia Clinical Practice Guidelines (BC Guidelines). We chose these repositories as they are likely to include CPGs relevant to our systematic review. To complement these measures, we also searched the websites of professional societies such as the American Academy of Sleep Medicine (AASM), the American Academy of Dental Sleep Medicine (AADSM), and the European Respiratory Society (ERS). These professional societies focus closely on OSA and regularly publish and update CPGs to inform clinicians' practice. The search period encompassed January 2013 to December 2023. The detailed search strategy is provided in Supplementary Information (Tables S1–S6).

2.2. Selection criteria

The CPGs were included if they: (1) targeting the management of OSA; (2) specific attention given to the adult population aged 18 or above; (3) published in either English or Chinese languages. Exclusion criteria were: (1) older versions of updated CPGs; (2) commentaries or interpretations of existing CPGs; (3) translated copies of original CPGs; (4) CPGs developed based solely on expert opinions or consensus.

2.3. Literature selection and data extraction

All identified records were imported into EndNote X9 to identify and eliminate any duplicates. Two researchers (XPX and QQP) individually screened the title and abstract of the remaining records to identify potentially eligible CPGs. Any discrepancies were resolved through consultation with a third reviewer (HLY). Consensus was reached between the reviewers regarding the inclusion and exclusion criteria for the selection of CPGs. Two reviewers (XPX and LM) then individually extracted data from the selected CPGs, which included information such as year of publication, country or region, organization, funding source, competing interests, topics covered, evidence grading system, and developed methods. A flowchart outlining the literature search process can be seen in Fig. 1.

2.4. Methodological quality assessment of CPGs

The methodological quality of the guidelines was assessed using the AGREE II instrument by three reviewers (XPX, QQP, and LM). The AGREE II instrument comprises 23 items organized into 6 domains, i.e., "scope and purpose", "stakeholder involvement", "rigor of development", "clarity of presentation", "applicability", and "editorial independence" [15]; each item is scored on a scale of 1–7, with 1 indicating "strongly disagree" and 7 indicating "strongly agree" [17]. According to the User's Manual of the AGREE II Instrument [17], the formula of (actually obtained score-minimum possible score)/(maximum possible score-minimum possible score) × 100% was applied to calculate the domain standardized scores, with the value ranging from 0% to 100%. Since there are no specific cut-off points on the AGREE II Instrument, the three reviewers referred to transparent and practical criteria from previous studies [18,19] to calculate the mean standardized score for each domain of the included CPGs and to determine the quality and level of recommendation of the included CPGs based on the standardized scores across six dimensions as follows: (1) if the standardized score for all six domains is greater than 60%, the guideline would be rated as grade A (strongly recommended); (2) if more than three domains have a standardized score between 30% and 60%, the guideline would be rated as grade B (recommended with modifications); (3) if the standardized score of more than three domains is less than 30%, the guideline would be rated as grade C (not recommended).

2.5. Reporting quality assessment of CPGs

The reporting quality of each guideline was appraised by two independent reviewers (XPX and QQP) using the RIGHT checklist. Disagreements among the reviewers were resolved through group discussions, and the assessment results were further checked by a third reviewer (MW). The RIGHT checklist consists of 35 items organized into 7 domains, i.e.,: "basic information", "background", "evidence", "recommendations", "review and quality assurance", "funding, declaration and management of interests", and "other information" [16]. Each item can be categorized into "reported" (fully presented the pertinent information), "partially reported" (partially presented the pertinent information), "not reported" (no relevant information available), or "not applicable" (the item was not applicable for assessing the guideline due to certain features). We calculated the reporting rate of the overall guidelines, as well as for each domain and item of all included CPGs. Additionally, we calculated the average reporting rate for each domain within each guideline. When calculating the reporting rate, the numerator included the number of items rated as "reported", and the items designated as "not applicable" were also contained in the denominator. The grading of reporting rates for CPGs was classified as "well-reported" (>80%), "moderate-reported" (50%–80%), and "low--reported" (<50%) [20].

2.6. Statistical analysis

The internal consistency of the three reviewers (assessed by the intraclass correlation coefficient, ICC) in using the AGREE II instrument was analyzed with the IBM SPSS 26.0. The ICC values range from 0 to 1, and they were classified as satisfactory (>0.75), generally acceptable (0.50–0.75), and unsatisfactory (<0.50) [21]. GraphPad Prism 8.0 was used to create violin plots, which describe the distribution and probability densities of each domain score for the methodological quality of all guidelines. The reporting rates of the RIGHT checklist and the domain standardized scores of AGREE II were calculated using Excel 2019. The correlation among the AGREE II standardized scores and the RIGHT reporting rates of the included CPGs was analyzed using Spearman's correlation in IBM SPSS 26.0.

3. Results

3.1. Study selection

The initial search identified 958 relevant records, with 936 records obtained from electronic databases, 14 records from guideline-related

Table 1
Characteristics of the included guidelines.

No.	Year	Country or Region	Organization	Topics	Evidence grading system	Developed methods	Funding source	Competing interests
1 [22]	2023	South Korea	KORL-HNS	Treatment	OCEBM	Evidence-based/ Consensus	Yes	No
2 [23]	2023	USA, United Kingdom, Spain, Canada, Italy, France, Germany	KCL	Management	Not mentioned	Evidence-based/ Consensus	Yes	Yes
3 [24]	2023	United Kingdom	NICE	Treatment	Not mentioned	Evidence-based	Not reported	Yes
4 [25]	2023	China (Taiwan)	TSOC, TSSM, TSPCCM	Assessment, Management	GRADE	Evidence-based	Not reported	Yes
5 [26]	2023	USA, United Kingdom, Canada	SASM, SOAP	Screening, Diagnosis, Treatment	ACC/AHA recommendation system	Evidence-based/ Consensus	Not reported	Yes
6 [27]	2023	Germany	DGZS	Treatment	Not mentioned	Evidence-based/ Consensus	Yes	Yes
7 [28]	2022	France	SFORL	Treatment	GRADE	Evidence-based/ Consensus	No	Yes
8 [29]	2022	United Kingdom	NICE	Treatment	Not mentioned	Evidence-based	Not reported	Yes
9 [30]	2022	United Kingdom	NICE	Treatment	Not mentioned	Evidence-based	Not reported	Yes
10 [31]	2022	Germany	DGSM	Management	OCEBM	Evidence-based/ Consensus	Yes	Yes
11 [32]	2022	USA	AADSM	Screening, Treatment, Management	Not mentioned	Evidence-based	Not reported	Yes
12 [33]	2022	USA	USPSTF	Screening	USPSTF Grades	Evidence-based	Yes	Yes
13 [34]	2022	Spain, Argentina, Mexico, France, Portugal, Brazil, Colombia	Multiple scientific societies	Management	Not mentioned	Evidence-based	Not reported	Yes
14 [35]	2022	Japan	JRS	Treatment, Management	MINDS method	Evidence-based/ Consensus	Yes	Yes
15 [36]	2021	Europe	ERS	Treatment	GRADE	Evidence-based	Yes	Yes
16 [37]	2021	USA	AASM	Treatment	GRADE	Evidence-based	Yes	Yes
17 [38]	2021	Canada	BC	Management , Diagnosis	OCEBM	Evidence-based	Not reported	Yes
18 [39]	2021	USA	AASM	Management	Not mentioned	Evidence-based/ Consensus	Yes	Yes
19 [40]	2019	Netherlands	OLVG	Management	GRADE	Evidence-based/ Consensus	Yes	Yes
20 [41]	2019	USA	VA/DoD	Management	GRADE	Evidence-based	Not reported	Yes
21 [42]	2019	USA	AASM	Treatment	GRADE	Evidence-based	Not reported	Yes
22 [43]	2019	Spain	SES, SEORL-CCC	Screening	GRADE	Evidence-based/ Consensus	No	Yes
23 [44]	2018	China	CASSM	Treatment , Diagnosis	GRADE	Evidence-based/ Consensus	Not reported	Not reported
24 [45]	2018	China	CMA	Treatment , Diagnosis	Not mentioned	Evidence-based/ Consensus	Not reported	Yes
25 [46]	2018	USA, Canada, Austria	SASM	Management	GRADE	Evidence-based/ Consensus	No	Yes
26 [47]	2018	USA	ATS	Management	GRADE	Evidence-based	Not reported	Yes
27 [48]	2018	USA	AASM	Diagnosis	Not mentioned	Evidence-based	Not reported	Yes
28 [49]	2017	USA	AASM	Diagnosis	GRADE	Evidence-based	Yes	Yes

(*continued on next page*)

Table 1 (*continued*)

No.	Year	Country or Region	Organization	Topics	Evidence grading system	Developed methods	Funding source	Competing interests
29 [50]	2017	Netherlands	OCA	Management	GRADE	Evidence-based/ Consensus	Yes	Yes
30 [51]	2017	United Kingdom	NICE	Treatment	Not mentioned	Evidence-based/ Consensus	Not reported	Not reported
31 [52]	2017	USA	AASM	Management	Not mentioned	Evidence-based	No	Yes
32 [53]	2016	USA, Canada, Austria, Peru	SASM	Screening	GRADE	Evidence-based/ Consensus	No	Yes
33 [54]	2016	USA	AADSM	Management	Not mentioned	Evidence-based/ Consensus	No	Yes
34 [55]	2016	Germany	DGHNO-KHC	Treatment	OCEBM	Evidence-based	No	Yes
35 [56]	2016	Italy	AIMS	Treatment	CeVEAS	Evidence-based/ Consensus	Not reported	Yes
36 [57]	2015	USA	AASM/AADSM	Treatment	GRADE	Evidence-based	No	Yes
37 [58]	2014	USA	ACP	Diagnosis	GRADE	Evidence-based	Yes	Yes
38 [59]	2014	USA	ASA	Management	Not mentioned	Evidence-based	Not reported	Yes
39 [60]	2014	India	MoHFW	Management	Not mentioned	Evidence-based/ Consensus	Not reported	Yes
40 [61]	2014	Brazil	BMA, CFM	Treatment	Not mentioned	Evidence-based	Not reported	Not reported
41 [62]	2014	Brazil	BMA, CFM	Diagnosis	Not mentioned	Evidence-based	Not reported	Not reported
42 [63]	2013	USA	ACP	Management	GRADE	Evidence-based	Yes	Yes
43 [64]	2013	Australia	RNSH	Treatment	Not mentioned	Evidence-based	Not reported	Yes
44 [65]	2013	USA	ATS	Management	GRADE	Evidence-based	Not reported	Yes

KORL-HNS, Korean Society of Otorhinolaryngology-Head and Neck Surgery; KCL, King's College London; NICE, National Institute for Health and Care Excellence; TSOC, Taiwan Society of Cardiology; TSSM, Taiwan Society of sleep Medicine; TSPCCM, Taiwan Society of pulmonary and Critical Care Medicine; SASM, Society of Anesthesia and Sleep Medicine; SOAP, Society for Obstetric Anesthesia and Perinatology; ACC/AHA recommendation system, American College of Cardiology/American Heart Association Clinical Practice Guideline recommendation classification system; DGZS, German Society of Dental Sleep Medicine; SFORL, French Society of Otorhinolaryngology; DGSM, German Sleep Society; AADSM, American Academy of Dental Sleep Medicine; USPSTF, The U.S. Preventive Services Task Force; JRS, Japanese Respiratory Society; MINDS method, Medical Information Network Distribution Service; GRADE, Grading of Recommendations Assessment, Development and Evaluation; ERS, European Respiratory Society; AASM, American Academy of Sleep Medicine; BC, Clinical Practice Guidelines and Protocols in British Columbia; OCEBM, Oxford Centre for Evidence-Based Medicine; OLVG, Onze Lieve Vrouwe Gasthuis; VA, U.S.Department of Veterans Affairs; DoD, U.S.Department of Defense; CASSM, Chinese Academy Society of Sleep Medicine; SES, Spanish Sleep Society; SEORL-CCC, Spanish Society of Otolaryngology and Head and Neck Surgery; SASM, Society of Anesthesia and Sleep Medicine; DGHNO-KHC, German Society of Otorhinolaryngology, Head and Neck Surgery; AIMS, Italian Association of Sleep Medicine; CeVEAS, Centre for the Evaluation of Effectiveness of Health Care; ATS, American Thoracic Society; OCA, Obesity Center Amsterdam; ACP, American College of Physicians; MoHFW, Ministry of Health & Family Welfare; BMA, Brazilian Medical Association; CFM, Federal Council of Medicine; RNSH, Royal North Shore Hospital.

Table 2
Assessment of AGREE II scores for included CPGs.

No.	Scope and purpose (%)	Stakeholder involvement (%)	Rigor of development (%)	Clarity of presentation (%)	Applicability (%)	Editorial independence (%)	Recommended grade
1 [22]	85.19	83.33	77.08	68.52	31.94	50.00	B
2 [23]	94.44	55.66	50.69	100.00	79.17	100.00	B
3 [24]	96.30	87.04	88.19	66.67	75.00	97.22	A
4 [25]	92.59	79.63	52.08	100.00	77.78	50.00	B
5 [26]	92.59	57.41	75.00	92.59	76.39	50.00	B
6 [27]	94.44	50.00	47.92	55.56	87.50	50.00	B
7 [28]	70.37	24.07	39.58	83.33	36.11	77.78	B
8 [29]	85.19	92.59	71.53	100.00	62.50	50.00	B
9 [30]	87.04	92.59	72.92	100.00	63.89	50.00	B
10 [31]	81.48	75.93	84.03	96.30	81.94	91.67	A
11 [32]	75.93	57.41	25.69	74.07	65.28	50.00	B
12 [33]	100.00	100.00	83.33	66.67	77.78	100.00	A
13 [34]	90.74	70.37	52.08	90.74	72.22	50.00	B
14 [35]	90.74	85.19	81.94	90.74	83.33	100.00	A
15 [36]	85.19	74.07	74.31	94.44	79.17	66.67	A
16 [37]	79.63	72.22	68.75	92.59	76.39	66.67	A
17 [38]	57.41	42.59	44.44	85.19	62.50	30.56	B
18 [39]	83.33	59.26	40.28	100.00	61.11	80.56	B
19 [40]	75.93	66.67	50.00	70.37	58.33	50.00	B
20 [41]	92.59	94.44	68.75	96.30	90.28	50.00	B
21 [42]	90.74	70.37	65.97	88.89	58.33	50.00	B
22 [43]	98.15	48.15	70.14	94.44	65.28	100.00	B
23 [44]	72.22	61.11	39.58	79.63	58.33	0.00	B
24 [45]	72.22	62.96	25.00	79.63	55.56	50.00	B
25 [46]	83.33	68.52	59.03	75.93	34.72	91.67	B
26 [47]	87.04	98.14	76.39	96.30	70.83	50.00	B
27 [48]	88.89	46.30	20.83	88.89	70.83	0.00	B
28 [49]	77.78	74.07	72.22	90.74	50.00	63.89	B
29 [50]	74.07	51.85	52.78	87.03	52.78	50.00	B
30 [51]	94.44	53.70	71.53	62.96	90.28	0.00	B
31 [52]	77.78	72.22	22.92	74.07	87.50	100.00	B
32 [53]	87.04	79.63	69.44	90.74	48.61	91.67	B
33 [54]	87.04	53.70	50.69	79.63	37.50	50.00	B
34 [55]	72.22	42.59	39.58	100.00	51.39	100.00	B
35 [56]	87.04	51.85	42.36	88.89	56.94	50.00	B
36 [57]	77.78	62.96	61.11	77.78	41.67	86.11	B
37 [58]	81.18	61.11	72.22	87.03	27.78	80.56	B
38 [59]	87.04	46.29	44.44	75.92	41.67	50.00	B
39 [60]	62.96	44.44	26.39	75.92	54.17	50.00	B
40 [61]	94.44	48.15	36.81	88.89	51.39	0.00	B
41 [62]	92.59	27.78	39.58	85.19	69.44	0.00	B
42 [63]	88.89	61.11	79.86	85.19	33.33	75.00	B
43 [64]	61.11	51.85	29.16	66.67	48.61	13.89	B
44 [65]	88.89	59.26	81.25	100.00	38.89	50.00	B
Mean (%)	84.01	64.06	56.77	85.10	61.24	58.27	–
ICC (95% CI)	0.847 (0.764–0.908)	0.950 (0.920–0.971)	0.927 (0.883–0.957)	0.893 (0.831–0.936)	0.938 (0.900–0.963)	0.977 (0.963–0.987)	–

databases, and 8 records from academic websites. After removing duplicates, 563 records were considered potentially relevant. Through a thorough review of titles, abstracts, and full-texts, 44 eligible CPGs were included for assessment. The steps of literature selection are depicted in Fig. 1.

3.2. Guideline characteristics

44 CPGs [22–65] were assessed in the review, with 2 CPGs in Chinese and 42 in English. Among these CPGs, 3 (6.82%) focused on screening, 4 (9.09%) on diagnosis, 15 (34.09%) on treatment, and 22 (50.00%) on comprehensive management. The Medical specialty societies in the US developed the highest number of CPGs, representing more than 30% (n = 16) of the total. Thirteen CPGs were developed in Europe, three in China, two in Brazil, and one each in, South Korea, Canada, India, Japan, and Australia. Additionally, five CPGs were the result of collaborative efforts involving multiple nations. Fourteen CPGs [22,23,27,31,33,35–37,39,40,49,50,58,63] reported the sources of funding, eight [28,43,46,52–55,57] indicated that they did not receive any financial support, and the remainder did not report the funding status. Sixteen CPGs [22–25,29,30,32,33,36,37,41,42,47,49,51,57] tried to elicit or identify the preferences and values of the target populations through appropriate strategies. 26 CPGs used an evidence grading system, among which eighteen [25,28,36,37,40–44,46,47,49,50,53,57,58,63,65] used the GRADE system, four [22,31,38,55] used the OCEBM system, and four [26,33,35,56] used other evaluation systems. The characteristics of all the assessed CPGs are shown in Table 1.

3.3. Methodological quality of CPGs

The inter-reviewer internal consistency, as measured by the ICC, ranged from 0.847 to 0.977, with a mean of 0.922. The results indicate a satisfactory level of agreement among the reviewers involved. The quality appraisal outcomes revealed that four domains (“Scope and purpose”, “Stakeholder involvement”, “Clarity of presentation”, and “Applicability”) attained an average standardized score exceeding 60%. The domain with the highest standardized score was “clarity of presentation” (85.10%), whereas the domain with the lowest standardized score was “rigor of development” (56.77%). Six of the included CPGs [24,31,33,35–37] were rated as grade A (strongly recommended), while the remaining 38 CPGs received a grade B (recommended with modifications) rating. The detailed information of methodological quality

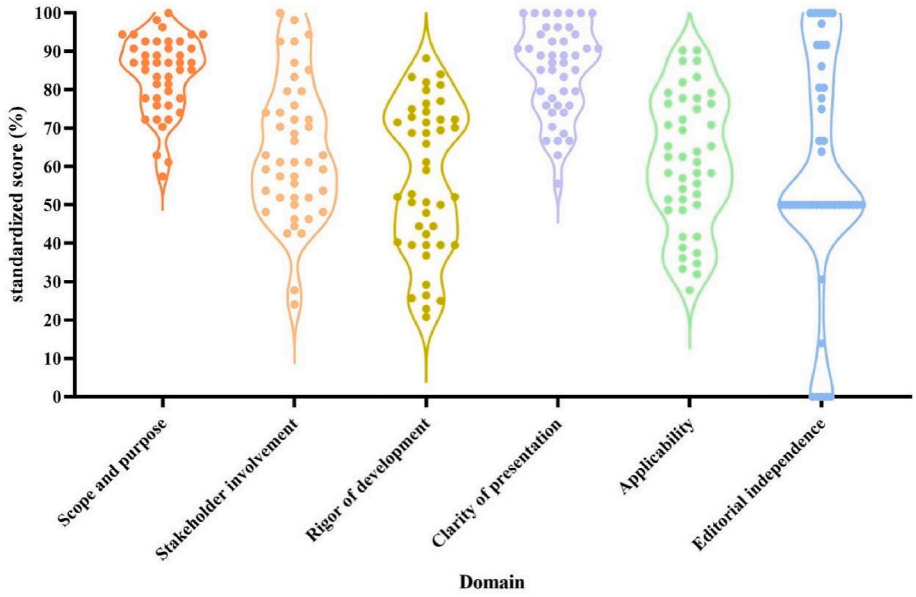

Fig. 2. AGREE II overall assessment of included guidelines (The violin plots depict the variation in standardized scores for each domain of per CPGs. Point represents the standardized score for the domain of the guidelines.).

appraisal is shown in Table 2 and Fig. 2.

3.4. Reporting quality of CPGs

Table 3 provides an overview of the reporting rates of the included CPGs, evaluated using the RIGHT checklist. Only one guideline was rated as well-reported [33], while 22 (50.00%) of the 44 CPGs received a rating of moderate-reported. The average reporting rates for three domains exceeded 50%, which include "basic information" (60.61%), "background" (57.10%) and "recommendations" (58.44%). On the other hand, the domain with the lowest reporting rate was "review and quality assurance" (15.91%). The average reporting rate for other domains were as follows: "evidence" (49.09%), "funding, declaration and management of interests" (44.89%), and "other information" (36.36%) (Fig. 3). The overall average reporting rate for the 35 items was 51.30%. Among these items, item 7a (describe the primary population that is affected by the recommendations in the guideline) and item 13a (provide clear, precise, and actionable recommendations) were reported in all CPGs. However, item 17 (indicate whether the guideline was subjected to a quality assurance process) was only reported in three guidelines [24,38,51], indicating the poorest reporting rate (Fig. 4).

3.5. Correlates of AGREE II with RIGHT

The results indicated a strong positive correlation between the standardized scores of AGREE II and the reporting rates of RIGHT ($r = 0.808$, $P < 0.001$). The correlation was further visually represented in the scatter plot (Fig. 5). Consequently, it can be inferred that CPGs exhibiting a higher reporting rate also displayed better methodological quality.

4. Discussion

High-quality CPGs must adhere to stringent methodological standards during development and also ensure clear and comprehensive reporting. To our knowledge, this is the first review to appraise the comprehensive quality of CPGs for adult OSA by utilizing a combination of the AGREE II instrument and the RIGHT checklist. This review contributes to the existing body of knowledge by shedding light on areas of improvement for the development of CPGs for adult OSA. The systematic assessment of 44 CPGs revealed that only six CPGs [24,31,33,35–37] achieved a Grade A (strongly recommended) rating, indicating good or moderate reporting rates and suitability for direct recommendation to clinicians and policymakers. The majority of CPGs, approximately six-sevenths, were recommended with modifications. Furthermore, 2.27% of all CPGs were defined as having good reporting rates, 50% were categorized as having moderate reporting rates, while 47.73% were deemed to have low reporting rates. Overall, the quality of adult OSA guidelines was deemed unsatisfactory, emphasizing the need for significant improvements moving forward.

Based on our analysis of the methodological quality of adult OSA guidelines, we observed that the standardized scores for the domains of "rigor of development" and "editorial independence" were below 60%. These findings highlight the need for substantial improvements in the methodology employed in these guidelines.

The "rigor for development" domain plays a pivotal role in assessing the methodological quality of CPGs. It evaluates the comprehensiveness of the methods used and signifies the evidence-based quality of the CPGs [66,67]. This domain directly impacts the credibility and value of the recommendations provided in the CPGs. However, a majority of the included CPGs in this review were found to have varying degrees of deficiencies in this domain. There are several possible reasons for this observation. Firstly, the methodology involved in developing compliant evidence-based CPGs is inherently more challenging, requiring a higher level of professional competence from the guideline development working group. Secondly, the importance of methodologist engagement is often overlooked during the development of CPGs. It is crucial to address these methodological challenges in future CPG development efforts and consider including methodologists as the members of the expert panel to mitigate the risk of groupthink.

The domain of "editorial independence" incorporates considerations regarding the influence of sponsors and disclosures of conflicts of interest within CPGs [68]. The standardized score for this particular domain was found to be 58.27%, indicating that a significant proportion of the 44 CPGs did not explicitly address the potential impact of funding on the guideline development process. It is advised that future development groups place emphasis on addressing this issue and explicitly state that the development process remains uninfluenced by sponsorship.

However, we were concerned that the standardized score in the

Table 3
RIGHT score of the included guidelines.

No.	Basic information (%)	Background (%)	Evidence (%)	Recommendations (%)	Review and quality assurance (%)	Funding and declaration and management of interests (%)	Other information (%)	Total reporting rate (%)	Grading of reporting rates
1 [22]	66.67	62.50	40.00	71.43	0.00	50.00	33.33	54.29	moderate-reported
2 [23]	83.33	62.50	40.00	57.14	0.00	75.00	66.67	60.00	moderate-reported
3 [24]	50.00	62.50	60.00	85.71	100.00	50.00	66.67	65.71	moderate-reported
4 [25]	83.33	62.50	60.00	85.71	0.00	25.00	66.67	62.86	moderate-reported
5 [26]	66.67	62.50	80.00	85.71	50.00	25.00	66.67	65.71	moderate-reported
6 [27]	66.67	50.00	20.00	57.14	0.00	75.00	0.00	45.71	low-reported
7 [28]	66.67	37.50	40.00	57.14	0.00	50.00	66.67	48.57	low-reported
8 [29]	50.00	75.00	60.00	100.00	50.00	50.00	33.33	65.71	moderate-reported
9 [30]	50.00	75.00	60.00	100.00	50.00	50.00	33.33	65.71	moderate-reported
10 [31]	33.33	62.50	60.00	57.14	50.00	75.00	33.33	54.29	moderate-reported
11 [32]	50.00	62.50	0.00	42.86	0.00	25.00	66.67	40.00	low-reported
12 [33]	66.67	100.00	100.00	100.00	50.00	100.00	66.67	88.57	well-reported
13 [34]	50.00	75.00	20.00	57.14	0.00	25.00	33.33	45.71	low-reported
14 [35]	50.00	75.00	80.00	57.14	0.00	50.00	33.33	57.14	moderate-reported
15 [36]	50.00	50.00	100.00	71.43	0.00	75.00	66.67	62.86	moderate-reported
16 [37]	66.67	50.00	80.00	71.43	0.00	75.00	33.33	60.00	moderate-reported
17 [38]	66.67	50.00	0.00	28.57	100.00	25.00	33.33	40.00	low-reported
18 [39]	66.67	62.50	40.00	42.86	0.00	50.00	33.33	48.57	low-reported
19 [40]	66.67	50.00	40.00	57.14	0.00	75.00	66.67	54.29	moderate-reported
20 [41]	66.67	100.00	100.00	85.71	50.00	25.00	100.00	80.00	moderate-reported
21 [42]	66.67	50.00	80.00	71.43	0.00	50.00	0.00	54.29	moderate-reported
22 [43]	50.00	37.50	60.00	57.14	0.00	75.00	0.00	45.71	low-reported
23 [44]	66.67	62.50	20.00	42.86	0.00	0.00	33.33	40.00	low-reported
24 [45]	83.33	62.50	0.00	28.57	0.00	25.00	0.00	37.14	low-reported
25 [46]	66.67	75.00	40.00	42.86	0.00	50.00	66.67	54.29	moderate-reported
26 [47]	66.67	62.50	80.00	100.00	0.00	50.00	33.33	65.71	moderate-reported
27 [48]	66.67	50.00	0.00	28.57	0.00	0.00	0.00	28.57	low-reported
28 [49]	66.67	50.00	80.00	71.43	50.00	75.00	33.33	62.86	moderate-reported
29 [50]	66.67	62.50	60.00	57.14	0.00	50.00	66.67	57.14	moderate-reported
30 [51]	50.00	25.00	60.00	42.86	100.00	0.00	66.67	42.86	low-reported
31 [52]	83.33	50.00	40.00	42.86	0.00	50.00	0.00	45.71	low-reported
32 [53]	66.67	87.50	40.00	57.14	0.00	50.00	33.33	57.14	moderate-reported
33 [54]	50.00	50.00	40.00	42.86	0.00	50.00	33.33	42.86	low-reported
34 [55]	66.67	25.00	20.00	42.86	0.00	50.00	33.33	37.14	low-reported
35 [56]	50.00	62.50	40.00	57.14	0.00	25.00	0.00	42.86	low-reported

(*continued on next page*)

Table 3 (*continued*)

No.	Basic information (%)	Background (%)	Evidence (%)	Recommendations (%)	Review and quality assurance (%)	Funding and declaration and management of interests (%)	Other information (%)	Total reporting rate (%)	Grading of reporting rates
36 [57]	83.33	25.00	80.00	57.14	0.00	50.00	33.33	51.43	moderate-reported
37 [58]	66.67	50.00	60.00	42.86	0.00	100.00	33.33	54.29	moderate-reported
38 [59]	66.67	50.00	60.00	57.14	0.00	25.00	33.33	48.57	low-reported
39 [60]	66.67	50.00	0.00	42.86	0.00	25.00	0.00	34.29	low-reported
40 [61]	16.67	37.50	40.00	42.86	0.00	0.00	0.00	25.71	low-reported
41 [62]	16.67	50.00	40.00	42.86	0.00	0.00	33.33	31.43	low-reported
42 [63]	66.67	50.00	60.00	42.86	0.00	100.00	33.33	54.29	moderate-reported
43 [64]	66.67	50.00	0.00	28.57	0.00	0.00	0.00	28.57	low-reported
44 [65]	33.33	50.00	80.00	57.14	50.00	25.00	33.33	48.57	low-reported
Average of domains (%)	60.61	57.10	49.09	58.44	15.91	44.89	36.36	–	

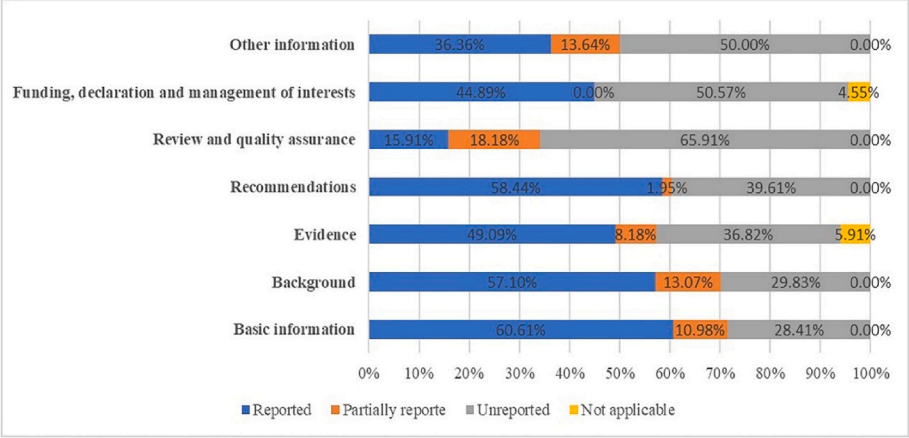

Fig. 3. The average reporting rate of the RIGHT checklist domains in the eligible guidelines.

domain of "applicability" was merely 61.24%. The successful implementation of CPGs relies greatly on their applicability. Guideline developers must consider not only the efficacy of the recommendations but also practical factors such as resource allocation, medical insurance system, cost analysis, and weighing the pros and cons [69]. Consistent with previous studies [66,70], the domain of "applicability" received an unsatisfactory mean standardized score among the 44 CPGs. This indicates that many of the included CPGs did not sufficiently address clinical applicability. Currently, developers of CPGs tend to allocate more resources and time towards formulating recommendations rather than towards implementation and monitoring [66]. Consequently, for better promotion and adoption of CPGs, developers should conduct preliminary investigations to identify factors influencing implementation (e.g., noncompliance with continuous positive airway pressure, the side effects of oral appliance therapy, the perceptions of medical staff on preoperative screening and assessment of OSA patients, etc.), thoroughly consider the compatibility of resource input with local healthcare services and health economics, and provide tools for implementing the guidelines (e.g., training materials, user manuals, mobile applications, etc.) to enhance the accessibility of the CPGs.

Furthermore, it is important to highlight that within the domain of "stakeholder involvement", item 5 (values and preferences of the target populations) received a relatively low score, despite the overall average standardized score in this domain exceeding 60%. This finding suggests a lack of active participation of the target populations in guideline development process. It indicated that there was which is inconsistent with the principles of the patient-centered healthcare model. The values and preferences of the target populations not only directly affect whether recommendations are accepted and adopted into practice, but even overturn some recommendations based on high quality evidence [71]. To address this discrepancy, it is recommended to involve the target populations directly in the development of CPGs. This can be achieved through methods such as questionnaires, internet survey, literature reviews, interviews, and other appropriate means, in order to obtain and incorporate the preferences of the target population.

According to our statistics of the reporting quality in the included CPGs, it was found that the overall reporting rate was 51.30%. Among the various domains, the domain with the lowest reporting rate was "review and quality assurance", with the value of 15.91%. This poor reporting rate can be attribute to the neglect of quality control and external peer review in the development process. Eleven CPGs [24,26,29–31,33,38,41,49,51,65] reported the implementation of an independent external review process, and only three guidelines [24,38,51] followed a strict quality assurance procedure to ensure robustness and

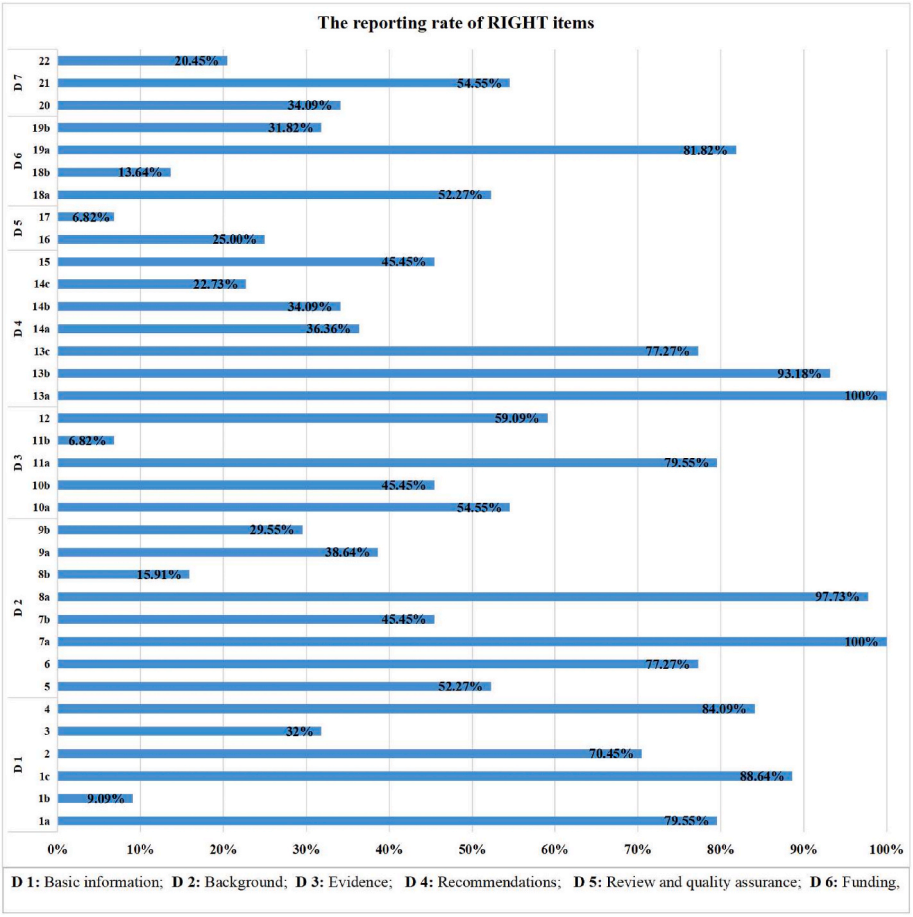

Fig. 4. The reporting rate of each RIGHT checklist item in the included guidelines (The details of each item are presented in http://www.right-statement.org/right-statement/checklist.).

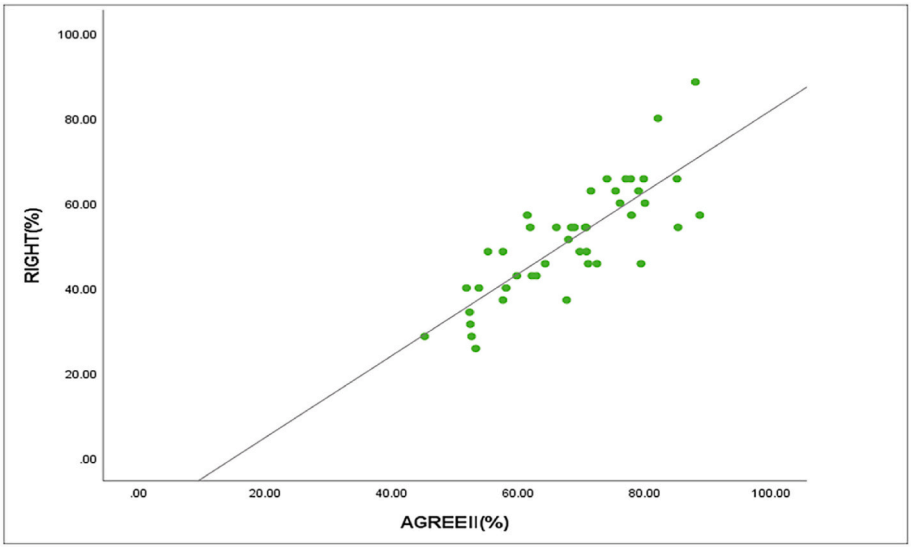

Fig. 5. Scatter plot for the correlation between AGREE-II and RIGHT scores.

reliability.

The second point to highlight is the under-reporting of items within the domains of "evidence", "funding, declaration and management of interests", and "other information". Future improvements in reporting should prioritize these areas to ensure more detailed and comprehensive reports. Specifically, it was observed that only a limited number of CPGs provided descriptions of the roles played by sponsors in the development, publication, dissemination, and implementation of the CPGs. This finding underscores the urgent need for standardized reporting of conflicts of interest and funding sources, as well as the promotion of greater transparency in the roles of sponsors.

Within the "background" domain, it is noteworthy that only seven

CPGs (15.91%) [24,33,35,41,45,59,60] explicitly reported item 8b, which relates to the environment for which the guideline is intended. Clearly defining this item is crucial, as guidelines may be applicable to specific geographic regions or healthcare institutions. Insufficient reporting of this item can pose challenges for clinicians in determining when and in which context the CPGs are appropriate for use.

Notably, although the guideline for adult OSA developed by the US Department of Veterans Affairs (VA) and US Department of Defense (DoD) [41] only achieved a Grade B (recommended with modifications) rating, it had a high reporting rate of 80.00% and four domains ("Scope and purpose", "Stakeholder involvement", "Clarity of presentation", and "Applicability") of methodological quality attained an average standardized score exceeding 90%. Therefore, the guideline development process which is used by the VA/DoD could serve as a template for other medical organizations to develop future guidelines, and there is still a need to continuously optimize the deficiencies in the domain of "Editorial independence".

Another significant finding of this review was that adult OSA guidelines with a higher reporting rate demonstrated better methodological quality, which aligns with previous research in this area [72]. It is important to note that the AGREE II instrument primarily concentrates on appraising the rigor of methodology in the guideline development, while the RIGHT checklist aims to guide the developers in adequately reporting guideline and promote better understanding and application of guideline by clinicians. Nonetheless, considering the overlap between the two tools, utilizing both in conjunction allows for a comprehensive evaluation of the overall quality of CPGs. This approach helps identify potential gaps in each domain and content, providing valuable insight for further enhancements and improvements.

5. Limitation

This study is subject to several limitations. Firstly, the inclusion of only CPGs published in English and Chinese languages may introduce selection bias, as it may not fully represent the global landscape of published CPGs for adult OSA. Secondly, the analysis was limited to descriptive and simple correlation analysis approaches, potentially limiting the depth of examination. Lastly, for CPGs published in journals, space constraints may hinder the complete reporting of the development process, and this limitation could impact the comprehensive assessment of methodological quality, potentially resulting in lower quality appraisal outcomes.

6. Conclusions

This review systematically assessed the overall quality of CPGs for adult OSA and found that the quality was below optimal standards. The findings of this study offer valuable insights for health professionals and stakeholders involved in the integrated management of adult OSA. Among the evaluated CPGs, only six were deemed recommendable, and all of them were published within the past three years. Additionally, 18 CPGs incorporated the use of the GRADE system to demonstrate the strength of recommendation and/or the grade of evidence, whereas only one displayed a good reporting rate. The majority of the CPGs, however, overlooked important aspects such as "rigor of development", "values and preferences of the target populations", and "funding source and conflicts of interest". It is evident that there is a need to progressively improve the overall quality of CPGs for adult OSA. Future CPGs should aim to adhere to the AGREE II criteria to ensure the development of evidence-based CPGs that are both of thorough report and high quality. By doing so, these CPGs can provide practical tools to facilitate the effective implementation of evidence-based care.

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Data availability

The data that support the findings of this study are available from the corresponding author, Mian Wang or Changyu Wang, upon reasonable request.

CRediT authorship contribution statement

Xiaopan Xu: Writing – original draft, Visualization, Methodology, Data curation. **Qianqian Peng:** Data curation, Methodology, Writing – original draft. **Ling Meng:** Data curation, Methodology, Writing – original draft. **Hualu Yang:** Methodology, Writing – original draft. **Yingzhen Wang:** Data curation. **Yan Luo:** Data curation. **Min Dong:** Data curation. **Changyu Wang:** Writing – review & editing, Supervision, Project administration, Methodology, Conceptualization. **Mian Wang:** Writing – review & editing, Supervision, Software, Project administration, Methodology, Conceptualization.

Declaration of generative AI and AI-assisted technologies in the writing process

There was no use of generative AI or AI-assisted technology in the writing process.

Declaration of competing interest

The authors declare that they have no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sleep.2024.03.045.

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