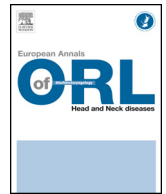




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Original article

Definition of severity, management, and follow-up of isolated snoring in adults: An international consensus



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ABSTRACT

Introduction: Isolated snoring (IS), defined by nocturnal upper airway vibration without apneas, remains a prevalent yet underrecognized condition lacking standardized definitions for severity and management. Despite its significant impact on bed partners' sleep quality and social life, no consensus exists on severity criteria or follow-up practices. This international Delphi consensus aimed to define IS severity, address the management of nasal comorbidity, and establish follow-up protocols to support personalized patient care.

Methods: A two-round Delphi process was conducted from December 2024 to April 2025, involving 35 otolaryngology experts from 16 countries. Thirty-nine initial statements were developed by a steering committee and evaluated using a 9-point Likert scale. Consensus was defined as $\geq 75\%$ agreement.

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Results: Of 58 evaluated statements, 44 reached consensus. IS severity was associated with frequency of snoring, bed partner's complaints, and impact on the couple's quality of life, while objective acoustic parameters alone were not deemed reliable indicators. Nasal obstruction was recognized as a treatable comorbidity that may be assessed before snoring management. Personalized management using validated subjective tools was strongly recommended. For follow-up, expert consensus supported a 3- to 6-month reassessment using smartphone apps or quality-of-life metrics, with distinctions made between clinical and research goals.

Conclusion: This consensus supports a patient- and partner-centered approach to IS. It discourages reliance on isolated acoustic data for severity grading, promotes proactive management of nasal factors, and highlights the need for individualized treatment strategies. Future research should aim to validate objective and subjective tools to further standardize care pathways for IS.

1. Introduction

Isolated or primary snoring (IS) is defined as a harsh sound, mainly inspiratory, associated with vibration of the pharyngeal soft tissues, without significant apneas or hypopneas (Apnea-Hypopnea Index [AHI] below 5), and with no associated daytime symptoms related to sleep [1–3]. The prevalence of snoring is estimated to be greater than 50% among in individuals over 60 years of age [4]. The stakes of managing snoring patients are twofold. First, screening for a comorbid obstructive sleep apnea (OSA) syndrome is required as there is a continuum ranging from simple snoring, to upper airway resistance syndrome to obstructive sleep apnea syndrome [3,5]. Second, addressing the noise nuisance is often the principal demand of bed-partners, as it can impair sleep efficiency and quality of life [6].

However, since IS is not considered a disease, otolaryngologists should carefully select patients before proposing potentially invasive therapeutic options. This implies establishing severity criteria to determine the best benefit/risk strategy for each patient. The first difficulty in managing a patient with IS is quantifying the snoring intensity. Snoring can be assessed through polygraphic or polysomnographic parameters (average volume, maximum volume), partner questionnaires [7], or nighttime sound recording applications, which have gained increasing interest in the recent years [8]. Noise nuisance and the partner's sleep disturbances may be important factors to consider, even though snoring itself does not appear to directly cause micro-arousals or awakenings [9] and some bed partners may have a light sleeper profile, or other sleep disorder, independently of snoring [10]. However, there is no consensus on average or maximum volume thresholds to consider snoring as severe.

Treatment of snoring remains multimodal, and its efficacy should be evaluated. Therapeutic options include lifestyle modifications such as weight loss, sufficient sleep time, avoidance of muscle relaxants, positional therapy as well as mandibular advancement devices, or targeted surgical interventions [2,11]. The widespread use of drug-induced sleep endoscopy (DISE) has also improved the understanding of the vibratory sites to propose targeted treatments for patients [12,13] as well as to associate specific snoring patterns with the vibratory sites [12,14]. However, DISE is not routinely performed in this indication. The most common sites of vibration are velar and oropharyngeal, but epiglottic snoring may also occur [15]. In addition, nasal obstruction or mouth breathing increase pharyngeal collapse [16] thereby promoting snoring. Although nasal management is not a treatment for OSA [3,17], but its modalities and timing have not yet been clearly defined in patients with IS.

Recently published expert consensus statements [2,18] have focused mainly on the diagnostic evaluation of IS and its medical and surgical management. These approaches depend on the severity of snoring, which remains poorly defined. The objective of this modified Delphi study is to reach expert consensus on the definition of IS severity, management of nasal comorbidities and follow-up modalities.

2. Materials and methods

2.1. Modified Delphi method

The modified Delphi consensus process was conducted between December 2024 to April 2025. The steering committee consisted of a chair (VF), an assistant chair (FC), and a methodologist (HC) who proposed the initial statements. The first round took place from December 18, 2024 to January 19, 2025, and the second round from February 22, 2025 to April 15, 2025. Each statement was independently rated on a 9-point Likert scale, with the lowest score corresponding to “totally disagree” and the highest to “totally agree.” A consensus was considered reached when more than 75% of the voters gave a response of 7 or higher. A statement was rejected when 50% of the experts voted 5 or fewer. Responses in between were modified according to the panel comments and resubmitted in the next round. Due to the nature of the study, no specific approval by an Institutional Review Board was required.

2.2. Expert panel selection

Expert otolaryngologists specializing in obstructive sleep disease were recruited as active members of national and international sleep societies. A total of 55 practitioners were invited to participate in our study, spanning 16 countries.

2.3. Questionnaires

Participants were contacted by email and invited to complete a GoogleForm® questionnaire. Email addresses were collected solely to prevent duplicate entries and enable follow-up, and all responses were anonymized by an independent evaluator (HC). The results of the different questionnaires were compiled in a Microsoft Excel® spreadsheet for data analysis.

The initial questionnaire was prepared beforehand by the steering committee after reviewing the literature, focusing on areas lacking consensus or supported by insufficient evidence. The first questionnaire thus contained 39 statements, grouped into four domains: definition of severity, nasal and general management, criteria for selection for invasive treatment, and follow-up modalities. Experts were encouraged to provide free-text feedback in case of disagreement or to propose a new statement to improve the proposals.

3. Results

Thirty-five panelists participated in the study. The demographic characteristics of the expert panel are presented in Table 1, and in Fig. 1. All panelists are members of national or international Sleep Societies, detailed in Fig. 2.

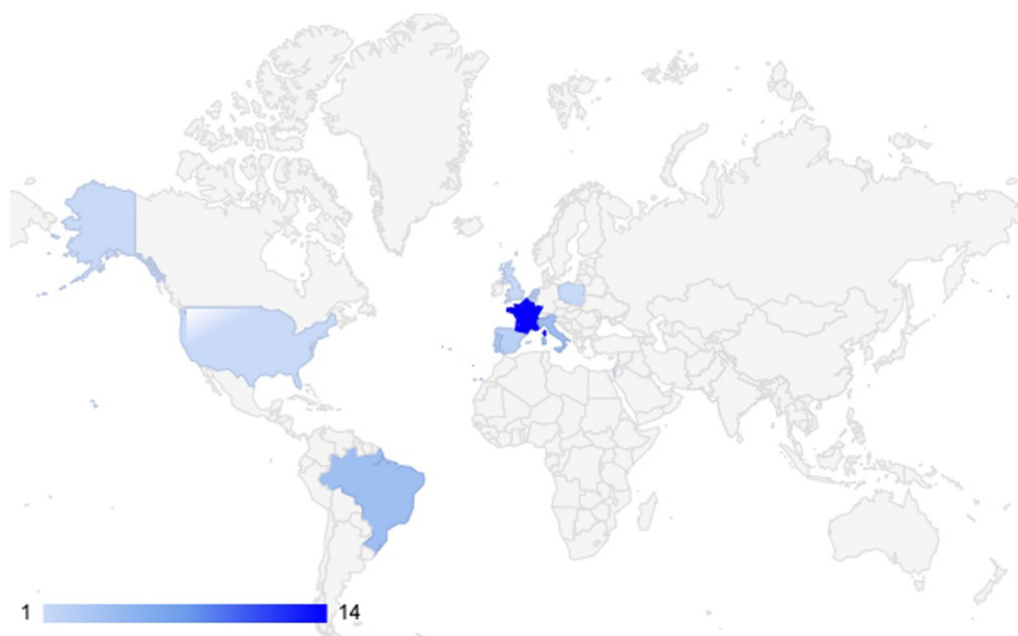


Fig. 1. Geographical origin of the panelists.

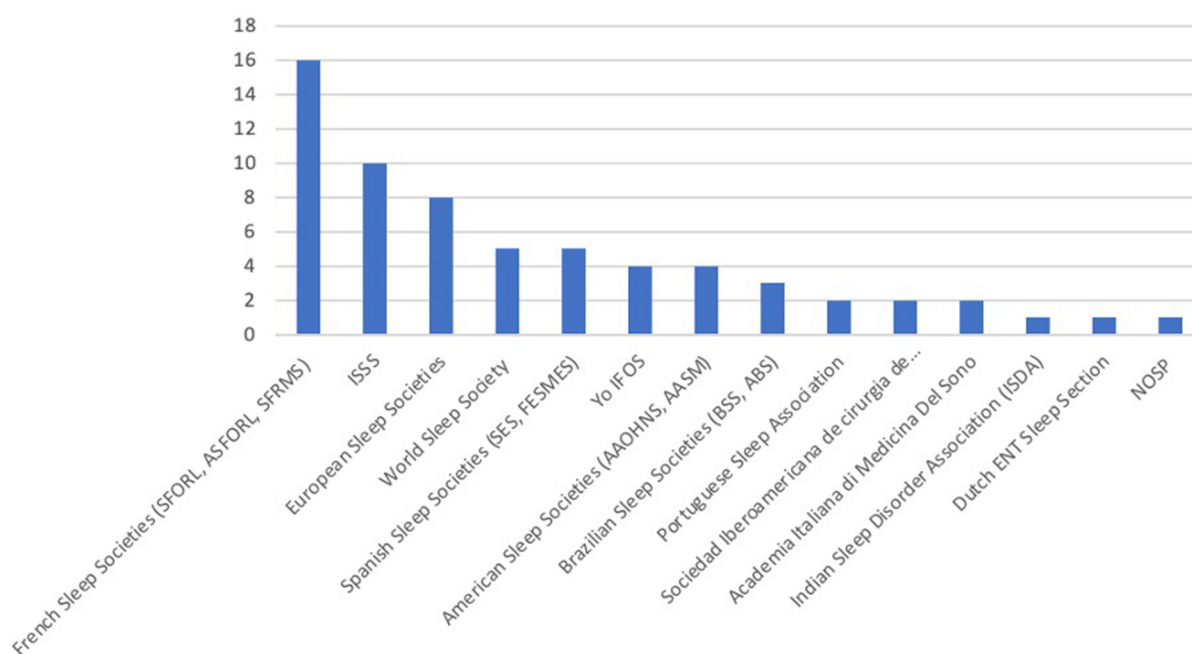


Fig. 2. Sleep Learning Societies.

3.1. Delphi rounds results

In the first round, 11 statements addressed the diagnosis and severity of IS, 8 statements focused on the management of nasal and general comorbidities, 5 statements explored the selection of patients to undergo invasive management of snoring, and 15 statements explored follow-up modalities for both clinical and research purposes. The flow chart of our Delphi study is shown in Fig. 3.

In the second round, 19 statements were assessed, including 14 statements that had not been rejected and had not reached consensus, with the addition of 5 new statements based on comments made after the first round. After this round, 11 statements achieved consensus, while 8 proposals did not. A third round was deemed unnecessary,

as no other statement proposition or modification emerged from the panel.

3.2. Severity of IS

In the first round, of the 11 proposals, 3 reached consensus and 1 was rejected. The remaining 7 proposals were revised, along with 3 new proposals derived from first-round feedback. Of these 10 new proposals, 5 reached consensus. The detailed results are presented in Table 2.

According to the panelists, IS is considered severe when it occurs on most nights (77.4% consensus) without other sleep respiratory symptoms (which defines its isolated nature). All statements regarding social impact and bed partner's impairment achieved agreement, suggesting

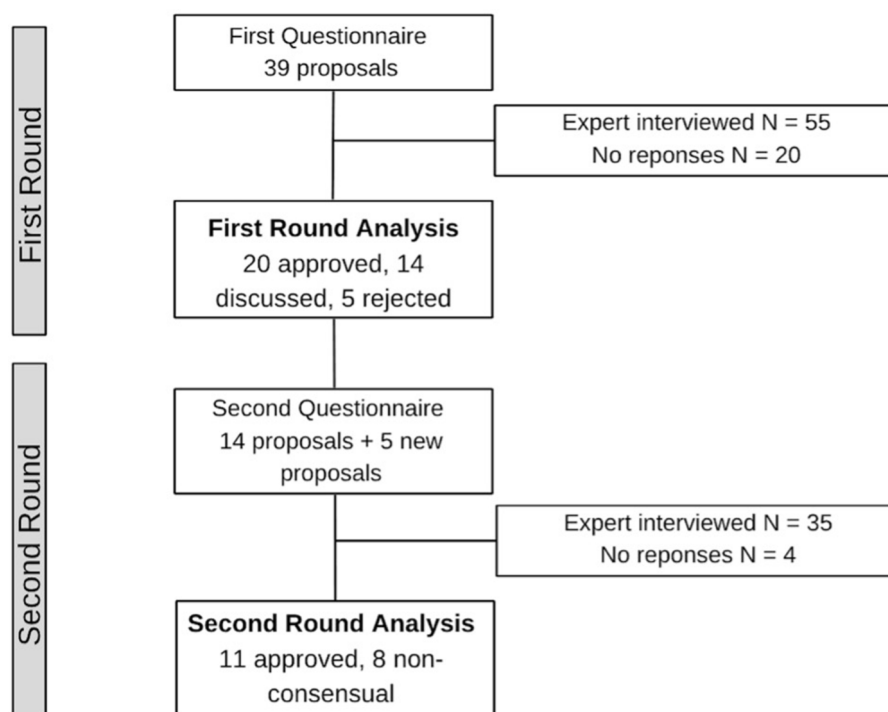


Fig. 3. Flow-chart of the Delphi study.

Table 1
Demographics of panelists ($n = 35$).

	Median or n (%)	Range
Years of experience in sleep disorder management	15	(3–40)
Gender		
Males	28 (80)	
Females	7 (20)	
Practice setting		
Public	6 (17)	
Academic Hospital	3 (9)	
Private	7 (21)	
Public and Academic	2 (6)	
Hospital		
Public and Private	1 (3)	
Academic Hospital and Private	10 (27)	
Public and Academic Hospital and Private	6 (17)	

that the severity of IS should be assessed through the input of the patient's relatives. This highlights the importance of interviewing the partner to evaluate the severity, but it is also useful to inquire about their respective sleep habits (short sleeper, insomnia, and other sleep disorders). By contrast, the frequency of snoring, the maximum and mean intensities were not considered as reliable indicators for assessing the severity of snoring alone.

3.3. Management of nasal comorbidities

Eight proposals related to the management of sinonasal comorbidities in IS were evaluated: 7 reached consensus (5 in the first round, 2 in the second round), while one was rejected on the first round. The detailed proposals are summarized in Table 3.

The experts agreed on the evaluation and medical or surgical management of nasal obstruction in IS, which can be undertaken prior to further investigation of snoring in the absence of signs suggestive of OSA. In cases of nasal mucosa inflammation, an investigation of allergic rhinitis should be performed. Rhinomanometry was not retained as a useful tool in routine practice.

3.4. Patient selection for surgery and management

In the first round, out of the 5 proposed statements exploring the selection of patients for surgical management of IS, 2 reached consensus. The remaining 3 proposals were revised, along with 2 new proposals. Of these 5 new proposals, 2 reached consensus (Table 4).

The experts strongly acknowledge that management of IS should be personalized (97.1% consensus) and be guided by specific assessment tools as Visual Analog Scale (VAS), the Snore Outcome Survey (SOS), the Snoring Scale Score (SSS), or the Snoring Symptoms Inventory (SSI). The statement about systematic drug-induced sleep endoscopy before soft palate surgery failed to reach consensus (74.2%).

3.5. Follow-up modalities for clinical and research purposes

Of the 15 proposed statements about follow-up, 10 reached consensus on the first round, and 3 were rejected. The 2 remaining proposals were revised and approved in the second round (Table 5).

Regarding follow-up, 94.3% of panelists agreed to a re-evaluation of 3 to 6 months after initial management. The objectives differed between clinical and research purposes. Concerning research, all proposed statements reached consensus in the first round, emphasizing the need for a better knowledge of objective measurement for postoperative outcomes. However, for clinical practice, only the used of patient smartphone applications or specific quality of life questionnaires achieved consensus.

4. Discussion

While previous expert statements have addressed general management principles for IS, few have attempted to quantify severity or

Table 2

Summary of validated and rejected items in the category: diagnosis and severity.

Item	Experts' agreement (%)	Validation round 1	Range (median)	Reformulation round 2	Experts' agreement (%)	Validation round 2	Range (median)
A severe IS occurs most nights, without other sleep symptom impairment	62.8	No	2–9 (7)	A severe IS occurs most nights, without other respiratory sleep disease	77.4	Yes	1–9 (8)
A severe IS might cause disturbances for bed partners	94.3	Yes	5–5 (9)				
A severe IS might cause disturbances for persons outside the bedroom	80.0	Yes	4–9 (8)				
The snoring rate on total sleep time should be considered to assess severity	68.6	No	2–9 (8)	A snoring rate $\geq 50\%$ of total sleep time should be considered to assess snoring severity	74.2	No	2–9 (8)
Snoring intensity (mean volume) should be considered to define snoring severity	68.6	No	1–9 (8)	A mean volume of snoring intensity ≥ 60 dB (conversational intensity) should be considered to assess snoring severity	67.7	No	1–9 (7)
Snoring intensity (maximum volume) should be considered to define snoring severity	54.3	No	1–9 (7)	A maximum volume of snoring intensity ≥ 80 dB should be considered to assess snoring severity	64.5	No	1–9 (8)
Presence of a social impairment (e.g.: restriction of social activities...) in patients defines a severe IS	71.4	No	1–9 (9)	Presence of a social impairment (e.g.: restriction of social activities, snore shaming...) in patients should be considered to assess snoring severity	87.1	Yes	1–9 (8)
A significant reduction in patients' quality of life defines a severe IS	60	No	1–9 (7)	A significant reduction in couplehood quality of life attributed to snoring defines a severe IS	83.9	Yes	1–9 (8)
The presence of depressive syndrome assessed using specific scales (such as Beck's Depression Inventory...) in IS patients defines a severe IS	25.7	Rejected	1–9 (4)				
The severity of IS should be assessed through input from the bed partner	88.6	Yes	3–9 (9)				
Past episode(s) of isolated uvula edema upon waking (with no other etiology found) is a marker of IS severity	51.4	No	3–9 (7)	Past episode(s) of isolated uvula edema upon waking (with no other etiology found like pharyngolaryngeal reflux) should be considered to assess snoring severity	51.6	No	1–9 (8)
				Snoring rate or mean/maximum snoring volume should not be considered as the sole parameters for assessing severity	83.9	Yes	2–9 (7)
				A severe IS occurs independently of sleep position	51.6	No	1–9 (5)
				In case of bed partner impairment, it is necessary to ask for the partner's sleep habits (light sleeper profile, insomnia...)	87.10	Yes	1–9 (8)

Bold means Validated item.

Table 3

Summary of validated and rejected items in the category: management of nasal comorbidities.

Item	Experts' agreement (%)	Validation round 1	Range (median)	Reformulation round 2	Experts' agreement (%)	Validation round 2	Range (median)
It is necessary to search for nasal obstruction in IS	91.4	Yes	5–9 (9)				
In case of nasal obstruction, it is necessary to look for an increase during sleep	74.3	No	1–9 (8)	In case of nasal obstruction, it is necessary to ask patients for an increase during supine position/sleep	80.6	Yes	1–9 (8)
It is necessary to search for the presence of rhinological symptoms (nasal congestion, rhinorrhea, sinus pain)	97.1	Yes	5–9 (9)				
Rhinomanometry should be proposed in case of discordance between physical examination and patient's complaint	48.6	Rejected	1–9 (6)				
In case of nasal mucosa inflammation, a medical management could be proposed including nasal rinses and nasal corticosteroids	94.3	Yes	1–9 (9)				
In case of nasal mucosa inflammation, an allergic rhinitis should be investigated and managed accordingly	88.6	Yes	5–9 (9)				
Nasal obstruction surgical management could be proposed to snoring patients according to specific guidelines	85.7	Yes	5–9 (9)				
In case of nasal obstruction associated to snoring without suspicion of obstructive sleep apneas, primary treatment of nasal obstruction could be proposed before investigating snoring	68.6	No	1–9 (9)	From a chronological perspective, in a patient complaining of snoring and nasal obstruction without any clinical signs suggesting OSA, it is possible to first treat the nasal obstruction before investigating snoring	77.4	Yes	1–9 (8)

Bold means Validated item.

integrate psychosocial dimensions into clinical assessment. To date, the definition of IS severity remains unclear, with no consensus on criteria to differentiate “severe” snoring from non-severe snoring in the absence of obstructive sleep apnea syndrome [19]. This Delphi study emphasized the impact of IS on both the snorer's quality of life and the partner's sleep. All statements regarding social and bed partner's impairment achieved agreement. This highlights the importance of interviewing the partner to assess the severity, but it is also essential to inquire about their sleep habits (short sleeper, insomnia) that can be confounding factors of poor sleep quality of the partner [9]. A weak correlation has already been noted between partner evaluation of snoring and the severity of its acoustic parameters [7], but we did not reach consensus on any objective threshold (snoring rate or sound intensity) to define IS severity. It may be explained by inter-individual differences in auditory tolerance and sleep depth of the partner. Moreover, although snoring intensity does not appear to be correlated with micro-arousals of the partner [9], the noise disturbance could contribute to difficulty falling

asleep. From a personalized medicine perspective, IS represents a unique clinical challenge. Despite the absence of physiological daytime consequences, the social and relational impact—primarily affecting the bed partner—requires a tailored management approach. In this context, the traditional patient-centered model must evolve into a patient–partner-centered paradigm, integrating the partner's experience and quality of life into the assessment of severity and therapeutic decision-making.

Another way to assess snoring severity is the use of subjective tools. VAS allow classification of snoring by frequency and volume, but like the Pittsburgh Sleep Quality Index (PSQI) and the Epworth Sleepiness Scale (ESS), they are not specific for IS or obstructive sleep apnea [20]. SOS, SSS, and SSI are other validated questionnaires for evaluating snoring intensity at diagnosis or during follow-up [21,22]. However, there is to date no cut-off value to determine severity only based on these tools, but the panelists agreed that their change in score over time may be relevant for clinical and research purposes. The emergence of digital health technologies, such as mobile snoring apps, comple-

Table 4

Summary of validated and rejected items in the category: selection of patients eligible for surgery.

Item	Experts' agreement (%)	Validation round 1	Range (median)	Reformulation round 2	Experts' agreement (%)	Validation round 2	Range (median)
The management modalities of snoring are plural and could be discussed with the patient in a personalized way	97.1	Yes	6–9 (9)				
The use of validated smartphone apps can guide the diagnostic work-up of snoring	80	Yes	2–9 (8)				
Drug-induced sleep endoscopy (DISE) can be proposed (not mandatory) to patients presenting with isolated snoring to identify an obstructive factor and suggest personalized treatment	68.6	No	1–9 (8)	Drug-induced sleep endoscopy (DISE) can be considered, though not mandatory, for patients with IS that is resistant to first-line treatment, in order to identify obstructive factors and recommend a personalized treatment approach	71	No	1–9 (8)
A specific snoring assessment questionnaire (as the Snore Outcome Survey [SOS], the Snoring Scale Score [SSS], or the Snoring Symptoms Inventory [SSI]...) should be used for the assessment of individuals with IS.	74.3	No	4–9 (8)	Specific snoring assessment tools, such as Visual Analog Scale (VAS), Snore Outcome Survey (SOS), Snoring Scale Score (SSS), or Snoring Symptoms Inventory (SSI) could be used for the assessment of individuals with IS	90.3	Yes	1–9 (8)
DISE should be proposed before any invasive surgical management in isolated snorers.	57.1	No	1–9 (7)	A DISE should be proposed before any surgical treatment of the soft palate in a patient with snoring to ensure that it is the only vibratory site	74.2	No	1–9 (8)
				The decision to initiate treatment should be based on the complaints of both the patient and their partner, as well as a careful assessment of the expected benefits and risks of the treatment	87.1	Yes	6–9 (9)
				The bed partner may be advised to use earplugs to help improve their sleep quality	64.5	No	1–9 (8)

Bold means Validated item.

ments a personalized care strategy by enabling at-home monitoring of symptoms and facilitating patient engagement. Although further validation is required, these tools offer accessible, real-world data that can inform both diagnosis and follow-up. Their integration into care pathways aligns with the principles of personalized medicine, particularly in resource-limited settings or when standard sleep assessments are not feasible.

The management of IS should be guided by individualized prioritization of contributing factors. In cases where nasal obstruction is present, addressing this comorbidity first may reduce snoring intensity and obviate the need for further invasive investigations. This pragmatic, stepwise approach reflects a personalized care model, optimizing benefit-risk ratios while minimizing unnecessary procedures. The role of nasal breathing, particularly nasal obstruction, in the severity and recurrence of snoring has already been studied [20,23], but the literature has provided limited evidence on the effect of nasal pathway restoration

on snoring intensity in patients with nasal breathing impairment. Generally, a reduction in the subjective intensity of snoring is observed by partners after nasal surgery, but this effect has not been demonstrated with objective evaluation criteria [24–26]. Currently, the optimal chronological management strategy of nasal obstruction in IS patients is not established. The panelists determined that it is possible to treat nasal obstruction first, before further exploring snoring in the absence of clinical argument for OSA, as it can be a treatment modality of IS. Managing nasal obstruction implies considering both surgical [27] and medical management, notably allergy testing and the use of nasal corticosteroids and saline irrigation. Interestingly, steroid-sensitive receptors are present in both the palatal mucosa (particularly the uvula) and the nasal mucosa [28] suggesting the potential efficacy in both sites. Using intra-nasal corticosteroids improves nasal breathing and modestly decreases some acoustic parameters of snoring [29]. A noteworthy outcome of our study is the consensus that nasal obstruction can be managed before ex-

Table 5

Summary of validated and rejected items in the category: follow-up modalities.

Item	Experts' agreement (%)	Validation round 1	Range (median)	Reformulation round 2	Experts' agreement (%)	Validation round 2	Range (median)
Re-assessment of snoring should be performed 3 to 6 months after management	94.3	Yes	6–9 (9)				
It is necessary to maintain a sleep diary	48.6	Rejected	1–9 (6)				
The use of validated smartphone apps may be useful to follow the efficacy of snoring management	68.6	No	2–9 (8)	The use of patients' smartphone app may be useful to follow the efficacy of snoring management	87.1	Yes	6–9 (8)
For clinical purpose							
One of the aims of snoring treatment is to improve objective sleep parameters (on oximetry, respiratory polygraphy, polysomnography...)	22.8	Rejected	1–9 (4)				
One of the aims in snoring treatment is to decrease snoring sleep time	88.6	Yes	3–9 (8)				
One of the aims of snoring treatment is to improve quality of life (QoL) through specific QoL questionnaires	71.4	No	1–9 (7)	For clinical purpose, one of the aims of snoring treatment is to improve quality of life (QoL) through specific VAS or QoL questionnaires	83.9	Yes	4–9 (8)
One of the aims in snoring treatment is to decrease snoring mean intensity	85.7	Yes	3–9 (9)				
One of the aims of snoring treatment is to improve bed's partner sleep quality	91.4	Yes	4–9 (9)				
One of the aims in snoring treatment is to decrease snoring maximum intensity	80.0	Yes	1–9 (9)				
For research purpose							
One of the aims of snoring treatment is to improve objective sleep parameters (on oximetry, respiratory polygraphy, polysomnography...)	45.7	Rejected	1–9 (6)				
One of the aims in snoring treatment is to decrease snoring sleep time	85.7	Yes	3–9 (9)				
One of the aims of snoring treatment is to improve quality of life (QoL) through specific QoL questionnaires	85.7	Yes	4–9 (9)				
One of the aims in snoring treatment is to decrease snoring mean intensity	82.9	Yes	3–9 (9)				
One of the aims of snoring treatment is to improve bed's partner sleep quality	85.7	Yes	4–9 (8)				
One of the aims in snoring treatment is to decrease snoring maximum intensity	80.0	Yes	1–9 (9)				

Bold means Validated item.

haustive snoring investigations in patients without signs of OSA. This reflects real-world clinical logic, although nasal surgery alone rarely abolishes snoring. Future prospective trials should explore the impact of managing nasal obstruction as a primary therapeutic step and its role in a multimodal care pathway.

Snoring management remains multimodal, ranging from simple lifestyle measures to palatopharyngoplasty [2,4,11]. The criteria for guiding patients to a given treatment are not clearly established. Before an invasive procedure is envisaged, a rigorous selection of patients may be conducted. The growing use of DISE could allow identification

of vibratory sites, enabling more targeted treatments [12,30,31], but only 74.2% of panelists judged it necessary to perform before any soft palate surgery for IS, failing to reach the 75% consensus threshold. A common pitfall of DISE is the lack of reproduction of rapid-eye movement sleep stage, but snoring is not predominant during this sleep stage [32]. More clinical studies are required to precisely define the role of DISE in IS management [33–35]. Indeed, some panelists argued that vibration sites in IS are commonly uvula and soft palate, with epiglottis or pharyngeal wall rarely involved. Beyond DISE, translational research efforts could refine the phenotyping of IS by exploring inflammatory markers, anatomical variations, or acoustic signatures. Emerging technologies such as machine learning algorithms applied to snore analysis may contribute to a more precise stratification of patients and a targeted selection of therapeutic options. Such innovations represent promising pathways toward precision medicine in non-apneic sleep-disordered breathing.

This study has several limitations inherent to the Delphi methodology. First, the consensus reached reflects expert opinion rather than empirical validation and may be influenced by the geographic and professional distribution of the panelists. However, Delphi method is often used to achieve consensus regarding otolaryngology management of obstructive sleep disorders [36]. Although international representation was achieved, some regions or specialties may have been underrepresented, potentially limiting generalizability. Finally, the absence of standardized outcome metrics or validated thresholds for severity assessment restricts the immediate translation of these recommendations into quantitative clinical algorithms. Further prospective and multicenter studies are warranted to validate the proposed approaches and integrate them into standardized care pathways.

Our findings highlight the relevance of a patient- and partner-centered approach, where therapeutic decisions rely not only on clinical data but also on relational context and perceived burden. This personalized care model may benefit from validated questionnaires and emerging digital tools, such as smartphone applications, which can be used both in initial IS assessment and longitudinal monitoring — pending formal validation. This consensus lays a foundation for future research in IS. Key priorities include validating multimodal severity assessment tools, refining treatment indications based on subjective impact, and clarifying the role of DISE in non-apneic snorers. Moreover, longitudinal studies should explore the psychosocial burden of snoring and assess how partner-reported outcomes evolve post-treatment.

5. Conclusion

This study suggests that it is not advisable to evaluate snoring intensity by isolated objective measures alone; instead, subjective impact, especially on the partner's quality of life, should be a central focus of evaluation. Management of nasal comorbidities is recognized as an essential diagnostic and therapeutic component. This study also lays the foundation for future research needed to refine objective severity criteria, validate evaluation tools, and assess the proposed treatment criteria. Meanwhile, the proposals from this consensus enable clinicians to adopt a more coherent, tailored, as well as patient-and-partner-centered approach.

Complicance with ethical standards

Research not involving human participants.

Informed consent

NA.

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Disclosure of interest

The authors declare that they have no competing interest.

Références

- [1] Huang L, Quinn SJ, Ellis PD, Williams JE. Biomechanics of snoring. *Endeavour* 1995;19(3):96–100.
- [2] Sarkis LM, Jones AC, Ng A, Pantin C, Appleton SL, MacKay SG. Australasian Sleep Association position statement on consensus and evidence based treatment for primary snoring. *Respirology* 2023;28(2):110–9.
- [3] Chang JL, Goldberg AN, Alt JA, et al. International Consensus Statement on Obstructive Sleep Apnea. *Int Forum Allergy Rhinol* 2023;13(7):1061–482.
- [4] Yaremchuk K. Why and when to treat snoring. *Otolaryngol Clin North Am* 2020;53(3):351–65.
- [5] Young T, Shahar E, Nieto FJ, et al. Predictors of sleep-disordered breathing in community-dwelling adults: the Sleep Heart Health Study. *Arch Intern Med* 2002;162(8):893–900.
- [6] Sowho M, Sgambati F, Guzman M, Schneider H, Schwartz A. Snoring: a source of noise pollution and sleep apnea predictor. *Sleep* 2020;43(6):[szs305].
- [7] Fischer R, Kuehnel TS, Vielsmeier V, Haubner F, Mueller S, Rohrmeier C. Snoring: is a reliable assessment possible? *Eur Arch Otorhinolaryngol* 2020;277(4):1227–33.
- [8] Brown J, Mitchell Z, Jiang YA, Archdeacon R. Accuracy of smartphone-mediated snore detection in a simulated real-world setting: algorithm development and validation. *JMIR Form Res* 2025;9:e67861.
- [9] Blumen MB, Quera Salva MA, Vaugier I, et al. Is snoring intensity responsible for the sleep partner's poor quality of sleep? *Sleep Breath* 2012;16(3):903–7.
- [10] Blumen M, Quera Salva MA, d'Ortho MP, et al. Effect of sleeping alone on sleep quality in female bed partners of snorers. *Eur Respir J* 2009;34(5):1127–31.
- [11] Stuck BA, Dreher A, Heiser C, et al. Diagnosis and treatment of snoring in adults-S2k Guideline of the German Society of Otorhinolaryngology, Head and Neck Surgery. *Sleep Breath* 2015;19(1):135–48.
- [12] Pilaete K, De Medts J, Delsupehe KG. Drug-induced sleep endoscopy changes snoring management plan very significantly compared to standard clinical evaluation. *Eur Arch Otorhinolaryngol* 2014;271(5):1311–9.
- [13] Koutsourelakis I, Safiruddin F, Ravesloot M, Zakynthinos S, de Vries N. Surgery for obstructive sleep apnea: sleep endoscopy determinants of outcome. *Laryngoscope* 2012;122(11):2587–91.
- [14] Herzog M, Plöchl S, Glien A, et al. Evaluation of acoustic characteristics of snoring sounds obtained during drug-induced sleep endoscopy. *Sleep Breath* 2015;19(3):1011–9.
- [15] Qualickuz Zanan NH, Azman M, Zainuddin K, Wan Puteh SE, Mohamed AS, Mat Baki M. Sound frequency spectra of snore in relation to the site of obstruction among snorers. *Acta Otorhinolaryngol Ital* 2021;41(4):348–55.
- [16] Georgalas C. The role of the nose in snoring and obstructive sleep apnoea: an update. *Eur Arch Otorhinolaryngol* 2011;268(9):1365–73.
- [17] Leitzen KP, Brietzke SE, Lindsay RW. Correlation between nasal anatomy and objective obstructive sleep apnea severity. *Otolaryngol Head Neck Surg* 2014;150(2):325–31.
- [18] Hofauer B, Braumann B, Heiser C, et al. Diagnosis and treatment of isolated snoring-open questions and areas for future research. *Sleep Breath* 2021;25(2):1011–7.
- [19] De Meyer MMD, Jacquet W, Vanderveken OM, Marks LAM. Systematic review of the different aspects of primary snoring. *Sleep Med Rev* 2019;45:88–94.
- [20] Virkkula P, Maasilta P, Hytönen M, Salmi T, Malmberg H. Nasal obstruction and sleep-disordered breathing: the effect of supine body position on nasal measurements in snorers. *Acta Otolaryngol* 2003;123(5):648–54.
- [21] Gliklich RE, Wang PC. Validation of the snore outcomes survey for patients with sleep-disordered breathing. *Arch Otolaryngol Head Neck Surg* 2002;128(7):819–24.
- [22] Lim PV, Curry AR. A new method for evaluating and reporting the severity of snoring. *J Laryngol Otol* 1999;113(4):336–40.
- [23] Young T, Finn L, Kim H. Nasal obstruction as a risk factor for sleep-disordered breathing. The University of Wisconsin Sleep and Respiratory Research Group. *J Allergy Clin Immunol* 1997;99(2):S757–62.
- [24] Fairbanks DN. Effect of nasal surgery on snoring. *South Med J* 1985;78(3):268–70.
- [25] Virkkula P, Bachour A, Hytönen M, et al. Snoring is not relieved by nasal surgery despite improvement in nasal resistance. *Chest* 2006;129(1):81–7.
- [26] Wu J, Zang HR, Wang T, et al. Evaluation of the subjective efficacy of nasal surgery. *J Laryngol Otol* 2017;131(1):37–43.
- [27] Schoustra E, van Maanen P, den Haan C, Ravesloot MJL, de Vries N. The role of isolated nasal surgery in obstructive sleep apnea therapy – a systematic review. *Brain Sci* 2022;12(11):1446.
- [28] Hultcrantz E, Harder L, Harder H, Zetterlund EL, Roberg K. To treat snoring with nasal steroids – effects on more than one level? *Acta Otolaryngol* 2010;130(1):124–31.
- [29] Koutsourelakis I, Keliris A, Minaritzoglou A, Zakynthinos S. Nasal steroids in snorers can decrease snoring frequency: a randomized placebo-controlled crossover trial. *J Sleep Res* 2015;24(2):160–6.

- [30] De Vito A, Carrasco Llatas M, Vanni A, et al. European position paper on drug-induced sedation endoscopy (DISE). *Sleep Breath* 2014;18(3):453–65.
- [31] Eichler C, Sommer JU, Stuck BA, Hörmann K, Maurer JT. Does drug-induced sleep endoscopy change the treatment concept of patients with snoring and obstructive sleep apnea? *Sleep Breath* 2013;17(1):63–8.
- [32] Suzuki M, Kawai Y, Funayama Y. Exploring the dynamics of snoring in relation to sleep stages: implications for gender differences, sleep position, and upper airway collapsibility. *PLoS One* 2024;19(1):e0295232.
- [33] Olszewska E, De Vito A, Baptista P, et al. Consensus Statements among European Sleep Surgery Experts on Snoring and Obstructive Sleep Apnea: part 1 definitions and diagnosis. *J Clin Med* 2024;13(2):502.
- [34] Olszewska E, De Vito A, O'Connor-Reina C, et al. Consensus Statements among European Sleep Surgery Experts on Snoring and Obstructive Sleep Apnea: part 2 decision-making in surgical management and peri-operative considerations. *J Clin Med* 2024;13(7):2083.
- [35] Olszewska E, De Vito A, Heiser C, et al. Consensus Statements among European Sleep Surgery Experts on Snoring and Obstructive Sleep Apnea: part 3 palatal surgery, outcomes and follow-up, complications, and post-operative management. *J Clin Med* 2024;13(18):5438.
- [36] Ravesloot MJL, de Raaff CAL, van de Beek MJ, et al. Perioperative care of patients with obstructive sleep apnea undergoing upper airway surgery: a review and consensus recommendations. *JAMA Otolaryngol Head Neck Surg* 2019;145(8):751–60.