

Voice Diagnostics: Current US American, European and German voice assessment guidelines - a comparison of recommended methods

Stimmdiagnostik: aktuelle US-amerikanische, europäische und deutsche Richtlinien zur Stimmbeurteilung – ein Vergleich der empfohlenen Methoden

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Abstract

International recommendations on clinical voice assessment call for multidimensional, evidence-based protocols, yet national guidelines differ in scope and standardisation. This narrative review compares open-access standards of the American Speech-Language-Hearing Association (ASHA), the European Laryngological Society with the Union of European Phoniaticians (ELS–UEP) and the German Society of Phoniatics and Pediatric Audiology (DGPP).

Across guidelines, there is general consensus that a voice assessment should include a detailed case history, visual laryngeal examination, patient-reported outcome measures (PROMs), auditory-perceptual evaluation, and acoustic and aerodynamic measurements. Differences arise in the weighting of domains, the definition of basic versus extended standards, and the specification of technical requirements and reporting formats. While ASHA offers the most detailed technical recommendations for visual, acoustic and aerodynamic techniques including reporting, the European guideline emphasises a short protocol for visual, perceptual acoustic and aerodynamic parameters. The German guideline provides the most comprehensive description of case history aspects and the measurement of different voice range profile types, and discusses a basic and extended standard including all assessment domains. In all guidelines, adapted protocols are recognised for professional voice users and children, but only partly specified. Underlying reasons for differing recommendations across guidelines include the literature search and consensus finding strategy, availability of validated questionnaires in specific languages and considerations regarding the respective healthcare services. This comparison highlights the need for international harmonisation of current feasible standards and strategies to integrate future technologies including AI driven assessment approaches, transparent reporting of results and shared normative datasets.

Abstrakt

Internationale Richtlinien zur klinischen Diagnostik von Stimmstörungen fordern multidimensionale, evidenzbasierte Protokolle, doch die verfügbaren Leitlinien unterscheiden sich hinsichtlich ihres Umfangs und ihrer Standardisierung. Dieser narrative Review vergleicht die frei zugänglichen Standards der American Speech-Language-Hearing Association (ASHA), der European Laryngological Society mit der Union of European Phoniaticians (ELS–UEP) und der Deutschen Gesellschaft für Phoniatrie und Pädaudiologie (DGPP).

Über alle Leitlinien hinweg besteht allgemeiner Konsens darüber, dass eine Stimmuntersuchung eine detaillierte Anamnese, eine visuelle Untersuchung des Kehlkopfes, vom Patienten berichtete subjektive Beschwerden (PROMs), eine perzeptive Beurteilung sowie akustische und aerodynamische Messungen umfassen sollte. Unterschiede bestehen in der Gewichtung der Bereiche, der Definition von Basisstandards und erweiterten Standards sowie der Spezifizierung von technischen Anforderungen und Berichtsformaten. Während die ASHA die detailliertesten technischen Empfehlungen für visuelle, akustische und aerodynamische Techniken einschließlich der Berichterstattung bietet, legt die europäische Leitlinie den Schwerpunkt auf ein kurzes Protokoll für visuelle, perzeptive und aerodynamische Parameter. Die deutsche Leitlinie enthält die umfassendste Beschreibung zu den Bereichen Anamnese und Messung von unterschiedlichen Stimmumfangsprofilen, und erörtert einen Basisstandard sowie einen erweiterten Standard, der alle Untersuchungsbereiche umfasst. In allen Richtlinien werden angepasste Protokolle für „professional voice users“ und Kinder als notwendig anerkannt, jedoch nur teilweise spezifiziert. Zu den Gründen für die unterschiedlichen Empfehlungen in den Leitlinien zählen die Strategie der Literaturrecherche und Konsensfindung, die Verfügbarkeit validierter Fragebögen in bestimmten Sprachen sowie die Möglichkeiten im jeweiligen Gesundheitssystem. Der vorliegende Vergleich unterstreicht die Notwendigkeit einer internationalen Harmonisierung von Standards und Strategien zur Integration künftiger Technologien, darunter KI-gestützte Untersuchungsansätze, sowie für eine transparente und vergleichbare Berichterstattung von Ergebnissen und die gemeinsame Erstellung und Nutzung von Normdaten.

Keywords:

voice assessment – dysphonia – international guidelines – evidence-based practice

Schlüsselwörter:

Stimmdiagnostik – Dysphonie – internationale Leitlinien – evidenzbasierte Praxis

INTRODUCTION

Voice disorders may result from changes in the structure, innervation, or function of the voice production system and substantially affect communicative abilities and thus participation (Van Houtte et al., 2010). Major symptoms include *dysphonia*, a reduced voice capacity and involuntary alterations of vocal pitch and intensity (Schwartz et al., 2009). Moreover, a voice disorder may lead to substantial psychological distress, potentially contributing to its persistence. Therefore, a comprehensive clinical voice assessment should consider physical, functional and psychological aspects.

Recommendations and guidelines focusing on the assessment of voice disorders across Europe, the United States, Japan, India, as well as a global survey among voice professionals, agree that a case history and visual laryngeal assessment are indispensable examination methods. Moreover, recommended methods partially include the use of symptom specific questionnaires or so-called patient-reported outcome measures (PROMs), a perceptual and acoustic evaluation and aerodynamic measurements. From published research and guidelines, a broad agreement can be inferred that voice assessment procedures should be evidence based, including standardization of procedures (Beushausen et al., 2023; Boominathan et al., 2014; Carding et al., 2009; Lechien et al., 2023; Patel et al., 2018; Payten et al., 2024; Schwartz et al., 2009; Stachler et al., 2018; Umeno et al., 2020).

However, most country specific sources for guidelines are not publicly accessible, or only available in a specific language such as the German voice assessment and treatment guideline, hindering the evaluation and comparison of practices. Moreover, there may be more than one guideline per country, such as in Australia with recommendations from the professional associations RACGP (The Royal Australian College of General Practitioners) and NSW Health (New South Wales Health). Nonetheless, the availability of standards is key to improving clinical services as well as the underlying evidence base.

The present work compares current voice assessment standards from the last 10 years, published by clinician associations, based on a review of methods and available as open access

publication. For this purpose, the voice assessment section of the German voice assessment and treatment guideline will be summarized in more detail (Beushausen et al., 2023), and compared with the assessment protocols published by the American Speech-Language-Hearing Association (Patel et al., 2018) and the European Laryngological Society (ELS) together with the Union of European Phoniaticians (UEP) (Lechien et al., 2023).

US AMERICAN GUIDELINE BY THE ASHA

The US American voice assessment guideline aims to standardize instrumental voice assessment procedures including visual, aerodynamic and acoustic examination methods (Patel et al., 2018). The recommendations are based on a prior work by the ASHA's Special Interest Group for Voice and Voice Disorders (SIG 3) and the National Center for Evidence Based Practice in Communication Disorders (EBSR), which had found insufficient evidence to recommend a comprehensive set of methods for a standard clinical voice evaluation (Patel et al., 2018; Roy et al., 2013). Thus, the current ASHA guideline goals include improving the evidence base and ensuring measurement consistency as well as repeatability. Main aim is to facilitate accurate assessment of treatment outcomes and reliable comparisons between clinicians, clients and institutions (Patel et al., 2018).

An expert panel consisting of speech-language pathologists, (oto-)laryngologists, and voice scientists reviewed research and protocols from various sources including textbooks, peer-reviewed and non-peer-reviewed publications, supplementing evidence with expert consensus where needed. Agreement of content was achieved in seven consensus conference calls and three consensus meetings (2013 - 2015). Detailed results of these conferences are not publicly available.

The guideline provides structured recommendations across three defined key domains: laryngeal endoscopic imaging, acoustic and aerodynamic measurements. Each domain includes defined voice tasks, key characteristics or parameters along with detailed technical specifications for data acquisition, as well as a consistent presentation of results in reporting outcomes (Table 2).

EUROPEAN GUIDELINE BY THE ELS AND UEP

Basis of the current European consensus guideline protocol for voice quality assessment is a preceding guideline for functional voice assessment from the European Laryngological Society (Dejonckere et al., 2001; Lechien et al., 2023). Main aim of the current guideline by the European Laryngological Society (ELS) and the Union of the European Phoniatrians (UEP) is to provide an update and protocol for clinical voice assessment (Lechien et al., 2023).

The present guideline was drafted by a statement committee, composed of 4 experts from the ELS and UEP. Of these, 2 experts chose relevant papers in PubMed, Cochrane Library, and Scopus database using the keywords “voice”; “dysphonia”; “evaluation”; “assessment”. All papers were selected and processed according to PRISMA 2020, however documentation of this process is not accessible for the public (Page et al., 2021). For an initial set of 90 statements, grades of evidence using the GRADE system, focusing on an indication of the likely impact of further research to the statements, were assigned (Guyatt et al., 2008). Thereafter, 19 experts from 13 countries assessed these 90 statements using a Delphi method with two iterative voting rounds (80% agreement for validation), resulting in 51 final statements.

The resulting European guideline specifies methods for five main voice assessment domains, and describes a baseline laryngology consultation and voice quality evaluation, including: (1) medical history, (2) videolaryngostroboscopy, (3) patient-reported voice quality evaluation, (4) perceptual voice quality evaluation, and (5) acoustic measurements. As extended standard, the addition of aerodynamic measurements, a phonetogram (that is, voice range profile, for singing students or singers especially with negative stroboscopy), or an assessment of cough during videoendoscopy are described (Table 2).

GERMAN GUIDELINE BY THE DGPP

Main scope of the German guideline was to develop an interdisciplinary consensus on the diagnosis and treatment of patients with structural, neurogenic and functional voice disorders. Further aims included avoiding inappropriate therapeutic and diagnostic measures, thereby improving the quality of care and reducing health-related costs. Since the relevant documentation is only publicly available in German language, the following section outlines the creation process of the German guideline in more detail (Beushausen et al., 2023).

An expert panel appointed by the executive board of the German Society of Phoniatics and Pediatric Audiology (DGPP) developed the guideline in accordance with the formal procedures of the Association of the Scientific Medical Societies in Germany (AWMF). AWMF are reflecting on new guidelines for the evidence-based diagnosis and treatment of diseases. In this role, the AWMF specifies review, summary and agreement procedures as well as patient information for medical guidelines (see guideline register; (AWMF, 2025 a)) For the here presented German guideline, the project was registered with the AWMF prior to step 1 (Table 1, Supplement 1), and the guideline level S2k was chosen. The relevant rules for the composition are summarised in Table 1 and further specified in Supplement 2 (see step classification; (AWMF, 2025 b)). Moreover, there is a publicly available guideline report (in German), describing all steps taken for this guideline in detail (DGPP, 2022).

Following the policies of the AWMF, the expert group included representatives from all relevant professional associations involved in the diagnosis and treatment of people with voice disorders. Supplement 1 reports the participating specialist societies/organisations and mandate holders. Conflict of interest declarations of all experts were submitted and independently reviewed by Prof. Dr. A. Keilmann, the guideline coordinator from DGPP, and Dr. S. Blödt, representative of the AWMF. There was no relevant conflict of interest or financial aid by third parties, granting editorial independence (DGPP, 2022).

After agreeing on the scope and guideline level, step 2 involved defining review questions covering 4 specified main fields: (1) anatomy and physiology, (2) clinical diagnoses, (3) examination methods and (4) treatment. The present work focuses on chapter 3 “Voice diagnostics” (Beushausen et al., 2023).

Four specialist subgroups performed a narrative review of current literature and proposed text drafts, core statements and recommendations to the guideline group. These were refined in plenary discussion and submitted for online preliminary voting. Recommendations reaching >95% approval (with ≥75% participation) and no major objections were considered pre-consented. These were not put to a second vote at the subsequent consensus conference (step 2). A dedicated patient representative, like all other mandated members, was accorded full voting rights and permitted to propose changes prior to and during the consensus process, such as recommendations of new content, deletions of statements, and the final content vote.

Based on the results of the preliminary vote, the draft guideline was revised by the expert group and submitted to the guideline group again in preparation

of consensus conferences. A two-day consensus conference (step 2) was held in August 2022 with relevant clinicians, practitioners and patient representatives for the purpose of agreeing on the final guideline version. Representatives of the AWMF moderated this meeting and monitored the compliance to the prescribed procedures (Table 1, Supplement 2). The process of structured consensus building was based on the approach of the National Institutes of Health (NIH) and consisted of 7 steps (Supplement 3). In Step 5 of the overall procedure (Table 1), the guideline was adopted by the executive boards of the participating specialist societies/organisations between 13.10.2022 and 05.12.2022 and published on 30.01.2023 in the official open access repository of the AWMF.

REVIEW OF VOICE ASSESSMENT DOMAINS

There is broad agreement between the US American and European with the German guidelines, that a comprehensive voice assessment should comprise at least a visual examination and a medical history, with addition of patient directed symptom specific questionnaires, plus perceptual, aerodynamic, and instrumental acoustic evaluations of the voice production system (Beushausen et al., 2023; Lechien et al., 2023; Patel et al., 2018). However, there are relevant differences regarding the exact assessment methods and procedures (Table 2), which will be reviewed in the following sections.

PATIENT HISTORY

Since the patient history was not a primary focus of the US American guideline, core questions or domains are not explicitly stated. However, the authors emphasise that comprehensive voice evaluation includes obtaining a thorough case history, alongside a comprehensive assessment battery and an evaluation of the impact of the voice disorder on an individual's daily function and quality of life.

In contrast, the European guideline lists highly relevant topics in the patient history, including general medical history with information on current treatments, symptoms of laryngopharyngeal reflux, allergies, tobacco or alcohol use, and the patient's voice use including occupation and singing practices.

In the German guideline, an exhaustive list of important patient history domains with detailed descriptions is given. Recommended domains include a general medical history, with specifically ear (hearing), nose, and throat conditions, allergies, medications and past surgeries, current

Step	Description (please refer for further details to Supplement 2)
1	Formation of guideline group representative of the target audience and relevant professional association(s) and/or organisation(s) including patients/citizens (see AGREE II, criteria 4 + 5). Guideline text and recommendations are formulated.
2	Methods for formulating consensus are clearly described and include formal consensus techniques, for example, consensus conference, nominal group process, or Delphi method (see AGREE II criterion 10)
3	Each recommendation is discussed and agreed upon employing a structured consensus-building process under neutral moderation. Outstanding decision-making issues are resolved, the grading of the recommendations is determined, and the strength of the consensus is measured.
4	Writing of a description of the methodological approach (guideline report) including information on the validity period and updating of the guideline, and a contact person for updating.
5	Approval by executive boards of all participating professional societies and organisations for the guideline.

Table 1. Summary of steps for the guideline building process as specified by the Association of Scientific Medical Societies e.V. (Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften e. V., AWMF)

psychological stress, exposure to nicotine, alcohol, solvents or dust. Further a voice specific family history, current occupation and leisure-time voice use and voice related symptoms such as dysphonia or increased effort, including their onset, trigger, duration until recovery and accompanying symptoms (such as cough or pain) and their impact on everyday life are addressed. Additional topics are voice function in childhood and during voice mutation, voice training experiences (speech training, singing activities) and previous voice treatments. Specific domains of relevance for professional singers and children are described in individual sections. Further, the guideline summarises medications suspected to affect laryngeal function (section 2.9).

ASSESSMENT OF VOICE RELATED SUBJECTIVE SYMPTOMS: QUESTIONNAIRES

In the European guideline, either the 30-question version of the Voice Handicap Index (VHI) or the 10-question version of the Voice Handicap Index (VHI-10) are recommended as basic standard. As extended standard, the Reflux Symptom Score (RSS) and Reflux Sign Assessment (RSA) are described for suspected laryngopharyngeal reflux (LPR), and the Eating-Assessment Tool-10 (EAT-10) and Dysphagia Handicap Index (DHI) for the assessment of dysphagia.

In the German guideline, the Voice Handicap Index (VHI) in the German 30, 12 and 9 question ver-

Symptom specific questionnaires
This assessment domain was not in the scope of the US American guideline

Assessment domain	USA (Patel et al., 2018)	EU (Lechien et al., 2023)	Germany (G) (Beushausen et al., 2023)	Comment
Singing Voice Range Profile	–	(X) <i>f</i> ₀ STD, range of intensity (dB), minimal and maximal intensity (dB)	(X)	
Jitter	–	X percent jitter	(X)	
Shimmer	–	X percent shimmer	(X)	
Harmonics-to-noise-ratio (HNR)	–	–	(X)	
Noise-to-harmonic ratio	–	X	–	
CPP(S)	X	–	(X)	
Spectrogram	–	–	(X) tasks: vowel, weekdays, text	
Specification of vocal tasks for measuring voice quality related parameters such as jitter, shimmer HNR, NHR, CPP(S)	CPP: sustained vowel /a:/ for 3–5 s and standard reading passage	jitter, shimmer, NHR: sustained vowel /a:/, considering the 3 middle seconds, possibly also at different levels of 60, 70, and 80 dB	jitter, HNR, CPP(S): three times sustained vowel /a:/ with minimum of 5 seconds, analysis of stable mid-portion, mean value of the 3 recordings	
Specification of voice tasks for measurements of <i>f</i> ₀ and SPL	mean <i>f</i> ₀ and SPL, <i>f</i> ₀ standard deviation: standard reading passage <i>f</i> ₀ and SPL range (minimum and maximum): glide on vowel /a:/	–	verbal instructions and task description for all voice range profile parameters	
Technical specifications: acoustic recording equipment and technique	comprehensive summary of specification	computer with analysis acoustic software or with professional high-resolution sound microphone (microphone at 4 cm from the mouth)	after Patel et al., 2018	
Technical specifications: acoustic recording environment	comprehensive summary of specification	quiet room, or a quiet consultation office, or (if available, a sound proof booth)	after Patel et al., 2018	
Aerodynamic				
Maximum phonation time (MPT)	–	(X) 3 times sustained vowel /a:/, of these the longest take	X reference to ELS Guideline (by Dejonckere et al., 2001)	
Vital Capacity (VC)	–	(X) recommended for patients with lung dysfunction	X	
S/Z ratio	–	–	(X)	
Average glottal airflow rate	X	–	(X)	
Average interpolated air pressure	X	–	(X)	
Tasks specified	measurement under control of mean vocal SPL (dB) and vocal frequency (Hz) during the task, /pi:pi:pi:pi:pi:/ at habitual pitch and loudness levels at ~1.5–2 syllables/s /pi:pi:pi:pi:pi:/ at raised loudness levels (e.g., increased by 6 dB SPL) at ~1.5–2 syllables/s, measures are from the three middle syllables of each syllable string	MPT: 3 sustained vowel /a:/, the longest MPT is taken	reference to US American standard by Patel et al., 2018	

(X) indicates the extended standard in the European and German guidelines

Table 2: Main recommendations of assessment steps after domains in patients with voice disorders according to the current American, European and German guidelines

sions have been recommended as core standards (Gräßel, Hoppe & Rosanowski, 2007; Nawka et al., 2003; Nawka et al., 2009).

As extended standard, the German Vocal Tract Discomfort (VTD) Scale has been recommended. The VTD Scale measures symptoms of discomfort in the vocal tract including burning, tightness, dryness, pain, tickling, soreness, irritation, and a lump in the throat (Mathieson et al., 2009). These symptoms are rated on two seven-point Likert subscales, recording the frequency (0= never, 2= sometimes, 4= often, 6= always) and severity (0= none, 2= mild, 4= moderate, 6= extreme) of each symptom. To date, the scale has been translated and validated into several languages, for example Polish, Portuguese and German (Lukaschyk, Brockmann-Bauser & Beushausen 2016). The German translation has been successfully used in longitudinal studies by Lukaschyk et al., (2021).

Moreover, the German version of the Voice-Related Quality of Life Questionnaire (V-RQOL) assessing the general quality of life in persons with voice disorders was recommended for specific clinical questions (Hogikyan & Sethuraman 1999; Schwanfelder et al., 2008). The 10 items, rated on a five-point Likert scale, map various aspects of voice-related quality of life regardless of age, type of voice disorder, and gender. Cut-off values are not yet available, and voice-related quality of life is described in an overall score.

Also, the German questionnaire for the assessment of the voice self-concept (Fragebogen zur Erfassung des Stimmlichen Selbstkonzepts, FESS) was included as recommendation for specific questions regarding personality-related aspects of the voice. Namely, the closeness of the relationship with one's own voice, voice awareness, and the connection between voice and emotion are covered (Nusseck et al. 2015).

Furthermore, the German Pediatric Voice Handicap Index (pVHI; Zur et al., 2007), designed for completion by children and/or their parents, and the German Singing Voice Handicap Index (SVHI; Cohen et al., 2007; Lorenz et al., 2013) developed for singers, are recommended as specific assessment tools for children and singers respectively (Beushausen et al., 2023).

Overall, the VHI-30 or VHI-10 is standard in all three guidelines. However, the German VHI versions (long and short), as well as the VTD scale, are cross-cultural validations of English-language instruments, with heterogeneous translation and validation procedures. Further, the FESS is a new German-language development with no equivalent in the US and EU guideline.

As a conclusion, there remains a lack of well-designed, psychometrically robust and comparable self-assessment instruments across all guidelines. Also, especially vulnerable patient groups such as children, professional voice users or aged persons are not sufficiently considered to date.

VISUAL ASSESSMENT

For visual assessment, the US American guideline recommends both videoendoscopy and videostroboscopy as standard assessments. Videoendoscopy is recommended for the gross level visual-perceptual laryngeal assessment, including vocal fold medial edges and mobility (for example, abduction/adduction), supraglottic activity during phonation, and laryngeal maneuvers during transitional movements. Recommended stroboscopic assessment criteria of videostroboscopy are the vibratory function of the vocal folds, including the parameters regularity, vocal fold vibratory amplitude and mucosal wave, vocal fold phase symmetry, vertical level, and glottal closure patterns and duration. The guideline specifies observation tasks such as rest breathing, the diadochokinetic task to phonate /i:/, alternated /i:/-sniff maneuver or /i:/-quick inhale, sustained phonation of /i:/ at stable typical pitch and loudness, varied pitches and loudness levels. Moreover, detailed technical requirements, examination procedure, definition of key terms (such as “regularity”) are provided. As supplement, a specific template for the visual examination is provided, on which the mucosal wave and amplitude of each side are rated in steps of 0, 25, 50, 75 and 100%. To further assess the vocal fold vibratory properties in more detail, when the triggering of stroboscopic light remains intermittent or irregular, laryngeal high-speed videoendoscopy and videokymography are recommended.

In the European guideline, a structured videolaryngostroboscopic assessment with flexible or rigid endoscope during rest breathing, sustained vowel /i/ and sniff maneuver is recommended. Mucosal wave symmetry and amplitude, the regularity, glottal closure, vocal fold movement and mobility and cord joint, and morphological characteristics such as color, vascularisation and lesions should be rated with a 4-point Likert scale [no (0), mild (1), moderate (2), and severe (3) alteration]. These characteristics are partially included in the accompanying overall assessment template ‘Voice Quality Assessment of ELS – UEP’.

In the German guideline, both videoendoscopy and videostroboscopy are described as standard assessments. Details regarding advantages and

disadvantages of the techniques and assessment criteria are described in the text. As main assessment criteria, glottal opening and closure, the vocal fold vibratory amplitude and mucosal wave are specified. For the rating scheme, the guideline refers, as a minimal standard, to the specifications of the US American guideline. Further, it is recommended to consider high-speed video endoscopy (HSV) as a supplement to stroboscopy for the objective assessment of vocal fold vibration behavior.

PERCEPTUAL ASSESSMENT

In general, perceptual voice evaluation is recognised as a core assessment domain, but it is operationalised differently across the guidelines. The US American ASHA guideline does not formally define a specific rating scale within its instrumental focus, although CAPE-V has become the *de facto* standard protocol. In turn, the European guideline recommends the GRBAS/GIRBAS scale, whereas the German guideline recommends RBH scale as the routine clinical instrument, with GRBAS mainly used in research contexts and as extended standard.

Initially recommended by The Japan Society of Logopedics and Phoniatics for the diagnosis of dysphonia, the GRBAS scale (Hirano 1981) has become one of the most widely used perceptual assessment systems. The acronym *GRBAS* denotes the five dimensions Grade (of overall dysphonia), Roughness, Breathiness, Asthenia and Strain. Each parameter is assessed on a four-point ordinal scale from 0 to 3 (0 – not dysphonic/normal; 1 – slight; 2 – moderate; 3 – extreme). While *G* represents the general degree of dysphonia, the other four parameters refer to subcomponents of audible hoarseness, whereby the point value of *G* is equal to the highest value of the other subcomponents. Dejonckere and colleagues later introduced the parameter *I* (for instability) into this system (Dejonckere et al. 1996). Instability represents the occurrence of fluctuations in voice quality over time. Together, these variants are used worldwide as the so-called GIRBAS or GRBAS_I score.

In German-speaking countries, clinical routine mainly relies on the RBH scale (R=roughness, B=breathiness, H=hoarseness), which was developed as a simplified adaptation of the GRBAS scale using the identical rating scheme (Wendler et al. 1986; Anders et al. 1988). Considered more economical than the GRBAS score in the assessment of voice quality, this system has become established in German-speaking countries and is also recommended in the ELS protocol (Dejonckere et al., 2001).

The Consensus Auditory Perceptual Evaluation of Voice (CAPE-V) was proposed in 2002 by the American Speech-Language-Hearing Association (ASHA) (Kempster et al., 2009; Zraick et al., 2011). The CAPE-V protocol organises auditory-perceptual ratings into a main severity level completed by several specific subcategories. Compared with the other instruments described above, it offers a more detailed and therefore more complex rating structure. The ASHA provides precise instructions on the recommended use of the CAPE-V for clinical voice assessment. The protocol specifies rating components of overall severity, roughness, breathiness, strain, pitch and loudness on visual analogue scales based on sustained vowels (/a:/, /i:/), six standardised sentences and spontaneous speech. In addition to these six components, the clinician can provide further information about the voice: up to two additional characteristics of the voice sound, such as diplophonia, vocal fry, falsetto, asthenia, aphonia, pitch instability, tremor, wetness/gurgling, and comments on resonance can thus complement the assessment of the voice. In contrast to the GRBAS scale and the RBH scores, the assessment is based on visual analog scales. The CAPE-V protocol is available in numerous linguistically adapted versions including Spanish, Portuguese, Italian, and Turkish.

INSTRUMENTAL ACOUSTIC MEASUREMENTS

In the US American guideline, the measurement of mean *f₀* and *f₀* standard deviation and mean SPL from a standard reading passage is recommended. In addition, minimum and maximum *f₀* and SPL ranges should be evaluated with a glide on the vowel /a:/, and CPP is recommended as a voice quality related measure during vowel phonation and reading of a standard text (for example, CAPE-V recordings). All recommended parameters are defined with their respective measurement method, and an outcome reporting scheme is provided (Appendix B of the guideline).

The US guideline summarises a comprehensive state-of-the-art technical recommendation for acoustic recording and calibrating procedures. External recording hardware, a sampling rate of ≥ 44.1 kHz and 16 bits resolution, and file storage as uncompressed standard formats such as .wav format are recommended. Background noise levels should be recorded for 5 seconds to verify signal quality, and ambient noise levels should be at least 10 dB below the quietest phonations.

The European guideline specifies that mean *f₀*, percent jitter, percent shimmer, and noise-to-harmonic

ratio (NHR) should be assessed in all patients. In professional voice users, additional measures such as the standard deviation of f_0 (STD), range of intensity (dB), minimal intensity (dB), and maximal intensity (dB) were recommended. Acoustic parameters should primarily be measured on a sustained vowel /a:/, considering the 3-middle seconds at stable dB level; as possible extension, measurements at 60, 70, and 80 dB are described.

Recording recommendations include a quiet room, consultation office or sound-proof booth, voice sample recording using a PC with acoustic analysis software such as PRAAT or commercial systems, including a professional high-resolution microphone with a recording distance of 4 cm from the mouth (Lechien et al., 2023). A documentation sheet (Appendix 1) lists the parameters mean f_0 , percent jitter, percent shimmer, NHR, and the optional measures (STD (f_0), range of intensity, minimal/maximal intensity), but does not specify exact parameters or recording conditions.

In the German guideline, instrumental acoustic assessment recommendations comprise voice range profile (VRP)-based measures of vocal intensity and pitch, complemented by selected voice quality parameters. The basic standard includes the measurement of a so-called speaking voice range profile, with determination of the mean and range of the fundamental frequency (f_0) and intensity (SPL) of the speaking voice. For the extended standard, a complete VRP of the speaking, calling and singing voice are recommended. The definitions for the VRP types and eliciting tasks refer to a paper by Reetz et al. and are provided as Supplement 4 (Reetz et al., 2019).

In the guideline, the standardised reading text, evaluation and reporting criteria for the speaking voice profile are described, including the mean speaking voice frequency (in Hz and/or musical notation) and frequency range (in semitones, specified in musical notation and/or in Hz), the average speaking volume (dB(A)) and dynamic range (SPL max - SPL min, dB(A)) and/or maximum calling voice intensity (SPL max, dB(A)). For the singing voice profile, the minimum and maximum intensity (SPL min and SPL max, dB(A)), dynamic range (SPL max - min, dB(A)), the minimum and maximum frequency (f_0 min and f_0 max. in Hz and/or musical notation) and the frequency range (Hz, and/or musical notation and semitones, Hz) have been described as assessment and reporting criteria.

For instrumental acoustic evaluation of voice quality, the parameters jitter, harmonics-to-noise-ratio (HNR) and (Smoothed) Cepstral Peak Prominence (CPP(S)) as well as Spectrograms are named. Jitter, HNR and CPP(S) should be derived from three phonations of /a:/ with minimum duration of 5 seconds, analysing

a stable mid-portion and averaging across the three recordings (Table 2). Jitter and shimmer analyses are only recommended for voices that are perceptually at most moderately dysphonic (R2B2H2, equaling G2R2B2A-S-). Standardised spectrograms should be based on at least 3 seconds of vowel phonation, automated speech (for example weekdays), and text. Evaluation criteria are regularity (= defined wave-like appearance of the overtone bands), noise (= unspecific distribution), hard voice onset, voice breaks (= highly noisy components) and attenuation of specific frequency ranges (such as damping or missing overtones above 1000 Hz).

The German guideline includes a description and review of the recommended acoustic parameters and technical requirements for data acquisition largely basing on the guidelines by the ASHA (Patel et al., 2018). German recommendations also include microphone specifications, for example an omnidirectional headset microphone with a standard distance of 4–10 cm or 30 cm at an angle of 45°–90° to the side of the mouth, frequency response between 50–8000 Hz, sensitivity of at least -60 dB with balanced output, used with preamplifiers without automatic gain control, filter or equalizer functions, and adjustable amplification (and preamplification), to avoid signal distortion and peak clipping. According to the guideline, reporting of results should include technical specifications such as recording conditions, equipment, exact parameters including calculation strategy and software, and the voice intensity level during voice quality measurements to facilitate basic data comparability.

AERODYNAMIC ASSESSMENT

In the European guideline, Maximum Phonation Time (MPT) is part of the current extended standard and is defined as the longest of three repetitions of the sustained /a:/ (Lechien et al., 2023). In turn, in the German guideline, the parameters MPT and Vital Capacity (VC) are recommended as basic aerodynamic assessment parameters. Included are a definition and description of the parameters' clinical role, and a reference to the original European guideline from 2001 for their measurement (Dejonckere et al., 2001).

For the extended standard in the German guideline, supplemental parameters are s/z ratio, average glottal airflow rate (L/s or ml/s) and average interpolated (subglottal) air pressure (cmH₂O or kPa). For the latter two a reference is done to the US American guideline, which proposes their measurement under controlled mean vocal SPL (dB) and frequency f_0 (Hz) during the production of the syllable trains

/pi:pi:pi:pi:/ at habitual and increased loudness levels. The US American guideline provides detailed technical instructions and a reporting template for these measures (Appendix C; Patel et al., 2018).

SPECIFIC RECOMMENDATIONS

While the US American and European guidelines do not focus on assessing children, the German guideline specifies recommendations based on the protocol for adults of the European Laryngological Society (ELS) (Friedrich, 2005), which should be adapted to the age of the patient. In so-called functional voice disorders, the case history should follow the International Classification of Functioning, Disability and Health-Children & Youth (ICF-CY) framework, covering the developmental status, interaction, personality, and social environment. Laryngeal exams should be conducted in an age-appropriate manner, using flexible endoscopes ($\varnothing$ 2.4–2.8 mm) or in children >2.5 years with paediatric rigid optics (70°/90°). However, due to the challenges to conduct a laryngoscopic assessment in children, assessing vocal function and performance is described as crucial. Recommendations include pre/post-therapeutic samples (spontaneous speech, serial speech, a picture description, reading, calling), measurements of MPT, /s/ and /z/, mean speaking frequency (f_0) as well as the frequency and dynamic range. Moreover, the RBH scale is recommended, with minimal breathiness as expected voice characteristic in children. Acoustic analysis of the sustained /a:/ was described for jitter/shimmer extraction. From age 3 onwards, with reference to normative data for ages 6–17, speech and singing VRPs are recommended (Berger et al., 2019; Dienerowitz et al., 2021).

For singers, the three guidelines differ considerably in the extent to which they address the singing voice. The US protocol remains predominantly speech-oriented and does not include dedicated singing tasks, whereas both the European and the German guidelines explicitly consider singers. The European consensus recommends a voice range profile (VRP, phonetogram) and glissando tasks, while the German guideline underlines the importance of an extensive assessment, as even subtle voice dysfunction can greatly affect a singer's performance. It specifically recommends a perceptual evaluation of the singer's habitual artistic singing voice (vocal exercises and selected repertoire), an extended singing voice range profile combined with a speech voice range profile, and documentation of cervical muscle tension, visible neck strain, and patient-reported throat discomfort. Nonetheless, the authors note that the evaluation of the singing voice

is not standardised, and singing style-specific adaptation remains necessary.

DISCUSSION

Regarding the assessment domains, there is broad agreement between the here discussed US American, European and German guidelines, that primarily a patient history and visual examination of the larynx, then patient-reported outcome measurements by questionnaires, perceptual voice evaluation, instrumental acoustic and aerodynamic measurements are components of a comprehensive voice examination (Beushausen et al., 2023; Lechien et al., 2023; Patel et al., 2018). However, the exact methods and parameters differ in several relevant aspects, especially regarding the assignment of assessment domains to essential and supplementary categories and the measurement and reporting of acoustic and aerodynamic data (Table 2).

IMPLICATIONS OF THE DIAGNOSTIC PROCESS AND REPORTING FOR THE TREATMENT STRATEGY

Considerations of the implications of the presently available guidelines include a discussion about what we aim to achieve with a voice assessment. In some cases, it may be sufficient for the individual to rule out structural pathology, whereas others present with complex situations that clearly require a thorough evaluation of voice function restriction and the respective impact on daily life. In both cases, a successful treatment depends on precise diagnosis and clear reporting to support appropriate referral. To provide the best available care, equal basic standards should be applied.

However, in individuals with special vocal demands such as singers, or with suspected illnesses such as in Parkinson's disease, tailored assessment protocols may yield more informative markers of functional limitations (Baker et al., 2024; Brockmann-Bauser & de Paula Soares, 2023; Rusz et al., 2021). Similarly, age specific criteria for healthy voice function should be applied at least in children (Berger et al., 2019; Sood et al., 2017; Voigt-Zimmermann et al., 2015). For these specific questions, disease-, demand-, and age-specific assessment protocols have to be described and evaluated, requiring far more normative data for an informed choice of standards.

It is comparatively easy to report on questionnaires (please indicate the questionnaire version and reference to the evaluation key). By contrast, a comprehensive summary of visual and acoustic findings

presupposes standardised acquisition, analysis and detailed reporting including technical details. While the German guideline states, that such details should be reported, the US American guideline offers the most comprehensive technical description including a detailed template for reporting laryngoscopic, acoustic and aerodynamic findings.

However, all guidelines circumvent the problem that there is a lack of comprehensive normative values with regard to age and training status for visual assessment and most acoustic analysis approaches. This raises the question of how an evidence based international consensus can be achieved and implemented best within realistic resource constraints. It is clear from these questions, that there will be no simple answer. Therefore, joint international efforts are needed to promote the use and transparent reporting of comparable standardised assessment parameters and classification systems in both clinical and research settings.

HOW SHOULD WE SHAPE FUTURE GUIDELINES?

Naturally, in the choice of questionnaires, availability in the respective language has been one of the leading criteria. For visual, acoustic and aerodynamic techniques, however, the selection of literature, review strategy and consensus process as well as structural factors, including accessibility and reimbursement of specific assessment techniques, have strongly impacted the recommendations. This was openly discussed in the German and European

guideline for High-Speed Video (HSV) techniques, which were not recommended due to a lack of availability in clinical and research settings. While clinician associations should address demands specific to their respective healthcare systems, it is important to look at assessment standards from the perspective of evidence. That is, to define the best possible standards in terms of current knowledge. While this leaves out the question of feasibility, this provides a scientifically driven basis for decision-making in patient care, research, education of professionals as well as the negotiation for funding and reimbursement.

Thus, for the future we should consider how the best possible assessment can be provided on the basis of existing evidence, and, in parallel, how low-cost strategies can be developed to increase the accessibility. Smartphone-based, AI-supported screening tools have been tested in a number of studies, and may be accessible in the near future. However, as stressed by several authors, a successful application depends on accurate accumulation and labeling of training data. Therefore, international standardisation of data collection and a clear rationale of what we specifically measure will be crucial for further development of these techniques (Al-Hussain et al., 2022; Bensoussan et al., 2024; Brockmann-Bauser, 2025; Yao et al., 2025).

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

References

- [1] Al-Hussain, G., Shuweihdi, F., Alali, H., Househ, M., & Abd-Alrazaq, A. (2022). The Effectiveness of Supervised Machine Learning in Screening and Diagnosing Voice Disorders: Systematic Review and Meta-analysis. *Journal of Medical Internet Research*, 24(10), e38472. <https://doi.org/10.2196/38472>
- [2] AWMF. Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften. (2025 a). Die AWMF – *Die starke Stimme der wissenschaftlichen Medizin*. <https://www.awmf.org/die-awmf>
- [3] AWMF. Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften. (2025 b). *Stufenklassifikationen. AWMF-Regelwerk Leitlinien*. <https://www.awmf.org/regelwerk/stufenklassifikationen>
- [4] Baker, C. P., Sundberg, J., Purdy, S. C., Rakena, T. J., & Leão, S. H. de S. (2024). CPPS and Voice-Source Parameters: Objective Analysis of the Singing Voice. *Journal of Voice: Official Journal of the Voice Foundation*, 38(3), 549–560. <https://doi.org/10.1016/j.jvoice.2021.12.010>
- [5] Bensoussan, Y., Elemento, O., & Rameau, A. (2024). Voice as an AI Biomarker of Health-Introducing Audiomics. *JAMA Otolaryngology Head & Neck Surgery*, 150(4), 283–284. <https://doi.org/10.1001/jamaoto.2023.4807>
- [6] Berger, T., Peschel, T., Vogel, M., Pietzner, D., Poulain, T., Jurkutat, A., Meuret, S., Engel, C., Kiess, W., & Fuchs, M. (2019). Speaking Voice in Children and Adolescents: Normative Data and Associations with BMI, Tanner Stage, and Singing Activity. *Journal of Voice: Official Journal of the Voice Foundation*, 33(4), 580.e21-580.e30. <https://doi.org/10.1016/j.jvoice.2018.01.006>
- [7] Beushausen, U., Bohlender, J., Brockmann-Bauser, M., Caffier, P., Dicks, P., Deuster, D., Echternach, M., Fuchs, M., Hülse, R., Jungheim, M., Keilmann, A., Lehnert, B., Mürbe, D., Nawka, T., Richter, B., Schönweiler, R., Schützenberger, A., Traser, L., & Voigt-Zimmermann, S. (2023). *S2k-Leitlinie. Diagnostik und Therapie von Störungen der Stimmfunktion (Dysphonien)*, (AWMF-Registernummer 049 – 008; Version 4.0). AWMF-Institut

- für Medizinisches Wissensmanagement. <https://www.awmf.org/service/awmf-aktuell/diagnostik-und-therapie-von-stoerungen-der-stimmfunktion-dysphonien>
- [8] Boominathan, P., Samuel, J., Arunachalam, R., Nagarajan, R., & Mahalingam, S. (2014). Multi parametric voice assessment: Sri ramachandra university protocol. *Indian Journal of Otolaryngology and Head and Neck Surgery: Official Publication of the Association of Otolaryngologists of India*, 66(Suppl 1), 246–251. <https://doi.org/10.1007/s12070-011-0460-y>
- [9] Brockmann-Bauser, M. (2025). How Well Will AI Help Recognize Voice Disorders? A State-of-the-art Review of Current Acoustic Assessment Strategies and Future Applications. *World Journal of Otorhinolaryngology - Head and Neck Surgery*, n/a(n/a). <https://doi.org/10.1002/wjo2.70015>
- [10] Brockmann-Bauser, M., de Paula Soares, M. F. (2023). Do We Get What We Need from Clinical Acoustic Voice Measurements? *Applied Sciences*, 13(2), 941.
- [11] Carding, P. N., Wilson, J. A., Mackenzie, K., & Deary, I. J. (2009). Measuring voice outcomes: State of the science review. *The Journal of Laryngology & Otology*, 123(8), 823–829. DOI: 10.1017/S0022215109005398
- [12] Cohen, SM., Jacobson, BH., Garrett, CG., Noordzij, JP., Stewart, MG., Attia, A. u. a. Creation and validation of the Singing Voice Handicap Index. *Ann Otol Rhinol Laryngol*. Juni 2007;116(6):402–6.
- [13] Dejonckere, P. H., Bradley, P., Clemente, P., Cornut, G., Crevier-Buchmann, L., Friedrich, G., Van de Heryning, P., Remacle, M., & Woisard, V. (2001). A basic protocol for functional assessment of voice pathology, especially for investigating the efficacy of (phonosurgical) treatments and evaluating new assessment techniques. Guideline elaborated by the Committee on Phoniatrics of the European Laryngological Society (ELS). *European Archives of Otorhinolaryngology*, 258, 77–82. <https://doi.org/10.1007/s004050000299>
- [14] DGPP. Deutsche Gesellschaft für Phoniatrie und Pädaudiologie e. V. (2022). *Leitlinienreport zur S2k-Leitlinie Diagnostik und Therapie von Störungen der Stimmfunktion (Dysphonien) (AWMF-Registernummer 049-008)*. AWMF-Institut für Medizinisches Wissensmanagement. <https://register.awmf.org/de/leitlinien/detail/049-008>
- [15] Dienerowitz, T., Peschel, T., Vogel, M., Poulain, T., Engel, C., Kiess, W., Fuchs, M., & Berger, T. (2021). Establishing normative data on singing voice parameters of children and adolescents with average singing activity using the voice range profile. *Folia Phoniatrica et Logopaedica*, 73(6), 565–576. <https://doi.org/10.1159/000517774>
- [16] Friedrich, G. & Dejonckere, P. H. (2005). Das Stimmdiagnostik-Protokoll der European Laryngological Society (ELS)—Erste Erfahrungen im Rahmen einer Multizenterstudie. *Laryngo-Rhino-Otologie*, 84(10), 744–752. <https://doi.org/10.1055/s-2005-861450>
- [17] Guyatt, G. H., Oxman, A. D., Vist, G. E., Kunz, R., Falck-Ytter, Y., Alonso-Coello, P., & Schünemann, H. J. (2008). GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ (Clinical Research Ed.)*, 336(7650), 924–926. <https://doi.org/10.1136/bmj.39489.470347.AD>
- [18] Grässel, E., Hoppe, U., Rosanowski, F. (2008). Graduierung des Voice-Handicap-Index. *HNO*. 56(12).
- [19] Hogikyan, ND., Sethuraman, G. Validation of an instrument to measure voice-related quality of life (V-RQOL). *J Voice* Dezember 1999;13(4):557–69.
- [20] Lechien, J. R., Geneid, A., Bohlender, J. E., Cantarella, G., Avellaneda, J. C., Desuter, G., Sjogren, E. V., Finck, C., Hans, S., Hess, M., Oguz, H., Remacle, M. J., Schneider-Stickler, B., Tedla, M., Schindler, A., Vilaseca, I., Zabrodsky, M., Dikkers, F. G., & Crevier-Buchman, L. (2023). Consensus for voice quality assessment in clinical practice: Guidelines of the *European Laryngological Society and Union of the European Phoniatrists*. *European Archives of Oto-Rhino-Laryngology: Official Journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS): Affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery*, 280(12), 5459–5473. <https://doi.org/10.1007/s00405-023-08211-6>
- [21] Lorenz, A., Kleber, B., Büttner, M., Fuchs, M., Mürbe, D., Richter, B., u. a. Validierung des Singing Voice Handicap Index in der deutschen Fassung. *HNO*. August 2013;61(8):699–706.
- [22] Lukaschik, J., Abel, J., Brockmann-Bauser, M., Keilmann, A., Braun, A., Rohlf, A. K. Cross-Validation and Normative Values for the German Vocal Tract Discomfort Scale. *J Speech Lang Hear Res*. 2021 Jun 4;64(6):1855-1868.
- [23] Lukaschik, J., Brockmann-Bauser, M., Beushausen, U. Transcultural Adaptation and Validation of the German Version of the Vocal Tract Discomfort Scale. *J Voice*. März 2017;31(2):261.e1-261.e8.
- [24] Mathieson, L., Hirani, SP., Epstein, R., Baken, RJ., Wood, G., Rubin, JS., Laryngeal manual therapy: a preliminary study to examine its treatment effects in the management of muscle tension dysphonia. *J Voice*. 2009 May;23(3):353-66.
- [25] Nawka, T. I., Wiesmann, U., Gonnermann, U., Validierung des Voice Handicap Index (VHI) in der deutschen Fassung. *HNO*. November 2003;51(11):921–30.
- [26] Nusseck, M., Richter, B., Echternach, M., Spahn, C. Entwicklung eines Fragebogens zur Erfassung des stimmlichen Selbstkonzepts. *HNO* 2015;63(2):125–31.
- [27] Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- [28] Patel, R. R., Awan, S. N., Barkmeier-Kraemer, J., Courey, M., Deliyiski, D., Eadie, T., Paul, D., Svec, J. G., & Hillman, R. (2018). Recommended Protocols for Instrumental Assessment of Voice: American Speech-Language-Hearing Association Expert Panel to Develop a Protocol for Instrumental Assessment of Vocal Function. *Am J Speech Lang Pathol*, 27(3), 887–905. https://doi.org/10.1044/2018_ajslp-17-0009
- [29] Payten, C. L., Weir, K. A., & Madill, C. J. (2024). Investigating current clinical practice in assessment and diagnosis of voice disorders: A cross-sectional multidisciplinary global web survey. *International Journal of Language & Communication Disorders*, 59(6), 2786–2805. <https://doi.org/10.1111/1460-6984.13116>

- [30] Reetz, S., Bohlender, J. E., & Brockmann-Bauser, M. (2019). Do Standard Instrumental Acoustic, Perceptual, and Subjective Voice Outcomes Indicate Therapy Success in Patients With Functional Dysphonia? *J Voice*, 33(3), 317–324. <https://doi.org/10.1016/j.jvoice.2017.11.014>
- [31] Roy, N., Barkmeier-Kraemer, J., Eadie, T., Sivasankar, M. P., Mehta, D., Paul, D., & Hillman, R. (2013). Evidence-based clinical voice assessment: A systematic review. *Am J Speech Lang Pathol*, 22(2), 212–226. [https://doi.org/10.1044/1058-0360\(2012/12-0014\)](https://doi.org/10.1044/1058-0360(2012/12-0014))
- [32] Rusz, J., Tykalova, T., Ramig, L. O., & Tripoliti, E. (2021). Guidelines for Speech Recording and Acoustic Analyses in Dysarthrias of Movement Disorders. *Movement Disorders: Official Journal of the Movement Disorder Society*, 36(4), 803–814. <https://doi.org/10.1002/mds.28465>
- [33] Schwartz, S., Cohen, S., Dailey, S., Rosenfeld, R., Deutsch, E., Gillespie, M., Granieri, E., Hapner, E., Kimball, C., Krouse, H., McMurray, J., Medina, S., O'Brien, K., Ouellette, D., Messinger-Rapport, B., Stachler, R., Strode, S., Thompson, D., Stemple, J., ... Patel, M. (2009). Clinical practice guideline: Hoarseness (dysphonia). *Otolaryngology–Head and Neck Surgery*, 141(3 Suppl. 2), S1–S31. <https://doi.org/10.1016/j.otohns.2009.06.744>
- [34] Sood, S., Street, I., & Donne, A. (2017). Hoarseness in children. *British Journal of Hospital Medicine*, 78(12), 678–683. <https://doi.org/10.12968/hmed.2017.78.12.678>
- [35] Stachler, R. J., Francis, D. O., Schwartz, S. R., Damask, C. C., Digoy, G. P., Krouse, H. J., McCoy, S. J., Ouellette, D. R., Patel, R. R., Reavis, C. C. W., Smith, L. J., Smith, M., Strode, S. W., Woo, P., & Nnacheta, L. C. (2018). Clinical Practice Guideline: Hoarseness (dysphonia) (Update)–Executive Summary. *Otolaryngology–Head and Neck Surgery*, 158(3), 409–426. <https://doi.org/10.1177/0194599817751031>
- [36] Umeno, H., Hyodo, M., Haji, T., Hara, H., Imaizumi, M., Ishige, M., Kumada, M., Makiyama, K., Nishizawa, N., Saito, K., Shimoto, O., Suehiro, A., Takahashi, G., Tateya, I., Tsunoda, K., Shiotani, A., & Omori, K. (2020). A Summary of the Clinical Practice Guideline for the Diagnosis and Management of Voice Disorders, 2018 in Japan. *Auris, Nasus, Larynx*, 47(1), 7–17. <https://doi.org/10.1016/j.anl.2019.09.004>
- [37] Van Houtte, E., Van Lierde, K., D'Haeseleer, E., & Claeys, S. (2010). The prevalence of laryngeal pathology in a treatment-seeking population with dysphonia. *Laryngoscope*, 120(2), 306–312. <https://doi.org/10.1002/lary.20696>
- [38] Voigt-Zimmermann, S., Schönweiler, R., Fuchs, M., Beushausen, U., Kollbrunner, J., Ribeiro von Wersch, A., & Keilmann, A. (2015). Dysphonien bei Kindern – Teil 2: Interdisziplinärer Konsens zu Diagnostik und Therapie. *Sprache – Stimme – Gehör*, 39(1), 44–51. <https://doi.org/10.1055/s-0035-1545295>
- [39] Yao, D., Koivu, A., & Simonyan, K. (2025). Applications of Artificial Intelligence in Neurological Voice Disorders. *World Journal of Otorhinolaryngology - Head and Neck Surgery*, n/a(n/a). <https://doi.org/10.1002/wjo2.70017>
- [40] Zur, K. B., Cotton, S., Kelchner, L., Baker, S., Weinrich, B., & Lee, L. (2007). Pediatric Voice Handicap Index (pVHI): A new tool for evaluating pediatric dysphonia. *International Journal of Pediatric Otorhinolaryngology*, 71(1), 77–82. <https://doi.org/10.1016/j.ijporl.2006.09.004>

SUPPLEMENTS

Supplement 1: Specialist Societies involved in the creation of the german voice assessment and treatment guideline

Lead specialist society	Mandate holder
German Society of Phoniatrics and Pediatric Audiology (DGPP)	Prof. Dr. Matthias Echternach Prof. Dr. Annerose Keilmann (lead of guideline) Prof. Dr. Dirk Mürbe Prof. Dr. Anne Schützenberger
Participating specialist societies/ organisations	
German Society of Oto-Rhino-Laryngology, Head and Neck Surgery (DGHNO-KHC)	Prof. Dr. Christopher Bohr
The German Society of Pediatrics and Adolescent Medicine e.V. (DGKJ)	Dr. Cordula Koerner-Rettberg
German Society of Neurology e.V. (DGN)	Prof. Dr. Hermann Ackermann
German Society for Psychosomatic Medicine and Medical Psychotherapy e.V. (DGPM)	Prof. Dr. Georgios Paslakis
The German College of Psychosomatic Medicine and Psychotherapy e.V. (DKPM)	Prof. Dr. Georgios Paslakis
German Singing Teachers Association e.V. (BDG)	Prof. Dr. Philipp Caffier
National Association of People with Laryngectomies and Throat Surgery e.V.	Jörg Schneider
German Society for Speech Communication and Speech Training e.V. (dgss)	Prof. Dr. Susanne Voigt-Zimmermann
German Society For Music Physiology And Music Medicine e.V. (DGfMM)	Prof. Dr. Bernhard Richter
German Professional Association of Specialists in Phoniatrics and Paedaudiology e.V.	Dr. Peter Hulin
German Professional Association of Ear, Nose and Throat Doctors e.V. (BVHNO)	Dr. Karsten Nubel
German Federal Association for Academic Speech Therapy and Logopaedics (dbs)	Prof. Dr. Susanne Voigt-Zimmermann
German Federal Association of Breathing, Speech and Voice Teachers (dba)	Jutta Ottenbreit
German Federal Association for Speech Therapy e.V. (dbl)	PD Dr. Meike Brockmann-Bauser
German-speaking Society for Speech and Voice Medicine e.V. (DGSS)	Prof. Dr. Ulla Beushausen Prof. Dr. Rainer Schönweiler

Supplement 2: specification of guideline classifications of the AWMF

Translated excerpt from the AWMF website (*Stufenklassifikationen*, Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften (AWMF, 2025 b):

If it is an S2k guideline,

1. The guideline group is representative of the target audience and representatives of the relevant professional association(s) and/or organisation(s), including patients/citizens, are involved in the guideline development at an early stage (see AGREE II, criteria 4 + 5).
2. Are the methods for formulating the recommendations clearly described? Formal consensus techniques are required for this, for example, consensus conference, nominal group process, or Delphi method (see AGREE II criterion 10).
3. Each recommendation is discussed and agreed upon within the framework of a structured consensus-building process under neutral moderation, the objectives of which are to resolve outstanding decision-making issues, to finalise the grading of the recommendations, and to measure the strength of the consensus.
4. The guideline is accompanied by a description of the methodological approach (guideline report). Note: Recommendations from S2k guidelines do not contain schematic information on levels of evidence and recommendation, as they are not based on a systematic review of the evidence. Information on the validity period and updating of the guideline is available (see AGREE II criterion 14) and a contact person for updating is named. For "living guidelines," the planned update periods are specified; these are a maximum of 12 months.
5. The guideline is finally approved by the executive boards of all participating professional societies and organisations.

Supplement 3: 7 steps of consensus building

The process of structured consensus building was based on the approach of the National Institutes of Health (NIH) and consisted of 7 steps:

1. Explanation of the methodology guidelines classified as “S2k”, meaning “consensus based” guideline. Disclosure of declarations of interest and handling of identified conflicts of interest.
2. Brief introduction to the core content by the experts, opportunity for queries and discussion of the overall draft text and the literature.
3. Appraisal of the results of the preliminary vote, the recommendations (incl. grading) and statements.
4. Queries and discussion by the plenary; if necessary, introduction of new proposals or amendments (in addition to those from the online preliminary vote) and statements.
5. Questions and discussion by the plenary; if necessary, introduction of new proposals or amendments (in addition to those from the online preliminary vote).
6. Voting on all recommendations and recommendation grades, the core statements and, if necessary, the alternative proposals.
7. If there is no consensus: continuation of the discussion and new vote

Supplement 4: Voice range profile types and elicitation tasks of the german voice assessment and treatment guideline

Voice range profile type	Verbal instruction (translated from German)
Speaking voice	“Can you please tell me how you came here today?”
Counting voice (in 4 steps a-d)	“Please count from 20 to 30 with a) very soft voice, b) comfortable voice intensity, c) elevated voice intensity, as if you would speak to three people in this room, d) elevated voice intensity, so you can be heard in the next room”
Calling voice	“Please call as loudly as you can: Hello Anton, come here! Please repeat three times.”
Singing voice	“Please sing the syllable “la” as softly as you can, from a medium pitch downwards, three times. Please sing the syllable “la” as softly as you can upwards, three times.” These instructions are then repeated, adding “as loudly as you can.”